COMMON PARTS/MATERIALS, SPACE USE, APPLICATION DATA SHEET FOR

Part Description	TRANSFORMERS AND INDUCTORS, POWER
Part Number and Type	NASDA 2110/A114-T000
Applicable Specification	JAXA-QTS-2110 JAXA-QTS-2110/A114

August 2022

Prepared and Established by Tamura Corporation

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: February 10, 2023

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Revision Log

Rev.	Date	Revised Contents
NC	01 Nov. 2005	Original (Converted from NASDA-ADS-1240 to reflect transition from QPL system to QML system.)
A	20 June 2012	(1) Page 13: Outgassing Data of Materials Added data for wire of Furukawa Magnet Wire and Hitachi Cable. Added data for adhesive (due to insufficient data). (2) Page 3: Added paragraph 6 RELIABILITY (3) Page 4: Changed the contact due to the reorganization. Before → After Avio & Industrial Devices → Electronic Components Business Unit → Business Sector Components Quality Assurance Group → Quality Assurance Group (4) Pages 8, 9 and 10: Added change rates and graphs to the limit test data in Tables 4-1, 4-2, 5-1, 5-2, 6-1 and 6-2. (5) Others: Page 11: Added table number in Table 7. Pages 11 and 12: Updated the test data. (the data of Group A and B tests of Quality Conformance test was updated) Page 12: Added the table title of Table 8 "Evaluation Test Results (Electrical Characteristics)".
B	21 Feb. 2018	(1) Page 4: Changed contact in association with organization change Components Quality Assurance Group →Magnetic Business Unit, Production Management dept., Quality Assurance Group (2) Page 5: Added Manufacture line identification letter to the serial number in the marking; Added marking example; W: Wakayanagi Tamura Corporation, No letter added: Tamura corporation (3) Page 12, Table 8: Added the data for “sample made by Wakayanagi Tamura Corporation” to the parameter range.
C	6 Jan. 2020	(1) Page 4, Paragraph 9: Changed contact division and telephone number in association with organization change. (2) Page 13, Table 9: Added a note for the name change of No. 5 Adhesive tape “560S”.
D	22 Aug. 2022	(1) Page 4, Paragraph 9: Changed contact division and telephone number in association with organization change. ・ Quality Assurance Division, Components Quality Assurance Management Department, AO Quality Assurance Section → Magnetic Business Unit, AVIO Department, Quality Assurance Group ・ +81-49-284-9163 → +81-50-3664-0489

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COMMON PARTS AND MATERIALS, SPACE USE,
APPLICATION DATA SHEET FOR

1. GENERAL

1.1 Scope

This Application Data Sheet details additional general information necessary for parts selection and/or equipment design that is not contained in JAXA-QML. Users are encouraged to look into other information sources for specific applications, and responsible for their decisions on part selection and usage.

1.2 Applicable Documents

(1) JAXA-QTS-2000	Common Parts/Materials, Space Use, General Specification for
(2) JAXA-QTS-2110	Transformers and Inductors, High Reliability, Space Use, General Specification For
(3) JAXA-QTS-2110/A114	NASDA 2110/A114 Type, Transformers and Inductors, Power, High Reliability, Space Use, Detail Specification For

1.3 Supplementary Information

Tamura Corporation obtained certification of JAXA-QTS-2110/A114 (QML system) without changing the qualification coverage of NASDA-QTS-39013C/114. Therefore, the applicable data of NASDA-QTS-39013C/114 and JAXA-QTS-2110/A114 are the same. To use this data sheet, the specification number and part number shall be replaced as shown below.

Detail specification number

Detail specification No. of NASDA-QTS-39013C	Corresponding detail specification No. of JAXA-QTS-2110
NASDA-QTS-39013C/114	JAXA-QTS-2110/A114

Parts number

Part No. of NASDA-QTS-39013C	Corresponding part No. of JAXA-QTS-2110
NASDA 39013/114T1X000	NASDA 2110/A114-T000

2. SUMMARY OF PRODUCTS

The transformer described in this data sheet is an open type high reliability product for electrical equipment to be installed on satellites and/or launch vehicles.

