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**Universal Power Module**

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**1. SCOPE**

## 1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) Universal Power Module. This module is a hard metric, board-to-board power connector designed to be compatible with IEC 1076-4-101 and is offered in 3 through 12 position modules. The design is in an "inverse-sex" orientation with the vertical receptacle module for finger probe protection. Both the headers and receptacles utilize ACTION PIN\* press-fit leads for assembly onto printed circuit boards. The vertical receptacle leads are polarized to allow only 1 orientation onto the printed circuit board, eliminating the possibility of reverse placement.

## 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

## 1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed on 06Feb96. The Qualification Test Report number for this testing is 501-461. Additional testing was completed on 24Jul06. This documentation is on file at and available from Engineering Practices and Standards (EPS).

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

## 2.1. TE Documents

- 109-1: Test Specification (General Requirements for Test Specifications)
- 109 Series: Test Specifications as indicated in Figure 1
- 114-1103: Application Specification (Universal Power Module (UPM) Connectors)
- 501-461: Qualification Test Report (Universal Power Module)

## 2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC 1076-4-101: Connectors for Electronic Equipment

## 2.3. Reference Documents

- 109-197: Test Specification (TE Test Specifications vs EIA and IEC Test Methods)
- 502-1309: Engineering Report (Evaluation Testing of UPM High Current Header and Receptacle Assemblies)

**3. REQUIREMENTS**

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Voltage: 250 volts AC
- Temperature: -55 to 125°C
- Current:
  - Standard Contacts: 10 amperes per contact (4 position module, 30°C temperature rise at 23°C ambient, fully energized, terminated to 12 AWG wire)
  - High Current Contacts: 16 amperes per contact (4 position module, 30°C temperature rise at 23°C ambient, fully energized, terminated to 12 AWG wire)
- UL Current Interruption Rating: 12 amperes at 250 volts AC (3 position module, fully energized, terminated to printed circuit board with .800 inch wide X 4 ounce trace) UL file E28476, Vol 23 Section 47

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions per Test Specification 109-1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of product.	Meets requirements of product drawing and Application Specification 114-1103.	Visual, dimensional and functional per applicable quality inspection plan.
<b>ELECTRICAL</b>		
Termination resistance, gold plated product.	5 milliohms maximum.	TE Spec 109-6-6. Subject mated contacts assembled in housing to 20 millivolts maximum open circuit at 100 milliamperes maximum.
Low Level Contact Resistance (LLCR), palladium nickel plated product.	5 milliohms maximum.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Insulation resistance.	10000 megohms minimum.	TE Spec 109-28-3. Test between adjacent contacts of mated specimens.

Figure 1 (continued)

Test Description	Requirement	Procedure
Dielectric withstanding voltage.	One minute hold with no breakdown or flashover.	TE Spec 109-29-1. 1000 volts AC at sea level. Test between adjacent contacts of mated specimens.
Temperature rise vs current.	30°C maximum temperature rise at specified current.	TE Spec 109-45-1. Energize all contacts with 7.33 amperes.
MECHANICAL		
Sinusoidal vibration, gold plated product.	No discontinuities of 1 microsecond or longer duration. See Note.	TE Spec 109-21-2. Subject mated specimens to 10 to 500 to 10 Hz traversed in 11.25 minutes with 0.71 mm total excursion or 5 G's whichever is less. Two hours in each of 3 mutually perpendicular planes.
Sinusoidal vibration, palladium nickel plated product.	See Note.	EIA-364-28, Test Condition II. Subject mated specimens to 10 to 500 to 10 Hz traversed in 15 minutes with 1.5 mm maximum total excursion. Three hours in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	TE Spec 109-26-1. Subject mated specimens to 50 G's half-sine shock pulses of 11 milliseconds duration. Five shocks in each direction applied along 3 mutually perpendicular planes, 30 total shocks.
Durability, gold plated product.	See Note.	TE Spec 109-27. Mate and unmate specimens for 250 cycles at a maximum rate of 325 cycles per hour.
Durability, palladium nickel plated product.	See Note.	EIA-364-9. Mate and unmate specimens for 250 cycles at a maximum rate of 300 cycles per hour.

Figure 1 (continued)

Test Description	Requirement	Procedure
Contact retention.	Axial displacement shall not exceed 0.2 mm with force applied or 0.1 mm after force has been removed.	<p>TE Spec 109-30-1. Apply axial force of 10 N to pin contacts in the unmating direction at a maximum rate of 2.54 mm per minute and hold for 5 seconds.</p> <p>Apply axial force of 5 N to pin contacts in the mating direction at a maximum rate of 2.54 mm per minute and hold for 5 seconds.</p> <p>Apply axial force of 5 N to receptacle contacts in both the mating and unmating directions at a maximum rate of 2.54 mm per minute and hold for 5 seconds.</p>
Mating force.	1 N per contact maximum.	TE Spec 109-42, Condition A. Measure force necessary to mate specimens at a maximum rate of 25.4 mm per minute.
Unmating force.	0.5 N per contact minimum.	TE Spec 109-42, Condition A. Measure force necessary to unmate specimens at a maximum rate of 25.4 mm per minute.
Termination strength.	See Note.	TE Spec 109-64, Condition A. Apply axial force of 10 N to plug contacts in both the mating and unmating directions at a maximum rate of 2.54 mm per minute and hold for 10 seconds.
Static load, transverse.	See Note.	A 25 N side-to-side load and a 50 N front-to-back load shall be applied to unmated plug and receptacles using a 3 mm rod with rounded end. Load shall be applied in the middle of the plug and receptacle modules approximately 6 and 11 mm above the printed circuit board.
ENVIRONMENTAL		
Thermal shock.	See Note.	TE Spec 109-22. Subject mated specimens to 5 cycles between -55 and 125°C.
Humidity, steady state.	See Note.	TE Spec 109-23-2, Condition D. Subject specimens to 56 days at 40°C and 93% RH with 60 volts DC applied between adjacent contacts.

