

Registration No. 1263

JAXA-QTS-2040/M105E

12 December 2022

Superseding

JAXA-QTS-2040/M105D

Cancelled

12 December 2022

CAPACITORS, MINIATURE, HIGH-CAPACITY,  
SURFACE MOUNT, FINE CERAMIC DIELECTRIC (J2040/M105),  
HIGH RELIABILITY, SPACE USE,

DETAIL SPECIFICATION FOR

Prepared and Established by Fukui Murata Manufacturing Co., Ltd.

Issued by 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: June 14, 2023

**Revision log**

Rev.	Date	Revised Contents
NC	8 May 2012	Original
A	27 October 2014	Table M-6: Qualification Test Table M-7: Quality Conformance Inspection (Group A): Changed the order of the test items “Insulation resistance (+125°C)” and “Dielectric withstanding voltage” for improving the operational efficiency as it was confirmed that changing the test order did not affect the characteristics.
B	30 Nov. 2016	Table M-4 Performance Requirements: Changed voltage aging conditions and added voltage aging test method to paragraph 4.5.1. Table M-6 Qualification Test and Table M-7 Quality Conformance Inspection (Group A): Changed test method paragraph number of “Thermal shock and voltage aging” to paragraph 4.5.1 of this specification as it was confirmed that changing the voltage aging conditions for the purpose of shortening the manufacturing period did not affect the quality of the products.
C	18 Nov. 2019	Table M-3: Changed the dimensions L, W, T, G, and S to the proper values in order to reduce the selection effort by correcting the dimensions.  · Tables M-6, M-7, M-8, M-9: Changed the wording of the title to “sample size/accept number” and combined the columns for clarification.
D	21 Oct. 2022	· Paragraph 1.1 Scope: Added the type 1005 due to additional lineup. · Paragraph 1.1 Scope: Deleted “The capacitors specified in this specification was developed to be used for high reliability Point-of-Load (POL) DC/DC converters for space use (JAXA-QTS-2020/0101)” the use application of type 1005 being not limited to POL DC/DC converters. · Table M-1 Part number: Added type 1005 to style due to additional lineup. · Table M-1 Part number: Added X7S to characteristics due to type 1005's characteristic. · Table M-1 Part number: Changed “terminal finish” to “construction and terminal finish”, and changed "100% Sn plating on the underlying Ni barrier" as Y to " Ni and Sn plating over underlying metal ". Added “Resin electrode, Ni plating, Sn plating, and soldering (SnPb) plating over underlying metal” as R, for unifying the expression and addition of size 1005 being different from the traditional external electrode construction. · Paragraph 1.3, Table M-2 Rating: Added 1005, characteristic X7S, rated voltage 8.0V, nominal capacitance 0.1 μF, capacitance tolerance, K, terminal finish R due to additional lineup. · Paragraph 1.4 Other requirements: Added size 1005 spec. to Table M-3 Dimensions in paragraph 1.4.1 External and dimensions due to additional lineup.

Rev.	Date	Revised Contents
D	21 Oct. 2022	<ul style="list-style-type: none"> <li>· Paragraph 1.4 Other requirements, Added Table M-4 Voltage-Temperature characteristics to paragraph 1.4.2 Characteristics due to addition of X7S characteristic which was not specified in Appendix M of JAXA-QTS-2040, to clarify the difference between X7R and X7S in detail specification, (Thereafter Tables M- are renumbered with one increased number)</li> <li>· Paragraph 3.1 Performance: Divided Tables M-5 Performance requirements into three tables (1/3, 2/3, 3/3) due to increased descriptions.</li> <li>· Table M-5 Performance requirements (External electrode/Materials): Changed "Nickel plated over copper. Tin plating finish" to "For terminal finish "Y", Ni plating over underlying metal with Sn plating finish". Added "For terminal finish "R", resin electrode over underlying metal, and on top of that, Ni plating, Sn plating, and solder (SnPb) plating are performed", for unifying the expression and addition of size 1005 being different from the traditional external electrode construction.</li> <li>· Table M-5 Performance requirements (Electrical performance/ Insulation resistance (IR) and (Hot-IR)): Added size 1005 performance due to additional lineup.</li> <li>· Table M-5 Performance requirements (Electrical performance/ Voltage-temperature characteristics): Added X7S performance due to additional lineup.</li> <li>Table M-5 Performance requirements (Mechanical performance/Shear): Added size 1005 and minimum strength of 5N due to additional lineup.</li> <li>· Table M-5 Performance requirements (Mechanical performance/resistance to soldering heat): Added performance for size 1005 or smaller due to additional lineup.</li> <li>· Table M-5 Performance requirements (Environmental performance/thermal shock (I), Thermal shock and voltage aging, thermal shock and immersion cycling): Added size 1005 performance due to additional lineup.</li> <li>· Table M-5 Performance requirements (Environmental performance/ thermal shock and immersion cycling): Changed IR specs. For size 1608 or larger to 50MΩ μF to correct an error.</li> <li>· Table M-5 Performance requirements (Environmental performance/ Moisture resistance, and Humidity, steady state, low voltage): Added the performance of size 1005 or smaller due to additional lineup.</li> <li>· Table M-5 Performance requirements (Durability performance/life): Added size 1005 or smaller due to additional lineup.</li> </ul>

