Registration No.1246

JAXA-QTS-2050E 29 June 2021

Superseding JAXA-QTS-2050D Cancelled 29 June 2021

RESISTORS, HIGH RELIABILITY, SPACE USE, GENERAL SPECIFICATION FOR

JAXA JAPAN AEROSPACE EXPLORATION AGENCY This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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Revision	Date	Description
NC	31 March 2004	Original
A	20 Sept. 2007	(1) Revised to reflect the changes associated with revision from JAXA-QTS-2000B to JAXA-QTS-2000C.
		<ul> <li>Changed "NASDA ****" to "JAXA ****" in the part number definition.</li> </ul>
		(2) Changed the requirements of film chip resistors to cover the added types.(Appendix E)
		<ul> <li>Table E-3 Added a symbol indicating resistance temperature characteristics.</li> </ul>
		• Paragraph E.1.3.3 Changed to represent the nominal resistance by 3 digit for F deviation (±1.0%).
		• Table E14 Changed the voltage to measure resistance.
		(3) Added requirements on jumper resistors.(Appendix E)
		• Paragraph E.1.3 Added the part number definition.
		<ul> <li>Paragraph E.3 Added specific requirements</li> <li>Paragraph E.4.2 Specified inspection items and sample sizes for qualification conformance inspection.</li> </ul>
		<ul> <li>Figures E-1 through E-4 Specified the dimensions of board for installation</li> </ul>
		• Paragraph E.4.4.5 to E.4.4.8 Specified load conditions for each test.
		(4) Clarified the inspection lots for qualification conformance inspection (Appendixes A, B, E and F)
		<ul> <li>(5) Other changes for clarification and consistency of the requirements.</li> <li>Paragraph 2.2 Reflected the revision of NASDA Parts Application Handbook from NASDA-HDBK-4 to JERG-0-035.</li> </ul>
		<ul> <li>Added "In-Process Inspection", "Long-Term Storage", "Change of Tests ar Inspections", "Preparation for Delivery" and "Note" in each appendix.</li> </ul>
В	23 June 2009	(1) Reflected the required specification including the additional styles for chi fixed film resistor (Appendix E)
		• Table E-2: Changed the rated power for the style "CRK".
		Table E-3: Added symbols indicating resistance temperature characteristic
		• E.4.3.1: Changed inspection lot selection for quality conformance inspection.
		• E.4.4.2: Added a glass woven base epoxy resin base material copper-clad laminate, printed wiring board for usable material in the test.
		(2) Clarified the test conditions in Life and Power conditioning in each appendix.
		(3) Clarified the description of inspection lot for quality conformance inspection (H.4.3.1)
		(4) Other changes: Corrected errors.
С	12 July 2010	(1) Added required specification (Appendix J) of Chip fixed metal film resisto

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Revision	Date	Description
	Date	<ul> <li>(1) Reflected the contents of Notification of Change 1 to the main text (Appendix E and J)</li> </ul>
		<ul> <li>(2) Reviewed the requirements of RESISTOR NETWORKS, FIXED, FILM (Appendix D)</li> </ul>
D	11 June 2013	· Paragraph 1.3: Modified the part number
J	11 Julie 2013	· Paragraph 3.3.1: Modified the marking on the product
		• Tables D-10, D-12 and D-13: Modified the quantity of allowable defects
		· Paragraph D.4.3.1: Clarified the definition of inspection lot of Quality conformance inspection
		(1) Cover: Changed corporate name.
		(2) Paragraph 4.4.3: As for sample size, added that the samples had to include all types of construction and materials used for products, which we within the qualification coverage. Furthermore, added description that manufacturer had to take counsel with JAXA to select sample to typify qualification coverage.
		(3) Deleted paragraphs 3.1.3 and 3.1.4.
		(4) Paragraph 3.1.5: changed paragraph number as "3.1.3 Change of Qualification Coverage".
		(5) Reconsidered requirement specification of power type, wire wound, fixe resistors (Appendix G).
		· Paragraph G.1.3: Specified the part number except for RWS.
		• Paragraph G.1.3.1: Added description that the configuration except for R
		had to be specified in detail specification.
		<ul> <li>Paragraph G.1.3.4 Table G-5 and Table G-6: Added tolerance of resistant value ±0.1% (symbol B).</li> </ul>
		• Paragraph G.3.2.4.2: Added description that solderability test was not applicable to weldable terminals.
E	29 June 2021	· Paragraphs G.3.3, G.4.4.2 and Table G-7: Added "mass" in item name.
	29 June 2021	• Paragraph G.3.4 b): Changed average winding pitch from five times to for times. Furthermore, added provision when the average winding pitch was equal to or more than four times.
		· Paragraphs G.3.4.2, G.4.4.3.2, and Table G-7 and Table G-8: Added
		radiographic inspection as requirement. · Paragraphs G.3.6.1 and G.4.4.4.1: Clarified confirmation items after tests
		<ul> <li>Paragraphs G.3.7.3, G.4.4.5.3, and Table G-7 and Table G-9: Added resistance to soldering heat test as requirement.</li> </ul>
		• Table G-7 Note( <sup>2</sup> ): As for sample size, specified that the size had to be judged on the basis of acceptable quality level (AQL) 1.0% or 10 samples,
		whichever was greater.
		<ul> <li>Table G-7 Note(<sup>3</sup>): Deleted.</li> <li>Table G-7 Note(<sup>5</sup>): Added description that in-process inspection could be</li> </ul>
		replaced by radiograph inspection records.
		$\cdot$ Table G-8: Added Notes ( <sup>1</sup> ) and ( <sup>5</sup> ).
		• Paragraph G.4.4.1: Added d) magnification of external visual inspection a
		common requirement for test methods.
		<ul> <li>General: Clarified magnification of visual inspection as 5x to 20x.</li> <li>Furthermore, clarified provision in case of conflict.</li> </ul>

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dimen	graphs G.4.4.2.1 and G.4.4.2.2: Reco sions and defined that provision of qu lity conformance inspection.	•	,
mass	graphs G.4.4.2.1 and G.4.4.2.2: Reco and defined that provision of qualifica conformance inspection.	•	,
	graph G.4.4.3.1: Changed "DPA man compose of quality assurance progra	-	dures et al,
added	graph G.4.4.3.1 b): On the basis of M provision of "close adhesion state of f cap and lead wire".		
	graph G.4.4.5.1.2: Added plating crite test of cable terminals.	ria to e) inspection	after tests of
Paragraph G.4.4.6.5: Clarified that solvent types had to be in accord with Test Method 215 of MIL-STD-202 and clarified that solvents had specified in detail specification when the solvent type was limited.			

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		· · · ·		
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	JAXA-QTS-2050EJAXA29 June 2021Parts Specification						
		RESISTORS,					
		IIGH RELIABILITY, SPACE USE, GENERAL SPECIFICATION FOR					
1.	GENERAL						
1.1	Scope						
	for space use, high reliab electronic equipment inst QTS-2000 (Common Par	shes the general requirements and ility, fixed resistors (hereinafter refe alled on spacecrafts. This specifica ts/Materials, Space Use, General S ansition to the qualified manufacturi ns.	erred to as "resist ation complies wi Specification for)	tors") used for ith JAXA- which was			
	a) NASDA-QTS-55182 Specification for	G Resistors, Fixed, Film, High R	eliability, Space	Use, General			
	b) NASDA-QTS-39017 Space Use, General		ed Small), High F	Reliability,			
	c) NASDA-QTS-83401 General Specificatio	A Resistor Networks, Fixed, Filn	n, High Reliability	/, Space Use,			
	d) NASDA-QTS-55342 General Specificatio		ligh Reliability, S	pace Use,			
	e) NASDA-QTS-1059 General Specificatio	Resistor Networks, Chip, High n for	n Reliability, Spac	ce Use,			
	f) NASDA-QTS-39007 Space Use, General	B Resistors, Fixed, Wire Wound	(Power Type), H	igh Reliability,			
	g) NASDA-QTS-39009	-	( , , , , , , , , , , , , , , , , , , ,	hassis-			
1.2	Terms and Definitions						
	The definitions for terms a) Resistance-temperat	used herein are as follows and as s ure characteristics	specified in JAXA	-QTS-2000.			
	The relative change	(average coefficient) in the resistar d by the temperature difference. G					
	temperature express	cal difference between reference to ed in degrees Celsius.	emperature and t	est			
	r D	e at reference temperature ce at test temperature					
, -	-	o at test temperature					
1.3	Classification Products covered by this	specification shall be classified as	specified in Table	e 1.			

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#### 1.4 Part Number

The part number shall be in accordance with paragraph A.3.1.4 of JAXA-QTS-2000. The details shall be in accordance with each appendix.

Classification	Style	Appendix	Corresponding QPL Specification
Resistors, Fixed, Film	RNS 50, 55, 60, 65, 70 RNS 90C, 90P	А	NASDA-QTS-55182G
Resistors, Fixed, Film (Insulated Small)	RLS 05C, 07C, 20C, 32C,42C RLS 05T, 07T, 20T, 32T, 42T	В	NASDA-QTS-39017C
Resistor Networks, Fixed, Film		D	NASDA-QTS-83401A
Resistors, Chip, Fixed, Film	RMS 06, 10, 12, 15, 20, 35 CRK 2H, 4H, 8H, 10H, 16H SCR 16, 20,32, 35, 50 WCR 32, 50, 64	E	NASDA-QTS-55342A
Resistor Networks, Chip,	RZCS 16	F	NASDA-QTS-1059
Resistors, Fixed, Wire Wound, Power Type	RWS 80, 81, 83, 84, 89	G	NASDA-QTS-39007B
Resistors, Fixed, Wire Wound (Power Type, Chassis-Mounted)	RES 40, 50, 60, 65, 70, 75	Н	NASDA-QTS-39009A
Resistor, Chip, Fixed, Metal Film	1005, 1608, 2012, 3216, 3225	J	_

### Table 1. Classification

### 2. APPLICABLE DOCUMENTS

#### 2.1 Applicable Documents

The documents listed below form a part of this specification to the extent specified herein. These documents are the latest issues available at the time of contract award or application. If it is necessary to designate an issue, the issue shall be specified in the detail specification.

### a) JAXA-QTS-2000 Common Parts/Materials, Space Use, General Specification for

- b) JIS B 7502 Micrometer Callipers
- c) JIS B 7507 Vernier, Dial and Digital Callipers
- d) JIS B 7601 Trip Balances
- e) JIS C 5201-1 Fixed Resistors for Use in Electronic Equipment Part 1: Generic Specification
- f) JIS K 8839 2-Propanol
- g) JIS Z 3197 Testing Method for Soldering Fluxes
- h) JIS Z 9015-1 Sampling Procedures for Inspection by Attributes Part 1: Sampling Plans Indexed by Acceptable Quality Level (AQL) for Lot-by-Lot Inspection
- i) MIL-STD-202 Test Method Standard, Electronic and Electrical Component Parts
- j) MIL-STD-1276 Interface Standard, Leads for Electronic Component Parts

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	,	ndard Test Method for Total Mas Ils from Outgassing in a Vacuum		cted Volatile
2.2	Reference Documents Following document is a r	eference document.		
	a) JERG-0-0035	NASDA Parts Application Hand	book	
2.3	<ul><li>documents, the following</li><li>a) Detail specification</li><li>b) This specification</li><li>c) JAXA-QTS-2000</li></ul>	etween the text of this specification order of precedence shall be app s of this specification (paragraph	lied.	
2.4	detail specification. The detail specification sh accordance with Section A	the style and performance of the all be prepared and implemented A.4 of JAXA-QTS-2000. The deta ne Japan Aerospace Exploration	l by a manufactur	er in shall also be
2.4.1	Detail Specification Nur The detail specification with paragraph A.2.2.2 Example: <u>JAXA-QTS-20</u>	number shall be indicated in the of JAXA-QTS-2000.	following form in a	accordance
	This specificati number		Revision lette	er
2.4.2	Revision Letter of the D A revision letter in the o paragraph A.2.2.2.4 of	etail specification number is assi	gned in accordan	ce with
2.4.3	Independency of Detail The detail specification accordance with paragr	shall be a stand-alone document	with a unique nu	mber in
2.4.4	Format of Detail Specifi	cation		

The detail specification format shall be in accordance with item b), paragraph A.6. of JAXA-QTS-2000 and shall specify each requirement in accordance with section A.4 of JAXA-QTS-2000.

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	<u> </u>	<u></u>	<u></u>
3. REQUIREMENTS			
3.1 Certification			
3.1.1 Qualification Coverage			
Qualification coverage	shall be as specified in each apper	ndix.	
3.1.2 Initial Qualification			
manufacturer shall esta 3.2.1, perform the quali certification status from	of the resistors in compliance with blish a quality assurance program fication tests as specified in parag JAXA as specified in paragraph 3 sted on the Qualified Manufacture XA QML).	in accordance w raph 4.4, and acc .4.1 of JAXA-QT	ith paragraph quire a S-2000.  The
3.1.3 Change of Qualification	Coverage		
•	tion coverage, the manufacturer s nce with paragraph 3.4.3 of JAXA-		edures for re-
3.2 Quality Assurance Progra	m		
3.2.1 Establishment of a Qua	lity Assurance Program		
responsible for establis specified in paragraph manufacturer shall gen paragraph 3.3.2 of JAX	in compliance with this specification hing a quality assurance program 3.3.1 of JAXA-QTS-2000 and this serate a quality assurance program A-QTS-2000 and provide the plan raph 3.3.6 of JAXA-QTS-2000.	that satisfies the specification. Th plan in accordar	requirements e ice with
3.2.2 TRB Formation			
•	n status in compliance with this sp the Technical Review Board (TRB A-QTS-2000.		
3.3 Materials			
specification. A material r	acturing the resistors shall be in ac not specified shall satisfy the requi he manufacturing conditions of the	rements of this s	pecification
3.3.1 Outgassing			
following requirements a) Total Mass Loss (1	fied, organic materials used for res when tested in accordance with AS FML): 1.0% or less Condensable Material (CVCM): 0.2	STM E 595.	y the

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3.4	•	hall be in accordance with each a cified in the detail specification.	ppendix. Detaile	d	
3.5	Externals, Dimensions and Marking The externals, dimensions, mass, marking and other requirements shall be in accordance with each appendix.				
3.6	Workmanship The workmanship of the re	esistors shall be in accordance wi	th each appendix		
3.7	Rating The rating of the resistors	shall be in accordance with each	appendix.		
3.8	Electrical Performance Electrical performance of	the resistors shall be in accordanc	ce with each appe	endix.	
3.9	Mechanical Performance Mechanical performance of the resistors shall be in accordance with each appendix.				
3.10	Environmental Performance Environmental performance of the resistors shall be in accordance with each appendix.				
3.11 4. C	Durability Durability of the resistors QUALITY ASSURANCE PR	shall be in accordance with each a OVISIONS	appendix.		
4.1	General Requirements The manufacturer shall be specified in paragraph 3.2	e responsible for implementing the and operating the TRB.	quality assuranc	e program	
4.2	Classification of Test and The tests and inspections accordance with paragrap a) In-process inspection b) Qualification test c) Quality conformance	shall be classified into the followir h 4.3 of JAXA-QTS-2000.	ng three categori	es in	
4.3	process to detect any failu products, assure the work measured using the finish	erform the in-process inspections of the which could seriously affect the manship, and characterize proper ed products. The manufacturing f shall define the inspection process	e reliability and qu ties which canno lowchart in the q	uality of the t be uality	

process inspections are shown below.

	JAXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	- 6 -
4.4	or sampled inspection b) Physical and chemical sampled inspection for c) Characterization of se sampled inspection) Qualification Test	tion of semi-finished products (100 n) Il inspection of semi-finished products for non-destructive inspection) emi-finished products (100% non-o	ucts (destructive o	or 100% or
4.4.1	•	factured in accordance with the pr program and shall also typify the		•
4.4.2	Manufacturing Records			
	certification, receiving ir	intends to acquire certification stanspection data or test data of mate inspection data or test data of mate iration, and in-process inspection equest.	erials used, work	records
4.4.3	accordance with each a Samples shall include a qualification coverage a	ts, number of samples and sampli appendix. Il types of construction and mater at minimum resistance value, critic lue. The manufacturer shall take	ials used for prod al resistance valu	ucts within le and
4.4.4	Criteria for Pass/Fail			
	failure of the qualification equal to the specified a	ne qualification tests specified in e on tests. If the observed number of cceptance number, but the failure oen or short circuit where the funct alification test.	f defects are less mode of the defe	s than or ect is
4.4.5	same inspection lot that	e qualification test shall not be del t have passed the qualification tes ality conformance inspections.	•	
4.5	Quality Conformance Insp	ection		
4.5.1	Quality Conformance In All products shall be sul	spection (Group A) bjected to Group A inspections at	the time of produ	ction.

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4.5.1.1		ples for Group A inspection lots sh ions of the quality assurance prog		part of the
4.5.1.2	•	Sample Size inspection order, the number of s is shall be in accordance with eac	•	pling method
4.5.1.3	failure of the Group A equal to the specified catastrophic such as	n Group A inspections specified in a inspections. If the observed num acceptance number, but the failu open or short circuit where the fur the Group A inspection. Details s	ber of defects ar re mode of the de action of the resis	e less than or efect is tor might be
4.5.1.4	Disposition after Insp The lots rejected in th specified in each app	e Group A inspection shall not be	delivered. Detai	is shall be
4.5.2	<ul> <li>Group B and C inspection</li> <li>schedule.</li> <li>a) The Group B inspection</li> <li>manufactured within</li> <li>b) The Group C inspection</li> <li>products were manufactured</li> </ul>	spection (Group B and C) ons shall be performed in accorda ction shall be performed using sau n the certification period. action shall be performed prior to the sufactured within the previous cert anted without performing a quality	mples from the fir ne restart of prod ification period ar	rst products uction if no
4.5.2.1	Sample Inspection lots for Gro passed Group A insp	oup B and C inspections shall con ections.	sist of samples th	nat have
4.5.2.2	accordance with each	Sample Size number of samples of Group B ar appendix. Sampling method sha ary shape and resistance or shall b	all be constant sa	mpling from
4.5.2.3	constitute failure of th observed number of o number, but the failur	ction in Group B or C inspection s le quality conformance inspection defects are less than or equal to th re mode of the defect is catastroph tion of the resistor might be lost, th on.	of each group. If ne specified acce nic such as open	f the ptance or short

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4.5.2.4	The samples used for samples fail in the Gr analysis on the defec manufacturing proces	ections the Group B and C inspections s oup B or C inspections, the manu t and take corrective actions on a ses. Delivery of the products sha of corrective actions.	facturer shall con pplicable materia	duct a failure ls and/or
4.6	Method for Test or Inspec	ion		
4.6.1	Externals, Dimensions a The externals, dimensions tested in accordance wi	ns, marking and other requireme	nts of the resistor	s shall be
4.6.2	Workmanship The workmanship of the	e resistors shall be tested in accor	rdance with each	appendix.
4.6.3	Electrical Performance The electrical performan appendix.	nce of the resistors shall be tested	d in accordance w	<i>i</i> ith each
4.6.4	Mechanical Performanc The mechanical perforn appendix.	e nance of the resistors shall be tes	ted in accordance	e with each
4.6.5	Environmental Performa The environmental perfo appendix.	ance ormance of the resistors shall be	tested in accorda	nce with each
4.6.6	Durability The durability of the res	istors shall be tested in accordan	ce with each appe	endix.
4.7	Long-Term Storage			
4.7.1	When products have be after the Group A inspe	ed for a Long-Term at the Manufa en stored at the manufacturer's s ction, the manufacturer shall perfo e prior to delivery. Only the resist products.	ite for 24 months orm 100% inspec	tion for
4.7.2	Storage by Purchasers Storage conditions and specification.	the storage time limit shall be in a	accordance with t	ne detail
	Change of Tests and Insp Any change in the in-proce	ections ess inspection and quality conforr	mance inspection	specified

Any change in the in-process inspection and quality conformance inspection specifie shall be made in accordance with paragraphs 4.4 and 6.1 of JAXA-QTS-2000.

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	29 June 202 I	Parts Specification			
-	PREPARATION FOR DELIN Preparation for delivery shal QTS-2000.	/ERY I be as follows and in accordance	with paragraph 5	of JAXA-	
5.1	manufacturer to the purch a) Unit packaging Each resistor shall be b) Whole packaging Individually packaged materials to protect th	ropriately packaged as high reliab aser. e packaged separately using appro d resistors shall be placed in a con ne products. Additional requireme nent documents, if required.	opriate case mate	erials.	
5.2	<ul> <li>5.2 Marking on Package</li> <li>The following shall be marked on the unit package or the whole package.</li> <li>a) Part name</li> <li>b) Part number</li> <li>c) Applicable specification number</li> <li>d) Lot identification code</li> <li>e) Purchaser's name</li> <li>f) Manufacturer's name</li> <li>g) Quantity of packages</li> <li>h) Date of inspection</li> <li>i) Inspection result</li> </ul>				
6.	NOTES				
6.1	Notes for Manufacturer				
6.1.1	The manufacturer shall	ration of Application Data Sheet prepare the application data shee nd register it with JAXA.	t in accordance v	vith Appendix	
6.1.2	To acquire certification	of a resistor qualified by other mai with the qualified resistor includir			
6.2	Notes for Acquisition Offic Detailed product data and	ers notes shall be specified in the ap	plication data she	eet.	
6.2.1	•	nanufactured in compliance with th ng information.	nis specification, t	the purchaser	

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c) Detail specification number

d) Test data or source inspection results shall be submitted for delivery

e) Others

As mentioned in e), requirements other than those defined in this specification may be specified for special applications. However, if the requirements conflict with the existing requirements in this specification, the manufacturer shall not indicate that the resistor complies with this specification.

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29 June 20	21	Faits Specification		
		APPENDIX A		
		RESISTORS, FIXED, FILM		
A.1. General.				A-′
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A.1.2 Clas	sification			A-
A.1.3 Part	Number			A-
A.1.3.1	Style and Te	rmination Type		A-2
A.1.3.2	Characterist	cs		A-2
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This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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		APPENDIX A		
		RESISTORS, FIXED, FILM		
A.1. (	General			
A.1.1	Scope			
	•	ishes the general requirements ar	nd quality assurance	provisions
	••	stors (hereinafter referred to as "re		
A.1.2	Classification			
, 1.2		/ this specification shall be classifi	ed as specified in Ta	able A-1
		Table A-1. Classification		
	Construction	Style and termination type	Terminal type	
	Mold type	RNS50, 55, 60, 65, 70	Lead	
	Mold type	RNS90C	Lead	
	Mold type	RNS90P	Square lead	
	,,		-	
Λ 1 3				
A.1.3	Part Number	I he indicated as follows . Defer t	o the dotail on ocifica	
A.1.3	Part Number The part number sha	Ill be indicated as follows. Refer to	o the detail specifica	ation for
A.1.3	Part Number	all be indicated as follows. Refer to	o the detail specifica	ation for
A.1.3	Part Number The part number sha details.	all be indicated as follows. Refer to hber for all resistor types except fo		ation for
A.1.3	Part Number The part number sha details. Example 1: Part num	ber for all resistor types except fo	or RNS90	
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A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type	nber for all resistor types except fo - <u>J</u> - <u>1001</u> I Characteristic Nominal re	or RNS90 - <u>F</u> esistance Resistan	<u>-</u>
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type	nber for all resistor types except fo - <u>J</u> - <u>1001</u>	or RNS90 - <u>F</u>	<u>-</u>
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type	nber for all resistor types except fo - <u>J</u> - <u>1001</u> d Characteristic Nominal re .3.2) (A.1.3.3)	or RNS90 - <u>F</u> esistance Resistan	<u>-</u>
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1. Example 2: Part num	nber for all resistor types except fo - <u>J</u> - <u>1001</u> Characteristic Nominal re .3.2) (A.1.3.3) nber for RNS90	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4)	<u>-</u> ce tolerand
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1. Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> -	nber for all resistor types except fo - <u>J</u> - <u>1001</u> Characteristic Nominal re .3.2) (A.1.3.3) nber for RNS90 <u>C</u> - <u>100k00</u> -	or RNS90 - <u>E</u> esistance Resistan (A.1.3.4) <u>A</u> -	<u>-</u> ce tolerano
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1. Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> - Style and	nber for all resistor types except fo - <u>J</u> - <u>1001</u> Characteristic Nominal re .3.2) (A.1.3.3) nber for RNS90 <u>C</u> - <u>100k00</u> - Device Nominal	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch	<u>-</u> ce tolerand
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1. Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> -	nber for all resistor types except fo - J - <u>1001</u> Characteristic Nominal re .3.2) (A.1.3.3) nber for RNS90 <u>C</u> - <u>100k00</u> - Device Nominal tructure resistance toleran	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch	<u>-</u> ce tolerand
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1.1 Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> - Style and termination type st (A.1.3.1) (A.1.3	nber for all resistor types except fo - J - <u>1001</u> Characteristic Nominal re .3.2) (A.1.3.3) nber for RNS90 <u>C</u> - <u>100k00</u> - Device Nominal tructure resistance toleran	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch nce (A.1.3.2)	<u>-</u> ce tolerand <u>Y</u> naracteristic
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1.4 Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> - Style and termination type st (A.1.3.1) (A.1.4 Note: <sup>(1)</sup> "JAXA" indic	ther for all resistor types except for - <u>J</u> - <u>1001</u> Characteristic Nominal results (A.1.3.3) (A.1.3.3) Ther for RNS90 <u>C</u> - <u>100k00</u> - Device Nominal tructure resistance tolerant (A.1.3.3) (A.1.3.4)	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch nce (A.1.3.2) se and may be abbr	<u>Y</u> naracteristic
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1.4 Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> - Style and termination type st (A.1.3.1) (A.1.4 Note: <sup>(1)</sup> "JAXA" indic	ther for all resistor types except for - J - 1001 Characteristic Nominal results (A.1.3.3) (A.1.3.3) Ther for RNS90 <u>C</u> - 100k00 - Device Nominal tructure resistance tolerant (A.1.3.3) (A.1.3.4) ates the common part for space u	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch nce (A.1.3.2) se and may be abbr	<u>Y</u> naracteristic
A.1.3	Part Number The part number sha details. Example 1: Part num JAXA <sup>(1)</sup> <u>RNS55</u> Style and termination type (A.1.3.1) (A.1.4 Example 2: Part num JAXA <sup>(1)</sup> <u>RNS90</u> - Style and termination type st (A.1.3.1) (A.1.4 Note: <sup>(1)</sup> "JAXA" indic	ther for all resistor types except for - J - 1001 Characteristic Nominal results (A.1.3.3) (A.1.3.3) Ther for RNS90 <u>C</u> - 100k00 - Device Nominal tructure resistance tolerant (A.1.3.3) (A.1.3.4) ates the common part for space u	or RNS90 - <u>F</u> esistance Resistan (A.1.3.4) <u>A</u> - Resistance Ch nce (A.1.3.2) se and may be abbr	<u>Y</u> naracteristic

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A.1.3.1	a two-digit num terminal type sh	ermination type s ber. The "RNS"	indicates the higl 2. The two-digit	by a three letter sy h reliability, fixed, f number indicates t	ilm resistors of the
	<b></b>	Table A	-2. Terminal Ty	pe	
	Symbo	ol	Term	ninal	
	RNS		Solderable a	nd weldable	
	accordance with		nce-Temperature	e Characteristic	
		Resistance-temp	erature characteris	stic (referenced:25°C	Unit: x10 <sup>-6</sup> /°
Symbol	-55°C or more and less than -15°C	-15°C to +65°C	More than +65°C to +125°C	More than +125°C to +150°C	More than +150°C to +175°C
S	±2.5	±2.5	±2.5	±3.5	±4.5
Α	±5	±2.5	±5	±6	±7
Y	±5	±5	±5	±10	±10
В	±10	±10	±10	±10	±10
J	±25	±25	±25	±25	±25
Н	±50	±50	±50	±50	±50
К	±100	±100	±100	±100	±100
A.1.3.3	Nominal Resist The nominal res characters.		fied in ohms (Ω)	by 4 digits or 6 alpl	nanumeric

five digits represent significant figures.

 For resistors of nominal resistance greater than 10ohms but less than 1kilohm, the letter "R" shall represent a decimal point. Example: 10R000= 10.000Ω 100R00=100.000Ω

							1	
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<ul> <li>2) For resistors of nominal resistance greater than 1kilohm but less than 1megohm, the letter "k" shall represent a decimal point. The unit shall be kilohm.</li> <li>Example: 1k2100= 1,210.0Ω= 1.2100kΩ 100k00=100.000 Ω=100.00 kΩ</li> </ul>								
b) Resistar								
±0.25% ( figures a ohm are a decima	<ul> <li>b) Resistance identified by 4 digits The resistance identified by 4 digits applies to resistors with resistance tolerances of ±0.1% (B), ±0.25% (C), ±0.5% (D), ±1.0% (F), or ±2.0% (G). The first three digits represent the significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures. Example: 97R6= 97.6 Ω 1500= 150 Ω 1501= 1,500 Ω= 1.50kΩ 1503=150,000 Ω=150 kΩ</li> <li>A.1.3.4 Resistance Tolerance The resistance tolerance is identified by a single capital letter in accordance with Table A-4.</li> </ul>							
		10		sistance Tole	oranoo		. 0/	
	Symbol	Resistan	ice tolerance	Symbol	Res	Unit: istance tolerance	<u>~~</u>	
	V			C	1.05		-	
			0.005	_		±0.25	_	
	T		±0.01	D		±0.5	_	
	Q	4	0.02	F		±1.0	_	
	Α	±	0.05	G		±2.0		
	B ±0.1							
1								

### A.1.3.5 Device Structure

The device structure of RNS90 style is identified by a single capital letter following the symbol "RNS90" in accordance with Table A-5.

Symbol	Device structure
С	Cylinder type with more than two internal connecting points
Р	Plate type with two internal connecting points

# Table A-5. Device Structure

JAXA-QTS-2050E	JAXA	Page	– A-4 –
29 June 2021	Parts Specification	гауе	- <del>A-4</del> -
Applicable Documents			
Applicable Documents			
The applicable docume	nts shall be as specified in paragra	aph 2.1 of JAXA-	QTS-2050.
Reference Documents			
The following is a refere a) MIL-PRF-55182	Resistors, Fixed, Film, Nonest		•
Requirements			
Qualification Coverage			
conforms to materials, of in paragraphs A.3.2 to A samples that have pass	lesigns, constructions, specification A.3.9. The qualification coverage and the qualification test.	ons and performa shall be represen	nce specified ited by
	29 June 2021 Applicable Documents Applicable Documents The applicable docume Reference Documents The following is a refere a) MIL-PRF-55182 Requirements Qualification Coverage Qualification shall be va conforms to materials, o in paragraphs A.3.2 to A samples that have pass	29 June 2021       Parts Specification         Applicable Documents       Applicable Documents         Applicable Documents       The applicable documents shall be as specified in paragraments         Reference Documents       The following is a reference document.         a)       MIL-PRF-55182       Resistors, Fixed, Film, Nonest Established Reliability, and Sp Specification for         Requirements       Qualification Coverage       Qualification shall be valid for resistors that are produced conforms to materials, designs, constructions, specification in paragraphs A.3.2 to A.3.9. The qualification coverage samples that have passed the qualification test.	29 June 2021       Parts Specification       Page         Applicable Documents       Applicable Documents       Applicable Documents         The applicable documents shall be as specified in paragraph 2.1 of JAXA-       Reference Documents         The following is a reference document.       a)       MIL-PRF-55182         Resistors, Fixed, Film, Nonestablished Reliabilitie       Established Reliability, and Space Level, Gener         Specification for       Requirements         Qualification Coverage       Qualification shall be valid for resistors that are produced by the manufacture conforms to materials, designs, constructions, specifications and performa in paragraphs A.3.2 to A.3.9.

Characteristics and resistance tolerance of the resistors to be qualified shall be classified as specified in Tables A-6 and A-7. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification. If necessary, additional qualification coverage shall be specified in the detail specification.

Characteristic submitted	Characteristic qualified	Characteristic submitted	Characteristic qualified
S	S, A, Y, B	J	J, H, K
A	Α, Υ, Β	Н	Н, К
Y	Υ, Β	К	К
В	В		

 Table A-6.
 Characteristics Qualification

Table A-7.	Resistance	Tolerance	Qualification
------------	------------	-----------	---------------

Resistance tolerance submitted	Resistance tolerance qualified
V	V, T, Q, A, B, C, D, F, G
Т	T, Q, A, B, C, D, F, G
Q	Q, A, B, C, D, F, G
A	A, B, C, D, F, G
В	B, C, D, F, G
С	C, D, F, G
D	D, F, G
F	F, G
G	G

J	AXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– A-5 –
		I		<u> </u>
A.3.2	Materials The materials shall be s QTS-2050.	specified as follows and as specifie	ed in paragraph 3	.3 of JAXA-
A.3.2.1	Base Substance (Co The volume resistivity temperature of 300°C	of the base substance shall be 10	) <sup>8</sup> Ω·cm or more a	at a
A.3.2.2	Copper Wire Copper wire used as MIL-STD-1276, or its	a resistor terminal shall be made o equivalent.	of materials which	n conform to
A.3.2.3	use noncorrosive flux test shall be performe be verified that the wa	all completely remove corrosive su When non-corrosive flux is used of in accordance with paragraph 4 ater extract resistivity is not less th sed, the mass ratio range of resin t	, the water extrac .9 of JIS Z 3197, an 100kΩ·cm.  W	ct resistivity and it shall /hen resin
A.3.3	Externals, Dimensions a Resistors shall satisfy th paragraph A.4.4.2.	and Marking ne following requirements when te	sted in accordan	ce with
A.3.3.1	following shall be clea	g tering or film blemishes on the sur arly marked in such a manner to er legible at the completion of any te	nsure legibility. A	
	precludes inclusi marked as a min b) Year and week r The number of th	nanufactured ne last two digits of the calendar ye	ear and the numb	e shall be
		ndar year beginning with January me or its abbreviation.	shall be marked.	
A.3.3.2	resistor element shall	sions and Mass nstructed of a film resistor element be molded to protect it from moist mass shall satisfy the requirement	ure or mechanica	al damage.
A.3.4		ufactured based on good design p ce program defined in paragraph 3		

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29 June 2021	Parts Specification	. age	
blisters, thin spots, blemishes likely to Where one turn or 70% of resistor-ele shall be defined as terminals minus 1.2 b) Terminal leads The resistor's termine mechanically. The requirements. The style shall satisfy the matter or an impuring from the root. The satisfy the requirem c) Protection against The resistor eleme moisture-resistant in any portion intende 2.5mm from the root.	be uniformly deposited. The resist incomplete adhesion to substrate cause flaking or a nonuniform ribb more of spiraling is used, the spirat ment effective length. The resisto 80% of the distance between terr 2mm, whichever is longer. inal leads shall be securely conne length and diameter of the lead w width, thickness and length of the ne standards. If any lead wire is c ty, the length of the contaminated solderable and weldable lead wire nents of solderability. moisture in shall be protected against moist insulating material. The external of the lead wire. The external c uniformly applied to be free from	, discolored spots oon when spiraled aling shall occupy or-element effective ninals or the distance cted electrically a vires shall comply e lead wires for the ontaminated by m portion shall be we es shall be suitab ture by an extern coating shall not b oating shall not b	s, or other d (helixed). y no less than ye length ance between and with he RNS90P honconductive within 2.5mm ly treated to al coating of be applied to xceeding he readily
prove that no foreign properly aligned, and	ion sted as specified in paragraph A.4 particles are on the resistor eleme that there is no defect in details of sive, the resistors shall be rotated	nts, that all portic f workmanship.  I	ons are f pass/fail
terminal connections, successfully achieved	sted as specified in paragraph A.4 helical cutting, and external coatir . The internal structure shall be a However, the helical cutting requir rs.	ng shall have bee is specified in the	en quality
A.3.5 Ratings			
resistance tolerance a	lues of nominal resistance shall b and shall be as specified in Table <i>i</i> s shall satisfy the requirements of t	A-8. The minimu	m and

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29 June 2021	Parts Specification	Page	– A-7 –

	Table A-8.       Standard Resistance Values (1/2)								
			Resistar	nce toleran	ce and sym	nbols (%)			
B (±0.1)		B (±0.1)		B (±0.1)		B (±0.1)		B (±0.1)	
C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)
D (±0.5)		D (±0.5)		D (±0.5)		D (±0.5)		D (±0.5)	
10.0	10.0	13.3	13.3	17.8	17.8	23.7	23.7	31.6	31.6
10.1	-	13.5	-	18.0	-	24.0	-	32.0	-
10.2	10.2	13.7	13.7	18.2	18.2	24.3	24.3	32.4	32.4
10.4	-	13.8	-	18.4	-	24.6	-	32.8	-
10.5	10.5	14.0	14.0	18.7	18.7	24.9	24.9	33.2	33.2
10.6	-	14.2	-	18.9	-	25.2	-	33.6	-
10.7	10.7	14.3	14.3	19.1	19.1	25.5	25.5	34.0	34.0
10.9	-	14.5	-	19.3	-	25.8	-	34.4	-
11.0	11.0	14.7	14.7	19.6	19.6	26.1	26.1	34.8	34.8
11.1	-	14.9	-	19.8	-	26.4	-	35.2	-
11.3	11.3	15.0	15.0	20.0	20.0	26.7	26.7	35.7	35.7
11.4	-	15.2	-	20.3	-	27.1	-	36.1	-
11.5	11.5	15.4	15.4	20.5	20.5	27.4	27.4	36.5	36.5
11.7	-	15.6	-	20.8	-	27.7	-	37.0	-
11.8	11.8	15.8	15.8	21.0	21.0	28.0	28.0	37.4	37.4
12.0	-	16.0	-	21.3	-	28.4	-	37.9	-
12.1	12.1	16.2	16.2	21.5	21.5	28.7	28.7	38.3	38.3
12.3	-	16.4	-	21.8	-	29.1	-	38.8	-
12.4	12.4	16.5	16.5	22.1	22.1	29.4	29.4	39.2	39.2
12.6	-	16.7	-	22.3	-	29.8	-	39.7	-
12.7	12.7	16.9	16.9	22.6	22.6	30.1	30.1	40.2	40.2
12.9	-	17.2	-	22.9	-	30.5	-	40.7	-
13.0	13.0	17.4	17.4	23.2	23.2	30.9	30.9	41.2	41.2
13.2	-	17.6	-	23.4	-	31.2	-	41.7	-

# Table A-8. Standard Resistance Values (1/2)

JAXA-QTS-2050E	JAXA	Davia	
29 June 2021	Parts Specification	Page	– A-8 –

	Γ	Resistance	tolerance and s	symbols (%)	I	
B (±0.1)		B (±0.1)		B (±0.1)		
C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)	C (±0.25)	F (±1.0)	G (±2.0)
D (±0.5)		D (±0.5)		D (±0.5)		
42.2	42.2	56.2	56.2	75.0	75.0	10
42.7	-	56.9	-	75.9	-	11
43.2	43.2	57.6	57.6	76.8	76.8	12
43.7	-	58.3	-	77.7	-	13
44.2	44.2	59.0	59.0	78.7	78.7	15
44.8	-	59.7	-	79.6	-	16
45.3	45.3	60.4	60.4	80.6	80.6	18
45.9	-	61.2	-	81.6	-	20
46.4	46.4	61.9	61.9	82.5	82.5	22
47.0	-	62.6	-	83.5	-	24
47.5	47.5	63.4	63.4	84.5	84.5	27
48.1	-	64.2	-	85.6	-	30
48.7	48.7	64.9	64.9	86.6	86.6	33
49.3	-	65.7	-	87.6	-	36
49.9	49.9	66.5	66.5	88.7	88.7	39
50.5	-	67.3	-	89.8	-	43
51.1	51.1	68.1	68.1	90.9	90.9	47
51.7	-	69.0	-	92.0	-	51
52.3	52.3	69.8	69.8	93.1	93.1	56
53.0	-	70.6	-	94.2	-	62
53.6	53.6	71.5	71.5	95.3	95.3	68
54.2	-	72.3	-	96.5	-	75
54.9	54.9	73.2	73.2	97.6	97.6	82
55.6	-	74.1	-	98.8	-	91

# Table A-8. Standard Resistance Values (2/2)

# A.3.5.2 Operating Temperature Range

The operating temperature range shall be between -55 and +175°C unless otherwise specified.

# A.3.5.3 Power Rating

Resistors shall have a power rating as specified in the detail specification. The rated ambient temperature shall be 125°C unless otherwise specified.

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2	9 June	202	I		Fai	is oper	Sincatio	Л			
A.3.5.4	Maxin	num	Power								
	power maxin the de	<sup>•</sup> rati num eratir er tha	ng. Fo power ng curv an the a	r tempe shall b e show	eratures e detern 'n in Figu	in exce nined by ure A-1.	ss of th deratii In no d	e rated ng the µ case sh	ambier bower ra	nt tempera	cordance with Itage be
120											
100											
08 o											
09 Wer											
Rated power ratio (%) 09 09 08											
20											
0											
	2	20	40	60 Ambie	80 nt tempera	100 ature (°C	120 ↑ )  12	140 5	160	180 175	
							. 12	~			
				F	igure A-	1. Der	ating C	Curve			
A.3.5.5	Volta	ge R	ating								
	Resist	tors	shall h	ave a ra	ated dire	ct curre	nt (DC)	) contin	uous op	perating vo	oltage or an

rated voltage exceeds the maximum operating voltage specified in the detail specification, the maximum operating voltage shall be the rated voltage.

$E = \sqrt{P \cdot R}$	Where:
	E = Voltage rating (V)
	P = Power rating (W)
	$R = Nominal resistance (\Omega)$

# A.3.6 Electrical Performance

Resistors shall satisfy the following electrical requirements.

# A.3.6.1 Overload

When resistors are tested as specified in paragraph A.4.4.4.1, the change in resistance before and after the test of paragraph A.4.4.6.3.1 shall satisfy the

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	requirements of the d or charring after the c	etail specification. There shall be ompletion of this test.	no evidence of a	rcing, burning,
A.3.6.2	Resistance			
		sted as specified in paragraph A.4 A.4.4.1), the resistance shall be v nce.		
A.3.6.3	Resistance-Tempera	ture Characteristic		
		sted as specified in paragraph A.4 ristic, at each of the temperatures ble A-3.	-	
A.3.6.4	Dielectric Withstandir	ng Voltage		
	specified test voltage, satisfy the requirement	fied in paragraph A.4.4.4.4, resiste and the change in resistance beforts of the detail specification. The sulation breakdown or mechanica	ore and after the re shall be no evi	test shall dence of
A.3.6.5	Insulation Resistance	,		
		sted as specified in paragraph A.4 y the requirements of the detail sp		tion
A.3.6.6	Voltage Coefficient			
		nominal resistance of $1k\Omega$ or mor the voltage coefficient shall satisfy		
A.3.7	Mechanical Performanc	e		
	Resistors shall satisfy the	ne following mechanical requireme	ents.	
A.3.7.1	Terminal Strength			
	resistance before and specification. There s	sted as specified in paragraph A.4 after the test shall satisfy the requision of breaking o r other evidence of mechanical da	uirements of the o	detail minals,
A.3.7.2	Mechanical Shear			
	in resistance before a	istors are tested as specified in pa nd after the test shall satisfy the re shall be no evidence of mechanica	equirements of th	e detail

-	(A-QTS-2050E 9 June 2021	J A X A Parts Specification	Page	– A-11 –
A.3.7.3	terminal surface shall pinholes or rough are	sted as specified in paragraph A.4 be evenly covered with new sold as shall be acceptable, provided t area of the pinholes or rough are	er. The existence hat they are not c	e of small concentrated
A.3.7.4	Resistance to Solderi	ng Heat		
	resistance before and	sted as specified in paragraph A.4 after the test shall satisfy the req hall be no evidence of mechanica	uirements of the o	detail
A.3.8 E	Environmental Performa	ance		
F	Resistors shall satisfy th	ne following environmental require	ements.	
A.3.8.1	Vibration			
A.3.8.1.1	resistance before a specification. Ther	ibration tested as specified in paragraph nd after the test shall satisfy the r e shall be no electrical discontinu dence of mechanical damage afte	equirements of th ity of 0.1ms or lor	ne detail nger during
A.3.8.1.2	Random Vibratior			
	resistance before a specification. Ther	tested as specified in paragraph nd after the test shall satisfy the r e shall be no electrical discontinu dence of mechanical damage afte	equirements of th ity of 0.1ms or lor	ne detail nger during
A.3.8.2	Shock			
	resistance before and specification. There s	sted as specified in paragraph A.4 after the test shall satisfy the req hall be no electrical discontinuity of mechanical damage after the c	uirements of the o of 0.1ms or longe	detail er during the
A.3.8.3	Thermal Shock			
A.3.8.3.1	Thermal Shock [I]			
	no evidence of n	re tested as specified in paragrap nechanical damage. For the RNS e and after the test shall satisfy th	90P style, the cha	ange in
A.3.8.3.2	Thermal Shock [II	]		
	When resistors a	re tested as specified in paragrap	h A A A A B 3 2 the	o hongo in

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	completion of the	here shall be no evidence of mech e test. Fine cracks on the surface when subjected to more than 100	of resistors shall				
A.3.8.4	Moisture Resistance						
	When resistors are tested as specified in paragraph A.4.4.6.4, the change in resistance before and after the test shall satisfy the requirements of the detail specification. In addition, the dielectric withstanding voltage shall be as specified in paragraph A.3.6.4, and the insulation resistance shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.						
A.3.8.5	Resistance to Solven	ts					
	When resistors are tested as specified in paragraph A.4.4.6.5, the marking shall remain legible. The details shall be as defined in the detail specification.						
A.3.8.6	Low Temperature Sto	orage					
	When resistors are tested as specified in paragraph A.4.4.6.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.						
A.3.8.7	Low Temperature Op	eration					
	When resistors are tested as specified in paragraph A.4.4.6.7, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.						
A.3.8.8	Stability						
	resistance before and specification. The cha voltage test shall also insulation resistance a	sted as specified in paragraph A.4 after the test shall satisfy the requ ange in resistance before this test satisfy the requirements of the de after the test shall not be less than al damage after the completion of	uirements of the of and after the with tail specification. 1,000ΜΩ. Ther	detail nstanding The			
A.3.9	Durability						
	Resistors shall satisfy the	ne following durability requirement	S.				
A.3.9.1	Life (125°C)						
	When resistors are tested as specified in paragraph A.4.4.7.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.						

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A.3.9.2	resistance before and	sted as specified in paragraph A.4 after the test shall satisfy the requishall be no evidence of mechanica	uirements of the	detail				
A.4. (	Quality Assurance Provision	ons						
A.4.1	In-Process Inspection							
	The in-process inspection	on shall be as specified in paragra	aph 4.3 of JAXA-0	QTS-2050.				
A.4.2	Qualification Test							
	The qualification test sh as provided below.	all be in accordance with paragra	ph 4.4 of JAXA-C	)TS-2050 and				
A.4.2.1	Test Items and Number of Samples							
	resistance, and critical and characteristic spectric sample units shall be selected at random shift maximum resistance so If the critical resistance the minimum and maximum To qualify samples of (resistance) and III-1 ( with an additional 10 so resistance tolerance in specification, "select" passed the Group I te ranked characteristic of Tests within each group completion of Group I	es shall be 555: 185 each for mininal l resistance or nearest to critical re- scified in Table A-6 shall be qualifie subjected to the I-6, DPA, of Table hall be subjected to the Group II te shall be subjected to the Group X e is not specified, the samples sha kimum resistance. higher ranked characteristic or res (resistance-temperature character samples exhibiting the highest ran nanufactured for each resistor styl means to select the appropriate st st of Table A-9 in order to qualify a or resistance tolerance. up shall be performed in the order tests, Group III through X tests sh the appropriate group tests.	esistance. Each ed separately. Tr e A-9, and 12 sar ests. Ten sample test. all be equally divi sistance toleranc ristic) tests shall to ked characteristic le. For the purpo amples from thos as the requested	resistor style wo additiona mples s of the ded betweer e, the I-4 be performed c and use of this se which higher -9. Upon				

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		Tab	le A-9. Qu	alification	Test (1/2)		
Test			Require-			Criteria for Pass/fa	ail
Group	Order	Item	ment paragraph	Test method paragraph		Sample size	No. of defectives allowed <sup>(1)</sup>
1	1	Externals, dimensions and marking <sup>(2)</sup>	A.3.3	A.4.4.2			
	2	Thermal shock [I]	A.3.8.3.1	A.4.4.6.3.1		100% <sup>(3)</sup>	
Ι	3	Overload	A.3.6.1	A.4.4.4.1		0	
	4	Resistance	A.3.6.2	A.4.4.4.2			
	5	Radiographic inspection	A.3.4.1	A.4.4.3.1			
	6	DPA <sup>(4)</sup>	A.3.4.2	A.4.4.3.2		2 or 3	0
II 2	1	Solderability	A.3.7.3	A.4.4.5.3	- 12 <sup>(3)</sup> Any resistance		0
	2	Resistance to solvents	A.3.8.5	A.4.4.6.5	12 <sup>(3)</sup> Any re	0	
	1	Resistance-temperature characteristic	A.3.6.3	A.4.4.3	( 10	Highest resistance	
	2	Low temperature storage	A.3.8.6	A.4.4.6.6	30 { 10 10	Critical resistance Lowest resistance	1
	3	Low temperature operation	A.3.8.7	A.4.4.6.7			
	4	Terminal strength	A.3.7.1	A.4.4.5.1			
	1	Dielectric withstanding voltage	A.3.6.4	A.4.4.4.4	10	Highest resistance	
IV	2	Insulation resistance	A.3.6.5	A.4.4.4.5		Critical resistance	1
īv	3	Resistance to soldering heat	A.3.7.4	A.4.4.5.4	10	Lowest resistance	
	4	Moisture resistance	A.3.8.4	A.4.4.6.4			
	1	Shock	A.3.8.2	A.4.4.6.2	10 ]	Highest resistance	
V	2	High frequency vibration	A.3.8.1.1	A.4.4.6.1.1	30 { 10	Critical resistance	1
	3	Thermal shock [II]	A.3.8.3.2	A.4.4.6.3.2	l 10	Lowest resistance	
VI	1	Random vibration	A.3.8.1.2	A.4.4.6.1.2	30 {10 10 10	Highest resistance Critical resistance Lowest resistance	1
VII	1	Life (125°C)	A.3.9.1	A.4.4.7.1	231 {77 77 77 77	Highest resistance Critical resistance Lowest resistance	0
VIII	1	Life (70°C)	A.3.9.2	A.4.4.7.2	$102 \begin{cases} 34\\ 34\\ 34\\ 34 \end{cases}$	Highest resistance Critical resistance Lowest resistance	1

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Test		Deguire		Criteria for Pass/fail			
Group	Order	ltem	Require- ment paragraph	Test method paragraph	Sample size defe		No. of defectives allowed <sup>(1)</sup>
іх	1	Stability	A.3.8.8	A.4.4.6.8	102 (5) 34 34 34	Highest resistance Critical resistance Lowest resistance	1
х	1	Voltage coefficient	A.3.6.5	A.4.4.4.6	10	Highest resistance	0
^	2	Mechanical shear	A.3.7.2	A.4.4.5.2	10	nighest resistance	0
-	1	Materials	A.3.2	-		(6)	

Notes:

<sup>(1)</sup>When a sample has failed to pass 2 or more tests of one group, it shall be counted as a single defective.

<sup>(2)</sup> For dimensions and mass, sample size shall be 4.0% of the acceptable quality level (AQL) in "Special Inspection Level S-4" specified in JIS Z 9015-1.

<sup>(3)</sup> The samples for the Group II test shall not be subjected to the Group I test.

<sup>(4)</sup> The DPA test for RNS90 style shall be performed with 3 samples; other styles shall be tested with 2 samples.

<sup>(5)</sup> After the stability test, the 10 random samples shall be selected for each resistance (30 samples total) and subjected to dielectric withstanding voltage test (at atmospheric pressure) and the insulation resistance test.

<sup>(6)</sup> Data to certify compliance with design specifications shall be submitted.

### A.4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph 4.5 of JAXA-QTS-2050 and as provided below.

### A.4.3.1 Samples

The inspection lot for Group A inspection shall be as specified in paragraph 4.5.1.1 of JAXA-QTS-2050. Inspection lots for Group B and C inspections shall consist of samples that have passed Group A inspections. Unless otherwise specified, Group B and C inspections shall be performed for each shape. Resistors with the critical resistance or closest to the critical resistance and the highest grade of characteristics shall be selected. If the design criteria are identical and the materials and the structures are similar, the inspection lot may be represented by one of the shapes specified in the detail specification.

### A.4.3.2 Inspection Items and Number of Samples

The items and number of samples of the Group A, B and C inspections of the quality conformance inspection shall be as specified in Tables A-10, A-11 and A-12, respectively. Group tests shall be performed in the group order and the inspections within each group shall be performed in the specified order. The sampling plan used for the Group A inspection shall be in accordance with Appendix 1 of JIS Z 9015-1. "General Inspection Level II" and "Special Inspection Level S-4" specified therein

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shall apply to the Group A2 and A5 inspections, respectively. For Group B and C inspections, a pre-defined quantity of samples shall be selected from each category shown in Table A-1. The samples in each category shall be in the same form that can be arbitrary selected.

