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JAXA-QTS-2140/B701

24 July 2025

FINE PITCH PRINTED WIRING BOARDS,
GLASS BASE WOVEN EPOXY RESIN BASE MATERIAL,
HIGH RELIABILITY, SPACE USE,
DETAIL SPECIFICATION FOR

Prepared and Established by MEIKO ELECTRONICS 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.

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Record of Revisions

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Revision History

Rev.	Date	Description
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**FINE PITCH PRINTED WIRING BOARDS,
GLASS BASE WOVEN EPOXY RESIN BASE MATERIAL,
HIGH RELIABILITY, SPACE USE,
DETAIL SPECIFICATION FOR**

1. GENERAL**1.1 Scope**

This specification applies to fine pitch printed wiring boards, glass base woven epoxy resin base material (hereinafter referred to as PWB), which are manufactured by Meiko Electronics Co., Ltd., certified by JAXA in accordance with JAXA-QTS-2140.

1.2 Part Number

The part numbers for the PWB are shown as below.

(Example) JAXA ⁽¹⁾ 2140/B 701 GF III 10 ⁽²⁾

Individual base processing number of
number material code layers

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

Note:⁽²⁾ Shows number of the conductor layers.

The base material code is shown in Table 1. Base Material Code .

Table 1. Base Material Code

Base material code	Base material
GF	Glass base epoxy resin in accordance with IPC-4101.

The processing code is shown in Table 2. Processing Code.

Table 2. Processing Code

Processing code	Construction	Remark
III	Multilayer	-

The maximum number of layers is shown in Table 3. Ratings.

1.3 Ratings

Ratings are shown in Table 3. Ratings.

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Qualified products	Fine Pitch Printed Wiring Boards, Glass Base Woven Epoxy Resin Base Material
Applicable standard for the base material	IPC-4101
Material	GF
Number of layers	10 layers as a maximum
Board thickness	1.8 mm as a maximum
Conductor width	0.13 mm as a minimum
Split board	Including slots, V-cuts, and perforations.
Connection resistance	As specified in paragraph B.3.8.3, appendix B of JAXA-QTS-2140.
Terminal pull strength	As specified in paragraph B.3.9.1, appendix B of JAXA-QTS-2140.
Heat resistance	Classification of heat resistance and thermal shock resistance Thermal shock temperature range: -30 °C to 125 °C Number of thermal shock cycle: 1,000 cycles

2.

APPLICABLE DOCUMENTS

The applicable documents shall be in accordance with paragraph B.2, appendix B of JAXA-QTS-2140.

3.

REQUIREMENTS

The requirements shall be in accordance with paragraph B.3, appendix B of JAXA-QTS-2140.

The inner layer copper foil with IVH and SVH shall be at least 12 μm (nominal).

3.1

Qualification Coverage

The qualification coverage is shown in Table 4. Qualification Coverage.

Table 4. Qualification Coverage

Specification		Standard 10 layers
Base material		GF epoxy (R1566)
Applicable standard for the base material		IPC-4101
Maximum number of layers	Through-holes	10 layers
	SVH/IVH	2 layers / 2 layers
Maximum number of lamination cycles		1 cycle
Maximum board thickness		1.8 mm
Minimum drill diameter	Through-holes	Φ 0.35 mm
	SVH/IVH	Φ 0.2 mm
Minimum plating thickness	Through-holes	30 μm
	SVH/IVH	15 μm
Conductor width		0.13 mm as a minimum
Conductor spacing		0.18 mm as a minimum
Conductor keep-out area from board edge		0.3 mm as a minimum
Solder resist ink		Equivalent to IPC-SM-840, class H
Surface treatment		Solder leveler

3.2 Marking

The marking shall be in accordance with paragraph B.3.4.3, appendix B of JAXA-QTS 2140 and the following.

a) Part number

Part number shall be in accordance with paragraph 1.2 of this specification.

b) Manufacturing date

Kanagawa factory

<u>YYYY</u>	<u>MM</u>	<u>DD</u>
4-digit	Month	Day
year		

Kahoku factory

<u>YY</u>	<u>MM</u>	<u>DD</u>
2-digit	Month	Day
year		

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c) Qualified manufacturer's name and identification code

Kanagawa factory: MK

Kahoku factory: MY

d) Part serial number or lot number

Kanagawa factory: XXXXXXXXXX (8-digit factory identification number)

Kahoku factory: XXXXXXXXXX (9-digit factory identification number)

Example of Kanagawa factory's number

20250101: January 1st, 2025

12345678: 8-digit factory identification number

MK: Identification code of Kanagawa factory

Example of Kahoku factory's number

250101

January 1st,
2025

MY

Identification
code of
Kahoku factory

123456789

9-digit factory
identification number

3.3

Performances

Performance shall be shown in Table 5. Performance.

