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**Power Distribution Module**

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**1. SCOPE**

## 1.1. Content

This specification covers performance, tests and quality requirements for the Power Distribution Module (PDM), intended for use as sealed enclosure for housing electrical components. The PDM consists of a 5 by 12 contact pattern base/seal assembly and cover. The PDM contact pattern is that of Tyco VJ28 and VF28 relays as well as mini fuses intended for use in this application. A fuse removal tool is housed in one of unused cavities.

## 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 24May05. The Qualification Test Report number for this testing is 501-610. 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. Tyco Electronics Documents

- 109-197: Test Specification (AMP Test Specifications vs EIA and IEC Test Methods)
- 501-610: Qualification Test Report(Power Distribution Module)

## 2.2. Industry Standards

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC 60512: Electromechanical Components For Electronic Equipment; Basic Testing Procedures and Measuring Methods Part 1: General
- IEC 60529: Degrees of Protection Provided by Enclosures (IP Code)

**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

- Temperature: -40 to 80°C
- Current: Refer to Tyco MCP 2.8 mm terminal system specification 108-18513-1, PN's 1-968857-1 and -3 sealed terminal 14-16 AWG, PN's 1-968855-1, -2, -3 sealed terminal 18 AWG for electrical rating and heat rise characteristics.
- Seal: IP-66, IP-67

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 EIA-364.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Visual examination.	Meets requirements of product drawing.	Examine visually under fluorescent lighting for form, fit and function. Verify print dimensions.
<b>ELECTRICAL</b>		
Termination resistance, dry circuit, per single interface.	2 milliohms maximum initial. 20 milliohms maximum final.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Temperature rise vs current at elevated ambient conditions.	Shall not exceed 40°C temperature rise above ambient.	EIA-364-70. IEC 60512-5-1. Ampere terminals higher than 10 amperes due to thermal runaway. Conduct test at 80°C. Loading configuration per Figure 3.
Dielectric withstanding voltage.	Two minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 500 volts DC at sea level. Test between adjacent contacts. Instantaneous rate of rise.

Figure 1 (continued)

Test Description	Requirement	Procedure
Fuse blow.	No plastic or terminal interface degradation.	Subject each fuse under load to 12 volts DC battery voltage and current until the fuse "opens" for a total of 5 times per fused circuit under load. Use 30 ampere fuse.
<b>MECHANICAL</b>		
Free fall.	Shall remain functional, some chips and dents permitted but not over seal area. Meet requirements of IP67. See Note.	Subject specimens affixed to a 750 mm cable and loaded per Figure 3, routed symmetrically, to 8 drops, rotated 45 degrees each drop.
Vibration.	No discontinuities of 10 microseconds or longer duration. See Note.	Eight hours in each of 3 mutually perpendicular planes. Component monitoring and measurement excludes VF28 relay. See Figure 4.
Mechanical shock.	No discontinuities of 10 microseconds or longer duration. See Note.	EIA-364-27, Method H. Subject specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks. Component population limited to fuses.
Housing locking mechanism strength.	Shall withstand disengagement force of 100 N without depressing latches. See Note.	EIA-364-98. Subject specimens to a force of 100 N for 1 minute in the unmating direction with latches engaged.
Housing locking mechanism retention force to failure.	Shall withstand disengagement force of 250 N before latches are damaged (pull to failure). See Note.	EIA-364-98. Subject specimens to force in the unmating direction until latches are damaged.
Secondary lock strength.	Secondary lock shall prevent the cover from opening while the latch unit is subjected to a force of 45 N.	Attempt to open the cover while applying a force of 45 N to the latch unit.
Connector cover durability at room ambient.	No visible hinge cracking. See Note.	Mount and unmount cover 50 times at room ambient temperature.
Connector cover durability at -40°C.	No visible hinge cracking. See Note.	Mount and unmount cover 5 times at -40°C.
Durability, misaligned hinges.	Shall meet visual requirements and show no breakage after misaligned forces. Stress mark surface cracking permissible. Final removal cover with latches engaged shall be greater than 100 N. See Note.	Subject specimens to 3 misaligned mounting/dismounting cycles at room ambient temperature applying a force of 100 N for 1 minute.

