

# Product Series Specification Document

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**Product Series**      3.96mm pitch board-to-board connectors - Header

## SCOPE

This document covers 3.96mm header connectors. The connector will perform to the specifications outlined. All tests have been performed with the GradConn plug (pin header) connector and the GradConn socket (female) connector mated.

## APPLICABLE DOCUMENTS

When releasing this specification, we referenced the most current versions of the following documents. These documents form a part of this specification as described within this document.

Industry Specifications / Standards

UL-94 Flammability

ASTM B-103 Phosphor Bronze or Brass Plate, Rod, Sheet, Strip and Rolled Bar

EIA Specifications

EIA-364-D Electrical Connector/Socket Test Procedures Including Environmental Classifications



## 1.0 REQUIREMENTS

### 1.1 DIMENSIONAL

Connectors shall meet the physical dimensions specified on the applicable product drawing.

### 1.2 MATERIAL

Each component shall be constructed of the materials specified within this document. Substitute materials must meet the performance requirements of this specification.

- 1.2.1 Contacts: Phosphor Bronze or other equivalent copper alloys.
- 1.2.2 Housings: LCP in flame retardant UL94V-0.

### 1.3 FINISH

- 1.3.1 Contact Finish: See plating on drawing.

### 1.4 DESIGN

- 1.4.1 Mating: The connector shall be capable of mating and unmating manually with the test board.

### 1.5 MECHANICAL REQUIREMENTS

- 1.5.1 Workmanship:  
The product shall be uniform in quality and free from defects that will adversely affect the product performance.
- 1.5.2 Insertion Force:  
When measured in accordance with EIA-364-13C, 7N / pin maximum  
(Receptacle / Plug)
- 1.5.3 Unmating Force:  
When measured in accordance with EIA-364-13C, the following details shall apply:  
0.5N / pin minimum initial (Receptacle / Plug).
- 1.5.4 Contact Retention Force:  
The end of a post shall be pushed in a perpendicular to base housing at a constant speed of 25 mm / minute. Minimum Retention Force for 9.8N / pin.
- 1.5.5 Durability:  
When measured in accordance with EIA-364-09C, the following details shall apply:  
100 mating cycles at a rate of 25.4mm / minute, contact resistance 30 mΩ max.



## 1.6 ELECTRICAL REQUIREMENTS

### 1.6.1 Current Rating:

When measured in accordance with EIA-364-70.  
7.9A maximum based on a 30°C rise over ambient.

### 1.6.2 Voltage Rating:

250V AC/DC. When measured in accordance with EIA-364-20B.

### 1.6.3 Low-Level Circuit Resistance:

When measured in accordance with EIA-364-23B, Initial:  $\leq 30 \text{ m}\Omega$ , after environmental test:  $\leq 50 \text{ m}\Omega$ . The following details shall apply:

- (a). Current: 100 mA max.
- (b). Maximum Open Circuit Voltage: 20 mV DC.

### 1.6.4 Dielectric Withstanding Voltage:

There shall be of no evidence of flashover when the mated plug and receptacle are tested in accordance with EIA-364-20B. The following details shall apply:

- (a). Voltage: 1000V AC at 50 Hz.
- (b). Duration: 60 sec.
- (c). Measurement Points: Measure across a minimum of 10 adjacent and 10 opposing contacts.

### 1.6.5 Insulation Resistance:

Shall be a minimum of 1000 M $\Omega$  before conditioning and a minimum of 500M $\Omega$  after conditioning. When measured in accordance with EIA-364-21C, the following details shall apply:

- (a). Voltage: 500 V DC for 1 min.
- (b). Measurement Points: Measure between 10 adjacent and 10 opposing contacts per plug and receptacle.

### 1.6.6 Capacitance:

Measure the capacitance between adjacent unmated contacts. The capacitance shall not exceed a maximum of 2 pF at 1 KHz.



## 1.7 ENVIRONMENTAL REQUIREMENTS

1.7.1 Operating Temperature Range:  $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$ .

1.7.2 Temperature Life:

After exposure of the unmated connector to a high-temperature operating environment, the contact resistance shall not exceed the value specified in paragraph 1.6.3. Test shall be in accordance with EIA-364-17B.