Table 5. Performance (1 / 5)

Item	Requirement paragraph of JAXA-QTS-2140	Specification
Materials	B.3.2	As specified in appendix B of JAXA-QTS-2140.
Metal-clad laminate and prepreg	B.3.2.1	As specified in IPC-4101. The board thickness shall be equal to or more than 0.05 mm (nominal). The inner layer copper foil with IVH and SVH shall be equal to or more than 12 μm (nominal).
Solder coating	B.3.2.2	Solder bath metal composition limits (wt%) Sn ≤ 62.0±1.0, Cu ≤ 0 to 0.35, Sb ≤ 0.20, Bi ≤ 0.10, Zn ≤ 0.001, Fe ≤ 0.02, Al ≤ 0.001, As ≤ 0.03, Pb: remaining
Solder resist	B.3.2.3	Equivalent to IPC-SM-840, class H
Marking ink	B.3.2.4	Epoxy based ink

Table 5. Performance (2 / 5)

Item	Requirement paragraph of JAXA-QTS-2140	Specification
Plating	B.3.2.5	-
(1) Electroless copper plating	B.3.2.5.1	Perform pretreatment to form electrolytic copper plating.
(2) Electrolytic copper plating	B.3.2.5.2	Copper purity 99.5 % min.
(3) Electrolytic gold plating	B.3.2.5.3	Not applicable due to non-use.
(4) Electrolytic nickel plating	B.3.2.5.4	Not applicable due to non-use.
Design and construction	B.3.3	-
Manufacturing drawings and artwork master	B.3.3.1	As specified in appendix B of JAXA-QTS-2140.
Connector for printed wiring boards	B.3.3.2	Do not use direct PWB connectors.
Interlayer connection	B.3.3.3	Process by through-holes including small via holes (min. drill diameter 0.35 mm), IVH (min. drill diameter 0.2 mm) and SVH (min. drill diameter 0.2 mm).
Conductor width	B.3.3.4	As specified in appendix B of JAXA-QTS-2140.
Conductor spacing	B.3.3.5	As specified in appendix B of JAXA-QTS-2140.
Land diameter	B.3.3.6	As specified in appendix B of JAXA-QTS-2140.
Plating thickness and others	B.3.3.7	-
(1) Electroless copper plating	-	Necessary and sufficient thickness for electrolytic copper plating in the next process.
(2) Electrolytic copper plating	-	Parts hole: 25 µm as a minimum. Small via hole: 30 µm as a minimum. IVH and SVH: 15 µm as a minimum.
(3) Electrolytic gold plating	-	Not applicable due to non-use.
(4) Electrolytic nickel plating	-	Not applicable due to non-use.
(5) Solder coating	-	As specified in appendix B of JAXA-QTS-2140.
Operating temperature range	B.3.3.8	-65 to +125 °C

Table 5. Performance (3 / 5)

Item	Requirement paragraph of JAXA-QTS-2140	Specification
Externals, dimensions, marking and others	B.3.4	-
Conductive pattern	B.3.4.1.1 a)	As specified in appendix B of JAXA-QTS-2140.
Conductor	B.3.4.1.1 b)	As specified in appendix B of JAXA-QTS-2140.
Annular ring	B.3.4.1.1 c)	Plated-through hole: 0.05 mm as a minimum. Non-plated-through hole: 0.38 mm as a minimum.
Dielectric layer between conductor layers	B.3.4.1.1 d)	The surface of the insulator shall be free of unwanted residual conductors or foreign materials.
Electrolytic solder plating and solder coating	B.3.4.1.1 e)	Complete coverage of conductors with no pinholes, pits and others.
Edges of printed wiring board	B.3.4.1.1 f)	As specified in appendix B of JAXA-QTS-2140.
Surface of printed wiring board	B.3.4.1.1 g)	As specified in appendix B of JAXA-QTS-2140.
Solder resist	B.3.4.1.1 h)	As specified in appendix B of JAXA-QTS-2140.
Dimensions	B.3.4.2	As specified in appendix B of JAXA-QTS-2140.
Marking	B.3.4.3	As specified in appendix B of JAXA-QTS-2140.
Marking on split board	B.3.4.3.1	As specified in appendix B of JAXA-QTS-2140.
Through holes	B.3.4.4	-
a) Voids	B.3.4.4 a)	As specified in appendix B of JAXA-QTS-2140.
b) Conductive interface	B.3.4.4 b)	As specified in appendix B of JAXA-QTS-2140.
c) Layer-to-layer registration	B.3.4.4 c)	0.20 mm as a maximum.
d) Dielectric layer thickness	B.3.4.4 d)	0.08 mm as a minimum.
e) Plating thickness	B.3.4.4 e)	As specified in appendix B of JAXA-QTS-2140.
f) Annular ring	B.3.4.4 f)	As specified in appendix B of JAXA-QTS-2140.
Solder resist thickness	B.3.4.5	As specified in appendix B of JAXA-QTS-2140.