If the selected products for the higher ranked characteristic and resistance tolerance are shipped, the products shall be those which have been selected from the samples which passed the tests of Group A1. The products shall be marked with their identification code as specified, and re-examined for the resistance.

### A.4.3.3 Criteria for Pass/Fail

A failure of any test specified in Table A-10, A-11 or A-12 shall constitute failure of each inspection group of the quality conformance inspection. When the number of defects does not exceed the permitted number specified in Table A-10, but the failure mode of a defect is catastrophic, such as open- or short-circuit where the function of the resistor may be lost, the resistor fails the Group A inspections.

# A.4.3.4 Post-Test Disposition of Sample

Products from the lot rejected in the Group A quality conformance inspection shall not be shipped. If the lot has not passed the Group A2 or A5 inspection, all products of the lot shall be subjected to the failed inspection item, and only the good products shall be shipped.

Inspection			Require-	Test	Criteria for Pass/fail	
Group	Order	Item	ment paragraph	method paragraph	Sample size	No. of defectives allowed
	1	Thermal shock [I]	A.3.8.3.1	A.4.4.6.3.1		
A1	2	Overload	A.3.6.1	A.4.4.1	100%	0
	3	Resistance	A.3.6.2	A.4.4.4.2		
A2	1	Externals, dimensions and marking	A.3.3	A.4.4.2	AQL 4.0%	
A3	1	Radiographic inspection <sup>(1)</sup>	A.3.4.1	A.4.4.3.1	100%	0
A4	1	DPA <sup>(2)</sup>	A.3.4.2	A.4.4.3.2	2 or 3	0
	1	Resistance-temperature characteristic	A.3.6.3	A.4.4.4.3	AQL 2.5%	
A5	2	Dielectric withstanding voltage (atmospheric pressure)	A.3.6.4	A.4.4.4.1		
	3	Insulation resistance	A.3.6.6	A.4.4.4.5		

# Table A-10. Quality Conformance Inspection (Group A)

Notes:

<sup>(1)</sup>When radiographic inspection has been performed as a part of the in-process inspection in the manufacturing process, the inspection record may be substituted for the quality conformance inspection.

<sup>(2)</sup> The DPA test for RNS90 style shall be performed with 3 samples; other styles shall be tested with 2 samples.
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		Inspection	Require-	Test	Criteria	for Pass/fail
Group	Order	Item	ment paragraph	method paragraph	Sample size	No. of defectives allowed <sup>(1)</sup>
	1Resistance-temperature characteristicA.3.6.3A.4.4.4.3					
	2	Dielectric withstanding voltage	A.3.6.4	A.4.4.4.4		
B1	3	Insulation resistance	A.3.6.5	A.4.4.4.5	10	0
	4	Resistance to soldering heat	A.3.7.4	A.4.4.5.4		
	5	Moisture resistance	A.3.8.4	A.4.4.6.4		
B2	1	Solderability	A.3.7.3	A.4.4.5.3	5	0
D2	2	Resistance to solvents	A.3.8.5	A.4.4.6.5	5	U
	1	Low temperature storage	A.3.8.6	A.4.4.6.6		
B3	2	Low temperature operation	A.3.8.7	A.4.4.6.7	10	0
	3	Terminal strength	A.3.7.1	A.4.4.5.1		
B4	1	Life (125°C)	A.3.9.1	A.4.4.7.1	10	0
B5	1	Life (70°C)	A.3.9.2	A.4.4.7.2	10	0
B6	1	Stability	A.3.8.8	A.4.4.6.8	10	0

## Table A-11. Quality Conformance Inspection (Group B)

# Table A-12. Quality Conformance Inspection (Group C)

	Inspection		Require-	Test	Criteria for Pass/fail		
Group	Order	Item	ment paragraph	method paragraph	Sample size	No. of defectives allowed <sup>(1)</sup>	
C1	1	Shock	A.3.8.2	A.4.4.6.2	10	0	
CI	2	High frequency vibration	A.3.8.1.1	A.4.4.6.1.1	10	0	
C2	1	Thermal shock [II]	A.3.8.3.2	A.4.4.6.3.2	10	0	
C3	1	Random vibration	A.3.8.1.2	A.4.4.6.1.2	10	0	
C4	1	Voltage coefficient	A.3.6.5	A.4.4.4.6	10	0	
- 04	2	Mechanical shear <sup>(1)</sup>	A.3.7.2	A.4.4.5.2	10	0	

Note <sup>(1)</sup> This test is applied to RNS50 style resistors.

#### A.4.4 Methods for Test and Inspection

#### A.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

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	pressure of 101.3 c) Judgment condit Judgment condit Unless specified	tions shall be a 3kPa. ions ions shall be ei , condition A sh	ther condition A o	5°C and an atmos r B specified in Ta <b>ns</b>	
	Conditi		<u>е</u> А	В	]
	Temperatu		23±2	20±2	
	Relative hum	· · /	50±5	65±5	
	Atmospheric pre	• • •	86 to 106	86 to 106	-
A.4.4.2	Externals, Dimension	s and Marking			
A.4.4.2.1	<ul> <li>A.4.4.2.1 Qualification Test <ul> <li>a) The external inspection shall be performed visually.</li> <li>b) The marking test shall be performed visually.</li> <li>c) The dimensions shall be measured with a vernier caliper or micrometer compliant to JIS B 7507 and JIS B 7502, respectively. If the measured values are questionable, another measuring instrument may be used.</li> <li>d) The mass shall be measured with a trip balance compliant to JIS B 7601. If the measured values are questionable, another measuring instrument may be used.</li> </ul> </li> </ul>				
A.4.4.3	determined in ad Workmanship				
<ul> <li>A.4.4.3.1 Radiographic Inspection The radiographic inspection shall be performed in accordance with Test Method 209 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Criteria sample for radiographic inspection shall be prepared and inspection results shall be judged in accordance with the criteria sample.</li> <li>b) When a test lot is evaluated as defective in the Group A quality conformance inspection, the following three consecutive lots shall be tested in two directions</li> </ul>					

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	•	es before final pass or fail is deterr shall be performed in only one di		
A.4.4.3.2	<ul> <li>connections, hell successfully ach manual cited in the manual cited in th</li></ul>	shall be embedded in a proper res ng the longitudinal axis of the resis amined visually or by using a 5x r d voids in the external coating. hinations a) and b) shall require the	or enclosure shall accordance with an. ed from the resist shall be examine eal ratio of helical ing width, state o est is not applicab sin or other mate stors. One cut fa magnifier for the p	have been the DPA ors with a ed visually or cutting, state f resistor films, le to the rials, and cut ce shall be press fitting
A.4.4.4	photographed ar Electrical Performanc		follows	
A.4.4.1	Overload The resistors sha succession to the test, the resistors before the resist A.4.4.4.2 to calc and after this test for significant ab for legibility. Thi a) Method of mour 1) Qualificat The resist 75mm be no closer mounted resistors 2) Group A The resist size. For temperat	all be tested under the conditions a e test of paragraph A.4.4.6.3.1 (Th s shall be left at room temperature ance measurement is made in acc ulate the change in resistance before t. At the completion of this test, the normality in appearance. The main s overload test shall be performed atting:	as specified in Ta hermal shock [I]). and at no load for cordance with par ore the thermal s he resistors shall rking shall also b I under the follow with no object cl hting base which The resistors sha her than the heat cion and in the sp aintain a test amb C. The average v	After this or 30 minutes ragraph hock [I] test be examined e examined ing conditions. oser than shall be II be of the ace of any pient relocity of

## b) Test conditions

The voltage applied shall be alternating current voltage (root-mean-square value at commercial-line frequency) and waveform or direct current voltage. The test shall be performed at the load and for the duration specified in Table A-14, provided that the applied voltage shall not exceed the maximum overload voltage.

## c) Visual examination after test

The resistors shall be examined visually for evidence of arcing, burning or charring.

ſ	Resistor style	Overload	Duration	Maximum overload voltage (V)
	RNS50, RNS55, RNS60	Rated power $\times$ 5	1 hour	500
	RNS65	Rated power $\times 4$	1 hour	600
	RNS70	Rated power $\times$ 2.25	1 hour	700
	RNS90	Rated power $\times$ 6.25	5 seconds	-

# Table A-14. Overload Test Conditions

# A.4.4.4.2 Resistance

The resistance test shall be performed in accordance with Test Method 303 of MIL-STD-202. The following details and exceptions shall apply.

# a) Measuring apparatus

The same measuring equipment shall be used for each test, but not necessarily for all tests.

b) Accuracy of measuring apparatus

 $\pm$ (0.005% $\pm$ 0.01 $\Omega$ ), but not exceeding one-fourth of the resistance tolerance or the resistance change limit for which the measurement is being made. The manufacturer may use apparatus of less accuracy, provided that limits are reduced to fully compensate for accuracy deviation.

# c) Test voltage

Test voltages shall be applied in accordance with Table A-15. The voltages of category A and B shall be applied to the resistors with a rated power of less than 0. 5W and 0.5W or more, respectively.

# d) Temperature

As a rule, the Group I resistance test of the qualification test and Group A1 of the Group A quality conformance inspection shall be performed at  $25\pm2^{\circ}$ C. Unless otherwise specified, the temperature at which subsequent and final resistance measurements are made shall be within  $\pm 2^{\circ}$ C of the temperature at which the initial measurement was made.

e) To measure the resistance of the RNS90 style, the measuring terminal shall be held at a position between 9.52mm and 15.88mm from the base of the terminal.

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		Unit: V <sub>DC</sub>
Nominal resistance range ( $\Omega$ )	A (maximum value)	B (maximum value)
Less than 1	0.1	0.1
1 or more and less than 10	0.3	0.3
10 or more and less than 100	0.3	1.0
100 or more and less than 1k	1.0	3.0
1k or more and less than 10k	3.0	10.0
10k or more and less than 100k	10.0	30.0
100k or more and less than 1M	30.0	50.0
1M or more	50.0	100.0

### Table A-15. Resistance Test Voltages

A.4.4.3 Resistance-Temperature Characteristic

The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following conditions shall apply.

- a) Reference temperature: 25°C
- Test temperature: As specified in Table A-16. At the quality conformance inspection, the test temperature of 125°C shall apply only to the RNS90 style.
- c) Unit of resistance-temperature characteristic: 10<sup>-6</sup>/°C.

## Table A-16. Test Temperature for Resistance-Temperature Characteristic

		Unit: °C
Order	Test	temperature
Order	Qualification test	Quality conformance inspection
1	25±3	25±3
2	-15±3	-55±3
3	-55±3	25±3
4	25±3	125±3
5	65±3	175±3
6	125±3	-
7	175±3	-

## A.4.4.4 Dielectric Withstanding Voltage

#### A.4.4.4.1 Atmospheric Pressure

Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202. The following details and exceptions shall apply.

a) Method of mounting

The resistors shall be mounted in accordance with paragraph A.4.4.5 a). However, the RNS90 style shall be mounted as shown in Figure A-2.

b) Measurement before test The resistance shall be measured in accordance with paragraph A.4.4.4.2.



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A.4.4.4.5	Insulation Resista	nce		
	The resistors sha	all be measured in accordance wit	h Test Method 30	02 of MIL-
	STD-202. The fe	ollowing details and exceptions sh	all apply.	
	a) Mounting me	thod		
		shall be placed on the groove of		
		nents do not protrude from either of		
		ween the resistor terminal lead and er than the difference in radius bet	• •	
		NS90 style shall be mounted as sh		
		Test condition A ( $100V_{DC} \pm 10\%$ ).	0	
A.4.4.4.6	Voltage Coefficier	nt		
	Resistors shall b	e tested in accordance with Test I	Method 309 of MI	L-STD-202.
	This provision sh	all apply only to the resistors with	a resistance of 1	$K\Omega$ or more.
A.4.4.5 N	lechanical Performa	nce		
TI	he mechanical perfo	rmance tests shall be performed a	as follows.	
	Tormain of Strongth			
A.4.4.5.1	Terminal Strength			
		e tested in accordance with Test I (pull test) and D (twist test) shall a		
		following details and exceptions.	ppiy. However, t	
A.4.4.5.1.1	Pull Test (Test C	•		
A.4.4.3.1.1	a) Measuremen	,		
	/	e shall be measured in accordance	e with paragraph	n A.4.4.4.2.
	b) Load		,	
	Unless other	wise specified in the detail specific	ation, loads of 9.	8N and 24.5N
		ed to the resistors at power rated		
		tively. However for the RNS90 sty	/le, a load of 8.82	2N shall be
	applied. c) Test method			
	,	load shall be applied in the axial	direction of the le	ad without
	-	impact. The point of application o		
		to the lead edge.		
	d) Measuremen			
		hall not be measured after the pull		
	A.4.4.5.1.2.	combination with the twist test spe	somed in paragra	рп
	e) Examination	after test		
	,	s shall be examined visually for ev	idence of mechai	nical damage.

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<ul> <li>A.4.4.5.1.2 Twist Test (Test Condition D)</li> <li>Following the pull test, the twist test shall be performed with the same sa unless otherwise specified.</li> <li>a) Measurement before test The resistance shall not be measured before the test.</li> <li>b) Test conditions With the center axis of the resistor's lead wire used as a rotating axis lead wire shall be rotated 360 degrees along a plane perpendicular to rotating axis. This operation shall be defined as the first twist. Then lead wire shall be rotated 360 degrees in the opposite direction. This be counted as the second twist. Using this counting method, a total twists shall be made.</li> <li>c) Measurement after test The resistance shall be measured in accordance with paragraph A.4</li> </ul>				g axis, the ular to the Then, the . This shall total of five
	d) Examination The termina	s shall be examined for evidence		osening.
A.4.4.5.2	Mechanical Shear	-		
		ested in accordance with the follo	wing procedures	
	,	nt before test ce shall be measured in accordan ounting	ce with paragrap	h A.4.4.4.2.
	,	s shall be mounted on the fixtures	shown in Figure	A-3.
	c) Load: 35.28	±0.098N		
	•	d load shall be applied at a consta he fixtures. Duration of the load s		
		nt after test ce shall be measured in accordan change in resistance before and	-	h A.4.4.4.2 to
	f) Examination The resistors	after test s shall be examined visually for ev	idence of mecha	nical damage.





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A.4.4.5.3		be tested in accordance with Test Netails and exceptions shall apply.	Method 208 of MI	L-STD-202.
	-	hall be performed.		
	/	inals tested: all terminals.		
	c) Solder temperat			
	,	on time: 5±0.5 sec.		
	The terminals sl However, the R f) Examination aft	hall be immersed to within 2.5mm f NS 90 style shall be within 1.3 mm		he terminals.
A.4.4.5.4	Resistance to So	Idering Heat		
A.T.T.U.T	Resistors shall I The following de a) Measurement b The resistance s b) Solder temperat	be tested in accordance with Test Metails and exceptions shall apply. efore test shall be measured in accordance w		-
	d) Solder immersio	on depth		
	Terminals shall	be immersed to within 4±0.8mm fro er immersion: 3 hours or more	om the base of th	e terminals.
	The terminals sl test before the r	hall remain at room temperature for esistance measurement is made in culate the change in resistance befo	accordance with	n paragraph
	0/	all be examined visually for eviden	ce of mechanical	l damage.
A.4.4.6	Environmental Perfo	rmance		
	The environmental p	erformance tests shall be performe	d as follows.	
A.4.4.6.1	Vibration			
A.4.4.6.1.1	1 High Frequency	Vibration		
	The following de a) Method of n The resistor A.4.4.6.2.	be tested in accordance with Test M etails and exceptions shall apply. nounting rs shall be mounted in accordance A shielded cable, which may be need the vibration table, shall be clamp	with item a), para cessary because	agraph of the field
	,	nt before test nce shall be measured in accordar	nce with paragrap	oh A.4.4.4.2.

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200				<u> </u>			
	c) Test condition Test condition the smaller)	n n D (196m/s² p-p or 1.5mm in do	uble amplitude, v	vhichever is			
	d) Direction of motion In each of two mutually perpendicular directions, one perpendicular and the						
	e) Duration of v	other parallel to the longitudinal axis of the resistors. e) Duration of vibration Four hours in each direction for a total of 8 hours.					
	f) Measureme Each resiste		d equipment durii	ng vibration to			
	g) Measureme The resistar	t after test ce shall be measured in accorda	nce with paragrap	oh A.4.3.4.2			
	to calculate the change in resistance before and after the test. h) Examination after test The resistors shall be examined visually for evidence of mechanical dama						
A.4.4.6.1.2	Random Vibratio	ı					
	<ul> <li>Resistors shall be tested in accordance with Test Method 214 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Method of mounting</li> <li>The resistors shall be mounted in accordance with item a), paragraph A.4.4.6.2.</li> </ul>						
	<ul> <li>b) Measuremen</li> <li>The resistar</li> <li>c) Test condition</li> </ul>	ce shall be measured in accorda	nce with paragrap	oh A.4.4.4.2.			
	Test condition			;			
		notion o mutually perpendicular directio I to the longitudinal axis of the res	• •	cular and the			
	Vibration sh	oplication and duration of vibration all be applied for 2 minutes, 5 time e of 20 minutes.		on with a			
	<ul> <li>f) Measurement during test</li> <li>Each resistor shall be monitored with specified equipment during vibratic determine no electrical discontinuity of 0.1ms or greater.</li> </ul>						
		t after test ce shall be measured in accordai he change in resistance before a		bh A.4.4.4.2			
	h) Examination	-		anical damage.			
A.4.4.6.2	Shock						
		e tested in accordance with Test l ails and exceptions shall apply.	Method 213 of MI	L-STD-202.			

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	<ul> <li>bodies cemer leads support shall be consi supports will I fixtures shall subjected to t Test lead use diameter, so t minimum. Th</li> <li>b) Measurement The resistance</li> <li>c) Test condition</li> <li>d) Direction of a In each of two other parallel</li> <li>e) Number of ap The resistors 20.</li> <li>f) Measurement Each resistor determine no</li> <li>g) Measurement The resistance</li> <li>calculate the h) Examination a</li> </ul>	Il be rigidly mounted on appropria need to a flat surface. The resiston ed approximately 6mm from the r tructed to insure that the points of nave the same motion as the shore be constructed to preclude any re he shock test, and the fixtures shi d during this test shall be strande that the influence of the test lead that the influence of the test lead to the lead length shall be no great to before test e shall be measured in accordance to the longitudinal axis of the resist plied shocks shall be subjected to 10 shocks in the during test shall be monitored with specified electrical discontinuity of 0.1ms of the test e shall be measured in accordance the shall be measured in accordance	rs shall be fixed we resistor body. The resistor mound of the resistor mound of the resistor mound of the resistor mound of the monitored in the fixed wire no larger the on the resistor will atter than necessance with paragraph s, one perpendiculators.	vith their e fixtures nting unting ktures when f necessary. han 0.6mm in I be held to a ary. n A.4.4.4.2. ular and the or a total of g the shock to n A.4.4.4.2 to
A.4.4.6.3	Thermal Shock			
A.4.4.6.3.1	<ul> <li>The following defails</li> <li>a) Method of m</li> <li>The resistors</li> <li>in trays of sn</li> <li>b) Test condition</li> <li>Test condition</li> <li>c) Measurement</li> <li>The resistant</li> <li>d) Number of test</li> <li>e) Cycle condition</li> </ul>	e tested in accordance with Test tails and exceptions shall apply. ounting s shall be mounted by means other nall heat inertia. ons ons shall be as specified in Table of before test ace shall be measured in accordance set cycles: 25 cycles	er than soldering o A-17. nce with paragrap fter the five cycles	or be placed oh A.4.4.4.2.

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f) g)	overload test resistors shal the resistance A.4.4.4.2 to c Examination a	hall not be measured specified in paragrap I be at room tempera e measurement is ma alculate the change in	h A.4.3.4.1. ture for a min de in accord n resistance	For the RNS90 nimum of 30 mir lance with parag before and after	P style, the nutes before graph r the test.
	Table A-17	. Test Conditions o	of Thermal S	hock [l]	
	Step	Temperature (°C)	Time (min	ı.)	
	1	-65 <sup>0</sup> <sub>-5</sub>	15		
	2	150 <sup>+3</sup> <sub>0</sub>	15		
sha	all be subjected bwn in Table A- bly. Method of mo The resistors in trays of sm Number of tes Cycle condition The first 25 c interrupted fo Measurement The resistant temperature for $100^{+10}_{0}$ cycles resistors shall Measurement The resistors hours or less paragraph A. the test. Examination a	shall be mounted by r all heat inertia. at cycles: 1,000 cycles ons ycles shall run continu- llowing completion of a during test and exter ce shall be measured for 30 minutes or mor s, $250_{0}^{+10}$ cycles and I be inspected visually after test shall be at room tem , and the resistance s 4.4.4.2 to calculate th	mal shock cy The following means other any full cycle any full cycle after the res e for each 29 500 <sup>+10</sup> cycle y for cracks of perature for hall be meas le change in	r 25 cycles, the istors are at roo $5^{+5}_{0}$ cycles, $50^{+5}_{0}$ es. The external on the surface. 30 minutes or m sured in accorda resistance befo	ne conditions eptions shall or be placed test may be m cycles, ls of all nore but 2 ance with re and after

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Table A-18. Test Conditions of Thermal Shock [II]Figure A-4. Test Conditions of Thermal Shock [II]							
	me (min.) 100	<u>, </u> <u></u>					
1 -30 <sup>0</sup> <sub>-5</sub>	15						
2 100 <sup>+3</sup>	15 Û						
$\begin{array}{ c c c c c c } \hline 2 & 100_{0} & 15 \\ \hline 2 & 100_{0} & 15 \\ \hline 0 & 0 \\ \hline 0 & 0 \\ \hline 0 & 0 \\ \hline 0 & 15 \\ \hline 1 & 0 \\ \hline 1 $							
Resistors shall The following d a) Method of mou 1) Where Solder I mounts lead is a support 2) Where One ha covered resistor corrosid body by noncon the resi of moisi individu metal st shown i b) Polarization a 1) Polarization positive negativ	<ul> <li>A.4.4.6.4 Moisture Resistance</li> <li>Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Method of mounting <ol> <li>Where polarization is not applied</li> <li>Solder both leads to rigid mounts or terminal lugs. The spacing of the mounts or terminal lugs shall be such that the length of each resistor lead is approximately 10mm when measured from the edge of the supporting terminal to the resistor body.</li> </ol> </li> <li>Where polarization is applied <ol> <li>One half of the resistors mounted as specified in 1) above shall be covered with a V-shape metal strap whose width is equal to that of the resistor body as indicated in Figure A-5. The strap shall be made from corrosion-resistant metal and shall be kept in contact with the resistor body by supporting the body as indicated in Figure A-5, with a nonconducting, noncorrosive support whose width is less than that of the resistor body. In addition, the support shall not allow condensation of moisture which could have an inverse influence on the test. An individual metal strap may be used for each resistor or one continuous metal strap for all resistors. The RNS90 style shall be mounted as shown in Figure A-2.</li> </ol> </li> </ul>						

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<ul> <li>potential equivalent to 100% rated wattage, but not exceeding the maximum operating voltage, shall be applied.</li> <li>3) Measurement after test <ul> <li>Upon completion of step 6 of the final cycle, the resistors shall be held at a relative humidity of 90 to 95% and a temperature of 25±2°C for a period of 1 hour and 30 minutes to 3 hours and 30 minutes. Resistors shall be removed from the chamber and remain at room temperature for 1 to 2 hours. The resistance, dielectric withstanding voltage (atmospheric pressure) and insulation resistance shall then be measured in that order as specified in paragraphs A.4.4.4.2, A.4.4.4.1 and A.4.4.5</li> <li>respectively. The change in resistance before and after the test shall also be calculated.</li> </ul> </li> <li>4) Examination after test <ul> <li>The resistors shall be examined visually for evidence of mechanical damage.</li> </ul> </li> </ul>				
Cross section A-A' Plarizing strap Resistor body Support				
Figure A-	5. Mounting Straps for Polarize	ed Units		
A.4.4.6.5 Resistance to Sol	vents			
The following detain a) Application ar b) Solvents to be 1) 2-propanol 2) 42 parts by	tested in accordance with Test Me ils and exceptions shall apply. rea: Marked portion e used (Isopropyl alcohol) volume of water, one part by volume thyl ether and one part by volume	ne of propylene g	glycol	
A.4.4.6.6 Low Temperature	Storage			
The resistance s hour after this m temperature of - chamber shall th resistors are ren shall be removed more but 8 hours	shall be measured as specified in p easurement, the resistors shall be $65^{0}_{-5}$ °C for a period of 24±4 hours. nen be gradually returned to room hoved from the chamber. Any wat d. The resistors shall remain at ro s or less. The resistance shall the A.4.4.4.2 to calculate the change in	placed in a cold The temperatur temperature befo er droplets on the om temperature f n be measured in	chamber at a e in the re the e surface for 2 hours or a accordance	

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		e test, the resistors shall be exam all be examined for legibility.	nined for significa	nt abnormality.
A.4.4.6.7	Low Temperature	Operation		
	hour after this m room temperatur and the resistors	shall be measured as specified in peasurement, the resistors shall be re. The temperature shall be grad be left for 1 hour at no load. The ration in the temperature shall be grad	e placed in a test lually decreased t ted voltage shall t	chamber at to -65 <sup>º</sup> -5 °C then be
	gradually increas resistors are rem shall be removed temperature for measured again resistance before	se the chamber temperature to roo noved from the chamber. Any wat d. Unless otherwise specified, the 1 hour or more but 2 hours or less as specified in paragraph A.4.4.4 e and after the test. After the test inificant abnormality. The marking	om temperature b er droplets on the resistors shall re . The resistance .2 to calculate the , the resistors sha	before the e surface emain at room shall then be e change in all be
A.4.4.6.8	Stability			
	resistors shall be temperature in th	nce is measured in accordance wi e put in a test chamber maintained ne chamber shall then be graduall 75 <sup>+15</sup> <sub>0</sub> °C. After stabilizing at the te	l at room tempera y increased to a t	ature. The est
	shall remain at n	io load for 2,000 $^{+48}_{-0}$ hours. When t	the specified test	time has
	resistors shall th temperature of 2 accordance with before and after pressure) and in paragraphs A.4.	perature shall gradually be returned en be removed from the test chan 25±5°C for 6±1hours. The resistan paragraph A.4.4.4.2 to calculate to the test. The dielectric withstandi sulation resistance test shall then 4.4.4.1 and A.4.4.4.5, respectively ed for significant abnormality.	nber and remain a nce shall then be the change in res ng voltage test (a be performed as	at a measured in istance atmospheric specified in
A.4.4.7	Durability			
	Durability test shall b	be performed as follows.		
A.4.4.7.1	The following de a) Method of moun The resistors sha	all be mounted on terminal lugs as dered at a distance of 25mm from e: 125±5°C	s shown in Figure	A-6. The
	,	rs are mounted in a test fixture, the	e resistance shall	be measured

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d)	shall be performed Measurements of After the resistor	ture in accordance with paragrap ed at a temperature difference of luring and after test is are left at room temperature for stance shall be measured in acco	⁺±2°C. r a minimum of 4	5 minutes at	
e)	A.4.4.4.2. Test conditions The rated dc vol 90 minutes ON a operating voltage voltage shall be The test duration				
f)	Measurements of 1) Qualificat 2,000 <sup>+72</sup> 0	tion test: $250^{+48}_{0}$ hours, $500^{+48}_{0}$ hours. hours. onformance inspection: $250^{+48}_{0}$ ho	urs, 1,000 <sup>+48</sup> hou		
g)	Examination after The resistors sha	er test all be examined for evidence of n	nechanical dama	ge.	

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	6       4       5       25		Init: mm	
	1     Solde       2     3mm       1     Solde       2     3mm       3     Shake       4     Flat b       5     Lock I       6     Hexag       7     Rack,	eproof washer, stee rass washer orass washer gon nut,brass phenolic	ew, 15 mm	
<ul> <li>Figure A-6. Example of Recommended Mounting Fixture</li> <li>A.4.4.7.2 Life (70°C) <ul> <li>Resistors shall be tested in accordance with Test Method 108 of MIL-STD-202</li> <li>The following details and exceptions shall apply.</li> </ul> </li> <li>a) Method of mounting <ul> <li>The resistors shall be mounted in accordance with item a), paragraph A.4.4.7.1</li> </ul> </li> <li>b) Measurement before test <ul> <li>The resistance shall be measured in accordance with paragraph A.4.4.2.</li> <li>During and after the test, the resistance shall be measured in accordance with item d), paragraph A.4.4.7.1.</li> <li>c) Test temperature: 70±5°C</li> <li>d) Test conditions <ul> <li>The rated dc voltage corresponding to rated power shall be applied intermitten 90 minutes ON and 30 minutes OFF. If the rated voltage exceeds the maximul operating voltage specified in Table A-19, the maximum operating voltage shall be applied. Test voltage shall be maintained within ±5% of the rated dc voltage corresponding to the rated power specified in Table A-19. The test time shall be for 2,000<sup>+72</sup>/<sub>0</sub> hours.</li> </ul> </li> </ul></li></ul>				
f) Examination afte			•	

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Style	Rated power at 70°C (W)	Maximum operating voltage at 70°C ( $V_{DC}$ )
RNS50	0.1	200
RNS55	0.125	200
RNS60	0.25	300
RNS65	0.5	350
RNS70	0.75	500
RNS90	0.6	300

Table A-19. Test Conditions of Life at 70°C

#### A.4.5 Long-Term Storage

Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.

#### A.4.6 Change of Tests and Inspections

Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.

## A.5. PREPARATION FOR DELIVERY

Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.

## A.6. NOTES

Refer to the paragraph 6 of JAXA-QTS-2050.

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-			
1			
-			
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	esistance		
	e Tolerance		
-	nts		
	cuments		
	uments		
•	overage		
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B.6. NOTES				B-27

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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		APPENDIX B		
	RESISTO	RS, FIXED, FILM (INSULATED, \$	SMALL)	
B.1. G	General			
B.1.1	Scope			
	••	es the general requirements and c s (insulated, small) (hereinafter re		•
B.1.2	Classification			
	Resistors covered by th	is specification shall be classified	as specified in Ta	able B-1.
		Table B-1. Classification		
	Construction	Style and termination	type	
	Non-molded type	e RLS05, 07, 20, 32, 4	2C	
	Molded type	RLS05, 07, 20, 32, 4	2T	
B.1.3	Part Number The part number shall b details.	e indicated as follows. Refer to th	e detail specifica	tion for
B.1.3	The part number shall b	e indicated as follows. Refer to th	ie detail specifica	tion for
B.1.3	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C	<u>C</u> - <u>1001</u> Construction Nominal resistanc	- <u>E</u>	
B.1.3	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C	<u>C</u> - <u>1001</u>	- <u>E</u>	tolerance
B.1.3	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate	<u>C</u> - <u>1001</u> Construction Nominal resistanc and terminal	- <u>E</u> e Resistance (B.1. and may be abb	tolerance 3.4) reviated to "J'
B.1.3 B.1.3.1	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate	<u>C</u> - <u>1001</u> Construction Nominal resistanc and terminal (B.1.3.2) (B.1.3.3) es the common part for space use	- <u>E</u> e Resistance (B.1. and may be abb	tolerance 3.4) reviated to "J'
	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate "NASDA" used i Style The style shall be ideu number. The "RLS" in	<u>C</u> - <u>1001</u> Construction Nominal resistanc and terminal (B.1.3.2) (B.1.3.3) es the common part for space use	- <u>F</u> Resistance (B.1. and may be abb abbreviated to "N' RLS", followed b film (insulated, sr	tolerance 3.4) reviated to "J' '. y a two-digit nall) resistors.
	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate "NASDA" used i Style The style shall be ideu number. The "RLS" in	<u>C</u> - <u>1001</u> Construction Nominal resistance and terminal (B.1.3.2) (B.1.3.3) es the common part for space use in the detail specification may be a number of the symbol, " indicates the high reliability, fixed, to indicates the power rating and pho-	- <u>F</u> Resistance (B.1. and may be abb abbreviated to "N' RLS", followed b film (insulated, sr	tolerance 3.4) reviated to "J' '. y a two-digit nall) resistors.
B.1.3.1	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate "NASDA" used i Style The style shall be idea number. The "RLS" in The two-digit number Construction and Ter	<u>C</u> - <u>1001</u> Construction Nominal resistance and terminal (B.1.3.2) (B.1.3.3) es the common part for space use in the detail specification may be a htified by the three-letter symbol, " indicates the high reliability, fixed, to indicates the power rating and ph minal terminal shall be identified by a si	- <u>E</u> Resistance (B.1. and may be abb abbreviated to "N" RLS", followed b film (insulated, sr ysical size of the	tolerance 3.4) reviated to "J' '. y a two-digit nall) resistors resistors.
B.1.3.1	The part number shall b details. Example: JAXA <sup>(1)</sup> <u>RLS20</u> - Style C (B.1.3.1) Note: <sup>(1)</sup> "JAXA" indicate "NASDA" used i Style The style shall be idea number. The "RLS" in The two-digit number Construction and Ter The construction and	<u>C</u> - <u>1001</u> Construction Nominal resistance and terminal (B.1.3.2) (B.1.3.3) es the common part for space use in the detail specification may be a htified by the three-letter symbol, " indicates the high reliability, fixed, to indicates the power rating and ph minal terminal shall be identified by a si	- <u>E</u> Resistance (B.1. and may be abb abbreviated to "N" RLS", followed b film (insulated, sr ysical size of the	tolerance 3.4) reviated to "J" '. y a two-digit nall) resistors resistors.

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	Tab	le B-2.	Construction and Termi	nal	
	Symbol		Construction and Ter	minal	
	С		Coated type, solderable ar	nd weldable	
	Т		Molded type, solderable ar	nd weldable	
B.1.3.3	Nominal Resistance				
	The nominal resista	nce shall l	be identified in ohms ( $\Omega$ ) b	oy 3 or 4 digits.	
The four digit resistance designation shall be applicable to resistance tolerance "F"( $\pm$ 1.0%). The first three digits represent significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, succeeding digits of the group represent significant figures.					
	<ul> <li>Example: 97R6= 97.6Ω 1500= 150 Ω 1501= 1,500 Ω= 1.50kΩ 1503=150,000 Ω=150 kΩ</li> <li>b) Three digit resistance designation The three digit resistance designation shall be applicable to resistance tolerand "G"(±2.0%). The first two digits represent significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, succeeding digits of t group represent significant figures.</li> </ul>				
			Ω Ω= 1.50kΩ		
B.1.3.4	Resistance Toleran	ce			
	The resistance toler with Table B-3.	ance shal	l be identified by a single o	capital letter in ac	cordance
	r	able B-3	. Resistance Tolerance	1	
	_		Unit: %		
		Symbol	Resistance tolerance		
		F	±1.0		

G

±2.0

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	29 June 2021 Parts Specification					
B.1.4 Characteristics The change in resistance referred to an ambient temperature of 25°C shall not exceed $\pm 100x10^{-6}$ /°C.						
B.2. A	pplicable Documents					
B.2.1	Applicalble Documents					
	The applicable docume	nts shall be as specified in paragra	aph 2.1 of JAXA-	QTS-2050.		
B.2.2	Reference Documents					
	The following is a refere a) MIL-PRF-39017	nce document. Resistors, Fixed, Film (Insulate and Established Reliability, Ge	,	•		
B.3. R	equirements					
B.3.1	<ul> <li>B.3.1 Qualification Coverage</li> <li>Qualification shall be valid for resistors that are produced by the manufacturing line that conforms to materials, designs, constructions, specifications and performance specified in paragraphs B.3.2 to B.3.9. The qualification coverage shall be represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification. If necessary, additional qualification coverage shall be specified in the detail specification.</li> </ul>					
B.3.2	Materials The materials shall be s QTS-2050.	pecified as follows and as specifie	ed in paragraph 3	.3 of JAXA-		
B.3.2.1	Base Substance (Cor	re)				
	The volume resistivity temperature of 300°C	of the base substance shall be 10	) <sup>8</sup> Ω·cm or more a	at a		
B.3.2.2	Copper Wire					
	Copper wire used as MIL-STD-1276 or its e	a resistor terminal shall be made o equivalent.	of materials which	n conform to		
B.3.2.3	Flux					
The manufacturer shall completely remove corrosive substances after soldering use noncorrosive flux. When non-corrosive flux is used, the water extract resisting test shall be performed in accordance with paragraph 4.9 of JIS Z 3197, and it she verified that the water extract resistivity is greater than $100k\Omega \cdot cm$ . When resistored solder is used, the mass ratio range of resin to solder shall be between 1 a 3%.						

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B.3.3	Externals, Dim Resistors shal paragraph B.4	l satisfy th	and Marking e following requirements when te	sted in accordanc	ce with			
B.3.3.1	Externals ar	nd Marking	n					
D.3.3.1			ering or film blemishes on the sur	face of the regist	ore The			
	following sha	following shall be clearly marked to ensure legibility. As a rule, the marking shall remain legible at the completion of any test.						
	<ul> <li>Part number</li> <li>The marking of "JAXA" may be omitted. When the physical size of the resistor precludes inclusion of the complete part number, nominal resistance shall be marked as a minimum.</li> </ul>							
	, The nu	mber of th	nanufactured le last two digits of the calendar y ndar year beginning in January sh		per of the			
	c) Manufa	acturer nar	me or its abbreviation.					
B.3.3.2	Construction	n, Dimens	ions and Mass					
	Resistor shall be constructed of a film resistor element and external terminals. The resistor element shall be molded to protect it from moisture or mechanical damage. The dimensions and mass shall satisfy the requirements as specified in each detail specification.							
B.3.4	Workmanship							
	Resistors shal	l be manu	factured based on good design p	ractices and in ac	cordance			
			ce program defined in paragraph (	3.2.1.				
	a) Resistor f		ha an itan a bada a tana a ita da <b>T</b> ha ana ita		4			
	blisters, the blemishes When one of resiston defined a	hin spots, s likely to o e turn or n r-element s 80% of t minus 1.2	be uniformly deposited. The resist incomplete adhesion to substrate cause flaking or a nonuniform ribb nore of spiraling is used, spiraling effective length. The resistor-elen he distance between terminals or 2mm, whichever is longer.	, discolored spots oon when spiraled shall occupy no l ment effective ler	s, or other d (helixed). ess than 70% ngth shall be			
	The resis mechanic STD-1270 not be mo not be no specified resistors, satisfy the	tor's termi cally. The 6 or its equ ore than tw n-conduct length bet this length e requirem	nal leads shall be securely conne lead wires shall conform to all rec uivalent. The maximum plating the vice the minimum thickness at any ive impurities on the surface of le tween the resistance element and in shall be within 2.5mm from the b ments of solderability.	uirements of type ickness of the lea y cross section. ad wires in exces clean lead. For	e C of MIL- ad wires shall There shall is of the RLSxxT			
	c) Insulating	enclosure	e					

 Insulating enclosure
 The resistor element shall be protected against moisture by an external enclosure of moisture-resistant insulating material.

J	AXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– B-5 –		
B.3.4.1	terminal connection, h	sted as specified in paragraph B. nelical cutting, and external coatin al structure shall be as specified in	g shall have beer	n successfully		
B.3.5	Ratings					
B.3.5.1	5.1 Nominal Resistance As a rule, standard values of nominal resistance shall be defined relative to the resistance tolerance and shall be as specified in Table B-4. The minimum and maximum resistances shall be specified in the detail specification.					
B.3.5.2	<ul> <li>3.5.2 Operating Temperature Range</li> <li>The operating temperature range shall be between -55 and +150°C unless otherwise specified.</li> </ul>					
B.3.5.3	Power Rating Resistors shall have a power rating specified in the detail specification. The rated ambient temperature shall be 70°C unless otherwise specified.					
B.3.5.4	Maximum Power The maximum power at or below the rated ambient temperature shall be equal to the power rating. For temperatures in excess of the rated ambient temperature, the maximum power shall be determined by derating the power rating in accordance with the derating curve shown in Figure B-1.					
B.3.5.5	approximate sine way operating voltage at o power rating, as deter rated voltage exceeds	a rated direct current (DC) continu ve root-mean-square (rms) alterna commercial-line frequency and wa rmined from the following formula s the maximum operating voltage timum operating voltage shall be t	ating current (AC) veform correspor . However, if the specified in the d	continuous iding to the calculated		
	E=√P•R					
	Where: E = Voltage rating (V) P = Power rating (W) R = Nominal resistand					
	R = Nominal resistand	ce (Ω)				

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Table B-4.       Standard Resistance Values							
Resistance tolerance and symbols (%)							
G (±2.0)	F (±1.0)	G (±2.0)	F (±1.0)	G (±2.0)	F (±1.0)	G (±2.0)	F (±1.0)
10.0	10.0	-	18.7	-	33.2	-	56.2
-	10.2	-	19.1	-	34.0	-	57.6
-	10.5	-	19.6	-	34.8	-	59.0
-	10.7	20	20.0	-	35.7	-	60.4
11	11.0	-	20.5	36	-	-	61.9
-	11.3	-	21.0	-	36.5	62	-
-	11.5	-	21.5	-	37.4	-	63.4
-	11.8	22	-	-	38.3	-	64.9
12	-	-	22.1	39	-	-	66.5
-	12.1	-	22.6	-	39.2	68	-
-	12.4	-	23.2	-	40.2	-	68.1
-	12.7	-	23.7	-	41.2	-	69.8
13	13.0	24	-	-	42.2	-	71.5
-	13.3	-	24.3	43	-	-	73.2
-	13.7	-	24.9	-	43.2	75	75.0
-	14.0	-	25.5	-	44.2	-	76.8
-	14.3	-	26.1	-	45.3	-	78.7
-	14.7	-	26.7	-	46.4	-	-
15	15.0	27	-	47	-	-	80.6
-	15.4	-	27.4	-	47.5	82	-
-	15.8	-	28.0	-	48.7	-	82.5
16	-	-	28.7	-	49.9	-	84.5
-	16.2	-	29.4	51	-	-	86.6
-	16.5	30	-	-	51.1	-	88.7
-	16.9	-	30.1	-	52.3	-	90.9
-	17.4	-	30.9	-	53.6	91	-
-	17.8	-	31.6	-	54.9	-	93.1
18	-	-	32.4	56	-	-	95.3
-	18.2	33	-	-	-	-	97.6

# Table B-4. Standard Resistance Values



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B.3.6.6	Insulation Resistance						
	When resistors are tested as specified in paragraph B.4.4.4.6, the insulation resistance shall satisfy the requirements of the detail specification.						
B.3.7	Mechanical Performanc	0					
		e following mechanical requireme	inte				
			1113.				
B.3.7.1	Terminal Strength	stad as specified in paragraph R 4	4.5.1 the change	o in			
	resistance before and specification. There s	sted as specified in paragraph B.4 after the test shall satisfy the requishall be no evidence of breaking ou r other evidence of mechanical dat	uirements of the o	detail minals,			
B.3.7.2	Solderability						
	When resistors are tested as specified in paragraph B.4.4.5.2, a minimum of 95% of the terminal surface shall be evenly covered with new solder. The existence of small pinholes or rough areas shall be acceptable, provided that they are not concentrated in one spot. The total area of the pinholes or rough areas shall be less than 5% of the solder area.						
B.3.7.3	Resistance to Solderi	ng Heat					
	resistance before and	sted as specified in paragraph B.4 after the test shall satisfy the requishall be no evidence of mechanica	uirements of the o	detail			
B.3.8	Environmental Performa Resistors shall satisfy th	ance ne following environmental require	ments.				
B.3.8.1	Vibration						
<b>D</b> 2 0 1 1		viction					
<ul> <li>B.3.8.1.1 High Frequency Vibration</li> <li>When resistors are tested as specified in paragraph B.4.4.6.1.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.</li> </ul>							
B.3.8.1.2	Random Vibration						
When resistors are tested as specified in paragraph B.4.4.6.1.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.							

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B.3.8.2 Shock	sted as specified in paragraph B /	462 the chang	

When resistors are tested as specified in paragraph B.4.4.6.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.

# B.3.8.3 Thermal Shock

# B.3.8.3.1 Thermal Shock [I]

When resistors are tested as specified in paragraph B.4.4.6.3.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of this test.

# B.3.8.3.2 Thermal Shock [II]

When resistors are tested as specified in paragraph B.4.4.6.3.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test. Fine cracks on the surface of resistors shall be acceptable only when subjected to more than 500 cycles.

# B.3.8.4 Moisture Resistance

When resistors are tested as specified in paragraph B.4.4.6.4, the change in resistance before and after the test shall satisfy the requirements of the detail specification. In addition, the dielectric withstanding voltage shall be as specified in paragraph B.3.6.5, and the insulation resistance shall satisfy with the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

# B.3.8.5 Resistance to Solvents

When resistors are tested as specified in paragraph B.4.4.6.5, the marking shall remain legible. The details shall be as defined in the detail specification.

# B.3.8.6 Low Temperature Storage

When resistors are tested as specified in paragraph B.4.4.6.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

# B.3.8.7 Low Temperature Operation

When resistors are tested as specified in paragraph B.4.4.6.7, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

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#### B.3.8.8 Stability

When resistors are tested as specified in paragraph B.4.4.6.8, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

### B.3.9 Durability

Resistors shall satisfy the following durability requirements.

#### B.3.9.1 Life

When resistors are tested as specified in paragraph B.4.4.7.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

#### B.4. Quality Assurance Provisions

B.4.1 In-Process Inspection

The in-process inspection shall be as specified in paragraph 4.3 of JAXA-QTS-2050.

## B.4.2 Qualification Test

The qualification test shall be as specified in paragraph 4.4 of JAXA-QTS-2050 and as provided below.

## B.4.2.1 Test Items and Number of Samples

Test items and number of samples of the qualification test shall be as specified in Table B-5.

The number of samples shall be 453; 151 each for minimum resistance, maximum resistance, and critical resistance or nearest to critical resistance. These samples are prepared for each resistor style. Two additional sample units shall be subjected to the Group I-4 test of Table B-5, and 12 random samples shall be subjected to the Group II tests. If the critical resistance is not specified, the samples shall be equally divided between the minimum and maximum resistance.

Tests of each group shall be performed in the order listed in Table B-5. Upon completion of Group I tests, Group III through VIII tests shall be performed using samples allocated to the appropriate group tests.

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		т	able B-5.	Qualificatio	on Test		
		Test				Criteria for Pass/f	ail
Group	Order	ltem	Requirement paragraph	Test method paragraph		Sample size	No. of defective allowed
	1	Externals, dimensions and marking <sup>(1)</sup>	B.3.3	B.4.4.2			
Ι	2	Voltage aging	B.3.6.1	B.4.4.4.1		100% <sup>(2)</sup>	0
	3	Resistance	B.3.6.2	B.4.4.4.2			
	4	DPA	B.3.4.1	B.4.4.3.1		2	0
Ш	1	Solderability	B.3.7.2	B.4.4.5.2	12 <sup>(2)</sup> Any re	ristanco	0
11	2	Resistance to solvents	B.3.8.5	B.4.4.6.5		SISIANCE	0
	1	Thermal shock [I]	B.3.8.3.1	B.4.4.6.3.1			
	2	Resistance-temperature characteristic	B.3.6.3	B.4.4.4.3	(10	Highest resistance	
	3	Low temperature storage	B.3.8.6	B.4.4.6.6	√ 10	Critical resistance	0
	4	Low temperature operation	B.3.8.7	B.4.4.6.7	10	Lowest resistance	
	5	Short-time overload	B.3.6.4	B.4.4.4.4	C		
	6	Terminal strength	B.3.7.1	B.4.4.5.1			
	1	Dielectric withstanding voltage	B.3.6.5	B.4.4.4.5	(10	Highest resistance	
	2	Insulation resistance	B.3.6.6	B.4.4.4.6	30 √ 10	Critical resistance	
IV	3	Thermal shock [I]	B.3.8.3.1	B.4.4.6.3.1	10	Lowest resistance	0
	4	Resistance to soldering heat	B.3.7.3	B.4.4.5.3			
	5	Moisture resistance	B.3.8.4	B.4.4.6.4			
	1	Shock	B.3.8.2	B.4.4.6.2	10 ک	Highest resistance	
V	2	High frequency vibration	B.3.8.1.1	B.4.4.6.1.1	30 { 10	Critical resistance	0
	3	Thermal shock [II]	B.3.8.3.2	B.4.4.6.3.2	L 10	Lowest resistance	
VI	1	Random vibration	B.3.8.1.2	B.4.4.6.1.2	30 { 10 10 10	Highest resistance Critical resistance Lowest resistance	0
VII	1	Life	B.3.9.1	B.4.4.7.1	231 { 77 77 77 77	Highest resistance Critical resistance Lowest resistance	0
VIII	1	Stability	B.3.8.8	B.4.4.6.8	$102 \begin{cases} 34\\34\\34\\34 \end{cases}$	Highest resistance Critical resistance Lowest resistance	0
-	1	Materials	B.3.2	_		(3)	I

Notes:

<sup>(1)</sup> For dimensions and mass, sample size shall be 4.0% of the acceptable quality level (AQL) in "Special Inspection Level S-4" specified in JIS Z 9015-1.

<sup>(2)</sup> The samples for the Group II test shall not be subjected to the Group I test.

<sup>(3)</sup> Data to certify compliance with design specifications shall be submitted.

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## B.4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph 4.5 of JAXA-QTS-2050 and as provided below.

### B.4.3.1 Samples

The inspection lot configuration of group A shall be as specified in paragraph 4.5.1.1 of JAXA-QTS-2050. Inspection lots for Group B and C inspections shall consist of samples that have passed Group A inspections. Unless otherwise specified, Group B and C inspections shall be performed for each shape. Resistors with the critical resistance or closest to the critical resistance and the highest grade of characteristics shall be selected. If the design criteria are identical and the materials and the structures are similar, the inspection lot may be represented by one of the shapes specified in the detail specification.

## B.4.3.2 Inspection Items and Number of Samples

The items and number of samples of the Group A, B and C inspections of the quality conformance inspection shall be as specified in Tables B-6, B-7 and B-8, respectively. Group tests shall be performed in the group order and the inspections within each group shall be performed in the specified order. The sampling plan used for the Group A inspection shall be in accordance with Appendix 1 of JIS Z 9015-1. "Normal Inspection Level II" and "Special Inspection Level S-4" specified therein shall apply to the Group A2 and A3 inspections, respectively. For Group B and C inspections, quantities of samples shall be specified and the samples shall be any from one shape group for each classification of Table B-1.

## B.4.3.3 Criteria for Pass/Fail

A failure of any test specified in Table B-6, B-7 or B-8 shall constitute failure of each inspection group of the quality conformance inspection. When the number of defects does not exceed the permitted number specified in Table B-6, but the failure mode of the defects is catastrophic, such as open- or short-circuit where the function of the resistor may be lost, the resistor fails the Group A inspections.

## B.4.3.4 Post-Test Disposition of Sample

Products from the lot rejected in the Group A quality conformance inspection shall not be shipped. If the lot has not passed Group A2-1 or Group A3 inspection of Table B-6, all products of the lot shall be subjected to the failed inspection item, and only the good products shall be shipped.

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Inspection		Doguiro	ire- Test	Criteria for Pass/fail		
Group	Order	ltem	Require- ment paragraph	method paragraph	Sample size	No. of defectives allowed <sup>(1)</sup>
A 1	1	Voltage aging	B.3.6.1	B.4.4.4.1	100%	0
A1	2	Resistance	B.3.6.2	B.4.4.4.2	100%	
A2	1	Externals, dimensions and marking	B.3.3	B.4.4.2	AQL 4.0%	
	2	DPA	B.3.4.1	B.4.4.3.1	2	0
	1	Resistance-temperature characteristic	B.3.6.3	B.4.4.4.3	AQL 2.5%	
A3	2	Dielectric withstanding voltage (atmospheric pressure)	B.3.6.5	B.4.4.4.5.1		
	3	Thermal shock [I]	B.3.8.3.1	B.4.4.6.3.1		
	4	Short-time overload	B.3.6.4	B.4.4.4.4		

# Table B-6. Quality Conformance Inspection (Group A)

Note <sup>(1)</sup>When a sample has failed to pass 2 or more tests in one group, it shall be counted as a single defect.

