Registration No. 1289

JAXA-QTS-2110/A200
20 November 2024

TRANSFORMERS
HIGH RELIABILITY, SPACE USE,
(JAXA2110/A200 TYPE)
DETAIL SPECIFICATION FOR

Prepared and Established by IRIICHI Technologies Inc.

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.

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Record of revisions

Rev.	Date	Description
NC	20 Nov. 2024	Original Issued a document by IRIICHI Technologies Inc. Document number: GR6-02002 (Rev. 3)

GR6-02002 (Rev. 3)

Revision history

Rev.	Date	Description	Reasons for revision
1	18 Apr. 2023	Original	
2	27 Jul. 2024	・ 3.4 Electrical characteristic, Table 4. "1. Core" "MTB1 EEPA25B" has changed to "MB4 EEPC25. 1K-Z" ・ 3.4 Electrical Characteristics, Table 4. "3. Electrical Characteristics" (2) Primary inductance "8.23mH±35%" has changed to "6.45mH±35%"	To review the requirements of core used. To change the performance requirements of the ferrite in consideration of availability.
3	7 Oct. 2024	1.1 Scope "The coils specified herein" has corrected to "The transformers specified herein". ・ 3.3 Performance, Table 3. "Performance Requirements" "Temperature rise at 25°C maximum (at ambient temperature 105°C)" has changed to "Temperature rise at 25℃ maximum (at room temperature)". ・4.2 Qualification Test, Table 6 "Details are shown in detail specification" has been deleted. ・ 7. Change to Tests and Inspections The detail reasons of the temperature rise during the qualification test was measured at room temperature has added.	To correct error. To apply measurements at room temperature (see paragraph 7 for details.) To review the description. To clarify the reasons of the test to be applied.

GR6-02002 (Rev. 3)

Contents

GR6-02002 (Rev. 3)

TRANSFORMERS,
HIGH RELIABILITY, SPACE USE,
(JAXA 2110/A200 TYPE)
DETAIL SPECIFICATION FOR

1. GENERAL

1.1 Scope

This specification establishes the detail requirements for transformer with an EPC ferrite core (JAXA2110/A200 type) specified in JAXA-QTS-2110 (Transformers and Inductors, High Reliability, Space use, General Specification for.)
The transformers specified in this specification do not meet outgassing requirements.

1.2 Part Number

The part number shall be indicated in accordance with paragraph A.1.2 of JAXA-QTS-2110 as shown below. When there is a part number defined by purchaser, a part number defined in this specification shall also be provided in a product specification.

(Example)

JAXA(1) 2110/A200 – T000

Identification number

Note: (1) "JAXA" indicates the common part for space use and may be abbreviated to “J”.

1.3 Ratings

The ratings shall be as specified in Table 1.

Table 1. Ratings

Item	Applicable paragraph of JAXA-QTS-2110	Identification number	
		T000	T001 or subsequent
Grade	A.3.3.8	6 (open type)	
Operating ambient temperature	–	-55°C to +105°C	As specified in the product specification.
Class	A.3.6.1	S (130°C)	
Operating frequency	–	100kHz	
Input voltage	–	100Vrms	
Output power	–	18.1VA	

GR6-02002 (Rev. 3)

2. APPLICABLE DOCUMENTS

Applicable documents shall be as specified in paragraph A.2.1 of JAXA-QTS-2110.

3. REQUIREMENTS

Requirements shall be as specified in paragraph A.3 of JAXA-QTS-2110 and as follows.

3.1 Qualification Coverage

The qualification coverage shall be as specified in Table 2.

