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		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>05 Jan 2014</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## 1.0 Objective

This specification defines performance, tests, quality and reliability requirements of the PwrLoPro product.

## 2.0 Scope

This specification is applicable to the termination characteristics of the PwrLoPro family of products which provides low profile power application.

## 3.0 Ratings

### 3.1 Operating Voltage Rating : See Table 1


CONTACT		MAXIMUM VOLTAGE RATING IN AC (RMS) OR DC			
FUNCTION	PITCH	Within Primary Circuits	Primary to Secondary Circuits	Primary to Ground Circuits	Within Secondary Circuits
Signal	2.00	—	—	—	60●
Power	2.75	150	150	150	150
	5.50	400	—	400	400

● Safety Extra Low Voltage (SELV) Circuits

### 3.2 Operating Current Rating : See Table 2 and 3

Table 2	Current per Power Contact (amperes)					
Number of contacts energized	1	2	4	8	12	24
Steady State - 2.75mm contact pitch	26	22	20	17	16	13

Table 3	Current per Signal Contact (amperes)	
Number of contacts energized	1	40
Steady State - 2.00mm contact pitch	3	1

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3.3 Operating Temperature Range: -40~125 °C

3.4 For low level current or non-energized testing, connectors are applied to test boards with 2 layers, 2 ounce thick copper power planes.

For higher current testing, connectors are applied to test boards with 4 layers, 2 ounce thick copper power planes.

#### 4.0 Applicable Documents

##### 4.1 FCI Specifications

###### 4.1.1 Engineering drawings

Right Angle Header customer drawing: 10108877

Right Angle Receptacle customer drawing: 10108888

Vertical Receptacle customer drawing: 10121382

##### 4.2 Industry or Trade Association standards

CISCO L1 test

##### 4.3 National or International Standards


4.3.1 Flammability: UL94V-0 or similar applicable specification

4.3.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.

4.3.3 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement

##### 4.4 FCI Laboratory Reports - Supporting Data

##### 4.5 Safety Agency Approvals

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## 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 Contacts: High Conductivity Copper alloy.

Signal contacts: Copper alloy.

Housing Resin: Glass filled, LCP, or other high performance resin rated flame retardant 94 V-0 in accordance with UL-94.

### 5.3 Finish

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

*Contact area: GXT*

*Solder area: Matte Sn*

*Under plating: Ni*

### 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.

## 6.0 Examination

### 6.1 Initial examination of product

Visual and dimensional, inspection per product drawing.


Document noble plating thickness at contact interfaces.

Reference EIA 364-18

### 6.2 Final examination of product

Visual inspection.

Reference : EIA 364-18

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## 7.0 Electrical Characteristics

### 7.1 Contact Resistance, Low Level (LLCR)

The low level contact resistance shall not exceed:

Power contacts: 5 milliohms initially

Signal contacts: 20 milliohms initially

The low level contact resistance shall also not exceed:

Power contacts: 5 milliohms change

Signal contacts: 10 milliohms change

(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:

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

### 7.2 Contact Resistance, Specified Current

The contact resistance at a specified current shall not exceed 1.6 milliohms

Initially and after any treatment and/or environmental exposure.

Test Current: see table 2 and 3.

### 7.3 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 1000Mohms initially and after environmental exposure.

Measurements shall be in accordance with EIA 364-21.

The following details shall apply:


- Test Voltage: signal contacts 100 volts DC, power contacts 500 volts DC
- Electrification Time: 2 minutes, unless otherwise specified.
- Points of Measurement: Between adjacent contacts

### 7.4 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (> 1 Milliampere) when *mated* connectors are tested in accordance with EIA 364-20, condition I.

The following details shall apply:

- Test Voltage: signal contacts 750 volts, power contacts 2500 volts DC.
- Test Duration: 60 seconds.

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- c. Test Condition: 1 (760 Torr - sea level).
- d. Points of Measurement: Between adjacent contacts of mated samples and between closest signal and power contacts.

#### 7.5 Current Rating


The temperature rise above ambient shall not exceed 30 deg C at any point in the system.  
current refer to table2, table3.

The following details shall apply:

- a. Ambient Conditions: Still air at 25°C
- b. Test configuration: Stabilize at a single current level until 3 readings at 5 minutes intervals are within 1°C.
- c. Test with 1,2,4,8,12,24 adjacent power contacts energized
- d. Record data over a range 20 to 50°C temperature rise.