Table 5. Performance (4 / 5)

Item	Requirement paragraph of JAXA-QTS-2140	Specification
Workmanship	B.3.5	As specified in appendix B of JAXA-QTS-2140.
Bow and twist	B.3.5.1	0.8 % as a maximum.
Repair	B.3.5.2	As specified in appendix B of JAXA-QTS-2140.
Plating adhesion and overhang	B.3.6	As specified in appendix B of JAXA-QTS-2140.
Cleanliness	B.3.7	Resistivity of solvent extract: $2 \times 10^6 \Omega \cdot \text{cm min.}$
Electrical performance	B.3.8	-
Dielectric withstanding voltage	B.3.8.1	As specified in appendix B of JAXA-QTS-2140.
Circuitry	B.3.8.2	As specified in appendix B of JAXA-QTS-2140.
Connection resistance	B.3.8.3	As specified in appendix B of JAXA-QTS-2140.
Mechanical performance	B.3.9	As specified in appendix B of JAXA-QTS-2140.
Terminal pull strength	B.3.9.1	As specified in appendix B of JAXA-QTS-2140.
a) Bond strength	B.3.9.1 a)	As a minimum of 89.2 N or 1380 N/cm ² , whichever is smaller.
b) Conductor and land	B.3.9.1 b)	As specified in appendix B of JAXA-QTS-2140.
c) Microsection of through hole	B.3.9.1 c)	As specified in appendix B of JAXA-QTS-2140.
Solderability	B.3.9.2	-
a) Hole solderability	B.3.9.2 a)	As specified in appendix B of JAXA-QTS-2140.
b) Surface solderability	B.3.9.2 b)	As specified in appendix B of JAXA-QTS-2140.
Environmental performance	B.3.10	-
Thermal shock [I]	B.3.10.1.1	As specified in appendix B of JAXA-QTS-2140.
Thermal shock [II]	B.3.10.1.2	As specified in appendix B of JAXA-QTS-2140.
Humidity and insulation resistance	B.3.10.2	As specified in appendix B of JAXA-QTS-2140.
Hot oil resistance	B.3.10.3	As specified in appendix B of JAXA-QTS-2140.

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Table 5. Performance (5 / 5)		
Item	Requirement paragraph of JAXA-QTS-2140	Specification
Thermal stress	B.3.10.4	As specified in appendix B of JAXA-QTS-2140.
a) Externals	B.3.10.4 a)	As specified in appendix B of JAXA-QTS-2140.
b) Copper foil	B.3.10.4 b)	As specified in appendix B of JAXA-QTS-2140.
c) Laminate voids	B.3.10. 4 c)	As specified in appendix B of JAXA-QTS-2140.
Radiation hardness	B.3.10.5	As specified in appendix B of JAXA-QTS-2140.

4. QUALITY ASSURANCE PROVISIONS

The quality assurance provisions shall be as specified in paragraph B.4, appendix B of JAXA-QTS-2140.

4.1 In-process Inspection

In-process inspection shall be as specified in paragraph B.4.1, appendix B of JAXA-QTS-2140 and shall be shown in Table 6. In-Process Inspection.