Rev.	Date	Revised Contents
D	21 Oct. 2022	<ul style="list-style-type: none"> <li>· Paragraph 3.2 Burn-in: Added performance for size 1005 or smaller to (b) Insulation resistance due to additional lineup.</li> <li>· Paragraph 4.5 Change to tests and inspections: Added resin board (FR-4) to paragraph 4.5.2 Mounting of test samples because it is not specified in Appendix M of JAXA-QTS-2040.</li> <li>· Paragraph 4.5 Change to tests and inspections: Added 0.8mm board to paragraph 4.5.3 Substrate bending because it is not specified in Appendix M of JAXA-QTS-2040.</li> <li>· Paragraph 4.5 Change to tests and inspections: Added the description about the solder fillet height being less than 1/2 (size 1005 or smaller) of the capacitor thickness to paragraph 4.5.4 Thermal shock (I) because it is not specified in Appendix M of JAXA-QTS-2040.</li> <li>· Paragraph 4.5 Change to tests and inspections: Changed to tests and inspections: Added the description about the solder fillet height being less than 1/2 (size 1005 or smaller) of the capacitor thickness to paragraph 4.5.5 Thermal shock because it is not specified in Appendix M of JAXA-QTS-2040.</li> <li>· Paragraph 4.5 Change to tests and inspections: Added table for Classification of Quality Conformance Inspection (Group B/Group C) because family products of quality conformance inspection (group B/Group C) were reviewed.</li> <li>· Supplementary Table 1 Part list: Added a size 1005 product due to additional lineup.</li> <li>· Supplementary Table 1 Parts list: Changed element thickness to dielectric thickness in line with the expression in JAXA-QTS-2040/L104 and to standardize the dielectric thickness by the measurements in DPA manual.</li> <li>· Paragraph 4.5 Change to tests and inspections: Added paragraph 4.5.7 to state that random vibration and shock are deleted and the group/order numbers of the tests are unassigned and the sample size of group I in Table M-7 is changed because (1) these tests are applicable to lead type, not surface mount type according to MIL-PRF-123, MIL-PRF-32535, and MIL-PRF-55681 and (2) the structure and mounting form of the surface mount type are less susceptible to stress concentration than the lead type.</li> </ul>
E	12 Dec. 2022	<ul style="list-style-type: none"> <li>· Paragraph 4.5 Change to tests and inspections: Added paragraph 4.5.8 to state that silver content of tin/lead/silver solder shall be 3wt% or less because 3wt% silver containing solder is difficult to obtain.</li> <li>· Supplementary Table 1 Part list: Added footnote <sup>(3)</sup> to specify the part number of products which are scheduled to be discontinued.</li> </ul>

**Contents**

1. GENERAL.....	1
1.1 Scope.....	1
1.2 Part Number.....	1
1.3 Rating.....	2
1.4 Other Requirements.....	2
1.4.1 Externals and Dimensions.....	2
1.4.2 Characteristics.....	3
2. APPLICABLE DOCUMENTS.....	3
3. REQUIREMENTS.....	3
3.1 Performances.....	3
3.2 Burn-In.....	6
4. QUALITY ASSURANCE PROVISIONS.....	6
4.1 In-Process Inspection.....	6
4.1.1 Burn-In.....	6
4.2 Qualification Test.....	6
4.3 Quality Conformance Inspection.....	7
4.4 Long-Term Storage.....	9
4.4.1 Storage by Purchasers.....	9
4.5 Change to Tests and Inspections.....	9
4.5.1 Test Method of Voltage Aging.....	9
4.5.2 Mounting of Test Samples.....	10
4.5.3 Substrate Bending.....	10
4.5.4 Thermal Shock (I).....	10
4.5.5 Thermal Shock.....	11
4.5.6 Qualify Conformance Inspection (Group B and Group C).....	11
4.5.7 Random Vibration and Shock.....	11
4.5.8 Solder.....	11
5. PREPARATION FOR DELIVERY.....	11
6. NOTES.....	11