The following details shall apply:

(a). Test Condition:  $105^{\circ}\text{C}$ , 96 hours.

1.7.3 Thermal shock test:

There shall be no evidence of physical damage when the mated module and socket are subjected to transient acceleration. During and after each shock, the test shall show no evidence of discontinuity greater than 1 microsecond.

The test shall be in accordance with EIA-364-32C, Test Condition (a), (b).

(a). Temperature:  $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$ , 5 cycles.

(b). Initial, After Test Thermal: Maximum Circuit Resistance:  $30\text{ m}\Omega$  or below.

1.7.4 Humidity Test:

After exposure of the plug and receptacle to a high humidity environment, the insulation resistance shall not be less than  $500\text{ M}\Omega$ . The dielectric withstanding voltage shall be greater than  $1000\text{V AC}$  for 1 minute. The low-level contact resistance shall not exceed the value specified in paragraph 1.6.3.

The test shall be in accordance with EIA-364-31B. Test Condition (a):

(a).  $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 90-95% RH, 96 hours.

1.7.5 Salt Spray:

After exposure, the contact resistance shall not exceed that specified (see paragraph 1.6.3). The insulation resistance shall not be less than  $500\text{ M}\Omega$  (see paragraph 1.6.5). The dielectric withstanding voltage shall be greater than  $1000\text{V AC}$  for 1 minute (see paragraph 1.6.4). The test shall be in accordance with EIA-364-26B, The following details shall apply:

(a). Gold, Test Condition:  $35^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 16 hours, 5% NaCL.

(b). Gold / Tin, Tin, Nickel Test Condition:  $35^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 8 hours, 5% NaCL.

(c). Special Handling: The mated sockets shall be mildly rinsed in water to remove salt residue and allowed to dry for 24 hours at room temperature before measurements are to be taken.

1.7.6 Resistance to Soldering Heat:

There shall be no evidence of physical damage to the insulator or finished product when the unmated socket is subjected to the reflow soldering process.

The following details shall apply:

(a). Test Condition: Test connector shall be placed on the printed circuit board.

(b). Pre-Heat Temperature:  $100^{\circ}\text{C} \sim 150^{\circ}\text{C}$  for 60 seconds maximum.

(c). Temperature: minimum  $210^{\circ}\text{C}$  for 30 seconds maximum.

(d). Peak Temperature:  $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ,  $10 \pm 5\text{sec}$ .

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## 1.7.7 Solderability Test:

After exposure, the contact solder tails shall have a minimum of 95% solder coverage. The covered area must not show any evidence of voids or pinholes. The test shall be in accordance with EIA-364-71B, the contact solder tails must have solder coverage of 95% up. The plastics have no damage.

The following details shall apply:

- (a). Solder Dwell Time: Contacts shall be held above the solder for 3 to 5 seconds before being immersed in the solder.
- (b). Test Temperature:  $245^{\circ}\text{C}\pm 3^{\circ}\text{C}$ , 3~5 sec.

## 2.0 QUALITY ASSURANCE PROVISIONS

### 2.1 INSPECTION CONDITIONS

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

- (a) Temperature:  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$
- (b) Relative Humidity: 30% to 70%
- (c) Barometric Pressure: Local Ambient

### 2.2 QUALIFICATION INSPECTION

Qualification inspections shall be performed on sample units produced with production equipment.

2.2.1 Sample Selection: Connectors shall be prepared according to applicable instruction sheets. Samples shall be selected at random from current production. A total of 26 samples are required for the specified test sequence.

2.2.2 Test Sequence: The sample connectors shall be subjected to the inspections specified in the order shown.

Test Item	A	B	C	D	E	F	G	H
Sample Size	3	3	3	3	5	3	3	3
Examination of Product	1,5	1,5	1,9	1,7	1,9	1,3	1,3	1,3
Terminal Resistance	2,4	2,4	2,8		2,8			
Insulation Resistance			3,7	2,5				
Dielectric Withstanding Voltage			4,6	3,6				
Temperature Life		3						
Humidity Test				4				
Thermal Shock	3							
Solderability								2
Resistance to Soldering Heat							2	
Insertion Force					3,6			
Unmating Force					4,7			
Contact Resistance Force						2		
Durability					3			
Salt Spray			5					