


NUMBER <b>GS-12-1344</b>	TYPE <b>PRODUCT SPECIFICATION</b>		
TITLE <b>PwrMAX® Mezzanine Connector with 3HP+10S configuration</b>		PAGE <b>1 of 9</b>	REVISION <b>A</b>
		AUTHORIZED BY <b>Zhijun.He</b>	DATE <b>Dec 02, 2021</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## 1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the PwrMAX® Mezzanine connector with 3HP+10S configuration.

## 2.0 Scope

This specification is applicable to the termination characteristics of the PwrMAX® Mezzanine connector with 3HP+10S configuration which provides a separable interface which provides separable vertical board plug that mate to vertical board receptacle.

## 3.0 Ratings

- 3.1 Operating Voltage Rating: 35V<sub>AC</sub> RMS for power contacts.
- 3.2 Operating Current Rating: refer to values in the table in section 6.5.
- 3.3 Operating Temperature Range = -55°C ~ +125°C<sup>1</sup>

Operating temperature is tested in accordance with EIA-364-17 Method A for 1000 hours at 125°C per EIA-364-1000 Table 8 to meet field temperature of 95°C for 10 years field life (95°C field temperature is based on the assumption that the contact spends 1/3 of its field life at that temperature and its remaining life at 40°C or less).

*Note 1: includes the terminal temperature rise when powered*

## 4.0 Applicable Documents

- 4.1 Specifications
  - 4.1.1 Engineering drawings: 10137214, 10137125
  - 4.1.2 Application specification: GS-20-0463
- 4.2 National or International Standards
  - 4.2.1 Flammability: UL94 V-0
  - 4.2.2 EIA 364: Electrical connector/Socket test procedures include environmental classification.
  - 4.2.3 ANSI-J-STD-002: Solder ability Tests for Component Leads, Termination, Lugs, Terminals and Wires.
- 4.3 Laboratory Reports - Supporting Data  
DL-2016-09-022-CR

## 5.0 Requirements

### 5.1 Qualification

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

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## 5.2 Material

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

High Power Contacts:	Copper alloy
Signal Plug Contacts:	Copper alloy
Signal Receptacle Contacts:	Copper alloy
Plug and Receptacle Housings:	High temperature thermoplastic, UL 94V-0 compliant.

## 5.3 Finish

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

Contact Area (power & signal):  
GCS® for Power contacts, GXT® for Signal contacts

Tails (power & signal):  
Tin plated over Nickel

## 5.4 Design and Construction

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.

## 5.5 Examination of product – EIA 364-18, visual and dimensions inspection per product drawings, meets requirements of product drawings.

## 6.0 Electrical Characteristics

### 6.1 Contact Resistance, Low Level (Signal contacts)

The increase in low level contact resistance shall not exceed 10 mΩ (from the initial measurement) after any treatment and environmental expose.

Measurements shall be in accordance with EIA 364-23.

The following details shall apply:

- Test Voltage - 20 milli-volts DC max open circuit.
- Test Current - Not to exceed 100 milli-amperes

### 6.2 Contact Resistance, Specified Current (Power contacts)

The contact resistance at a specified current shall not exceed 0.3 milliohms initially or after mating cycles and environmental exposure.

Measurements shall be in accordance with EIA 364-06.

The following details shall apply:

Test Current – Shown in the table in section 6.5.

### 6.3 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 10000 MΩ (megohms) for the High Power contacts, and 500 MΩ for Signal initially and after environmental exposure.

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Measurements shall be in accordance with EIA 364-21

The following details shall apply:

- a. Test Voltage - 500 volts DC.
- b. Electrification Time - 2 minutes, unless otherwise specified.
- c. Points of Measurement - Between adjacent contacts.

#### 6.4 Dielectric Withstanding Voltage

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

Measurements shall be in accordance with EIA 364-20

The following details shall apply:

- a. Test Voltage - 2500 volts DC (power), 1000 volts DC (signal).
- b. Test Duration - 60 seconds.
- c. Test Condition - 1 (760 Torr - sea level).
- d. Points of Measurement - Between adjacent contacts.

#### 6.5 Current Rating

The temperature rise above ambient shall not exceed 30°C at any point in the system when all contacts are powered at specified current as below.

The following details shall apply:

- a. Ambient Conditions – still air at 25°C;
- b. Reference - EIA 364-70.
- c. Test configuration: Test boards have 8 layers X 2 ounces copper, 6 layers of them for power planes, remaining 2 layers for thermal planes.