Inspection		Require-	Test	Criteria for Pass/fail		
Group	Order	Item	ment paragraph	method paragraph	Sample size	No. of defectives allowed
B1	1	Solderability	B.3.7.2	B.4.4.5.2	8	0
ы	2	Resistance to solvents	B.3.8.5	B.4.4.6.5	0	
	1	Dielectric withstanding voltage	B.3.6.5	B.4.4.4.5		0
	2	Insulation resistance	B.3.6.6	B.4.4.4.6	10	
B2	3	Thermal shock [I]	B.3.8.3.1	B.4.4.6.3.1		
	4	Resistance to soldering heat	B.3.7.3	B.4.4.5.3		
	5	Moisture resistance	B.3.8.4	B.4.4.6.4		
	1	Thermal shock [I]	B.3.8.3.1	B.4.4.6.3.1		0
D2	2	Low temperature storage	B.3.8.6	B.4.4.6.6	10	
B3	3	Low temperature operation	B.3.8.7	B.4.4.6.7		
	4	Terminal strength	B.3.7.1	B.4.4.5.1		
B4	1	Life	B.3.9.1	B.4.4.7.1	10	0
B5	1	Stability	B.3.8.8	B.4.4.6.8	10	0

# Table B-7. Quality Conformance Inspection (Group B)

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		Inspection	Require-	Test method paragraph	Criteria for Pass/fail	
Group	Order	Item	ment paragraph		Sample size	No. of defectives allowed
C1	1	Random vibration	B.3.8.1.2	B.4.4.6.1.2	10	0
C2	1	Shock	B.3.8.2	B.4.4.6.2	10	0
02	2	High frequency vibration	B.3.8.1.1	B.4.4.6.1.1	10	
C3	1	Thermal shock [II]	B.3.8.3.2	B.4.4.6.3.2	10	0

## Table B-8. Quality Conformance Inspection (Group C)

#### B.4.4 Methods for Test and Inspection

#### B.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, the test and measurement shall be performed in accordance with condition c). The conversion shall be in compliance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

- Reference conditions Reference conditions shall be a temperature of 25°C and an atmospheric pressure of 101.3 kPa.
- c) Judgment conditions
   Judgment conditions shall be either condition A or B specified in Table B-9.
   Unless specified, condition A shall apply.

Condition	A	В	
Temperature (°C)	23±2	20±2	
Relative humidity (%)	50±5	65±5	
Atmospheric pressure (kPa)	86 to 106	86 to 106	

Table B-9. Judgment Conditions

#### B.4.4.2 Externals, Dimensions and Marking

#### B.4.4.2.1 Qualification Test

- a) The external inspection shall be performed visually.
- b) The marking test shall be performed visually.
- c) The dimensions shall be measured with a vernier caliper or micrometer compliant to JIS B 7507 and JIS B 7502, respectively. If the measured values are questionable, another measuring instrument may be used.
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|-----------|---|---|--|---|
|           | d) The mass sha   | all be measured with a trip balance<br>ues are questionable, another mea  | •  |   |
| B.4.4.2.2 | <ul> <li>a) The external</li> <li>b) The marking</li> <li>c) The dimensionadvance, unleadvance, unleadvance,</li></ul> | nce Inspection (Group A)<br>inspection shall be performed visu<br>test shall be performed visually.<br>ons may be measured with a dimer<br>ess the measured value is question<br>at the dimension gauge is sufficient<br>he sample shall pass this test whe<br>imensional tolerances specified in<br>inspection, the pass/fail results sh<br>e criteria samples of maximum mast<br>a advance. | nsion gauge which<br>nable. Prior to the<br>tly functional as a<br>n the measureme<br>the detail specific<br>all be made by co   | e test, it shall<br>measuring<br>ents do not<br>ation.<br>omparing the  |
| B.4.4.3   | Workmanship   |   |  |   |
| B.4.4.3.1 | <ul> <li>connections, heliciachieved. DPA sl<br/>Quality Assurance</li> <li>a) Protective coresinous solv<br/>or by a 5 to 5<br/>of helical cutt<br/>films, and we</li> <li>b) The resistors<br/>at the center<br/>grounded and<br/>engagement</li> </ul>   | ating or enclosure shall be remove<br>ent or by other means. The resiste<br>0x magnifier for inspecting the are<br>ing grooves, uniformity of helical c<br>Id state of caps with terminal leads<br>shall be embedded in a proper res<br>along the longitudinal axis of the re<br>d examined visually or by using a 5<br>of caps and voids in the external c                                   | all have been suc<br>ith the DPA manu<br>d from the resisted<br>ors shall be exam<br>al ratio of helical of<br>utting width, state<br>sin or other mater<br>esistors. One cut<br>fix magnifier for th<br>oating. | cessfully<br>al cited in the<br>ors with a<br>ined visually<br>cutting, state<br>of resistor<br>ials, and cut<br>face shall be<br>e |
| B.4.4.4   | Electrical Performan<br>The electrical perform  | ce<br>nance tests shall be performed as   | follows.   |   |
| B.4.4.4.1 | 75mm belo<br>closer than  |   | g base which sha<br>esistors shall be n  | ll be no<br>nounted in  |

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	T si te	he resistor ize. Force emperature	ality conformance inspe s shall be mounted in a d air cooling may be use . The average velocity 2.5m per second.	ny position ed to maint	tain the test am	bient
	b) Mea	asurement	before test all be measured as spe	cified in pa	aragraph B.4.4.4	4.2.
	c) Tes 1) T	t condition	s nt temperature: 20 to 45			
	<ul> <li>2) Loading power</li> <li>The loading power shall be one and a half times the rated power. The maximum test voltage shall be as specified in the detail specification.</li> <li>3) Nature of voltage:</li> <li>Direct or alternating (root-mean-square value at commercial-line frequency) voltage</li> <li>4) Loading time: 24<sub>0</sub><sup>+4</sup> hours</li> </ul>					
	d) Mea The for :	Measurement after test The load shall be removed and the resistors shall remain at room temperatur for 30 minutes or more before the resistance is measured in accordance with paragraph B.4.4.4.2.				
	e) Exa The	mination a		lly for evid	ence of arcing,	burning or
B.4.4.4.2	Resistan	се				
	The resistance test shall be performed in accordance with Test Method 303 of M STD-202. The following details and exceptions shall apply. a) Test voltage Test voltages shall be applied in accordance with Table B-10.					nod 303 of MIL-
	<ul> <li>b) Test temperature</li> <li>As a rule, the Group I resistance test of the qualification test and Group A1</li> <li>the Group A quality conformance inspection shall be performed at 25±2°C.</li> <li>Unless otherwise specified, the temperature at which subsequent and final</li> </ul>					
resistance measurements are made shall be within $\pm 2^{\circ}$ C of the temperatu which the initial measurement was made.						temperature at
		Tabl	e B-10. Resistance Te	est Voltage		
	<b></b>	N a sar line r	registeres report (0)	Maria	Unit: V <sub>DC</sub>	
			resistance range (Ω) ore and less than 10		n voltage	
			ore and less than 10		1	
			more and less than 1k		3	
100 of more and less that 1k 5						

1k or more and less than 10k

10k or more and less than 100k 100k or more and less than 1M

1M or more

10

30

100

100

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## B.4.4.4.3 Resistance-Temperature Characteristic

The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following details and exceptions shall apply.

- a) Reference temperature: 25°C
- b) Test temperature: As specified in Table B-11.
- c) Unit of resistance-temperature characteristic: 10<sup>-6</sup>/°C.

## Table B-11. Test Temperature for Resistance-Temperature Characteristic

Unit: °C							
Order	Test temperature						
Order	Qualification test	Quality conformance inspection					
1	25±3	25±3					
2	-15±3	-55±3					
3	-55±3	25±3					
4	25±3	125±3					
5	65±3	-					
6	125±3	-					

# B.4.4.4.4 Short-Time Overload

The resistance shall be measured as specified in paragraph B.4.4.4.2. Following this measurement, dc or ac (root-mean-square value at commercial-line frequency) test voltage shall be applied to the resistors under the conditions shown below and the resistors shall be examined for evidence of arcing or any other damage. After this test, the test voltage shall be removed and the resistors shall remain at room temperature with no load for 30 minutes before the resistance is measured in accordance with paragraph B.4.4.4.2 to calculate the change in resistance before and after the test. At the completion of this test, the resistors shall be examined for significant abnormalities. The marking shall also be examined for legibility. This test shall be performed under the following conditions.

- a) Mounting method: As specified in item a), paragraph B.4.4.4.1.
- b) Test temperature: 25±5°C
- c) Test condition:

A potential of 2.5 times the rated voltage shall be applied for 5±1 seconds to the resistors. The test voltage shall not exceed the maximum overload voltage as specified in the detail specification.

## B.4.4.4.5 Dielectric Withstanding Voltage

## B.4.4.4.5.1 Atmospheric Pressure

Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202. The following details and exceptions shall apply.



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B.4.4.5	Mechanical Performa	· · ·	<u> </u>	<u> </u>			
-		ormance tests shall be performed a	as follows.				
B.4.4.5.1	specified in Test M	Terminal Strength Resistors shall be tested in accordance with condition A (pull test) and D (twist test) specified in Test Method 211 of MIL-STD-202. The following details and exceptions shall apply.					
B.4.4.5.1.1	<ul> <li>Pull Test (Test Condition A)</li> <li>a) Measurement before test The resistance shall be measured in accordance with paragraph B.4.4.4.2.</li> <li>b) Load Load shall be 9.8N for the resistors with the rated power of 0.125W or less and 24.5N for 0.25W or more.</li> <li>c) Duration of load applied: 5 to 10 seconds</li> <li>d) Test method The load shall be applied in the axial direction of lead wires without inducing shock. The lead wire shall be clamped at the closest point to the lead end.</li> <li>e) Measurement after test Resistance shall not be measured after the pull test since this test shall be performed in combination with the twist test specified in paragraph B.4.4.5.1.2.</li> <li>f) Examination after test The terminals shall be examined visually for evidence of mechanical</li> </ul>						
B.4.4.5.1.2	<ul> <li>5.1.2 Twist Test (Test Condition D)</li> <li>Following the pull test, the twist test shall be performed with the same samples.</li> <li>a) Measurement before test: The resistance shall not be measured before the test.</li> <li>b) Test method</li> <li>With the center axis of the resistor's lead wire used as a rotating axis, the lead wire shall be rotated 360 degrees along a plane perpendicular to the rotating axis. This operation shall be defined as the first twist. The lead wire shall then be rotated 360 degrees in the opposite direction. This shall be counted as the second twist.</li> <li>c) Number of twists: 5</li> <li>d) Measurement after test The resistance shall be measured in accordance with paragraph B.4.4.4.2.</li> <li>e) Examination after test The terminals shall be examined for evidence of breaking or loosening.</li> </ul>						
B.4.4.5.2	Solderability Resistors shall be The following detai	tested in accordance with Test Me ls and exceptions shall apply. Shall be performed.	-	-			

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	c) d) e) f)	Solder temper Solder immers Depth of imme Non-molded ty Molded type s Examination a	vpe shall be within 1.3mm from th hall be within 2.5mm from the bas	se of the terminals	
B.4.4.5.3	Resis	stance to Solde	ering Heat		
<ul> <li>Resistors shall be tested in accordance with Test Method 210 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Measurement before test The resistance shall be measured in accordance with paragraph B.4.4.4.2.</li> <li>b) Solder temperature: 350±10°C</li> <li>c) Duration of immersion: 3<sup>+0.5</sup><sub>0</sub> seconds</li> </ul>					
<ul> <li>d) Depth of immersion: Within 1.3mm from the base of the terminals.</li> <li>e) Cooling time after immersion: 3 hours or more</li> <li>f) Measurement after test The terminals shall remain at room temperature for the specified time after test before the resistance measurement is made in accordance with paragraph B.4.4.4.2.</li> <li>g) Examination after test The resistors shall be examined visually for evidence of mechanical dama</li> </ul>					time after the <i>v</i> ith
B.4.4.6	Enviror	nmental Perfor	mance		
	The en	vironmental pe	rformance tests shall be performe	ed as follows.	
B.4.4.6.1	Vibra	ation			
B.4.4.6.1.1	Re	e following det Mounting m The resistor B.4.4.6.2. <i>A</i> surrounding fixture. Measureme Resistance shall be perf specified in	e tested in accordance with Test I ails and exceptions shall apply.	e with item a), par ecessary because ped to the resisto s vibration test sine nock test (specifie	agraph e of the field r mounting ce this test d pulse) as

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d) e) f) g) h)	other paralle Duration of Measureme Each resister vibration to Measureme The resistar Examination	wo mutually perpendicular direction el to the longitudinal axis of the res vibration: Six hours in each direction nt during test or shall be monitored with specified determine no electrical discontinui nt after test nece shall be measured in accordar	sistors. on for a total of 1 d equipment durin ty of 0.1ms or gro nce with paragrap	2 hours. ng the eater. oh B.4.4.4.2.	
	-	-			
_	ndom Vibratic				
		e tested in accordance with Test M ails and exceptions shall apply.	iethoa 214 of MII	L-STD-202.	
a)	•	ethod: As specified in item a), para	agraph B 4 4 6 2		
b)	•	nt before test	agraph D.4.4.0.2.		
		nce shall be measured in accordar	nce with paragrap	oh B.4.4.4.2.	
c)		on: II-H Frequency range: 20 to 2			
		Rms value of acceleration	n: 334m/s² rms		
d)	Direction of				
e)	other paralle Number of a	wo mutually perpendicular direction el to the longitudinal axis of the res application and duration of vibratio	sistors. n		
	time of 30 m	all be applied for 15 minutes in ea		a iolai lesi	
f)		nt during test			
, ,		or shall be monitored with specified	d equipment durir	na the	
		determine no electrical discontinui	• •	•	
g)	Measureme				
		nce shall be measured in accordar	nce with paragrap	oh B.4.4.4.2.	
h)	Examination				
	The resistor damage.	s shall be examined visually for ev	vidence of mecha	inical	
	•				
B.4.4.6.2 Shock					
		tested in accordance with Test Me	tnoa 213 of MIL-	STD-202.	
	-	ls and exceptions shall apply.			
,	<ul> <li>Mounting method: Resistors shall be rigidly mounted on appropriate fixtures or mounted with the state of the</li></ul>				
		ted to a flat surface. The resistors			
	supported app	proximately 6mm from the resistor	body. The fixture	es shall be	
	constructed to	insure that the points of the resist	or mounting supp	ports will	
		e motion as the shock table. The r	•		
		preclude any resonance in the fix	-		
	snock test, an	d the fixtures shall be monitored if	necessary. Test	lead used	

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B.4.4.6.3 B.4.4.6.3.1

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T	able B-12.	Test Conditions of	f Thermal Sh	nock [l]	
	Step	Temperature (°C)	Time (min.	.)	
	1	-65 <sup>0</sup> -5	15		
	2	150 <sup>+3</sup> <sub>0</sub>	15		
After m shall be shown apply. a) M Th pl: b) Ni c) Cy Th be d) M Th te 10 re e) E2 Th re ca f) E3 Th	e subjected to in Table B-13 ounting meth- ne resistors s aced in trays umber of test ycle condition ne first 25 cyc e interrupted easurements ne resistance mperature fo $00^{+5}$ cycles, 3 sistors shall camination at ne resistors s sistance sha alculate the c camination at	shall be mounted by of small heat inertia t cycles: 1,000 cycle ns cles shall run contine following the comple s during test and exte shall be measured or 30 minutes or mor $250_{0}^{+10}$ cycles and 5 be inspected visually fter test shall be at room tem II be measured in ac hange in resistance	mal shock cyc he following of means other a. s uously. After etion of any fu ernal inspect after the resi e at each 25 $600_{0}^{+10}$ cycles y for cracks of perature for 3 ccordance with before and a	than soldering than soldering the 25 cycles, ull cycle. ion stors are at roo $_{0}^{+5}$ cycles, $50_{0}^{+5}$ . The externals on the surface. 80 minutes or m th paragraph B. ifter the test.	e conditions eptions shall or may be the test may m cycles, s of all hore, and the 4.4.4.2 to

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Table B-13. Test Condition Thermal Shock [II]	100	k <sup>15</sup> →				
0	<u>e (min.)</u>					
400 +3	15 <b>e</b>					
StepTemperature (°C)Time (min.)1 $-30 \frac{0}{.5}$ 153 $100 \frac{+3}{0}$ 15 $3$ $100 \frac{+3}{0}$ 15 $-30 - 15$ $-30 - 15$ $15 - 30 - 15$ <t< th=""></t<>						
	Figure B-3.	Test Condition	is of			
	Ther	mal Shock [II]				
<ul> <li>B.4.4.6.4 Moisture Resistance</li> <li>Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Mounting method <ol> <li>Where polarization is not applied</li> <li>Solder both leads to rigid mounts or terminal lugs. The spacing of the mounts or terminal lugs shall be such that the length of each resistor lead is approximately 10mm when measured from the edge of the supporting terminal to the resistor body.</li> </ol> </li> <li>Where polarization is applied <ol> <li>One half of the resistors mounted as specified in 1) above shall be covered with a V-shape metal strap whose width is equal to that of the resistor body as indicated in Figure B-4. The strap shall be made from corrosion-resistant metal and shall be kept in contact with the resistor body by supporting the body as indicated in Figure B-4, with a nonconducting, noncorrosive support whose width is less than that of the resistor body. In addition, the support shall not allow condensation of moisture which could have an inverse influence on the test. An individual metal strap may be used for each resistor or one continuous metal strap may be used for all resistors.</li> </ol> </li> <li>Measurement before test <ul> <li>Following the pretreatment, the resistors shall be at room temperature for a minimum of 2 hours before the resistance is measured in accordance with paragraph B.4.4.4.2.</li> <li>Polarization and loading voltage</li> </ul> </li> </ul>						

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d) e)	Polarization metal strat applied w together, 2) Loading v Loading v with the m potential of maximum Measurement Upon complet relative humid hour and 30 m from the cham the resistance insulation resis paragraphs B. Examination a	roltage shall be applied to the resist netal strap. During the first 2 hours equivalent to 100% rated wattage, operating voltage, shall be applie after test ion of step 6 of the final cycle, the ity of 90 to 95% and a temperature ninutes to 3 hours and 30 minutes. ber, and remain at room temperat , dielectric withstanding voltage (a stance shall be measured in that o 4.4.4.2, B.4.4.4.5.1 and B.4.4.4.6	00 volt dc potenti the resistor termin o the polarizing s stors which are no s of steps 1 and 4 but not exceedin d. resistors shall be e of 25±2°C for a Resistors shall be ure for 1 to 2 hou tmospheric press order as specified respectively.	al shall be hals tied straps. ot covered 4, a dc test g the held at a period of 1 be removed urs. Then, sure) and in
, (	Figure B-	4. Mounting Straps for Polarize	Supp	Resistor body
Resi The a) b)	following detai Application are Solvents to be 1) 2-propanol 2) 42 parts by	tested in accordance with Test Me Is and exceptions shall apply. ea: Marked portion	me of propylene (	glycol

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B.4.4.6.6	hour after this mea temperature of -65 chamber shall then are removed from t removed. The resi than 8 hours. The paragraph B.4.4.4. After the test the re	Storage all be measured as specified in par surement, the resistors shall be pl ${}_{-5}^{0}$ °C for a period of 24±4 hours. T the gradually returned to room ter the chamber. Any water droplets of stors shall be at room temperature resistance shall then be measured 2 to calculate the change in resistance sistors shall be examined for sign xamined for legibility.	aced in a cold ch he temperature i nperature before on the surface sh e for 2 hours or m d in accordance v ance before and	amber at a n the the resistors all be nore but less with after the test.
B.4.4.6.7	Low Temperature C The resistance sha hour after this mea room temperature. the resistors shall r applied for $45^{+5}_{0}$ m gradually increase resistors are remove be removed. The r less than 2 hours. paragraph B.4.4.4. After the test the res	Operation all be measured as specified in par surement, the resistors shall be pl The temperature shall be gradua remain for 1 hour at no load. The r inutes. Wait $15^{+5}_{0}$ minutes after th the chamber temperature to room yed from the chamber. Any water resistors shall remain at room temp The resistance shall then be meas 2 to calculate the change in resistance esistors shall be examined for sign	aced in a test cha lly decreased to rated voltage sha e removal of volt temperature bef droplets on the s perature for 1 ho sured again as sp ance before and	amber at -65 <sup>0</sup> <sub>-5</sub> °C and Ill then be age to ore the urface shall ur or more but pecified in after the test.
B.4.4.6.8	Stability After the resistance resistors shall be p temperature in the of $150^{+15} \circ C$ . After no load for 2,000 <sup>+4</sup> temperature shall b then be removed fr 6±1 hours. The res B.4.4.4.2 to calcula	kamined for legibility. e is measured in accordance with put in a test chamber maintained at chamber shall then be gradually in stabilizing at the test temperature to stabilizing at the test temperature of hours. When the specified test to be gradually returned to room temperature to room the test chamber and remain a sistance shall then be measured in the test change in resistance before that the change in resistance before that the examined for significant at	t room temperatu increased to a tes , the resistors sh ime has passed, perature. The res at a temperature in accordance with e and after the tes	re. The t temperature all remain at the sistors shall of 25±5°C for n paragraph
B.4.4.7	Durability Durability test shall be	e performed as follows.		
B.4.4.7.1		tested in accordance with Test Me Is and exceptions shall apply.	thod 108 of MIL-	STD-202.

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a)	of each termin	unting shall be mounted on light weight to al shall be a minimum of 12.5mm s as a rule. The distance betwee	. Resistors shall	be soldered
b)	Measurement After the resist measured at re	before test tors are mounted in a test fixture, com temperature in accordance v s shall be performed at a tempera	vith paragraph B.4	4.4.4.2. All
c) d)	90 minutes ON controlled to m		voltage shall be re The test duration	egulated and n shall be
e)	conformance inspection. Measurements during and after test After the resistors are at room temperature for a minimum of 45 minutes at no load, the resistance shall be measured in accordance with paragraph B.4.4.4.2.			
f)	Measurements 3) Qualification 2,000 <sup>+72</sup> h 4) Quality co	on test: $250 \frac{+48}{0}$ hours, $500 \frac{+48}{0}$ hournours.	Ū	
g)	1,000 <sup>+48</sup> h Examination a The resistors s		mechanical dam	age.
0	erm Storage m storage shall	be in accordance with paragraph	4.7 of JAXA-QTS	S-2050.
<ul> <li>B.4.6 Change of Tests and Inspections</li> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> </ul>			3 of JAXA-	
	3.5. PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.		QTS-2050.	
B.6. NOTES Refer to				

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This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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D.1. General				
D.1.1 Scope				
		the general requirements and m resistor networks (hereinaft	•	
D.1.2 Classification	on			
Resistors c	overed by this	specification shall be classified	d as specified in Ta	able D-1.
		Table D-1. Classification		
	Construction	n Identification number		
	SIP	402		
details. Example: JAXA(¹) 205	50/D <u>402</u>   ID Number	terminal re	1001     F       Nominal     Resistance       esistance     tolerance       (D.1.3.3)     (D.1.3.4)	C  Schematic (D.1.3.5)
D.1.3.1 Terminal	s	the common part for space us dentified by a two digit number		

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Table D-2.	Terminals
------------	-----------

Symbol	Number of terminals
04	4
05	5
06	6
07	7
08	8
09	9
10	10

#### D.1.3.2 Characteristic

The characteristic shall be identified by a single capital letter in accordance with Table D-3.

## Table D-3. Characteristic

(Unit: x10<sup>-6</sup>/°C)

Symbol	Resistance-temperature characteristic (referenced:25°C)	
М	±200	

#### D.1.3.3 Nominal Resistance

The nominal resistance shall be identified in ohms ( $\Omega$ ) by 3 or 4 digits.

#### a) Resistance identified by 4 digits

The resistance identified by 4 digits applies to resistors with resistance tolerance of  $F(\pm 1.0\%)$ . The first three digits represent the significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.

Example: 97	7R6=	97.6	δΩ		
15	500=	150	Ω		
15	501=	1,500	Ω=	1.50	)kΩ
15	503=15	50,000	Ω=15	50	kΩ

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tolerances of J (	dentified by 3 digits applies to resis ±5.0%) or G (±2.0%). The first two ast digit specifies the number of ze 10Ω	o digits represent	

151= 150Ω 152= 1,500Ω= 1.50kΩ 154=150,000Ω=150 kΩ

D.1.3.4 Resistance Tolerance

The resistance tolerance shall be identified by a single capital letter in accordance with Table D-4.

	Unit: %
Symbol	Resistance tolerance
F	±1.0
G	±2.0
J	±5.0

# Table D-4. Resistance Tolerance

#### D.1.3.5 Schematic

The schematic shall be identified by a single capital letter in accordance with Table D-5.

Symbol	Schematic
С	V V V V V V V V V V V V V V V V V V V
G	

 Table D-5.
 Schematic

	JAXA-QTS-2050D 11 June 2013	J A X A Parts Specification	Page	– D-4 –
D.2.	Applicable Documents			
D.2.1	Applicable Documents			
	The applicable docume 2050.	nts shall be as specified in paragra	aph 2.1 of JAXA-	QTS-
D.2.2	Reference Documents			
	The following is a refere a) MIL-PRF-83401	ence document. Resistors Networks, Fixed, Filr Networks, Ceramic Capacitor a General Specification for	-	
D.3.	Requirements			
D.3.1	Qualification Coverage			
	that conforms to materia specified in paragraphs represented by samples Characteristics, resistar shall be classified as sp the manufacturer is allo	lid for resistors that are produced als, designs, constructions, specifi D.3.2 to D.3.9. The qualification is that have passed the qualification ace tolerance and schematics of the ecified in Tables D-6, D-7 and D-8 wed to supply qualified products in ecessary, additional qualification of pecification.	cations and perfo coverage shall be n test. ne resistors to be 3. Within this cov n accordance with	ormance qualified verage, h the
	Table	D-6. Characteristics Qualificat	ion	

Table D-6. C	haracteristics	Qualification
--------------	----------------	---------------

Characteristic submitted	Characteristic qualified	
М	М	

# Table D-7. Resistance Tolerance Qualification

Resistance tolerance submitted	Resistance tolerance qualified
F	F, G, J
G	G, J
J	J

Table D-8.	<b>Schematics</b>	Qualification
------------	-------------------	---------------

Schematic submitted	Schematic qualified
С	C, G
G	G

JA	4XA-QTS-2050D 11 June 2013	J A X A Parts Specification	Page	– D-5 –		
D.3.2	Materials The materials shall be s JAXA-QTS-2050.	pecified as follows and as specifi	ed in paragraph 3	5.3 of		
D.3.2.1	Enclosure Resistors shall be su specified.	Resistors shall be sufficiently encapsulated to withstand the environmental tests				
D.3.2.2	Terminal Leads Terminal leads shall l	be free of foreign material.				
D.3.2.3	use noncorrosive flux test shall be performe be verified that the wa	all completely remove corrosive s . When non-corrosive flux is used ed in accordance with paragraph 4 ater extract resistivity is not less th sed, the mass ratio range of resin	d, the water extra 4.9 of JIS Z 3197, han 100kΩ∙cm.  V	ct resistivity and it shall Vhen resin		
D.3.3	Externals, Dimensions a Resistors shall satisfy th paragraph D.4.4.2.	and Marking ne following requirements when te	ested in accordance	ce with		
D.3.3.1	Externals and Marking There shall be no defects such as cracks on the surface of the resistors. The following shall be clearly marked in such a manner to ensure legibility. As a rule, the marking shall remain legible at the completion of any test. Resistors with a small shape and physical dimensions shall be marked on its front and rear separately.					
	•	JAXA 2050D" and the hyphen be nber of terminal may be omitted.	tween the Identific	cation		
	<ul><li>"●" or "■" shall be</li><li>c) Year and week r</li><li>As specified in d</li></ul>	e used to identify pin no.1. nanufactured etail specification. me or its abbreviation.				
D.3.3.2		sions and Mass nstructed of a film resistor elemer s shall satisfy the requirements sp				
D.3.4		ufactured based on good design p ality assurance program defined i				

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## D.3.4.1 DPA

When resistors are tested as specified in paragraph D.4.4.3.1, processes such as terminal connections, connection between each resistor element, helical cutting, and external coating shall have been successfully achieved. The internal structure shall be as specified in the quality assurance program.

### D.3.5 Ratings

### D.3.5.1 Nominal Resistance

As a rule, standard values of nominal resistance shall be defined in relation to the resistance tolerance and shall be as specified in Table D-9. The minimum and maximum resistances shall satisfy the requirements of the detail specification.

### D.3.5.2 Operating Temperature Range

The operating temperature range shall be between -55 and +125°C.

## D.3.5.3 Power Rating

Resistors shall have a power rating as specified in the detail specification. The rated ambient temperature shall be 70°C.

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Resistance tolerance and symbols (%)							
F (±1.0)	G (±2.0) J (±5.0)	F (±1.0)	G (±2.0) J (±5.0)	F (±1.0)	G (±2.0) J (±5.0)	F (±1.0)	G (±2.0) J (±5.0)
10.0	10.0	18.7	-	33.2	-		
10.2	-	19.1	-	34.0	-	57.6	-
10.5	-	19.6	-	34.8	-	59.0	-
10.7	-	20.0	20	35.7	-	60.4	-
11.0	11	20.5	-	-	36	61.9	-
11.3	-	21.0	-	36.5	-	-	62
11.5	-	21.5	-	37.4	-	63.4	-
11.8	-	-	22	38.3	-	64.9	-
-	12	22.1	-	-	39	66.5	-
12.1	-	22.6	-	39.2	-	-	68
12.4	-	23.2	-	40.2	-	68.1	-
12.7	-	23.7	-	41.2	-	69.8	-
13.0	13	-	24	42.2	-	71.5	-
13.3	-	24.3	-	-	43	73.2	-
13.7	-	24.9	-	43.2	-	75.0	75
14.0	-	25.5	-	44.2	-	76.8	-
14.3	-	26.1	-	45.3	-	78.7	-
14.7	-	26.7	-	46.4	-	80.6	-
15.0	15	-	27	-	47	-	82
15.4	-	27.4	-	47.5	-	82.5	-
15.8	-	28.0	-	48.7	-	84.5	-
-	16	28.7	-	49.9	-	86.6	-
16.2	-	29.4	-	-	51	88.7	-
16.5	-	-	30	51.1	-	90.9	-
16.9	-	30.1	-	52.3	-	-	91
17.4	-	30.9	-	53.6	-	93.1	-
17.8	-	31.6	-	54.9	-	95.3	-
-	18	32.4	-	-	56	97.6	-
18.2	-	-	33	56.2	-		

# Table D-9. Standard Resistance Values

# D.3.5.4 Maximum Power

The maximum power at or below the rated ambient temperature shall be equal to the power rating. For temperatures in excess of the rated ambient temperature, the maximum power shall be determined by derating the power rating in accordance with the derating curve shown in Figure D-1.



JA	AXA-QTS-2050D 11 June 2013	J A X A Parts Specification	Page	– D-9 –		
D.3.6.3	<ul> <li>D.3.6.3 Resistance-Temperature Characteristic</li> <li>When resistors are tested as specified in paragraph D.4.4.4.3, the resistance- temperature characteristic, at each of the temperatures specified in Table D-16, shall be as specified in Table D-3.</li> </ul>					
D.3.6.4	resistance before and specification. There s	Short-Time Overload When resistors are tested as specified in paragraph D.4.4.4.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of arcing, burning, or charring after the completion of this test.				
D.3.6.5	shall satisfy the requi	ng Voltage sted as specified in paragraph D.4 rements of the detail specification arcing, or insulation breakdown.		•		
D.3.6.6		sted as specified in paragraph D.4 y the requirements of the detail sp		ation		
D.3.7	Mechanical Performanc Resistors shall satisfy th	e ne following mechanical requireme	ents.			
D.3.7.1	Terminal Strength When resistors are tested as specified in paragraph D.4.4.5.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage, loosening of terminals or chipping of coating after the completion of the test.					
D.3.7.2	the terminal surface s pinholes or rough are	sted as specified in paragraph D. hall be evenly covered with new s as shall be acceptable, provided t l area of the pinholes or rough are	older. The existent they are not o	ence of small concentrated		
D.3.7.3	resistance before and	ng Heat sted as specified in paragraph D.4 I after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail		
D.3.8	Environmental Performa Resistors shall satisfy th	ance ne following environmental require	ments.			

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D.3.8.1		tion sted as specified in paragraph D after the test shall satisfy the rec		-			
D.3.8.2		When resistors are tested as specified in paragraph D.4.4.6.2, the change in resistance before and after the test shall satisfy the requirements of the detail					
D.3.8.3	resistance before and	sted as specified in paragraph D after the test shall satisfy the rec shall be no evidence of mechanic	quirements of the	detail			
D.3.8.4	resistance before and	sted as specified in paragraph D after the test shall satisfy the rea shall be no evidence of mechanic	quirements of the	detail			
D.3.8.5		ts sted as specified in paragraph D etails shall be as specified in the		•			
D.3.8.6	resistance before and	rage sted as specified in paragraph D after the test shall satisfy the rec shall be no evidence of mechanic	quirements of the	detail			
D.3.8.7	resistance before and	eration sted as specified in paragraph D after the test shall satisfy the rea shall be no evidence of mechanic	quirements of the	detail			
D.3.8.8	resistance before and	sted as specified in paragraph D after the test shall satisfy the rea shall be no evidence of mechanic	quirements of the	detail			

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D.3.9	Durability				
	Resistors shall satisfy the	ne following durability requirement	S.		
D.3.9.1	Life				
When resistors are tested as specified in paragraph D.4.4.7.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the compof the test.					
D.4. C	Quality Assurance Provisi	ons			
D.4.1	In-Process Inspection				
	The in-process inspection 2050.	on shall be as specified in paragra	ph 4.3 of JAXA-0	QTS-	
D.4.2	Qualification Test				
	The qualification test sh as provided below.	all be as specified in paragraph 4.	4 of JAXA-QTS-2	2050 and	
D.4.2.1	Test Items and Numb	per of Samples			
	Test items and numb Table D-10.	er of samples for the qualification	test shall be as s	pecified in	
	resistance, and critica shall have the maxim Each construction sh	es shall be 180: 60 each for minin al resistance or closest to the critic um number of elements shown in all be separately qualified. Two ac up IB test of Table D-10, DPA, and up II tests.	al resistance. The schematics to distribute the schematics to distribute the schematics to distribute the schematic schematics and the schematic schematics and the schematic schematic schematics and the schematic schematic schematics and the schematic sche	ne samples o be qualified. units shall be	
	completion of Group	shall be performed in the order list I tests, Group III through VII tests s the appropriate group tests.		•	

		A-QTS-2050D 1 June 2013	Parts	J A X A Specificat	tion	Page	– D-12 –
		Та	able D-10.	Qualificati	on Test		
		Test	<b>.</b> .			Criteria for Pass/f	ail
Group	Order	Item	Require- ment paragraph	Test method paragraph		Sample size	No. of defectives allowed <sup>(1)</sup>
	1	Thermal shock [I]	D.3.8.3	D.4.4.6.3			
Ι	2	Power conditioning	D.3.6.1	D.4.4.4.1			
	3	Resistance	D.3.6.2	D.4.4.4.2		100%	0
IA	1	Externals, dimensions and marking <sup>(2) (3)</sup>	D.3.3	D.4.4.2			
IB	1	DPA	D.3.4.1	D.4.4.3.1		2	0
	1	Solderability	D.3.7.2	D.4.4.5.2	404		
II	2	Resistance to solvents	D.3.8.5	D.4.4.6.5	12 Any resistance		0
	1	Resistance-temperature characteristic	D.3.6.3	D.4.4.4.3	(10 н	ighest resistance	
	2	Low temperature storage	D.3.8.6	D.4.4.6.6		ritical resistance	
111	3	Low temperature operation	D.3.8.7	D.4.4.6.7		owest resistance	0
	4	Short-time overload	D.3.6.4	D.4.4.4.6			
	5	Terminal strength	D.3.7.1	D.4.4.5.1			
	1	Dielectric withstanding voltage	D.3.6.5	D.4.4.4.4	(10 н	ighest resistance	
IV	2	Insulation resistance	D.3.6.6	D.4.4.4.5		ritical resistance	0
IV	3	Resistance to soldering heat	D.3.7.3	D.4.4.5.3		owest resistance	0
	4	Moisture resistance	D.3.8.4	D.4.4.6.4			
V	1	Shock	D.3.8.2	D.4.4.6.2		ighest resistance ritical resistance	0
	2	High frequency vibration	D.3.8.1	D.4.4.6.1	10 L	owest resistance	
VI	1	Life	D.3.9.1	D.4.4.7.1	60 { 20 C	ighest resistance ritical resistance owest resistance	0
VII	1	Stability	D.3.8.8	D.4.4.6.8	30 { 10 C	ighest resistance ritical resistance owest resistance	0
-	1	Materials	D.3.2	_		(4)	1

Notes:

<sup>(1)</sup>When a sample has failed to pass 2 or more tests of one group, it shall be counted as a single defect.

<sup>(2)</sup> For dimensions and mass, sample size shall be 1.0% of the acceptable quality level (AQL) in "Special Inspection Level S-4" specified in JIS Z 9015-1.

<sup>(3)</sup> If the critical resistance is not specified, the samples shall be equally divided between the minimum and maximum resistance.

<sup>(4)</sup> Data to certify compliance with design specifications shall be submitted.

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D.4.3	Quality Conformance Inspection					
D.4.3.1	Samples					
	The composition of the Group A inspection lot is as specified in Paragraph 4.5.1.1. Group B and C inspections shall be performed for each structure and the inspection samples used for these inspections shall be the ones passed the Group A inspection. Any number of terminal and resistance may be chosen.					
D.4.3.2	Inspection Items and	Number of Samples				
	The items and number of samples of the Group A, B and C inspections of the quality conformance inspection shall be as specified in Tables D-11, D-12 and D-13, respectively.					
D.4.3.3	Criteria for Pass/Fail					
	each inspection group defects does not exce mode of a defect is ca	pecified in Table D-11, D-12 or D- o of the quality conformance inspe- eed the permitted number specifie atastrophic, such as open- or shor ost, the resistor fails the Group A in	ection. When the d in Table D-11, t-circuit where th	number of but the failure		
D.4.3.4	Post-Test Disposition	of Sample				
	be shipped. If the lot	rejected in the Group A quality co has not passed the Group A2 or A sted to the failed inspection item, a	A4 inspection, all	products of		

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		Inspection	Doguiro	Test	Criteria for Pass/fail	
Group	Order	Item	Require- ment paragraph	method paragraph	Sample size	No. of defectives allowed <sup>(1)</sup>
	1	Thermal shock [I]	D.3.8.3	D.4.4.6.3	100%	
A1	2	Power conditioning	D.3.6.1	D.4.4.4.1		0
	3	Resistance	D.3.6.2	D.4.4.4.2		
A2	1	Externals, dimensions and marking	D.3.3	D.4.4.2	AQL <sup>(2)</sup> 4.0%	
A3	1	DPA	D.3.4.1	D.4.4.3.1	2	0
	1	Resistance-temperature characteristic	D.3.6.3	D.4.4.4.3	AQL <sup>(2)</sup> 2.5%	
A4	2	Dielectric withstanding voltage (atmospheric pressure)	D.3.6.5	D.4.4.4.1		
	3	Insulation resistance	D.3.6.6	D.4.4.4.5		
	4	Short-time overload	D.3.6.4	D.4.4.4.6		

# Table D-11. Quality Conformance Inspection (Group A)

Notes:

<sup>(1)</sup>When a sample has failed to pass 2 or more tests of one group, it shall be counted as a single defect.

<sup>(2)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Normal Inspection Level II" and "Special Inspection Level S-4" specified therein shall apply to the Group A2 and A4 inspections, respectively.

	Inspection			Require- Test		Criteria for Pass/fail	
Group	Order	Item	ment paragraph	method paragraph	Sample size	No. of defectives allowed	
	1	Resistance-temperature characteristic	D.3.6.3	D.4.4.4.3			
	2	Low temperature storage	D.3.8.6	D.4.4.6.6			
B1	3	Low temperature operation	D.3.8.7	D.4.4.6.7	10	0	
	4	Short-time overload	D.3.6.4	D.4.4.4.6			
	5	Terminal strength	D.3.7.1	D.4.4.5.1			
	1	Dielectric withstanding voltage	D.3.6.5	D.4.4.4.4	10	0	
50	2	Insulation resistance	D.3.6.6	D.4.4.4.5			
B2	3	Resistance to soldering heat	D.3.7.3	D.4.4.5.3			
	4	Moisture resistance	D.3.8.4	D.4.4.6.4			
B3	1	Life	D.3.9.1	D.4.4.7.1	10	0	
B4	1	Solderability	D.3.7.2	D.4.4.5.2	10	0	
D4	2	Resistance to solvents	D.3.8.5	D.4.4.6.5	10	U	
B5	1	Stability	D.3.8.8	D.4.4.6.8	10	0	

# Table D-12. Quality Conformance Inspection (Group B)

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Table D-13.	Quality Conformance	Inspection (Group C)
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	Inspection		Require-	Test Criteria for Pa		for Pass/fail
Group	Order	Item	ment paragraph	method	Sample size	No. of defectives allowed
C1	1	Shock	D.3.8.2	D.4.4.6.2	10	0
C1	2	High frequency vibration	D.3.8.1	D.4.4.6.1	10	0

#### D.4.4 Methods for Test and Inspection

#### D.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in questionable pass/fail results, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

b) Reference conditions

Reference conditions shall be a temperature of  $25^{\circ}$ C and an atmospheric pressure of 101.3 kPa.

- Judgment conditions
   Judgment conditions shall be either condition A or B specified in Table D-14.
   Unless specified, condition A shall apply.
- d) Specified mounting

The resistors shall be mounted on a suitable test board of glass epoxy base nominally 1.6mm thick. Resistors must be spaced at least 13mm from apart. Since the mounting method is not specified, a pressure type contact may be used.

Condition	А	В
Temperature (°C)	23±2	20±2
Relative humidity (%)	50±5	65±5
Atmospheric pressure (kPa)	86 to 106	86 to 106

Table D-14. Judgment Conditio	ns
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_	(A-QTS-2050D 1 June 2013	J A X A Parts Specification	Page	– D-16 –			
				I			
D.4.4.2	D.4.4.2 Externals, Dimensions and Marking						
D.4.4.2.1	<ul> <li>b) The marking te</li> <li>c) The dimension</li> <li>compliant to J</li> <li>are questiona</li> </ul>	nspection shall be performed visua est shall be performed visually. Is shall be measured with a vernie IIS B 7507 and JIS B 7502, respec ble, another measuring instrument II be measured with a measuring ir	r caliper or micro tively. If the mea may be used.	sured values			
	questionable	pass/fail result.		-			
D.4.4.2.2	<ul> <li>a) The external ir</li> <li>b) The marking te</li> <li>c) The dimension advance or a measured val be proven tha instrument. T exceed the dim</li> <li>d) For the mass i</li> </ul>	nce Inspection (Group A) inspection shall be performed visual est shall be performed visually. Ins may be measured with a dimension gauge of n times using a universal ue could result in a questionable re- t the dimension gauge is sufficient he sample shall pass this test whe mensional tolerances specified in t inspection, pass/fail results shall be criteria samples of maximum mas advance.	sion gauge which projector, unless esult. Prior to the ly functional as a in the measurem the detail specific e made by compa	s the e test, it shall measuring ents do not ation. aring the			
D.4.4.3	Workmanship						
D.4.4.3.1	<ul> <li>connections, connections, connections, connections, connective coaresinous solve or by using a connection be electrodes.</li> <li>b) The resistors se electrode, terr cut in the plan resistors. One</li> </ul>	be disassembled to ensure that prection between each resistor elem en successfully achieved. DPA shate DPA manual cited in the Quality ting or enclosure shall be removed ent or by other means. The resistor 5 to 50x magnifier for inspecting the etween resistor elements, and connections and resistance en initial connections and resistance en- te including the terminals along the e cut face shall be grounded and en- initier for inspecting the terminal con- nd enclosure.	ent, helical cuttin hall be conducted Assurance Prog from the resisto ors shall be exam he areal ratio of he nection of termina n or other materia element of the res e longitudinal axis examined visually	g, and in ram Plan. rs with a ined visually elical cutting, als to als, and the sistor shall be s of the or by using a			
	The above examin	ations a) and b) shall require the r	espective sample	es to be			

The above examinations a) and b) shall require the respective samples to be photographed and recorded.

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D.4.4.4	Electrical Performance	ance						
	i ne electrical performa	trical performance tests shall be performed as follows.						
D.4.4.4.1	Power Conditioning	Power Conditioning						
		istors shall be tested in accordance with Test Method 108 of MIL-STD-202.						
	The following details a) Test temperatur		-	apply.				
	b) Measurement b							
	The resistance			accordance	e with p	aragraph	D.4.4.4.2.	
	c) Test duration: 100±4 hours							
	d) Loading condition The rated voltag		ified in naraar	anh D 3 5 5	shall h	e annlied	to the	
	resistor intermit	• •		•		• •		
	exceed the max		•	ige specified	d in the	detail spe	ecification.	
	e) Measurement at			raturo for a	minim	im of 30 n	ninutos th	
	After the resisto resistance shall		•					le
	calculate the ch				•	•		
	f) Examination after							
	The resistors sh		examined for e	evidence of I	mecnal	nical dama	age.	
D.4.4.4.2	Resistance			_				
	The resistance test s STD-202. The follow		•			est Metho	od 303 of N	∕IIL-
	a) Test voltage	wing de			арріу.			
	Test voltages s	hall be a	applied in acc	ordance with	h Table	e D-15.		
	b) Temperature:	rouple	anintanan tant	of the quali	fication	toot and		of
	As a rule, the G the Group A gu	-		•				
	the Group A quality conformance inspection shall be performed at 25±2°C. Unless otherwise specified, the temperature at which subsequent and final							
	<ul><li>resistance measurements are made shall be within ±2°C of the temperature at which the initial measurement was made.</li><li>c) Procedure</li></ul>							
	The resistor elements shall be individually measured.							
Table D-15. Maximum Test Voltages								
	Iable	; U-15.		-			Unit: V <sub>DC</sub>	
Nominal resistance range ( $\Omega$ )				Allowab	-			
			10mW	25mW - 98	95mW 100mW - 225mW			

Nominal resistance range (Ω)	Allowable power			
Nominal resistance range (12)	10mW	25mW - 95mW	100mW - 225mW	
10 or more and less than 100	0.3	0.5	1.0	
100 or more and less than 1,000	1.0	1.0	1.0	
1,000 or more and less than 10,000	3.0	3.0	3.0	
10,000 or more and less than 100,000	10.0	10.0	10.0	
100,000 or more	30.0	30.0	30.0	

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## D.4.4.4.3 Resistance-Temperature Characteristic

The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following details and exceptions shall apply.

- a) Reference temperature: 25°C
- b) Test temperature: As specified in Table D-16.
- c) Unit of resistance-temperature characteristic: 10<sup>-6</sup>/°C.

## Table D-16. Test Temperature for Resistance-Temperature Characteristic

		Unit: °C			
Order	Test temperature				
	Qualification test	Quality conformance inspection			
1	25±3	25±3			
2	-15±3	-55±3			
3	-55±3	25±3			
4	25±3	125±3			
5	65±3	-			
6	125±3	-			

#### D.4.4.4.4 Dielectric Withstanding Voltage

#### D.4.4.4.1 Atmospheric Pressure

Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202. The following details and exceptions shall apply

a) Mounting method

The resistor shall be secured by mounting its sides on metal plates of sufficient size to extend beyond the resistor edges. The metal plates shall avoid contact with the terminals. All resistor terminals shall be connected using appropriate conductors or conductive fixtures. An example is shown in Figure D-2.

- b) Test voltage: 200V<sub>AC</sub> (root-mean-square value at commercial-line frequency)
- c) Duration of application of test voltage:  $60_0^{+10}$  seconds
- Points of application of test voltage
   The test points shall be between the terminals connected together with an appropriate conductor and metal mounting plate.

# Measurement during test During the test, the leakage current shall be monitored and the resistors examined for evidence of arcing and breakdown.

