PRODUCT SPECIFICATION FOR
EXTreme Ten60Power™
BOARD TO BOARD
INTERCONNECT SYSTEMS

PRODUCT SPECIFICATION FOR
EXTreme Ten60Power™
BOARD TO BOARD
INTERCONNECT SYSTEMS
Note: All power modules are available at 5.5 mm pitch for DC (low voltage) applications and 7.5 mm pitch AC (high voltage) application. See pg. 13 for recommended PCB lay-outs.
RA Signal Plug Modules (6-36 ckt) or RA HDS Plug Module (10-40 ckt)

RA Signal Receptacle Modules (6-36 ckt) or RA HDS Receptacle Module (10-40 ckt)

Vertical Signal Recpt. Modules (6-36 ckt) or Vertical HDS Recpt. Module (10-40 ckt)

Vertical Plug and Receptacle Assembly (Mezzanine)
1.0 SCOPE

2.0 PRODUCT DESCRIPTION
   2.1 Product Name and Series Numbers
   2.2 Dimensions, Materials, Platings and Markings
   2.3 Safety Agency Approvals

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS
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   7.4 Soldering Profile
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   7.6 Typical Mating Sequence: Power & 5 Row Signal

8.0 TEST SEQUENCE PER EIA-364-1000.01
1.0 SCOPE

The specification covers the performance requirements and test methods of Ten60Power and signal modular board to board interconnect systems.

2.0 PRODUCT DESCRIPTION

2.1 This specification covers the following board to board configurations:

Right Angle (RA) Plug assy mated to RA Receptacle assy (Coplanar configuration)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46436-XXXX</td>
<td>RA Receptacle Side Assembly</td>
</tr>
<tr>
<td>46437-XXXX</td>
<td>RA Plug Side Assembly</td>
</tr>
</tbody>
</table>

Right Angle (RA) Plug assy mated to Vertical Receptacle assy (Backplane configuration)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46562-XXXX</td>
<td>Vertical Receptacle Side Assembly</td>
</tr>
<tr>
<td>46437-XXXX</td>
<td>RA Plug Side Assembly</td>
</tr>
</tbody>
</table>

Vertical Plug assy mated to Vertical Receptacle assy (Mezzanine configuration)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>76541-XXXX</td>
<td>Vertical Receptacle Side Assembly</td>
</tr>
<tr>
<td>76546-XXXX</td>
<td>Vertical Plug Side Assembly</td>
</tr>
</tbody>
</table>

2.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKINGS

Dimensions: See individual sales drawings.
Material: RoHS compliant materials.
(LCP or equivalent plastic for housings and guide modules, copper alloy for terminals).
Plating: Gold on mating surfaces and tin on PC tail with nickel under-plating overall.
2.3 SAFETY AGENCY APPROVALS

2.3.1 File Number*: LR-19980_A_000 Class 6233-81

CSA approval meets following standards/test procedures:

a) CSA std. C22.2 No. 182.3-M1987
b) UL-1977

* - “C” and “US” mark adjacent to CSA signifies that the product has been evaluated to the applicable CSA and ANSI/UL standards, for use in Canada and US respectively.

<table>
<thead>
<tr>
<th>CSA</th>
<th>CSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-current interruption</td>
<td>Current interruption</td>
</tr>
<tr>
<td>2.5 Amps @ 250V for Legacy Signal ckt</td>
<td>2.5 Amp at 28V for Legacy Signal ckt</td>
</tr>
<tr>
<td>4.5 Amps @ 75V for HDS Signal ckt</td>
<td>4.5 Amps @ 28V for HDS Signal ckt</td>
</tr>
<tr>
<td>60 Amps @ 600V for power ckt</td>
<td>50 Amps at 60V for power ckt</td>
</tr>
</tbody>
</table>

2.3.2 UL – IEC61984

EU- Certificate Number: UL-EU-01060-A1

UL-CB - Report – E29179-D1-CB

IEC 61984-1
NON-current interruption
Power
7.5mm Pitch 600 volts AC/DC @ 60 amps
5.5mm Pitch 250 volts DC @ 60 amps
Signal
Signal Legacy (3 row) 120 Volts AC/DC @ 1.0 amps
Signal HDC (5 row) 120 volts AC/DC @ 1.0 amps.