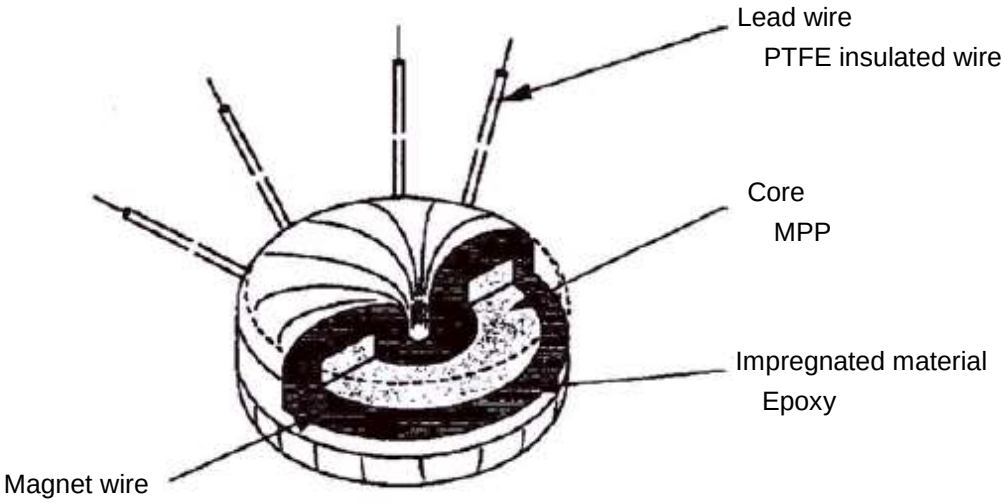
2.1 Externals, Dimensions and Mass

Externals, dimensions, mass and markings of the transformers are shown below.

Part number	Externals, dimensions and markings	Mass (nominal value)
NASDA 2110/A114-T000	See Figure 1	635g

2.2 Construction

The transformer is of epoxy resin impregnated open type. Magnet wires are wound around a toroidal core. The magnet wires or PTFE insulated wires are pulled out to serve as the leads. The following figure shows a simplified internal construction.



3. USAGE

3.1 Rating

The transformer is rated as follows.

Part number	Rated power	Operating frequency	Operating ambient temperature ([1])	Temperature rise ([1])	Input voltage
NASDA 2110/A114-T000	253VA	20kHz	-55°C to 100°C	30°C max.	50Vrms

Note ([1]) Operating ambient temperature + Temperature rise = Maximum operating temperature
: Class S (130°C) max.

3.2 Mounting Methods

It is recommended to mount the transformer as follows.

(a) Use both a retainer plate and epoxy adhesive. The retainer plate shall be fastened with stainless-steel screws.

4. CHARACTERISTICS UNDER NORMAL OPERATING CONDITIONS

4.1 Electrical Characterisitcs

The transformer satisfied the electrical characteristics specified in the detail specification.
Test results are shown in Tables 7 and 8.

4.2 Environmental Resistance

The transformer satisfied the environmental conditions specified in the detail specification.
Test results are shown in Tables 7 and 8.

4.3 Outgassing

Outgassing data of organic materials used in the transformer is shown in Table 9.

5. ENVIRONMENTAL LIMIT

Vibration and shock tests were conducted to evaluate the mechanical strength.
The vibration test results are shown in Table 1.
The shock test results are shown in Table 2.

The thermal shock tests were conducted to evaluate the thermal strength.
The thermal shock test results are shown in Table 3.

6. RELIABILITY

6.1 Possible Failure Mode

· Open circuit (breaking, bad connection)
· Short circuit (Insulation breakage, insulating film breakage)
· Low Inductance (iron core breakage, flexure, layer short)

7. HANDLING AND STORAGE CONDITIONS

(1) Caution shall be used not to give excess stress such as drop impact.
(2) It is advisable to store the transformer under the following conditions.

Items	Conditions
(1) Temperature	+0°C to +35°C
(2) Relative humidity	75%RH max.
(3) Pressure	86kPa to 106kPa
(4) Others	It is advisable to store where vibrations and shocks are minimal.

8. PRECAUTIONS

8.1 Instructions for Purchaser

If purchaser's specification is included in the "qualification coverage" specified in the detail specification, JAXA-QTS-2110/A114, paragraph 3.1, or if "qualification by similarity" specified in JAXA-QTS-2110, Appendix A (paragraph A.3.1.1.1), is applicable, products can be provided as JAXA qualified parts. In this case, the purchaser can specify requirements for specific applications in product specification (refer to JAXA-QTS-2110, paragraph 6.3) for each procurement.

8.2 Instructions for User

- Apply sufficient amount of adhesive to the bonding surface.
- The acceptable adhesive is rigid epoxy adhesive.
- It is advisable to keep the operating frequency deviation within ±5% of the rated operating frequency.
- It is advisable to operate the transformer within the rated output power and direct current.
- Operate the transformer in the temperature class S (130°C) as a maximum.
- Use the transformer in consideration of its outgassing characteristics.

9. OTHERS

Direct all inquiries about this data sheet to Tamura Corporation.