Document 30°C temperature rise current.

- e. Reference: EIA 364-70, method I.

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## 8.0 Mechanical Characteristics

### 8.1 Random vibration

No discontinuities of 1 microsecond or longer duration.

The following details shall apply:

- Subject mated samples to 4.90G's rms between 20 to 500 HZ.
- Fifteen minutes in each of 3 mutually perpendicular planes.
- Reference: EIA 364-28, test condition VII, condition E.

### 8.2 Mechanical shock

No discontinuities of 1 microsecond or longer duration.

The following details shall apply:

- Subject mated samples to 50G's half-sine shock pulses of 11 milliseconds duration.
- Three shocks in each direction applied along 3 mutually perpendicular planes.  
18 total shocks.
- Reference: EIA 364-27, condition A.

### 8.3 Durability

The connector pairs shall be capable of withstanding 250 mating/un-mating cycles at a maximum rate of 500 cycles per hour.

Reference: EIA-364-09.

### 8.4 Mating/Unmating Force

The force to mate a receptacle connector and compatible header shall not exceed :

Per power contact: 3 Newtons Max

Per signal contact: 1.65 Newtons Max


The unmating force shall not be less than:

Per power contact: 0.5 Newtons Min

Per signal contact: 0.15 Newtons Min

The following details shall apply:

- Cross Head Speed: 12.7mm per minute.
- Lubrication: none
- Utilize free floating fixtures.
- Reference : EIA 364-13.

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#### 8.5 Compliant pin insertion/retention.

Per pin insertion: 44.5 Newtons max per pin

Per pin retention: 10 Newtons min per pin

The following details shall apply:

- Test Speed: 12.7mm max per minute.
- Reference: EIA 364-05.

#### 8.6 Static load, transverse.

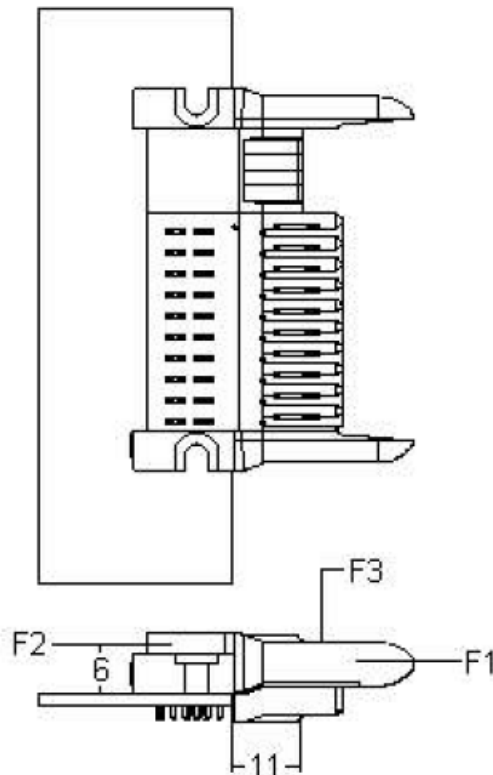
No displacement of connector on PCB likely to impair normal operation.

F1 = 100N


F2 = 75N

F3 = 50N

The following details shall apply:



- Test direction refer to below figure:
- Apply specified force in middle of the samples approximately 6 and 11mm above the PCB.

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#### 8.7 Contact retention.

Signal pin:

In the mating direction: 2N axial force to header and receptacle

In the un-mating direction: 9.5N axial force to header

5N axial force to receptacle

Power pin:

In the mating direction: 5N axial force to header and receptacle

In the un-mating direction: 10N axial force to header

5N axial force to receptacle

The following details shall apply:

- Test rate : 2.54mm/minute max
- Hold for 5 seconds
- 0.1mm max axial displacement

#### 8.8 Minute disturbance.

Un-mate and mate each connector pair a distance of approximately 0.1mm

#### 8.9 Component heat resistance to wave soldering.

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in 10.7: Qualification Test Table.

Reference: EIA-364-56, test condition- E.