**CAPACITORS, MINIATURE, HIGH-CAPACITY,  
SURFACE MOUNT, FINE CERAMIC DIELECTRIC (J2040/M105),  
HIGH RELIABILITY, SPACE USE,  
DETAIL SPECIFICATION FOR**

1. GENERAL

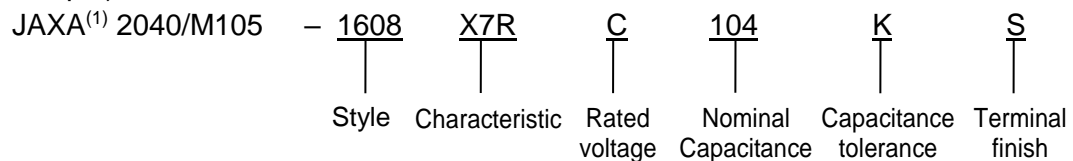
1.1 Scope

This specification establishes the detail requirements for types 1005, 1608, 3216 and 3225 of space use, high reliability, fine ceramic dielectric, surface mount, high-capacity miniature capacitors that satisfied JAXA-2040, Capacitors, Fixed, High Reliability, Space use, General Specification for (Appendix M).

1.2 Part Number

The part number shall consist of "JAXA2040/M105-", followed by style, characteristic, rated voltage, nominal capacitance, capacitance tolerance and terminal finish as given below.

(Example)



Note <sup>(1)</sup>: "JAXA" indicates the common part for space use and may be abbreviated to "J".

**Table M-1. Part Number**

Item	Applicable paragraph of JAXA-QTS-2040	Description
Style <sup>(1)</sup>	M.1.3.1	1005, 1608, 3216, 3225
Characteristic	M.1.3.2	X7R, X7S
Rated voltage	M.1.3.3	A (3.5V), B (8.0V), C (25V)
Nominal capacitance	M.1.3.4	e.g.: 104 (0.1μF)
Capacitance tolerance	M.1.3.5	K (±10%), M (±20%)
Construction and Terminal finish	M.1.3.6	Y: Ni and Sn plating over underlying metal S: Replacement solder coating for terminal finish "Y" R: Resin electrode, Ni plating, Sn plating, and solder (SnPb) plating over underlying metal.

Note: <sup>(1)</sup> Indicates "rectangular, electrode in both directions" (see Figure M-1).

1.3 Rating

Ratings shall be as specified in Table M-2.

**Table M-2. Rating<sup>(1)</sup>**

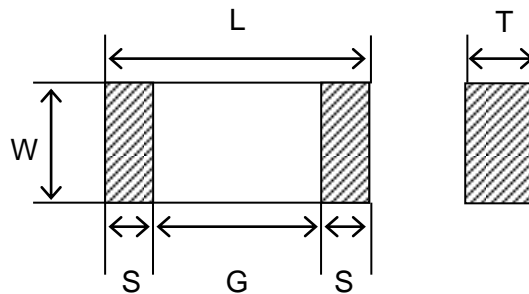
Item	Description			
	1005	1608	3216	3225
Characteristic	X7S	X7R	X7R	X7R
Rated voltage	8.0V	8.0V, 25V	3.5V, 8.0V	8.0V
Nominal capacitance	0.1 $\mu$ F	0.1 $\mu$ F, 1 $\mu$ F	10 $\mu$ F, 22 $\mu$ F	22 $\mu$ F
Capacitance tolerance	K	K, M	K, M	K, M
Terminal Finish	R	S, Y	S, Y	S, Y

Note: <sup>(1)</sup> See Supplementary Table 1 for details.

1.4 Other Requirements

1.4.1 Externals and Dimensions

Externals and dimensions are shown in Figure M-1 and Table M-3, respectively.



**Figure M-1. Externals**

**Table M-3. Dimensions**

(Unit: mm)

Symbol Style	L		W		T		G	S
	Max.	Min.	Max.	Min.	Max.	Min.		
1005	1.10	0.90	0.60	0.40	0.60	0.40	0.3 min.	0.1 to 0.4
1608	1.80	1.50	1.00	0.70	1.00	0.70	0.5 min.	0.2 to 0.6
3216	3.60	3.05	1.90	1.45	1.90	1.50	1.2 min.	0.3 min.
3225	3.60	2.90	2.80	2.30	2.80	2.30	1.0 min.	0.3 min.



### 1.4.2 Characteristics

Voltage –Temperature characteristic specified in paragraph M.1.3.2, Appendix M of JAXA-QTS-2040 is accordance with Table M-4. Voltage-Temperature Characteristics.