Manufacturer	TAMURA CORPORATION Electronic Components Business Sector, Magnetic Business Unit AVIO Department, Quality Assurance Group
Address	5-30, Chiyoda 5-chome, Sakado-city, Saitama 350-0214, Japan
Telephone	+81-50-3664-0489

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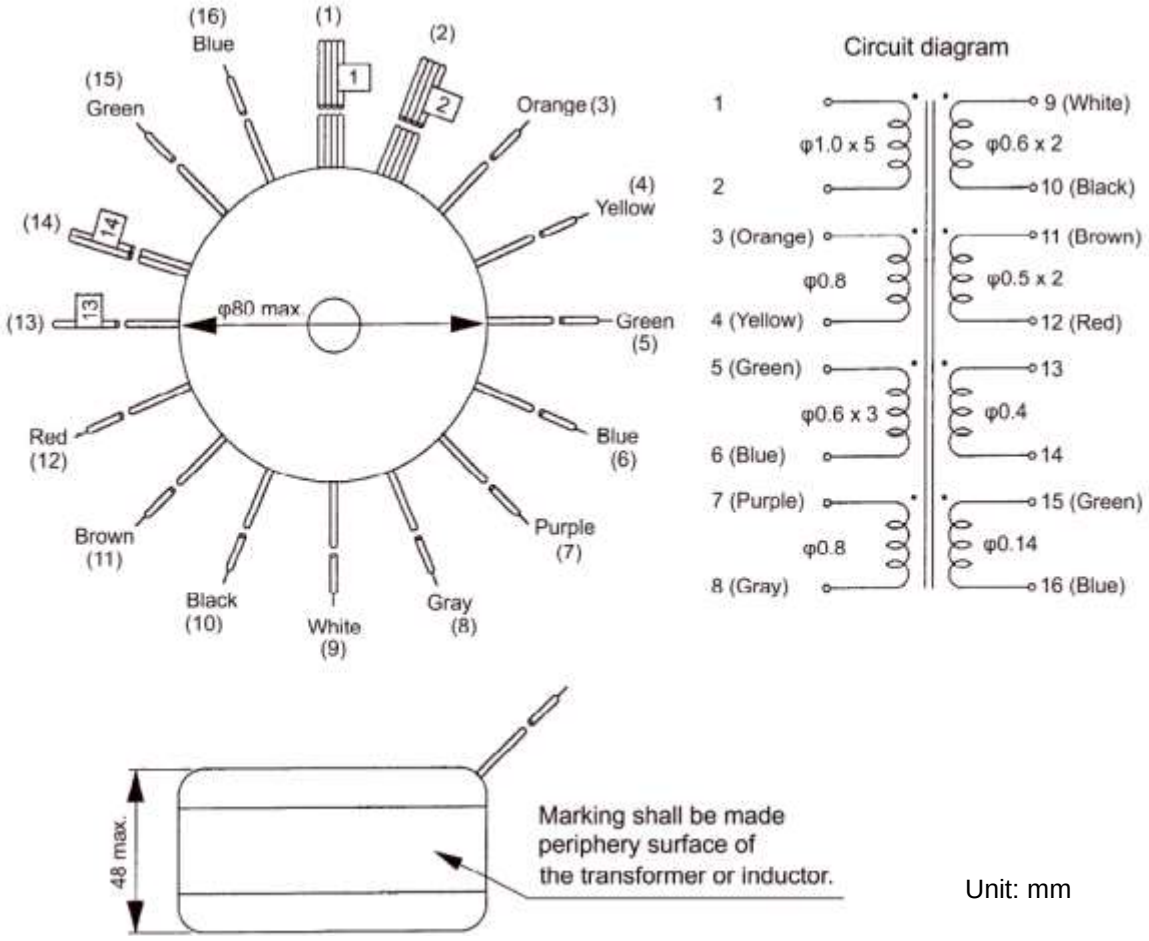


Unit: mm

1. Lead wire length: 100mm min.
   AWG 18 for terminals 5, 6
   AWG 20 for terminals 3, 4, 7, 8, 9, 10, 11, 12
   AWG 28 for terminals 15, 16
   Direct wire leads of φ1.0mm x 5 for terminals 1, 2
   Direct wire leads of φ0.4mm for terminals 13, 14
   Insulator removed approx.10mm at the end
2. Mass: 900g max.
3. Markings:
   NASDA 2110/A114-T000
   Terminal identification
   Lot identification code
   Serial number and manufacture line identification letter

(Marking example)

No. 1 W

Serial number — Manufacture line identification letter:
Letter "W": Wakayanagi Tamura Corporation
No letter added: Tamura Corporation

Trademark

Figure 1. Externals, Dimensions and Markings

Table 1. Evaluation Results of Vibration Limit Test

Test item	Test condition	Results
Random vibration	Step 1 MIL-STD-202 Test method: 214 Test condition: II-H (34.02Grms) 30 minutes each for three axis Step 2 MIL-STD-202 Test method: 214 Test condition: II-J (43.92Grms) 15 minutes each for three axis Step 3 MIL-STD-202 Test method: 214 Test condition: II-K (53.79Grms) 15 minutes each for three axis	See Tables 4-1 and 4-2 for the test data.