Table 6. In-Process Inspection					
No.	Inspection item	Requirement paragraph of JAXA-QTS-2140	Test method paragraph of JAXA-QTS-2140	Number of samples	
				Products	Test coupon
1	Externals, construction and dimensions of inner layers Externals and construction Dimensions Marking Workmanship	B.3.4.1 B.3.4.2 B.3.4.3	B.4.4.2.1	All	Not applicable
2	Cleanliness ⁽¹⁾	B.3.7	B.4.4.5	1	Not applicable

Note ⁽¹⁾ For products from which chips generated during the router process have been removed, one sample per lot is measured using a Contaminometer.

4.2 Qualification Test

Qualification tests shall be as specified in paragraph B.4.2, appendix B of JAXA-QTS-2140 and shall be shown in Table 7. Qualification Test.

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Table 7. Qualification Test (1 / 2)							
Test			Requirement paragraph of JAXA-QTS- 2140	Test method paragraph of JAXA-QTS- 2140	Determination of pass and fail		
Group	Order	Item			Quantity of samples ⁽¹⁾		Quantity of allowable defects
					Production PWBs	Test coupon ⁽²⁾	
I	1	Design and construction	B.3.3	B.4.4.2	No. 1 to No. 6	A, B, C, D, E, F, G, H, K and L ⁽⁴⁾	0
	2	Externals, dimensions, marking and others	B.3.4	B.4.4.2.1			
		Externals and construction	B.3.4.1				
		Dimensions	B.3.4.2				
		Marking	B.3.4.3				
	3	Workmanship ⁽³⁾	B.3.5	B.4.4.3			
II	1	Plating adhesion and overhang	B.3.6	B.4.4.4	No. 1 to No. 6	C	
	2	Bow and twist	B.3.5.1	4.4.2 of this specification		Not applicable	
III	1	Through holes	B.3.4.4	B.4.4.2.2	No. 1	A, F and K	
	2	Terminal pull strength	B.3.9.1	B.4.4.7.1		F	
	3	Solder resist thickness	B.3.4.5	B.4.4.2.3		J	
IV	1	Connection resistance	B.3.8.3	B.4.4.6.3	No. 2	D	
	2	Hot oil resistance	B.3.10.3	B.4.4.8.3			
	3	Connection resistance	B.3.8.3	B.4.4.6.3			
V	1	Circuitry	B.3.8.2	B.4.4.6.2	No. 3	E and G ⁽⁵⁾	
	2	Connection resistance	B.3.8.3	B.4.4.6.3			
	3	Thermal shock [I]	B.3.10.1.1	B.4.4.8.1 a)			
	4	Circuitry	B.3.8.2	B.4.4.6.2			
	5	Connection resistance	B.3.8.3	B.4.4.6.3			
VI	1	Humidity and insulation resistance	B.3.10.2	B.4.4.8.2	No. 4	E	
	2	Dielectric withstanding voltage	B.3.8.1	B.4.4.6.1			

Table 7. Qualification Test (2 / 2)

Test			Requirement paragraph of JAXA-QTS-2140	Test method paragraph of JAXA-QTS-2140	Determination of pass and fail		
Group	Order	Item			Quantity of samples ⁽¹⁾		Quantity of allowable defects
					Production PWBs	Test coupon ⁽²⁾	
VII	1	Thermal stress	B.3.10.4	B.4.4.8.4	No. 5	A, B and L	0
	2	Solderability	B.3.9.2	B.4.4.7.2		B and H ⁽⁶⁾	
VIII	1	Radiation hardness	B.3.10.5	B.4.4.8.5	No. 6	Not applicable	
-	1	Material	B.3.2	Not applicable	⁽⁷⁾		Not applicable

Notes:

- (1) The number of test coupons submitted for group I test shall be a summation of the test coupons for group II through VIII tests. For group II through VII tests, one test coupon shall be provided for each coupon type specified above.
In order to qualify split boards, split board specimens shall be submitted as the production samples.
- (2) Test coupons and sample product shall be manufactured simultaneously. For group III through VIII tests, each test coupon shall be manufactured on the same work board as the production printed wiring boards which shall be subjected to the same bow and twist test (paragraph B.3.5.1 of JAXA-QTS-2140).
- (3) Bow and twist (paragraph B.3.5.1 of JAXA-QTS-2140) of the samples shall be tested during the second test of group II test.
- (4) Group I test shall be performed on the test coupons which are to be provided for group II through VIII tests. When a test coupon has failed to pass the marking test, the coupon may be replaced with a non-defective one.
- (5) Under the circuitry test, the test coupons G and E shall be subjected to the continuity test and circuit shorts test, respectively.
- (6) The test coupons B and H shall be subjected to the tests for hole solderability and surface solderability, respectively. The coupon B for the hole solderability test shall be the coupon which has been subjected to the thermal stress.
- (7) Data to certify compliance with the design specifications shall be submitted.