**Table M-4. Voltage-Temperature Characteristics**

Characteristic symbol	Operating temp. range (°C)	Capacitance change from +25°C	
		Step A: +25±2°C Step B: -55±2°C Step C <sup>(1)</sup> : +25±2°C Step D: +125±2°C (no voltage applied)	Step E: +125±2°C Step F: +25±2°C Step G: -55±2°C (rated voltage applied)
X7R	-55 to +125	±15%	-- <sup>(2)</sup>
X7S	-55 to +125	±22%	-- <sup>(2)</sup>

Notes: <sup>(1)</sup> Reference value.

<sup>(2)</sup> Refer to the application datasheet for the detail.

## 2. APPLICABLE DOCUMENTS

Refer to paragraph M.2.1, Appendix M of JAXA-QTS-2040 for applicable documents.

## 3. REQUIREMENTS

Requirements for capacitors shall be as specified in paragraph M.3, Appendix M of JAXA-QTS-2040 and as follows.

### 3.1 Performances

Performance requirements shall be as specified in Table M-5.

**Table M-5. Performance Requirements (1/3)**

Item	Requirement paragraph <sup>(1)</sup>	Performance
Materials		
Dielectric	M.3.2 a)	Barium titanate based materials fired at a high-temperature. Dielectric constant shall be 2,000 to 4,000.
Internal electrode	M.3.2	Nickel
External electrode	M.3.2 b)	For terminal finish "Y", Ni plating over underlying metal with Sn plating finish. For terminal finish "S", Sn plating is replaced with 3wt% silver Sn60Pb by hot solder dip. For terminal finish "R", resin electrode, Ni plating, Sn plating, and solder plating over underlying metal.
Design and construction	M.3.3	As specified in Figure M-1.
Non-destructive internal inspection	M.3.4	As specified in Appendix M of JAXA-QTS-2040. Ultrasonic test equipment shall be used.
Externals	M.3.5.1	As specified in Appendix M of JAXA-QTS-2040.
Dimension	M.3.5.2	As specified in Appendix M of JAXA-QTS-2040. Detailed dimensions shall be as given in Figure M-1 and Table M-3. Thickness of dielectric element shall be as shown in Supplementary table 1.

Note <sup>(1)</sup>: Indicates the requirement paragraph of JAXA-QTS-2040.

**Table M-5. Performance Requirements (2/3)**

Item	Requirement paragraph <sup>(1)</sup>	Performance										
DPA	M.3.6.1	The following items shall be examined. Requirements specified in paragraph M.3.6 of JAXA-QTS-2040, Appendix M shall be satisfied. (1) Internal major dimensions (2) Craze or hole on the capacitor element (3) Separation of the Internal electrode and ceramic element (4) Voids or peeling of external electrodes										
Electrical performance	M.3.8	As specified in Appendix M of JAXA-QTS-2040.										
Capacitance (Cap.)	M.3.8.1	As shown in Supplementary Table 1.										
Dissipation factor (tan $\delta$ )	M.3.8.2	15% max.										
Dielectric withstanding voltage (DWV)	M.3.8.3	2.5WV x 5s										
Insulation resistance (IR)	M.3.8.4	@ +25°C 100M $\Omega$ $\mu$ F min. for size 1608 or larger 50M $\Omega$ $\mu$ F min. for size 1005 or smaller										
Insulation resistance (Hot-IR)	M.3.8.4	@ +125°C 10M $\Omega$ $\mu$ F min. for size 1608 or larger 5 M $\Omega$ $\mu$ F min. for size 1005 or smaller										
Voltage-temperature characteristics	M.3.8.5	X7R: Within $\pm$ 15% (no bias) X7S: Within $\pm$ 22% (no bias)										
Mechanical performance	M.3.9	As specified in Appendix M of JAXA-QTS-2040.										
Shear	M.3.9.1	<table border="1"> <thead> <tr> <th>Size</th> <th>1005</th> <th>1608</th> <th>3216</th> <th>3225</th> </tr> </thead> <tbody> <tr> <td>Minimum strength</td> <td>5N</td> <td>15N</td> <td>30N</td> <td>60N</td> </tr> </tbody> </table>	Size	1005	1608	3216	3225	Minimum strength	5N	15N	30N	60N
Size	1005	1608	3216	3225								
Minimum strength	5N	15N	30N	60N								
Substrate bending	M.3.9.2	Amount of deflection: 1mm x 5s $\Delta$ Cap.: Within $\pm$ 10%										
Solderability	M.3.9.3	Wettability: 95% min.										
Resistance to soldering heat	M.3.9.4	Dip: +260°C x 10s IR: 100M $\Omega$ $\mu$ F min., for size 1608 or larger 50M $\Omega$ $\mu$ F min. for size 1005 or smaller tan $\delta$ : 15% max. Capacitance: As shown in Supplementary Table 1.										
Environmental performance	M.3.10	As specified in Appendix M of JAXA-QTS-2040.										
Thermal shock (I)	M.3.10.3	-30 to +100°C x 1,000cy DWV: 2.5WV x 5s, IR: 30M $\Omega$ $\mu$ F min. for size 1608 or larger 15M $\Omega$ $\mu$ F min. for size 1005 or smaller $\Delta$ Cap.: Within $\pm$ 10% , tan $\delta$ : 15% max.										