Table 2. Evaluation Results of Shock Limit Test

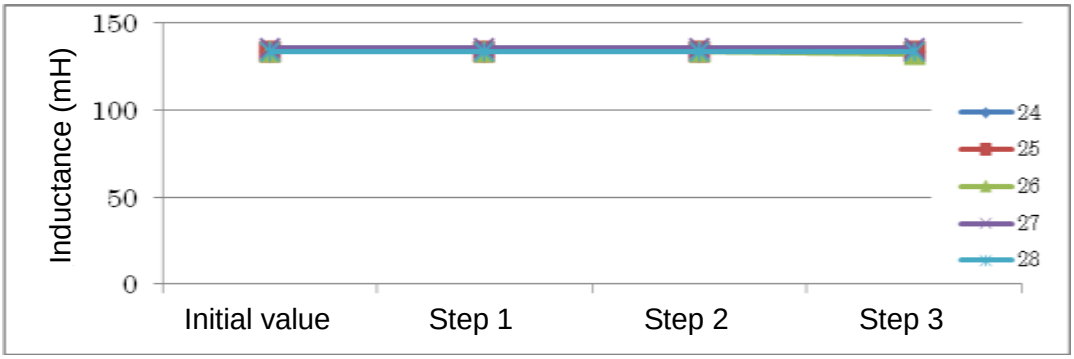
Test item	Test condition	Results
Shock	Step 1 MIL-STD-202 Test method: 213 Test condition: E (Half-sine shock pulse: 1000G, 0.5ms) 3 times each for 6 directions Step 2 MIL-STD-202 Test method: 213 Test condition: F (Half-sine shock pulse: 1500G, 0.5ms) 3 times each for 6 directions Step 3 MIL-STD-202 Test method: 213 Test condition: (Half-sine shock pulse: 2000G, 0.5ms) 3 times each for 6 directions Step 4 MIL-STD-202 Test method: 213 Test condition: (Half-sine shock pulse: 2500G, 0.5ms) 3 times each for 6 directions	0 out of 5 There were no defects in appearance, withstanding voltage, insulation resistance, inductance and DC resistance. (Steps 3 and 4 test were cancelled because the adhesion was destroyed in step 2.) See Tables 5-1 and 5-2 for the test data.

Table 3. Evaluation Results of Thermal Shock Limit Test

<table>
<tr><th>Test item</th><th>Test condition</th><th>Results</th></tr>
<tr><td>Thermal shock</td><td>MIL-STD-202
Test method: 107
Test condition:
<table>
<tr><th>Step</th><th>Temperature (°C)</th><th>Time (min)</th></tr>
<tr><td>1</td><td>-55</td><td>60 MIN</td></tr>
<tr><td>2</td><td>+25</td><td>5 MAX</td></tr>
<tr><td>3</td><td>+115</td><td>60 MIN</td></tr>
<tr><td>4</td><td>+25</td><td>5 MAX</td></tr>
</table>
Cycles: 1,000 max.</td><td>See Tables 6-1 and 6-2 for the test data.</td></tr>
</table>

