

NUMBER GS-12-1529	TYPE GENERAL PRODUCT SPECIFICATION	Amphenol ICC	
TITLE BergStak® FX10 0.5mm BTB Product Specification		PAGE 1 of 11	REVISION B
		AUTHORIZED BY LQ.LEI	DATE Feb 28 2022
		CLASSIFICATION UNRESTRICTED	

1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the 0.5mm Board to Board product.

2.0 Scope

This specification is applicable to the termination characteristics of the 0.5 BTB family of products which provides PCB header-to-PCB receptacle interconnecting

3.0 Ratings

- 3.1 Operating Voltage Rating = 30 V_{AC}
- 3.2 Operating Current Rating = see test item
- 3.3 Operating Temperature Range = -55 °C to 105 °C¹
- 3.4 Storage Temperature Range = -10 °C to 60 °C²
- 3.5 Operating Humidity 95 % MAX³

Note 1: includes the terminal temperature rise when powered

Note 2: This storage indicates a long-term storage state for the unused product before the board mounted.

Note 3: Non-condensing.

4.0 Applicable Documents

4.1 AICC Specifications

Engineering drawings

10147520 - Header

10147523 - Receptacle

4.2 Industry or Trade Association standards

N/A

4.3 National or International Standards

List applicable specifications that are referenced in the specification e.g.:

4.3.1 Flammability: UL94V-0 or similar applicable specification

4.3.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.

4.3.3 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement

4.3.4 JIS C 60068: Sulfur dioxide.

4.4 AFCI Laboratory Reports - Supporting Data

List lab report numbers that contain the supporting qualification test data

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4.5 Safety Agency Approvals

List the UL, CSA, TUV other product safety agency certification file numbers.

5.0 Requirements

5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

5.2 Material

The material for each component shall be as specified herein or equivalent.

5.2.1 Housing material:

Insulation body: LCP

UL flame rating: UL 94 V-0

UL file plastic material: E54705

MSL JEDEC J-STD-020: Level 1

5.2.2 Contact and Fitting Material:

Base material: Phosphor Bronze

5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

5.3.1 Mating area: Gold Plating

5.3.2 Termination area: Gold flash

5.4 Appearance and Construction (JIS C 54024.14.3)

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.

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6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

The low level contact resistance shall not exceed 50 milliohms initially. The low level contact resistance shall also not exceed 10 milliohms changes (from the initial measurement) after any treatment and/or environmental exposure. Measurements shall be in accordance with EIA 364-23.

The following details shall apply:

- b. Test Voltage - 20 milli-volts a.c or less, 1kHz.
- c. Test Current - Not to exceed 100 milli-amperes a.c.

6.2 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 1000M ohms initially and environmental exposure.

Measurements shall be in accordance with EIA 364-21.

The following details shall apply:

- a. Test Voltage – 500 volts DC.
- b. Electrification Time - 1 minutes, unless otherwise specified.
- c. Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

6.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, when mated connectors are tested in accordance with EIA 364-20.

The following details shall apply:

- a. Test Voltage – 150 volts AC RMS, 60Hz.
- b. Test Duration - 60 seconds.
- c. Test Condition - 1 (760 Torr - sea level).
- d. Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

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6.4 Current Rating

Test method

The test is conducted according to the conditions specified in the table below:

	Condition 1	Condition 2	Condition 3
Connection method (Series connection)	Circuit A: Contact Nos. A1 to A62 Circuit B: Contact Nos. B1 to B62 Circuit C: Contact Nos. A65 to A72 Circuit D: Contact Nos. B65 to B72	Circuit A: Contact Nos. A1 to A62 Circuit B: Contact Nos. B1 to B62 Circuit C: Contact Nos. A65 to A72 Circuit D: Contact Nos. B65 to B72	Circuit A: Contact Nos. A1 to A62 Circuit B: Contact Nos. B1 to B62 Circuit C: Contact Nos. A65 to A72 Circuit D: Contact Nos. B65 to B72
Test current	Circuit A: 0.30 A Circuit B: 0.30 A Circuit C: 0.35 A Circuit D: 0.45 A	Circuit A: 0.30 A Circuit B: 0.30 A Circuit C: 0.25 A Circuit D: 0.56 A	Circuit A: 0.30 A Circuit B: 0.30 A Circuit C: 0.25 A Circuit D: 0.60 A