**Table M-5. Performance Requirements (3/3)**

Item		Requirement paragraph <sup>(1)</sup>	Performance
	Thermal shock and voltage aging	M.3.10.4	Thermal shock: -55 to +125°C x 100cy Voltage aging: 3WV x 21h@+125°C DWV: 2.5WV x 5s, IR: 100MΩ μF min. for size 1608 or larger 50MΩ μF min. for size 1005 or smaller Hot-IR: 10MΩ μF min. for size 1608 or larger 5 MΩ μF min. for size 1005 or smaller Cap.: As shown in Supplementary Table 1 tan δ: 15% max.
	Thermal shock and immersion cycling	M.3.10.5	Thermal shock: -55 to +125°C x 250cy Immersion cycling: MIL-STD-202 TM104 Cond. B DWV: 2.5WV x 5s, IR: 50MΩ μF min. for size 1608 or larger 25MΩ μF min. for size 1005 or smaller ΔCap.: Within ±10% , tan δ: 15% max.
	Moisture resistance	M.3.10.6	MIL-STD-202 TM106 (20cy except for 7b vibration) DWV: 2.5WV x 5s, IR: 50MΩ μF min. for size 1608 or larger 25MΩ μF min. for size 1005 or smaller ΔCap.: Within ±10%
	Humidity, steady state, low voltage	M.3.10.7	1.3V x 240h@+85°C, 85%RH IR: 100MΩ μF min. for size 1608 or larger 50MΩ μF min. for size 1005 or smaller ΔCap.: Within ±10%
	Barometric pressure (reduced)	M.3.10.8	1.5WV x 5s@1.1kPa
Durability performance		M.3.11	As specified in Appendix M of JAXA-QTS-2040.
	Life	M.3.11.1	1.5WV x 4,000h@+125°C <u>For up to 250h</u> IR: 50MΩ μF min. for size 1608 or larger 25MΩ μF min. for size 1005 or smaller Hot-IR: 5MΩ μF min. for size 1608 or larger 2.5MΩ μF min. for size 1005 or smaller ΔCap.: Within ±15% , tan δ: 15% max. <u>For 1,000h, 2,000h, up to 4,000h</u> IR: 30MΩ μF min. for size 1608 or larger 15MΩ μF min. for size 1005 or smaller Hot-IR: 3MΩ μF min. for size 1608 or larger 1.5MΩ μF min. for size 1005 or smaller ΔCap.: Within ±20% , tan δ: 15% max.

Note: (1) Indicates the requirement paragraph of JAXA-QTS-2040.

### 3.2 Burn-In

When tested in accordance with paragraph 4.1.1, capacitors shall satisfy the following requirements.

- (a) Dielectric withstanding voltage: There shall be no damage or dielectric breakdown.
- (b) Insulation resistance (+25°C): 100MΩ·μF min. for size 1608 or larger  
50MΩ μF min. for size 1005 or smaller
- (c) Capacitance: Within the tolerance specified in this specification
- (d) Dissipation factor:  $\tan \delta \leq 15\%$

## 4. QUALITY ASSURANCE PROVISIONS

Quality assurance provisions shall be as specified in paragraph M.4, Appendix M of JAXA-QTS-2040 and as follows.

### 4.1 In-Process Inspection

The in-process inspection shall be as specified in paragraph M.4.1, Appendix M of JAXA-QTS-2040 and Table M-6 of this specification.

**Table M-6. In-Process Inspection**

Inspection item	Requirement paragraph <sup>(1)</sup>	Test method paragraph <sup>(1)</sup>	Sample size
Non-destructive internal inspection	M.3.4	M.4.4.4	100%
Burn-in	3.2	4.1.1	100%
External inspection	M.3.5.1	M.4.4.5	100%

Note: <sup>(1)</sup> Indicate paragraph numbers in JAXA-QTS-2040 except for the Burn-in that indicate the paragraphs in this specification.