IEC 61984 Certification: Tested to and found in compliance with IEC 61984. Certificate available from Molex upon request. Contact Molex Safety Agency team for questions regarding certification on specific part numbers.
2.3.3 UL File Number: E29179

<table>
<thead>
<tr>
<th>UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-current interruption</td>
</tr>
<tr>
<td>2.5 Amps @ 250V for Legacy signal ckt</td>
</tr>
<tr>
<td>4.5 Amps @ 120V for HDS signal ckt</td>
</tr>
<tr>
<td>80 Amps @ 600V for power ckt</td>
</tr>
</tbody>
</table>

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

3.1 See sales drawings and the other sections of this specifications for the necessary referenced documents and specifications.
4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE *

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy Signal Module</td>
<td>250 Volts</td>
</tr>
<tr>
<td>HDS Signal Module</td>
<td>120 Volts</td>
</tr>
<tr>
<td>Power Module</td>
<td>250 or 600 Volts (Ref. to pads layout in section 7.2)</td>
</tr>
</tbody>
</table>

**Connector Rating per UL-1977**

Connector voltage rating meets the connector approval level defined by UL 1977, Sect. 11 for spacing per table 11.1. Example: 1.2 mm for \( \geq 250 \) volt; 3.2 mm for \( \leq 250 \) volt.

Exception taken for spacing less than those specified are permitted, if the device complies with the requirements in the dielectric voltage withstanding test per Sect. 17.

**Application Voltage Guideline**

For application voltage requirements please refer to UL-60950 or other applicable standards, the creepage & clearance also needs to be determined based upon pads/traces on the PCB.

4.2 CURRENT **

<table>
<thead>
<tr>
<th>Contact Type</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Contact</td>
<td>2.5 Amps</td>
</tr>
<tr>
<td>HDS Signal Contact</td>
<td>4.5 Amps</td>
</tr>
<tr>
<td>Power Contact</td>
<td>60 Amps</td>
</tr>
</tbody>
</table>

** Tested in accordance with EIA-364-70.

Current rating is application dependent and should be used as a guideline. Appropriate rating is required per ckt size, ambient conditions, copper trace size on the PCB, gross heating from adjacent modules/components and other factors that influence connector performance.
Temperature Rise vs. Current per EIA-364-70

V-drop (max) vs. Current per EIA-364-70

8-ckt set up
4-ckt set up
2-ckt set up
1-ckt set-up

Current (Amps)

Temperature (C)

Voltage (V)

Current (Amps)
4.3 **TEMPERATURE***

Operating temperature (including T-rise from applied current) is -40º C to +105º C.

Temperature life tested per EIA 364-17 Method A for 240 hrs@105º per table 8 to meet field temperature of 65º C for 10 years life. See page 20 for detail test sequence of EIA-364-1000.01, Group I.

4.4 **DURABILITY**

200 cycles**

** - Based on EIA-364-1000.01 Test Method C Section 7

4.5 **HOT-PLUG/RESISTANCE TO THE ARC RATING:**

277 Volt AC @ 50 Amp – Power Ckt only

Tested 50 cycle at 277 volt AC with peak current of 50 Amp (35 amp RMS) hot-mate test conducted for power contact followed by T-rise and voltage drop. Test result shows 30º C temperature rise at 60 Amp (5oz/side-10oz copper test board used).

5.0 **QUALIFICATION**

Laboratory condition and sample selection are in accordance with EIA-364-1000.01. See page 20 for detail test sequence of EIA-364-1000.01
## 6.0 PERFORMANCE

### 6.1 ELECTRICAL PERFORMANCE

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TEST CONDITION</th>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIAL CONTACT RESISTANCE (LOW LEVEL)</td>
<td>Per EIA-364-23</td>
<td>Signal Contact: 30 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Contact: 0.3 mΩ</td>
</tr>
<tr>
<td>VOLTAGE DROP (@ RATED CURRENT)</td>
<td>Mate connectors; apply the rated current.</td>
<td>Typical Voltage Drop:</td>
</tr>
<tr>
<td></td>
<td>Per EIA-364-70</td>
<td>Power Contact: see chart, page 8</td>
</tr>
<tr>
<td>INSULATION RESISTANCE</td>
<td>Apply 500 VDC between adjacent terminals or ground.</td>
<td>5,000 MΩ minimum</td>
</tr>
<tr>
<td></td>
<td>Per EIA-364-21</td>
<td></td>
</tr>
<tr>
<td>DIELECTRIC WITHSTANDING VOLTAGE</td>
<td>Apply 1500 VDC for 1 minute between adjacent terminals or ground. Per EIA-364-20</td>
<td>No breakdown</td>
</tr>
<tr>
<td>TEMPERATURE RISE</td>
<td>Mate connectors Measure T-Rise @ Rated Current After 96 Hours. Per EIA-364-70</td>
<td>30 °C T-Rise</td>
</tr>
</tbody>
</table>
## 6.2 MECHANICAL PERFORMANCE