Application	Contact	Number of adjacent contacts (fully powered)	Test Board (Copper Pad)	Air Starting Temp.	Still Air	T-Rise (°C)	Current Rating per power contact (Amp)
PwrMAX® Mezzanine	<b>Power</b> (4.00mm Pitch)	3	8 layers (2 oz. copper for each layer)	Ambient	Yes	30	100
PwrMAX® Mezzanine	<b>Signal</b> (2.50mm Pitch)	10		Ambient	Yes	30	1.5

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## 7.0 Mechanical Characteristics

### 7.1 Mating/Un-mating Force

The following details shall apply:

- Cross Head Speed - 25.4mm per minute.
- Lubrication: Yes
- Utilize free floating fixtures.
- Reference – EIA 364-13.

Configuration	Mating Force (N) Max. Allowance	Un-mating Force (N) Min. Allowance
3HP+10S	65	21.5

### 7.2 Contact retention

Test condition: Per EIA-364-29C, method C, a maximum rate of 25.4mm per minute.

Requirements:

Signal Contact: individual signal contact shall withstand an axial retention load of 10 N minimum.

High Power Contact: individual power contact shall withstand an axial retention load of 25 N minimum.

### 7.3 Compliant Pin Insertion Force – EIA 364-05

High Power - Individual compliant Pin

The force required to insert an individual compliant pin into a plated through hole in a tin/OSP printed circuit board at a rate of 5.08mm/minute shall not exceed 67 N.

Signal Receptacle - Individual compliant Pin

The force required to insert an individual compliant pin into a plated through hole in a tin/OSP printed circuit board at a rate of 5.08mm/minute shall not exceed 178 N.

### 7.4 Compliant Pin / Retention Force – EIA 364-05

High Power - Individual compliant Pin

The retention force in the axial direction opposite that of insertion at a rate of 5.08mm/minute shall not be less than 8.0 N per press-fit tail.

Signal - Individual compliant Pin

The retention force in an axial direction opposite that of insertion at a rate of 5.08mm/minute shall not be less than 3.0 N.

### 7.5 PCB Hole Deformation Radius and Remaining Cu Plating Thickness (compliant pin)

Use PCB's with minimum diameter holes, tin/OSP plating, and 1.57mm overall thickness.

Metallographic cross-sections shall be prepared parallel to the PCB surface (transverse section) to facilitate radial hole deformation measurement, photographs, and remaining Cu plating measurement.

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Prior to cross-section preparation, perform 3 compliant pin insertions and 3 compliant pin withdrawals. The measurements and photographs shall be performed at 0.3 mm, [+0.2 mm,-0.1 mm] (0.012", [+0.008",-0.004"]) from the connector side PCB laminate (not copper) surface and at the center of the compliant pin section on a minimum of 10 holes. The average (of 10 holes) hole deformation radius shall be no greater than 37.5 µm (0.0015") when measured from the drilled hole. The absolute maximum deformation radius shall not exceed 50 µm (0.002"). The minimum average (of 10 holes) copper thickness remaining between the compliant pin and the printed wiring board laminate shall not be less than 7.5 µm (300 µ"). Refer to EIA-364-96.

#### 7.6 PCB Hole Wall Damage

Use PCB's with minimum diameter holes, tin/OSP plating, and 1.57mm overall thickness. Metallographic cross-sections shall be prepared perpendicular to the PCB surface (longitudinal section) and through the compliant section wear track to facilitate examination of the PTH. Prior to cross-section preparation, perform 3 compliant pin insertions and 3 compliant pin withdrawals. There shall be no copper cracks, separations between conductive interfaces, or laminate-to-copper separations. Test 10 pins/holes. Refer to EIA-364-96.

### 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.

#### 8.1 Thermal Shock – EIA 364-32.

- a. Number of Cycles - 5
- b. Temperature Range - Between -65°C and +125°C
- c. Time at Each Temperature - 30 minutes
- d. Transfer Time - 5 minutes, maximum

#### 8.2 Cyclic Temperature & Humidity – EIA 364-31 method VI (cyclic temperature).

- a. Relative Humidity – 90~98%
- b. Temperature – 25°C to 65°C
- c. Duration – 10 hours/cycle, 50 cycles, 500 hours total

#### 8.3 High Temperature Life – EIA 364-17.

- a. Test Temperature - 125± 2°C
- b. Test Duration - 1000 hours


#### 8.4 Mixed Flowing Gas corrosion (MFG) – EIA 364-65.

- a. Class - IIA
- b. Duration – Un-mated 10 days and mated 10 days, total 20 days

