

NUMBER GS-12-1709	TYPE PRODUCT SPECIFICATION	Amphenol FCI	
TITLE 0.635mm Pitch BTB CONN		PAGE 1 of 11	REVISION 2
		AUTHORIZED BY HL.Sun	DATE 30 Sep 2022
		CLASSIFICATION UNRESTRICTED	

1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the 0.635mm Pitch BTB CONN

2.0 Scope

This specification is applicable to the termination characteristics of the 0.635mm Pitch BTB CONN family of products which provides PCB header-to-PCB receptacle interconnecting

3.0 Ratings

- 3.1 Operating Voltage Rating = 100 V_{DC/AC}
- 3.2 Operating Current Rating = 0.5A
- 3.3 Operating Temperature Range = -55 °C ~+85°C

4.0 Applicable Documents

- 4.1 AFCI Specifications
 - Engineering drawing
- 4.2 National or International Standards
 - 4.2.1 Flammability: UL94V-0 or similar applicable specification;
 - 4.2.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications;
 - 4.2.3 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement;
 - 4.2.5 IPCECA J-STD-002: Solderability Test.
 - 4.2.6 MIL-STD-202: Test methods for electronic and electrical component parts.

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

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UL flame rating: UL 94 V-0

MSL JEDEC J-STD-020: Level 1

5.2.2 Contact and Hold down Material:

Contact material: Copper Alloy

Hold down: Copper Alloy

5.3 Finish

The finish for applicable components shall be specified in product drawings with plating area, plating material and plating thickness.

5.4 Appearance and Construction (EIA-364-48)

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.

6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

Measurements shall be in accordance with EIA-364-23C

The low level contact resistance shall not exceed 20 milliohms initially. The low level contact resistance shall also not exceed 20 milliohms changes (from the initial measurement) after any treatment and/or environmental exposure.

The following details shall apply:

- b. Test Voltage - 20 milli-volts MAX
- c. Test Current - Not to exceed 10 milli-amperes -

6.2 Insulation Resistance

Measurements shall be in accordance with EIA 364-21

The insulation resistance of mated connectors shall not be less than 1000 MΩ

The following details shall apply:

- a. Test Voltage - 250 volts DC.
- b. Electrification Time - 1 minute.
- c. Points of Measurement - Between adjacent contacts

6.3 Voltage proof

Measurements shall be in accordance with EIA 364-20.

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current > 1mA when mated)

The following details shall apply:

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- a. Test Voltage - 500 volts (AC RMS, 60Hz).
- b. Test Duration - 1 minute
- c. Test Condition - 1 (760 Torr - sea level).
- d. Points of Measurement - Between adjacent contacts

6.4 Current Rating

Mated connectors are tested in accordance with EIA-364-70
The following details shall apply:

- a. All contacts powered at 0.5A
- b. Ambient Conditions : 25 °C
- c. The temperature rise above ambient shall not exceed **30 °C** at any point in the system

7.0 Mechanical Characteristics

7.1 Total Insertion and Withdrawal force

Measurements shall be in accordance with EIA 364-13

Function	Per contact :
Insertion Force :	70g max
Withdrawal Force :	12g Min

The following details shall apply:

- a. Cross Head Speed – 25±3 mm per minute.
- c. Utilize free floating fixtures.

7.2 Contact retention

Measurements shall be in accordance with EIA 364-29.

Contact retention Force/Pin	
Header	3.9N Min
Receptacle	1.96N Min

- a. Operating speed – 25±3 mm per minute.
- b. Require 6 contacts/specimen

7.3 Pre-Conditioning cycles

Measurements shall be in accordance with EIA-364-09

Number Cycles -20 cycles

- a. Cycling Rate – 10 cycles per minute
- b. Use free floating fixtures

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7.4 Durability (Mechanical operation)
Measurements shall be in accordance with EIA-364-09

- c. Number Cycles -50 cycles
- d. Cycling Rate – 10 cycles per minute
- e. Use free floating fixtures

7.5 Reseating

Manually insert/extract the connector 3 cycles, there shall no evidence of physical damage.