Table 4-1. Vibration Limit Test Data

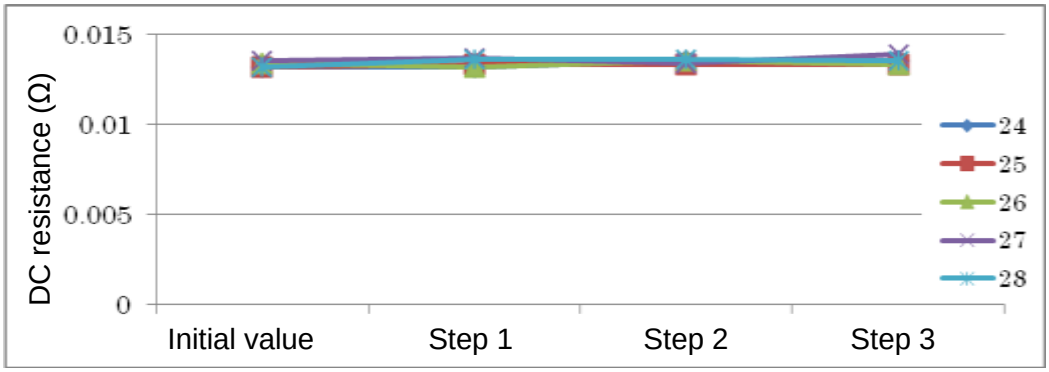
Test sample No.	Inductance between (1-2) (mH)						
	Initial value	Step 1		Step 2		Step 3	
		Measured	Change rate	Measured	Change rate	Measured	Change rate
24	134	134	0.0%	134	0.0%	134	0.0%
25	134	134	0.0%	134	0.0%	134	0.0%
26	134	134	0.0%	134	0.0%	132	-1.5%
27	136	136	0.0%	136	0.0%	136	0.0%
28	134	134	0.0%	134	0.0%	134	0.0%



Notes: Inductance: within ±10% of the initial value (at 10kHz, 0.1V)

Table 4-2. Vibration Limit Test Data

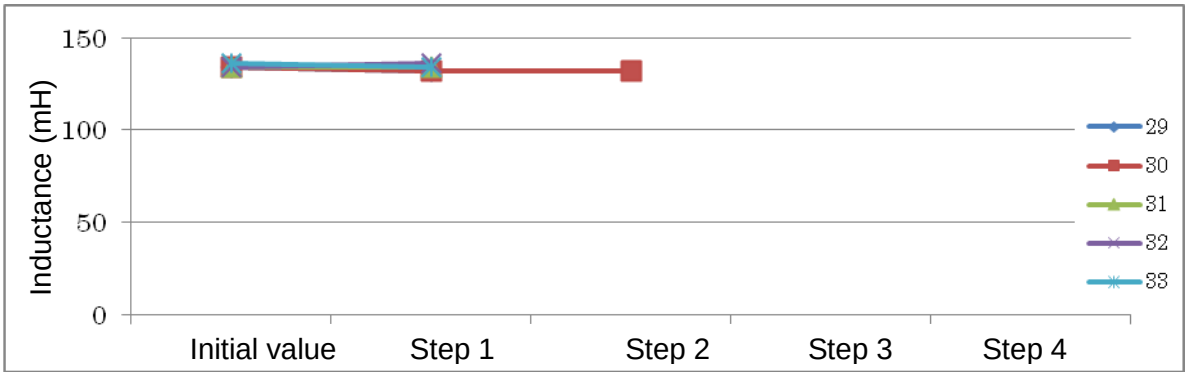
Test sample No.	DC resistance between (1-2) (Ω)						
	Initial value	Step 1		Step 2		Step 3	
		Measured	Change rate	Measured	Change rate	Measured	Change rate
24	0.0132	0.0132	0.0%	0.0135	2.3%	0.0135	2.3%
25	0.0132	0.0133	0.8%	0.0133	0.8%	0.0133	0.8%
26	0.0134	0.0132	-1.5%	0.0135	0.7%	0.0133	-0.7%
27	0.0135	0.0137	1.5%	0.0134	-0.7%	0.0139	3.0%
28	0.0132	0.0136	3.0%	0.0136	3.0%	0.0135	2.3%



Notes: DC resistance: ±5% of the initial value (at 25 ±5°C)

Table 5-1 Shock Limit Test Data

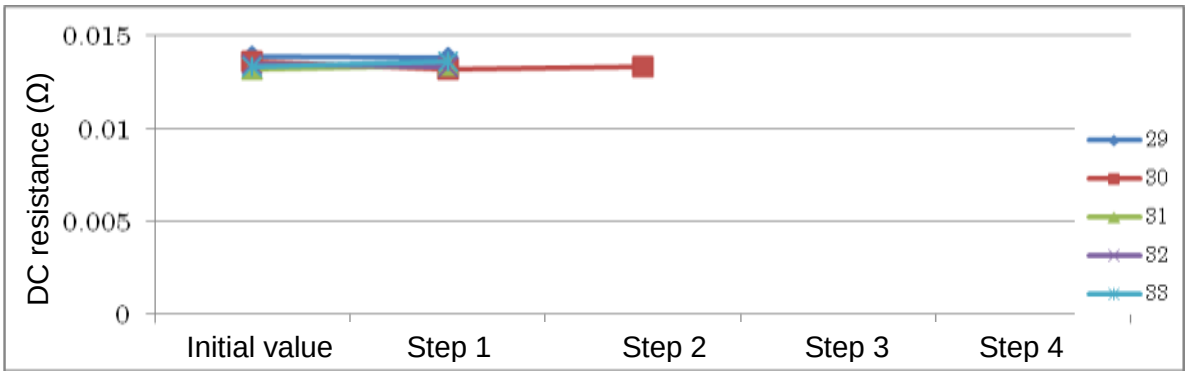
Test sample No.	Inductance between (1-2) (mH)								
	Initial value	Step 1		Step 2		Step 3		Step 4	
		Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate
29	134	132	-1.5%	—	—		—		—
30	134	132	-1.5%	132	-1.5%		—		—
31	134	134	0.0%	—	—		—		—
32	134	136	1.5%	—	—		—		—
33	136	134	-1.5%	—	—		—		—