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f) Examination after test The resistors shall be examined visually for evidence of mechanical damage, arcing and insulation breakdown.					
Metal plate Metal plate Metal plate Resistor Terminal					
<ul> <li>J</li> <li>Figure D-2. Test Jig for the Dielectric Withstanding Voltage Test</li> <li>D.4.4.4.2 Barometric Pressure (Reduced) Resistors shall be tested in accordance with Test Method 105 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Mounting method The resistors shall be mounted as specified in item a), paragraph D.4.4.4.4.1.</li> <li>b) Test voltage 100V<sub>AC</sub> (root-mean-square value at commercial-line frequency)</li> <li>c) Test condition: D (1.1±0.1kPa)</li> <li>d) Duration of application of test voltage: 60<sup>+10</sup><sub>0</sub> seconds</li> <li>e) Points of application of test voltage: As specified in item d), paragraph D.4.4.4.4.1.</li> <li>f) Measurement during test During the test, the leakage current shall be monitored and the resistors examined for evidence of arcing and breakdown.</li> <li>g) Examination after test The resistors shall be examined visually for evidence of mechanical</li> </ul>					
D.4.4.4.5	<ul><li>202. The following</li><li>a) Test condition:</li><li>b) Mounting meth</li><li>The resistors s</li></ul>	be measured in accordance with <sup>-</sup> details and exceptions shall apply A (100V <sub>DC</sub> )	/. em a), paragraph		

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c	d) Points of applic D.4.4.4.4.1.	cation of test voltage: As specified	in item d), parag	raph	
D.4.4.4.6 S	D.4.4.4.6 Short-Time Overload				
<ul> <li>The resistance shall be measured as specified in paragraph D.4.4.4.2. A dc test potential, 2.5 times the rated voltage but not exceeding the maximum overload voltage as specified in the detail specification, shall be applied for 5±1 seconds to each resistor in the network. The following conditions shall be maintained.</li> <li>a) Mounting method <ul> <li>Resistors are to be mounted horizontally to the fixture in still air with no circulation other than the heat of the resistor being tested.</li> </ul> </li> <li>b) Test temperature: 25<sup>+5</sup><sub>0</sub> °C</li> <li>c) Measurement after test <ul> <li>Wait 30<sup>+15</sup><sub>0</sub> minutes after removal of the test potential before measuring the resistance as specified in paragraph D.4.4.4.2 to calculate the change in resistance before and after the test.</li> </ul> </li> <li>d) Examination after test <ul> <li>The resistors shall be examined visually for evidence of arcing, burning or charring.</li> </ul> </li> </ul>					
D.4.4.5 Me	chanical Performa	nce			
The	e mechanical perfo	ormance tests shall be performed	as follows.		
D.4.4.5.1 T	Terminal Strength				
D.4.4.5.1.1	Pull Test				
	•	nditions shall apply. nt before test			
	/	nce shall be measured in accordar	nce with paragrap	oh D.4.4.4.2.	
<ul> <li>c) Duration of load applied: 30±5 seconds</li> <li>d) Number of terminals to be tested: Five randomly selected terminals.</li> <li>e) Test method</li> </ul>					
	specified we be tested in maintained t to the end o of enduring	shall be securely mounted to an a eight shall be applied, without show a direction parallel to the axis of the for the specified test time. The ter f the lead (or terminal) as practica the specified load. Each terminal ne. The direction of the force shall	ck, to each lead o he lead (or termir nsion shall be ap I. The fixture sha shall be tested fo	or terminal to nal) and plied as close all be capable or the	
	f) Measureme The resistar		d in paragraph D.	-	
		after test Is shall be examined visually for e ipping of the coating and loosenin			




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<ul> <li>D.4.4.5.3 Resistance to Soldering Heat</li> <li>Resistors shall be tested in accordance with Test Method 210 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Measurement before test <ul> <li>The resistance shall be measured in accordance with paragraph D.4.4.4.2.</li> <li>b) Test condition</li> <li>The leads shall not have been soldered through the immediately preceding test.</li> <li>c) Solder temperature: 350±10°C</li> <li>d) Solder Immersion time: 3±0.5 seconds</li> <li>e) Solder immersion depth</li> <li>Terminals shall be immersed to within 1.6mm of the resistor body.</li> </ul> </li> <li>f) Measurement after test <ul> <li>The terminals shall be at room temperature for a minimum of 3 hours before the resistance measurement is made in accordance with paragraph D.4.4.4.2 to calculate the change in resistance before and after the test.</li> <li>g) Examination after test</li> </ul> </li> </ul>					
D.4.4.6 Envir	The resistors shall be examined visually for evidence of mechanical damage.				
<ul> <li>D.4.4.6.1 High Frequency Vibration <ul> <li>Resistors shall be tested in accordance with Test Method 204 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Mounting method <ul> <li>Resistors shall be mounted in accordance with item d), paragraph D.4.4.1 on an appropriate mounting fixture and attached to the vibration table through the vibration generator. The mounting fixture shall be constructed to preclude any resonance in the fixture and vibration generator when subjected to the shock test. A shielded cable, which may be necessary because of the field surrounding the vibration table, shall be clamped to the resistor mounting fixture.</li> <li>b) Measurement before test</li> <li>The resistance shall be measured in accordance with paragraph D.4.4.4.2.</li> <li>c) Test condition: D (196.13m/s<sup>2</sup>)</li> <li>d) Direction of motion</li> <li>The direction of vibration</li> <li>Four hours in each direction for a total of 12 hours.</li> </ul> </li> <li>f) Measurement after test</li> <li>The resistance shall be measured in accordance with paragraph D.4.4.2 to calculate the change in resistance before and after the test.</li> </ul></li></ul>					

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	g) Examination a The resistors	fter test shall be examined visu	ally for evide	ence of mechanie	cal damage.				
D.4.4.6.2	Shock								
	Resistors shall be	tested in accordance w	/ith Test Met	hod 213 of MIL-	STD-202.				
	The following detai	Is and exceptions shal	l apply.						
	a) Method of mo	unting							
	The resistors	The resistors shall be mounted in accordance with item d), paragraph D.4.4.1.							
	b) Measurement	before test							
	The resistance	e shall be measured in	accordance	with paragraph	D.4.4.4.2.				
	c) Test condition	: I (980.7m/s², 6ms sav	vtooth).						
	d) Direction of ap	plied shocks							
	The shock dire	ection shall be in each	of two mutua	ally perpendicula	ar directions,				
		ular and the other para	allel to the te	erminal of the res	istors.				
	e) Number of ap								
		shall be subjected to 1	0 shocks in e	each direction fo	r a total of 20.				
	f) Measurement								
		The resistance shall be measured in accordance with paragraph D.4.4.4.2 to							
		change in resistance be	elore and all	er the test.					
	57	shall be examined visu	ally for ovide	ance of mechani	cal damaga				
			ally for evide		cal uamaye.				
D.4.4.6.3	Thermal Shock [I]								
	Resistors shall be	tested in accordance w	ith Test Met	hod 107 of MIL-	STD-202.				
	-	Is and exceptions shal	l apply.						
	a) Mounting met								
	•	fixture shall ensure cir	culation of a	mbient air to eac	ch resistor.				
	b) Measurement								
		e shall be measured in	accordance	with paragraph	D.4.4.4.2.				
	c) Test condition		in Table D 4	17					
		s shall be as specified t cycles: 25 cycles		17.					
	e) Cycle conditio	•							
	, ,	ycles shall run continu	ouslv After	the five cycles t	he test may				
		following the completion	•	•					
	f) Measurement	•		,					
	,	shall be at room tempe	rature for a	minimum of 30 n	ninutes				
		istance measurement i							
	D.4.4.4.2 to calculate the change in resistance before and after the test.								
	g) Examination a	fter test							
	The resistors a	shall be examined visu	ally for evide	ence of mechani	cal damage.				
	Table D-17	7. Test Conditions o	f Thermal S	hock [l]					
	Step		Time (mir						
	1	-65 <sup>0</sup> <sub>-5</sub>	15	<u> </u>					
	2	125 <sup>+3</sup>	15						
		- U							

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D.4.4.6.4	Moisture Resistance	·	ļ	<u></u>	
<ul> <li>Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Measurement before test The resistance shall be measured in accordance with paragraph D.4.4.4.2.</li> <li>b) Loading voltage A dc voltage equivalent to 0.10 of rated wattage shall be applied to all resistor elements during the first 2 hours of steps 1 and 4.</li> <li>c) Subcycle Step 7b shall not be applicable. Step 7a shall be performed during any five of the first nine cycles only.</li> <li>d) Measurements at high humidity: None.</li> <li>e) Measurement after test Upon completion of step 6 of the final cycle, the resistors shall be removed from the chamber and remain at room temperature for 24±4 hours. The resistance shall then be measured in accordance with paragraph D.4.4.4.2 to calculate the change in resistance before and after the test.</li> <li>f) Examination after test The resistors shall be examined visually for evidence of mechanical damage.</li> </ul>					
D.4.4.6.5	<ul> <li>Resistance to Solvents</li> <li>Resistors shall be tested in accordance with Test Method 215 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Application area: Marked portion</li> <li>b) Solvents to be used <ol> <li>2-propanol (Isopropyl alcohol)</li> <li>42 parts by volume of water, one part by volume of propylene glycol monomethyl ether and one part by volume of monoethanolamine.</li> </ol> </li> </ul>				
D.4.4.6.6	hour after this mea temperature of -65 chamber shall then are removed from t removed. The resi less than 8 hours. paragraph D.4.4.4. After the test the re	Storage III be measured as specified in parsurement, the resistors shall be p <sup>0</sup> / <sub>5</sub> °C for a period of 24±4 hours. The gradually returned to room term the chamber. Any water droplets stors shall remain at room temper The resistance shall then be mea 2 to calculate the change in resist esistors shall be examined for sign camined for legibility.	laced in a cold ch The temperature i mperature before on the surface sh rature for 2 hours isured in accordan tance before and	amber at a n the the resistors all be or more but nce with after the test.	
D.4.4.6.7	hour after this mea room temperature.	Dperation II be measured as specified in pa surement, the resistors shall be p The temperature shall then be gr emaining at no load for 1 hour. Th	laced in a test cha radually decrease	amber at d to -65 <sup>°</sup> -5°C	

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	gradually increase resistors are removed. The removed. The removed. The removed but less than 2 hour paragraph D.4.4.4. After the test the rest the	ninutes. Wait 15 <sup>+5</sup> minutes after the chamber temperature to room red from the chamber. Any water resistors shall remain at room temp rs. The resistance shall then be n 2 to calculate the change in resistance resistors shall be examined for sign camined for legibility.	temperature befor droplets on the s perature for 1 hou neasured again a ance before and a	ore the urface shall ur or more as specified in after the test.
D.4.4.6.8	resistors shall be p 100 <sup>+4</sup> hours. The r remaining at a tem measured in accord resistance before a	e is measured in accordance with placed in a test chamber maintaine esistors shall then be removed from perature of 25±5°C for 4 hours. The dance with paragraph D.4.4.4.2 to and after the test. After the test the rmality. The marking shall be example	d at 125±5°C at r om the test chamb he resistance sha calculate the cha e resistors shall b	no load for per before all then be ange in ne examined
	Durability Durability test shall be	e performed as follows.		
D.4.4.7.1	<ul> <li>The following detail</li> <li>a) Method of mount of the resistors of the wiring consumer of the resistors.</li> <li>b) Measurement of the resistors.</li> <li>b) Measurement of the resistors.</li> <li>b) Measurement of the resistors.</li> <li>c) Test temperature of the rated voltations.</li> <li>c) Test temperature of the rated voltations.</li> <li>d) Test conditions.</li> <li>The rated voltation of the rated voltations.</li> <li>c) The rated voltations.</li> <li>c) The rated voltations.</li> <li>c) Test temperature of the rated voltation.</li> <li>d) Test conditions.</li> <li>c) The rated voltation.</li> <li>d) The rated voltation.</li> <li>d) The rated voltation.</li> <li>d) Test condition.</li> <li>d) The rate of the resist.</li> <li>d) Test condition.</li> <li>d) The rate of the rate of the rate.</li> <li>d) The rate.</li> <li>d) The rate of the rate.</li> <li>d) The ra</li></ul>	shall be mounted as specified in ite nected to landing pads on the top culation is used, the air velocity sh no direct impingement of the force before test fors are mounted in the test fixture com temperature in accordance w is shall be performed at a temperat age specified in paragraph D.3.5.5 age specified in paragraph D.3.5.5 and 30 minutes OFF. The test w naintain $\pm 5\%$ of the rated voltage. is for the qualification test and 1,00	em d), paragraph and bottom of the nall not exceed 2. ed-air supply upor e, the resistance s ith paragraph D.4 cure difference of 5 shall be applied oltage shall be re The test duration $0^{+48}_{-0}$ hours for the minimum of 45 n	D.4.4.1 with e circuit board. 5m/s and n the shall be 4.4.4.2. All ±2°C. I intermittently, egulated and n shall be e quality

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<ul> <li>f) Measurements during test <ol> <li>Qualification test: 250 <sup>+48</sup>/<sub>0</sub> hours, 500 <sup>+48</sup>/<sub>0</sub> hours and 1,000 <sup>+48</sup>/<sub>0</sub> hours.</li> </ol> </li> <li>2) Quality conformance inspection: 250 <sup>+48</sup>/<sub>0</sub> hours and 500 <sup>+48</sup>/<sub>0</sub> hours.</li> <li>g) Examination after test The resistors shall be examined for evidence of mechanical damage. </li> </ul>						
D.4.5	D.4.5 Long-Term Storage Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.					
D.4.6	<ul> <li>D.4.6 Change of Tests and Inspections</li> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> </ul>					
D.5.	PREPARATION FOR DE	LIVERY				
	Preparation for delivery sl	nall be in accordance with paragra	ph 5 of JAXA-QT	S-2050.		
D.6.	D.6. NOTES Refer to the paragraph 6 of JAXA-QTS-2050.					

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	esistance		
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This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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RMS15, RMS20, RMS35									
		Metal alloy	film	CRK2H, CRK4H, CRK8H, CRK10H, CRK16H					
		Motal alloy	SCR16, SCR20, SCR32, SCR35, SCR50						
				WCR32, 1	WCR50, WCR6	64			
		Metal filr	n	RMS06, F	RMS10, RMS12	2			
E.1.3	Part Num	ber							
	details.				llows. Refer		e detail spe	ecifica	tion for
	JAXA <sup>(1)</sup>	<u>RMS15</u> Style (E.1.3.1)	<u>k</u> Charac (E.1	_	<u>1000</u> Nominal resistance (E.1.3.3)	to	<u>E</u> sistance blerance E.1.3.4)	stru	<u>C</u> ctrode ucture 1.3.5)
Example 2: For jumper resistors									
	JAXA <sup>(1)</sup>	<u>CRK8H</u> Style (E.1.3.1)	re	<u>R00</u> ominal esistance E.1.3.3)	<u>R</u> Electrode structure (E.1.3.5)				
				•	art for space cification may		•		eviated to "J". ".

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#### E.1.3.1 Style

Style indicates the rated power and physical size of the resistor and is as specified in Table E-2.

Table E-2. Style						
Symbol	Rated power (mW)	Dimensions	Construction			
RMS06	63	Dimensione shell be	Rectangular,			
RMS10	100	Dimensions shall be as specified in the	nonmetallic enclosure, surface mounted electrode,			
RMS12	125	detail specifications.	metal film			
RMS15	150	Dimensions shall be				
RMS20	200	Dimensions shall be as specified in the				
RMS35	350	detail specifications.				
CRK2H	500	Dimensions shall be as specified in the detail specifications.				
CRK4H	330					
CRK8H	250					
CRK10H	125		detail specifications.			
CRK16H	100		Rectangular, nonmetallic enclosure,			
SCR16	100		surface mounted electrode, alloy metal film			
SCR20	125	Dimensions shall be				
SCR32	250	as specified in the				
SCR35	330	detail specifications.				
SCR50	500					
WCR32	500	Dimensions shall be				
WCR50	1000	as specified in the				
WCR64	2000	detail specifications.				

## Table E-2. Style

# E.1.3.2 Characteristics

The resistance-temperature characteristic shall be identified by a single letter symbol in accordance with Table E-3.

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	(Unit: x10 <sup>-6</sup> /°C)
Symbol	Resistance-temperature characteristic (referenced:25°C)
Y	±10
E	±25
Н	±50
К	±100
L	±200
М	±300
Ν	±500
Р	-100 to +600

#### E.1.3.3 Nominal Resistance

The nominal resistance shall be identified in ohms ( $\Omega$ ) by 3 or 4 digits. Nominal resistance for jumper resistors shall be represented as "R00" and the details are specified in the detail specification.

a) Resistance identified by 3 digits

The resistance identified by 3 digits applies to resistors with resistance tolerance of  $\pm 2.0\%$  (G) or  $\pm 5.0\%$  (J). The first two digits represent the significant figures and the last digit specifies the number of zeros to follow. If a resistance needs to be specified in a form including a decimal point, the decimal point shall be replaced with "R."

Example: 4R7= 4.7Ω 271= 270Ω 104= 100,000Ω=100kΩ 106=10,000,000Ω=10ΜΩ

b) Resistance identified by 4 digits:

The resistance identified by 4 digits applies to resistors with resistance tolerance of  $\pm 0.1\%$  (B),  $\pm 0.5\%$  (D) or  $\pm 1.0\%$  (F). The first three digits represent the significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.

Example: 97R6= 97.6Ω 1500= 150 Ω 1501= 1,500 Ω= 1.50kΩ 1503=150,000 Ω=150 kΩ

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## E.1.3.4 Resistance Tolerance

The resistance tolerance shall be identified by a single capital letter in accordance with Table E-4.

## Table E-4. Resistance Tolerance

	Unit: %
Symbol	Resistance tolerance
В	±0.1
D	±0.5
F	±1.0
G	±2.0
J	±5.0

#### E.1.3.5 Electrode Structure

The electrode structure shall be identified by a single capital letter in accordance with Table E-5.

#### Table E-5. Electrode Structure

Symbol	Structure	Mounting method				
С	Double-sided electrode	High temperature soldering				
R	Double-sided electrode	Soldering				

#### E.2. Applicable Documents

#### E.2.1 Applicable Documents

The applicable documents shall be as specified in paragraph 2.1 of JAXA-QTS-2050.

## E.2.2 Reference Documents

The following is a reference document..

- a) MIL-PRF-55342 Resistors, Chip, Fixed, Film, Nonestablished Reliability, Established Reliability, Space Level, General Specification for
- b) MIL-PRF-32159 Resistors, Chip, Fixed, Film, Zero Ohm, Industrial, High Reliability, Space Level, General Specification for

Resistors, Fixed Film

- c) ESCC Generic Specification No. 4001
- d) ESCC Detail Specification No. 4001/026 Resistors, Fixed, Chip, Thick Film Based on Type CHP

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#### E.3. Requirements

## E.3.1 Qualification Coverage

Qualification shall be valid for resistors that are produced by the manufacturing line that conforms to materials, designs, constructions, specifications and performance specified in paragraphs E.3.2 to E.3.9. The qualification coverage shall be represented by samples that have passed the qualification test. Characteristics and resistance tolerance of the resistors to be qualified shall be classified as specified in Tables E-6 and E-7. The characteristics specified in Table E-6 shall be separately qualified for each film type, metal film and alloy metal film. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.

If necessary, additional qualification coverage shall be specified in the detail specification.

Characteristic submitted	Characteristic qualified
Y	Y, E, H, K, L, M, N, P
E	E, H, K, L, M, N, P
Н	H, K, L, M, N, P
К	K, L, M. N, P
L	L, M, N
М	M, N
Ν	N
Р	Р

Table E-6. Characteristics Qualification

Resistance tolerance submitted	Resistance tolerance qualified
В	B, D, F, G, J
D	D, F, G, J
F	F, G, J
G	G, J
J	J

## E.3.2 Materials

The materials shall be specified as follows and as specified in paragraph 3.3 of JAXA-QTS-2050.

## E.3.2.1 Base Substance (Core)

The resistor substrate shall be formed by a mixture of alumina and other oxides baked at high temperatures. The substrate shall be a minimum of 96% alumina.

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E.3.2.2	Electrode									
	The electrode shall be	e as specified in the detail specific	cation.							
E.3.2.3	Resistance Material									
	The resistance mater	ial shall be as specified in the det	ail specification.							
E.3.2.4	Insulation Material									
	The insulation materia	al shall be as specified in the deta	il specification.							
E.3.2.5	Solder									
		hall be as specified in paragraph l	E.4.4.2.							
<b>F</b> 2 2 6	Coldening Flux									
E.3.2.6	Soldering Flux	terial shall be as specified in para	agraph F 4 4 2							
E.3.3	Externals, Dimensions a	·								
	Resistors shall satisfy the paragraph E.4.4.3.	e following requirements when te	sted in accordance	ce with						
E.3.3.1	Externals and Markin	g								
	following shall be clea	ects such as cracks on the surfac arly marked in such a manner to in legible at the completion of any te	nsure legibility. A							
		ce stance shall be marked as specifi ly be marked as specified in the d								
E.3.3.2	Construction, Dimens	ions and Mass								
	The construction, dim specification and as f	ensions and mass of resistors sh ollows.	all be as specified	d in the detail						
	a) Construction									
		nent shall be completely covered bisture or mechanical damage.	with insulation ma	aterials to						
E.3.4	Workmanship									
	<ul> <li>Workmanship</li> <li>Resistors shall be manufactured based on good design practices and in accordance with the quality assurance program defined in paragraph 3.2.1. The resistor body shall not have defects such as cracks, holes and scratches which may adversely affect the performance of the resistors and shall be free from other defects that will affect life, serviceability, or appearance. The resistors shall also satisfy the following requirements.</li> <li>a) Resistor films <ul> <li>Resistor films shall be free of cracks, chipping, pin holes or deformation which may adversely affect the performance of the resistors.</li> </ul> </li> </ul>									

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	<ul> <li>b) Protection against moisture The resistor element shall be protected against moisture by a coating of moisture- resistant insulating material.</li> <li>c) Electrodes The resistor electrode shall be securely connected to the resistor element and substrates, both electrically and mechanically. The electrode shall be fabricated from solderable materials.</li> </ul>											
E.3.4.1												
E.3.5	Ratings											
E.3.5.1	Nominal Resistance As a rule, standard values of nominal resistance shall be defined in relation to the resistance tolerance and shall be as specified in Table E-8. The minimum and maximum resistances and resistance tolerance shall satisfy the requirements of the detail specification.											
E.3.5.2	Operating Temperati	ure Range										
	The operating tempe	rature range shall be as specified	in the detail spec	ification.								
E.3.5.3	Power Rating Resistors shall have a power rating as specified in the detail specification. The rated ambient temperature shall be 70°C.											
E.3.5.4	power rating. For ter maximum power sha	r at or below the rated ambient tem nperatures in excess of the rated a Il be determined by derating the po pecified in the detail specification.	ambient tempera	ture, the								

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	Table E-8.       Standard Resistance Values															
	Resistance tolerance and symbols (%)															
B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	B (±0.1) D (±0.5)	F (±1.0)	G (±20) J (V5.0)
10.0	10.0	13.3	13.3	17.8	17.8	23.7	23.7	31.6	31.6	42.2	42.2	56.2	56.2	75.0	75.0	1.0
10.1	-	13.5	-	18.0	-	24.0	-	32.0	-	42.7	-	56.9	-	75.9	-	1.1
10.2	10.2	13.7	13.7	18.2	18.2	24.3	24.3	32.4	32.4	43.2	43.2	57.6	57.6	76.8	76.8	1.2
10.4	-	13.8	-	18.4	-	24.6	-	32.8	-	43.7	-	58.3	-	77.7	-	1.3
10.5	10.5	14.0	14.0	18.7	18.7	24.9	24.9	33.2	33.2	44.2	44.2	59.0	59.0	78.7	78.7	1.5
10.6	-	14.2	-	18.9	-	25.2	-	33.6	-	44.8	-	59.7	-	79.6	-	1.6
10.7	10.7	14.3	14.3	19.1	19.1	25.5	25.5	34.0	34.0	45.3	45.3	60.4	60.4	80.6	80.6	1.8
10.9	-	14.5	-	19.3	-	25.8	-	34.4	-	45.9	-	61.2	-	81.6	-	2.0
11.0	11.0	14.7	14.7	19.6	19.6	26.1	26.1	34.8	34.8	46.4	46.4	61.9	61.9	82.5	82.5	2.2
11.1	-	14.9	-	19.8	-	26.4	-	35.2	-	47.0	-	62.6	-	83.5	-	2.4
11.3	11.3	15.0	15.0	20.0	20.0	26.7	26.7	35.7	35.7	47.5	47.5	63.4	63.4	84.5	84.5	2.7
11.4	-	15.2	-	20.3	-	27.1	-	36.1	-	48.1	-	64.2	-	85.6	-	3.0
11.5	11.5	15.4	15.4	20.5	20.5	27.4	27.4	36.5	36.5	48.7	48.7	64.9	64.9	86.6	86.6	3.3
11.7	-	15.6	-	20.8	-	27.7	-	37.0	-	49.3	-	65.7	-	87.6	-	3.6
11.8	11.8	15.8	15.8	21.0	21.0	28.0	28.0	37.4	37.4	49.9	49.9	66.5	66.5	88.7	88.7	3.9
12.0	-	16.0	-	21.2	-	28.4	-	37.9	-	50.5	-	67.3	-	89.8	-	4.3
12.1	12.1	16.2	16.2	21.5	21.5	28.7	28.7	38.3	38.3	51.1	51.1	68.1	68.1	90.9	90.9	4.7
12.3	-	16.4	-	21.8	-	29.1	-	38.8	-	51.7	-	69.0	-	92.0	-	5.1
12.4	12.4	16.5	16.5	22.1	22.1	29.4	29.4	39.2	39.2	52.3	52.3	69.8	69.8	93.1	93.1	5.6
12.6	-	16.7	-	22.3	-	29.8	-	39.7	-	53.0	-	70.6	-	94.2	-	6.2
12.7	12.7	16.9	16.9	22.6	22.6	30.1	30.1	40.2	40.2	53.6	53.6	71.5	71.5	95.3	95.3	6.8
12.9	-	17.2	-	22.9	-	30.5	-	40.7	-	54.2	-	72.3	-	96.5	-	7.5
13.0	13.0	17.4	17.4	23.2	23.2	30.9	30.9	41.2	41.2	54.9	54.9	73.2	73.2	97.6	97.6	8.2
13.2	-	17.6	-	23.4	-	31.2	-	41.7	-	55.6	-	74.1	-	98.8	-	9.1

# Table E-8. Standard Resistance Values

## E.3.5.5 Voltage Rating

Resistors shall have a rated direct current (DC) continuous operating voltage or an approximate sine wave root-mean-square (rms) alternating current (AC) continuous operating voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula. However, if the calculated rated voltage exceeds the maximum operating voltage specified in the detail

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	specification, the max	kimum operating voltage shall be	the rated voltage.		
	E=√P•R				
	Where: E = Voltage rating (V) P = Power rating (W) R = Nominal resistand				
E.3.5.6	Rated Current The rated current of j	umper resistor shall be as specifi	ed in the detail sp	ecification.	
E.3.6	Electrical Performance Resistors shall satisfy th	e following electrical requiremen	ts.		
E.3.6.1		sted as specified in paragraph E sulation breakdown, or mechanic		ll be no	
E.3.6.2	conditions (paragraph of the nominal resista	sted as specified in paragraph E n E.4.4.1), the resistance shall be nce in Table E-4. For jumper res resistance specified in the detai	within the specifie istors, resistance s	ed tolerance	
E.3.6.3	temperature as the re at each of the temper	ture Characteristic sted as specified in paragraph E ference temperature, the resista atures specified in the detail spe ole E-3. This condition shall not a	nce-temperature c cification, shall not	haracteristic t exceed the	
E.3.6.4 Dielectric Withstanding Voltage When tested as specified in paragraph E.4.4.5.4, the resistors shall withstand the specified test voltage, and the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance change shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of flashover or arcing, insulation breakdow or mechanical damage after the completion of the test.					
E.3.6.5		sted as specified in paragraph E y the requirements of the detail s		ation	

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E.3.6.6 Short-Time Overload When resistors are tested as specified in paragraph E.4.4.5.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of arcing, burning, or charring after the completion of this test.							
E.3.7 N	lechanical Performanc	e					
R	esistors shall satisfy th	e following mechanical requireme	ents.				
E.3.7.1	Solderability						
E.3.7.1.1	tested as specified surface shall be ev or rough areas sha	Il be applicable to electrode struct in paragraph E.4.4.6.1.1, a minim enly covered with new solder. The Il be acceptable, provided that the a of the pinholes or rough areas s	um of 95% of the e existence of sm y are not concen	e terminal nall pinholes trated in one			
E.3.7.1.2 Solderability [II] Solderability [II] shall be applicable to electrode structure R. When retested as specified in paragraph E.4.4.6.1.2, a minimum of 95% of the surface shall be evenly covered with new solder. The existence of s or rough areas shall be acceptable, provided that they are not concerspot. The total area of the pinholes or rough areas shall be less than solder area.				e terminal nall pinholes trated in one			
E.3.7.2	Adhesion When resistors are te mechanical damage.	sted as specified in paragraph E.4	1.4.6.2, there sha	ll be no			
E.3.7.3	resistance before and specification. For jun	sted as specified in paragraph E.4 I after the test shall satisfy the req oper resistors, the resistance shall of the detail specification. There sh of the test.	uirements of the not exceed the r	detail naximum			
E.3.7.4	resistance before and specification. For jun resistance specified in	g Exposure sted as specified in paragraph E.4 I after the test shall satisfy the req oper resistors, the resistance shall of the detail specification. The elec of or less of the total surface and th	uirements of the not exceed the r trode area covere	detail naximum ed by solder			

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E.3.8	Environmental Performa	ance					
	Resistors shall satisfy th	ne following environmental require	ments.				
E.3.8.1	Random Vibration						
	When resistors are tested as specified in paragraph E.4.4.7.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.						
E.3.8.2	Shock						
	When resistors are tested as specified in paragraph E.4.4.7.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.						
E.3.8.3	Thermal Shock [II]						
	When resistors are tested as specified in paragraph E.4.4.7.3, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of mechanical damage after the completion of the test. Fine cracks on the surface of resistors shall be acceptable only when subjected to more than 500 cycles.						
E.3.8.4	Moisture Resistance						
	Moisture Resistance When resistors are tested as specified in paragraph E.4.4.7.4, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of mechanical damage after the completion of the test.						
E.3.8.5	Resistance to Solven	ts					
		ested as specified in paragraph E.4 details shall be as defined in the de		•			
E.3.8.6	Low Temperature Op	eration					
	Low Temperature Operation When resistors are tested as specified in paragraph E.4.4.7.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of						

mechanical damage after the completion of the test.

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#### E.3.8.7 Stability

When resistors are tested as specified in paragraph E.4.4.7.7, the change in resistance before and after the test shall satisfy the requirements of the detail specification. The change in resistance before this test and after the withstanding voltage test shall also satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. The insulation resistance after the test shall satisfy the requirements of the detail specification after the detail specification. The insulation resistance after the test shall satisfy the requirements of the detail specification of the test.

#### E.3.9 Durability

Resistors shall satisfy the following durability requirements.

#### E.3.9.1 Life

When resistors are tested as specified in paragraph E.4.4.8.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. For jumper resistors, the resistance shall not exceed the maximum resistance specified in the detail specification. There shall be no evidence of mechanical damage after the completion of the test.

## E.4. Quality Assurance Provisions

#### E.4.1 In-Process Inspection

The in-process inspection shall be as specified in paragraph 4.3 of JAXA-QTS-2050.

#### E.4.2 Qualification Test

The qualification test shall be as specified in paragraph 4.4 of JAXA-QTS-2050 and as provided below.

## E.4.2.1 Test Items and Number of Samples

Test items and number of samples of the qualification test shall be as specified in Table E-9.

The number of samples having minimum resistance, maximum resistance, and critical resistance or closest to critical resistance shall be prepared as specified in Table E-9. Each resistor style and characteristic shall be qualified separately. The number of samples shall be 439 to acquire certification for all electrode types. If the critical resistance is not specified, the samples shall be equally divided between the minimum and maximum resistance.

Tests that apply to all electrode structures shall be conducted with samples of electrode structure R. The number of samples shall be 385 for electrode structure R and 54 for electrode structure C. If the manufacturer requests separate approval for each resistor's electrode structure, all tests shall be conducted for each electrode structure.

If the manufacturer requests qualification of jumper resistors, samples shall be provided in accordance with "R00" of Table E-9 for each type and electrode construction. If the resistors are similar in material and structure, Group II through IV

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tests, Group VI and Group VIII through XI tests may be exempted. Tests of each group shall be performed in the order listed in Table E-9. Upon completion of Group I tests, Group II through XI tests shall be performed using samples allocated to the appropriate group tests.

	Table E-9.	Qualification Test (1/2)
--	------------	--------------------------

		Test	Require-			Criteria for F	Pass/fail	-	
Croup	Ordor	ltom	ment	Test method paragraph	Sample size			No. of defectives	
Group Order		ltem	paragraph	paragraph	R	С	R00	allowed <sup>(1)</sup>	
I	1	Application of pulse	E.3.6.1	E.4.4.5.1	10	0%	100%	0	
1	2	Resistance	E.3.6.2	E.4.4.5.2		JU 78	100 %	0	
IA	1	Externals, dimensions and marking	E.3.3	E.4.4.3	10	0% <sup>(1)</sup>	100% (1)	0	
					4	4			
IB	1	DPA	E.3.4.1	E.4.4.4.1	2 Highest 2 Lowest		2	0	
	1	Dielectric withstanding voltage	E.3.6.4	E.4.4.5.4	10	0	10	0	
	2	Insulation resistance	E.3.6.5	E.4.4.5.5	Any re	esistance			
	1	Resistance-temperature characteristic	E.3.6.3	E.4.4.5.3	30	0	-		
Ш	2	Low temperature operation	E.3.8.6	E.4.4.7.6	10Highest	resistance		0	
	3	Short-time overload	E.3.6.6	E.4.4.5.6	10 Critical resistance 10 Lowest resistance		10		
					30	0			
IV	1	Moisture resistance	E.3.8.4	E.4.4.7.4	10 Highest	resistance	10	0	
					(10 Lowest				
V	1	Life	E.3.9.1	E.4.4.8.1	231 0 77 Highest resistance 77 Critical resistance 77 Lowest resistance		10	0	
VI	1	Stability	E.3.8.7	E.4.4.7.7	30 0 10 Highest resistance 10 Critical resistance 10 Lowest resistance		10	0	
	1	Resistance to bonding exposure	E.3.7.4	E.4.4.6.4	10	10			
VII	2	Shock	E.3.8.2	E.4.4.7.2	Any resistance		10	0	
	3	Thermal shock [II]	E.3.8.3	E.4.4.7.3					
VIII	1	Random vibration	E.3.8.1	E.4.4.7.1	10 Any re	10 sistance	10	0	

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Test		Require-		Criteria for Pass/fail				
			ment	Test method paragraph	Sa	ample size		No. of defectives allowed <sup>(1)</sup>
Group Order	Item	paragraph	paragraph	R	С	R00		
IX	1	Solderability	E.3.7.1	E.4.4.6.1	10	10	10	0
	2	Resistance to solvents	E.3.8.5	E.4.4.7.5	Any resistance		10	U
x	1	Adhesion	ion E.3.7.2	E.4.4.6.2	10	10	10	0
	•				Any resistance		10	0
XI	1	Board bending	E 0 7 0	3.7.3 E.4.4.6.3	10	10	10	0
	I		E.3.7.3		Any resistance		10	0
-	1	Materials	E.3.2	-	(2)			

#### Table E-9. Qualification Test (2/2)

Notes:

<sup>(1)</sup> For dimensions and mass, sample size shall be 1.0% of the acceptable quality level (AQL) in "Special Inspection Level S-4" specified in JIS Z 9015-1.

<sup>(2)</sup> Data to certify compliance with design specifications shall be submitted.

## E.4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph 4.5 of JAXA-QTS-2050 and as provided below.

## E.4.3.1 Samples

The inspection lot configuration of group A shall be as specified in paragraph 4.5.1.1 of JAXA-QTS-2050. Inspection lots for Group B and C inspections shall consist of samples that have passed Group A inspections. Unless otherwise specified, Group B and C inspections shall be performed for all combinations of shapes and electrode structures. Resistors with the critical resistance or the closest to the critical resistance shall be selected. Further, the highest grade of characteristics shall be selected. If the design criteria are identical and the materials and the structures are similar, the inspection lot may be represented by one of the shapes specified in the detail specification.

## E.4.3.2 Inspection Items and Number of Samples

The items and number of samples of the Group A, B and C inspections of the quality conformance inspection shall be as specified in Tables E-10, E-11 and E-12, respectively. Group tests shall be performed in subgroup order and the inspections within each group shall be performed in the specified order. The sampling plan used for the Group A inspection shall be in accordance with Appendix 1 of JIS Z 9015-1.

# E.4.3.3 Criteria for Pass/Fail

A failure of any test specified in Table E-10, E-11 or E-12 shall constitute failure of each inspection group of the quality conformance inspection. When the number of defects does not exceed the permitted number specified in Table E-10, but the failure

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mode of a defect is catastrophic, such as open- or short-circuit where the function of the resistor may be lost, the resistor fails the Group A inspections.

## E.4.3.4 Post-Test Disposition of Sample

Products from the lot rejected in the Group A quality conformance inspection shall not be shipped. If the lot has not passed test order 1 of Group A1-2 inspection or any test of Group A1-3 inspection, all products of the lot shall be subjected to the failed inspection, and only the good products shall be shipped. The samples subjected to DPA and Group A2 inspections shall not be shipped.

		Inspe	ction			Criteria fo	r Pass/fail
Group	Sub- group	Order	ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
	1	1	Application of pulse	E.3.6.1	E.4.4.5.1	100%	0
	I	2	Resistance	E.3.6.2	E.4.4.5.2	100%	0
. 1	2	1	Externals, dimensions and marking	E.3.3	E.4.4.3	AQL <sup>(1)</sup> 4.0%	
AI	A1 2 -	2	DPA	E.3.4.1	E.4.4.4.1	4	0
	3		Dielectric withstanding voltage	E.3.6.4	E.4.4.5.4	AQL <sup>(1)</sup> 2.5%	
	2	Insulation resistance	E.3.6.5	E.4.4.5.5			
		1	Resistance to bonding exposure	E.3.7.4	E.4.4.6.4	AQL <sup>(1)</sup> 2.5%	
	1	2	Resistance-temperature characteristic	E.3.6.3	E.4.4.5.3		
A2		3	Low temperature operation	E.3.8.6	E.4.4.7.6		
		4	Short-time overload	E.3.6.6	E.4.4.5.6		
	2	1	Solderability	E.3.7.1	E.4.4.6.1	AQL (	<sup>I)</sup> 2.5%
	3	1	Adhesion	E.3.7.2	E.4.4.6.2	AQL <sup>(1)</sup> 2.5%	

 Table E-10.
 Quality Conformance Inspection (Group A)

Note:<sup>(1)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Normal Inspection Level II" specified therein shall apply to test order 1 of Group A1-2 inspection. "Special Inspection Level S-4" shall apply to the Group A1-3 and A2 inspections.

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	Table E-11. Quality Conformance Inspection (Group B)						
	Sub-				Criteria for Pass/fail		
Group			Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed	
	1	1	Moisture resistance	E.3.8.4	E.4.4.7.4	10	0
	2	1	Life	E.3.9.1	E.4.4.8.1	10	0
B1	3	1	Stability	E.3.8.7	E.4.4.7.7	10	0
	4	1	Resistance to solvents	E.3.8.5	E.4.4.7.5	10	0
	5	1	Board Bending	E.3.7.3	E.4.4.6.3	5	0

Table E-11.	Quality Conformance Inspection (Group B)	
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 Table E-12.
 Quality Conformance Inspection (Group C)

		Inspe	ction			Criteria for Pass/fail	
Group	Group Sub- group Order Item		Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed	
			Shock	E.3.8.2	E.4.4.7.2	10	0
С	I	2	Thermal shock [II]	E.3.8.3	E.4.4.7.3	10	0
	2	1	Random vibration	E.3.8.1	E.4.4.7.1	10	0

## E.4.4 Methods for Test and Inspection

## E.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

 Reference conditions Reference conditions shall be a temperature of 25°C and an atmospheric pressure of 101.3kPa.

# Judgment conditions Judgment conditions shall be either condition A or B specified in Table E-13. Unless specified, condition A shall apply.

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Condition	А	В
Temperature (°C)	23±2	20±2
Relative humidity (%)	50±5	65±5
Atmospheric pressure (kPa)	86 to 106	86 to 106

#### Table E-13. Judgment Conditions

#### E.4.4.2 Method of Mounting

The mounting method shall be one of the following methods as specified in paragraph E.4.4.5 to E.4.4.8.

- a) Mounting method A
  - 1) Test board

The test boards shall be alumina substrate (alumina of 95% purity or higher) with a thickness of 0.8mm±0.3mm. The dimensions shall be as specified in Figure E-1.

## 2) Mounting procedure

Pre-solder the sample in a nitrogen gas environment using gold-tin alloy solder (nominal gold content 80%). The sample shall then be placed on the test substrate using sheet type pellet solder of the same composition between them before heating them on a hot plate or in a tunnel oven to melt the solder. Flux shall not be used.

Soldering temperature and time shall be as follows.

2.1)	Presoldering	Temperature: 320±10°C Duration: 3±0.5 seconds
2.2)	Soldering	Temperature: 320±10°C Duration: 10±2 seconds

- b) Mounting method B
  - 1) Test board

The test boards shall be either alumina substrate (alumina of 95% purity or higher) with a thickness of  $0.8\pm0.3$ mm or glass woven base material epoxy resin copper-lad laminate board with a thickness of  $1.6\pm0.1$ mm. The test board shall not affect the test or measurement. The dimensions shall be as specified in Figure E-1.

2) Mounting procedure

Mount the sample on the test substrate by reflow soldering or dip soldering using tin-lead alloy solder with nominal tin content of 60% including inactivated flux.

Soldering temperature and time shall be as follows.

- 2.1) Temperature: 260±5°C
- 2.2) Duration: 10±2 seconds



d) The mass shall be measured with a measuring instrument which will not give a questionable pass/fail result. The number of samples shall be 10.

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E.4.4.3.2	<ul> <li>a) The external in</li> <li>b) The marking te</li> <li>c) The dimension advance, unle</li> <li>shall be prove</li> <li>instrument. The</li> <li>exceed the dir</li> <li>d) For the mass in</li> </ul>	ce Inspection (Group A) spection shall be performed using est shall be performed visually. s may be measured with a dimens ss the measured value may be qu n that the dimension gauge is fund he sample shall pass this test whe nensional tolerances specified in t nspection, the pass/fail results sha criteria samples of maximum mas advance.	sion gauge which estionable. Prior ctional as a meas in the measureme he detail specific all be made by co	is set in to the test, it uring ents do not ation. mparing the
E.4.4.4	Workmanship			
E.4.4.4.1	<ul> <li>protective coating a structures are as s conducted in accord Program Plan.</li> <li>a) The resistors s along the line shall be groun electrode, thic electrodes. O resistance shat</li> <li>b) The resistors s along the line face shall be go the protective minimum resistance</li> </ul>	be disassembled to ensure that the against moisture are properly man pecified in the Quality Assurance I dance with the DPA manual cited hall be embedded in a proper resi parallel to the longitudinal axis of the ded and examined by a 10 to 2000 kness of protective coating, and co ne resistor with a maximum resistant all be embedded in a proper resis perpendicular to the longitudinal a prounded and examined by a 10 to coating. One resistor with a maximum stance shall be subjected to the test a) and b) above shall require the maximum recorded.	ufactured and the Program Plan. D in the Quality As n or other materia the resistors. On x magnifier for the onnection of resis ance and one wit n or other materia xis of the resistor 200x magnifier f mum resistance a st.	e internal PA shall be surance als and cut e cut face e resistor film, stor film and h a minimum als and cut rs. One cut for inspecting and one with a
E.4.4.5	Electrical Performanc The electrical perform	e nance tests shall be performed as	follows.	
E.4.4.5.1	current specified in second to the resis voltage specified ir	hich is 2.5 times the rated voltage detail specification for jumper res tors. The test voltage shall not ex the detail specification. At the con xamined for evidence of arcing, in	istors) shall be a ceed the maximum pletion of this te	oplied for 1 um overload est, the

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E.4.4.5.2	Resistance	· · ·			_	
	STD-202. The follo	The resistance test shall be performed in accordance with Test Method 303 of MIL- STD-202. The following details and exceptions shall apply.				
	-	ults are questionab	le, the condition	ns specified in <sup>-</sup>	Table E-14 shal	
	apply. b) Temperature:	b) Temperature:				
		As a rule, the resistance test of Group I of the qualification test shall be performed at $25\pm2^{\circ}$ C. Unless otherwise specified, the temperature at which				
	•	nd final resistance i	-	•		
	of the tempera	ture at which the ir	nitial measurem	ent was made.		
Table E-14. Test Voltage						
Unit: V <sub>DC</sub>						
	Nominal resistance (Ω)		0.1 as a max			
		Less than 10 10 or more and less than 100				
		nd less than 1k	0.3			
		d less than 10k	3			
	10k or more an	10k or more and less than 100k				
	100k or more a	nd less than 1M	25			
	1M o	r more	30			
	Note <sup>(1)</sup> The power maximum.	applied to the resi	stor shall be 10	% of the rated	power as a	
E.4.4.5.3	Resistance-Tempe	rature Characterist	ic			
	The resistance-ten with Test Method 3 apply.	•		•		
	<ul> <li>a) Mounting method</li> <li>The resistors shall be mounted as specified in item b), paragraph E.4.4.2. This test shall be performed following the resistance to bonding exposure test of paragraph E.4.4.6.4 in the Group A quality conformance inspection.</li> <li>b) Reference temperature: 25°C</li> </ul>					
	, .	re: As specified in ce-temperature ch	•			
E.4.4.5.4	Dielectric Withstan	ding Voltage				
E.4.4.5.4.1	•	Atmospheric Pressure Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202.				
	a) Method of n	ails and exceptions nounting esistor with its insu		ward on the me	tal plate so	

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b)	of the resist at 1.0±0.2N Measureme	of the metal block is positioned at a or's two electrodes as shown in Fig nt before test nce shall be measured in accordar	gure E-2, and pre	essurize
c)	line frequen	e tages of 150±15V <sub>AC</sub> (root-mean-sc cy) shall be applied between the n and measuring point B on the met	neasuring point A	
d)	Duration of	test: 1 minute $_{0}^{+10}$ seconds		
e)	The leak cu resistors sha	nt during test rrent shall be measured throughou all be examined for evidence of are		
f)		nt after test nce shall be measured in accordar calculate the change in resistance		
g)	The resistor	n after test s shall be examined for evidence o eakdown and mechanical damage		•
	Metal block		Insulation pl	ate
	Measuring poin			2
Metal p (Measuri	late ng point B)	R0.5mm Sample resistor Insulation jacket faci	ing upward	
Figure E-2. Test	Method for th	ne Dielectric Withstanding Volta Tests	ge and Insulatio	n Resistance
E.4.4.5.4.2 Re	duced Pressu	re		
		e tested in accordance with Test M ails and exceptions shall apply.	lethod 105 of MII	STD-202.

a) Method of mounting
 The resistors shall be mounted as specified in item a), paragraph
 E.4.4.5.4.1.

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	,	ent before test nce shall be measured in accorda	ince with paragrap	bh	
	75±7.5V <sub>AC</sub>	(root-mean-square value at comr	nercial-line freque	ncy)	
	,	on: D (1.1kPa) application of test voltage: 1 minu	ute <sup>+10</sup> seconds		
<ul> <li>f) Measurement during test</li> <li>The leak current shall be measured throughout the test, and the resistors shall be examined for evidence of arcing or any breakage.</li> </ul>					
	E.4.4.5.2 to	nce shall be measured in accorda calculate the change in resistanc			
		raiter test s shall be examined for evidence reakdown and mechanical damag		•	
E.4.4.5.5	Insulation Resistar	nce			
	202. The following a) Mounting meth The resistors b) Test voltage: 1	shall be mounted as specified in i	ly.		
E.4.4.5.6	Short-Time Overloa	ad			
	temperature opera measured as spec voltage of 2.5 time seconds. The test specified in the det a) Mounting meth b) Test temperatu	rload test shall be performed in a tion test of paragraph E.4.4.7.6. ified in paragraph E.4.4.5.2. Follo s the rated voltage shall be applie voltage shall not exceed the max cail specification. The following co nod: As specified in item b), parag- ure erature shall be at 25±3°C in still	The resistance sh owing this measur ed to the resistors kimum overload vo onditions shall app graph E.4.4.2.	all be ement, dc tes for 5±1 bltage bly.	
	than the heat c) Measurement The resistors the test voltag	of the resistors being operated.	for 30 minutes or ce is measured in	more after accordance	
		fter test shall be examined for evidence o fier of 10x or greater.	f arcing, burning, a	and charring	

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20			<u> </u>			
E.4.4.6	Mechanical Performa	ince				
	The mechanical performance tests shall be performed as follows.					
E.4.4.6.1	Solderability					
E.4.4.6.1.1	test procedure sh However, the foll a) Solder type Gold-tin allo b) Solder temp c) Solder imme d) Procedure Both electro The test sha not be used e) Examination	n after test nall be examined for solder wettab	ph 4.17 of JIS C %) shall be used. Ider at the same environment. Flu	5201-1. time. ux shall		
E.4.4.6.1.2	The solderability test procedure sh However, the foll a) Solder type Tin-lead allo inactivated f b) Solder temp c) Solder imme d) Procedure Both electro e) Examination	nall be examined for solder wettab	ph 4.17 of JIS C of 60% including older at the same	5201-1. time.		
E.4.4.6.2	Adhesion The adhesion test = 5201-1. The follow a) Mounting meth The resistors s electrode struct b) Load: 5±0.5N	shall be performed in accordance ving conditions shall apply.	em a), paragraph 1.4.2 for electrode	1 E.4.4.2 for		

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	d) Examination aff The resistors s 10x or greater.	hall be examined for mechanica	I damage using a	magnifier of
	Figure E-	3. Test Method for the Adhes	ion Test	
E.4.4.6.3	<ul> <li>The following condi</li> <li>a) Mounting meth The resistors s specified in iter</li> <li>b) Measurement</li> <li>b) Measurement</li> <li>c) Deflection: 2min</li> <li>d) Number of ben</li> <li>e) Measurement</li> <li>The resistance</li> <li>paragraph E.4.</li> <li>f) Examination at</li> </ul>	nod shall be mounted on a test board m b), paragraph E.4.4.2. The te before test e shall be measured in accordance m nding: 1 during test: e shall be measured with the test .4.5.2. fter test shall be examined for mechanica	as shown in Figu st temperature sh ce with paragraph board bent in acc	re E-4 as all be 235±5° E.4.4.5.2. ordance with
E.4.4.6.4	<ul> <li>shall be mounted of shall remain at roor apply.</li> <li>a) Mounting meth The resistors since electrode struct</li> <li>b) Measurement in the resistance calculate the circle calculate the circle struct of the resistors since calculate the circle calculate the calculate the</li></ul>	Il be measured as specified in pa n an alumina test board. The tes n temperature for 4 to 12 hours. hod shall be mounted as specified in sture C and item b), paragraph E after test shall be measured in accordance hange in resistance before and a	st board, with resis The following cor item a), paragraph .4.4.2 for electrode ce with paragraph after the test.	stors mounted inditions shall in E.4.4.2 for e structure R. E.4.4.5.2 to

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					Unit: mm
Lar	<u>1d</u> 🖌 🛏	<u> </u>			
F77777			mm.	7777	
	/////		///		
	<u>IIIA</u>	<b>a</b> 1/4	<u>                                     </u>		
	1111			¥ 🖇	
		a ////			
			/////	<u>///// *</u>	
<b>~</b>	<u></u> .	100			
· · ·	• Dimensions (mm)				
	а	b	<u>с (ппп)</u>	f	-
RMS06	1.0	3.0	1.2	(2.0)	1
RMS10	1.2	4.0	1.65		
RMS12	2.2	5.0	2.0	(2.5)	
RMS15	1.23	4.0	1.4	(3.0)	
RMS20	1.87	4.67	1.4	(2.5)	
RMS35	3.14	5.94	1.4	(2.5)	
CRK2H	3.6	7.0	3.0	(3.0)	_
CRK4H	2.2	5.0	3.0	(3.0)	_
CRK8H	2.2	5.0	2.0	(2.5)	_
CRK10H CRK16H	1.2 1.0	4.0 3.0	1.65 1.1	(3.0) (2.0)	-
SCR16	1.0	3.0	1.1	(2.0)	-
SCR20	1.2	4.0	1.65	. ,	-
SCR32	2.2	5.0	2.0	(2.5)	-
SCR35	2.2	5.0	2.9	(2.5)	-
SCR50	3.2	6.6	3.0	(2.5)	-
WCR32	0.65	2.65	3.2	(7.0)	
WCR50	1.30	7.0	5.5	(1.85)	
WCR64	1.45	6.0	6.4	(1.7)	
Remarks:					
1. The material shall be glass base woven epoxy resin.					
Thickness 1.6mm					
Copper foil 0.035mm					
2. The solder resist (soldering heat resistance resin) shall be applied to the					
shaded area in the figure.					
3. The values in	parentheses	in the figure a	and table	e above are for r	eference.
Figure E-4.	Test Board	l for the Boa	rd Bend	lina Test	
Figure E-4. Test Board for the Board Bending Test					
E.4.4.7 Environmental Performance					
The environmental performance tests shall be performed as follows.					
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	calculate the h) Examination The resistors	ce shall be measured in acco change in resistance before	and after the test.		
E.4.4.7.3	Thermal Shock [I	]			
	<ul> <li>shall be subjecte</li> <li>shown in Table E</li> <li>apply.</li> <li>a) Method of m</li> <li>This test shate</li> <li>E.4.4.7.2.</li> <li>b) Number of test</li> <li>c) Measurement</li> <li>The resistant</li> </ul>	resistance in accordance with d to the specified thermal sho is 15 and Figure E-5. The follo ounting all be performed following the est cycles: 1,000 cycles hts during test and external in ce shall be measured after th es or more at each $25^{+5}_{0}$ cycle	shock test specified in spection e resistors are at room	conditions otions shall paragraph temperature	
		es and 500 $^{+10}_{0}$ cycles. The ex	<b>U U U</b>	-	
	d) Measuremen The resistors resistance is	sually for cracks on the surfac nt after test s shall be at room temperatur measured in accordance wit sistance before and after the	e for 30 minutes or mo h paragraph E.4.4.5.2 t		
	e) Examination The resistor			age using a	
Table	e E-15. Test Condit Thermal Shock [II]		15 min. 		
Step		ime (min.) 0			
1	-30 <sup>0</sup> <sub>-5</sub>	15 g 60			

tep	Temperature (°C)	Time (min.)
1	-30 <sup>0</sup> <sub>-5</sub>	15
2	100 <sup>+5</sup> <sub>0</sub>	15



Thermal Shock [II]

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	une 2021	Parts Specification	Page	– E-28 –
E.4.4.7.4	<ul> <li>The following detail</li> <li>a) Method of mode</li> <li>b) Measurement</li> <li>The resistance</li> <li>c) Polarization and No voltage shade</li> <li>d) Subcycle</li> <li>d) Subcycle</li> <li>d) Step 7b shall measurement</li> <li>f) Measurement</li> <li>f) Measurement</li> <li>from the charm of the resistance</li> <li>to calculate the g</li> </ul>	tested in accordance with Test Me Is and exceptions shall apply. Unting: As specified in item b), par before test e shall be measured in accordance and loading voltage all be applied. Not be applicable. Step 7a shall of nine cycles. Is at high humidity: None. after test ion of step 6 of the final cycle, the other and maintained at room temp e shall then be measured in accord e change in resistance before and after test shall be examined for evidence of	ragraph E.4.4.2. e with paragraph nly be performed resistors shall be erature for 30 mir dance with parag l after the test.	E.4.4.5.2. during any e removed nutes or more. raph E.4.4.5.2
E.4.4.7.5	Resistance to Solve Resistors shall be to The following detain a) Application are b) Solvents to be 1) 2-propanol 2) 42 parts by	ents tested in accordance with Test Me Is and exceptions shall apply. ea: Marked portion	ume of propylene	glycol
E.4.4.7.6	characteristic test s measured when me Within 1 hour after chamber at room te the temperature sp no load for 1 hour. shall then be applie voltage to gradually the resistors are re shall be removed. more but less than specified in paragra	Operation erformed in accordance with the respecified in paragraph E.4.4.5.3. To ounted on a test board as specifie this measurement, the resistors st emperature. The temperature shat ecified in the detail specification. The rated dc voltage (the rated co ed for 45 minutes. Wait $15_{0}^{+15}$ minutes y increase the chamber temperature moved from the chamber. Any wa The resistors shall be left at room 2 hours. The resistance shall the aph E.4.4.5.2 to calculate the char r the test, the resistors shall be exa	The resistance shad in paragraph E hall be placed in all be gradually de The resistors sha urrent for jumper utes after the rem ater droplets on the temperature for in be measured a nge in resistance	hall be 4.4.5.2. a test ecreased to all remain at resistors) hoval of erature before he surface 1 hour or gain as before and

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	abnormality using a legibility.	a magnifier of 10x or greater. The	marking shall be	e examined for
E.4.4.7.7	E.4.4.2 and the respressions shall be preventions shall be preventions the temperature in the temperature specified test time temperature. The maintained at a termeasured in accord resistance before a (atmospheric pressions)	are mounted on a test board as sp sistance is measured in accordanc ut in a test chamber maintained at chamber shall then be gradually ir ied in the detail specification. Afte esistors shall remain at no load for has passed, the temperature shall resistors shall then be removed fro nperature of $25\pm5^{\circ}$ C for $6\pm1$ hours. dance with paragraph E.4.4.5.2 to and after the test. The dielectric with sure) and insulation resistance test aphs E.4.4.5.4.1 and E.4.4.5.5, resist xamined for significant abnormality	e with paragraph room temperatu ncreased to the te r stabilizing at the $2,000 + \frac{72}{0}$ hours. gradually be retu om the test cham The resistance calculate the cha ithstanding voltage t shall then be per	E.4.4.5.2, the re. The est e test When the urned to room ber and shall then be ange in ge test erformed as the test, the
E.4.4.8	Durability			
	The durability test sha	all be performed as follows.		
E.4.4.8.1	The following detail a) Method of more The resistors as paragraph E.4 not exceed 2.8 supply upon the b) Test temperate c) Measurements shall be mease 1) Inside char The resister be perform stabilized of reference condition. 2) Outside char The resister shall be performed transference condition. 2) Outside char The resister shall be performed transference condition. 2) Outside char The resister transference condition. 2) Outside char The resister transference condition.	shall be mounted on a test board a .4.2. If forced air circulation is em 5m/s and there shall be no direct in he resistors. ure: 70±5°C before test s may be taken inside or outside the ured in accordance with paragraph mber or shall be placed in the chamber. hed 8 hours after the temperature at the test temperature. This mea temperature for all subsequent me hamber ors shall be mounted in the test fix performed at room temperature. The perence temperature for all subsequent	as specified in iter ployed, the air ve mpingement of th ne chamber. The n E.4.4.5.2. A pre-test meas inside the chamb surement shall be easurements und ture. A pre-test n is measurement	m b), elocity shall le forced-air e resistance surement shall ber is e used as the er the same measurement shall be used