Condition4: Each contacts are powered at 0.4 A

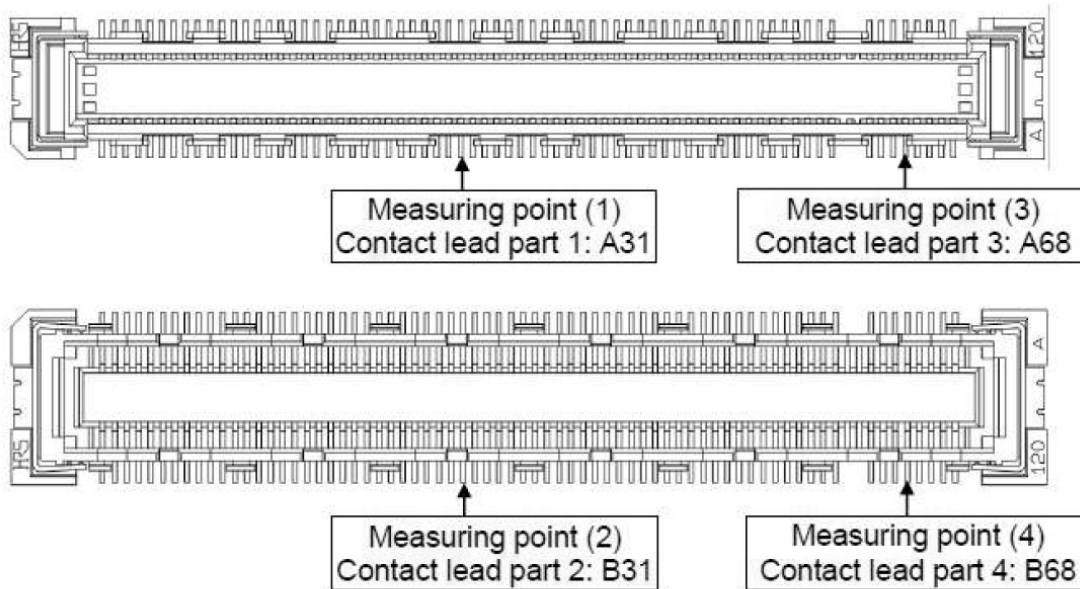


Figure: Testing method

The following details shall apply:

- Ambient Conditions – 25 °C
- The temperature rise above ambient shall not exceed 20 °C at any point in the system
- Reference - EIA 364-70

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7.0 Mechanical Characteristics

7.1 Mating/Unmating Force

The force to mate a receptacle connector and compatible header shall not exceed 86.4 Newtons per pair of connectors. The unmating force shall not be less than 11.5 Newtons per pair of connectors.

If total force per connector is to be reported, change wording accordingly and/or place in table form below for various connector sizes

The following details shall apply:

- Cross Head Speed – 25.4 mm per minute.
- Lubrication – No extra.
- Utilize free floating fixtures.
- Reference –EIA 364-13.

7.2 Normal Force

The End of Life (EOL) contact normal force shall be 0.25N minimum.

The following details shall apply:

- Cross Head Speed – between 0.254 and 25.4 mm per minute.
- Reference –EIA 364-04.
- The test applies to spring contact, deflection 0.15mm.

7.3 Contact retention

Measurements contact retention force shall be 1 N min

- Cross Head Speed – 25.4mm per minute.
- The specified force shall be maintained for 6 seconds \pm 1 second
- Reference –EIA 364-29.

7.4 Mechanical Operation

The connector pairs shall be capable of withstanding 100 mating/unmating cycles. Cycling Rate – 300 times/Hour or less

- Latches disabled (If applicable)
- Use free floating fixtures
- Reference EIA-364-09

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8.0 Environmental Conditions

After exposure to the following environmental conditions in accordance with the specified test procedure and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in the Table 1 test sequences. Unless specified otherwise, assemblies shall be mated during exposure.