#### 4.1.1 Burn-In

Capacitors shall be tested as follows.

- (a) Test temperature: +85°C
- (b) Applied voltage: 200% of the rated voltage
- (c) Duration of application: 4 hours
- (d) Post-test measurements

The dielectric withstanding voltage, insulation resistance, capacitance, and dissipation factor shall be measured as specified in paragraphs M.4.4.7.3, M.4.4.7.4, M.4.4.7.1 and M.4.4.7.2, Appendix M of JAXA-QTS-2040.

### 4.2 Qualification Test

The qualification test shall be as specified in paragraph M.4.2, Appendix M of JAXA-QTS-2040 and Table M-7 of this specification.

**Table M-7. Qualification Test**

Group	Test order	Test item	Requirement paragraph	Test method paragraph	Pass/fail criteria
					Sample size / Accept number
I	1	Thermal shock and voltage aging	M.3.10.4	4.5.1 <sup>(2)</sup>	221 (0)
	2	Dielectric withstanding voltage	M.3.8.3	M.4.4.7.3	
	3	Insulation resistance (+125°C)	M.3.8.4	M.4.4.7.4	
	4	Insulation resistance (+25°C)	M.3.8.4	M.4.4.7.4	
	5	Capacitance	M.3.8.1	M.4.4.7.1	
	6	Dissipation factor (tan δ)	M.3.8.2	M.4.4.7.2	
II	1	Externals, dimensions, mass and marking	M.3.5	M.4.4.5	15 (0)
	2	DPA	M.3.6.1	M.4.4.6.1	
III	1	Solderability	M.3.9.3	M.4.4.8.3	4 (0)
	2	Resistance to soldering heat	M.3.9.4	M.4.4.8.4	4 (0)
IV	1	Voltage-temperature characteristics	M.3.8.5	M.4.4.7.5	12 (0)
	2	Moisture resistance	M.3.10.6	M.4.4.9.6	
V	1	Humidity, steady state, low voltage	M.3.10.7	M.4.4.9.7	12 (0)
VI	1	Life	M.3.11.1	M.4.4.10.1	123 (0)
VII	1	Barometric pressure (reduced)	M.3.10.8	M.4.4.9.8	6 (0)
VIII	1	Thermal shock and immersion cycling	M.3.10.5	M.4.4.9.5	18 (0)
IX	1	(Deleted)	--	--	--
	2	(Deleted)	--	--	--
X	1	Thermal shock (I)	M.3.10.3	M.4.4.9.3	18 (0)
XI	1	Shear (Destructive)	M.3.9.1	M.4.4.8.1	6 (0)
	2	Substrate bending	M.3.9.2	M.4.4.8.2	3 (0)
-	-	Material	M.3.2	-	(1)

Notes: <sup>(1)</sup> Documents shall be submitted to prove that the samples satisfy the design specification.

<sup>(2)</sup> Indicates paragraph number of this specification.

#### 4.3 Quality Conformance Inspection

The quality conformance inspections shall be as specified in paragraph M.4.3, Appendix M of JAXA-QTS-2040 and Tables M-8 through M-10 of this specification.

**Table M-8. Quality Conformance Inspection (Group A)**

Subgroup	Test order	Inspection item	Requirement paragraph	Test method paragraph	Pass/fail criteria
					Sample size / Accept number
A1	1	Thermal shock and voltage aging	M.3.10.4	4.5.1 <sup>(1)</sup>	100%(0)
	2	Dielectric withstanding voltage	M.3.8.3	M.4.4.7.3	
	3	Insulation resistance (+125°C)	M.3.8.4	M.4.4.7.4	
	4	Insulation resistance (+25°C)	M.3.8.4	M.4.4.7.4	
	5	Capacitance	M.3.8.1	M.4.4.7.1	
	6	Dissipation factor (tan δ)	M.3.8.2	M.4.4.7.2	
A2	1	Externals, dimensions, mass and marking	M.3.5	M.4.4.5	20(0)
A3	1	Humidity, steady state, low voltage	M.3.10.7	M.4.4.9.7	12(0)
A4	1	DPA	M.3.6.1	M.4.4.6.1	Table M-14 in JAXA-QTS-2040

Note<sup>(1)</sup> Indicates paragraph number of this specification.

