


NUMBER GS-12-1380	TYPE GENERAL PRODUCT SPECIFICATION		
TITLE ENHANCED HIGH POWER CARD EDGE (eHPCE®) VERTICAL RECEPTACLE CONNECTOR		PAGE 1 of 11	REVISION A
		AUTHORIZED BY Andy Lu	DATE June 25, 2019
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1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the eHPCE® connector system which includes the vertical type configurations.

2.0 Scope

This specification is applicable to the termination characteristics of the eHPCE® Connector System which provides a separable interface for power to Edge card applications.

3.0 Ratings

- 3.1 Operating Voltage Rating: 300V DC for power contact, 100V DC for signal contact.
- 3.2 Operating Current Rating: refer to values in the table in section 6.5.
- 3.3 Operating Temperature Range = -55°C ~ +140°C¹

Note 1: includes the terminal temperature rise when powered


4.0 Applicable Documents

4.1 Specifications

- 4.1.1 Engineering drawings: 10140903, 10143917, 10139482, 10141274, 10142907, 10144129 etc
- 4.1.2 Application specification: GS-20-0488

4.2 National or International Standards

- 4.2.1 Flammability: UL94V-0
- 4.2.2 EIA 364: Electrical connector/Socket test procedures include environmental classification.
- 4.2.3 EIA 364-1000: Environmental test methodology for assessing the performance of electrical connectors and sockets used in business office applications.
- 4.2.4 EIA 364-1004: Environmental test methodology for verifying the current rating of freestanding power contacts or electrical connectors and sockets.

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- 4.3 Laboratory Reports - Supporting Data
DL-2017-04-018-CR
- 4.4 Safety Agency Approvals
UL/CSA File #: E66906 Vol. 1 Sec. 124

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

Power Receptacle Contacts: Copper alloy

Signal Receptacle contacts: Copper alloy

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.

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Configuration 14 Middle power + 20 Signal as shown
(One Middle power has three contact beams and two tails)

6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (Signal contact)

The low level contact resistance shall not exceed 25mΩ initially. The low level contact resistance shall also not exceed 10mΩ change in resistance (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:

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

6.2 Contact Resistance, Specified Current (Power contact)

The contact resistance at a specified current shall not exceed 1.0mΩ initially or after any treatment and/or environmental exposure.

Measurements shall be in accordance with EIA 364-06.


The following details shall apply:

- a. Test Current – refer to section 6.5.

6.3 Insulation Resistance

The insulation resistance of unmated connectors shall not be less than 5000MΩ (mega ohms) for power contact and 500MΩ for signal contact.

Measurements shall be in accordance with EIA 364-21.

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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.

6.4 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current > 1 mA when unmated connectors are tested in accordance with or EIA 364-20.

The following details shall apply:

- a. Test Voltage - 1800 VDC for power contact and 500 VDC for signal contact.
- 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.

Contact current rating	
Contact type	Current(ampere)
AMPS per MP(total MPs ≤ 28MPs)	28A
AMPS per Signal(total Signal ≤ 24S)	1.0A (2.5A/pin if it is applied for standby power)
NOTES: 1. The applicable maximum configuration: 28MP+24S. 2. "MP" stands for Middle Power with 2 tails . 3. Temperature rise: 30 °C Max. 4. Test board has 8 layers and 2oz copper for each layer; top layer and bottom layer are for both signal and power, all 8 layers including (top and bottom layers) for current carrying of power. 5. The maximum quantity of signal pin used for standby power is 4 pieces among total 24 pcs signal pins when signal pins are used as standby power pin with 2.5 Amp Max.	

The following details shall apply:

- a. Ambient Conditions – still air at lab room ambient;
- b. Reference - EIA 364-70.

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7.0 Mechanical Characteristics

7.1 Mating/Unmating Force

The following details shall apply:

- a. Cross Head Speed - 25.4mm per minute.
- b. Utilize free floating fixtures.
- c. Reference – EIA 364-13.

Configuration	Mating Force (N) (Max. Allowance)	Un-Mating Force (N) (Min. Allowance)
Single Middle Power Contact	3.00	0.55
Single Signal Contact	0.22	0.06

7.2 Contact retention

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

Requirement:

Signal Pin: individual signal pin shall withstand an axial retention load of 6 N minimum

Power Contact: individual power pin shall withstand an axial retention load of 8 N minimum

7.3 Reseating

Test condition: Manual plug/unplug the connector with module board.

Requirement: Perform 3 such cycles.

7.4 Compliant Pin Insertion Force

Power - Individual compliant Pin

The force required to insert an individual compliant pin into a plated through hole in a printed circuit board at a rate of 5.08mm/minute shall not exceed 120 N.

Signal - Individual compliant Pin

The force required to insert an individual compliant pin into a plated through hole in a printed circuit board at a rate of 5.08mm/minute shall not exceed 30 N.

7.5 Compliant Pin / Retention Force

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 10 N per press-fit tail.

Signal Individual compliant Pin

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The retention force in an axial direction opposite that of insertion at a rate of 5.08mm/minute shall not be less than 8 N.

7.6 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.

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"). Reference EIA-364-96.