Use recommended details or select others as appropriate

8.1 Thermal Shock – EIA 364-32.

- a. Number of Cycles: 5
- b. Temperature Range: Between -55 °C and +105 °C
- c. Time at Each Temperature 30 minutes
- d. Transfer Time : 5 minutes, maximum

8.2 Humidity –EIA 364-31 method IV, performance of step 7a

- a. Relative Humidity - 90%~95% % (for cyclic humidity, specify for temperature ramps, if applicable, and temperature dwells)
- b. Temperature : 25 °C ± 3 °C to 65 °C ± 3 °C;
- c. Duration: 10 cycles
- d. Cycle duration: 24 hours;

8.3 High Temperature Life - EIA 364-17.

- a. Test procedure: Method A
- b. Test Temperature: 105 °C
- c. Test Duration: 250 hours

8.4 Temperature life (preconditioning)- EIA364-1000, Table 9

- a. Mated/Unmated: Mated
- b. Test Temperature: 115 °C ± 2°C
- c. Test Duration: 24 hours

8.5 Cold Temperature Life – IEC 60512-9-2 or EIA 364-59.

- a. Test Temperature : -55°C
- b. Test Duration: 96 hours

8.6 Mixed Flowing Gas corrosion (MFG) – IEC 60512-11-7 or EIA 364-65

- a. Class -IIA
- b. Duration : 7 days
- c. unmated for the duration 112 hours and mated the remaining duration 56 hours
- d. Mechanical operation: 1 time between unmated duration and mated duration

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8.7 Thermal disturbance

Cycle the connector or socket between 15 °C ± 3 °C and 85 °C ± 3 °C, as measured on the part. Ramps should be a minimum of 2 °C per minute, and dwell times should insure that the contacts reach the temperature extremes (a minimum of 5 minutes). Humidity is not controlled. Perform 10 such cycles.

8.8 Salt Spray – EIA-364-26

- a. Test Condition: 5% Salt Concentration
- b. Duration: 48 (hours if not specified by selected condition above)
- c. Acceptance criteria – (visual examination requirements and/or LLCR criteria)

8.9 Vibration Sinusoidal - EIA 364-28

- a. Test Condition – II (refer to specified test method for appropriate test condition)
- b. Vibration Amplitude : 1.52mm, 10 G (98m/s²)
- c. Frequency Range :10 hertz to 500 hertz to 10 hertz
- d. Sweep Time and Duration :15 minutes per sweep, 3 hours along each of three orthogonal axes (9 hours total)
- e. No discontinuities greater than 1 microsecond.

8.10 Mechanical Shock –EIA 364-27

- a. Condition – A (refer to specified test method for appropriate test condition) (50G, 11 millisecond, half-sine pulse type)
- b. Shocks – 3 shocks in both directions along each of three orthogonal axes
- c. No discontinuities greater than 1 microsecond.

8.11 Solderability IPCECA J-STD-002

- a. Test condition:S1
- b. Steam or dry aging 4 hours
- c. Minimum solder coverage: 95 %

Pb-free Reflow Parameter Requirements

	Temperature	Time
Vapor Phase Reflow	217-240°C [423-464°F]	45-90 seconds dwell at reflow
IR/Convection Reflow	150-180°C [302-356°F] Preheat	60-120 seconds
	230-250°C [446-482°F] Reflow	30-60 seconds
Oven	230-250°C [446-482°F]	2-5 minutes (until reflow is assured)

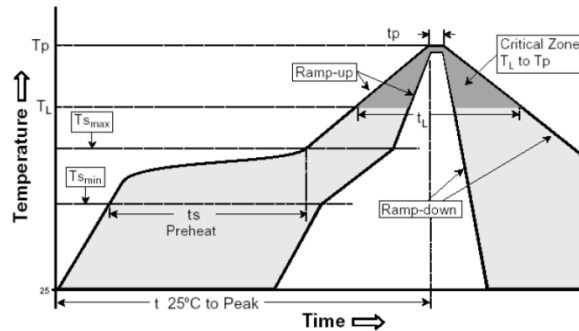
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8.12 Heat resistance, - EIA-364-56

- a. Test Number of cycles: 3
- b. There shall be no evidence of physical or mechanical damage
- c. No deformation of case of excessive Looseness of the terminal.