### 9.0 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.


#### 9.1 Thermal Shock /unmated specimens: EIA-364-32.

- Number of Cycles: 5 cycles.
- Temperature Range : Between -40 and 125 deg C
- Time at Each Temperature: 30 minutes
- Transfer Time: 1 minute, maximum

#### 9.2 Humidity/temperature cycling/unmated specimens: EIA-364-31 method III (cyclic temperature)

- Relative Humidity: 80%~100%
- Temperature: 25~65 deg C
- Duration: 10cycles (10days)



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d. Omit step 7a (cold shock) & 7b (vibration) where applicable

9.3 Temperature Life/mated specimens: EIA 364-17, method A, test condition 3, test time condition C.

- a. Test Temperature: 85 deg C
- b. Test Duration: 500 hours

9.4 Mixed Flowing Gas corrosion (MFG) : EIA 364-65

- a. Class: IIA (4gas)
- b. Duration: 20 days
- c. Specify unmated for ½ the duration and mated the remaining ½ the duration

9.5 Dust - EIA 364-91/unmated specimens

- a. Dust Composition: #1 (refer to EIA-364-91 for dust composition type)
- b. Duration (hours): 1hour at airflow of 1000 cfm
- c. Both halves to be placed in the chamber
- d. Mating interface upward in the chamber.

## 10.0 QUALITY ASSURANCE PROVISIONS

### 10.1 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.

### 10.2 Inspection Conditions

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

- a. Temperature: 25 +/- 5 deg C
- b. Relative Humidity: 30% to 60%
- c. Barometric Pressure: Local ambient

### 10.3 Sample Quantity and Description

Samples shall be prepared in accordance with applicable instruction sheets and shall be selected at random from current production.


Test groups 1,3,4,8 and10 shall each consist of 5 mated headers and receptacles.

Test group 2 shall consist of 15 mated headers and receptacles: 5 headers fully loaded with power and signal contacts; 5 with power contacts only; and 5 with signal contacts only.

Test group 5 shall consist of 3 mated headers and receptacles.

Test group 6 shall each consist of 5 headers.

Test group 7 and 9 shall each consist of 5 receptacles

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#### 10.4 Acceptance

9.4.1 Acceptance is based on verification that the product meets the requirements of paragraph 3.0. Electrical and mechanical requirements placed on test samples as indicated in paragraphs 7.0 and 8.0 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.


#### 10.5 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 latest print revision, verification of plating composition and thickness, etc.

#### 10.6 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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### 10.7 Qualification Test Table

TEST	PARA	Test Group (a)									
		1	2	3	4	5	6(b)	7(c)	8	9	10
		Test Sequence (d)									
Initial examination of product	6.1	1	1	1	1	1	1	1	1	1	1
Low level contact resistance, Signal and Power contacts	7.1	2,4,6	3,7		2,4				2,4,6		
Low level contact resistance, Power contacts only	7.1					2,4,6 8					
Contact Resistance at rated current, Power contacts	7.2					10					
Insulation resistance	7.3			2,6							
Dielectric Withstanding Voltage	7.4			3,7							
Current Rating (Temperature rise vs current)	7.5					3(f),9					
Vibration, Random	8.1		5			7(e)					
Mechanical Shock	8.2		6								
Durability	8.3		4								
Mating Force	8.4		2(g)								
Un-Mating Force	8.5		8(g)								
Compliant pin insertion	8.5							2			
Compliant pin retention	8.5							3			
Static load, transverse	8.6									2	
Contact retention	8.7										2
Minute disturbance	8.8	5							5		
Component heat resistance to wave soldering	8.9						2				
Thermal Shock	9.1			4							
Humidity-temperature cycling	9.2			5							
Temperature Life	9.3				3	5					
Mixed Flowing Gas	9.4	3(f)(h)									
Dust	9.5								3(f)		
Final examination of product	6.2	7	9	8	5	11	3	4	7	3	3

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- a) See paragraph 10.3
- b) Test on boards
- c) Insertion only for fully loaded connectors, insertion and retention for loose power header contacts and loose signal IMLA contacts.
- d) Numbers indicate sequence in which tests are performed.
- e) Engergize at current for 18°C temperature rise.
- f) Precondition specimens with 10 durability cycles.
- g) Power only in housing, signal only in housing, and signal and power in housing.
- h) Measure LLCR after 10 days unmated exposure.

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<u>Rev</u>	<u>Page</u>	<u>Description</u>	<u>EC#</u>	<u>Date</u>
A	ALL	Version A Initial	N/A	03 Dec 2012
B	6	Section 8.2, 6 mutually perpendicular planes corrected to 3 mutually perpendicular planes	ELX-DG-16806-1	05 Jan 2014

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