Table 2. Qualification Coverage

No.	Item	Specification
1	Class (maximum operating temperature)	S (130°C) maximum
2	External/internal mounting construction	Adhesion
	External dimensions (mm)(2)	28.5 (W) x 26.0 (D) x 12.0 (H) maximum
	Total volume (cm^3)	8.9 maximum
3	Operating voltage	285Vpeak maximum
	Insulator	Polyester, equivalent to or better
4	Magnet wire diameter (mm)	Φ0.10 minimum
	Coating material	Polyester, equivalent to or better
5	Grade	6
	Insulation, impregnation, and filling material	Epoxy impregnation
6	Construction and material of terminal	Gull-wing terminal CP wire (0.7 x 0.4 mm minimum)
	Terminal strength	Tensile strength test: MIL-STD-202, test method 211, test condition A Bend test: as specified in item c) in paragraph A.4.4.5.1.2 "Twist or Bend Test" of JAXA-QTS-2110B
7	Shock	MIL-STD-202, test method 213 Test conditions: 1,000G, 0.5ms, half sine wave
	Vibration	MIL-STD-202, test method 204, test condition D MIL-STD-202, test method 214, test condition II-H
8	Core material	Ferrite
	Core shape	EPC type
9	Dielectric withstanding voltage	AC 800V maximum

Note(2) (W) and (D) are the dimensions of the transformer body and do not include the protrusions of the terminals.

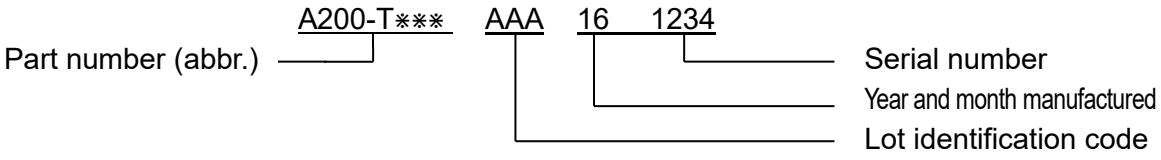
GR6-02002 (Rev. 3)

3.2 Externals, Dimensions and Marking

The externals and dimensions shall be as specified in Figure 1. Marking items shall be in accordance with paragraph A.3.4.1 of JAXA-QTS-2110 and as follows. If the product specification has marking requirements, marking shall be made as specified in the product specification.

1) Part number (abbreviation) in this specification
2) Terminal identification (see Figure 1)
3) Lot identification code
4) Year and month manufactured
5) Serial number

<Marking example>



6) Trademark of manufacturer

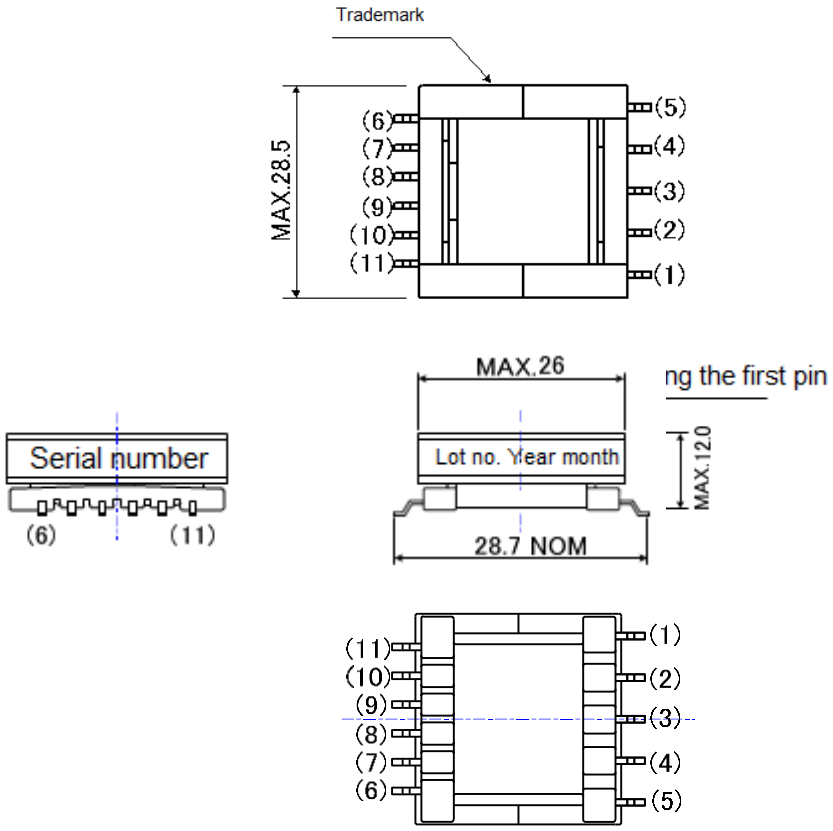


Figure 1. Externals Dimensions, Marking

Notes: a) The core and winding are fixed together using epoxy and silicone adhesives.
b) Installation shall be by soldering and adhesive.
c) The numbers in ( ) in this figure indicate the terminal number.
d) The part number, year and month manufactured, lot identification code, serial number, and trademark of manufacturer are displayed around the edge.