Figure 1 (continued)

Test Description	Requirement	Procedure
Contact retention.	80 N minimum for all (60) contact cavities.	IEC-60512-16-20, Method A. Test to failure.
Fuse extractor durability, multiple fuse removal.	Extractor tool shall withstand 6 fuse removals from cover, and 12 fuse removals from base.	Conduct at room ambient.
Fuse extractor durability, extractor retention.	Extractor tool shall withstand 10 insertions into base cavity.	Conduct at room ambient.
<b>ENVIRONMENTAL</b>		
Degrees of protection.	See Note.	IEC-60529, IP 66
	See Note.	IEC-60529, IP 67.
Salt fog.	No water ingress. See Note.	EIA-364-26, Condition D. Subject specimens to 5% salt concentration at 35°C for 1000 hours.
Temperature life.	See Note.	EIA-364-17, Method A, Test Time Condition A. Subject specimens loaded per Figure 3 to 80°C for 96 hours.
Thermal shock.	See Note.	EIA-364-32, Test Condition I. Subject specimens to 50 cycles between -55 and 85°C.
Humidity-temperature cycling.	See Note.	EIA-364-31, Method IV. Subject specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH with -10°C cold shock.

**NOTE** *Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.*

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)								
	1	2,12	3,13	4,14	5,15	6,16	7,17	8,18	9,19
	Test Sequence (b)								
Visual examination	1,15	1,5	1,5	1,6	1,5	1,5	1,10	1,6	1,6
Termination resistance, dry circuit, per single interface	2,5,8,11			2,5			2,5,9	2,5	2,4
Temperature rise vs current at elevated ambient conditions								3	
Dielectric withstanding voltage					2,4	2,4			
Fuse blow									3
Free fall				3					
Vibration, Z axis	4								
Vibration, Y axis	7								
Vibration, X axis	10								
Mechanical shock, Z axis	3								
Mechanical shock, Y axis	6								
Mechanical shock, X axis	9								
Housing locking mechanism strength		4							
Housing locking mechanism retention force to failure			4						
Secondary lock strength			3						
Connector cover durability at room ambient		3							5
Connector cover durability at -40°C	14								
Durability, misaligned hinges		2							
Contact retention			2						
Fuse extractor durability, multiple fuse removal	12						7		
Fuse extractor durability, extractor retention	13						8		
Degree of protection, IP66							6		
Degree of protection, IP67				4			4		
Salt fog						3			
Temperature life								4	
Thermal shock							3		
Humidity-temperature cycling					3				

**NOTE** (a) See paragraph 4.1.A.  
 (b) Numbers indicate sequence in which tests are performed.

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 drawings and shall be selected at random from current production. Each test group shall consist of a minimum of 3 specimens.

**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. If 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 shall 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.

Cell Identification

	1	2	3	4	5	6	7	8	9	10	11	12
A	9.7		0,2	0.3	0.3	6.9	6.9					T
B	0.2		9.7					4	4			
C				1.5	1.5	2.4	2.4			8.7		0.2
D	1,8		0.2					0.1	0.1	0.2		8.7
E	0.2		1.8	1.5	1.5	1.8	1.8					

**NOTE** Numbers in cell indicates current in amperes, i.e. cell B1 = 0.2 amperes.

Figure 3  
Current Loading

Breakpoint Frequency (Hz)	Magnitude (G <sup>2</sup> /Hz)	Slope Between Breakpoint (dB/Octave) (see Note 1)
10 (see Note 1)	.070	0.0
20 (see Note 1)	.070	-5.42
40	.020	0.0
350	.020	-9.20
550	.005	-20.02
700	.001	-100.12
750	.0001	0.0
2000	.0001	0.0

- NOTE**
1. Linear slopes on log-log plots only.
  2. RMS G Level: - 3.2 G's maximum G level limited to 3 x the RMS level.
  3. Tolerance: ± 4 db from 10 to 2000 Hz.
  4. Wires to be firmly supported within 150 mm from PDM base wire exits. Device oriented to horizontal and vertical plane.
  5. For VF28 relay application, the use of compressed foam between the cover and relay or other means aiding stability is recommended. The application should be tested to application specific vibration profile and heat rise for specific current loads.

Figure 4  
Vibration Outline