Notes: Inductance: within ±10% of the initial value (at 10kHz, 0.1V)

Table 5-2 Shock Limit Test Data

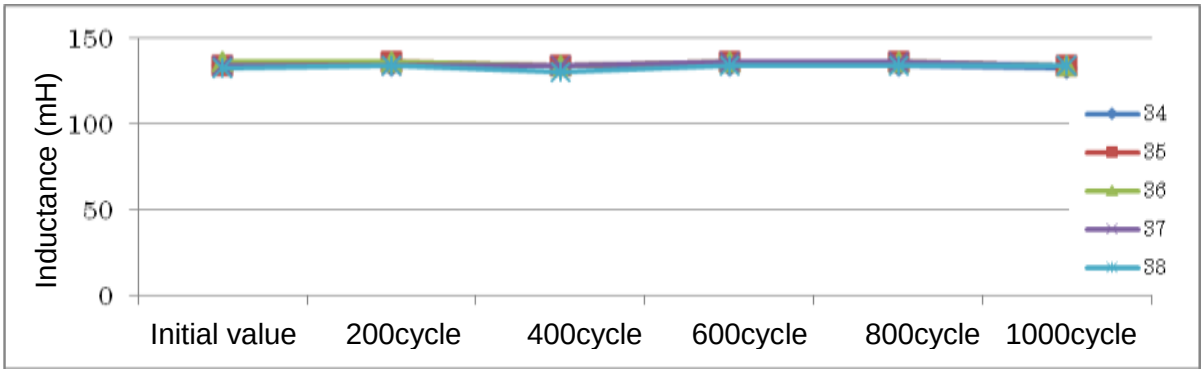
Test sample No.	DC resistance between (1-2) (Ω)								
	Initial value	Step 1		Step 2		Step 3		Step 4	
		Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate
29	0.0139	0.0138	-0.7%	—	—		—		—
30	0.0136	0.0132	-2.9%	0.0133	-2.2%		—		—
31	0.0132	0.0134	1.5%	—	—		—		—
32	0.0135	0.0133	-1.5%	—	—		—		—
33	0.0133	0.0136	2.3%	—	—		—		—



Notes: DC resistance: ±5% of the initial value (at 25 ±5°C)

Table 6-1. Thermal Shock Limit Test Data

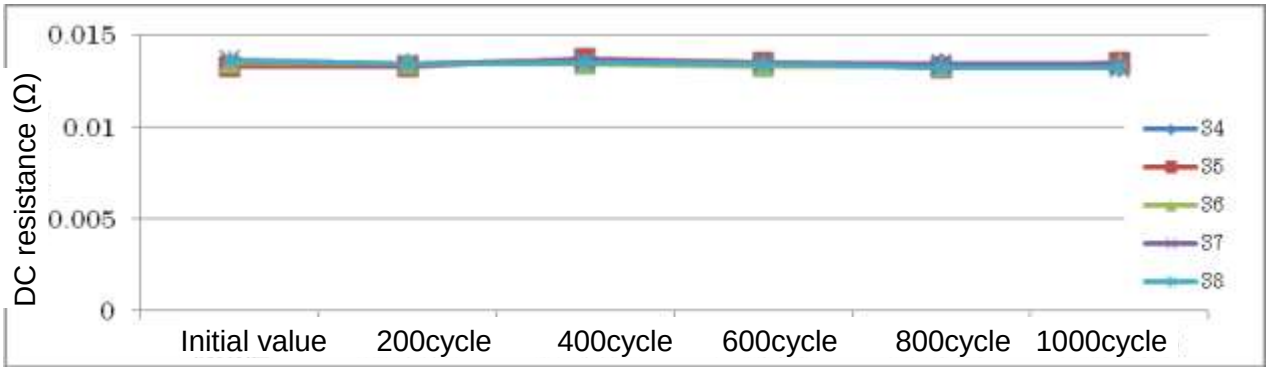
Test sample No.	Inductance between (1-2) (mH)										
	Initial value	200 cycle		400 cycle		600 cycle		800 cycle		1,000 cycle	
		Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate
34	134	134	0.0%	134	0.0%	134	0.0%	134	0.0%	132	-1.5%
35	134	136	1.5%	134	0.0%	136	1.5%	136	1.5%	134	0.0%
36	136	136	0.0%	134	-1.5%	136	0.0%	136	0.0%	134	-1.5%
37	134	134	0.0%	134	0.0%	136	1.5%	136	1.5%	134	0.0%
38	132	134	1.5%	130	-1.5%	134	1.5%	134	1.5%	134	1.5%