<ul> <li>d) Test conditions The rated voltage (the rated current for jumper resistors) specified in paragrap E.3.5.5 shall be applied intermittently, 90 minutes ON and 30 minutes OFF. The test voltage shall be regulated and controlled to maintain ±5% of the rated voltage. The test duration shall be 4,000 <sup>+7</sup>/<sub>0</sub> hours for the qualification test and 2,000 <sup>+7</sup>/<sub>0</sub> hours for the quality conformance inspection.</li> <li>e) Measurements during test 1) Qualification test: 250 <sup>+8</sup>/<sub>0</sub> hours, 500 <sup>+40</sup>/<sub>0</sub> hours, 1,000 <sup>+8</sup>/<sub>0</sub> hours and 2,000 <sup>+7</sup>/<sub>0</sub> hours.</li> <li>2) Quality conformance inspection: 250 <sup>+48</sup>/<sub>0</sub> hours, 500 <sup>+48</sup>/<sub>0</sub> hours and 1,000 <sup>+8</sup>/<sub>0</sub> hours.</li> <li>f) Measurements during and after test 1) Inside chamber At the end of the final 30 minute off time, the resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>2) Outside chamber After the resistors are at room temperature for a minimum of 45 minutes a no load, the resistance shall be measured in accordance with paragraph E.4.4.5.2</li> <li>g) Examination after test The resistors shall be examined for evidence of mechanical damage using a 10x magnifier.</li> <li>E.4.5 Long-Term Storage Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> <li>E.4.6 Change of Tests and Inspections Change of tests and Inspections</li> <li>change of tests and Inspections shall be in accordance with paragraph 4.8 of JAXA- QTS-2050.</li> <li>E.5 PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> </ul>	JAXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– E-30 –
<ul> <li>The rated voltage (the rated current for jumper resistors) specified in paragraps E.3.5.5 shall be applied intermittently, 90 minutes ON and 30 minutes OFF. The test voltage shall be regulated and controlled to maintain ±5% of the rated voltage. The test duration shall be 4,000 <sup>+72</sup>/<sub>0</sub> hours for the qualification test and 2,000 <sup>+72</sup>/<sub>0</sub> hours for the quality conformance inspection.</li> <li>e) Measurements during test <ol> <li>Qualification test: 250 <sup>+48</sup>/<sub>0</sub> hours, 500 <sup>+48</sup>/<sub>0</sub> hours, 1,000 <sup>+48</sup>/<sub>0</sub> hours and 2,000 <sup>+72</sup>/<sub>0</sub> hours.</li> </ol> </li> <li>Quality conformance inspection: 250 <sup>+48</sup>/<sub>0</sub> hours, 500 <sup>+48</sup>/<sub>0</sub> hours and 1,000 <sup>+48</sup>/<sub>0</sub> hours.</li> <li>f) Measurements during and after test <ol> <li>Inside chamber</li> <li>At the end of the final 30 minute off time, the resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>Outside chamber</li> <li>After the resistors are at room temperature for a minimum of 45 minutes a no load, the resistance shall be measured in accordance with paragraph E.4.4.5.2</li> <li>Examination after test</li> <li>The resistors shall be examined for evidence of mechanical damage using a 10x magnifier.</li> </ol> </li> <li>E.4.5 Long-Term Storage <ol> <li>Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> </ol> </li> <li>E.4.6 Change of Tests and Inspections <ol> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> </ol> </li> <li>E.5 PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050. </li> </ul>	29 June 2021	Parts Specification		
<ul> <li>e) Measurements during test <ol> <li>Qualification test: 250<sup>-48</sup>/<sub>0</sub> hours, 500<sup>+48</sup>/<sub>0</sub> hours, 1,000<sup>+48</sup>/<sub>0</sub> hours and 2,000<sup>+72</sup>/<sub>0</sub> hours.</li> <li>Quality conformance inspection: 250<sup>+48</sup>/<sub>0</sub> hours, 500<sup>+48</sup>/<sub>0</sub> hours and 1,000<sup>+88</sup>/<sub>0</sub> hours.</li> <li>Measurements during and after test <ol> <li>Inside chamber</li> <li>At the end of the final 30 minute off time, the resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>Outside chamber</li> <li>After the resistors are at room temperature for a minimum of 45 minutes a no load, the resistance shall be measured in accordance with paragraph E.4.4.5.2</li> <li>Examination after test</li> <li>The resistors shall be examined for evidence of mechanical damage using a 10x magnifier.</li> </ol> </li> <li>E.4.5 Long-Term Storage <ol> <li>Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> </ol> </li> <li>E.4.6 Change of Tests and Inspections <ul> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> </ul> </li> <li>E.5. PREPARATION FOR DELIVERY <ul> <li>Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> </ul> </li> </ol></li></ul>	The rated vol E.3.5.5 shall The test volta voltage. The	tage (the rated current for jumper r be applied intermittently, 90 minute age shall be regulated and controlle test duration shall be $4,000^{+72}_{0}$ hou	es ON and 30 mir ed to maintain ±50 rs for the qualifica	nutes OFF. % of the rated
<ul> <li>f) Measurements during and after test <ol> <li>Inside chamber</li> <li>At the end of the final 30 minute off time, the resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>Outside chamber</li> <li>After the resistors are at room temperature for a minimum of 45 minutes a no load, the resistance shall be measured in accordance with paragraph E.4.4.5.2</li> <li>Examination after test</li> <li>The resistors shall be examined for evidence of mechanical damage using a 10x magnifier.</li> </ol> </li> <li>E.4.5 Long-Term Storage <ol> <li>Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> </ol> </li> <li>E.4.6 Change of Tests and Inspections <ol> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> </ol> </li> <li>E.5. PREPARATION FOR DELIVERY <ul> <li>Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> </ul> </li> <li>E.6. NOTES</li> </ul>	e) Measurement 1) Qualificat 2,000 <sup>+72</sup>	ts during test ion test: $250^{+48}_{-0}$ hours, $500^{+48}_{-0}$ hours hours.	s, 1,000 <sup>+48</sup> hours a	
<ol> <li>Inside chamber At the end of the final 30 minute off time, the resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>Outside chamber After the resistors are at room temperature for a minimum of 45 minutes a no load, the resistance shall be measured in accordance with paragraph E.4.4.5.2</li> <li>Examination after test The resistors shall be examined for evidence of mechanical damage using a 10x magnifier.</li> <li>E.4.5 Long-Term Storage Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> <li>E.4.6 Change of Tests and Inspections Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA- QTS-2050.</li> <li>E.5 PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> <li>E.6. NOTES</li> </ol>	<b>1,000</b> <sup>+48</sup> <sub>0</sub>	hours.		
<ul> <li>Long-term storage shall be in accordance with paragraph 4.7 of JAXA-QTS-2050.</li> <li>E.4.6 Change of Tests and Inspections Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> <li>E.5. PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> <li>E.6. NOTES</li> </ul>	<ol> <li>Inside characteristic</li> <li>At the eniin accord</li> <li>Outside characteristic</li> <li>Outside characteristic</li> <li>After the no load, field</li> <li>E.4.4.5.2</li> <li>g) Examination a The resistors</li> </ol>	amber d of the final 30 minute off time, the lance with paragraph F.4.4.5.2. chamber resistors are at room temperature f the resistance shall be measured ir after test shall be examined for evidence of	for a minimum of n accordance with	45 minutes at n paragraph
<ul> <li>E.4.6 Change of Tests and Inspections Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA- QTS-2050.</li> <li>E.5. PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> <li>E.6. NOTES</li> </ul>	E.4.5 Long-Term Storage			
<ul> <li>Change of tests and inspections shall be in accordance with paragraph 4.8 of JAXA-QTS-2050.</li> <li>E.5. PREPARATION FOR DELIVERY Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.</li> <li>E.6. NOTES</li> </ul>	Long-term storage sha	ll be in accordance with paragraph	4.7 of JAXA-QTS	S-2050.
Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050. E.6. NOTES	Change of tests and in	•	ith paragraph 4.8	of JAXA-
			ph 5 of JAXA-QT	S-2050.
		of JAXA-QTS-2050.		

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	Tolerance		
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	ments		
	ments		
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This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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		RESIS	TOR NETWORKS	6, CHIP		
F.1. C	General					
F.1.1	Scope					
	This appendix esta provisions for the c		•		•	
F.1.2	Classification					
	Resistors covered	by this spec	ification shall be c	lassified a	as specified in Ta	able F-1.
		Tabl	e F-1. Classifica	ation		
	Material	Style and ty	pe of construction	Со	nstruction	
	Metal alloy film		RZCS		4512	
F.1.3 F.1.3.1	Part Number The part number s details. Example: JAXA <sup>(1)</sup> <u>RZCS</u> Style and type of construct (F.1.3.1) Note: <sup>(1)</sup> "JAXA " in "J". "NASDA"	<u>16</u> Number of tion terminals (F.1.3.2) dicates the o	<u>K</u> 1001 of Characteristic Non s resis (F.1.3.3) (F.1 common part for s	<u>l E</u> ninal Resi stance tole .3.4) (F. pace use	<u>A</u> stance Schematics erance 1.3.5) (F.1.3.6) and may be abb	<u>C</u> Electrode structure (F.1.3.7)
	The style and ty shown in Table and the "CS" inc	pe of constr F-2. The "R licates the ty	uction shall be ide Z" indicates the hi /pe of constructior <b>tyle and Type of</b>	gh reliabi n.	lity, chip, resisto	
	Symbo		Type of	constructi	on	
	RZ			CS		]

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#### F.1.3.2 Number of Terminals

The number of terminals shall be identified by a two-digit number as shown in Table F-3.

Symbol	Number of terminals
16	16

Table F-3. Number of Terminals

# F.1.3.3 Characteristics

The resistance-temperature characteristic shall be identified by a single letter symbol in accordance with Table F-4.

#### Table F-4. Resistance-Temperature Characteristic

(Unit: x10<sup>-6</sup>/°C)

Symbol	Resistance-temperature characteristic (referenced: 25°C)
М	±200
к	±100

#### F.1.3.4 Nominal Resistance

The nominal resistance shall be identified in ohms ( $\Omega$ ) by 3 or 4 alphanumeric characters.

a) Resistance identified by 3 digits

The resistance identified by 3 digits applies to resistors with resistance tolerance of  $\pm 2.0\%$ (G),  $\pm 5.0\%$  (J). The first two digits represent significant figures and the last digit specifies the number of zeros to follow.

Example: 150= 15Ω 152= 1,500Ω= 1.50kΩ 154=150,000Ω=150 kΩ

b) Resistance identified by 4 digits

The resistance identified by 4 digits applies to resistors with resistance tolerance of  $\pm 1.0\%$  (F). The first three digits represent the significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.

Example: 97R6= 97.6Ω

1500= 150 Ω 1501= 1,500 Ω= 1.50kΩ 1503=150,000 Ω=150 kΩ

F.1.3.5 Resistance Tolerance

The resistance tolerance shall be identified by a single capital letter in accordance with Table F-5.

	XA-QTS-2050 29 June 2021	)E		A X A pecification	Page	– F-3 –
		Tab	le F-5. Resi	stance Tolerance	)	
					Unit: %	
		Symbol	Res	istance tolerance		
		F		±1.0		
		G		±2.0		
		J		±5.0		
F.1.3.6	Schematic					
		atic shall be	identified by	a single capital let	ter in accordance	with Table F
	6.					
Г			Table D-6.	Schematic		
	Symbol			Schematic		
	A		N 0 	0 0 0 0 0 0 0 0 0 0 0 0 0 0	:	
	В		N N-1	0	0	
L F.1.3.7	Electrode S The electro Table F-7.		shall be iden	tified by a single c	apital letter in acc	ordance with
		<b>_</b> ·				
	Symbol		ble F-7. Elec	ctrode Structure	g method	7

Symbol	Structure	Mounting method
С	Double-sided electrode	High temperature soldering
R	Double-sided electrode	Soldering

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F.2.	Applicable Documents			
F.2.1	Applicable Documents The applicable docume 2050.	ents shall be as specified in paragra	aph 2.1 of JAXA-(	QTS-
F.2.2				
F.3.	Requirements			
F.3.1	Qualification			

### F.3.1.1 Qualification Coverage

Qualification shall be valid for resistors that are produced by the manufacturing line that conforms to materials, designs, constructions, specifications and performance specified in paragraphs F.3.2 to F.3.9. The qualification coverage shall be represented by samples that have passed the qualification test. Characteristics and resistance tolerance of the resistors to be qualified shall be classified as specified in Tables F-8 and F-9. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification. If necessary, additional qualification coverage shall be specified in the detail specification.

Characteristic submitted	Characteristic qualified
К	К, М
М	М

Table F-8.	Characteristics	Qualification
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Table F-9. Resistance Tolerance Qualificatio	n
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Resistance tolerance submitted	Resistance tolerance qualified
F	F, G, J
G	G, J
J	J

J	AXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– F-5 –
<ul> <li>F.3.2 Materials</li> <li>The materials shall be specified as follows and as specified in paragraph 3.3 of JAXA-QTS-2050.</li> </ul>				
F.3.2.1	3.2.1 Base Substance (Core) The resistor substrate shall be formed by a mixture of alumina and other oxides baked at high temperatures. The substrate shall be a minimum of 96% alumina.			
F.3.2.2	Electrode The electrode shall b	e as specified in the detail specific	ation.	
F.3.2.3	Resistance Material The resistance mater	ial shall be as specified in the deta	ail specification.	
F.3.2.4	Insulation Material The insulation materi	al shall be as specified in the deta	il specification.	
F.3.3	Externals, Dimensions a Resistors shall satisfy th paragraph F.4.4.3.	and Marking ne following requirements when te	sted in accordanc	ce with
F.3.3.1	following shall be clea	g ects such as cracks on the surface arly marked in such a manner to e legible at the completion of any te	nsure legibility.	
	<ul> <li>a) Characteristics Examples: M, K</li> <li>b) Nominal resistan The nominal resistan</li> <li>c) Resistance Toler Examples: F, G,</li> <li>d) Schematics Examples: A, B</li> </ul>	stance shall be marked as specificance	ed in paragraph F	<del>-</del> .1.3.4.
	as specified in the de	ace is limited, the order of preced tail specification. The marking iter Il be marked on the individual pac	ms, other than th	ose
F.3.3.2	Construction, Dimens The construction, dim specification.	ions and Mass iensions and mass of resistors sha	all be as specified	d in the detail

J	AXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– F-6 –	
F.3.4	<ul> <li>F.3.4 Workmanship Resistors shall be manufactured based on good design practices and in accordance with the quality assurance program defined in paragraph 3.2.1. The following requirements shall also apply. <ul> <li>a) Resistor films Resistor films shall be free of cracks, chipping, pin holes or deformation which may adversely affect the performance of the resistors. When the resistor films are trimmed, there shall be no residue remaining in the trimming groove. </li> <li>b) Protection against moisture The resistor element shall be protected against moisture by an external coating of moisture-resistant insulating material. </li> <li>c) Electrodes The resistor electrode shall be securely connected to the resistor element and substrates, both electrically and mechanically. The electrode shall be made of solderable materials. </li> </ul></li></ul>				
F.3.4.1	the resistor films, elec	sted as specified in paragraph F.4 strode and protective coating have shall be as specified in the quality	been properly m	anufactured.	
F.3.5	Ratings				
F.3.5.1	resistance tolerance	alues of nominal resistance shall b and shall be as specified in Table s and resistance tolerance shall sa	F-10. The minim	um and	
F.3.5.2	Operating Temperatu The operating temper	re Range ature range shall be between -55	and +125°C.		
F.3.5.3	Power Rating Resistors shall have a ambient temperature	a power rating as specified in the o shall be 70°C.	detail specificatio	n. The rated	
F.3.5.4	power rating. For ten	at or below the rated ambient tem operatures in excess of the rated a l be determined by derating the po own in Figure F-1.	ambient temperat	ure, the	
F.3.5.5	approximate sine way	a rated direct current (DC) continu /e root-mean-square (rms) alterna commercial-line frequency and way	ting current (AC)	continuous	

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	-	•	

power rating, as determined from the following formula. However, if the calculated rated voltage exceeds the maximum operating voltage specified in the detail specification, the maximum operating voltage shall be the rated voltage.

 $E=\sqrt{P \cdot R}$ 

Where:

E = Voltage rating (V)

P = Power rating (W)

 $R = Nominal resistance (\Omega)$ 

Resistance tolerance and symbols (%)					
	F (±1.0)				
10.0	17.8	31.6	56.2	1.0	
10.2	18.2	32.4	57.6	1.1	
10.5	18.7	33.2	59.0	1.2	
10.7	19.1	34.0	60.4	1.3	
11.0	19.6	34.8	61.9	1.5	
11.3	20.0	35.7	63.4	1.6	
11.5	20.5	36.5	64.9	1.8	
11.8	21.0	37.4	66.5	2.0	
12.1	21.5	38.3	68.1	2.2	
12.4	22.1	39.2	69.8	2.4	
12.7	22.6	40.2	71.5	2.7	
13.0	23.2	41.2	73.2	3.0	
13.3	23.7	42.2	75.0	3.3	
13.7	24.3	43.2	76.8	3.6	
14.0	24.9	44.2	78.7	3.9	
14.3	25.5	45.3	80.6	4.3	
14.7	26.1	46.4	82.5	4.7	
15.0	26.7	47.5	84.5	5.1	
15.4	27.4	48.7	86.6	5.6	
15.8	28.0	49.9	88.7	6.2	
16.2	28.7	51.1	90.9	6.8	
16.5	29.4	52.3	93.1	7.5	
16.9	30.1	53.6	95.3	8.2	
17.4	30.9	54.9	97.6	9.1	

#### Table F-10. Standard Resistance Values



J/	AXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– F-9 –	
F.3.6.6	F.3.6.6 Short-Time Overload When resistors are tested as specified in paragraph F.4.4.5.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of arcing, burning, or charring after the completion of this test.				
F.3.7	Mechanical Performance Resistors shall satisfy th	e ne following mechanical requireme	ents.		
F.3.7.1	Solderability				
F.3.7.1.	<ul> <li>F.3.7.1.1 Solderability [I]</li> <li>Solderability [I] shall be applicable to the electrode structure C. When resistors are tested as specified in paragraph F.4.4.6.1.1, a minimum of 95% of the terminal surface shall be evenly covered with new solder. The existence of small pinholes or rough areas shall be acceptable, provided that they are not concentrated in one spot. The total area of the pinholes or rough areas shall be less than 5% of the solder area.</li> </ul>				
F.3.7.1.2	Solderability [II] sh are tested as speci surface shall be ev or rough areas sha	nall be applicable to the electrode ified in paragraph F.4.4.6.1.2, a m enly covered with new solder. Th Il be acceptable, provided that the a of the pinholes or rough areas s	inimum of 95% o e existence of sm ey are not concen	f the terminal nall pinholes trated in one	
F.3.7.2	Adhesion				
	When resistors are te mechanical damage.	ested as specified in paragraph F.4	4.4.6.2, there sha	ll be no	
F.3.7.3	resistance before and	ested as specified in paragraph F. d after the test shall satisfy the req shall be no mechanical damage a	uirements of the	detail	
F.3.7.4	resistance before and specification. The ele	g Exposure ested as specified in paragraph F. d after the test shall satisfy the req ectrode area covered by solder lea the electrode shall be free from m	uirements of the aching shall be 10	detail )% or less of	
F.3.8	Environmental Performa Resistors shall satisfy th	ance ne following environmental require	ments.		

-	XA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– F-10 –	
F.3.8.1	F.3.8.1 Random Vibration When resistors are tested as specified in paragraph F.4.4.7.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.				
F.3.8.2	Shock When resistors are tested as specified in paragraph F.4.4.7.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.				
F.3.8.3	resistance before and specification. There s	sted as specified in paragraph F.4 I after the test shall satisfy the req shall be no evidence of mechanica ks on the surface of resistors shal In 500 cycles.	uirements of the al damage after th	detail ne completion	
F.3.8.4	resistance before and	sted as specified in paragraph F.4 I after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail	
F.3.8.5		ts sted as specified in paragraph F.4 letails shall be as defined in the d		-	
F.3.8.6	resistance before and	eration sted as specified in paragraph F.4 I after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail	
F.3.8.7	resistance before and specification. The ch voltage test shall also insulation resistance	sted as specified in paragraph F.4 I after the test shall satisfy the req ange in resistance before this test satisfy the requirements of the de after the test shall be more than the shall be no evidence of mechanica	uirements of the and after the wit etail specification ne value specified	detail hstanding . The l in the detail	

JAXA-QTS-2050E     JA X A Parts Specification     Page     -F-11-       F.3.9     Durability Resistors shall satisfy the following durability requirements.     F.3.9.1     Life       F.3.9.1     Life     When resistors are tested as specified in paragraph F.4.4.8.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.       F.4.     Qualify Assurance Provisions       F.4.1     In-Process Inspection The in-process inspection shall be as specified in paragraph 4.3 of JAXA-QTS- 2050.       F.4.2     Qualification Test The qualification test shall be in accordance with paragraph 4.4 of JAXA-QTS-2050 and as provided below.       F.4.2.1     Test items and Number of Samples Test items and number of samples of the qualification test shall be as specified in Table F-11.       When the materials differ greatly due to the resistance range, the samples shall be prepared for minimum resistance, maximum resistance, and critical resistance or closest to critical resistance of each material. The required tests shall be performed for the number of samples specified for each material. When the critical resistance or closest to critical resistance for GML certification for both schematics A and B and the materials of protective coating, resistor elements and electrodes, structures of electrodes, processes and quality levels are the same for both schematics with worse conditions, the tests for the other schematic type may be excluded. Tests for one of the schematics shall be conducted with samples of electrode structure R. The number of samples for each electrode shall be as specified in Tables F-11.1 and F-11.2. Howev									
<ul> <li>F.3.9 Durability F.3.9 Durability Resistors shall satisfy the following durability requirements. </li> <li>F.3.9.1 Life When resistors are tested as specified in paragraph F.4.4.8.1, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test. </li> <li>F.4.1 In-Process Inspection The in-process inspection shall be as specified in paragraph 4.3 of JAXA-QTS- 2050. </li> <li>F.4.2 Qualification Test The qualification test shall be in accordance with paragraph 4.4 of JAXA-QTS- 2050. </li> <li>F.4.2 Qualification Test The qualification test shall be in accordance with paragraph 4.4 of JAXA-QTS- 2050. F.4.2.1 Test Items and Number of Samples Test items and number of samples of the qualification test shall be as specified in Table F-11. When the materials differ greatly due to the resistance range, the samples shall be prepared for minimum resistance, maximum resistance, and critical resistance or closes to critical resistance of each material. The required tests shall be performed for the number of samples of OML certification for both schematics, A and B and the materials of protective coating, resistor elements and electrodes, structures of electrodes, processes and quality levels are the same for both schematics, east for one of the schematics shall be substituted for the other for test for one of the schematics shall be substituted for the other for test for one of the schematics shall be substituted for the other for test for oup II, IV, VI and VIII to XI tests. In addition, if the widths of the resistor bodies are the same in both schematics and the group VII tests are conducted using the schematics with worse conditions, the tests for the other schematic type may be excluded. Tests common to all electrode structures shall be conducted with samples of electrode structure R. The number of samples for each electrode</li></ul>			Page	– F-11 –					
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and F-11.2 and the tests of each group shall be performed in the order listed. Upon completion of Group I and IA tests, Group II through XI tests of Tables F-11.1 and F-	materials of protective coating, resistor elements and electrodes, structures of electrodes, processes and quality levels are the same for both schematics, tests fo one of the schematics shall be substituted for the other for test Group II, IV, VI and VIII to XI tests. In addition, if the widths of the resistor bodies are the same in both schematics and the group VII tests are conducted using the schematics with worse conditions, the tests for the other schematic type may be excluded. Tests common all electrode structures shall be conducted with samples of electrode structure R. The number of samples for each electrode shall be as specified in Tables F-11.1 at F-11.2. However, if the manufacturer requests to have the resistors approved separately for each electrode structure, all tests common to all electrode structures								
	The order of tests and number of samples shall be in accordance with Tables F-11.1 and F-11.2 and the tests of each group shall be performed in the order listed. Upon completion of Group I and IA tests, Group II through XI tests of Tables F-11.1 and F-								

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Table F-11.1.	Qualification	Test (Applicable	to Schematic A) (1/2)
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	Test Criteria for Pass/fail						
Group	Order	Item	Require- ment paragraph	Test method paragraph	Sample size for each electrode structure <sup>(1)</sup>		No. of defective
-			F <b>3</b> F		R	С	allowed
	1	Application of pulse	F.3.6.1	F.4.4.5.1	10	0%	0
I	2	Resistance	F.3.6.2	F.4.4.5.2	10	0%	0
IA	1	Externals, dimensions and marking	F.3.3	F.4.4.3		AQL <sup>(2)</sup> 1.0%	
IB	1	DPA	F.3.4.1	F.4.4.4.1	4 2 Highest res 2 Lowest res		0
II	1	Dielectric withstanding voltage	F.3.6.4	F.4.4.5.4	10 (R=80)	0	0
	2	Insulation resistance	F.3.6.5	F.4.4.5.5	Any re	sistance	
	1	Resistance-temperature characteristic	F.3.6.3	F.4.4.5.3	6 (R=48)	0	
III	2	Low temperature operation	F.3.8.6	F.4.4.7.6	2 Highest res	sistance	0
	3	Short-time overload	F.3.6.6	F.4.4.5.6	2 Critical resistance 2 Lowest resistance		
IV	1	Moisture resistance	F.3.8.4	F.4.4.7.4	6 (R=48) 2 Highest res 2 Critical res 2 Lowest res	istance	0
V	1	Life	F.3.9.1	F.4.4.8.1	30 (R=240) { 10 Highest res 10 Critical res 10 Lowest res	istance	0
VI	1	Stability	F.3.8.7	F.4.4.7.7	6 (R=48) 2 Highest res 2 Critical res 2 Lowest res	istance	0
	1	Resistance to bonding exposure	F.3.7.4	F.4.4.6.4	10	10	
VII	2	Shock	F.3.8.2	F.4.4.7.2	Δηγικο	sistance	0
	3	Thermal shock [II]	F.3.8.3	F.4.4.7.3	Any res		

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		Test			Criteria for Pass/fail		
Group	Order	ltem	Require- ment	Test method paragraph	Sample size for structi		No. of defectives
Croup	order	lom	paragraph		R	С	allowed
					10	10	
VIII	1	Random vibration	F.3.8.1	F.4.4.7.1	(R=80)	(R=80)	0
					Any resistance		
	1	Coldorobility	F.3.7.1	F.4.4.6.1	10	10	
IX		Solderability	F.3.7.1	F.4.4.0.1	(R=80)	(R=80)	0
	2	Resistance to solvents	F.3.8.5	F.4.4.7.5	Any resistance		
x	4	Adhaaian	E 0 7 0	E 4 4 6 0	10	10	0
~	1	Adhesion	F.3.7.2	F.3.7.2 F.4.4.6.2 Any resistance		istance	0
					10	10	
XI	1	Board bending	F.3.7.3	F.4.4.6.3	(R=80)	(R=80)	0
					Any res	stance	
-	1	Materials	F.3.2	-		(3)	•

# Table F-11.1. Qualification Test (Applicable to Schematic A) (2/2)

Notes:

<sup>(1)</sup> The number of samples shall be the number of packages (Schematic A: 8 elements/package). The numbers in parentheses indicates the number of resistor elements to be tested.

<sup>(2)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Special Inspection Level S-4" shall apply to each electrode structure.

<sup>(3)</sup> Data to certify compliance with design specifications shall be submitted.

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		Test	Require-		Require-	
Croup	Ordor	ltem	ment	Test method paragraph	Sample size (1)	No. of defectives
Group	Order	liem	paragraph	P	R	C allowed
	1	Application of pulse	F.3.6.1	F.4.4.5.1	100%	0
1	2	Resistance	F.3.6.2	F.4.4.5.2	100%	0
IA	1	Externals, dimensions and marking	F.3.3	F.4.4.3	AQL <sup>(2)</sup> 1.0%	0
					4	4
IB	1	DPA	F.3.4.1	F.4.4.4.1		ce 0
					2 Lowest resistanc	e
	1	Dielectric withstanding	F.3.6.4	F.4.4.5.4	10	0
П		voltage			(R=150)	0
	2	Insulation resistance	F.3.6.5	F.4.4.5.5	Any resistance	
	1	Resistance-temperature	F.3.6.3	F.4.4.5.3	3	0
	1	characteristic	1.5.0.5	1.4.4.0.0	(R=45)	
Ш	2	Low temperature operation	F.3.8.6	F.4.4.7.6	1 Highest resistance	ce 0
	3	Short-time overload	F.3.6.6	F.4.4.5.6	1 Critical resistance	e
					1 Lowest resistanc	e

# Table F-11.2. Qualification Test (Applicable to Schematic B) (1/2)

	1	characteristic	F.3.6.3	F.4.4.5.3	(R=45)		
Ш	2	Low temperature operation	F.3.8.6	F.4.4.7.6	1 Highest	resistance	0
	3	Short-time overload	F.3.6.6	F.4.4.5.6	1 Critical ı	resistance	
	3	Short-time overload	F.3.0.0	F.4.4.3.0	L1 Lowest	resistance	
					3	0	
					(R=45)		
IV	1	Moisture resistance	F.3.8.4	F.4.4.7.4	1 Highest	resistance	0
					1 Critical ı	esistance	
					L1 Lowest	resistance	
					18	0	
					(R=270)		
V	1	Life	F.3.9.1	F.4.4.8.1	6 Highest	resistance	0
					6 Critical ı	esistance	
					6 Lowest	resistance	
					3	0	
					(R=45)		
VI	1	Stability	F.3.8.7	5.7 F.4.4.7.7	1 Highest	resistance	0
					1 Critical ı	resistance	
					l Lowest	resistance	
	1	Resistance to bonding exposure	F.3.7.4	F.4.4.6.4	10	10	
VII	2	Shock	F.3.8.2	F.4.4.7.2		aiatanaa	0
	3	Thermal shock [II]	F.3.8.3	F.4.4.7.3	Any re	sistance	
				•			-

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		Test			Crit	Criteria for Pass/fail	
			Require- ment	Test method	Sample	e size (1)	No. of
Group	Order	Item	paragraph	paragraph paragraph —	R	С	defectives allowed
					10	10	
VIII	1	Random vibration	F.3.8.1	F.4.4.7.1	(R=150)	(R=150)	0
					Any resistance		
IX	1	Solderability	F.3.7.1	F.4.4.6.1	10	10	0
IX	2	Resistance to solvents	F.3.8.5	F.4.4.7.5	Any resistance		0
x	1	Adhesion	F.3.7.2	F.4.4.6.2	10	10	0
^	1	Adhesion	Any resistance		0		
					10	10	
XI	1	Board bending	F.3.7.3	F.4.4.6.3	(R=150)	(R=150)	0
					Any resistance		
-	1	Materials	F.3.2	-	(3)		

#### Table F-11.2. Qualification Test (2/2) (Applicable to Schematic B)

Notes:

<sup>(1)</sup> The number of samples shall be the number of packages (Schematic B: 15 elements/package.) The numbers in parentheses indicates the number of resistor elements to be tested.

- <sup>(2)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Special Inspection Level S-4" shall apply to each electrode structure.
- <sup>(3)</sup> Data to certify compliance with design specifications shall be submitted.

# F.4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph 4.5 of JAXA-QTS-2050 and as provided below.

#### F.4.3.1 Samples

The inspection lot configuration of group A shall be as specified in paragraph 4.5.1.1 of JAXA-QTS-2050. Inspection lots for Group B and C inspections shall consist of samples that have passed Group A inspections. Unless otherwise specified, Group B and C inspections shall be performed for all combinations of schematic types and electrode structures. Resistors with the maximum resistance, minimum resistance and critical resistance shall be selected. Further, the highest grade of characteristics shall be selected. If the design criteria are identical and the schematic types and the structures are similar, the inspection lot may be represented by one of the shapes specified in the detail specification.

# F.4.3.2 Inspection Items and Number of Samples The items and number of samples of the Group A, B and C inspections of the quality conformance inspection shall be specified in Tables F-12, F-13 and F-14, respectively. Group tests shall be performed in subgroup order and the inspections within each group shall be performed in the specified order. The sampling plan used

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for the Group A inspection shall be in accordance with Appendix 1 of JIS Z 9015-1. "General Inspection Level II" and "Special Inspection Level S-4" specified therein shall apply to test order 1, Group A1-2 and Group A1-3 inspections, respectively. For Groups B and C inspections, a pre-defined quantity of samples shall be selected from each category shown in Table F-1 regardless of circuit type and electrode structure.

#### F.4.3.3 Criteria for Pass/Fail

A failure of any test specified in Table F-12, F-13 or F-14 shall constitute failure of each inspection group of the quality conformance inspection. When the number of defects does not exceed the permitted number specified in Table F-12, but the failure mode of the defect is catastrophic, such as open- or short-circuit where the function of the resistor may be lost, the resistor fails the Group A inspections.

#### F.4.3.4 Post-Test Disposition of Sample

Products from the lot rejected in the Group A quality conformance inspection shall not be shipped. If the lot has not passed the A1 inspection, the lot shall be treated as a rejected lot. The samples subjected to the DPA of the Group A inspection shall not be shipped as products.

If the lot has not passed the sampling test other than the DPA, all products of the lot shall be subjected to the failed inspection item, and only the good products shall be shipped.

	Inspection					Criteria for Pass/fail	
Group	Sub- group Order Item		ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
1	1	1	Application of pulse	F.3.6.1	F.4.4.5.1	100%	0
	I	2	Resistance	F.3.6.2	F.4.4.5.2	100%	
A1	2	1	Externals, dimensions and marking	F.3.3	F.4.4.3	AQL	(1) 4%
AI			2	DPA	F.3.4.1	F.4.4.1	4
	3	1	Dielectric withstanding voltage	F.3.6.4	F.4.4.5.4	AQL	<sup>(1)</sup> 4%
	2	2	Insulation resistance	F.3.6.5	F.4.4.5.5		

# Table F-12. Quality Conformance Inspection (Group A)

#### (Applicable to Schematics A and B)

Note:<sup>(1)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Normal Inspection Level II" specified therein shall apply to test order 1 of Group A1-2 inspection. "Special Inspection Level S-4" shall apply to the Group A1-3 inspections.

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				•••••	-) (		
		Inspe	ction			Criteria fo	r Pass/fail
Group	Sub- group	Order	ltem	Requirement Test method paragraph paragraph		Sample size	No. of defectives allowed
		1	Resistance to bonding exposure	F.3.7.4	F.4.4.6.4	2 (R=16)	0
	1		Resistance-temperature characteristic	F.3.6.3	F.4.4.5.3	0	
			Low temperature operation	F.3.8.6	F.4.4.7.6	2 (R=16)	0
			Short-time overload	F.3.6.6	F.4.4.5.6		
	2	1	Moisture resistance	F.3.8.4	F.4.4.7.4	2 (R=16)	0
В	3	1	Life	F.3.9.1	F.4.4.8.1	2 (R=16)	0
	4	1	Stability	F.3.8.7 F.4.4.7.7		2 (R=16)	0
	5		Shock	F.3.8.2	F.4.4.7.2	2 (R=16)	0
	6	1	Solderability	F.3.7.1	F.4.4.6.1	5	0
	0	2	Resistance to solvents	F.3.8.5	F.4.4.7.5	5	U
	7	1	Adhesion	F.3.7.2	F.4.4.6.2	5	0
	8	1	Board bending	F.3.7.3	F.4.4.6.3	5 (R=40)	0

# Table F-13.1. Quality Conformance Inspection (Group B) (Applicable to Schematic A)

Note:<sup>(1)</sup> The number of samples shall be the number of packages (Schematic A: 8 elements/package).

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			,		-) (		
		Inspe	ction			Criteria for Pass/	
Group	Sub- group	Order	ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
		1	Resistance to bonding exposure	F.3.7.4	F.4.4.6.4	2 (R=30)	0
	1		Resistance-temperature characteristic	F.3.6.3	F.4.4.5.3	2	
		2	Low temperature operation	F.3.8.6	F.4.4.7.6	2 (R=30)	0
			Short-time overload	F.3.6.6	F.4.4.5.6		
	2	1	Moisture resistance	F.3.8.4	F.4.4.7.4	1 (R=15)	0
В	3	1	Life	F.3.9.1	F.4.4.8.1	1 (R=15)	0
	4	1	Stability	F.3.8.7	F.4.4.7.7	1 (R=15)	0
	5	1	Shock	F.3.8.2	F.4.4.7.2	1 (R=15)	0
	6	1	Solderability	F.3.7.1	F.4.4.6.1	5	0
	0	2	Resistance to solvents	F.3.8.5	F.4.4.7.5	5	0
	7	1	Adhesion	F.3.7.2	F.4.4.6.2	5	0
	8	1	Board bending	F.3.7.3	F.4.4.6.3	5 (R=75)	0

## Table F-13.2. Quality Conformance Inspection (Group B) (Applicable to Schematic B)

Note:<sup>(1)</sup> The number of samples shall be the number of packages (Schematic B: 15 elements/package).

# Table F-14. Quality Conformance Inspection (Group C)

# (Applicable to Schematics A and B)

	Inspection					Criteria fo	or Pass/fail
Group	Sub- group Order Item		Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed	
с	1	1	Random vibration	F.3.8.1	F.4.4.7.1	5 (R=40, 75)	0
	2	1	Thermal shock [II]	F.3.8.3	F.4.4.7.3	2	0

Note:<sup>(1)</sup> The number of samples shall be the number of packages (Schematic A: 8 elements/package, Schematic B: 15 elements/package).

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F.4.4 Methods for Test and Ir	nspection					
<ul> <li>F.4.4.1 Test Conditions <ul> <li>a) Standard conditions</li> <li>Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.</li> <li>b) Reference conditions</li> <li>Reference conditions shall be a temperature of 25°C and an atmospheric pressure of 101.3 kPa.</li> <li>c) Judgment conditions shall be either condition A or B as specified in Table F-15. Unless specified, condition A shall apply.</li> </ul> </li> </ul>						
Condit		Igment Conditions	B	]		
Temperatu		23±2	20±2	-		
Relative hun		50±5	65±5	-		
Atmospheric pre	essure (kPa)	86 to 106	86 to 106			
Atmospheric pressure (kPa)       86 to 106       86 to 106         F.4.4.2       Method of Mounting         The mounting method shall be one of the following as specified in paragraph F.4.4.5 to F.4.4.8.         a) Mounting method A         1)       Test board         The test boards shall be alumina substrate (alumina of 95% purity or higher) with a nominal thickness of 0.8mm. The dimensions shall be as specified in Figure F-2.         2)       Mounting procedure         Pre-solder the sample in a nitrogen gas environment, using gold-tin alloy solder (nominal gold content 80%). The sample shall be placed on the test substrate using a sheet type pellet solder of the same composition between them before heating them on a hot plate or in a tunnel oven to melt the solder. Flux shall not be used.         Soldering temperature and time shall be as follows.       2.1) Presoldering						

Duration: 3±0.5 seconds



d) The mass shall be measured in the qualification test, delivery inspection and the Group A quality conformance inspection. The number of samples inspected shall be 10.

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F.4.4.4	Workmanship								
F.4.4.4.1	DPA								
		be disassembled to ensure that the	-						
		protective coating against moisture are properly manufactured and the internal							
		pecified in the Quality Assurance l dance with the DPA manual cited	•						
	Program Plan.			ouranoo					
	a) The resistors s	hall be embedded in a proper resi	in or other materi	als and cut					
	•	parallel to the longitudinal axis of t							
	•	ded and examined using a 10 to 2 , thickness of protective coating, a	•						
	and electrode								
	b) The resistors s	hall be embedded in a proper resi	n or other materi	als and cut					
	•	perpendicular to the longitudinal a							
	•	face shall be grounded and examined using a 10 to 200x magnifier for							
	inspecting the protective coating.								
	The examinations photographed and	a) and b) above shall require the r recorded.	espective sample	es to be					
F.4.4.5	Electrical Performance	e							
	The electrical perform	nance tests shall be performed as	follows.						
F.4.4.5.1	Application of Pulse								
	A dc test voltage, 2.5 times the rated voltage shall be applied for 1 second to the resistors. The test voltage shall not exceed the maximum overload voltage								
	resistors. The test voltage shall not exceed the maximum overload voltage specified in the detail specification. At the completion of this test, the resistors								
	shall be examined for evidence of arcing, insulation breakdown and mechanical								
	damage.								
F.4.4.5.2	Resistance								
	The resistance test shall be performed in accordance with Test Method 303 of MIL-								
	STD-202. The following details and exceptions shall apply. a) Test voltage								
	,	ults are questionable, the conditio	ns specified in Ta	able F-16					
	shall apply.		-						
	b) Temperature								
		resistance test of Group I specifier med at 25±2°C. Unless otherwise							
	•	uent and final resistance measure	-	-					
		the temperature at which the initia							

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#### Table F-16. Test Voltage

	Unit: V <sub>DC</sub>
Nominal resistance ( $\Omega$ )	Maximum test voltage
10 or more and less than 1k	1.0
1k or more and less than 10k	3.0
10k or more and less than 100k	10.0
100k or more	30.0

#### F.4.4.5.3 Resistance-Temperature Characteristic

The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following details and exceptions shall apply.

a) Mounting method

The resistors shall be mounted as specified in item b), paragraph F.4.4.2. This test shall be performed following the resistance to bonding exposure test of paragraph F.4.4.6.4 in the quality conformance inspection.

- b) Reference temperature: 25°C
- c) Test temperature: As specified in Table F-17.
- d) Unit of resistance-temperature characteristic: 10<sup>-6</sup>/°C.

#### Table F-17. Test Temperature for Resistance-Temperature Characteristic

		Unit: °C				
Order	Temperature					
	Qualification test	Quality conformance inspection				
1	Room temperature	Room temperature				
2	-15±3	-55±3				
3	-55±3	Room temperature				
4	Room temperature	125±3				
5	65±3	-				
6	125±3	-				

#### F.4.4.5.4 Dielectric Withstanding Voltage

#### F.4.4.5.4.1 Atmospheric Pressure

Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202. The following details and exceptions shall apply.

a) Method of mounting

Mount the resistor with its insulation jacket upward on the metal plate

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		p of the metal block is positioned resistor's two electrodes as show t 1.0±0.2N.	••••••			
b)	Measureme	nt before test ice shall be measured in accordar	nce with paragrap	bh		
c)	F.4.4.5.2. Test voltage					
	commercial-	ages of 100±10V <sub>AC</sub> (root-mean-so line frequency) shall be applied be ne metal block and measuring poir	etween the meas	•		
d)	•	est: 1 minute $_{0}^{+10}$ seconds		1		
e)	The leak cur	nt during test rent shall be monitored during the d for evidence of arcing or any bro		sistors		
f)	Measureme The resistar	nt after test ice shall be measured in accordar	nce with paragrap			
g)	Examination	calculate the change in resistance after test s shall be examined for evidence (				
		eakdown and mechanical damage		-		
	Aetal block		Insulation	plate		
	suring point A	<sup>)</sup>		7		
6				7		
Metal plate	9					
(Measuring p		R=0.5mm Sample resistor Insulation jacket t	facing upward			
Figure F-3. Test Method for the Dielectric Withstanding Voltage and Insulation Resistance Tests						
F.4.4.5.4.2 Bard	ometric Press	sure (Reduced)				
The		e tested in accordance with Test M ails and exceptions shall apply. nounting	lethod 105 of MII	STD-202.		
	The resistor F.4.4.5.4.1.	s shall be mounted as specified in	item a), paragra	ph		
b)	Measureme	nt before test ice shall be measured in accordar	nce with paragrap	bh		

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	<ul> <li>d) Test condition</li> <li>e) Duration of a</li> <li>f) Measurement</li> <li>The leak current</li> <li>resistors are</li> <li>g) Measurement</li> <li>The resistant</li> <li>F.4.4.5.2 to</li> <li>h) Examination</li> <li>The resistor</li> </ul>	AC (root-mean-square value at co on: D (1.1kPa) application of test voltage: 1 minut nt during test rrent shall be measured throughou e examined for evidence of arcing nt after test nce shall be measured in accordan calculate the change in resistance	te <sup>+10</sup> seconds ut the test, and th or any breakage. nce with paragrap e before and after of flashover, arcin	e oh the test. ng,
T 2 a b	<ul> <li>Insulation Resistance</li> <li>The resistors shall be measured in accordance with Test Method 302 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Mounting method The resistors shall be mounted as specified in item a), paragraph F.4.4.5.4.1.</li> <li>b) Test voltage: 100±10V<sub>DC</sub></li> <li>c) Duration of application of test voltage: 1 minute</li> </ul>			
T tu n tu s s a b	<ul> <li>cemperature operative as specified as specified in the test</li> <li>cest voltage of 2.5 the seconds. The test</li> <li>specified in the determination of paragraphic test of paragraphic the test temperation.</li> <li>c) Test temperation of the test voltage with paragraphic the test.</li> <li>d) Examination a The resistors of the test stores of the test stores of the test.</li> </ul>	rload test shall be performed in action test of paragraph F.4.4.7.6. T fied in paragraph F.4.4.5.2. Followings the rated voltage shall be ap voltage shall not exceed the maxi- ail specification. The following co- nod be performed in accordance with ph F.4.4.7.6. ure erature shall be at 25±5°C in still a of the resistors being operated. after test shall remain at room temperature to e is removed before the resistance in F.4.4.5.2 to calculate the change	The resistance shawing this measure oplied to the resist mum overload vo nditions shall app the low temperat air, with no circula for 30 minutes or e is measured in e in resistance be	all be ement, dc tors for 5±1 ltage ly. ure operation tion other more after accordance fore and after

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F.4.4.6 Mechanical Performance The mechanical performance tests shall be performed as follows.					
F.4.4.6.1	Solderability				
F.4.4.6.1.1	<ul> <li>Solderability [I]</li> <li>The solderability [I] test shall be applied to electrode structure C resistors. The test procedure shall be in accordance with paragraph 4.17 of JIS C 5201-1. However, the following conditions shall apply.</li> <li>a) Solder type Gold-tin alloy solder (nominal gold content of 80%) shall be used.</li> <li>b) Solder temperature: 300±10°C</li> <li>c) Solder immersion time: 5±0.5 seconds</li> <li>d) Procedure Both electrodes shall be immersed into the solder at the same time. The test shall be performed in a nitrogen gas environment. Flux shall not be used.</li> <li>e) Examination after test Resistors shall be examined for solder wettability using a magnifier of 10x or greater.</li> </ul>				
F.4.4.6.1.2	<ul> <li>1.2 Solderability [II] The solderability [II] test shall be applied to electrode structure R resistors. The test procedure shall be in accordance with paragraph 4.17 of JIS C 5201-1. However, the following conditions shall apply.</li> <li>a) Solder type Tin-lead alloy solder with nominal tin content of 60% including inactivated flux shall be used.</li> <li>b) Solder temperature: 245±5°C</li> <li>c) Solder immersion time: 5±0.5 seconds</li> <li>d) Procedure Both electrodes shall be immersed into the solder at the same time.</li> <li>e) Examination after test Resistors shall be examined for solder wettability using a magnifier of 10x or greater.</li> </ul>				
F.4.4.6.2	The following cond a) Mounting meth The resistors s electrode struct b) Load: 5±0.5N c) Duration of ap d) Examination a	nod shall be mounted as specified in ite cture C and item b), paragraph F.4 plication of the load: 10±1 second	em a), paragraph I.4.2 for electrode s	n F.4.4.2 for	

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F.4.4.6.3	<ul> <li>Board Bending</li> <li>This test shall be p</li> <li>The following cond</li> <li>a) Mounting meth</li> <li>The resistors a specified in ite 235±5°C.</li> <li>b) Measurement</li> <li>The resistance</li> <li>c) Deflection: 2m</li> <li>d) Number of bere</li> <li>e) Measurement</li> <li>The resistance</li> </ul>	erformed in accordance with par itions shall apply. hod shall be mounted on a test boarc em b), paragraph F.4.4.2. The te before test e shall be measured in accordan m nding: 1 after test e shall be measured in accordan	I shown in Figure F st temperature sha ce with paragraph ce with paragraph	<sup>-</sup> -4 as all be F.4.4.5.2.
		change in resistance before and s epoxy base board Thickness: 1		Unit: mm
	4.5 17.5	29.55 3.3 5.9 5.9 65 100	<u>13.5</u> 17.5	40
	Figure F-	4. Test Board for Board Bend	ling Test	
F.4.4.6.4	shall be mounted or remain at room ten a) Mounting meth The resistors s	e is measured as specified in par on a test board. The test board, nperature for 4 to 12 hours. The hod shall be mounted as specified in cture C and item b), paragraph F	with resistors moun following condition item a), paragraph	nted, shall ns shall apply n F.4.4.2 for

The resistance shall be measured in accordance with paragraph F.4.4.5.2 to calculate the change in resistance before and after the test.

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<ul> <li>c) Examination after test</li> <li>The resistors shall be examined for mechanical damage and soldering corrosion using a magnifier of 10x or greater.</li> </ul>					
F.4.4.7	Environmental Pe	formance			
	The environmental performance tests shall be performed as follows.				
F.4.4.7.1	Random Vibrati	on			
	Resistors shall I	e tested in accordance with Test M	ethod 214 of MIL-	STD-202.	
	The following de	tails and exceptions shall apply.			
	a) Method of	nounting			
		rs shall be mounted in accordance v	vith item b), parag	raph F.4.4.2.	
	,	ent before test			
		nce shall be measured in accordance		F.4.4.5.2.	
	c) Test condit	on: II-H Frequency range: 50 to 2, Rms value of acceleration:			
	d) Direction of	motion: In each of three mutually pe		tions	
	,	application and duration of vibration		10113.	
	,	all be applied for 3 minutes in each	direction with a to	tal test time	
of 9 minutes. f) Measurement during test					
	Each resistor shall be monitored for electrical discontinuity of 0.1ms or g				
during this test. g) Measurement after test					
		e change in resistance before and a	ifter the test.		
	h) Examinatio		in a chanical dam.		
The resistors shall be examined for evic			mechanical dama	age using a	
magnifier of 10x or greater.					
F.4.4.7.2	Shock				
		e tested in accordance with Test M	ethod 213 of MIL-	STD-202.	
	•	tails and exceptions shall apply.			
	a) Method of	•			
	•	lification test, this test shall be perfo o bonding exposure test of paragrap			
		e inspection, the resistors shall be r			
	specified in	-			
	-	ard shall be rigidly mounted on appr	opriate fixtures. 1	he mounting	
	fixtures sha	Il be constructed to preclude any res	sonance in the fixt	ures when	
	subjected t	o the shock test, and the fixtures sha	all be monitored if	necessary.	
		cable, which may be necessary bec		-	
		n table, shall be clamped to the resis	stor mounting fixtu	re.	
	,	ent before test			
		nce shall be measured in accordanc on: I (980m/s², 6ms sawtooth).	e with paragraph	г.4.4.Э.Ζ.	