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- 8.5 Vibration (Random) – EIA 364-28
  - a. Test Condition - method VII, letter E
  - b. Vibration Amplitude - 4.90 rms G between 20~500 Hz
  - c. Duration – 15 minutes along each of three orthogonal axes
  - d. Mounting - Rigidly mount assemblies
  - e. No discontinuities greater than 1 microsecond
- 8.6 Mechanical Shock – EIA 364-27
  - a. Condition - Test condition A (50G, 11 milliseconds, half-sine pulse type)
  - b. Shocks - 3 shocks in both directions along each of three orthogonal axes (18 shocks total)
  - c. Mounting - Rigidly mount assemblies
  - d. No discontinuities greater than 1 microsecond.
- 8.7 Durability - EIA 364-09
  - a. Number of Cycles - 100 cycles
  - b. Cycling Rate - 127 mm/minute
  - c. Use free floating fixtures
- 8.8 Solder ability –ANSI-J-STD-002
  - a. Test Condition: Test S1
  - b. PCB termination area was evaluated and meets the requirements of ANSI-J-002
- 8.9 Resistance to Solder Heat – EIA 364-56
  - a. Test Condition - Condition 6 Level 6
  - b. There shall be no evidence of physical or mechanical damage
- 8.10 Dust - EIA 364-91
  - a. Dust Composition #1 (benign)
  - b. Duration: 1 hour
  - c. Half of the samples expose the plugs and the other samples expose the receptacles
- 8.11 Disturb - (ref. GR-1217-CORE)
 

Back the fully seated plug from the receptacle approximately 0.10 mm (0.004 in) and reseal fully.

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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

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

The sample size and description are listed for each test in the appropriate sections of this document.

### 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 1. 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 1

TEST GROUP ID:		1	2	3A	3B	4	5	6	7	8
TEST DESCRIPTION	SECTION	Mixed Flowing Gas	Temp Life	Thermal Shock & Humidity (Dielectric)	Thermal shock / Humidity	Vibration / Mech. Shock	Current Rating	Repair ability	Solder ability	Resistance to Solder Heat
VISUAL EXAMINATION	5.5	1,27	1,9	1,12	1,19	1,20	1,6	1, 10,	1,3	1,3
MATE PLUG & RECEPTACLE		2,10,15,	2	2	2,13	3,11	2			
UNMATE PLUG & RECEPTACLE		8,13,	8		11	9	5			
<b>ELECTRICAL:</b>										
CONTACT RESISTANCE AT LOW LEVEL	6.1	3,6,11,16,19,22,25	3,6		3,6,9,14,17	4,7,12,15,18				
CONTACT RESISTANCE AT SPECIFIED CURRENT	6.2	4,7,12,17,20,23,26	4,7		4,7,10,15,18	5,8,13,16,19	4			
INSULATION RESISTANCE	6.3			3,6,9						
DIELECTRIC WITHSTANDING VOLTAGE	6.4			4,7,10						
CURRENT RATING	6.5						3			
<b>MECHANICAL:</b>										
MATING / UNMATING FORCE	7.1					2				
CONTACT RETENTION	7.2			11						
PF PIN INSERTION FORCE	7.3							2,4,6		
PF PIN RETENTION FORCE	7.4							3,5,7		
PCB HOLE DEFORMATION RADIUS	7.5							8		
PCB HOLE WALL DAMAGE	7.6							9		
<b>ENVIRONMENTAL:</b>										
THERMAL SHOCK	8.1			5	5					
CYCLICAL HUMIDITY & TEMP.	8.2			8	16					
TEMPERATURE LIFE	8.3		5							
MFG – UNMATED, 5 Days	8.4	9,14,								
MFG - MATED, 5 Days	8.4	18,21								
VIBRATION	8.5					14				
MECHANICAL SHOCK	8.6					17				
DURABILITY, 100 CYCLES	8.7				8	6				
DURABILITY, 25 CYCLES	8.7	5								
Solder ability	8.8								2	
Resistance to Solder Heat	8.9									2
DUST CONT	8.10				12	10				
DISTURB	8.11	24								
Sample Quantity (pairs, Plug + REC)		4	4	4	4	4	3	9	4	4



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10. REVISION RECORD

**REVISION RECORD**

Rev	Page	Description	EC#	Date
A	ALL	Initial release	N/A	12/20/2021