Marking: Maru-Gothic in white	
1. Part number	Height 2.00mm
2. Lot identification number	Height 2.00mm
3. Year and month manufactured	Height 2.00mm
4. Serial number	Height 2.00mm
5. IRIICHI trademark	Trademark 3 #0

Year and Month Manufactured Indication Method

Year Manufactured		Last digit of the year
Month manufactured	January	1
	.	.
	.	.
	.	.
	September	9
	October	O
	November	N
	December	D

3.3 Performance

Performance requirements shall be as specified in Table 3.

GR6-02002 (Rev. 3)

Table 3. Performance Requirements ([3])

Item	Requirement paragraph of JAXA-QTS-2110	Requirement
Electrical characteristics	A.3.7.1	As specified in Table 4.
Dielectric withstanding voltage	A.3.7.2	At barometric pressure: AC800V for 1 minute At reduced pressure: 1.1kPa, AC360V for 1 minute
Interlayer withstanding voltage	A.3.7.3	200kHz, sine wave of 200Vrms applied between (1-2) for 5±0.5s
Insulation resistance	A.3.7.4	10,000MΩ minimum at DC500V
Corona discharge	A.3.7.5	Not specified
Temperature rise	A.3.7.6	25°C maximum (at room temperature)[(4)]
Overload	A.3.7.7	Between (1-2) for 112Vrms Ambient temperature: Maximum operating temperature (130°C) – measured temperature rise
Winding continuity	A.3.7.8	As specified in paragraph A.3.7.8 of JAXA-QTS-2110.
Terminal strength	A.3.8.1	MIL-STD-202, test method 211, test condition A Item c) in paragraph A.4.4.5.1.2 of JAXA-QTS-2110 "Twist or Bend Test" Force: 5N
Solderability	A.3.8.2	95% or more shall be covered with solder
Resistance to soldering heat	A.3.8.3	Not specified
Seal	A.3.8.4	Not applicable for an open type (Grade 6)
Vibration	A.3.9.1	MIL-STD-202 test method 204, test condition D MIL-STD-202 test method 214, test condition II-H
Shock	A.3.9.2	MIL-STD-202 test method 213 Test conditions: 1,000G, 0.5ms, half sine wave
Thermal shock	A.3.9.3	MIL-STD-202 test method 107 Test condition A-1 (temperature at 3rd step: 130°C)
Immersion	A.3.9.4	Not applicable as it is an open type (Grade 6)
Moisture resistance	A.3.9.5	As specified in paragraph A.3.9.5 of JAXA-QTS-2110.
Flammability	A.3.9.6	Not applicable for an open type (Grade 6)
Resistance to solvent	A.3.9.7	Not applicable for an open type (Grade 6)
Life	A.3.10.1	As specified in paragraph A.3.10.1 of JAXA-QTS-2110 Ambient temperature: Maximum operating temperature (130°C) – measured temperature rise
External and dimension	A.3.4	As specified in paragraph A.4.4.2 of JAXA-QTS-2110, and as specified in Figure 1 in this specification.

Notes ([3]) Table 3 shall be applicable to all qualified products. Performance of individual product included in the qualification coverage shall be in the product specification.

([4]) See paragraph 7 for the basis of measurements at room temperature.

3.4 Electrical Characteristics

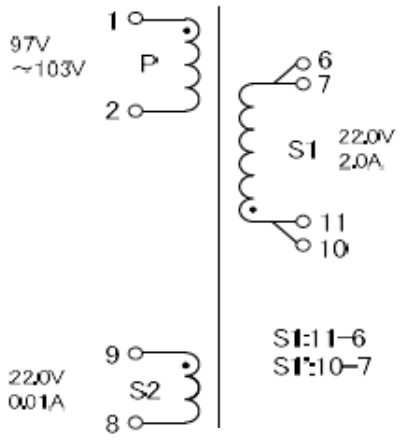
The electrical characteristics shall be as shown in Table 4.