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

Measurements shall be in accordance with EIA-364-32

- a. Number of Cycles - 5
- b. Temperature Range - Between -55 °C and +85 °C
- c. Time at Each Temperature - 30 minutes
- d. Transfer Time - 5 minutes, maximum

8.2 Vibration

Measurements shall be in accordance with MIL-STD-202, Method 201

Mate connectors and subject to the following vibration conditions,

- a. Amplitude – 1.5mm P-P,
- b. Frequency Range -10-55-10Hz,
 - c. Sweep Time and Duration – Shall be traversed in 1 minute ,2 Hours per axis, Total 6 hours
- d. Mounting - Rigidly mount assemblies; mounting location if appropriate.
- e. No discontinuities greater than 0.1 microsecond

8.3 Mechanical Shock

Measurements shall be in accordance with EIA 364-27

Mate connectors and subject to the following shock conditions.

- a. DC 10mA during the test.,
- b. Peak value : 490m/s² (50G), 11 millisecond, (Half Sine)

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- c. Shocks - 3 times of shocks shall be applied for each 6 directions along 3 mutually perpendicular axes (total of 18 shocks)
 - d. Mounting - Rigidly mount assemblies; specify cable length and mounting location if appropriate.
 - e. No discontinuities greater than 0.1 microsecond
- 8.4 High temperature life
Measurements shall be in accordance with EIA 364-17
- a. Temperature: 85 ±2 °C
 - b. Duration : 96 hours
 - c. Completion of the exposure period, the test specimens shall be conditioned at ambient room conditions for 1 to 2 hours, after which the specified measurements shall be performed.
- 8.5 Cold temperature life
Measurements shall be in accordance with EIA 364-59
- a. Temperature: -55 ±3 °C
 - b. Duration : 96 hours
 - c. Completion of the exposure period, the test specimens shall be conditioned at ambient room conditions for 1 to 2 hours, after which the specified measurements shall be performed.
- 8.6 Humidity
Measurements shall be in accordance with EIA 364-31
- a. Temperature: 65 ± 2 °C;
 - b. Relative Humidity: 90~95%
 - c. Duration: 96 Hours
 - d. Completion of the exposure period, the test specimens shall be conditioned at ambient room conditions for 1 to 2 hours, after which the specified measurements shall be performed.
- 8.7 Salt Spray
Measurements shall be in accordance with EIA-364-26
- a. Test Condition: 5% Salt Concentration
 - b. Duration: 48 (hours if not specified by selected condition above)
 - c. Ambient temperature: 35 ±2°C
 - c. Acceptance criteria – (visual examination requirements and/or LLCR criteria)
- 8.8 SO₂ Gas
Measurements shall be in accordance with IEC60068-2-42
- a. Test Condition: 50± 5ppm SO₂ gas,
 - b. Duration: 24 (hours if not specified by selected condition above)

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- c. Ambient temperature: 40 ±2°C
- d. Relative Humidity: 75%
- e. Acceptance criteria – (visual examination requirements and/or LLCR criteria)

8.9 Solderability

Measurements shall be in accordance with IPCECA J-STD-002

a. Soldering material:

The lead free alloy solder shall conform to composition Sn95.5Ag3.9Cu0.6, allowing variation of the Ag content between 3.0 – 4.0 wt% and Cu content between 0.5 – 1.0 wt. %

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

REFLOW SOLDERING SIMULATION PEAK PROFILE REFLOW AT 245 °C

DESCRIPTION	REQUIREMENT
Solder Type	None
Solder Flux Type	None
Paste Flux Type	None
Average Preheat Ramp Rate	3 °C/second maximum
Preheat Temperature	150 °C minimum; 200 °C maximum
Preheat Time	60 to 180 seconds
Ramp to Peak	3 °C/second maximum
Time over Liquidus (217 °C)	60 to 150 seconds
Peak Temperature	245 °C +0/-5 °C
Time within 5 °C of peak	20 to 40 seconds
Ramp – Cool Down	6 °C/second maximum
Time 25 °C to Peak	8 minutes maximum