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TEST CONDITION</th>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATING FORCE, SINGLE CIRCUIT</strong></td>
<td>Mate connectors at a rate of 25.4±6 mm per minute Per EIA-364-37</td>
<td>Legacy Signal 75 g/ckt Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vert Recept to R/A Plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>756 g/ckt Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R/A Recept to R/A Plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>443 g/ckt Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HDS*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55 g/ckt Max</td>
</tr>
<tr>
<td><strong>UNMATING FORCE, SINGLE CIRCUIT</strong></td>
<td>Mate connectors at a rate of 25.4±6 mm per minute Per EIA-364-37</td>
<td>Legacy Signal 23 g/ckt Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vert Recept to R/A Plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>316 g/ckt Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R/A Recept to R/A Plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>253 g/ckt Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HDS*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 g Min per Contact</td>
</tr>
<tr>
<td><strong>DURABILITY W/O ENVIRONMENT</strong></td>
<td>Mate connectors 20 cycles at a max rate of 10 cycles per minute Per EIA-364-09</td>
<td>Maximum Change:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signal Contact: 10 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Contact: 0.30 mΩ</td>
</tr>
<tr>
<td><strong>CONTACT RETENTION</strong></td>
<td>Axial pullout force on the terminal in the housing at a rate of 25.4±6 mm per minute Per EIA-364-29</td>
<td>R/A Power 1336 g Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vert Power 754 g Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vert HDS Signals 544 g Min per coupon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R/A HDS Signals 275 g Min per coupon</td>
</tr>
</tbody>
</table>

* HDS: High Density Signal (5 Row Signal Design)
** Mate/Unmate Data is for 1st Cycle
<table>
<thead>
<tr>
<th>ITEM</th>
<th>TEST CONDITION</th>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Insertion force in to PCB for Terminals with Compliant Pins</td>
<td>Insert contact at a rate of 25.4±6 mm per minute</td>
<td>MAX: 12.54 lbs/pin (5.7 Kg/ckt) (Legacy Signal Module) &lt;br&gt;MAX: 10.02 lbs/pin (4.54 kg/ckt) (HDS module)</td>
</tr>
<tr>
<td>Min Extraction force for Terminals with Compliant Pins</td>
<td>Pull-out contacts at a rate of 25.4±6 mm per minute</td>
<td>MIN: 1.10 lbs. (0.5 Kg/pin) (Legacy Signal Module) &lt;br&gt;MIN: 1.00 lbs. (0.45 Kg/pin) (HDS Module)</td>
</tr>
<tr>
<td>Solderability Dip Test</td>
<td>Molex test method:</td>
<td>Solder area shell have Min of 95% solder coverage</td>
</tr>
<tr>
<td>Resistance to soldering heat from rework</td>
<td>Per EIA-364-61, Test procedure 4 for compliant pin retention force</td>
<td>22.5 lbs. (10.2 Kg) Per Power contact extraction force from PCB</td>
</tr>
<tr>
<td>Resistance to soldering heat from rework</td>
<td>Per EIA-364-61, Test procedure 2 (Test Condition II)</td>
<td>No dimensions change &lt;br&gt;No physical damage</td>
</tr>
</tbody>
</table>
### 6.3 ENVIRONMENTAL PERFORMANCE*

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TEST CONDITION</th>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIBRATION (EIA-364-1000.01)</td>
<td>Mate connectors and vibrate per EIA-364-28 test condition VII-D 15 minutes each axis.</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>MECHANICAL SHOCK (EIA-364-1000.01)</td>
<td>Mate connectors and shock at 50 g with ½ sine wave (11 milliseconds) shocks in the 3 axes (18 shocks total) Per EIA-364-27</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>THERMAL SHOCK (EIA-364-1000.01)</td>
<td>Mate connectors, expose to 10 cycles from -55°C to 85°C Per EIA-364-32</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>TEMPERATURE LIFE (EIA-364-1000.01)</td>
<td>Mate Connectors, expose to 240 hours at 105°C Per EIA-364-17</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>CYCLIC TEMPERATURE AND HUMIDITY (EIA-364-1000.01)</td>
<td>Mate connectors: expose to 24 cycles from 25 °C / 80% RH to 65 °C / 50% RH Per EIA-364-31</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>DUST (EIA-364-1000.01)</td>
<td>Un-mated 1 hour duration 25°C/50% RH dust mass of 9 g/ft³ at rate of 300 m/min. Per EIA-364-91</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
<tr>
<td>MIXED FLOWING GAS (EIA-364-1000.01)</td>
<td>168 hours un-mated, 168 hours mated, Per EIA-364-65 Class II-A</td>
<td>Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ</td>
</tr>
</tbody>
</table>