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d e f) g	<ol> <li>Direction of ap In each of three Number of app The resistors a shocks.</li> <li>Measurement Each resistor a electrical disco Measurement The resistance calculate the co Examination a The resistors a</li> </ol>	oplied shocks be mutually perpendicular direction blied shocks: shall be subjected to 5 shocks in e during test shall be monitored with specified e ontinuity of 0.1ms or greater. after test e shall be measured in accordance shange in resistance before and af fter test shall be examined for evidence of	each direction, for equipment during e with paragraph fter the test.	the shock for F.4.4.5.2 to
<ul> <li>The resistors shall be examined for evidence of mechanical damage using a magnifier of 10x or greater.</li> <li>F.4.4.7.3 Thermal Shock [II]</li> <li>After measuring resistance in accordance with paragraph F.4.4.5.2, the resistors shall be subjected to the specified thermal shock cycle test under the conditions shown in Table F-18 and Figure F-5. The following details and exceptions shall apply.</li> <li>a) Method of mounting <ul> <li>This test shall be performed following the shock test specified in paragraph F.4.4.7.2.</li> <li>b) Number of test cycles: 1,000 cycles</li> <li>c) Measurements during test and external inspection <ul> <li>The resistance shall be measured after the resistors are at room temperature for 30 minutes or more for each 25<sup>45</sup>/<sub>0</sub> cycles, 50<sup>45</sup>/<sub>0</sub> cycles, 100<sup>410</sup>/<sub>0</sub> cycles, 250<sup>410</sup>/<sub>0</sub> cycles and 500<sup>410</sup>/<sub>0</sub> cycles. The externals of all resistors shall be inspected visually for cracks on the surface.</li> </ul> </li> <li>d) Measurement after test <ul> <li>The resistors shall be measured in accordance with paragraph F.4.4.5.2 to calculate the change in resistance before and after the test.</li> <li>e) Examination after test</li> <li>The resistors shall be examined for evidence of mechanical damage using a magnifier of 10x or greater.</li> </ul> </li> </ul></li></ul>			conditions tions shall paragraph temperature cycles, hall be e, and the 4.5.2 to	

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	e F-18. Test Conditio Thermal Shock [II]	100	15 min.				
Step		le (min.) 80 -					
1	-30 <sup>0</sup> <sub>-5</sub> 100 <sup>+5</sup>	<u>15</u> ູ <sup>60</sup> -					
2		•	1 cycle 15 30 Test Conditior	Time (min.)			
		Iher	mal Shock [II]				
	<ul> <li>F.4.4.7.4 Moisture Resistance</li> <li>Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Method of mounting: As specified in item b), paragraph F.4.4.2.</li> <li>b) Measurement before test <ul> <li>The resistance shall be measured in accordance with paragraph F.4.4.5.2.</li> <li>c) Polarization and loading voltage: No voltage shall be applied.</li> <li>d) Subcycle <ul> <li>Step 7b shall not be applicable. Step 7a shall only be performed during any five of the first nine cycles.</li> <li>e) Measurements at high humidity: None.</li> <li>f) Measurement after test <ul> <li>Upon completion of step 6 of the final cycle, the resistors shall be removed from the chamber, and maintained at room temperature for 30 minutes or more. The resistance shall then be measured in accordance with paragraph F.4.4.5.2 to calculate the change in resistance before and after the test.</li> </ul> </li> <li>g) Examination after test <ul> <li>The resistors shall be examined for evidence of mechanical damage using a magnifier of 10x or greater.</li> </ul> </li> </ul></li></ul></li></ul>						
F.4.4.7.5	<ul> <li>Resistance to Solvents</li> <li>Resistors shall be tested in accordance with Test Method 215 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Application area: Marked portion</li> <li>b) Solvents to be used: <ol> <li>2-propanol (Isopropyl alcohol)</li> </ol> </li> </ul>						
JAXA-	QTS-2050E	JAXA	Page	– F-30 –			
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29 J	lune 2021	Parts Specification	Fage	-1-30 -			
	<ol> <li>42 parts by volume of water, one part by volume of propylene glycol monomethyl ether and one part by volume of monoethanolamine.</li> </ol>						
F.4.4.7.6	Low Temperature	Operation					
	The resistance sha	all be measured as specified in pa	aragraph F.4.4.5.2	. The rated			
	•	en be applied to the resistors at th	•	oltage for 45			
	a) Method of mou	wing details and exceptions shall	арріу.				
		be performed in accordance with	the resistance-te	mperature			
		test of paragraph F.4.4.5.3.					
	, ,	ure: As specified in Figure F-6.					
	c) Measurement	after test e shall then be measured in acco	rdance with narad	ranh			
		alculate the change in resistance					
	d) Examination a						
		shall be examined for evidence of	f mechanical dama	age using a			
	magnifier of 1	-					
		15 min.	·				
	20 0 to 60 spec	ot 60 min. 45 min Not specified	60 to 120 min.				
	min.	(Apply speened)					
	0-	voltage)					
ature °C	-20-		** ** **				
	-20						
Tempe							
<sup>⊮</sup>	-40-						
	-60-						
	-65						
	0 1	2 3 4 5	6 7				
		Time					
Fig	gure F-6. Test Tei	mperature for the Low Tempera	ature Operation T	est			
F.4.4.7.7	Stability						
	•	e is measured as specified in para	agraph F.4.4.5.2.1	the resistors			
	After the resistance is measured as specified in paragraph F.4.4.5.2, the resistors shall remain at the specified test temperature at no load. The following details and						
	exceptions shall apply.						
	•	unting: As specified in item b), particular to the specified in item b), particular to the specified in the	ragraph F.4.4.2.				
	<ul><li>b) Test temperate</li><li>c) Duration of test</li></ul>	st: $2,000^{+72}_{-0}$ hours					
		s during test: $250^{+48}_{0}$ hours, $500^{+44}_{0}$	$^{8}$ hours and 1 000	+48 hours			
		5 daming tost. 200 <sub>0</sub> mours, 500 <sub>0</sub>	) 110013 and 1,000	<sub>0</sub> nours.			

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29 June	2021	Parts Specification	l ugo	
<ul> <li>e) Measurement after test The resistors shall be at 25±5°C for 6±1 hours. The resistance shall then I measured in accordance with paragraph F.4.4.5.2 to calculate the change resistance before and after the test.</li> <li>f) Dielectric withstanding voltage (atmospheric pressure) Following the measurement specified in e) above, the dielectric withstandin voltage test shall be performed in accordance with paragraph F.4.4.5.4.1.</li> <li>g) Insulation resistance Following the dielectric withstanding voltage test specified in f) above, the insulation resistance test shall be performed in accordance with paragraph F.4.4.5.5.</li> <li>h) Examination after test: The resistors shall be examined for evidence of mechanical damage using magnifier of 10x or greater.</li> </ul>				
F.4.4.8 Durab	oility			
	-	e performed as follows.		
F.4.4.8.1 Life	-			
The	<ul> <li>following detail Method of mou The resistors as paragraph F.4 not exceed 2.5 supply upon the Test temperatu Measurement of Measurement of Measurement of Measurement of Shall be measurement shall be measurement inside the measurement subsequent 2) Outside che When measurement subsequent outside the measurement subsequent outside the measurement subsequent of Test conditions The rated volta 90 minutes ON</li> </ul>	shall be mounted on a test board a .4.2. If forced air circulation is em 5m/s and there shall be no direct in the resistors. ure: 70±5°C before test is may be taken inside or outside the ured in accordance with paragraph mber asurements are taken inside the ch is measurement shall be taken 8 ho chamber is stabilized at the test te nent shall be used as the reference in the asurements under the same amber asurements are taken outside the is asurements are taken outside the is asurements are taken outside the measurements are taken outside the chamber asurements are taken outside the measurements are taken outside the measurements are taken outside the measurements are taken outside the measurements are taken	as specified in iter ployed, the air ve mpingement of th ne chamber. The n F.4.4.5.2. namber, the befor ours after the tem emperature. This e temperature for condition. chamber, the res e test resistance is measurement is measurement is measurement shall be applied oltage shall be re	m b), elocity shall e forced-air e resistance re the test perature all istors shall be measurement shall be used ats under the intermittently, egulated and

	JAXA-QTS 29 June		J A X A Parts Specification	Page	– F-32 –	
4,000 $^{+72}_{0}$ hours for the qualification test and 2,000 $^{+72}_{0}$ hours for the quality						
	<ul> <li>conformance inspection.</li> <li>e) Measurements during test</li> <li>1) Qualification test: 250 <sup>+48</sup>/<sub>0</sub> hours, 500 <sup>+48</sup>/<sub>0</sub> hours, 1,000 <sup>+48</sup>/<sub>0</sub> hours and</li> </ul>					
		2,000 <sup>+72</sup> <sub>0</sub> h 2) Quality cor 1,000 <sup>+48</sup> <sub>0</sub> h	nformance inspection: 250 <sup>+48</sup> hour	s, 500 <sup>+48</sup> hours a	nd	
<ul> <li>f) Measurements during and after test         <ol> <li>Inside chamber</li> <li>The resistance shall be measured as specified in paragraph F.4.4.5.2 the end of the OFF period after specified cycling time.</li> <li>Qutside chamber</li> <li>After the resistors are at room temperature for a minimum of 45 minute no load, the resistance shall be measured in accordance with paragraph</li> </ol> </li> </ul>				45 minutes at		
	g)	F.4.4.5.2. Examination at The resistors 10x magnifier.	shall be examined for evidence of	mechanical dama	age using a	
F.4.5	Long-Te	erm Storage				
	Long-te	rm storage shall	be in accordance with paragraph	4.7 of JAXA-QTS	6-2050.	
F.4.6	Change	e of Tests and In of tests and ins TS-2050.	spections pections shall be in accordance w	ith paragraph 4.8	of	
F.5.	PREPARA	ATION FOR DEI	LIVERY			
	Preparatio	on for delivery sh	nall be in accordance with paragra	ph 5 of JAXA-QT	S-2050.	
F.6.	NOTES Refer to th	ne paragraph 6 d	of JAXA-QTS-2050.			

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		APPENDIX H		•
RESIST	ORS, FIXED, W	IRE WOUND, POWER TYPE,	CHASSIS MOUN	TED
H.1. Genera	I			H
	•			
H.1.3.1	•			
H.1.3.2		blerance		
H.1.3.3		stance		
• •				
•	•	ents		
		ents		
•				
		rage		
H.3.2.1		ire		
H.3.2.2		ICE		
H.3.2.3	-	ial		
H.3.2.4		ating, Enclosure or Housing		
H.3.2.5				
H.3.2.6				
		ions and Marking		
H.3.3.1		Marking		
H.3.3.2		Dimensions and Mass		
H.3.4.1				
	•			
H.3.5.1		stance		
H.3.5.2		mperature Range		
H.3.5.3	•			
H.3.5.4		wer		
H.3.5.5	-	g		
		ance		
H.3.6.1				
H.3.6.2		emperature Characteristic		
H.3.6.3		ioning		
H.3.6.4		nstanding Voltage		
	H.3.6.5 Insulation Resistance			
H.3.6.6 Short-Time Overload				
H.3.6.7 Reactance				
		mance		
H.3.7.1		ngth		
H.3.7.2	Solderability			H

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29 June 2021	Parts Specification			
	Performance			
_	5 1 5			
	om Vibration			
	stance		-	
	hock			
	nal Shock [I]			
	nal Shock [II]			
	Resistance		_	
	e to Solvents			
•	erature Storage			
•				
•				
•	Provisions			
-	pection			
	est			
	and Number of Samples			
	mance Inspection			
	Items and Number of Samples			
	Pass/Fail			
	Disposition of Sample			
	st and Inspection			
	itions			
	Dimensions and Marking			
	ship			
-	<b>D</b> - of - one			
	Performance			
	tance-Temperature Characteristic			
	r Conditioning			
	ctric Withstanding Voltage			
	tion Resistance			
	-Time Overload			
	ance		-	
	al Performance			
	nal Strength			
	rability			
	ental Performance			
	ion			
	{ Decistance			
	Resistance			
	nal Shock			
H.4.4.6.5 Moist	ure Resistance		H-24	

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H.4.4.6.6 Resista	ance to Solvents		H-24
H.4.4.6.7 Low Te	mperature Storage		H-25
H.4.4.6.8 Stability	y		H-25
H.4.4.7 Durability			H-25
H.4.4.7.1 Life			H-25
H.4.5 Long-Term Stora	age		H-26
H.4.6 Change of Tests	and Inspections		H-26
H.5. PREPARATION FOR	R DELIVERY		H-26
H.6. NOTES			H-26

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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	APPENDIX H						
	RESISTORS, FIXED, WIRE WOUND, POWER TYPE, CHASSIS MOUNTED						
H.1. G	General						
<ul> <li>H.1.1 Scope</li> <li>This appendix establishes the general requirements and quality assurance provisions for the chassis mounted, power type, wire wound, fixed resistors (hereinafter referred to as "resistors").</li> </ul>							
H.1.2	Classification						
	Resistors covered b	by this specification sha	all be classified a	as specified in Ta	able H-1.		
		Table H-1. Cla	assification				
	Γ	Construction	Style and termin	ation type			
		Chassis mounted type	RES60, 65, 7	70, 75			
		Chassis mounted type	RES40, 5	50			
	details. Example:	all be indicated as follo					
	JAXA <sup>(1)</sup> <u>RES65</u> Style (H.1.3.1)	- <u>E</u> Resistance toleranc (H.1.3.2)	- <u>1001</u> e Nominal resis (H.1.3.3)				
		licates the part is for s ised in the detail speci	•	•	d "J".		
H.1.3.1	<ul> <li>H.1.3.1 Style</li> <li>The style shall be identified by a three letter symbol, "RES" and a two-digit number.</li> <li>The "RES" indicates the high reliability, wire wound, fixed resistors (power type, chassis mounted). The two-digit number indicates the power rating and physical size of the resistors.</li> </ul>						
H.1.3.2 Resistance Tolerance The resistance tolerance shall be identified by a single capital letter in accordance with Table H-2.							

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	Table H-2.   Resistance Tolerance							
	Unit: %							
	-	Symbol	Resistance tolerance					
		F	±1.0					
H.1.3.3	Nominal Resistance							
	The nominal resistance shall be identified in ohms ( $\Omega$ ) by 4 alphanumeric characters. The first three digits represent significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.							
		= Ω 00						
Н.2. Ар	plicable Documents							
r	Applicable Documents The applicable docume 2050.	nts shall b	e as specified in paragra	aph 2.1 of JAXA-(	QTS-			
H.2.2 I	Reference Documents							
	The following is the refe a) MIL-PRF-39009	Resiste Mounte	cument. ors, Fixed, Wire Wound, ed), Nonestablished Reli al Specification for	· · ·				
H.3. Re	equirements							
H.3.1 (	Qualification Coverage							
C t s v i	Qualification coverage Qualification shall be valid for resistors that are produced by the manufacturing line that conforms to materials, designs, constructions, style, characteristics and performance specified in paragraphs H.3.2 to H.3.9. The qualification coverage shall be represented by samples that have passed the qualification test. Within this coverage, the manufacturer shall be allowed to supply qualified products in accordance with the detail specification. If necessary, additional qualification coverage shall be as specified in the detail specification.							
H.3.2 I	Materials							
	The materials shall be specified as follows and as specified in paragraph 3.3 of JAXA-QTS-2050.							

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H.3.2.1	<ul> <li>H.3.2.1 Resistance Wire</li> <li>Resistance wire shall not include impurities or other factors that may cause local weak points. The minimum diameter of the resistance wires shall be as specified in the detail specification.</li> </ul>						
H.3.2.2	•	Base Substance The volume resistivity of the base substance shall be $10^8\Omega$ cm or greater at a temperature of 300°C.					
H.3.2.3	Sealing Material Sealing materials used for fixing resistors shall be ceramic powder, inorganic adhesives, or other material, and shall have good thermal conductivity.						
H.3.2.4	.4 Protective Coating, Enclosure or Housing The coating or enclosure to protect the resistor shall be free from cracks, crazing, chipping, distortion or corrosion at any temperature up to and including +275°C, regardless of the mounting position of the resistors.						
H.3.2.5	Terminals Terminals shall be treated to facilitate soldering. When a lead coating containing tin is used, the tin content shall be between 40 and 70%.						
H.3.2.6	Flux The manufacturer shall completely remove corrosive substances after soldering, or use noncorrosive flux. When non-corrosive flux is used, the water extract resistivity test shall be performed in accordance with paragraph 4.9 of JIS Z 3197, and it shall be verified that the water extract resistivity is not less than $100k\Omega \cdot cm$ . When resin flux cored solder is used, the mass ratio of resin to solder shall be between 1 and 3%.						
H.3.3	Externals, Dimensions a Resistors shall meet the paragraph H.4.4.2.	and Marking following requirements when test	ed in accordance	e with			
H.3.3.1	Externals and Marking There shall be no defects such as surface cracks on the resistors. The following shall be clearly marked in such a manner to ensure legibility. The marking shall remain legible at the completion of any test.						
	precludes inclus marked as a min						
	calendar year be	nanufactured ne last two digits of the calendar ye eginning with January shall be mar me or its abbreviation.		of the			

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H.3.3.2		nstructed of a wounded resistance is. The dimensions and mass sha				
H.3.4	Workmanship					
	<ul> <li>accordance with the quadesign of the resistors so voltage drop between the layer of resistance wire.</li> <li>resistors shall be wound addition, resistors shall</li> <li>a) Resistance wire The resistance wire</li> <li>b) Pitch For round wire, the diameter. When the test of tes</li></ul>	ality assurance program defined in hall preclude shorting of turns and he adjacent turns. Resistors shall When applicable, in order to min d by an Ayrton-Perry or a double-la satisfy the following requirements. es shall have no joints, welds or kr average winding pitch shall not ex he resistance value is less than 10	a paragraph 3.2.1 I shall obtain a m be wound with a imize inductance ayer reverse wind nots, except at er xceed five times t	inimum single ling. In nd terminals. the wire		
	<ul> <li>be less than 1.5 times the wire diameter.</li> <li>c) Effective winding coverage The effective winding coverage shall be the area between the starting and end points where the wires are wound in a uniform winding pitch. The effective winding coverage shall cover a minimum of 80% of the overall winding area.</li> <li>d) Protective coating, enclosure or housing The resistor enclosure or housing shall be made from an aluminum alloy, and shall protect against corrosion. All fasteners shall be properly plated. Unplated copper bear metals shall not be used in direct contact with aluminum.</li> <li>e) Sealing material The sealing material used for fixing and heat radiation for resistors shall not impair performance.</li> <li>f) Terminals The resistor's terminal leads shall be securely connected electrically and mechanically.</li> </ul>					
H.3.4.1	terminal connections	ested as specified in paragraph H.4 , and protective coating, enclosure d. The internal structure shall be a	or housing shall	have been		
H.3.5	Ratings					

## H.3.5.1 Nominal Resistance

As a rule, standard values of nominal resistance shall be defined relative to the resistance tolerance and shall be as specified in Table H-3. The minimum and maximum resistances shall satisfy the requirements of the detail specification.

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	Table	e H-3. Standard	l Resistance Va	lues		
	Resistance tolerance F(±1.0%)					
1.00	1.47	2.15	3.16	4.64	6.81	
1.02	1.50	2.21	3.24	4.75	6.98	
1.05	1.54	2.26	3.32	4.87	7.15	
1.07	1.58	2.32	3.40	4.99	7.32	
1.10	1.62	2.37	3.48	5.11	7.50	
1.13	1.65	2.43	3.57	5.23	7.68	
1.15	1.69	2.49	3.65	5.36	7.87	
1.18	1.74	2.55	3.74	5.49	8.06	
1.21	1.78	2.61	3.83	5.62	8.25	
1.24	1.82	2.67	3.92	5.76	8.45	
1.27	1.87	2.74	4.02	5.90	8.66	
1.30	1.91	2.80	4.12	6.04	8.87	
1.33	1.96	2.87	4.22	6.19	9.09	
1.37	2.00	2.94	4.32	6.34	9.31	
1.40	2.05	3.01	4.42	6.49	9.53	

#### H.3.5.2 Operating Temperature Range

2.10

3.09

The operating temperature range shall be between -55 and +275°C, unless otherwise specified.

4.53

6.65

9.76

## H.3.5.3 Power Rating

1.43

Resistors shall have a power rating specified in the detail specification. The rated ambient temperature shall be 25°C unless otherwise specified.

## H.3.5.4 Maximum Power

The maximum power at or below the rated ambient temperature shall be equal to the power rating. For temperatures in excess of the rated ambient temperature, the maximum power shall be determined by derating the power rating in accordance with the derating curve shown in Figure H-1.



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H.3.6.3	<ul> <li>H.3.6.3 Power Conditioning</li> <li>When resistors are tested as specified in paragraph H.4.4.4.3, there shall be no mechanical damage. The change in resistance before and after the test shall satisfy the requirements of the detail specification.</li> </ul>				
H.3.6.4	3.6.4 Dielectric Withstanding Voltage When tested as specified in paragraph H.4.4.4.4, resistors shall withstand the specified test voltage, and the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of flashover or arcing, insulation breakdown or mechanical damage after the completion of the test.				
H.3.6.5		e ested as specified in paragraph H.4 fy the requirements of the detail sp		ation	
H.3.6.6	resistance before and	ested as specified in paragraph H.4 I after the test shall satisfy the req shall be no evidence of arcing, bui t.	uirements of the	detail	
H.3.6.7		ested as specified in paragraph H.4 nts of the detail specification.	4.4.4.7, the react	ance shall	
H.3.7	Mechanical Performanc Resistors shall satisfy th	e ne following mechanical requireme	ents.		
H.3.7.1	resistance before and	ested as specified in paragraph H. d after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail	
H.3.7.2	the terminal surface s pinholes or rough are	ested as specified in paragraph H.4 shall be evenly covered with new s eas shall be acceptable, provided t pinholes or rough areas shall be le	older. The existen hat they are not i	ence of small n one spot.	
H.3.8	Environmental Performa Resistors shall satisfy th	ance ne following environmental require	ments.		

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H.3.8.1	Vibration					
H.3.8.1.1	resistance before a specification. Ther	bration tested as specified in paragraph and after the test shall satisfy the r e shall be no electrical discontinu dence of mechanical damage afte	equirements of th ity of 0.1ms or lor	ne detail nger during		
H.3.8.1.2	Random Vibration When resistors are tested as specified in paragraph H.4.4.6.1.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no electrical discontinuity of 0.1ms or longer during the test and no evidence of mechanical damage after the completion of the test.					
H.3.8.2	resistance before and specification. There s	sted as specified in paragraph H. I after the test shall satisfy the req shall be no electrical discontinuity of mechanical damage after the c	uirements of the of 0.1ms or long	detail er during the		
H.3.8.3	Heat Resistance When resistors are tested as specified in paragraph H.4.4.6.3, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.					
H.3.8.4	Thermal Shock					
H.3.8.4.1	resistance before a	tested as specified in paragraph and after the test shall satisfy the r e shall be no evidence of mechan est.	equirements of th	ne detail		
H.3.8.4.2						
H.3.8.5	resistance before and specification. In addi the detail specificatio	sted as specified in paragraph H. I after the test shall satisfy the req tion, the insulation resistance sha n. There shall be no evidence of I n after the completion of the test.	uirements of the Il satisfy the requ	detail irements of		

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H.3.8.6	Resistance to Solven	ts					
		sted as specified in paragraph H.		•			
	remain legible. The details shall be as specified in the detail specification.						
H.3.8.7	Low Temperature Sto	orage					
	When resistors are te	sted as specified in paragraph H.	4.4.6.7, the chan	ge in			
		after the test shall satisfy the req					
	specification. There a of the test.	shall be no evidence of mechanica	al damage after ti	he completion			
H.3.8.8	Stability						
	When resistors are te	sted as specified in paragraph H.	4.4.6.8, the chan	ge in			
		after the test shall satisfy the req					
	specification. There a of the test.	shall be no evidence of mechanica	al damage after ti	he completion			
H.3.9	Durability						
	Resistors shall satisfy the	e following durability requirement	s.				
H.3.9.1	Life						
		sted as specified in paragraph H. I after the test shall satisfy the req		-			
		shall be no evidence of mechanica					
H.4. C	Quality Assurance Provisi	ons					
H.4.1	In-Process Inspection						
	The in-process inspection	on shall be as specified in paragra	ph 4.3 of JAXA-0	QTS-			
	2050.						
H.4.2	Qualification Test						
	The qualification test sh as provided below.	all be as specified in paragraph 4.	4 of JAXA-QTS-2	2050 and			
H.4.2.1	Test Items and Numb	er of Samples					
11.1.2.1		er of samples of the qualification t	est shall be as sr	pecified in			
	Table H-4.			II			
	•	es for each style shall be as spec					
	•	ded for each test group as specifie performed in the order specified in					
	• · ·	s in that order, Group IB through	•	•			
	•	ted to the appropriate group tests.	• •	gh VII tests			
	are not required to be	e performed in the order of the gro	up number.				

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		т	able H-4.	Qualificati	on Test			
		Test	Deswine			Criteria for Pass/fail		
Group	Order	Item	Require- ment paragraph	Test method paragraph		Sample size		No. of efective llowed <sup>(1</sup>
I	1	Externals, dimensions and marking <sup>(2)</sup>	H.3.3	H.4.4.2				
IA	1	Power conditioning	H.3.6.3	H.4.4.4.3		100%		0
IA	2	Resistance	H.3.6.1	H.4.4.4.1				
IB	1	DPA	H.3.4.1	H.4.4.3.1		2		0
	1	Reactance <sup>(3)</sup>	H.3.6.7	H.4.4.4.7				
	2	Resistance-temperature characteristic	H.3.6.2	H.4.4.4.2				
	3	Heat resistance	H.3.8.3	H.4.4.6.3				
	4	Low temperature storage	H.3.8.7	H.4.4.6.7				
-	5	Dielectric withstanding voltage	H.3.6.4	H.4.4.4.4	ſ 1	2 Highest resistance	1	
II	6	Insulation resistance	H.3.6.5	H.4.4.4.5	24   1		e,	
	7	Thermal shock [I]	H.3.8.4.1	H.4.4.6.4.1	l	whichever is greater		
	8	Short-time overload	H.3.6.6	H.4.4.4.6				
	9	Moisture resistance	H.3.8.5	H.4.4.6.5				1
	10	Terminal strength	H.3.7.1	H.4.4.5.1				
	1	Shock	H.3.8.2	H.4.4.6.2	1 م	0 Highest resistance		
Ш	2	High frequency vibration	H.3.8.1.1	H.4.4.6.1.1	$20 \begin{cases} 1 \\ 1 \end{cases}$		æ, 1	
	3	Thermal shock [II]	H.3.8.4.2	H.4.4.6.4.2	l	whichever is greater		
					1 م	0 Highest resistance		
IV	1	Random vibration	H.3.8.1.2	H.4.4.6.1.2	20 { 1	0 1Ω or lowest resistant whichever is greater	æ, 1	)
V	1	Life	H.3.9.1	H.4.4.7.1	231 7 231 7	7 1kΩ	же,	0
VI	1	Stability	H.3.8.8	H.4.4.6.8	9 9 27 9	Highest resistance 1kΩ	xe,	1
	1	Solderability	H.3.7.2	H.4.4.5.2	ر	0 0		<u> </u>
VII	2	Resistance to solvents	H.3.8.6	H.4.4.6.6	1	0 Any resistance		0
-	1	Materials	H.3.2	_		(4)		

<sup>(1)</sup> When a sample has failed to pass 2 or more tests of one group, it shall be counted as a single defect. <sup>(2)</sup> For dimensions and mass, the sample size shall be 1.0% of the acceptable quality level (AQL) in

"Normal Inspection Level II" specified in JIS Z 9015-1. <sup>(3)</sup> The reactance test is applicable to noninductive resistors only.

<sup>(4)</sup> Data to certify compliance with design specifications shall be submitted.

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H.4.3	Quality Conformance In The quality conformance QTS-2050 and as provid	e inspection shall be as specified i	in paragraph 4.5	of JAXA-	
H.4.3.1	Samples The inspection lot cor of JAXA-QTS-2050. I samples that have pa and C inspections sha value shall be selected	nfiguration of group A shall be as a nspection lots for Group B and C issed Group A inspections. Unless all be performed for each shape. F ed. If the design criteria are identic , the inspection lot may be represe	inspections shall s otherwise speci Resistors with any al and the materi	consist of fied, Group B / resistance als and the	
H.4.3.2	conformance inspecti respectively. Group t within each group sha Group A shall be "Spe Z 9015-1. The pass o single sampling" spec apply to the Group A3	Number of Samples er of samples of the groups A, B a on shall be as specified in Tables ests shall be performed in the gro all be performed in the order speci ecial Inspection Level S-4" in accor- or fail result shall be in accordance cified in Appendix 2-A. However, f 3 and A4 inspections. The Group amples having the highest resistar	H-5, H-6 and H-7 up order and the fied. The sampli ordance with App e with "Normal Ins the constant sam A4 inspections sl	7, inspections ng plan for endix 1 of JIS spection, pling shall	
H.4.3.3	<ul> <li>Criteria for Pass/Fail</li> <li>A failure of any test specified in Table H-5, H-6 or H-7 shall constitute failure of each inspection group of the quality conformance inspection. When the number of defects does not exceed the permitted number specified in Table H-5, but the failure mode of the defects is catastrophic, such as open- or short-circuit where the function of the resistor may be lost, the resistor fails the Group A inspections.</li> </ul>				
H.4.3.4	be shipped. If the lot shall be subjected to shipped.	of Sample rejected in the group A quality cor has not passed the group A2 insp the failed inspection item, and onl re subjected to DPA shall not be s	pection, all produc y the good produ	cts of the lot	

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	Inspection			Test	Criteria fo	r Pass/fail	
Group	Order	Item	Require- Test ment method paragraph paragraph	Sample size	No. of defectives allowed <sup>(2)</sup>		
A 1	1	Power conditioning	H.3.6.3	H.4.4.4.3			
A1	2	Resistance	H.3.6.1	H.4.4.4.1	100%	0	
A2	1	Externals, dimensions and marking <sup>(3)</sup>	H.3.3	H.4.4.2			
A3 <sup>(1)</sup>	1	DPA	H.3.4.1	H.4.4.3.1	2	0	
	1	Reactance <sup>(4)</sup>	H.3.6.7	H.4.4.4.7			
	2	Resistance-temperature characteristic	H.3.6.2	H.4.4.4.2			
A4 <sup>(1)</sup>	3	Dielectric withstanding voltage	H.3.6.4	H.4.4.4.4	10	0	
	4	Insulation resistance	H.3.6.5	H.4.4.4.5			
	5	Thermal shock [I]	H.3.8.4.1	H.4.4.6.4.1			

## Table H-5. Quality Conformance Inspection (Group A)

Notes:

<sup>(1)</sup> The constant sampling shall apply to Group A3 and A4 inspections. The Group A4 inspections shall be performed using the samples with the highest resistance value.

- <sup>(2)</sup> When a sample has failed to pass 2 or more tests of one group, it shall be counted as a single defect.
- <sup>(3)</sup> The acceptance or rejection of the physical dimensions and mass shall be based on 1.0% of the acceptable quality level (AQL) in "Normal Inspection Level II" specified in JIS Z 9015-1.

<sup>(4)</sup> The reactance test is applicable to noninductive resistors only.

		Inspection	Require- Test		Criteria	for Pass/fail
Group	Order	Item	ment method paragraph paragraph	Sample size	No. of defectives allowed	
	1	Heat resistance	H.3.8.3	H.4.4.6.3		
	2	Low temperature storage	H.3.8.7	H.4.4.6.7		
B1 3	3	Short-time overload	H.3.6.6	H.4.4.4.6	10	0
	4	Moisture resistance	H.3.8.5	H.4.4.6.5		
	5	Terminal strength	H.3.7.1	H.4.4.5.1		
B2	1	Life	H.3.9.1	H.4.4.7.1	10	0
B3	1	Stability	H.3.8.8	H.4.4.6.8	10	0
D4	1	Solderability	H.3.7.2	H.4.4.5.2	0	0
B4	2	Resistance to solvents	H.3.8.6	H.4.4.6.6	8	0

 Table H-6.
 Quality Conformance Inspection (Group B)

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Inspection		Require-	Test	Criteria for Pass/fail			
Group	Order	Item	ment paragraph	nent method	Sample size	No. of defectives allowed	
C1	1	Random vibration	H.3.8.1.2	H.4.4.6.1.2	10	0	
	1	Shock	H.3.8.2	H.4.4.6.2			
C2	2	High frequency vibration	H.3.8.1.1	H.4.4.6.1.1	10	0	
	3	Thermal shock [II]	H.3.8.4.2	H.4.4.6.4.2			

## Table H-7. Quality Conformance Inspection (Group C)

#### H.4.4 Methods for Test and Inspection

#### H.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15°C and 35°C, relative humidity between 25% and 75% and atmospheric pressure between 86kPa and 106kPa. All tests and measurements shall be performed under the standard conditions. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

#### b) Reference conditions

Reference conditions shall be at 25°C and an atmospheric pressure of 101.3kPa.

#### c) Judgment conditions

Judgment conditions shall be either condition A or B as specified in Table H-8. Unless specified, condition A shall apply.

Condition	A	В
Temperature (°C)	23±2	20±2
Relative humidity (%)	50±5	65±5
Atmospheric pressure (kPa)	86 to 106	86 to 106

#### Table H-8. Judgment Conditions

#### H.4.4.2 Externals, Dimensions and Marking

- a) The external inspection shall be performed visually.
- b) The marking test shall be performed visually.
- c) The dimensions shall be measured with a vernier caliper or micrometer compliant to JIS B 7507 and JIS B 7502, respectively. If the measured values are questionable, another measuring instrument may be used.
- d) The mass shall be measured with a trip balance compliant to JIS B 7601. If the measured values are questionable, another measuring instrument may be used.

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H.4.4.3	Workmanship				•	
п.4.4.3	workmanship					
H.4.4.3.1	DPA					
	<ul> <li>The resistors shall be disassembled to ensure that the internal structure has been properly manufactured and the processes such as welding and soldering have been successfully achieved. DPA shall be conducted in accordance with the DPA manual referenced in the Quality Assurance Program Plan.</li> <li>a) The resistors shall be embedded in a proper resin or other materials, and cut at the center along the longitudinal axis of the resistors. One cut face shall be ground and examined visually or by using a 5 to 50x magnifier for the length of effective winding coverage, nominal diameter of the resistance wire, uniformity of the winding pitch, foreign inclusions, fitting of the inlet terminal with the winding core and voids in filling or undercoating.</li> </ul>					
	The sample shall b	e photographed and	recorded.			
H.4.4.4	Electrical Performanc					
	The electrical perform	-	performed as	follows.		
	STD-202. The follo	t shall be performed owing details and ex f measuring apparat	ceptions shall	apply.	od 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage	owing details and ex	ceptions shall us: ±(0.1%+0. ccordance wit	apply. 002Ω)	d 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage Test voltages	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b>	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b>	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub></u>	d 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage Test voltages	owing details and ex f measuring apparat shall be applied in a	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b>	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub> test voltage</u>	d 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage Test voltages Nominal resi	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω)	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub> test voltage .1</u>	d 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage Test voltages Nominal resi Less than 1 1 or more and	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω) less than 10	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum 0 0	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub> test voltage .1 .3</u>	d 303 of MIL-	
	STD-202. The follo a) Limit of error o b) Test voltage Test voltages Nominal resi Less than 1 1 or more and 10 or more and	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω) less than 10 d less than 100	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum 0 0 0	apply. 002Ω) h Table H-9. Unit: V <sub>DC</sub> test voltage .1 .3 .3	d 303 of MIL-	
	STD-202. The folk a) Limit of error o b) Test voltage Test voltages Nominal resise Less than 1 1 or more and 10 or more and 100 or more and	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω) less than 10	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum 0 0	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub> test voltage .1 .3 .3</u>	d 303 of MIL-	
	STD-202. The folk a) Limit of error o b) Test voltage Test voltages Less than 1 1 or more and 10 or more and 100 or more and	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω) less than 10 d less than 100 nd less than 1k	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum 0 0	apply. 002Ω) h Table H-9. Unit: V <sub>DC</sub> test voltage .1 .3 .3	d 303 of MIL-	
H.4.4.4.2	STD-202. The folk a) Limit of error o b) Test voltage Test voltages Less than 1 1 or more and 10 or more and 100 or more and 100 or more and 10k or more and	owing details and ex f measuring apparat shall be applied in a <b>Table H-9. Test</b> stance range (Ω) less than 10 d less than 100 nd less than 1k d less than 1k	ceptions shall us: ±(0.1%+0. ccordance wit <b>Voltages</b> Maximum 0 0 0	apply. 002Ω) h Table H-9. <u>Unit: V<sub>DC</sub> test voltage .1 .3 .3 1 3</u>	d 303 of MIL-	

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## Table H-10. Test Temperature for Resistance-Temperature Characteristic

		Unit: °C
	Test	temperature
Order	Qualification test	Quality conformance inspection (Group A)
1	25±3	25±3
2	-15±3	-55±3
3	-55±3	25±3
4	25±3	275±3
5	125±3	-
6	200±3	-
7	275±3	-

#### H.4.4.3 Power Conditioning

Resistors shall be tested in accordance with Test Method 108 of MIL-STD-202. The following details and exceptions shall apply.

a) Method of mounting

The resistors shall be supported by their terminal leads and not mounted on the chassis.

- b) Measurement before test The resistance shall be measured in accordance with paragraph H.4.4.4.1.
- c) Test temperature:  $25_0^{+15}$  °C
- d) Duration of test:  $100_{-4}^{+16}$  hours
- e) Test condition

The rated voltage specified in H.3.5.5 shall be applied intermittently, 90 minutes ON and 30 minutes OFF for the applicable number of hours.

## f) Measurement after test

After the resistors are at room temperature (25°C) for 30 minutes, the resistance shall be measured in accordance with paragraph H.4.4.1 to calculate the change in resistance before and after the test.

# g) Examination after test The resistors shall be examined visually for evidence of mechanical damage.

## H.4.4.4.4 Dielectric Withstanding Voltage

## H.4.4.4.1 Ambient Pressure

Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202. The following details and exceptions shall apply.

a) Method of mounting

Resistors shall be securely mounted on a metal plate using normal mounting hardware. The size of the plate shall extend beyond the resistor extremities.

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	<ul> <li>b) Measurement before test The resistance shall be measured in accordance with paragraph H.4.4.1.</li> <li>c) Test voltage</li> </ul>					
	The test vol	tages shall be a -line frequency)	n ac supply (root-r and as specified in	-	ie at	
	<ul> <li>Points of application of test voltage</li> <li>The test points shall be between the resistor terminals tied together with an appropriate conductor and the mounting plate.</li> </ul>					
	e) Duration of	test: 1 minute				
	<ul> <li>Measurement after test</li> <li>The resistance shall be measured in accordance with paragraph</li> <li>H.4.4.4.1 to calculate the change in resistance before and after the test.</li> </ul>					
	<ul> <li>g) Examination after test</li> <li>The resistors shall be examined for evidence of flashover, arcing, insulation breakdown and mechanical damage.</li> </ul>					
 	Table H-11	_	e (Atmospheric P	Unit: V <sub>AC</sub>		
		Style	Те	est voltage		
	RES60,	RES40	1,000			
	RES65					
	RES70,	RES50				
	RES75			2,000		
H.4.4.4.2	Reduced Pressu	ire				
	<ul> <li>Reduced Pressure</li> <li>Resistors shall be tested in accordance with Test Method 105 of MIL-STD-2</li> <li>The following details and exceptions shall apply.</li> <li>a) Method of mounting</li> <li>The resistors shall be mounted as specified in item a), paragraph</li> <li>H.4.4.4.1.</li> <li>b) Measurement before test</li> <li>The resistance shall be measured in accordance with paragraph</li> <li>H.4.4.4.1.</li> </ul>					
	<ul> <li>c) Test condition: C (4.4±0.2kPa)</li> <li>d) Test voltage</li> <li>The test voltages shall be an ac supply (root-mean-square value at commercial-line frequency) and as specified in Table H-12.</li> </ul>					
	H.4.4.4.1.	-	voltage: As specifi	ied in item d), par	agraph	
	g) Measureme					
	The resistar	nce shall be mea	asured in accordar nange in resistance			

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	insulation br	after test s shall be examined for evider eakdown and mechanical dar est Voltage (Reduced Baror	nage.	
	Style	Test voltage		<b>,</b>
	RES60, R	ES40		
	RES6	5		
	RES70, R	ES50	500	
	RES7	5		
H.4.4.4.5	202. The following	be measured in accordance w details and exceptions shall a	apply.	
	item a) of para	nting and points of applicatior graph H.4.4.4.4.1. est condition A (100V <sub>DC</sub> ) t: 2 minutes	n of test voltage: As s	pecified in
H.4.4.6	<ul> <li>short-time overload</li> <li>resistor's resistance</li> <li>test in accordance</li> <li>resistance before a</li> <li>evidence of arcing,</li> <li>a) Mounting meth</li> <li>Resistors shall</li> <li>b) Test conditions</li> <li>1) Terminals</li> <li>One resist</li> <li>the test.</li> <li>2) Nature of voltage</li> <li>3) Test voltage</li> </ul>	e is measured in accordance v I test shall be performed unde e shall be measured after wait with paragraph H.4.4.4.1 to ca nd after the test. The resistor burning, and charring. od I be mounted as specified in it tor terminal shall be grounded voltage: ac supply (root-mean- ency)	r the following condit ting at least 30 minut alculate the change in s shall then be exam em a), paragraph H.4 I to the resistor housi -square value at com	ions. The es after the n the nined for 4.4.7.1. ng during mercial-

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	Table	H-13. Maximun	n Overload Volt	age	
	<b></b>			Unit: V <sub>A</sub>	c T
	Styl	e	Test vo	oltage	
	RES60, I	RES40			
	RES	65	1,0	00	
	RES70, I	RES50			
	RES	75	2,0	00	
- 2 2 1	<ul> <li>Measuring freq</li> <li>Measuring met</li> <li>Preparatio</li> <li>The analy measuring 0S<sup>(1)</sup>, 50Ω</li> <li>Note: <sup>(1)</sup> "\$</li> <li>2) Measurem</li> <li>The analy</li> </ul>	ument A RF impedance uency: 1MHz hod n for measureme zer shall be autor g frequency range S" indicates sieme	analyzer or its e nt matically calibrat e using one refer ens, unit of cond	equivalent shall b ed for the desire ence terminatior uctance. equency of 1MH:	e used. d h types: 0Ω, z, and the
-	chanical Performa e mechanical perfo		all be performed a	as follows.	
F - 2	<ul> <li>Test conditions</li> <li>One-half of the remaining half</li> <li>1) Test condi</li> <li>With the remaining half</li> <li>1) Test condi</li> <li>With the remaining half</li> <li>1) Test condi</li> <li>and parall</li> <li>2) Test condi</li> <li>With the remaining half</li> </ul>	s and exceptions before test shall be measure samples submitt to the torque test tion A esistor body secu be applied to the one terminal at a el to the longitudi	shall apply. ed in accordance ted shall be subj t. urely clamped, th e hole of each te time, in a direction nal axis.	e with paragraph ected to the pull e load as specifi rminal for at leas on away from the torque of 5.7N·c	H.4.4.4.1. test and the ed in Table at 30 e resistor

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Tł ca d) Ex	applied to to the tern easurement a he resistance alculate the cl camination aft	one terminal at ninal and mainta after test shall be measu hange in resista ter test	e axis of the termin a time. The force ained for a period ured in accordance ance before and a ed visually for evic	e shall be gradual of 5 to 15 second e with paragraph ter the test.	ly applied s. H.4.4.4.1 to
		Table H-14.	Applied Force		
				Unit: N {kgf}	
	Styl	e	loa	ad	
	RES60, F	RES40			
	RES	65	24.5	[2.5]	
	RES70, F	RES50			
	RES	75	44.1	4.5}	
The fo a) Nu b) So c) So d) So Th po e) Ex	llowing detail umber of term older tempera older immersion older immersion he terminals s ortion of the to camination aff	s and exception hinals tested: all ture: 245±5°C on time: 5±0.5 s on depth shall be immers erminal (see Fig ter test	terminals. seconds ed to a depth suff	icient to cover the	
Fig	gure H-2. F	lattened Portic	on of Terminal (S	haded area)	
H.4.4.6 Environm	nental Perforr	mance			
The envi	ronmental pe	rformance tests	shall be performe	ed as follows.	

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H.4.4.6.1	Vibration					
H.4.4.6.1.1	High Frequency	Vibration				
	Resistors shall b	e tested in accordance with Test	Method 204 of MI	L-STD-202.		
	-	tails and exceptions shall apply.				
	a) Method of n	•				
		s shall be mounted in accordance	<i>,</i> .	•		
		A shielded cable, which may be ne ading the vibration table, shall be o	-			
	mounting fix	-				
	•	nt before test				
	The resistar	ce shall be measured in accorda	nce with paragrap	bh		
	H.4.4.4.1.					
	c) Test condition					
	d) Direction of	p-p or 1.5mm in double amplitude motion	e, whichever is sm	naller).		
	,	vo mutually perpendicular directio	ns, one perpendi	cular and		
		rallel to the longitudinal axis of the	• •			
	e) Duration of	vibration				
		each direction for a total of 12 ho	urs.			
	•	nt during test				
		or shall be monitored with specifie	• •	ng the		
	g) Measureme	electrical discontinuity of 0.1ms c	or greater.			
	0/	ice shall be measured in accorda	nce with paragrag	bh		
		calculate the change in resistanc				
	h) Examinatior	after test				
		s shall be examined for evidence		-		
	,	s shall be subjected to the dielect	•	•		
	test (at atmo	ospheric pressure) as specified in	paragraph H.4.4.	4.4.1.		
H.4.4.6.1.2	Random Vibratio	n				
		e tested in accordance with Test	Method 214 of MI	L-STD-202.		
	•	tails and exceptions shall apply.				
	a) Method of n	iounting: s shall be mounted in accordance	with itom a) par	aaraab		
	H.4.4.6.2.		e with item a), par	agraph		
		nt before test				
	The resistar	ice shall be measured in accorda	nce with paragrap	bh		
	H.4.4.4.1.					
	c) Test conditi		00011-			
	i est conditi	on II-H Frequency range: 20 to 2 Rms value of acceleratio				
	d) Direction of		011. JU4111/5 11115			
	,	vo mutually perpendicular directio	ns, one perpendi	cular and		
		rallel to the longitudinal axis of the	• •			

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	e) f)	Vibration sh time of 6 mi	application and duration of vibratio all be applied for 3 minutes in eac nutes. nt during test		otal test
	g)		or shall be monitored with specifie electrical discontinuity of 0.1ms of a start est	• •	ng the
	9)	The resistar H.4.4.4.1 to	nce shall be measured in accordan calculate the change in resistance		
	h)	Examinatior The resistor damage.	n after test 's shall be examined visually for e	vidence of mecha	inical
	i)	The resistor	s shall be subjected to the dielect ospheric pressure) as specified in	•	•
H.4.4.6.2	Shoc	k			
			tested in accordance with Test Me	thod 213 of MIL-	STD-202.
		ollowing detai /lethod of mou	Is and exceptions shall apply.		
		Resistors shal be constructed shock table. T resonances in shall be monit stranded wire test lead on th	I be securely mounted on appropr d to insure that the resistors will hat the mounting fixtures shall be con the fixtures when subjected to the ored if necessary. Test lead used no larger than 0.6mm in diameter e resistor will be held to a minimu than necessary.	ave the same mot structed to preclu e shock test, and during this test s so that the influe	tion as the Ide any the fixtures hall be nce of the
	-	The resistance	e shall be measured in accordance I (980m/s², 6ms sawtooth).	e with paragraph	H.4.4.4.1.
	d) [ I	Direction of ap		• •	lar and the
	-	lumber of app The resistors s shocks.	lied shocks shall be subjected to 5 shocks in e	ach direction, for	a total of 10
	,	/leasurement Each resistor :	•		
	(	electrical disco	shall be monitored with specified e ontinuity of 0.1ms or greater.	equipment during	
	g) N -	leasurement	ontinuity of 0.1ms or greater.	e with paragraph	the shock fo

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H.4.4.6.3	Heat Re	esistance				
			e is measured as spec test chamber at 275			
			chamber shall be grad			
	•		stors shall then be rer	•	•	
	· /		n temperature for at le			
			Il then be measured a	• •		
			inge in resistance befo xamined visually for e			
H.4.4.6.4	Therma					5
11.4.4.0.4	Incina	SHOCK				
H.4.4.6.4.1		nal Shock [	-			
			e tested in accordance		/lethod 107 of MI	L-STD-202.
	The following details and exceptions shall apply. a) Method of mounting					
	,		s shall be mounted by	means othe	er than soldering	or be
	-		ys of small heat inerti	a.		
	/		nt before test ce shall be measured	in accordar	ce with paragrar	h
		1.4.4.4.1.		in accorda	ice with paragrap	/11
	c) T	est condition	ons			
		,	nditions shall be as sp	pecified in Ta	able H-15.	
	2	) Load The vol	tage corresponding to	50% of the	rated power shal	ll he annlied
			esistors at the temperation		•	• •
		below.				
			est cycles: 25 cycles			
	,	Cycle condit	cycles shall run conti	nuously Af	ter five cycles th	e test
			rupted following the c	•	•	0 1001
	.,		nt after test	-		
			s shall remain at room	•	. ,	
			The resistance shall I.4.3.4.1 to calculate t			
	-	fter the tes		ne enange n		
	5/	Examination				
			s shall be examined v	isually for ev	vidence of mecha	inical
	U	amage.				
		Table H-15	. Test Conditions o	of Thermal S	Shock [l]	
		Step	Temperature (°C)	Time (mi	n.)	
		1	-65 <sup>0</sup> <sub>-5</sub>	15		
		2	150 <sup>+3</sup> <sub>0</sub>	15		

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H.4.4.6.4.2	After measures shall be sub- shown in Ta- apply. a) Method The re- placed b) Load of Load The do the res c) Number d) Cycle of The first interrup e) Measure The re- temper cycles, of all re- f) Measure The re- temper cycles, of all re- minute paragria	uring resistance ojected to the s able H-16 and I d of mounting sistors shall be in trays of sma onditions voltage corres istors at the ter er of test cycles conditions at 5 cycles shall bed following t rements during sistance shall be rature (25°C) for $100_{0}^{+10}$ cycles esistors shall be rement after te sistors shall be s before the re- aph H.4.4.4.1 to the test. hation after tests sistors shall be e.	ponding to 50% of the mperature specified in : 1,000 cycles Il run continuously. Af he completion of any test and external insp be measured after the or 30 minutes or more , 250 $^{+10}_{0}$ cycles and 5 e inspected visually for st at room temperature sistance is measured o calculate the change	k cycle test under the ving details and exc ther than soldering e rated power shall step 2 of Table H- ter 5 cycles, the tes full cycle. Dection resistors are at roo at each $25^{+5}_{0}$ cycle $200^{+10}_{0}$ cycles. The r cracks on the surf (25°C) for at least 3 in accordance with e in resistance befor evidence of mecha	the conditions ceptions shall or be be applied to 16. If the set may be m s, $50_{0}^{+5}$ externals face. Bo anical
Table	Thermal Shock		-	3. Test Condition	ns of
Step	Temperature (°C)	Time (min.)	Th	ermal Shock [II]	
1	-30 <sup>0</sup> <sub>-5</sub>	15	100		
2	100 +5	15	Temperature (°C) bc t_t_t_t_t_t_t_t_t_t_t_t_t		

15 1 cycle

| 0

15 30 4 Time (min.)