Table 4. Electrical characteristics

1. Core used: MB4 EEPC25.1K-Z, Gap 0 mm

2. Winding specifications

	Wire dia.(Φ)	Number	Number of winding (Ts)
P (1 - 2)	0.32	X 1	66
S1 (11 - 6)	0.32	X 2	15
S1' (10 -7)	0.32	X 2	15
S2 (9 – 8)	0.10	X 1	15



Wiring

3. Electrical characteristics

(1) DC resistance (at 20°C)

P	(1 – 2)	0.75	Ω	maximum
S1	(11 – 6)	82	mΩ	maximum
S1'	(10 – 7)	88	mΩ	maximum
S2	(9 – 8)	2.0	Ω	maximum

(2) Primary inductance	P(1-2)	10 kHz 1V,	6.45 mH±35%	
(3) Leakage inductance	P(1-2)	100 kHz 1 V,	10 μH maximum	S1 to S2: Short-circuit

(4) Transformation ratio (at 20kHz)

P: S1=	(1 - 2):(11 - 6)=	1:0.227±3%
P: S1'=	(1 - 2):(10 - 7)=	1:0.227±3%
P: S2	(1 - 2): (9 - 8)=	1:0.227±3%

4. Mass: 30 g maximum
5. Drive frequency: 100 kHz
6. Output capacity: 18.1 VA

Note (5) Table 4 shall be applicable to all qualified products. The electrical characteristics of each product included in the qualification coverage shall be as specified in the product specification.

GR6-02002 (Rev. 3)

4. QUALITY ASSURANCE PROVISIONS

Quality assurance provisions shall be as specified in paragraph A.4 of JAXA-QTS-2110.

4.1 In-process Inspection

The in-process inspection shall be in accordance with paragraph A.4.1 of JAXA-QTS-2110. The in-process inspection items and number of samples shall be as specified in Table. 5.1 and Table 5.2.

Table 5.1. In-process inspection 1 (Internal visual inspection)

Item	Requirement paragraph	Test method paragraph	Number of samples
Externals	A.4.1	A.4.4.2	100%
Internal visual inspection	A.4.1	A.4.4.2	100%
DC resistance	-	A.4.4.4.1.3	100%
Transformer turns ratio	-	A.4.4.4.1.17	100%

Table 5.2. In-process inspection 2

Item	Requirement paragraph	Test method paragraph	Number of samples
Inductance	-	A.4.4.4.1.4	100%
Leakage inductance	-	A.4.4.4.1.20	100%

4.2 Qualification Test

The qualification test shall be as specified in paragraph A.4.2 of JAXA-QTS-2110. The test items and number of samples shall be as specified in Table. 6. After conducting the tests for groups I and II, the samples shall be divided into groups III and below and tests shall be conducted on them.

Table 6. Qualification Test (1/2)

Test			Requirement paragraph	Test method number	Criteria for Pass/Fail	
Group	Order	Item			Number of samples	Allowable defects
I	1	DC resistance	A.3.7.1	A.4.4.4.1.3	10	1
	2	Inductance	A.3.7.1	A.4.4.4.1.4		
	3	Thermal shock (25cycles)	A.3.9.3	A.4.4.6.3		
	4	Winding continuity	A.3.7.8	A.4.4.4.7		
II	1	Externals, dimension and marking	A.3.2.1 to A.3.2.3, A.3.3.1 to A.3.3.3, A.3.3.6, A.3.4.1, A.3.4.2, A.3.5	A.4.4.2 and A.4.4.3	9 minimum	0
	2	DC resistance	A.3.7.1	A.4.4.4.1.3		
	3	Inductance	A.3.7.1	A.4.4.4.1.4		
	4	Leakage inductance	A.3.7.1	A.4.4.4.1.20		
	5	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		
	6	Dielectric withstanding voltage (at barometric pressure)	A.3.7.2	A.4.4.4.2.1		
	7	Dielectric withstanding voltage (at reduced pressure)	A.3.7.2	A.4.4.4.2.2		
	8	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	9	Insulation resistance	A.3.7.4 a)	A.4.4.4.4		
	10	Fungus (6)	A.3.2.3	---		

Note(6) The item may be omitted since it has been confirmed that all materials are antibacterial.