7.7 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. Reference 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 - 25
- b. Temperature Range - Between -55°C and +105°C
- c. Time at Each Temperature - 60 minutes
- d. Transfer Time - 5 minutes, maximum

8.2 Cyclic Temperature & Humidity – EIA 364-31 method III (cyclic temperature)

- a. Relative Humidity - 80% to 98%

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- b. Temperature - 25°C~65°C
 - c. Duration - 240 hours
 - d. Omit step 7b (vibration) where applicable
- 8.3 High Temperature Life – EIA 364-17.
- a. Test Temperature - 140± 2°C
 - b. Test Duration - 1008 hours
- 8.4 High Temperature Life(preconditioning) – EIA 364-17.
- a. Test Temperature - 140± 2°C
 - b. Test Duration - 497 hours
- 8.5 Mixed Flowing Gas corrosion (MFG) – EIA 364-65
- a. Class - IIA
 - b. Duration - 10 days
 - c. Specify mated state
- 8.6 Vibration (Random) – EIA 364-28
- a. Test Condition - method VII, letter E
 - b. Vibration Amplitude - 4.90 rms G
 - c. Duration – 1.5 hours along each of three orthogonal axes
 - d. Mounting - Rigidly mount assemblies
 - e. No discontinuities greater than 1 microseconds
- 8.7 Mechanical Shock – EIA 364-27
- a. Condition - Test condition A (50G, 11 millisecond, 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 microseconds.
- 8.8 Durability - EIA 364-09
- a. Number Cycles - 200 cycles
 - b. Cycling Rate - 127 mm/minute
 - c. Use free floating fixtures

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- 8.9 Durability (preconditioning) - EIA 364-09
 - a. Number Cycles - 20 cycles
 - b. Cycling Rate - 127 mm/minute
 - c. Use free floating fixtures

- 8.10 Solderability – ANSI-J-STD-002
 - a. Test Condition - method D
 - b. Steam aging - 8 hours
 - c. Minimum solder coverage: 95%

- 8.11 Thermal Disturbance – EIA 364-110
 - a. Number of Cycles - 10
 - b. Temperature Range - Between 15 ±3°C and +85 ±3°C
 - c. Dwell time for each extreme temperature – 5 minutes minimum
 - d. Ramp rate - a minimum of 2°C per minute

- 8.12 Dust - EIA 364-91
 - a. Dust Composition #1 (benign)
 - b. Duration: 1.0 hour
 - c. Unmated connector to be placed in the chamber

- 8.13 Resistance to Solder Heat – EIA 364-56
 - a. Test Condition - Condition H, Procedure 3
 - b. There shall be no evidence of physical or mechanical damage

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%

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c. Barometric Pressure: Local ambient

9.3 Sample Quantity and Description

The sample size and description is listed for each test in the appropriate section 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. 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

TEST GROUP ID:		1	2	3	4	5	6	7	8	9	10
TEST DESCRIPTION	SECTION	Temp Life	Thermal Shock & Humidity	Mech. Shock & Vibration	Mixed Flowing Gas	Dielectric	Dust	Durability	Current Rating	Terminal	Repair
VISUAL EXAMINATION		1,12	1,15	1,15	1, 18	1,10	1,15	1,12	1,4	1	1, 10
MATE RECEPTACLE & EDGE CARD		2	2	2	2		2	3	2		
ELECTRICAL:											
CONTACT RESISTANCE AT LOW LEVEL (Signal)	6.1	3,7,10	3,7,10,13,	3,7,10,13,	3,7,10,13,16		3,7,10,13	4,9			
CONTACT RESISTANCE (Power)	6.2	4,8,11	4,8,11,14,	4,8,11,14,	4,8,11,14,17		4,8,11,14	5,10			
INSULATION RESISTANCE	6.3					2,5,8					
DIELECTRIC WITHSTANDING VOLTAGE	6.4					3,6,9		2,11			
CURRENT RATING (Power&SIGNAL)	6.5								3		
MECHANICAL:											
MATING / UNMATING FORCE	7.1							6,8			
CONTACT RETENTION (Power & Signal)	7.2									2	
RESEATING	7.3	9	12		15		12				
COMPLIANT PIN INSERTION FORCE (Power & Signal)	7.4										2,4,6
COMPLIANT PIN RETENTION FORCE (Power & Signal)	7.5										3,5,7
PCB HOLE DEFORMATION RADIUS	7.6										8
PCB HOLE WALL DAMAGE	7.7										9
ENVIRONMENTAL:											
THERMAL SHOCK	8.1		6			4					
Cyclic Temperature & Humidity	8.2		9			7					
HIGH TEMPERATURE LIFE	8.3	6									
HIGH TEMPERATURE LIFE (Preconditioning)	8.4			6	6						
MFG (EIA-364-65 Class IIA)	8.5				9						
RANDOM VIBRATION	8.6			9							
MECHANICAL SHOCK	8.7			12							
DURABILITY, 200 Cycles	8.8							7			
DURABILITY, 20 CYCLES (Preconditioning)	8.9	5	5	5	5		5				
SOLDERABILITY	8.10									4	
THERMAL DISTURBANCE	8.11				12		9				
DUST CONTAMINATION	8.12						6				
COMPONENT HEAT RESISTANCE TO WAVE SOLDERING	8.13									3	

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SAMPLES QUANTITY(PCS)		5	5	5	5	5	5	5	3	5	5
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REVISION RECORD

Rev	Page	Description	EC#	Date
A	All	Initial released	N/A	2019/Jun/25