Heat resistance Reflow profile test

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T _{Smax} to T _p)	3°C/ second max.
Preheat	
- Temperature Min (T _{Smin})	150°C
- Temperature Max (T _{Smax})	200°C
- Time (t _{Smin} to t _{Smax})	60-180 seconds
Time maintained above:	
- Temperature (T _L)	217°C
- Time (t _L)	60-150 seconds
Peak/Classification Temperature (T _p)	260°C (+0/-5°C)
Time within 5 °C of actual Peak Temperature (t _p)	20-40 seconds
Ramp-Down Rate	6°C/second max.
Time 25 °C to Peak Temperature	8 minutes max



9.0 QUALITY ASSURANCE PROVISIONS

9.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ANSI Z-540 and ISO 9000.

9.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a. Temperature: 25 +/- 5 °C
- b. Relative Humidity: 30% to 60%
- c. Barometric Pressure: Local ambient

9.3 Sample Quantity And Description

Use this paragraph to describe the test samples required for the specific Test Groups in the qualification test table. Include information such as: number and size of plug and receptacle connectors and/or mated pairs, terminated or not terminated, printed wiring board conditions, wire size, crimp conditions, lubrication conditions, etc. Attach and reference drawings if necessary to clarify the description.

Unless otherwise specified in the application specification, sample quantities for each test group shall be specified in this section and/or the qualification test table. Refer to GS-01-029 section 5.9 for sample quantity recommendations.

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9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to print revision __, verification of plating composition and thickness, etc.

9.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix.

- a. A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.
- b. A significant change is made to the manufacturing process which impacts the product form, fit or function.
- c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

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9.7 Qualification Test Table

Insert qualification test table here. Refer to GS-01-029 and GS-03-004 for recommended test sequences.

Test	Para.	Test Sequences										
		Group A	Group B	Group C	Group D	Group E1	Group E2	Group F	Group G1	Group G2	Group H	Group I (d)
Visual Examination	5.4	1,5	1,4,6,9,12	1,4,6,9,12	1,4,6,9,12,15	1,6	1,7	1,3	1,5	1,7	1	
Contact Resistance	6.1	2,6	2,7,10,13	2,7,10,13	2,7,10,13,16	2,4			2,4		2,5	
Insulation Resistance	6.2						2,5			2,5		
Voltage proof	6.3						3,6			3,6		
Derating curve	6.4							2 (c)				
Mating/Unmating Force	7.1	3,7										
Normal Force	7.2					5						
Contact retention	7.3											1
Mechanical Operation	7.4		3(a),11(b)	3(a)	3(a),14(b)	3	4					
Thermal Shock	8.1		5									
Humidity	8.2		8									
High Temperature Life	8.3	4										
Temperature life (preconditioning)	8.4			5	5							
Cold Temperature Life	8.5								3	3		
MFG	8.6				8							
Thermal disturbance	8.7				11							
Salt Spray	8.8										3	
Vibration Sinusoidal	8.9			8								
Mechanical Shock	8.10			11								
SMT/ THR Solder Reflow	8.12											2
Heat resistance	8.13											3
Sample size		4	4	4+4	4	4	4	4	4	4	4	6

(a): Mechanical operation:50 times for Group B/C, 20 times for Group D
(b): Mechanical operation:3 times for Group B, 1 times for Group D
(c): Need to measure the bulk resistance of each sample.
(d):The test item is relatively independent

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REVISION RECORD

Rev	Page	Description	EC#	Date
A	All	Initial release	/	July 19 2019
B	2,3,8	1.Add detail spec of plating 2.Test Voltage from 100V DC to 500 V DC on item 6.2 Insulation Resistance 3.Change Heat resistance cycle from 2 to 3	ELX-N-43927-1	Feb 28 2022