GR6-02002 (Rev. 3)

Table 6. Qualification Test (2/2)

Test			Requirement paragraph	Test method number	Criteria for Pass/Fail	
Group	Order	Item			Number of samples	Allowable defects
III	1	Solderability	A.3.8.2	A.4.4.5.2	2	0
	2	Life	A.3.10.1	A.4.4.7.1		
	3	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	4	Insulation resistance	A.3.7.4 b)	A.4.4.4.4		
	5	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	6	Externals and mechanical inspection (after test)	A.3.4.3	A.4.4.2.1		
	7	DC resistance	A.3.7.1	A.4.4.4.1.3		
	8	Inductance	A.3.7.1	A.4.4.4.1.4		
	9	Leakage inductance	A.3.7.1	A.4.4.4.1.20		
	10	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		
IV	1	Terminal strength	A.3.8.1	A.4.4.5.1	6	0
	2	Temperature rise (2 samples)	A.3.7.6	A.4.4.4.6		
	3	Vibration (High frequency vibration)	A.3.9.1	A.4.4.6.1.1		
	4	Vibration (Random vibration)	A.3.9.1	A.4.4.6.1.2		
	5	Shock	A.3.9.2	A.4.4.6.2		
	6	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	7	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	8	Winding continuity	A.3.7.8	A.4.4.4.7		
	9	Moisture resistance	A.3.9.5	A.4.4.6.5		
	10	Overload	A.3.7.7	A.4.4.4.1.21		
	11	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	12	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	13	Insulation resistance	A.3.7.4 c)	A.4.4.4.4		
	14	Winding continuity	A.3.7.8	A.4.4.4.7		
	15	DC resistance	A.3.7.1	A.4.4.4.1.3		
	16	Inductance	A.3.7.1	A.4.4.4.1.4		
	17	Leakage inductance	A.3.7.1	A.4.4.4.1.20		
	18	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		
	19	Externals and mechanical inspection (after test)	A.3.4.3	A.4.4.2.1		
	20	DPA (3 samples)	A.3.2 A.3.3.4 A.3.3.5 A.3.3.7, A.3.5	A.4.4.3.1		

GR6-02002 (Rev. 3)

4.3 Quality Conformance Inspection

The quality conformance inspection shall be as specified in paragraph A.4.3 of JAXA-QTS-2110. Inspection items and number of samples shall be as specified in Tables 7 to 9.

Table 7. Quality Conformance Inspection (Group A)

Inspection			Requirement paragraph	Test method number	Criteria for Pass/Fail	
Group	Order	Item			Number of samples	Allowable defects
A1	1	DC resistance	-	A.4.4.4.1.3	100%	10% or 1, whichever is greater
	2	Inductance	-	A.4.4.4.1.4		
	3	Thermal Shock (5 cycles) (7)	A.3.9.3	A.4.4.6.3		
	4	Winding continuity	A.3.7.8	A.4.4.4.7		
A2	1	Externals, dimension, and marking	A.3.2.1 to A.3.2.3, A.3.3.1 to A.3.3.3, A.3.3.6, A.3.4.1, A.3.4.2, A.3.5	A.4.4.2 and A.4.4.3	100%	0
	2	Dielectric withstanding voltage (at barometric pressure)	A.3.7.2	A.4.4.4.2.1		
	3	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	4	Insulation resistance	A.3.7.4 a)	A.4.4.4.4		
	5	DC resistance	A.3.7.1	A.4.4.4.1.3		
	6	Inductance	A.3.7.1	A.4.4.4.1.4		
	7	Leakage Inductance	A.3.7.1	A.4.4.4.1.20		
	8	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		

Note (7) The number of cycles shall be applied to 25 cycles for the samples to be subjected to group B or group C inspection.