**Table M-9. Quality Conformance Inspection (Group B)**

Subgroup	Test order	Inspection item	Requirement paragraph	Test method paragraph	Pass/fail criteria
					Sample size / Accept number
B1	1	Thermal shock	M.3.11.1	M.4.4.9.4.1	25(0)
	2	Life		M.4.4.10.1	
B2	1	Voltage-temperature characteristics	M.3.8.5	M.4.4.7.5	12(0)
	2	Moisture resistance	M.3.10.6	M.4.4.9.6	
B3	1	Shear (Destructive)	M.3.9.1	M.4.4.8.1	6(0)
	2	Solderability	M.3.9.3	M.4.4.8.3	6(0)
	3	Resistance to soldering heat	M.3.9.4	M.4.4.8.4	6(0)

**Table M-10. Quality Conformance Inspection (Group C)**

Subgroup	Test order	Inspection item	Requirement paragraph	Test method paragraph	Pass/fail criteria
					Sample size / Accept number
C1	1	Thermal shock and immersion cycling	M.3.10.5	M.4.4.9.5	18(0)
C2	1	(Deleted)	--	--	--
	2	(Deleted)	--	--	
C3	1	Substrate bending	M.3.9.2	M.4.4.8.2	3(0)

#### 4.4 Long-Term Storage

Long-term storage shall be as follows and in accordance with paragraphs M.4.5, Appendix M of JAXA-QTS-2040.

##### 4.4.1 Storage by Purchasers

Capacitors shall not be stored at a high temperature and humidity or in an atmosphere polluted by such as sulfur or chlorine gas. Storage environment shall be an ambient temperature between 5 and 40°C and humidity between 20 and 70%RH.

The individual package shall be only opened just prior to use.

Opened capacitors shall be stored under the specified conditions after being appropriately packaged to avoid being adversely affected.

#### 4.5 Change to Tests and Inspections

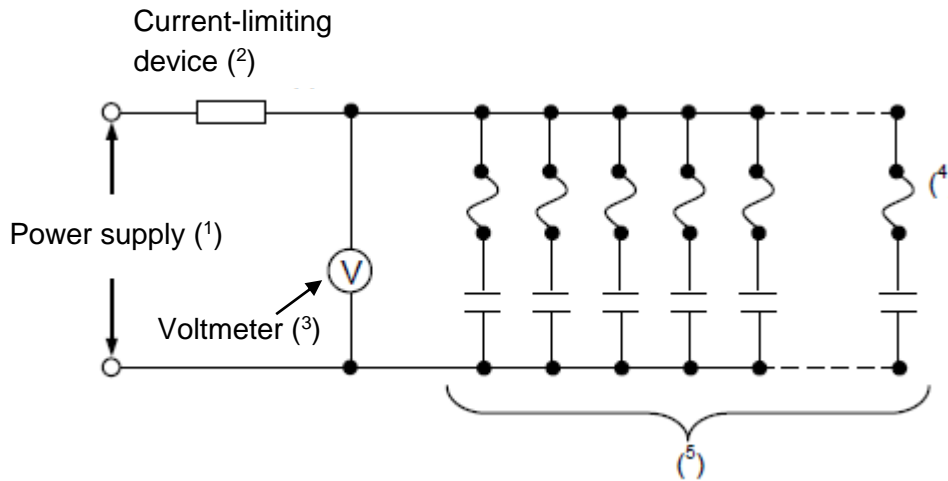
There are changes to the test or inspection from the quality conformance inspection specified in Appendix M of JAXA-QTS-2040.

##### 4.5.1 Test Method of Voltage Aging

After the completion of thermal shock test specified in paragraph M.4.4.9.4.1, Appendix M of JAXA-QTS-2040, voltage aging test shall be conducted under the following conditions. During the test, the circuit shown in Figure M-2 shall be used to maintain a minimum of 95% of specified test voltage. Blown fuses or the voltage drop below 95% of the specified voltage shall constitute failure of the test.

- a) Temperature:  $+125_{-0}^{+4}$  °C
- b) Applied voltage: 300% of the rated voltage
- c) Duration of application: 21 hours min. and the time allowed to reach the specified voltage from 0V shall be within 2 minutes. The test shall be conducted in accordance with JIS Z 3198-7.
- d) Post-test inspection and measurement

At the completion of the test while the capacitor is still maintained at the test temperature, insulation resistance shall be measured as specified in paragraph M.4.4.7.4, Appendix M of JAXA-QTS-2040. The test capacitor may be transferred to another chamber maintained at the same test temperature to measure the insulation resistance. The transfer time shall not exceed 15 minutes. The measurement shall be made after the test capacitor is stabilized at the test temperature. Then, the capacitor shall be restored back to its standard condition as specified in paragraph M.4.4.1 and the externals shall be examined using 10x magnifier for any evidence of mechanical damages. Also, dielectric withstanding voltage, insulation resistance, capacitance, and dissipation factor shall be measured as specified in paragraphs M.4.4.7.3, M.4.4.7.4, M.4.4.7.1, and M.4.4.7.2, respectively.