Notes: Inductance: within ±10% of the initial value (at 10kHz, 0.1V)

Table 6-2. Thermal Shock Limit Test Data

Test sample No.	DC resistance between (1-2) (Ω)										
	Initial value	200 cycle		400 cycle		600 cycle		800 cycle		1,000 cycle	
		Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate	Measured	Change rate
34	0.0134	0.0134	0.0%	0.0136	1.5%	0.0133	-0.7%	0.0134	0.0%	0.0133	-0.7%
35	0.0133	0.0133	0.0%	0.0137	3.0%	0.0135	1.5%	0.0132	-0.8%	0.0135	1.5%
36	0.0135	0.0134	-0.7%	0.0134	-0.7%	0.0133	-1.5%	0.0133	-1.5%	0.0134	-0.7%
37	0.0136	0.0134	-1.5%	0.0136	0.0%	0.0135	-0.7%	0.0134	-1.5%	0.0134	-1.5%
38	0.0136	0.0134	-1.5%	0.0135	-0.7%	0.0134	-1.5%	0.0132	-2.9%	0.0132	-2.9%



Notes: DC resistance: ±5% of the initial value (at 25 ±5°C)

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Table 7. Evaluation Test Results (Environmental Resistance and Electrical Characteristics)

Item no.		Test item	Test method([1])	Pass/Fail criteria	Test result (Parameter range)		
Group						Passed	Failed
I	1	Thermal shock	A.4.4.6.3	No corrosions affecting electrical performance nor mechanical damages	Acceptable	3	0
II	2	Material, design, structure, externals, dimension, marking, workmanship	A.4.4.2 A.4.4.3	Markings, dimension, mass and structures shall be as specified in the detail specification.	Acceptable	3	0
	3	Electrical characteristics	A.4.4.4.1	Shown in Table 8.		3	0
	4	Withstanding voltage (ambient pressure)	A.4.4.4.2.1	No dielectric breakdown	Acceptable	3	0
	5	Withstanding voltage (reduced pressure)	A.4.4.4.2.2	No dielectric breakdown	Acceptable	3	0
	6	Interlayer withstanding voltage	A.4.4.4.3	No dielectric breakdown	Acceptable	3	0
	7	Insulation resistance	A.4.4.4.4	10,000MΩ min.	100,000MΩ min.	3	0
	8	Bacteria resistance	—	External materials shall be processed to prevent bacterial infestation.	Bacteria resistance material used		
III([2])	9	Life	A.4.4.7.1	No mechanical or electrical damages	Acceptable	2	0
	10	Visual and mechanical inspection (post-test)	A.4.4.2.1	Markings, dimension, mass and structures shall be as specified in the detail specification	Acceptable	2	0
	11	Electrical characteristics	A.4.4.4.1	Shown in Table 8.		2	
IV	12	Terminal strength	A.4.4.5.1	No loosening, breakage or other mechanical damages to the terminals	Acceptable	3	0
	13	Temperature rise	A.4.4.4.6	30°C max.	5.0 to 6.7°C	3	0
	14	Vibration	A.4.4.6.1	No mechanical damages	Acceptable	3	0
	15	Shock	A.4.4.6.2	No mechanical damages	Acceptable	3	0
	16	Moisture resistance	A.4.4.6.5	No corrosions affecting electrical performance nor mechanical damages	Acceptable	3	0
	17	Overload	A.4.4.4.1.21	No corrosions affecting electrical performance nor mechanical damages	Acceptable	3	0
	18	Electrical characteristics	A.4.4.4.1	Shown in Table 8.		3	0
	19	Visual and mechanical inspection (post-test)	A.4.4.2.1	Markings, dimension, mass and structures shall be as specified in the detail specification	Acceptable	3	0
	20	DPA	A.4.4.3.1	No gap or cracks	Acceptable	3	0

Notes ([1]) Indicates paragraph number of JAXA-QTS-2110.