GR6-02002 (Rev. 3)

Table 8. Quality Conformance Inspection (Group B)

Inspection			Requirement paragraph	Test method number	Criteria for Pass/Fail	
Group	Order	Item			Number of samples	Allowable defects
B1	1	Dielectric withstanding voltage (at reduced pressure)	A.3.7.2	A.4.4.4.2.2	3	0
	2	Terminal strength	A.3.8.1	A.4.4.5.1		
	3	Temperature rise	A.3.7.6	A.4.4.4.6		
	4	Vibration (High frequency vibration)	A.3.9.1	A.4.4.6.1.1		
	5	Vibration (Random vibration)	A.3.9.1	A.4.4.6.1.2		
	6	Shock	A.3.9.2	A.4.4.6.2		
	7	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	8	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	9	Winding continuity	A.3.7.8	A.4.4.4.7		
	10	Moisture resistance	A.3.9.5	A.4.4.6.5		
	11	Overload	A.3.7.7	A.4.4.4.1.21		
	12	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	13	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	14	Insulation resistance	A.3.7.4 c)	A.4.4.4.4		
	15	Winding continuity	A.3.7.8	A.4.4.4.7		
	16	DC resistance	A.3.7.1	A.4.4.4.1.3		
	17	Inductance	A.3.7.1	A.4.4.4.1.4		
	18	Leakage inductance	A.3.7.1	A.4.4.4.1.20		
	19	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		
	20	Externals and mechanical inspection (after test)	A.3.4.3	A.4.4.2.1		
	21	DPA	A.3.2 A.3.3.4 A.3.3.5 A.3.3.7 A.3.5	A.4.4.3.1		

GR6-02002 (Rev. 3)

Table 9. Quality Conformance Inspection (Group C)

Inspection			Requirement paragraph	Test method number	Criteria for Pass/Fail	
Group	Order	Item			Number of samples	Allowable defects
C1	1	Solderability	A.3.8.2	A.4.4.5.2	2	0
	2	Life	A.3.10.1	A.4.4.7.1		
	3	Dielectric withstanding voltage (at reduced voltage)	A.3.7.2	A.4.4.4.2.3		
	4	Interlayer withstanding voltage	A.3.7.3	A.4.4.4.3		
	5	Insulation resistance	A.3.7.4 b)	A.4.4.4.4		
	6	DC resistance	A.3.7.1	A.4.4.4.1.3		
	7	Inductance	A.3.7.1	A.4.4.4.1.4		
	8	Leakage Inductance	A.3.7.1	A.4.4.4.1.20		
	9	Transformer turns ratio	A.3.7.1	A.4.4.4.1.17		
	10	Externals and mechanical inspection (after test)	A.3.4.3	A.4.4.2.1		

5. Preparation for Delivery

Preparation for delivery shall be in accordance with paragraph A.5 of JAXA-QTS-2110.

6. Long-Term Storage

Products that have been stored for 24 months or more after group A inspection shall not be delivered.

7. Change to Tests and Inspections

Temperature rise specified in order 2 of group IV of qualification test

The temperature rise of the products is measured at the room temperature in an air-flow free location.

The method at the maximum ambient temperature (105°C) specified in appendix A of JAXA QTS-2110 is that the sample to be measured is placed in a chamber keeping 105°C and the measurement system is placed outside the chamber in a room temperature. In this case, the winding resistance value calculated to resistance method conversion values, then more accurate value is acquired by placing the sample in a room temperature.

The temperature rise value in a room temperature is more than the temperature rise value at the maximum ambient temperature, therefore the measurement results in a room temperature environment guarantee the temperature rise value measured at the maximum ambient temperature (105°C).

For the results where the temperature rise value in a room temperature is more than the temperature rise value measured at the maximum ambient temperature, refer to the application datasheet (paragraph 4.2.2 of JAXA-ADS-2110/A200). The same condition also applies to measure the temperature rise specified in order 3 of group B1 in quality confirmation inspection (group B).

8. NOTES

Details of notes shall be as specified in paragraph A.6 of JAXA-QTS-2110.