8.10 Process simulation - Heat resistance test

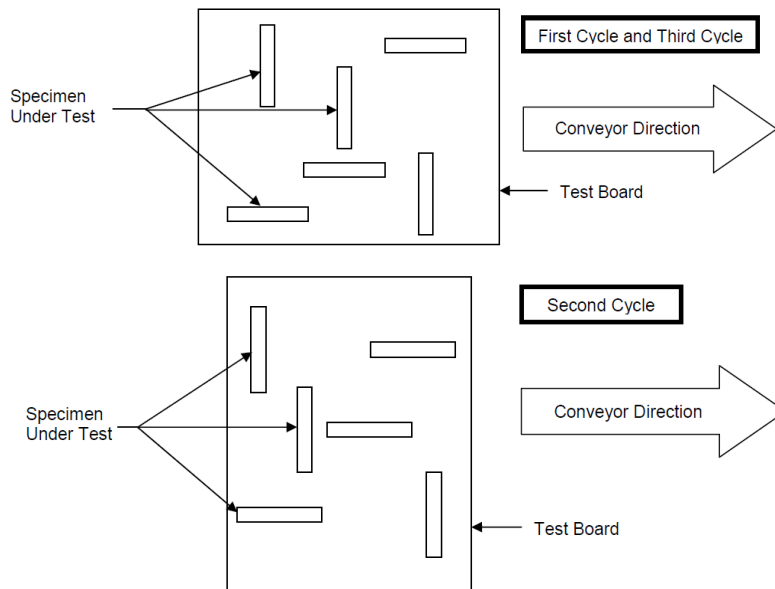
8.10.1 Preconditioning

Place specimens in a clean, dry, shallow container so that they do not touch or overlap each other. Subject the specimens to 85 °C ± 2 °C and 85 % ± 3 % relative humidity for 168 hours per JEDEC J-STD 020.

8.10.2 Specimen

Specimens should be placed on the test boards to allow an evaluation of all orientations during the solder simulation process and do not affect the temperature profile. Specimens shall be spaced to eliminate any potential temperature gradients that could impact the test simulation results. A thermocouple shall be mounted on the top of the specimen to record placement on test boards the temperature profile of the specimen.

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8.10.3 Heat resistance test

preconditioned specimens shall be stabilized at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and 20 % to 80% relative humidity for 15 minutes to 4 hours prior to subjecting specimens to solder simulation.

Subject the specimens to three (3) cycles of either of the following suggested reflow profiles with the test board rotated 90 degrees after each cycle or as specified for the product under test:

REFLOW SOLDERING SIMULATION PEAK PROFILE REFLOW AT 260 °C

DESCRIPTION	REQUIREMENT
Solder Type	None
Solder Flux Type	None
Paste Flux Type	None
Average Ramp Rate	3 °C/second maximum
Preheat Temperature	150 °C minimum; 200 °C maximum
Preheat Time	60 to 180 seconds
Ramp to Peak	3 °C/second maximum
Time over Liquidus (217 °C)	60 to 150 seconds
Peak Temperature	260 °C +0/-5 °C
Time within 5 °C of peak	20 to 40 seconds
Ramp – Cool Down	6 °C/second maximum
Time 25 °C to Peak	8 minutes maximum

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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

Inspection Conditions shall be in accordance with EIA-364F or IEC60068-1

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

- a. Temperature: 25 +/- 5 deg C
- b. Relative Humidity: 25~75%RH
- c. Barometric Pressure: Local ambient

9.3 Sample Quantity And Description

N/A

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.

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- 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

Test	Para.	Test Sequences										
		Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H	Group I	Group J	Group K
Visual Examination	5.4	1,8	1,8	1,12	1,8	1,9	1,5	1,5	1			
Contact Resistance	6.1	2,5,7	2,5,7	2,5,7,9	2,4,7	2,7	2,4	2,4				
Insulation Resistance	6.2			10								
Voltage proof	6.3			11		3,8						
Derating curve	6.4								2			
Mating/Unmating Force	7.1					4,6						
Contact retention	7.2									1		
Durability (Preconditioning)	7.3	3	3	3	3							
Durability	7.4					5						
Reseating	7.5	6	6	8								
Thermal shock	8.1			4								
Vibration	8.2				5							
Mechanical Shock	8.3				6							
High Temperature Life	8.4	4										
Cold Temperature Life	8.5		4									
Humidity	8.6			6								
Salt Spray	8.7						3					
SO2 Gas	8.8							3				
Solder ability	8.9										1	
Process simulation	8.10											1
Sample size		4	4	4	8	4	4	4	4	2	4	4

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REVISION RECORD

Rev	Page	Description	EC#	Date
1	All	Preliminary	/	7 July 2021
2	3	Correct the retention force of receptacle from 0.2N to 1.96N	/	30 Sep 2022