Figure 1 (continued)

Test Description	Requirement	Procedure
Humidity/temperature cycling.	See Note.	TE Spec 109-23-3. Subject specimens to 6, 24 hour cycles of humidity/temperature cycling. A cycle consists of the following: Transition from 25°C and 95% RH to 55°C and 90% RH in 3 hours. Dwell at 55°C and 90% RH for 9 hours. Transition from 55°C and 90% RH to 25°C and 80% RH in 3 hours. Dwell at 25°C and 95% RH for 9 hours. At the end of the first cycle, remove specimens from chamber and precondition at -55°C for 2 hours. Place specimens in an altitude chamber and subject all adjacent contact pairs to 200 volts AC for 1 minute at a simulated altitude of 30000 feet.
Electrical load, high temperature.	See Note.	TE Spec 109-43. Subject mated specimens with thermocouples attached and energized at 7.8 amperes to oven temperature of 70°C. Increase oven temperature until internal specimen temperature stabilizes at 125°C. Maintain temperature for 1000 hours.
Temperature life, gold plated product.	See Note.	TE Spec 109-43. Subject mated specimens to 125°C for 16 hours.
Temperature life, palladium nickel plated product.	See Note.	EIA-364-17, Method A, Test Condition 5. Subject mated specimens to 125°C for 16 hours.
Mixed flowing gas (3 gas).	See Note.	TE Spec 109-85-2. Subject mated specimens to environmental class II for 14 days.
Mixed flowing gas (4 gas), gold plated product.	See Note.	TE Spec 109-85-2A. Subject specimens to environmental class IIa for 20 days (10 days unmated, 10 days mated).
Mixed flowing gas, palladium nickel plated product.	See Note.	EIA-364-65, Class IIA (4 gas). Subject mated specimens to environmental Class IIA for 20 days (10 days unmated, 10 days mated).

Figure 1 (continued)

Test Description	Requirement	Procedure
Industrial atmosphere.	See Note.	Subject 4 mated and 4 unmated specimens to 10 days exposure in a 500 ppm concentration of sulphur dioxide and a 100 ppm concentration of hydrogen sulfide at 25°C and 75% RH.

**NOTE**

*Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests as specified in Test Sequence in Figure 2.*

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)							
	1	2	3	4	5	6	7	8
	Test Sequence (b)							
Examination of product	1,17	1,12	1,11	1,10	1,7	1,8	1,5	
Termination resistance, Au plated product	2,13	2,8	2,7	2,7	2	2,6	2,4	
LLCR, PdNi plated product								1,3,5,7,9,11,13
Insulation resistance	3,12	3,9	3,6	3,8	3			
Dielectric withstanding voltage	4,14	4,10	4,8	4,9	4			
Temperature rise vs current						7		
Sinusoidal vibration, Au plated product	7					5		
Sinusoidal vibration, PdNi plated product								12
Mechanical shock	8							
Durability, Au plated product		5,7		5				
Durability, PdNi plated product								4,10
Contact retention					6			
Mating force	5,15		9					
Unmating force	6,16		10					
Termination strength					5			
Static load, transverse		11						
Thermal shock	9							
Humidity, steady state			5					
Humidity/temperature cycling	11(c)							
Electrical load, high temperature				6				
Temperature life, Au plated product	10					4		
Temperature life, PdNi plated product								2
Mixed flowing gas (3 gas)						3(d)		
Mixed flowing gas (4 gas), Au plated product							3	
Mixed flowing gas, PdNi plated product								6(e),8(f)
Industrial atmosphere		6						

- NOTE**
- (a) See paragraph 4.1.A.
  - (b) Numbers indicate sequence in which tests are performed.
  - (c) Perform dielectric withstanding voltage at 30000 feet after first cycle
  - (d) Precondition specimens with 10 cycles durability.
  - (e) Mated specimens.
  - (f) Unmated specimens.

Figure 2

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#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Test group 1 shall consist of 6 receptacles and right angle headers. Test group 2 shall consist of 8 receptacles and right angle headers. Test groups 3, 4 and 5 shall each consist of 4 receptacles and right angle headers. Test group 6 shall consist of 10 receptacles and right angle headers. Test group 7 shall consist of 70 receptacles and right angle headers. Test group 8 shall consist of 10 receptacle and header assemblies with 30  $\mu\text{m}$  PdNi plated contacts.

###### B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

##### 4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

##### 4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

##### 4.4. Quality Conformance Inspection

The applicable quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.