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	June 2021 Moisture Resistance Resistors shall be to The following detail a) Method of mou 1) 100% load The resist H.4.4.7.1 2) Polarization The resist H.4.4.4.4 b) Measurement of The resistance c) Test conditions One-half of the polarization. d) Load and Pola 1) 100% load During the derated to shall be a electricall 2) Polarization	Parts Specification e ested in accordance with Test Me is and exceptions shall apply. nting fors shall be mounted as specified n ors shall be mounted as specified 1. before test e shall be measured in accordance e resistors shall be subjected to lo rization first 2 hours of step 1 and step 4 b the temperature attained at the e pplied to the resistors. The negat y grounded to the mounting surface n eps 2, 3, 5 and 6, a 100 volt dc po fors mounted on the metal plate. The d to the resistor terminals tied toged d to the mounted side.	ethod 106 of MIL-4 d in item a), parag d in item a), parag e with paragraph ad and the remai d, the rated dc vol end of the two hou tive terminals sha ce. tential shall be ap the positive lead	STD-202. Iraph Iraph H.4.4.4.1. ning half to tage, urs period, II be oplied to shall be
	Upon completi relative humid minutes and 2 Within 30±15 r measured as s The resistors s measurements f) Examination af	on of step 6 of the final cycle, the ty between 90 and 98% and at 25 10 minutes. Resistors shall then 1 ninutes, the resistance and insula specified in paragraphs H.4.4.4.1 a shall not be wiped or dried with for s. ter test shall be examined for evidence of	5±2°C for a period be removed from ition resistance sh and H.4.4.4.5, res rced air prior to th	l between 90 the chamber. nall be spectively. ese
H.4.4.6.6	The following detai a) Application are b) Solvents to be 1) 2-propano 2) 42 parts b	ested in accordance with Test Me ls and exceptions shall apply. a: Marked portion	ume of propylene	e glycol

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H.4.4.6.7	hour after this mean 65 <sup>0</sup> <sub>-3</sub> °C for 24±4 ho returned to room te chamber. Any wat remain at room ten resistance shall the calculate the chang	Storage all be measured as specified in par surement, the resistors shall be pl ours. The temperature in the charr emperature (25°C), and the resisto er droplets on the surface shall be nperature for at least 2 hours or m en be measured in accordance wit ge in resistance before and after th xamined for significant abnormalit	aced in a cold ch ober shall then be removed. The r ore but less than h paragraph H.4. ne test. After the	amber at - e gradually ved from the esistors shall 8 hours. The 4.4.1 to test the
H.4.4.6.8	resistors shall be p The temperature in temperature of 275 shall remain at no passed, the tempe resistors shall then 6±1hours. Then, the ground with an app accordance with pa	ility. is measured in accordance with put in a test chamber maintained at the chamber shall then be graduated by $5\pm7^{\circ}$ C. After stabilizing at the test cload for 2,000 $^{+48}_{-0}$ hours. When the rature shall gradually be returned to be removed from the test chamber be examined by the test chamber be examined by the removed from the test chamber be exampled by the test chamber by the te	t room temperatu ally increased to temperature, the specified test tin to room temperat er, and remain at e to be measured all be measured e change in resist	re (25°C). a test resistors ne has ture. The 25±5°C for d shall be in ance before
H.4.4.7	Durability Durability test shall b	e performed as follows.		
H.4.4.7.1	The following detail a) Method of mou Resistors shall chassis with th center of the o chassis are pa using a materi ensure that the temperature o over the resist b) Test temperature	I be mounted, by normal mounting the specified dimensions. The resist chassis such that the longitudinal a arallel to each other. The chassis s al with low thermal conductivity. F the temperature of any one resistor of any other resistor. There shall be cors. ure: 25±5°C	g means, to an all stors shall be mo exes of the resisto shall be horizonta Resistors shall be shall not influenc	uminum unted at the or and the ally supported arranged to e the
	c) Test conditions The rated volt	s age specified in H.3.5.5. shall be a	applied intermitter	ntly, 90

The rated voltage specified in H.3.5.5. shall be applied intermittently, 90 minutes ON and 30 minutes OFF. The test voltage shall be regulated and controlled to maintain  $\pm 5\%$  of the rated voltage. The test duration shall be

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4,000 confo d) Numb The r durin using meas e) Meas 1) C 2	prmance i ber of sho resistance g and afte g the mea suring poi urements Qualificatio $2,000^{+72}$ h	for the qualification test and 2,000 nspection. cks applied e shall be measured as specified in er the test. The change in the resi surement before the test and the r nt. during test on test: $250_{0}^{+48}$ hours, $500_{0}^{+48}$ hours hours.	n paragraph H.4. stance shall be c nean values of e s, 1,000 <sup>+48</sup> hours	4.4.1 before, alculated ach and
,		shall be examined visually for evident	ence of mechani	cal damage.
H.4.5 Long-Term Sto Long-term stor	•	be in accordance with paragraph	4.7 of JAXA-QTS	8-2050.
H.4.6 Change of Tes Change of test JAXA-QTS-208	s and ins	spections pections shall be in accordance wi	ith paragraph 4.8	of
H.5. PREPARATION Preparation for d		IVERY all be in accordance with paragra	ph 5 of JAXA-QT	S-2050.
H.6. NOTES Refer to the para	agraph 6 c	of JAXA-QTS-2050.		

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		APPENDIX J		
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		nance		
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		rmance		
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This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021
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		APPENDIX J			
	RESI	STORS, CHIP, FIXED, MET	AL FILM		
J.1. G	General				
J.1.1	Scope				
	••	es the general requirements p resistors (hereinafter referr	• •		e provisions fo
J.1.2	Classification				
	Resistors covered by th	is specification shall be class	sified as spe	ecified in Ta	able J-1.
		Table J-1. Classification	n		
		Construction		Designati	on number
	Square shape, non-me	tal externals and surface mount	t terminals	4	01
J.1.3	Part Number				
	The part number shall b details. Example:	e indicated as follows. Refe	r to the deta	ail specifica	ation for
	JAXA <sup>(1)</sup> 2050/J <u>401</u> Designation number			ance Termi ince structu	ire option
	Note: <sup>(1)</sup> "JAXA" indicate	s the common part for space	e use and m	nay be abbi	eviated to "J"
J.1.3.1	specified in Table J-2 detail specification. T	ysical size of the resistor and . The dimension of the resis he length, thickness, distance ed in detail specification.	tor shall be	in accorda	nce with in
	-	-			

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Table J-2. Style							
W $B$ $H$							
Unit: mm							
		E	External dimension				
Style	Length (L)	Width (W)	Thickness (T)	Distance between terminals (G)	Terminal width (B)		
1005	1.0±0.1	0.5 ±0.05	0.35±0.05				

1005	1.0±0.1	0.5 ±0.05	0.35±0.05		
1608	1.6±0.2	0.8 ±0.1	0.45±0.1	As specified	As specified
2012	2.0±0.2	1.25±0.2	0.5 ±0.1	in detail	in detail
3216	3.2 <sup>+0.2</sup> <sub>-0.3</sub>	1.6 ±0.2	0.6 ±0.1	specification	specification
3225	3.2 <sup>+0.2</sup> -0.3	2.5 ±0.2	0.6 ±0.1		
	0.0				

#### J.1.3.2 Characteristics

The resistance-temperature characteristic shall be identified by a single capital letter in accordance with Table J-3.

# Table J-3. Resistance-Temperature Characteristics

	(Unit: x10 <sup>-6</sup> /°C)
Symbol	Resistance-temperature characteristic (referenced:25°C)
А	±5
Y	±10
E	±25
Н	±50

#### J.1.3.3 Nominal Resistance

The nominal resistance shall be identified in ohms ( $\Omega$ ) by 4 digits number. The first three digits represent the significant figures and the last digit specifies the number of zeros to follow. When fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.

Example:  $97R6=97.6 \Omega$   $1500=150 \Omega$   $1501=1,500 \Omega=1.50k\Omega$  $1503=150,000 \Omega=150k\Omega$ 

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 J.1.3.4	Resistance Tolerand					
5.1.5.4	The resistance tolerance shall be identified by a single capital letter i with Table J-4.			n accordance		
	r	۲able J-4.	Resistance Tol	erance		
				Unit: %		
		Symbol	Resistance toler	rance		
	B         ±0.1           D         ±0.5					
		F	±1.0			
J.1.3.5	Electrode Structure					
0111010		ure shall be identified by a single capital letter in				
	Table J-5.	ure shall be	e identified by a s	ingle ca	pital letter in a	accordance with
			e identified by a s Electrode Stru	-	pital letter in a	accordance with
Symbol				-		accordance with
Symbol B	Table J-5.	<b>Table J-5.</b> Solder pla	Electrode Stru	acture erlying m	etal barrier	
В	Table J-5. Structure Double-sided	<b>Table J-5.</b> Solder pla	Electrode Stru Finish ting on top of unde	acture erlying m	etal barrier	Mounting method
В	Table J-5.StructureDouble-sided electrodeScreening Options	<b>Table J-5.</b> Solder pla (S	Electrode Stru Finish ting on top of unde n/Pb alloy with 3wt	erlying m t% min. F	etal barrier Pb)	Mounting method Soldering
В	Table J-5. Structure Double-sided electrode	<b>Table J-5.</b> Solder pla (S	Electrode Stru Finish ting on top of unde n/Pb alloy with 3wt	erlying ma t% min. F	etal barrier Pb) ich can be ad	Mounting method Soldering Ided to the
В	Table J-5.          Structure         Double-sided         electrode         Screening Options         Screening options sl	Table J-5. Solder pla (S hall be the o dentified by	Electrode Stru Finish ting on top of unde n/Pb alloy with 3wt	erlying ma t% min. F ents wh etter as	etal barrier Pb) ich can be ad	Mounting method Soldering Ided to the
-	Table J-5.          Structure         Double-sided         electrode         Screening Options         Screening options sl	Table J-5. Solder pla (S hall be the o dentified by	Electrode Stru Finish ting on top of unde n/Pb alloy with 3wt optional test cont a single capital I	erlying ma t% min. F ents wh etter as	etal barrier <sup>2</sup> b) ich can be ac specified in T	Mounting method Soldering Ided to the

Symbol	Test item		Test condition	
Symbol	reschem	Temperature (°C)	Load	Time (hr)
А	Power conditioning A	85 <sup>+5</sup> 0	Rated voltage	168 <sup>+24</sup>
В	Power conditioning B	85 <sup>+5</sup> 0	Equivalent to 1.5 times of rated voltage	100±4
Z	Not specified			

# J.2. Applicable Documents

# J.2.1 Applicable Documents

The applicable documents shall be as specified in paragraph 2.1 of JAXA-QTS-2050.

JAXA-QTS- 29 June 2		J A Parts Spe	X A ecification	Page	— J-4 —	
J.2.2 Referenc The follov a) MIL	e Documents vings are refere PRF-55342	nce document. Resistors, Ch	ip, Fixed, Film, I eliability, Space	Nonestablished I Level, General Resistors, Fixe	Specification fo	
c) ESC	C Detail Speci	fication No. 400	1/023 (Issue 6)	Resistors, Fixed Thick Film Base PHR and PFRF	ed on Type	
J.3. Requiremer	its					
Qualificat conforms in paragra samples is allowed	to materials, de aphs J.3.2 throu hat have passe I to supply qual ary, additional c	esigns, construc ugh J.3.10. The ed the qualification ified products in	tions, specificati qualification cov on test. Within t accordance wit	d by the manufac ons and perform verage shall be r his coverage, th h the detail spec pecified in the de	ance specified epresented by e manufacturer ification.	
J.3.1.1 Restriction for Qualification Test The coverage of the resistors to be qualified shall be between the maximum and minimum nominal resistances which are passed in the qualification test. Characteristics and resistance tolerance of the resistors to be qualified shall be classified as specified in Tables J-7 and J-8.						
The co minimu Charac	m nominal resis teristics and res ed as specified	stances which a sistance toleran in Tables J-7 ar	re passed in the ce of the resisto nd J-8.	qualification tes rs to be qualified	t.	
The co minimu Charac	m nominal resis teristics and res ed as specified <b>Table</b>	stances which a sistance toleran in Tables J-7 ar <b>J-7. Characte</b>	re passed in the ce of the resisto id J-8. ristics Qualifica	qualification tes rs to be qualified ation	t.	
The co minimu Charac	m nominal resis teristics and res ed as specified <b>Table</b> Sample ch	stances which a sistance toleran in Tables J-7 ar <b>J-7. Characte</b> aracteristic	re passed in the ce of the resisto nd J-8. ristics Qualifica Characteristic to	qualification tes rs to be qualified ation	t.	
The co minimu Charac	m nominal resis teristics and res ed as specified <b>Table</b>	stances which a sistance toleran in Tables J-7 ar <b>J-7. Characte</b> aracteristic	re passed in the ce of the resisto id J-8. ristics Qualifica	qualification tes rs to be qualified ation be qualified	t.	

Н

Н

Resistance tolerance submitted	Resistance tolerance qualified
В	B, D, F
D	D, F
F	F

# J.3.2 Materials

The materials shall be specified as follows and as specified in paragraph 3.3 of JAXA-QTS-2050.

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J.3.2.1		e of the resistors shall be formed b t high temperatures. The substrat	•				
J.3.2.2	<ul> <li>Terminals</li> <li>The materials for terminals shall be as specified in the detail specification. The barrier metal shall be a minimum of 1.27µm Nickel.</li> </ul>						
J.3.2.3	.3.2.3 Resistive Element The resistive element shall be as specified in the detail specification.						
J.3.2.4	Insulation Material The insulation materi	al shall be as specified in the deta	il specification.				
J.3.3	order to protest the resi	shall be covered by the moisture r stive element from any moisture a rely connected with both resistive	nd mechanical da	amages. The			
J.3.4	Externals, Dimensions	and Marking					
	Resistors shall satisfy th paragraph J.4.4.3.	ne following requirements when te	sted in accordance	ce with			
J.3.4.1	resistive eler (2) There shall b resistive eler (3) There shall b materials left (4) Any cracks o b) Terminals (1) There shall b (2) There shall b (3) There shall b (3) There shall b (4) There shall b average thick c) Resistive elemen (1) There shall b (2) There shall b of the resistant	e no junction parts of adjacent ma in the split materials. f 76.2µm or less generated on the e no scratches where any materia e no lifting, flaking or blisters. e no stains, corrosion, discoloration e no protrusions of metal material ness of terminal surface.	rs. re and generated iterials including r edge shall be ac als in the lower lay on and tachetic m exceeding 0.08m within the resistant thickness become	towards the resistance ceptable. yer is exposed. etals. hm from the ance patterns. es 50% or less			

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· · · · · ·		Faits Specification		
	<ul> <li>(5) There shall n the resistance treatment shall b patterns, whice</li> <li>(6) There shall b patterns, whice</li> <li>(7) There shall b the distance between the distance of between the distance of between the distance of between the distance between the distance between the distance between the distance of between the distance between the</li></ul>	e no chips or cracks in the resistiv ot be any evidences of local stains e patterns. However, any discolor all be acceptable. e no conductive bridges, between ch is generated by the photolithog e no partial bridge which is 50% o ween the adjacent resistance patter e no residues of resistance films in n conductor width after trimming sh dentical resistance patterns. I of the conductive link shall not too ration of the cut edge of laser or sh be no discontinuous cuts on the re- be no voids, cracks or similar dam l affect the materials in the lower la be no intentional burn in the resist or its unnecessary reflective light. f the cut area of conductive link ar h. The cut width of the conductive can not be removed with a soft bri- trogen or air is considered to be a ial that reduces the gap between on ed foreign material occupying 5% e no heavy metals with the length se materials or protective film. ot be 5 or more heavy metals with e resistance surface. However, if the dots is less than 76.2µm, the length s series of dots (a line or an area).	s, corrosions or d ation caused by t the adjacent res raphy failure. r less of the desig erns. n the trimming dit hall be 50% or me uch the resistanc urrounding area s esistive elements hages caused by ayer. tive elements cau hd ladder shall be link can be 100% istled brush or a n ttached. Reject a conductors to be or more on the s exceeding 254µn the length betwe the distance betw th of the metals s	the annealing istance gn value of cch. ore of the line e patterns. shall not be after trimming used by 50% or more 6 of its width. nominal gas attached 2.54µm or urface. m on the een 76.2 and veen the
J.3.4.2	Dimensions and Mas The dimensions and detail specification.	s mass of resistors shall meet the re	equirements spec	ified in the
J.3.4.3	applied in such a mat after any tests.	stors shall include the following at the the following at the that it is not come off easily. T		
	a) Nominal resistance	e chown as aposified in paragraph	1122 For small	norte the

The marking shall be shown as specified in paragraph J.1.3.3. For small parts, the method specified in detail specification can be applied.

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#### J.3.5 Workmanship

Resistors shall be manufactured based on good design practices and in accordance with the quality assurance program defined in paragraph 3.2.1. The resistor body shall not have defects such as cracks, holes and scratches which may adversely affect the performance of the resistors and shall be free from other defects that will affect life, serviceability, or appearance.

### J.3.5.1 DPA

Resistors tested as specified in paragraph J.4.4.4.1 shall confirm that the resistor materials, design, construction and workmanship are properly manufactured as specified in detail specification and quality assurance program and shall satisfy the requirements specified in paragraph J.3.4.1.

# J.3.6 Ratings

The following items shall be specified in detail specification.

- (a) Nominal resistance and resistance tolerance As a rule, standard values of nominal resistance shall be defined in relation to the resistance tolerance and shall be as specified in Table J-9.
- (b) Operating Temperature Range Unless otherwise specified, the operating temperature range shall be between -55 and +125°C.
- (c) Power Rating

The rated ambient temperature of the resistor shall be  $85^{\circ}$ C as a maximum. If the resistor is operated or tested continuously at the temperature exceeding  $85^{\circ}$ C, the power rating shall be derated in accordance with the derating curve shown in Figure J-1.



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	Resistance tolerance (%)														
В	F	В	F	В	F	В	F	В	F	В	F	В	F	В	F
(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)	(±0.1)	(±1.0)
D		D		D		D		D		D		D		D	
(±0.5)		(±0.5)		(±0.5)		(±0.5)		(±0.5)		(±0.5)		(±0.5)		(±0.5)	
10.0	10.0	13.3	13.3	17.8	17.8	23.7	23.7	31.6	31.6	42.2	42.2	56.2	56.2	75.0	75.0
10.1	—	13.5	—	18.0	—	24.0	—	32.0	—	42.7	—	56.9	—	75.9	_
10.2	10.2	13.7	13.7	18.2	18.2	24.3	24.3	32.4	32.4	43.2	43.2	57.6	57.6	76.8	76.8
10.4	—	13.8	—	18.4	—	24.6	—	32.8	—	43.7	—	58.3	—	77.7	_
10.5	10.5	14.0	14.0	18.7	18.7	24.9	24.9	33.2	33.2	44.2	44.2	59.0	59.0	78.7	78.7
10.6	—	14.2	_	18.9	—	25.2	_	33.6	—	44.8	_	59.7	—	79.6	_
10.7	10.7	14.3	14.3	19.1	19.1	25.5	25.5	34.0	34.0	45.3	45.3	60.4	60.4	80.6	80.6
10.9	_	14.5	—	19.3	—	25.8	_	34.4	—	45.9	_	61.2	_	81.6	—
11.0	11.0	14.7	14.7	19.6	19.6	26.1	26.1	34.8	34.8	46.4	46.4	61.9	61.9	82.5	82.5
11.1	_	14.9	_	19.8	_	26.4	_	35.2	_	47.0	_	62.6	_	83.5	_
11.3	11.3	15.0	15.0	20.0	20.0	26.7	26.7	35.7	35.7	47.5	47.5	63.4	63.4	84.5	84.5
11.4	_	15.2	_	20.3	_	27.1	_	36.1	_	48.1	_	64.2	_	85.6	_
11.5	11.5	15.4	15.4	20.5	20.5	27.4	27.4	36.5	36.5	48.7	48.7	64.9	64.9	86.6	86.6
11.7	_	15.6	_	20.8	_	27.7	_	37.0	_	49.3	_	65.7	_	87.6	_
11.8	11.8	15.8	15.8	21.0	21.0	28.0	28.0	37.4	37.4	49.9	49.9	66.5	66.5	88.7	88.7
12.0	_	16.0	_	21.2	_	28.4	_	37.9	_	50.5	_	67.3	_	89.9	_
12.1	12.1	16.2	16.2	21.5	21.5	28.7	28.7	38.3	38.3	51.1	51.1	68.1	68.1	90.9	90.9
12.3	_	16.4	_	21.8	_	29.1	_	38.8	_	51.7	_	69.0	_	92.0	_
12.4	12.4	16.5	16.5	22.1	22.1	29.4	29.4	39.2	39.2	52.3	52.3	69.8	69.8	93.1	93.1
12.6	_	16.7	_	22.3	_	29.8	_	39.7	_	53.0	_	70.6	_	94.2	_
12.7	12.7	16.9	16.9	22.6	22.6	30.1	30.1	40.2	40.2	53.6	53.6	71.5	71.5	95.3	95.3
12.9		17.2		22.9		30.5		40.7		54.2		723	_	96.5	
13.0	13.0	17.4	17.4	23.2	23.2	30.9	30.9	41.2	41.2	54.9	54.9	73.2	73.2	97.6	97.6
13.2		17.4	-			31.2		41.2	41.Z				-		97.0
13.Z		17.0		23.4		ວາ∠		41./		55.6		74.1		98.8	

# Table J-9. Standards of Nominal Resistance

#### d) Voltage rating

Resistors shall have a rated direct current (DC) continuous operating voltage or an approximate sine wave root-mean-square (rms) alternating current (AC) continuous operating voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula. However, if the calculated rated voltage exceeds the maximum operating voltage specified in the detail specification, the maximum operating voltage shall be the rated voltage.

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	E=√P•R					
	Where: E = Voltage rating P = Power rating (V R = Nominal resista	V)				
J.3.7	Electrical Performance					
	Resistors shall satisfy the	ne following electrical requirement	S.			
J.3.7.1	Application of Pulse					
		sted as specified in paragraph J.4 sulation breakdown, or mechanica		ll be no		
J.3.7.2	Resistance					
		sted as specified in paragraph J.E d tolerance of the nominal resistar		stance shall		
J.3.7.3	J.3.7.3 Resistance-Temperature Characteristic When resistors are tested as specified in paragraph J.4.4.5.3 using room ambient temperature of 25°C as the reference temperature, the resistance-temperature characteristic at each of the temperatures specified in Table J-17 shall not exceed the value specified in Table J-3.					
J.3.7.4	Dielectric Withstandir	a Voltage				
	When tested as spec specified test voltage satisfy the requirement	ified in paragraph J.4.4.5.4, the re , and the change in resistance be nts of the detail specification. The isulation breakdown or mechanica	fore and after the ere shall be no ev	test shall idence of		
J.3.7.5	Insulation Resistance					
		sted as specified in paragraph J.4 y the requirements of the detail sp	•	tion		
J.3.7.6	Short-Time Overload					
	resistance before and	sted as specified in paragraph J.4 I after the test shall satisfy the req shall be no evidence of arcing, but t.	uirements of the	detail		
J.3.7.7	Power Conditioning (i	f specified)				
	When resistors are te	sted as specified in paragraph J.4 I after the test shall satisfy the req				

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	•	shall be no evidence of arcing, ins after the completion of this test.	ulation breakdow	'n, or			
J.3.8	Mechanical Performanc Resistors shall satisfy th	e ne following mechanical requirem	ents.				
J.3.8.1	the terminal surface s pinholes or rough are	ested as specified in paragraph J.4 shall be evenly covered with new s as shall be acceptable, provided I area of the pinholes or rough are	solder. The existent that they are not o	ence of small concentrated			
J.3.8.2	Adhesion When resistors are te mechanical damage	ested as specified in paragraph J.4 on the resistors.	1.4.6.2, there sha	ll be no			
J.3.8.3	8.3 Board Bending When resistors are tested as specified in paragraph J.4.4.6.3, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no mechanical damage after the completion of the test.						
J.3.8.4	resistance before and specification. The ele	g Exposure ested as specified in paragraph J.4 d after the test shall satisfy the rec ectrode area covered by solder lea the electrode shall be free from m	uirements of the aching shall be 10	detail )% or less of			
J.3.9	Environmental Performa Resistors shall satisfy th	ance ne following environmental require	ements.				
J.3.9.1							
J.3.9.2							

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J.3.9.3	Thermal Shock						
J.3.9.3.1		tested as specified in paragraph nical damage after the completior		shall be no			
J.3.9.3.2	resistance before a specification. Ther completion of the te	Thermal Shock [II] When resistors are tested as specified in paragraph J.4.4.7.3.2, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test. Fine cracks on the surface of resistors shall be acceptable only when subjected to more than 500 cycles.					
J.3.9.4	resistance before and	sted as specified in paragraph J.4 I after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail			
J.3.9.5	Resistance to Solvents When resistors are tested as specified in paragraph J.4.4.7.5, there shall be no evidence of mechanical damage after the completion of the test and the marking shall remain legible.						
J.3.9.6	resistance before and	eration sted as specified in paragraph J.4 I after the test shall satisfy the req hall be no evidence of mechanica	uirements of the	detail			
J.3.9.7							
	Durability Resistors shall satisfy th	ne following durability requirement	S.				
J.3.10.1	resistance before and	sted as specified in paragraph J.4 I after the test shall satisfy the req shall be no evidence of mechanica	uirements of the	detail			

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### J.4. Quality Assurance Provisions

#### J.4.1 In-Process Inspection

The in-process inspection for resistors shall be performed per each manufacturing lot as specified in Table J-10. A manufacturer may perform in-process inspection other than the ones specified in Table J-10 as long as the inspection is in accordance with paragraph 4.3 of JAXA-QTS-2050.

Item No.	Test item	Requirement paragraph	Test method paragraph	Sample size
1	Application of pulse	J.3.7.1	J.4.4.5.1	100%
2	Resistance	J.3.7.2	J.4.4.5.2	100%
3	External inspection	J.3.4.1	J.4.4.3	100%

Table J-10. In-process Inspection

#### J.4.2 Qualification Test

The qualification test shall be as specified in paragraph 4.4 of JAXA-QTS-2050 and as provided below.

#### J.4.2.1 Samples

The inspection lot for qualification test shall be consisting of samples that have passed the in-process inspection. The samples with minimum resistance, maximum resistance and critical resistance (or the closest to the critical resistance) to be qualified shall be selected for each style, characteristic, resistance tolerance and terminal construction. The characteristics and resistance tolerance of the samples shall be selected with consideration of Tables J-7 and J-8.

# J.4.2.2 Test Items and Number of Samples

Test items and number of samples of the qualification test shall be as specified in Table J-11. If the critical resistance is not specified, the samples shall be equally divided between the minimum and maximum resistance.

Tests of each group shall be performed in the order listed in Table J-11. Upon completion of Group I tests, Group II through XI tests shall be performed using samples allocated to the appropriate group tests.

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		Та	able J-11.	Qualificati	ion Test		
		Test	Damina		Criteria for Pass/fail		
Group	Order	Item	Require- ment paragraph	Test method paragraph	Sample size		No. of defectives allowed
	1	Resistance	J.3.7.2	J.4.4.5.2			
I	2	Externals, dimensions and marking	J.3.5	J.4.4.3	100% (1)		0
	3	DPA	J.3.5.1	J.4.4.4.1	<ol> <li>Lowest resistance</li> <li>Highest resistance</li> </ol>	4	0
Ш	1	Dielectric withstanding voltage	J.3.7.4	J.4.4.5.4	Any resistance	10	0
	2	Insulation resistance	J.3.7.5	J.4.4.5.5			
	1	Resistance-temperature characteristic	J.3.7.3	J.4.4.5.3			
ш	2	Low temperature operation	J.3.9.6	J.4.4.7.6	10Highest resistance 10Critical resistance	30	0
	3	Short-time overload	J.3.7.6	J.4.4.5.6	10 Lowest resistance		
IV	1	Moisture resistance	J.3.9.4	J.4.4.7.4	10Highest resistance 10Critical resistance 10 Lowest resistance	30	0
V	1	Life	J.3.10.1	J.4.4.8.1	77 Highest resistance 77 Critical resistance 77 Lowest resistance	231	0
VI	1	Stability	J.3.9.7	J.4.4.7.7	10 Highest resistance 10 Critical resistance 10 Lowest resistance	30	0
	1	Resistance to bonding exposure	J.3.8.4	J.4.4.6.4			
VII	2	Shock	J.3.9.2	J.4.4.7.2	Any resistance	10	0
	3	Thermal shock [II]	J.3.9.3	J.4.4.7.3.2			
VIII	1	Random vibration	J.3.9.1	J.4.4.7.1	Any resistance	10	0
	1	Solderability	J.3.8.1	J.4.4.6.1	Any resistance 10		0
IX	2	Resistance to solvent	J.3.9.5	J.4.4.7.5			0
х	1	Adhesion	J.3.8.2	J.4.4.6.2	Any resistance	10	0
XI	1	Board bending	J.3.8.3	J.4.4.6.3	Any resistance	10	0
-	1	Materials	J.3.2	-	(2)		

Notes:

 $^{(1)}\mbox{For dimensions}$  and mass, the sample size shall be 1.0% of the acceptable quality level (AQL) in "Special Inspection Level S-4" specified in JIS Z 9015-1.

<sup>(2)</sup> Data to certify compliance with design specifications shall be submitted.

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J.4.3	Quality Conformance In The quality conformance QTS-2050 and as provid	e inspection shall be as specified	in paragraph 4.5	of JAXA-
J.4.3.1	of JAXA-QTS-2050. I samples that have pa and C inspections sha structures. Resistors	nfiguration of group A shall be as nspection lots for Group B and C ssed Group A inspections. Unles all be performed for all combination with the critical resistance or the o ther, the highest grade of charact	inspections shall s otherwise speci ons of shapes and closest to the critic	consist of fied, Group B I terminal cal resistance
J.4.3.2	conformance inspecti respectively. Group t	Number of Samples er of samples of the Group A, B ar on shall be as specified in Tables ests shall be performed in subgro all be performed in the specified o	J-12, J-13 and J oup order and the	-14,
J.4.3.3	each inspection group defects does not exce mode of a defect is ca	pecified in Table J-12, J-13 or J-1 o of the quality conformance inspe eed the permitted number specifie atastrophic, such as open- or sho ost, the resistor fails the Group A i	ection. When the ed in Table J-12, t rt-circuit where th	number of out the failure
J.4.3.4	be shipped. If the lot of Group A1-3 inspec inspection, and only t	of Sample rejected in the Group A quality co has not passed test order 1 of Gr tion, all products of the lot shall be he good products shall be shipped spections shall not be shipped.	roup A1-2 inspect e subjected to the	ion or any tes e failed

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r			-	•	、 •	•	
		Inspe	ction			Criteria for Pass/fail	
Group	roup Sub- group Order		ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
		1	Thermal shock (I)	J.3.9.3.1	J.4.4.7.3.1		
	1	2	Power conditioning (if specified)	J.3.7.7	J.4.4.5.7	100%	0
		3	Resistance	J.3.7.2	J.4.4.5.2		
A1 2		1	Externals, dimensions and marking	J.3.4	J.4.4.3	AQL <sup>(1)</sup> 4.0%	
		2	DPA	J.3.5.1	J.4.4.4.1	4	0
	3	1	Dielectric withstanding voltage	J.3.7.4	J.4.4.5.4	AQL <sup>(1)</sup> 2.5%	
		2	Insulation resistance	J.3.7.5	J.4.4.5.5		
		1	Resistance to bonding exposure	J.3.8.4	J.4.4.6.4		
A2	1	2	Resistance-temperature characteristic	J.3.7.3	J.4.4.5.3	AQL <sup>(</sup>	<sup>1)</sup> 2.5%
		3	Low temperature operation	J.3.9.6	J.4.4.7.6		
		4	Short-time overload	J.3.7.6	J.4.4.5.6		
	2	1	Solderability	J.3.8.1	J.4.4.6.1	AQL (*	<sup>I)</sup> 2.5%
	3	1	Adhesion	J.3.8.2	J.4.4.6.2	AQL <sup>(1)</sup> 2.5%	

Table J-12.	Quality Conformance	Inspection (Group A)
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Note:<sup>(1)</sup> The sampling plan shall be in accordance with Appendix 1 of JIS Z 9015-1. "Normal Inspection Level II" specified therein shall apply to test order 1 of Group A1-2 inspection. "Special Inspection Level S-4" shall apply to the Group A1-3 and A2 inspections.

Inspection					Criteria for Pass/fail		
Group	Sub- group	Order	ltem	Requirement Test method paragraph paragraph		Sample size	No. of defectives allowed
	1	1	Moisture resistance	J.3.9.4	J.4.4.7.4	10	0
	2	1	Life	J.3.10.1	J.4.4.8.1	10	0
B1	B1 3	1	Stability	J.3.9.7	J.4.4.7.7	10	0
	4	1	Resistance to solvents	J.3.9.5	J.4.4.7.5	10	0
	5	1	Board bending	J.3.8.3	J.4.4.6.3	5	0

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Table J-14.	Quality Conformance	Inspection (Group C)
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Inspection					Criteria for Pass/fail		
Group	Group Sub- group Order		ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
C1 1		1	Shock	J.3.9.2	J.4.4.7.2	10	0
		2	Thermal shock [II]	J.3.9.3.2	J.4.4.7.3	10	U
	2	1	Random vibration	J.3.9.1	J.4.4.7.1	10	0

#### J.4.4 Methods for Test and Inspection

#### J.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

- b) Reference conditions Reference conditions shall be a temperature of 25°C and an atmospheric pressure of 101.3kPa.
- c) Judgment conditions
   Judgment conditions shall be either condition A or B specified in Table J-15.
   Unless specified, condition A shall apply.

Condition	А	В
Temperature (°C)	23±2	20±2
Relative humidity (%)	50±5	65±5
Atmospheric pressure (kPa)	86 to 106	86 to 106

Table J-15. Judgment Conditions

# J.4.4.2 Method of Mounting

If the mounting is required in this specification, the resistor shall be mounted in accordance with the following methods. If the mounting is not required, resistor may not be mounted on the test board in any other appropriate methods.

a) Test board

Resistor shall be mounted on an appropriate printed wiring boards shown in Figure J-2. The printed wiring boards shall be either an alumina substrate (alumina of



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29 June 2021       Parts Specification       I age       Porto P         shall be polished and examined by a 20 to 200x magnifier for the resistor film, electrode, thickness of protective coating, and connection of resistor film and electrodes.       b) The protective film of resistor shall be dissolved by a chemical and inspected by a 20 to 200x magnifier for the condition of the resistor pattern.         The examinations a) and b) above shall require the respective samples to be photographed and recorded.         J.4.4.5       Electrical Performance         The test for electrical performances shall be conducted as follows.         J.4.4.5.1       Application of Pulse         A dc test voltage which is 2.5 times the rated voltage or the equivalent pulse shall be applied for 1 second to the resistors. The test voltage shall not exceed 2 times the maximum overload voltage specified in the detail specification. At the completion of this test, the resistors shall be visually examined for evidence of							
<ul> <li>arcing, insulation breakdown and mechanical damage.</li> <li>J.4.4.5.2 Resistance <ul> <li>The resistance test shall be performed in accordance with Test Method 303 of MIL-STD-202. The following conditions shall apply.</li> <li>a) Applied voltage <ul> <li>If pass/fail results are questionable, the conditions specified in Table J-16 shall apply.</li> </ul> </li> <li>b) Temperature: <ul> <li>As a rule, the resistance test of Group I of the qualification test and Group A1-1 of Group A test shall be performed at 25±2°C. Unless otherwise specified, the temperature at which subsequent and final resistance measurements are made shall be within ±2°C of the temperature at which the initial measurement was made.</li> </ul> </li> </ul></li></ul>							
		Table J-16. Appli	ed Voltage				
			-	Unit: V <sub>DC</sub>			
	Nominal re	esistance (Ω)	Maximum tes	t voltage			
	Less	than 10	0.1 as a max	kimum <sup>(1)</sup>			
	10 or more an	d less than 100	0.3				
	100 or more a	and less than 1k	1				
	1k or more an	d less than 10k	3				
	10k or more an	d less than 100k	10				
	100k or more a	and less than 1M	25				

Note<sup>(1)</sup> The power applied to the resistor shall be 10% of the rated power as a maximum.

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J.4.4.5.3       Resistance-Temperature Characteristic         The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following conditions shall apply.         a)       Mounting method         The resistors shall be mounted as specified in paragraph J.4.4.2.         b)       Reference temperature: 25°C         c)       Test temperature: As specified in table J-17.         d)       Test : The resistance shall be measured at each temperature after the resistor reaches a condition of thermal equilibrium. The temperature shall be maintained within the temperature tolerance specified in Table J-17.         e)       Unit of resistance-temperature characteristic: 10 <sup>-6</sup> /°C.         Unit of resistance-temperature characteristic: 10 <sup>-6</sup> /°C.         Unit: °C         Order       Temperature							
	1	25±3					
	2	Minimum operating temperature ±	±3				
	3	25±3					
	4	Maximum operating temperature	±3				
<ul> <li>J.4.4.5.4 Dielectric Withstanding Voltage</li> <li>J.4.4.5.4.1 Atmospheric Pressure <ul> <li>Resistors shall be tested in accordance with Test Method 301 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Method of mounting <ul> <li>Mount the resistor with its insulation jacket upward on the metal plate so that the tip of the metal block is positioned at approximately the center of the resistor's two electrodes as shown in Figure J-3, and pressurize at 1.0±0.2N.</li> <li>b) Measurement before test <ul> <li>The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>c) Test voltage <ul> <li>The test voltages of 150±15V<sub>AC</sub> (root-mean-square value at commercial-line frequency) shall be applied between the measuring point A on the metal block and measuring point B on the metal plate.</li> <li>d) Duration of test: 1 minute <sup>10</sup><sub>0</sub> seconds</li> <li>e) Measurement during test <ul> <li>The leak current shall be measured throughout the test, and the</li> </ul> </li> </ul> </li> </ul> </li> </ul></li></ul></li></ul>							
	<ul> <li>The leak current shall be measured throughout the test, and the resistors shall be examined for evidence of arcing and any breakage.</li> <li>f) Measurement after test</li> <li>The resistance shall be measured in accordance with paragraph J.4.4.5.2 to measure the resistance after the test.</li> </ul>						



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	<ul> <li>a) Mounting method The resistors shall be mounted as specified in item a), paragraph J.4.4.5.4.1.</li> <li>b) Test voltage: 100±10V<sub>DC</sub> (direct-current voltage)</li> <li>c) Duration of application of test voltage: About 1 minute</li> </ul>						
J.4.4.5.6	<ul> <li>this measurement,</li> <li>the resistors for 5±</li> <li>maximum overload</li> <li>conditions shall ap</li> <li>a) Mounting method</li> <li>b) Test temperature</li> <li>The test temperature</li> <li>than the heat of</li> <li>c) Measurement of</li> <li>the resistors of</li> <li>the test voltag</li> <li>with paragraph</li> <li>d) Examination at</li> </ul>	Ill be measured as specified in par dc test voltage of 2.5 times the ra 1 seconds. The test voltage shall I voltage specified in the detail spe ply. nod: As specified in paragraph J.4. ure erature shall be at 25±3°C in still a of the resistors being operated. after test shall remain at room temperature to e is removed before the resistance n J.4.4.5.2.	ted voltage shall not exceed 2 tim ecification. The fo 4.2. air, with no circula for 30 minutes or e is measured in	be applied to es the bllowing tion other more after accordance			
J.4.4.5.7	<ul> <li>108 of MIL-STD-20</li> <li>a) Test temperatulation</li> <li>b) Measurement</li> <li>The resistance</li> <li>measurement</li> <li>1) Measurement</li> <li>1) Measurement</li> <li>1) Measurement</li> <li>1) Measurement</li> <li>1) Measurement</li> <li>Place the resistance</li> <li>reference for</li> <li>2) Measurement</li> <li>after the resistence</li> <li>c) Operating condition</li> <li>1) Option A</li> <li>The rated voltage</li> <li>resistor internation</li> </ul>	pointing test shall be performed in ac optiming test shall be performed in ac 22. The following details and exce are: $85_0^{+5}$ °C after test a shall be measured in accordance may be performed inside or outside ent inside the chamber esistor inside the chamber esistor inside the chamber and state emperature for 8 hours. Then the re- formed. This fist measurement ter or all other subsequent measurement ent outside the chamber rement before the test shall be per- sistor is mounted on the test jig. The eshall be used as a reference for a ents under the same condition.	ptions shall apply e with paragraph de of the chambe bilize the chambe measurement bet mperature shall b ents under the sa formed at room t his fist measuren all other subsequ	<ul> <li>J.4.4.5.2. The r.</li> <li>er temperature fore the test e used as a ume condition.</li> <li>emperature nent ent</li> <li>oplied to the the applicable</li> </ul>			

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<ul> <li>29 June 2021 Parts Specification 1 uge 0 122</li> <li>2) Option B The DC or AC (root-mean-square value at commercial-line frequency) voltage which is 1.5 times the rated voltage shall be applied to the resistor intermittently, 90 minutes ON and 30 minutes OFF for the applicable number of hours. This voltage shall not exceed the maximum operating voltage specified in detail specification. The temperature of the resistive element shall not exceed the maximum operating temperature specified in detail specification at any time during the test. If necessary to fulfill this purpose, the ambient temperature can be adjusted. The tolerance for applied voltage shall be within ±5%.</li> <li>d) Test duration <ol> <li>Option A: 168<sub>0</sub><sup>+24</sup> hours</li> <li>Option B: 100±4 hours</li> </ol> </li> <li>e) Measurement after test <ol> <li>Measurement outside the chamber</li> <li>The resistor shall be left outside the chamber for 45 minuets or longer and then measured as specified in paragraph J.4.4.5.2.</li> </ol> </li> <li>f) Examination after test <ol> <li>Examination after test</li> <li>Examination after test</li> </ol> </li> </ul>					
	magnifier of 20				
	anical Performa nechanical perfo	nce ormance tests of the resistor shall	be performed as	follows.	
The Hov a b cj d	vever, the follow ) Solder type Tin-lead allo inactivated f ) Solder temp ) Solder imme ) Procedure Both electro ) Examination	nall be examined for solder wettab	of 60% including Ider at the same	time.	
The 520	1-1. The follow Mounting meth	shall be performed in accordance <i>v</i> ing conditions shall apply. od. shall be mounted as specified in p			



	QTS-2050E une 2021	J A X A Parts Specification	Page	– J-24 –			
Copper foi 2. The solo figure.	Copper foil 0.035mm 2. The solder resist (solder heat resistance resin) shall be applied to the shaded area in the figure. 3. The values in parentheses in the figure and table above are for reference. <b>Figure J-5. Test Board for Board Bending Test</b>						
	•						
J.4.4.6.4 Resistance to Bonding Exposure The resistance shall be measured as specified in paragraph J.4.4.5.2. The resistor shall be mounted on a test board as specified in paragraph J.4.4.2 and shall remain at room temperature for 4 to 12 hours. After the test, the resistance shall be measured in accordance with paragraph J.4.4.5.2 and the resistor shall be examined for mechanical damage and solder leaching using a magnifier of 20x or greater.							
-	nvironmental Perfor he environmental pe		ed as follows.				
<ul> <li>The environmental performance tests shall be performed as follows.</li> <li>J.4.4.7.1 Random Vibration <ul> <li>Resistors shall be tested in accordance with Test Method 214 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Method of mounting <ul> <li>The resistors shall be mounted in accordance with paragraph J.4.4.2.</li> <li>b) Measurement before test</li> <li>The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>c) Test condition: II-H Frequency range: 50 to 2,000Hz</li> <li>Rms value of acceleration: 334m/s<sup>2</sup> rms</li> </ul> </li> <li>d) Direction of motion: In each of three mutually perpendicular directions.</li> <li>e) Number of application and duration of vibration <ul> <li>Vibration shall be applied for 3 minutes in each direction with a total test time of 9 minutes.</li> </ul> </li> <li>f) Measurement during test <ul> <li>Each resistor shall be monitored for evidence of electrical discontinuity of 0.1ms or greater during the vibration.</li> <li>g) Measurement after test</li> <li>The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> </ul> </li> </ul></li></ul>				.4.2. J.4.4.5.2. ions. ital test time of tinuity of J.4.4.5.2.			
<ul> <li>J.4.4.7.2 Shock</li> <li>Resistors shall be tested in accordance with Test Method 213 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Method of mounting The resistors shall be mounted in accordance with paragraph J.4.4.2.</li> <li>b) Measurement before test The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> </ul>				.4.2.			

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<ul> <li>c) Test condition: I (980m/s<sup>2</sup>, 6ms sawtooth).</li> <li>d) Direction of applied shocks: In each of three mutually perpendicular directions.</li> <li>e) Number of applied shocks The resistors shall be subjected to 5 shocks in each direction, for a total of 15.</li> <li>f) Measurement during test Each resistor shall be monitored during the shock for evidence of electrical discontinuity of 0.1ms or greater.</li> <li>g) Measurement after test The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>h) Examination after test The resistors shall be examined for evidence of mechanical damage using a magnifier of 20x or greater.</li> </ul>					
J.4.4.7.3	Thermal Shoo				
J.4.4.7.3.1	The followin a) Test cond The test b) Number of c) Measurer d) Examinat The resis magnifier	all be tested in accordance with Tes g details and exceptions shall apply. ion ondition shall be in accordance with test cycles: 5 cycles ents before and after test: None	Table J-18. of mechanical dam		
	Step	Temperature (°C)	Time (min.)		
	1		15		
	2	25 <sup>+10</sup> -5	5 max.		
	3	+5	15		
	4	+10	5 max.		
<ul> <li>J.4.4.7.3.2 Thermal Shock [II] Resistors shall be tested in accordance with Test Method 107 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Method of mounting The resistors shall be mounted in accordance with paragraph J.4.4.2.</li> <li>b) Measurement before test The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>c) Test condition The test condition shall be in accordance with Table J-19.</li> <li>d) Number of test cycles: 1,000 cycles</li> </ul>					

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<ul> <li>e) Measurements during test and external inspection The resistance shall be measured after the resistors are at room temperature for 30 minutes or more at each 25<sup>+5</sup>/<sub>0</sub> cycles, 50<sup>+5</sup>/<sub>0</sub> cycles, 100<sup>+10</sup>/<sub>0</sub> cycles, 250<sup>+10</sup>/<sub>0</sub> cycles, 500<sup>+10</sup>/<sub>0</sub> cycles and 1,000<sup>+10</sup>/<sub>0</sub> cycles.</li> <li>1) Resistance measurement The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>2) External examination The resistors shall be examined for evidence of mechanical damage using a magnifier of 20x or greater.</li> <li>Table J-19. Test Conditions of Thermal Shock [II]</li> </ul>					
	St	<b>a a 0</b>	Time (min.)	_	
		or +10	15 5 m o v	-	
		400 +5	5 max.	_	
			15	_	
	2	$25_{-5}^{+10}$	5 max.		
<ul> <li>J.4.4.7.4 Moisture Resistance</li> <li>Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.</li> <li>a) Method of mounting <ul> <li>As specified in paragraph J.4.4.2.</li> <li>b) Measurement before test</li> <li>The resistance shall be measured in accordance with paragraph J.4.4.5.2.</li> <li>c) Polarization and loading voltage</li> <li>No voltage shall be applied.</li> <li>d) Subcycle</li> <li>Step 7b shall not be applicable. Step 7a shall only be performed during any five of the first nine cycles.</li> <li>e) Measurements at high humidity: None</li> <li>f) Measurement after test</li> <li>Upon completion of step 6 of the final cycle, the resistors shall be removed from the chamber and maintained at room temperature for 30 minutes or more. The resistance shall then be measured in accordance with paragraph J.4.4.5.2.</li> </ul> </li> <li>g) Examination after test</li> <li>The resistors shall be examined for evidence of mechanical damage using a magnifier of 20x or greater.</li> </ul>					
<ul> <li>J.4.4.7.5 Resistance to Solvents</li> <li>Resistors shall be tested in accordance with Test Method 215 of MIL-STD-202.</li> <li>The following details and exceptions shall apply.</li> <li>a) Application area: Marked portion</li> <li>b) Solvents to be used</li> </ul>					

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	<ol> <li>2-propanol (Isopropyl alcohol)</li> <li>42 parts by volume of water, one part by volume of propylene glycol monomethyl ether and one part by volume of monoethanolamine.</li> <li>c) Examination after test The resistors shall be examined for evidence of mechanical damage and marking legibility.</li> </ol>				
J.4.4.7.6	Low Temperature	Operation			
After the resistors are mounted on a test board as specified in paragraph J.4.4.2 and the resistance is measured in accordance with paragraph J.4.4.5.2, the resistors shall be put in a test chamber maintained at room temperature. The temperature in the chamber shall then be gradually decreased to the minimum operating temperature specified in the detail specification. After stabilizing at the specific temperature, the resistors shall remain at no load for 1 hour. The rated dc voltage shall then be applied for 45 minutes. Wait $15_{0}^{+15}$ minutes after the removal of voltage to gradually increase the chamber temperature to room temperature before the resistors are removed from the chamber. Any water droplets on the surface shall be removed. The resistors shall be left at room temperature for 1 hour or more but less than 2 hours. The resistance shall then be measured again as					
specified in paragraph J.4.4.5.2. After the test, the resistors shall be examined significant abnormality using a magnifier of 20x or greater.					
J.4.4.7.7 Stability After the resistors are mounted on a test board as specified in paragraph J.4.4.2 and the resistance is measured in accordance with paragraph J.4.4.5.2, the resistors shall be put in a test chamber maintained at room temperature. The temperature in the chamber shall then be gradually increased to the maximum operating temperature specified in the detail specification. After stabilizing at the specific temperature, the resistors shall remain at no load for 2,000 <sup>+72</sup> / <sub>0</sub> hours. When				2, the re. The naximum izing at the	
the specified test time has passed, the temperature shall gradually be returned to room temperature. The resistors shall then be removed from the test chamber and maintained at a temperature of 25±5°C for 6±1hours. The resistance shall then be measured in accordance with paragraph J.4.4.5.2 to calculate the change in resistance before and after the test. The dielectric withstanding voltage test (atmospheric pressure) and insulation resistance test shall then be performed as specified in paragraphs J.4.4.5.4.1 and J.4.4.5.5, respectively. After the test, the resistors shall be examined for significant abnormality using a magnifier of 20x or greater.				returned to chamber and shall then be nge in ge test rformed as he test, the	
J.4.4.8	Durability				
	The durability test sha	all be performed as follows.			
J.4.4.8.1		ested in accordance with Test Me Is and exceptions shall apply.	thod 108 of MIL-	STD-202.	

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a)	Method of mou	Inting		
α,		shall be mounted on a test board a	as specified in pa	radraph
		ed air circulation is employed, the	•	•
		ere shall be no direct impingement	•	
	the resistors.			
b)	Test temperatu	ıre: 85±5°C		
c)	Measurement			
,	Measurements	s may be taken inside or outside tl	he chamber. The	e resistance
	shall be meas	ured in accordance with paragrapl	h J.4.4.5.2.	
	1) Inside cha	mber		
	The resist	or shall be placed in the chamber.	A pre-test meas	urement sha
	be perforn	ned 8 hours after the temperature	inside the chamb	er is
	stabilized	at the test temperature. This mea	surement shall be	e used as th
	reference	temperature for all subsequent me	easurements und	er the same
	condition.			
	2) Outside ch			
		ors shall be mounted in the test fix	•	
	-	erformed at room temperature. Th		
		erence temperature for all subsequ	lent measuremer	nts under the
	same con			
d)	Test conditions		<b></b>	
		age specified in paragraph J.3.6 d	,	
		and 30 minutes off. The test voltage		
		naintain $\pm 5\%$ of the rated voltage. 5 for the qualification test and 2,000		
	Ũ			quanty
- )	conformance i	-		
e)	Measurements	-	4 000 +48 1	
		on test: $250^{+48}_{-0}$ hours, $500^{+48}_{-0}$ hours	$1,000^{+0.0}_{-0}$ hours a	and
	2,000 <sup>+72</sup> h	ours.		
	2) Quality cor	formance inspection: $250^{+48}_{-0}$ hours	s, 500 <sup>+48</sup> hours a	nd
	1,000 <sup>+48</sup> h	· ·	v	
0				
f)		during and after test		
	1) Inside char		radiatanaa ahall	ha magaura
		of the final 30 minute off time, the	e resistance shall	be measure
	2) Outside ch	nce with paragraph J.4.4.5.2.		
	,	esistors are at room temperature f	or a minimum of	15 minutes
		e resistance shall be measured in		
	J.4.4.5.2			i paragraph
a)	Examination at	ter test		
9/		shall be examined for evidence of	mechanical dama	age using a
	20x magnifier.			J
	5			

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J.4.5	Long-Term Storage			
	The products stored as inspections for total num a) External inspection ( For solderability and res terminal structure shall date shall be marked or	•	be subjected to t 7.2) ppling inspection able J-12. The r If the products di	he following for each e-examination d not pass the
J.4.6	Change of Tests and In Change of tests and ins QTS-2050.	spections pections shall be in accordance w	ith paragraph 4.8	3 of JAXA-
J.5.	PREPARATION FOR DEI Preparation for delivery sh	-IVERY nall be in accordance with paragra	ph 5 of JAXA-QT	S-2050.
J.6.	NOTES Refer to the paragraph 6 o	of JAXA-QTS-2050.		

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	APPENDIX G			
RESIST	ORS, FIXED, WIRE WOUND, POV	/ER TYPE		
			<b>a</b> <i>i</i>	
•				
-				
	Гуре			
	Resistance			
	e Tolerance			
	on Code		-	
	ents			
	cuments			
	cuments			
-				
	overage			
	e Wire			
	stance			
	Coating or Enclosure			
	ensions, Mass and Marking			
	and Marking			
	on, Dimensions and Mass			
•				
-	hic Inspection			
-				
	Resistance		G-6	
	Temperature Range		G-8	
G.3.5.3 Power Ra	ting		G-8	
G.3.5.4 Maximum	Power		G-8	
G.3.5.5 Voltage F	ating		G-9	
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G.3.6.1 Voltage A	ging		G-9	
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G.3.7 Mechanical P	rformance		G-10	
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G.3.7.2 Solderab	ity		G-10	

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		erformance		
G.3.8.1				
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G.3.8.4		sistance		
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G.3.8.6	=	ature Storage		
G.3.8.7	-			
	-			
G.3.9.1	Life			G-12
G.4. Quality	Assurance Pro	ovisions		G-13
G.4.1 In-	Process Inspe	ction		G-13
G.4.2 Qu	alification Test	t		G-13
G.4.2.1	Test Items a	nd Number of Samples		G-13
G.4.3 Qu	ality Conforma	ance Inspection		G-15
G.4.3.1	Inspection Ite	ems and Number of Samples		G-1
G.4.3.2	Criteria for P	Pass/Fail		G-15
G.4.3.3	Post-Test Di	sposition of Sample		G-18
G.4.4 Me	thods for Test	and Inspection		G-17
G.4.4.1	Test Condition	ons		G-17
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G.4.6 Ch	ange of Tests	and Inspections		G-32
	-	DELIVERY		

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: December 28, 2021

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APPENDIX G RESISTORS, FIXED, WIRE WOUND, POWER TYPE						
	RESISTOR	RS, FIXED, V		, POWER	TYPE	
G.1. General	G.1. General					
G.1.1 Scope						
• •	or the power	•	-	-	ility assurance ereinafter refer	
G.1.2 Classification	on					
Resistors co	overed by th	is specification	on shall be cla	ssified as	specified in Ta	able G-1.
		Table G-1	. Classificat	ion		
	Construc	tion		Style		
	Non-molde	d type RV	VS80, 81, 83, 84	4, 89 or det	ail specification	
G.1.3 Part Number The part nu details.		be indicated a	as follows. Re	fer to the c	detail specifica	tion for
Example 1:						
JAXA <sup>(1)</sup> <u>R</u>	·	<u>S</u> erminal type (G.1.3.2)	resistance	<u>F</u> Resistand tolerand (G.1.3.	ce code	e
	<b>、</b> ,	<b>、</b>	( , , , , , , , , , , , , , , , , , , ,	,	, (	,
Example 2:						
JAXA <sup>(1)</sup> 20	050/G	*** <sup>(2)</sup> Individual n	umber	<u>****(3)</u> Identifier character	indicating par ristics	t
Note: <sup>(1)</sup> "JAXA" indicates the common part for space use and may be abbreviated to "J". "NASDA" used in the detail specification may be abbreviated to "N". Note: <sup>(2)</sup> Individual number "***" shall be designated in accordance with JAXA-QTS-2000, paragraph A.2.2.2.3. Note: <sup>(3)</sup> Identifier indicating part characteristics shall be specified in detail specification.						