Notes:

- (1) The power supply shall be capable of providing at least twice the rated voltage of the capacitor at a leakage current of 30mA as a minimum.
- (2) The current-limiting device shall be a resistor and/or a fuse which current is limited to the range from 30mA to 10A.
- (3) The voltmeter shall have the function that triggers an alarm and terminates the test if the applied voltage falls below 95% of the specified voltage.
- (4) A fuse or a resistor may be used if desired by a customer. Regardless of the use of a fuse/resistor, the specified test voltage shall still be applied to the capacitor.
- (5) The number of capacitors to be tested per circuit shall be 10 or more.

**Figure M-2. Test Circuit for Voltage Aging**

4.5.2 Mounting of Test Samples

The mounting of the test samples specified in paragraph M.4.3.3, Appendix M of JAXA-QTS-2040 shall be performed by using resin board (FR-4) for type 1005.

4.5.3 Substrate Bending

For mounting method (in substrate bending) specified in paragraph M.4.4.8.2 a), Appendix M of JAXA-QTS-2040 the printed wiring board shall be between  $1.6 \pm 0.2$ mm thick (size 1608 or larger) and  $0.8 \pm 0.2$ mm thick (size 1005 or smaller) and shall not affect the tests and measurements.

4.5.4 Thermal Shock (I)

For mounting method (in thermal shock(I)) specified in paragraph M.4.4.9.3 a), Appendix M of JAXA-QTS-2040, the solder fillet height shall be less than 1/2 (size 1005 or smaller) of the capacitor thickness (T)(see Table M-3).



4.5.5 Thermal Shock

For mounting method (in thermal shock) specified in paragraph M.4.4.9.5.1 a), Appendix M of JAXA-QTS-2040, the solder filet height shall be less than 1/2 (size 1005 or smaller) of the capacitor thickness (T)(see Table M-3).

4.5.6 Quality Conformance Inspection (Group B and Group C)

Group B and Group C of quality conformance inspection shall be performed for each combination of characteristics and dielectric materials, and the composition of the inspection lot shall be in accordance with paragraph 4.5.2.1 of JAXA-QTS-2040. If there is more than one lot in a combination submitted to the Group A at the same time, samples shall be taken from the lot with the highest electric field strength among them.

Table M-11. Classification of Quality Conformance Inspection (Group B/Group C)

No.	Characteristic	No. of classification	Dielectric material
1	X7R, X7S	2	A, B

4.5.7 Random Vibration and Shock

Random vibration and shock are deleted from Table M-5 Performance requirements(2/3), Table M-7 Qualification test, and Table M-10 Quality conformance inspection (Group C). Due to this deletion, the group/order numbers are not used and the sample size of group I is changed.

4.5.8 Solder

The silver content of tin/lead/silver solder specified in paragraph M.4.4.3 (Mounting of Test Samples), Appendix M of JAXA-QTS-2040 shall be 3wt% or less.

5. PREPARATION FOR DELIVERY

Preparation for delivery shall be as follows and as specified in Section 5 of JAXA-QTS-2040.

6. NOTES

Notes shall be as specified in Section 6 of JAXA-QTS-2040.

In addition to provide the information specified in paragraph 6.2.1 of JAXA-QTS-2040, packaging style shall be designated when purchasing the products.

**Supplementary Table 1. Parts List**

Part number <sup>(1)</sup>	Rated voltage (VDC)	Characteristic	Nominal capacitance (μF)	Capacitance tolerance <sup>(2)</sup>	Dielectric thickness	Mass (mg) (reference)
J2040/M105-1005X7SB104**	8	X7S	0.1	K	2μm min.	1.6
J2040/M105-1608X7RC104**	25	X7R	0.1	K/M	7μm min.	7
J2040/M105-1608X7RB105**	8	X7R	1	K/M	2μm min.	7
J2040/M105-3216X7RB106** <sup>(3)</sup>	8	X7R	10	K/M	2μm min.	55
J2040/M105-3216X7RA226**	3.5	X7R	22	K/M	1μm min.	55
J2040/M105-3225X7RB226**	8	X7R	22	K/M	2μm min.	130

**Notes:**

- (1) Complete part number shall consist of capacitance tolerance and specified symbols (S, Y, R) for terminal finish replacing the asterisks.
- (2) Capacitance tolerance: K: ±10%, M: ±20%
- (3) J2040/M105-3216X7RB106\*\* will be discontinued in 2027. Please consider terminating the adoption of this product to new designs or discontinuing your products.