([2]) The evaluation test results in Group III consist of test data from NASDA-QTS-39013C. The temperature at the 3rd step when the data were obtained was 115°C.

Table 8. Evaluation Test Results (Electrical Characteristics)

NASDA2110/A114-T000

Item	Pass/Fail criteria		Parameter range	
			Tamura Corporation Sakado factory sample	Wakayanagi Tamura sample
Inductance	Between (1-2) 90μH min.		132 to 133μH	130.3 to 130.4μH
Transformer turns ratio	(3– 4) / (1–2) 2.467 ± 3%		0.5 to 0.6%	-0.1 to 0.1%
	(5– 6) / (1–2) 1.000 ± 3%		0.4%	-0.3 to -0.1%
	(7– 8) / (1–2) 2.467 ± 3%		0.3 to 0.4%	-0.3 to 0.0%
	(9–10) / (1–2) 1.200 ± 3%		0.2 to 0.3%	-0.4 to -0.2%
	(11–12) / (1–2) 1.200 ± 3%		0.2 to 0.3%	-0.3 to -0.2%
	(13–14) / (1–2) 1.000 ± 4%		0.2 to 0.3%	-0.2 to -0.1%
	(15–16) / (1–2) 0.800 ± 4%		0.2 to 0.8%	-0.3%
DC resistance	Between (1 – 2) 0.03Ω max.		0.013Ω	0.0132Ω
	Between (3 – 4) 0.40Ω max.		0.214 to 0.216Ω	0.212 to 0.214Ω
	Between (5 – 6) 0.20Ω max.		0.058 to 0.059Ω	0.0586 to 0.0589Ω
	Between (7 – 8) 0.45Ω max.		0.235 to 0. 236Ω	0.233 to 0.234Ω
	Between (9– 10) 0.30Ω max.		0.116 to 0.117Ω	0.177Ω
	Between (11–12) 0.35Ω max.		0.167 to 0.169Ω	0.170 to 0.171Ω
	Between (13–14) 0.90Ω max.		0.468 to 0.470Ω	0.476 to 0.478Ω
	Between (15–16) 5.00Ω max.		3.018 to 3.082Ω	3.020 to 3.079Ω
Polarity	Test points 1, 3, 5, 7, 9, 11, 13 and 15 shall have the same polarity.		Acceptable	Acceptable
Dimensions	A (Diameter)	Φ80mm max.	71.9 to 73.1mm	72.8 to 73.1mm
	B (Height)	48mm max.	42.3 to 43.0mm	41.7 to 42.1mm
	C (Lead length)	100mm min.	133 to 134mm	136 to 137mm
Volume	–		173.2 to 180.5cm^3	173.5 to 176.6cm^3
Mass	900g max.		618 to 633g	619 to 624g

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Table 9. Outgassing Data

JAXA qualified parts NASDA 2110/A114-T000

Outgassing Data of Materials

No.	Category	Part Number	Material	TML (%)	CVCM (%)	Mass (g)(ref.)
1	Adhesive tape	No. 56	Polyester	2.181	0.516	1
2-1	Wire	PEW (insulator) (Sumitomo Electric Wintec Co., Ltd.)	Polyester	0.122	0.009	---
2-2	Wire	PEW (insulator) (Furukawa Magnet Wire Co., Ltd.)	Polyester	0.009	0.000	---
2-3	Wire	PEW (insulator) (Hitachi Cable Ltd.)	Polyester	0.008	0.001	---
3	Lead wire	TYPE E (insulator)	PTFE	0.005	0.008	---
4	Adhesive tape	650S	Polyimide / silicone-based adhesive	1.664	0.491	0.5
5	Adhesive tape	560S ([1])	Polyamide / acrylic-based adhesive	2.932	0.335	0.5
6	Adhesives	Bond E set	Epoxy-based adhesive	3.738	0.072	2
7	Insulating tape	Merubon electric insulating tape	Polyester	0.120	0.029	2
8	Adhesives	Aron Alpha #201	α-cyanoacrylate resin	14.310	0.120	0.001
9	Ink	MARKEM7224 (Black)	Epoxy	5.408	0.013	0.05
10	Adhesive tape	No. 69	Glass / silicone-based adhesive	1.672	0.827	1
11	Impregnated material	No. 235	Epoxy	4.980	0.140	40
The outgassing data for the finished product				4.534	0.161	47.051

Note ([1]): The name of the material “560S “ in this qualified part has been changed to “5600 #5” in 2019, however, these materials are identical.
This outgassing data was obtained in 1989 with the part number “560S”.