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#### G.1.3.1 Style

The style shall be identified by a three letter symbol, "RWS", and a two-digit number. The "RWS" indicates the high reliability, power type, wire wound, fixed resistors. The two-digit number indicates the power rating and physical size of the resistors.

The style except for RWS shall be specified in detail specification.

### G.1.3.2 Terminal Type

The terminal type shall be identified by a single letter symbol in accordance with Table G-2.

Symbol	Terminal
S	Solderable
W	Weldable

### Table G-2. Terminal Type

# G.1.3.3 Nominal Resistance

The nominal resistance shall be identified in ohms ( $\Omega$ ) by 4 alphanumeric characters. The first three digits represent significant figures and the last digit specifies the number of zeros to follow. When the value of resistance is less than 100 ohms, or when fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent a decimal point, and the succeeding digits of the group represent significant figures.

Example:	1R00=	1.00	Ω	
	10R0=	10.0	Ω	
	1000=	100	Ω	
	1001=	1,000	Ω=	1kΩ
	1002=1	10,000	Ω=	10kΩ

# G.1.3.4 Resistance Tolerance

The resistance tolerance shall be identified by a single capital letter in accordance with Table G-3.

. . . . . . .

	Unit: %	
Symbol	Resistance tolerance	
В	±0.1	
D	±0.5	
F	±1.0	
G	±2.0	
J	±5.0	

#### Table G-3. Resistance Tolerance

# G.1.3.5 Identification Code

The identification code shall be a single capital letter as specified in the detail specification. The indication of the identification code shall be agreed upon by the qualified manufacturer and JAXA.

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G.2.	Applicable Documents				
G.2.1	Applicable Documents				
	The applicable documents shall be as specified in paragraph 2.1 of JAXA-QTS- 2050.				
G.2.2	Reference Documents				
	The following is a refere a) MIL-PRF-39007	nce document. Resistors, Fixed, Wire Wound Reliability, Established Reliabil Specification for	· · · · · · · · · · · · · · · · · · ·		
G.3.	Requirements				
G.3.1 Qualification Coverage					
	Qualification shall be valid for resistors that are produced by the manufacturing line that conforms to materials, designs, constructions, specifications and performance as specified in paragraphs G.3.2 to G.3.9. The qualification coverage shall be represented by samples that have passed the qualification test. Terminal types and resistance tolerance of the resistors to be qualified shall be classified as specified in Tables G-4 and G-5. Within this coverage, the manufacturer shall be allowed to supply qualified products in accordance with the				

detail specification. If necessary, additional qualification coverage shall be specified in the detail specification.

Terminal submitted	Terminal qualified	
S	S	
W	W	
S S, W (Additional submission of 32 type "W" resistors a uncoated or unenclosed resistors)		
W	W, S (Additional submission of 32 type "S" resistors and four uncoated or unenclosed resistors)	

Table G-4. Termin	als Qualification
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Resistance tolerance submitted	Resistance tolerance qualified	
В	B, D, F, G, J	
D	D, F, G, J	
F	F, G, J	
G	G, J	
J	J	

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Т	/laterials he materials shall be s AXA-QTS-2050.	pecified as follows and as specifie	ed in paragraph 3	.3 of		
G.3.2.1	Resistance Wire Materials used for resistance wires shall not include impurities or other factors that may cause local weak points. The minimum diameter of the resistance wires shall be as specified in the detail specification.					
G.3.2.2	Base Substance The volume resistivity of the base substance shall be $10^8\Omega$ cm or more at a temperature of 300°C.					
G.3.2.3	Protective Coating or Enclosure The protective coating shall not crack, craze, chip, distort or form globules at any temperature up to and including +275°C, which could have an inverse influence on characteristics, regardless of the mounting position of the resistors. The material shall provide adequate protection against the effects of prolonged exposure to high humidity. The protective coating or enclosure shall minimize leakage paths between the terminals as a result of moisture film collecting on the resistor's exterior surface.					
G.3.2.4	Terminals The terminals shall be diameter.	e formed from conducting wires wi	th the specified le	ength and		
G.3.2.4.1		nall be suitably treated to satisfy th n a lead coating containing tin is u	•			
G.3.2.4.2		s shall satisfy the requirements of hich is specified in paragraph G.3	••			
G.3.2.5	use noncorrosive flux test shall be performe 3197, and it shall be v	all completely remove corrosive su When non-corrosive flux is used d in accordance with paragraph 5 verified that the water extract resis solder is used, the mass ratio rar	l, the water extrac (paragraph 8.1.1 tivity is greater th	ct resistivity ) of JIS Z nan 100kΩ∙cm		
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G.3.3	Externals, Dimensions,		sted in accordanc	ce with		
G.3.3.1	the performance of th manner to ensure leg a) Part number The marking of " precludes inclus marked as a min b) Year and week r	cks on the surface of the resistors e resistors. The following shall be ibility. JAXA" may be excluded. When th ion of the complete part number, r imum.	e clearly marked i ne physical size o nominal resistanc	n such a of the resistor e shall be		
	calendar year be	eginning with January shall be main me or its abbreviation.				
G.3.3.2	Construction, Dimensions and Mass The resistor element shall be protected from moisture by a protective coating or enclosure. The dimensions and mass shall satisfy the requirements specified in each detail specification.					
G.3.4	<ul> <li>accordance with the quate</li> <li>a) Resistance wire</li> <li>The resistance wire</li> <li>b) Pitch</li> <li>The average winding</li> <li>When the average</li> <li>the average winding of</li> <li>c) Effective winding of</li> <li>The effective winding of</li> <li>The effective winding of</li> <li>The effective winding of</li> <li>Coverage shall coverage</li> <li>d) Protective coating</li> <li>Resistor assemblied</li> </ul>	ng coverage shall be the area bet ires are wound in a uniform windir er a minimum of 80% of the overa or enclosure es shall be protected by a coating o	n paragraph 3.2.1 nots, except at er es the wire diame ds four times the e basis of technic ween the starting ng pitch. The effe ill winding area.	nd terminals. ter. wire diamete al rationale. and end ective winding ant insulating		
	including connection e) Terminals	Il completely cover the exterior of ons or termination. al leads shall be securely connect				
G.3.4.1		sted as specified in paragraph G.4 and protective coating or enclosur	=			

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		al structure and the materials shall	be as specified	in the quality
G.3.4.2	Radiographic Inspect			
	have foreign materials terminals and caps, c thickness of exterior c	sted as specified in paragraph G.4 s, welding or soldering scattering, aps tilting 5 degrees or more to co coating, winding pitch equal to or n eviation of exterior coating.	inadequate conn re, void exceedir	ection of ng 50% of
	parts, if tests are exer inspection at part des	t criteria from the point of view of on npted, and if other methods can s ign and process design, manufact tion and alternative methods in de	ubstitute radiogra	aphic
G.3.5	Ratings			
G.3.5.1	Nominal Resistance			
	resistance tolerance a	d values of nominal resistance sha and shall be as specified in Table ( s shall satisfy the requirements of t	G-6. The minimu	im and

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Table G-6.    Standard Resistance Values (1/2)												
Series name		E192				E96						
Resistance tolerance and symbols		B (±0.1%) D (±0.5%)				F (±1.0%)						
	10.0	14.7	21.5	31.6	46.4	68.1	10.0	14.7	21.5	31.6	46.4	68.1
	10.1	14.9	21.8	32.0	47.0	69.0						
	10.2	15.0	22.1	32.4	47.5	69.8	10.2	15.0	22.1	32.4	47.5	69.8
	10.4	15.2	22.3	32.8	48.1	70.6						
	10.5	15.4	22.6	33.2	48.7	71.5	10.5	15.4	22.6	33.2	48.7	71.5
	10.6	15.6	22.9	33.6	49.3	72.3						
	10.7	15.8	23.2	34.0	49.9	73.2	10.7	15.8	23.2	34.0	49.9	73.2
	10.9	16.0	23.4	34.4	50.5	74.1						
	11.0	16.2	23.7	34.8	51.1	75.0	11.0	16.2	23.7	34.8	51.1	75.0
	11.1	16.4	24.0	35.2	51.7	75.9						
	11.3	16.5	24.3	35.7	52.3	76.8	11.3	16.5	24.3	35.7	52.3	76.8
	11.4	16.7	24.6	36.1	53.0	77.7						
	11.5	16.9	24.9	36.5	53.6	78.7	11.5	16.9	24.9	36.5	53.6	78.7
Standard	11.7	17.2	25.2	37.0	54.2	79.6						
resistance	11.8	17.4	25.5	37.4	54.9	80.6	11.8	17.4	25.5	37.4	54.9	80.6
value	12.0	17.6	25.8	37.9	55.6	81.6						
(significant figures	12.1	17.8	26.1	38.3	56.2	82.5	12.1	17.8	26.1	38.3	56.2	82.5
without unit)	12.3	18.0	26.4	38.8	56.9	83.5						
,	12.4	18.2	26.7	39.2	57.6	84.5	12.4	18.2	26.7	39.2	57.6	84.5
	12.6	18.4	27.1	39.7	58.3	85.6						
	12.7	18.7	27.4	40.2	59.0	86.6	12.7	18.7	27.4	40.2	59.0	86.6
	12.9	18.9	27.7	40.7	59.7	87.6						
	13.0	19.1	28.0	41.2	60.4	88.7	13.0	19.1	28.0	41.2	60.4	88.7
	13.2	19.3	28.4	41.7	61.2	89.8						
	13.3	19.6	28.7	42.2	61.9	90.9	13.3	19.6	28.7	42.2	61.9	90.9
	13.5	19.8	29.1	42.7	62.6	92.0	40 -			40.0		00 f
	13.7	20.0	29.4	43.2	63.4	93.1	13.7	20.0	29.4	43.2	63.4	93.1
	13.8	20.3	29.8	43.7	64.2	94.2	44.0	00 5	00.4	44.0		05.0
	14.0	20.5	30.1	44.2	64.9	95.3	14.0	20.5	30.1	44.2	64.9	95.3
	14.2	20.8	30.5	44.8	65.7	96.5	44.0	04.0		45.0	00 5	07.0
	14.3	21.0	30.9	45.3	66.5	97.6	14.3	21.0	30.9	45.3	66.5	97.6
	14.5	21.3	31.2	45.9	67.3	98.8						

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Table 0	G-6. Standar	d Resistance Valu	ies (2/2)	
	Name of series	E24		
	Resistance tolerance and symbols	G (±2.0%) J (±5.0%)		
	Standard resistance value (significant figures without unit)	10 11 12 13 15 16 18 20 22 24 27 30 22 24 27 30 33 36 39 43 47 51 56 62 68 75 82		

## G.3.5.2 Operating Temperature Range

The operating temperature range shall be between -55 and +275°C.

## G.3.5.3 Power Rating

Resistors shall have a power rating as specified in the detail specification. The rated ambient temperature shall be 25°C.

## G.3.5.4 Maximum Power

The maximum power at or below the rated ambient temperature shall be equal to the power rating. For temperatures in excess of the rated ambient temperature, the maximum power shall be determined by derating the power rating in accordance with the derating curve shown in Figure G-1.



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	for each of the tempe specified in the detail	ratures specified in Table G-13 sh specification.	all satisfy the req	uirements			
G.3.6.4	Dielectric Withstanding Voltage When tested as specified in paragraph G.4.4.4.5, resistors shall withstand the specified test voltage, and the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of flashover or arcing, insulation breakdown or mechanical damage after the completion of the test. The leakage current during the test shall satisfy the requirements of the detail specification.						
G.3.6.5 Insulation Resistance When resistors are tested as specified in paragraph G.4.4.4.6, the insulation resistance shall satisfy the requirements of the detail specification.							
G.3.6.6	Short-Time Overload When resistors are tested as specified in paragraph G.4.4.4.4, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of arcing, burning, or charring after the completion of this test.						
G.3.7	Mechanical Performanc Resistors shall satisfy th	e le following mechanical requireme	nts.				
G.3.7.1	resistance before and specification. There s	sted as specified in paragraph G.4 after the test shall satisfy the requishall be no evidence of breaking of chanical damage after the complet	uirements of the o	detail			
G.3.7.2	the terminal surface s pinholes or rough are	sted as specified in paragraph G.4 hall be evenly covered with new so as shall be acceptable, provided th area of the pinholes or rough area	older. The existen at they are not c	ence of small concentrated			

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<ul> <li>G.3.7.3 Resistance to Soldering Heat</li> <li>When resistors are tested as specified in paragraph G.4.4.5.3, the change in resistance before and after the test shall satisfy requirements specified in detail specification. Resistors shall not have mechanical damages after the completion of the test.</li> </ul>							
G.3.8 Environmental Perform Resistors shall satisfy t	ance he following environmental require	ments.					
G.3.8.1 Vibration							
resistance before specification. The	ibration e tested as specified in paragraph ( and after the test shall satisfy the r re shall be no electrical discontinui idence of mechanical damage after	equirements of th ty of 0.1ms or lor	ne detail nger during				
resistance before specification. The	e tested as specified in paragraph ( and after the test shall satisfy the re re shall be no electrical discontinui idence of mechanical damage after	equirements of th ty of 0.1ms or lor	ne detail nger during				
resistance before and specification. There	ested as specified in paragraph G.4 d after the test shall satisfy the requishall be no electrical discontinuity of mechanical damage after the co	uirements of the o of 0.1ms or longe	detail er during the				
G.3.8.3 Thermal Shock							
resistance before	e tested as specified in paragraph ( and after the test shall satisfy the r re shall be no evidence of mechan test.	equirements of th	ne detail				
	e tested as specified in paragraph ( and after the test shall satisfy the re		•				

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	completion of the t	e shall be no evidence of mechan est. Fine cracks on the surface of nen subjected to more than 100 cy	the resistors sha		
G.3.8.4	resistance before and specification. In addit paragraph G.3.6.4, ar	sted as specified in paragraph G.4 I after the test shall satisfy the requision, the dielectric withstanding vol and the insulation resistance shall s There shall be no evidence of mech	uirements of the ltage shall be as atisfy the require	detail specified in ments of the	
G.3.8.5		ts sted as specified in paragraph G.4 letails shall be as defined in the de		-	
G.3.8.6	5 Low Temperature Storage When resistors are tested as specified in paragraph G.4.4.6.6, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completion of the test.				
G.3.8.7	3.7 Stability When resistors are tested as specified in paragraph G.4.4.6.7, the change in resistance before and after the test shall satisfy the requirements of the detail specification. There shall be no evidence of mechanical damage after the completio of the test.				
G.3.9	Durability Resistors shall satisfy th	ne following durability requirements	S.		
G.3.9.1	resistance before and	sted as specified in paragraph G.4 I after the test shall satisfy the requishall be no evidence of mechanica	uirements of the	detail	

•	JAXA-QTS-2050E 29 June 2021	J A X A Parts Specification	Page	– G-13 –		
G.4.	Quality Assurance Provision	ons				
G.4.1	In-Process Inspection					
	The in-process inspection 2050.	on shall be as specified in paragra	ph 4.3 of JAXA-G	TS-		
G.4.2	Qualification Test					
	The qualification test sha as provided below.	all be as specified in paragraph 4.	4 of JAXA-QTS-2	2050 and		
G.4.2.1	Test Items and Numb	er of Samples				
The number of samples of the qualification test shall be as specified in Table G-7. Each resistor style and terminal type shall be qualified separately. When terminal type "S" in a style is submitted, qualification for type "W" shall be granted with the added submission of 32 type "W" resistors to Group I, IA, and III tests and 4 type "W" resistors to Group VI test of Table G-7. The samples shall be divided into groups to separately undergo each test group as specified in Table G-7. When terminal type "W" in a style is submitted, qualification for type "S" shall be granted with the added submission of 32 type "S" resistors to Group I, IA, and III tests and 4 type "S" resistors to the Group VI test of Table G-7. The samples shall be divided into groups to separately undergo each test group as specified in Table G-7. When terminal type "W" in a style is submitted, qualification for type "S" shall be granted with the added submission of 32 type "S" resistors to Group I, IA, and III tests and 4 type "S" resistors to the Group VI test of Table G-7. The samples shall be divided into groups to separately undergo each test group as specified in Table G-7.						
Tests within each group shall be performed in the order specified in Table G-7. Upor completion of Group I and IA tests in that order, Group IB through VIII tests shall be performed using samples allocated to the appropriate group tests. Group IB through VIII tests are not required to be performed in the group number.						

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		Та	able G-7.	Qualification	on Test			
		Test	Require-			Criteria for Pass/fa	ail	
Group	Order	Item	ment paragraph	Test method paragraph	Sample size		No. of defectives allowed <sup>(1)</sup>	
	1	Voltage aging	G.3.6.1	G.4.4.4.1				
I	2	Resistance	G.3.6.2	G.4.4.4.2				
IA	1	Externals, dimensions, mass and marking <sup>(2)</sup>	G.3.3	G.4.4.2		100%	0	
	2	Radiographic inspection (5)	G.3.4.2	G.4.4.3.2	2			
IB	1	DPA	G.3.4.1	G.4.4.3.1		2	0	
П	1	Solderability	G.3.7.2	G.4.4.5.2			0	
11	2	Resistance to solvents	G.3.8.5	G.4.4.6.5		2 Any resistance		
	1	Thermal shock [I]	G.3.8.3.1	G.4.4.6.3.1				
	2	Resistance-temperature characteristic	G.3.6.3	G.4.4.4.3	(16	(16 Highest resistance		
	3	Low temperature storage	G.3.8.6	G.4.4.6.6				
	4	Short-time overload	G.3.6.6	G.4.4.4.4	32	22		
ш	5	Dielectric withstanding voltage	G.3.6.4	G.4.4.4.5	16	Lowest resistance		
	6	Insulation resistance	G.3.6.5	G.4.4.4.6		Lowoot roolotanoo	1	
	7	Resistance to soldering heat	G.3.7.3	G.4.4.5.3				
	8	Moisture resistance	G.3.8.4	G.4.4.6.4				
	9	Terminal strength	G.3.7.1	G.4.4.5.1				
	1	Shock	G.3.8.2	G.4.4.6.2	16	Highest resistance		
IV	2	High frequency vibration	G.3.8.1.1	G.4.4.6.1.1	32		1	
	3	Thermal shock [II]	G.3.8.3.2	G.4.4.6.3.2	<sup>5</sup> [16	Lowest resistance		
v	1	Random vibration	G.3.8.1.2	G.4.4.6.1.2	$\begin{array}{c} 32 \\ 32 \\ 16 \end{array}$	Highest resistance Lowest resistance	0	
VI	1	Externals and construction (uncoated or unenclosed)	G.3.3	G.4.4.2	4 {2 2 l	Highest resistance owest resistance	0	
VII	1	Life	G.3.9.1	G.4.4.7.1	230 { 115 230 { 115	•	0	
VIII	1	Stability	G.3.8.7	G.4.4.6.7	102 { 51 51	Highest resistance Lowest resistance	1	
-	1	Materials	G.3.2	-		(4)		

#### Notes:

<sup>(1)</sup>When a sample has failed to pass one or more tests of one group, it shall be counted as a single defective.

<sup>(2)</sup> For dimensions and mass, sample size shall be 1.0% of the acceptable quality level (AQL) in "Normal Inspection Level II" specified in Appendix 1 of JIS Z 9015-1 or 10 samples, whichever is greater.

 $^{(3)}$  This note<sup>(3)</sup> is deleted.

<sup>(4)</sup> Data to certify compliance with design specifications shall be submitted.

<sup>(5)</sup> When radiographic inspection has been performed as a part of in-process inspection in the manufacturing process, the inspection record may be substituted for qualification test.

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## G.4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph 4.5 of JAXA-QTS-2050 and as provided below.

## G.4.3.1 Inspection Items and Number of Samples

The items and number of samples of the Group A, B, and C inspections of the quality conformance inspection shall be specified in Tables G-8, G-9 and G-10, respectively. Group tests shall be performed in the group order and the inspections within each group shall be performed in the specified order. The sampling plan used for the Group A inspection shall be in accordance with JIS Z 9015-1. "General Inspection Level II" and "Special Inspection Level S-4" specified therein shall apply to the Group A2 and A4 inspections, respectively. The constant sampling shall be applied to the Group A3 inspection.

## G.4.3.2 Criteria for Pass/Fail

A failure of any test specified in Table G-8, G-9 or G-10 shall constitute failure of each inspection group of the quality conformance inspection.

When the number of defects does not exceed the permitted number specified in Table G-8, but the failure mode of the defect is catastrophic, such as open- or short-circuit where the function of the resistor might be lost, the resistor fails the Group A inspections.

## G.4.3.3 Post-Test Disposition of Sample

Products from the lot rejected in the Group A quality conformance inspection shall not be shipped. If the lot has not passed the Group A2 or A4 inspection, all products of the lot shall be subjected to the failed inspection item, and only the good products shall be shipped. The samples which have been soldered or subjected to the DPA inspection shall not be delivered.

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			-		-	
		Inspection		Test	Criteria for Pass/fail	
Group	Order	Item	Requirement paragraph	method paragraph	Sample size	No. of defectives allowed
A1	1	Voltage aging	G.3.6.1	G.4.4.4.1	100%	0) 4.0%
	2	Resistance	G.3.6.2	G.4.4.4.2	100 /0	
A2	1	Externals, dimensions, mass and marking <sup>(1)</sup>	G.3.3	G.4.4.2	AQL <sup>(2)</sup> 4.0%	
A3	1	Radiographic inspection <sup>(5)</sup>	G.3.4.2	G.4.4.3.2	100%	0
A4	1	DPA	G.3.4.1	G.4.4.3.1	2	0
	1	Thermal shock [I]	G.3.8.3.1	G.4.4.6.3.1		
A5	2	Short-time overload	G.3.6.6	G.4.4.4.4	AQL <sup>(2)</sup> 2.5%	
Ab	3	Dielectric withstanding voltage <sup>(3) (4)</sup>	G.3.6.4	G.4.4.4.5	AQL	2.0%
	4	Insulation resistance	G.3.6.5	G.4.4.4.6		

## Table G-8. Quality Conformance Inspection (Group A)

Notes:<sup>(1)</sup> Sample fails the test only when marking is illegible. Marking shall be clearly legible at the completion of all tests.

<sup>(2)</sup> The sampling plan shall be in accordance with JIS Z 9015-1. "General Inspection Level II" and "Special Inspection Level S-4" specified therein shall apply to the Group A2 and A4 inspections, respectively.

<sup>(3)</sup> Only the leakage current shall be tested, and the resistance shall not be measured before and after the test.

<sup>(4)</sup> The test shall be performed at ambient pressure only.

<sup>(5)</sup> When radiographic inspection has been performed as a part of in-process inspection in the manufacturing process, the inspection record may be substituted for the quality conformance inspection.

		Inspection			Criteria fo	or Pass/fail
Group	Order	ltem	Requirement paragraph	Test method paragraph	Sample size	No. of defectives allowed
	1	Thermal shock [I]	G.3.8.3.1	G.4.4.6.3.1		
	2	Resistance-temperature characteristic	G.3.6.3	G.4.4.4.3		
	3	Low temperature storage	G.3.8.6	G.4.4.6.6		
	4	Short-time overload	G.3.6.6	G.4.4.4.4		
B1	5	Dielectric withstanding voltage	G.3.6.4	G.4.4.4.5	10	0
	6	Insulation resistance	G.3.6.5	G.4.4.4.6		
	7	Resistance to soldering heat	G.3.7.3	G.4.4.5.3		
	8	Moisture resistance	G.3.8.4	G.4.4.6.4		
	9	Terminal strength	G.3.7.1	G.4.4.5.1		
B2	1	Solderability	G.3.7.2	G.4.4.5.2	0	0
DZ	2	Resistance to solvents	G.3.8.5	G.4.4.6.5	8	U
B3	1	Life	G.3.9.1	G.4.4.7.1	10	0
B4	1	Stability	G.3.8.7	G.4.4.6.7	10	0

 Table G-9. Quality Conformance Inspection (Group B)

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	Inspection			– Test –		Criteria for Pass/fail	
Group	Order	ltem	Requirement paragraph	method paragraph	Sample size	No. of defectives allowed	
C1	1	Shock	G.3.8.2	G.4.4.6.2	10	0	
	2	High frequency vibration	G.3.8.1.1	G.4.4.6.1.1			
C2	1	Thermal shock [II]	G.3.8.3.2	G.4.4.6.3.2	10	0	
C3	1	Random vibration	G.3.8.1.2	G.4.4.6.1.2	10	0	
C4	1	Externals and construction (uncoated or unenclosed)	G.3.3	G.4.4.2	4	0	

## Table G-10. Quality Conformance Inspection (Group C)

#### G.4.4 Methods for Test and Inspection

#### G.4.4.1 Test Conditions

a) Standard conditions

Standard conditions shall be a temperature between 15 and 35°C, relative humidity between 25 and 75% and atmospheric pressure between 86 and 106kPa. All tests and measurements shall be performed under the standard conditions unless otherwise specified. If the values measured under the standard conditions may result in a questionable pass/fail result, or if required otherwise, the test and measurement shall be performed in accordance with condition c). The conversion shall be in accordance with condition b), if necessary. Other conditions may apply, unless the pass/fail result may be questionable.

b) Reference conditions
 Reference conditions shall be 25°C and an atmospheric pressure of 101.3kPa.

#### c) Judgment conditions

Judgment conditions shall be either condition A or B specified in Table G-11. Unless specified, condition A shall apply.

Condition	А	В
Temperature (°C)	23±2	20±2
Relative humidity (%)	50±5	65±5
Atmospheric pressure (kPa)	86 to 106	86 to 106

Table G-11. Judgment Conditions

d) Magnification of external inspection

Unless otherwise specified, magnification for external inspection shall be between 5X and 20X. In case of conflict, external inspection shall be performed with minimum 20X magnification.

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G.4.4.2	Externals, Dimensior	ns, Mass and Marking					
G.4.4.2.1	Qualification Test						
	<ul> <li>a) The external inspection shall be performed using magnifier with 5X to 20X magnification. In case of conflict, external inspection shall be performed with minimum 20X magnification.</li> <li>b) The marking test shall be performed viewelly.</li> </ul>						
	, .						
	as specified in dimensions m measured valu dimension gau gauge is suffic The sample si dimensional to d) The mass sha capacity of 50 The mass ma measured valu doubt. For the comparing the	IS Shall be measured with a vernie an JIS B 7507 or a micrometer comp ay be measured with another mea- ue is questionable. If the dimension uge which is set in advance, it shall ciently functional as a measuring in hall pass this test when the measured be measured with a precision-typ g and sensitivity of less than 50mg y be measured with another measured y be measured with another measured with another measured with another measured with another measured with another measured and sensitivity of less than 50mg y be measured with another measured with another measured with another measured a sample to the criteria samples of mined in advance.	pliant to JIS B 750 asuring instrument ons are measured Il be proven that to nstrument prior to urements do not e pecification. pe trip balance with g, compliant to JIS uring instrument, ues shall be judge sults may be dete	02. The t, unless the d with the dimension o the test. exceed the th a weighing S B 7601. unless the ed to avoid ermined by			
	Resistors without a a) Resistance wi	a protective coating or enclosure s re	hall be tested as	follows.			
	A magnifier of b) Winding pitch	5x-20x shall be used.					
	c) Effective wind		Ū.				
	The effective d) Terminals	winding coverage shall be measur	ed with a magnifi	er of 5x-20x.			
	The terminal of	connection, welded points and a re a magnifier of 5x-20x.	esistance wire sha	all be			
G.4.4.2.2	Quality Conformar	ice Inspection					
	magnification. minimum 20x	nspection shall be performed using In case of conflict, external inspe magnification.					
	c) The dimension as specified ir dimensions m measured value dimension gau	est shall be performed visually. It is shall be measured with a vernie In JIS B 7507 or a micrometer comp ay be measured with another mea ue is questionable. If the dimension uge which is set in advance, it sha ciently functional as a measuring in	pliant to JIS B 750 asuring instrumen ons are measured Il be proven that t	02. The t, unless the d with the dimension			

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The sample shall pass this test when the measurements do not exceed the dimensional tolerances specified in the detail specification.

d) The mass shall be measured with a precision-type trip balance with a weighing capacity of 50g and sensitivity of less than 50mg, compliant to JIS B 7601. The mass may be measured with another measuring instrument, unless the measured value may be questionable. Measured values shall be judged to avoid doubt. For the mass inspection, the pass/fail results may be determined by comparing the sample to the criteria samples of maximum mass for each style, which is determined in advance.

Resistors without protective coating or enclosure for the Group C quality conformance inspection shall be inspected as specified in paragraph G.4.4.2.1.

## G.4.4.3 Workmanship

G.4.4.3.1 DPA

The resistors shall be disassembled to ensure that processes such as terminal connection and protective coating or enclosure have been successfully achieved. DPA shall be conducted in accordance with the DPA procedures et al., which compose the Quality Assurance Program.

- a) The protective coating or enclosure shall be removed from the resistors with a resinous solvent or by other means. The resistors shall be examined visually or by using a 5 to 50x magnifier for inspecting the resistance wire, effective winding coverage, nominal diameter of the resistance wire, and weld condition of the caps with terminal leads.
- b) The resistors shall be embedded in a proper resin or other materials and cut at the center along the longitudinal axis of the resistors. One cut face shall be grounded and examined visually or by using a 5x magnifier for the length of effective winding coverage, uniformity of the winding pitch, foreign materials, close adhesion state and voids in the external coating and connection state of caps and lead wire (tilt of cap (shall be less than 5 degrees)).

The examinations a) and b) above shall require the respective samples to be photographed and recorded.

## G.4.4.3.2 Radiographic Inspection

The resistors shall be tested in accordance with Test Method 209 of MIL-STD-202. Test conditions shall be as follows:

- a) Criteria sample for radiographic inspection shall be prepared and inspection results shall be judged in accordance with the criteria sample.
- b) Radiograph shall have adequate quality to show images of penetrameter clearly and sharply.
- c) Sample shall be put into position to show contour of image clearly.
- d) Sample shall be radiographed from 2 directions crossing at right angles. Otherwise, X-ray radiograph system for 360 degrees real-time filming may be used.

r				
JA	KA-QTS-2050E	J A X A	Dama	0.00
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	f) Images of per g) When electro shall be in a demonstrate were taken a sample.	or radiograph shall have ability of de arly. enetrameter shall be included in eac onic data on images are shown, res ecordance with MIL-STD-202. Furth resolution of sample images using at filming and image processing con shall be inspected using equal to or	ch film. olution of the electron penetrameter ima ditions identical to	ctronic data ic data shall ages which o those of
G.4.4.4	Electrical Performa	nce		
	The electrical perfo	mance tests shall be performed as	follows.	
G.4.4.4.1	<ul> <li>a) Mounting me The resistor from the res</li> <li>b) Measuremen Resistance</li> <li>c) Test condition</li> <li>d) Test duration</li> <li>e) Test condition</li> <li>Rated dc voline frequent OFF, for 100</li> <li>f) Measuremen After the load resistance sistance sistance sistance</li> <li>g) Examination The resistor</li> </ul>	is shall be supported by their terminal istor body. In before test shall be measured as specified in parts: $25_0^{+15}$ °C n:100 <sup>+16</sup> hours ns tage or rated ac voltage (root-mean cy) shall be applied intermittently, 90 $0^{+16}_{-4}$ hours. In after test d is removed from the resistors for 3 hall be measured in accordance with e change in resistance before and a	al leads at a point aragraph G.4.4.4. n-square value at 0 minutes ON and 30 minutes or mo h paragraph G.4. fter the test.	2. commercial- d 30 minutes re, the 3.4.2 to
G.4.4.4.2	STD-202. The fo a) Limit of error b) Test voltage c) Points of app	est shall be performed in accordanc lowing details and exceptions shal of measuring apparatus: ±(0.05%+ Test voltages shall be applied in a plication of test voltage 20Ω and less, the test lead attach ly.	l apply. ·0.002Ω) ccordance with Ta	able G-12.

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## Table G-12. Test Voltages

	Unit: V <sub>DC</sub>
Nominal resistance range ( $\Omega$ )	Maximum test voltage
Less than 1	0.1
1 or more and less than 10	0.3
10 or more and less than 100	0.3
100 or more and less than 1k	1
1k or more and less than 10k	3
10k or more and less than 100k	10

## G.4.4.4.3 Resistance-Temperature Characteristic

The resistance-temperature characteristic test shall be performed in accordance with Test Method 304 of MIL-STD-202. The following details and exceptions shall apply.

- a) Reference temperature: 25°C
- b) Test temperature: As specified in Table G-13.
- c) Unit of resistance-temperature characteristic: 10<sup>-6</sup>/°C.

#### Table G-13. Test Temperature for Resistance-Temperature Characteristic

		Unit: °C		
Order	Test	Test temperature		
Order	Qualification test	Quality conformance inspection		
1	25±3	25±3		
2	-15±3	-55±3		
3	-55±3	25±3		
4	25±3	275±3		
5	125±3	-		
6	200±3	-		
7	275±3	-		

#### G.4.4.4.4 Short-Time Overload

The resistance shall be measured as specified in paragraph G.4.4.4.2 under condition b) specified below. After the test, the resistors shall remain at room temperature with no load for 30 minutes before the resistance is measured in accordance with paragraph G.4.4.2 to calculate the change in resistance before and after the test. At the completion of this test, the resistors shall be examined for evidence of arcing, burning or charring using 5x-20x magnifier. The marking shall also be examined for legibility. This test shall be performed under the following conditions.

a) Mounting method

The resistors shall be mounted to the fixtures by means other than soldering or be placed in a tray of small heat inertia.

b) Test condition

A dc potential of 10 times the rated power shall be applied to the resistors for

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		or the resistors with a rated powe ed power shall be applied to the		•
G.4.4.4.5	Dielectric Withstan	ding Voltage		
G.4.4.4.5.1	Atmospheric Pre	ssure		
	The following det a) Measureme The resistar G.4.4.4.2. T withstanding b) Method of m The resistor the resistive distance bet than the thic c) Test voltage The applied	s shall be placed on the joint of a -elements do not protrude from e ween the resistor lead and the V kness of the insulator.	ance with paragrap ured before the Group A inspectio a metal V block suc either end of the V block shall not be ent voltage (root-m	oh n. ch that block. A e less
		ation test: $60_0^{+0.5}$ seconds		
	e) Rate of appl 1) Qualific The tes the rate 2) Quality The tes	conformance inspection: $5_0^{+0.5}$ se ication of voltage ation test t voltage shall be increased from of $100V_{AC}$ per second. conformance inspection t voltage shall be increased from of $500V_{AC}$ per second.	zero to the applic	
	f) Measureme	nt during test rent shall be monitored during th	e application of te	st
	g) Measureme The resistar G.4.4.4.2 to The resistar test of Grou	ice shall be measured in accorda calculate the change in resistanc ice shall not be measured after th p A4 of the Group A inspection.	ce before and afte	r the test.
		after test s shall be examined for evidence eakdown and mechanical damag		-

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-	Table G-14. Diele	ectric Withsta	nding Voltage (An	bient Pressure)	)
				Unit: V <sub>AC</sub>	
	Rated po	wer (W)	Test v	oltage	]
	1,	2	50	00	
	3, 5	, 7	1,0	00	]
G.4.4.4.5.2	Reduced Pressu	re			
	Resistors shall be	e tested in acc	ordance with Test N	Aethod 105 of MI	L-STD-202.
	The following det	ails and excep	tions shall apply.		
	a) Method of n				
	The resistor	s shall be mou	inted as specified ir	n item b), paragra	ph
	G.4.4.4.5.1.				
	b) Measureme	nt before test			
	The resistar	nce shall be m	easured in accorda	nce with paragra	bh
	G.4.4.4.2.				
	c) Test condition	on: D (1.1± 0.1	lkPa)		
	d) Test voltage	;			
	The applied	voltage shall I	be alternating curre	nt voltage (root-m	nean-
	square valu	e at commerci	al-line frequency) ir	accordance with	n Table
G-15.					
	e) Duration of test: $60_0^{+0.5}$ seconds				
	f) Rate of app	lication of volta	age		
	,	tage shall be ii	ncreased from zero	to the application	n value at
	the rate of 1	00V <sub>AC</sub> per sec	ond.		
	g) Measureme	nt during test			
	The leakage	e current shall	be monitored during	g the application	of test
	voltage.				
	h) Measureme	nt after test			
	The resistar	nce shall be me	easured in accorda	nce with paragrap	bh
	G.4.4.4.2 to	calculate the	change in resistanc	e before and afte	r the test.
	i) Examinatior	n after test			
	The resistor	s shall be exa	mined for evidence	of flashover, arci	ng,
	insulation b	eakdown and	mechanical damag	e using 5x-20x m	agnifier.
Table (	G-15. Dielectric	Vithstanding	Voltage (Reduced	<b>Barometric Pre</b>	ssure)
				Unit: V <sub>AC</sub>	2
	Rated po		Test v	-	_
	1,		10		_
	3,5		20		
			30		]
G.4.4.4.6 I	Insulation Resistar	ce			
			in accordance with	Test Method 302	
			ceptions shall appl		
4	inc ionowing			J •	

As specified in item b), paragraph G.4.4.4.5.1.

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b) Test	voltage: Test condition A	(100V <sub>DC</sub> )					
G.4.4.5 Mechanical	Performance						
The mechanical performance tests shall be performed as follows.							
G.4.4.5.1 Terminal	Strength						
The cond	s shall be tested in accord lition A (pull test) specifie in shall apply. However, ptions.	d in paragraph 3.1	and D (twist test)	) in paragraph			
G.4.4.5.1.1 Pull Te	est (Test Condition A)						
a) M	easurement before test						
,	ne resistance shall be me	asured in accordar	nce with paragrap	bh			
_	.4.4.4.2.						
,	bad: As specified in Table						
,	uration of test: 5 to 10 sec est method	conds					
,	ne specified load shall be	applied in the axia	I direction of the	ead			
wi	thout inducing a shock.	The application poi	nt of the load sha	ll be at			
	e closest point to the lead	d edge.					
,	easurement after test						
	esistance shall not be me	•					
	e performed with the twist xamination after test	. test specified in pa	aragraph G.4.4.5	. 1.2.			
,	ne terminals shall be exa	mined for evidence	of mechanical da	amage			
	sing 5x-20x magnifier.						
		16. Load					
			Unit: N{kgf}				
Nom	ninal wire diameter (mm)	Loa					
	Less than 0.8	24.5 {					
	0.8 or more	44.1 {	[4.5]				
G.4.4.5.1.2 Twist T	Fest (Test Condition D)						
	ng the pull test, the twist	test shall be perfor	med using the sa	me samples.			
,	a) Measurement before test						
The resistance shall not be measured before the test. b) Test conditions							
With the center axis of the resistor's lead wire used as a rotating axis,							
	e lead wire shall be rotate			•			
	the rotating axis. This sl						
	re shall then be rotated 3	-	opposite directior	n. This			
	all be counted as the sec umber of twists: 5	cona twist.					

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	G.4.4.4.2 to e) Examinatior The termina Plating of th	nce shall be measured in accordar calculate the change in resistance	e before and afte of breaking or lo evidence of crac	r the test. osening.
G.4.4.5.2	Solderability			
	Resistors shall be to The following detai a) Preparations: s b) Number of terr c) Solder tempera d) Solder immers e) Solder immers The terminals f) Examination a	shall be immersed within 1.6mm f	rom the base of t	he terminals.
G.4.4.5.3	Resistance to Sold	ering Heat		
0.4.4.0.0	Resistors shall be t The following detai	ested in accordance with Test Me ls and exceptions shall apply.	thod 210 of MIL-	STD-202.
		before test shall be measured in accordance B (Solder dip method)	e with paragraph	G.4.4.4.2
	, .	ature: 350±10°C		
	<ul><li>d) Solder immers</li><li>e) Solder immers</li></ul>	ion time: 3+0.5/-0 seconds		
	,	shall be immersed within 1.3mm fr	rom the base of t	ne terminals.
	resistance is m	hall be at room temperature for sp neasured in accordance with parag resistance before and after the tes fter test	graph G.4.4.4.2 to	
	07	mages of the resistors shall be ex	amined using 5x-	·20x
G.4.4.6	Environmental Perfor	mance		
	The environmental pe	rformance tests shall be performe	ed as follows.	

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G.4.4.6.1	Vibration						
G.4.4.6.1.1	4.6.1.1 High Frequency Vibration						
	Resistors shall be	e tested in accordance with Test M	lethod 204 of MI	L-STD-202.			
	-	ails and exceptions shall apply.					
	a) Method of n	•		_			
		s shall be mounted in accordance	, · ·	•			
l		A shielded cable, which may be ne nding the vibration table, shall be c	•				
	mounting fix	•		515101			
	•	nt before test					
	,	nce shall be measured in accordar	nce with paragrap	bh			
	G.4.4.4.2.						
	c) Test conditi	วท					
		on D (196m/s² p-p or 1.5mm in do	uble amplitude, v	vhichever			
	is smaller).						
	d) Direction of						
	In each of two mutually perpendicular directions, one perpendicular and						
	•	the other parallel to the longitudinal axis of the resistors. e) Duration of vibration					
	/	hours in each direction for a total of 12 hours.					
	f) Measureme	nt during test					
	Each resiste	or shall be monitored with specified	d equipment durii	ng the			
	vibration for	electrical discontinuity of 0.1ms o	r greater.				
	g) Measureme						
		nce shall be measured in accordar					
		calculate the change in resistance	e before and afte	r the test.			
	h) Examination	s shall be examined for evidence	of mochanical da	maga			
	using 5x-20			mage			
G.4.4.6.1.2	Random Vibratio	n					
	Resistors shall b	e tested in accordance with Test M	lethod 214 of MI	L-STD-202.			
	The following det	ails and exceptions shall apply.					
	a) Method of n	nounting					
	The resistor	s shall be mounted in accordance	with item a), par	agraph			
	G.4.4.6.2.						
	,	nt before test					
	The resistance shall be measured in accordance with paragraph						
	G.4.4.4.2. c) Test conditi	<u></u>					
	/	on II-H Frequency range: 20 to 2	000Hz				
		Rms value of acceleratio					

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	Ín eac the oth e) Numb	er parallel to the er of application	v perpendicular directio longitudinal axis of the and duration of vibratio	e resistors. on	
<ul><li>Vibration shall be applied for 3 minutes, in each direction, for a total test time of 6 minutes.</li><li>f) Measurement during test</li></ul>					
	vibrati		monitored with specifie liscontinuity of 0.1ms c +		ig the
	The re	sistance shall be	ہ e measured in accorda he change in resistanc		
	h) Exami The re	nation after test	examined for evidence		
G.4.4.6.2	Shock				
	Resistors sha	ll be tested in ac	cordance with Test Me	thod 213 of MIL-	STD-202.
	The following	details and exce	eptions shall apply.		
	Resistor bodies c supporte be const have the construc shock te during th that the i The test b) Measure	emented to a fla d approximately fucted to insure same motion as red to preclude a st, and the fixture is test shall be s influence of the t lead length shall ment before test		s shall be fixed wi esistor body. The esistor mounting s mounting fixtures tures when subje f necessary. Test than 0.6mm in dia will be held to a n cessary.	th their leads fixtures shall upports will shall be ected to the lead used ameter so minimum.
			neasured in accordanc	e with paragraph	G.4.4.4.2.
	<ul> <li>c) Test condition: I (980m/s<sup>2</sup>, 6ms sawtooth)</li> <li>d) Direction of applied shocks : In each of two mutually perpendicular directions, one perpendicular and the other parallel to the longitudinal axis of the resistors</li> </ul>				
	<ul> <li>e) Number of applied shocks : The resistors shall be subjected to 10 shocks in each direction, for a total of 20 shocks.</li> </ul>				
	<ul> <li>f) Measurement during test</li> <li>Each resistor shall be monitored with specified equipment during the shock for electrical discontinuity of 0.1ms or greater.</li> </ul>				
	g) Measure The resis	ment after test stance shall be n	neasured in accordanc		G.4.4.4.2 to

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	h) Examination af The resistors s 20x magnifier.	ter test hall be examined for e	evidence of r	mechanical dama	age using 5x-
G.4.4.6.3	Thermal Shock				
G.4.4.6.3.1	The following det a) Method of m The resistor placed in tra b) Measureme The resistan G.4.4.4.2. c) Test condition 1) Temper 2) Load The dc applied Table G d) Number of tr e) Cycle condition The first five may be inter f) Measureme The resistor before the rea G.4.4.4.2 to g) Examination	e tested in accordance ails and exceptions shounting s shall be mounted by ys of small heat inertia int before test ince shall be measured ons rature: As specified in voltage corresponding to the resistors at the G-17 below. est cycles: 25 cycles ions cycles shall run contin rupted following comp int after test s shall be at room tem esistance is measured calculate the change i after test s shall be examined fo	all apply. means othe a. in accordan Table G-17. to 50% of th temperature nuously. Aft letion of any perature for in accordan n resistance	er than soldering the with paragrap he rated power s as specified in s e as specified in s fer five cycles, th full cycle. 30 minutes or m the with paragrap before and after	or be oh shall be step 2 of e test ore oh r the test.
G.4.4.6.3.2	Table G-17Step12Thermal Shock [After measuring rshall be subjectedshown in Table Ga) Method of mThe resistor	7. Test Conditions of Temperature (°C) $-65^{0}_{.5}$ $150^{+3}_{0}$ II] esistance in accordance d to the specified therm i-18 and Figure G-2. T	Time (mir 15 15 ce with para nal shock cy The following means othe	graph G.4.4.4.2, graph graph G.4.4.4.2, ycle test under th	e conditions l apply.

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		•			
age corresponding to $50\%$ of the r	ated nower shall	be applied at			
•	•	be applied at			
	er 25 cycles the	test may			
	•	loot may			
. ,	•				
<ul> <li>e) Measurements during test and external inspection The resistance shall be measured after the resistors are at room</li> </ul>					
temperature for 30 minutes or more for each 25 $^{+5}_{0}$ cycles, 50 $^{+5}_{0}$ cycles,					
les, $250^{+10}_{0}$ cycles and $500^{+10}_{0}$ cycl	es. The external	s of all			
	nce with paragrag	bh			
•					
rs shall be examined for evidence	of mechanical da	mage			
)x magnifier.					
Table G-18. Test Conditions of Thermal Shock [II]					
	< <sup>15</sup> →				
	Parts Specification age corresponding to 50% of the rational specified in step 2 of Table test cycles: 1,000 cycles litions cycles shall run continuously. After ted following completion of any full ents during test and external inspect ince shall be measured after the re- e for 30 minutes or more for each 2 des, $250_{0}^{+10}$ cycles and $500_{0}^{+10}$ cycles hall be inspected visually for surface ent after test ince shall be measured in accordant offer the resistors are at room tempor culate the change in resistance be on after test or shall be examined for evidence for the comparison of the cycles of the cycles of the cycles of the cycles are at room temported the change in resistance be on after test or shall be examined for evidence for the cycles of the	Parts SpecificationPageage corresponding to 50% of the rated power shall be ature as specified in step 2 of Table G-18 below. test cycles: 1,000 cyclesitions5 cycles shall run continuously. After 25 cycles, the steed following completion of any full cycle. tents during test and external inspection unce shall be measured after the resistors are at roo e for 30 minutes or more for each $25^{+5}_{-0}$ cycles, $50^{+6}_{-0}$ des, $250^{+10}_{-0}$ cycles and $500^{+10}_{-0}$ cycles. The external hall be inspected visually for surface cracks. ent after test unce shall be measured in accordance with paragrap fiter the resistors are at room temperature for 30 min lculate the change in resistance before and after the or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evidence of mechanical dates.In after test or shall be examined for evide			

Step	Temperature (°C)	Time (min.)
1	-30 <sup>0</sup> <sub>-5</sub>	15
2	100 +3	15



Figure G-2. Test Conditions of Thermal Shock [II]

## G.4.4.6.4 Moisture Resistance

Resistors shall be tested in accordance with Test Method 106 of MIL-STD-202. The following details and exceptions shall apply.

- a) Method of mounting
  - 1) Where polarization is not applied

Solder both leads to rigid mounts or terminal lugs. The spacing of the mounts or terminal lugs shall be such that the length of each resistor

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	lead is an	proximately 10mm when measur	ed from the edge	of the
		g terminal to the resistor body.	cu nom the cuge	
		arization is applied		
	, .	of the resistors mounted as speci	fied in 1) above s	shall he
		vith a V-shape metal strap whose	,	
		ody as indicated in Figure G-3. T	•	
		-resistant metal and shall remain	•	
	body by s	supporting the body as indicated i	n Figure G-3, wit	ha
	noncondu	ucting, noncorrosive support who	se width is less th	an that of
	the resiste	or body. In addition, the support	shall not allow co	ndensatior
		re which may have an adverse in		
		metal strap may be used for eac	h resistor or one	continuous
. 、 .		ap for all resistors.		
,	Measurement			
	• •	ions are finished, the resistors sh hours before the resistance is me		•
			easured in accord	ance with
	paragraph G.4 Polarization ar	nd loading voltage		
•	1) Polarizatio			
	,	ation voltage shall be applied to the	ne resistors cover	red with a
	•	strap. During steps 1 through 6,		
		d with the positive lead connected	-	
	tied toget	her, and the negative lead conne	cted to the polari	zing straps
	2) Loading vo	oltage		
	•	voltage shall be applied to the re		
		with the metal strap. During the fi		-
	-	potential equivalent to 100% rate	d wattage shall b	e applied.
,	-inal measure		registers shall b	a hald at a
	• •	ion of step 6 of the final cycle, the ity between 90 and 95% and 25 $\pm$		
		10 minutes. Within 30 minutes of $1000$	•	
		lielectric withstanding voltage (atr	•	
		stance of the resistors shall be m	• •	,
		.4.4.4.5.1 and G.4.4.4.6 respectiv	•	
	before and aft	er the test shall also be calculated	d. After the test t	he resistor
	shall be exam	ined for significant abnormality.		
		I not be wiped nor shall forced air	conditioning sha	all be used.
,	Subcycle			
	Step 7b shall r	not be applicable.		



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	The re magn		then be examined for significant a	bnormality using	5x-20x
G.4.4.7	Durabilit	y			
	The dura	ability test sha	all be performed as follows.		
G.4.4.7.1	Life				
	The fo a) M T o te b) T c) M T d) T g c c 4	ollowing detai lethod of mou fhe resistors s f each termin erminals. est temperatu leasurement fhe resistance est conditions fhe rated volt 0 minutes Of ontrolled to m .,000 <sup>+72</sup> hours onformance i	shall be mounted to lightweight ter al shall be $9.5\pm1.6$ mm. The resist ure: $25\pm5^{\circ}$ C before test e shall be measured in accordance age specified in paragraph G.3.5.4 N and 30 minutes OFF. The test v naintain $\pm5\%$ of the rated dc voltages for the qualification test and 2,00 nspection.	minals. The effe tors shall be sold e with paragraph 5 shall be applied roltage shall be re ge. The test dura	ctive length ered to the G.4.4.4.2. I intermittently, egulated and tion shall be
	,	2,000 <sup>+72</sup> h	on test: $250  {}^{+48}_{0}$ hours, $500  {}^{+48}_{0}$ hours nours. nformance inspection: $250  {}^{+48}_{0}$ hour		
	A re c g) E T	esistance sha alculate the c xamination a	tors are at room temperature for a all be measured in accordance with change in resistance before and af fter test shall be examined for evidence of	n paragraph G.4. ter the test.	4.4.2 to
	Long-Term	•			
	_ong-term	storage shall	be in accordance with paragraph	4.7 of JAXA-QTS	6-2050.
	•		spections pections shall be in accordance w	ith paragraph 4.8	of

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# G.5. PREPARATION FOR DELIVERY

Preparation for delivery shall be in accordance with paragraph 5 of JAXA-QTS-2050.

## G.6. NOTES

Refer to the paragraph 6 of JAXA-QTS-2050.