4.3 Quality Conformance Inspection

Quality conformance inspections shall be as specified in paragraph B.4.3, appendix B of JAXA-QTS-2140 and shall be shown in Tables 8 and 9.

Table 9. Quality Conformance Inspection (Group B)

Inspection			Requirement paragraph of JAXA-QTS-2140	Test method paragraph of JAXA-QTS-2140	Determination of pass and fail	
Group	Order	Item			Test coupon	Quantity of allowable defects
I	1	Plating adhesion and overhang	B.3.6	B.4.4.4	C	0
II	1	Terminal pull strength	B.3.9.1	B.4.4.7.1	F	
	2	Connection resistance	B.3.8.3	B.4.4.6.3	D	
	3	Hot oil resistance	B.3.10.3	B.4.4.8.3		
	4	Connection resistance	B.3.8.3	B.4.4.6.3		
III	1	Circuitry	B.3.8.2	B.4.4.6.2	E and G ⁽¹⁾	
	2	Connection resistance	B.3.8.3	B.4.4.6.3		
	3	Thermal shock [II]	B.3.10.1.2	B.4.4.8.1 b)		
	4	Circuitry	B.3.8.2	B.4.4.6.2		
	5	Connection resistance	B.3.8.3	B.4.4.6.3		
IV	1	Humidity and insulation resistance	B.3.10.2	B.4.4.8.2	E	
	2	Dielectric withstanding voltage	B.3.8.1	B.4.4.6.1		

Note: ⁽¹⁾ Under the circuitry test, the test coupons G and E shall be subjected to the continuity test and circuit shorts test, respectively.

4.4 Change of Tests and Inspections

4.4.1 In-process Inspection

(1) Cleanliness

Action: For products from which chips generated during the router process have been removed, one sample per lot is measured using a Contaminometer.

Reasons:

- (a) In the case of sampling after circuit formation, expecting waste samples per working unit.
- (b) When making samples, there is a concern that the correct cleanliness will not be reflected due to the risk of contamination from handling because sample cutting by router processing is a non steady operation. Therefore, the products processed through solder resist, solder leveling, and router are cleaned and used as samples.

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(c) The number of samples should be kept to a minimum because the sampling targets are to be discarded.

4.4.2 Bow and Twist

Action: The height H from the reference surface shall be determined by summing the gap from the reference surface and the board thickness.

Reason:Direct measurement of the height H is not feasible due to the lack of appropriate measurement equipment.

5. PREPARATION FOR DELIVERY

Marking on the packaging shall be as specified in paragraph 5 of JAXA-QTS-2000 and a shipping inspection report of PWBs shall be Included in the shipment. The materials for packaging shall be free from any harmful effects to PWBs.

Marking on the packaging specified in paragraph 5 of JAXA-QTS-2000 shall include the following.

a) Part name

Kanagawa factory: As shown on the label

Kahoku factory: As shown on the label

b) Part number (Part number specified in this specification and part number specified by the purchaser)

Kanagawa factory: As shown on the label

Kahoku factory: As shown in the shipping inspection report

c) Applicable specification number

Kanagawa factory: As shown on the label

Kahoku factory: As shown in the shipping inspection report

d) Manufacturing date, and serial number or lot identification number

Kanagawa factory: As shown on the label

Kahoku factory: As shown in the shipping inspection report

e) Delivery destination

Kanagawa factory: As shown on the label

Kahoku factory: As shown on the label

f) Qualified manufacturer's name

Kanagawa factory: As shown on the label

Kahoku factory: As shown in the shipping inspection report

g) Packaging quantity

Kanagawa factory: As shown on the label

Kahoku factory: As shown on the label

h) Inspection date

Kanagawa factory: As shown on the shipping inspection report

Kahoku factory: As shown in the shipping inspection report

i) Inspection results

Kanagawa factory: As shown on the shipping inspection report

Kahoku factory: As shown in the shipping inspection report

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6. NOTE Notes shall be as specified in paragraph 6 of JAXA-QTS-2140 and the following. a) Paragraph 3.2 Marking Any individual agreement with the delivery destination shall take precedence. b) Paragraph 5 Preparation for Delivery Any individual agreement with the delivery destination shall take precedence.			