- Environmental test has been performed per EIA-364-1000.01 Groups I, though VI, see TS-46436-100 for details.
7.0 PRINTED CIRCUIT BOARD SPECIFICATION

7.1 PCB THROUGH HOLE SPEC.

Profile for 1.02mm (finish) holes:

TIN PLATED OR OSP HOLE DIMENSIONS IN MM/IN

Profile for 0.70mm (finish) holes – Signal segment:

TIN PLATED OR OSP HOLE DIMENSIONS IN MM/IN

Notes:
1. The finished hole size is the critical feature for proper performance of the compliant pin terminal. The reference drill sizes listed are recommended by Molex to achieve the finished PCB hole size.
2. Depending on the specific manufacturer’s plating process a different drill size can be used to achieve the required finished PCB hole size.
7.2 Typical PCB pads lay-out and signal holes lay-out for ref. only

Dimensions are MM/IN

Pads lay-out for power modules with 7.5 mm pitch for high voltage

Pads lay-out for power modules with 5.5 mm pitch for low voltage

Typical hole lay-out for 5 row signal/ HDS modules (0.70mm dia holes)

PCB lay-out for HDS modules vertical conf. only

PCB lay-out for HDS modules R/A conf. only
Typical Signal Hole Lay-out for 2.54mmX2.54mm Signal modules (1.02mm dia holes)

7.3 NOMINAL WIPE LENGTHS (RA-VERTICAL CONF.)

Recommended Final Position

Final position/fully seated
Power Modules:
1. Long Blade (Ground) has 5.8mm nominal wipe
2. Short Blade has 3.8mm nominal wipe

Final position/fully seated
Signal Modules (2.54mmX2.54mm):
1. Long Pin has 3.67mm nominal wipe
2. Short Pin has 2.4mm nominal wipe

Final position/fully seated
HDS Modules (2.00mmX1.65mm):
1. Long Pin has 3.20mm nominal wipe
2. Short Pin has 2.20mm nominal wipe
7.4 SOLDERING PROFILE

(This profile is per JEDEC J-STD-020D.1 and it is for guide line only; please see notes for additional information)

<table>
<thead>
<tr>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Ramp Rate</td>
<td>3°C/sec Max</td>
</tr>
<tr>
<td>Preheat Temperature</td>
<td>150°C Min to 200°C Max</td>
</tr>
<tr>
<td>Preheat Time</td>
<td>60 to 180 sec</td>
</tr>
<tr>
<td>Ramp to Peak</td>
<td>3°C/sec Max</td>
</tr>
<tr>
<td>Time over Liquids (217°C)</td>
<td>60 to 150 sec</td>
</tr>
<tr>
<td>Peak Temperature</td>
<td>260 ±0/-5°C</td>
</tr>
<tr>
<td>Time within 5°C of Peak</td>
<td>20 to 40 sec</td>
</tr>
<tr>
<td>Ramp - Cool Down</td>
<td>6°C/sec Max</td>
</tr>
<tr>
<td>Time 25°C to Peak</td>
<td>8 min Max</td>
</tr>
</tbody>
</table>

Notes:

1. Temperature indicated refers to the PCB surface temperature at solder tail area.

2. Connector can withstand up to 3 reflow cycles with a cool-down to room temperature in-between.

3. Actual reflow profile also depends on equipment, solder paste, PCB thickness, and other components on the board. Please consult your solder paste & reflow equipment manufacturer for their recommendations to adopt a suitable process.
7.5 TYPICAL MATING SEQUENCE: Power & 3 Row Signal

1: Long power blade (typically used for FMLB) mates 1st

2: Short power blades are next

3: After short power blade (s) the long signal pins (typically the top row) mate

4: After long signal pins, the rest of the signal pins mate

(Shown mating sequence is typical, custom configurations available on request)
7.6 TYPICAL MATING SEQUENCE: Power & 5 Row Signal

1. Long/ground Power Blade (FMLB) mates first

2. Long/ground Signal Blade (FMLB) mates second

3. Standard Power & Signal Blades (LMFB) mates third
8.0 TEST SEQUENCE
Reliability Test Sequences (per -364-1000.01):

**Group I**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Temperature Life
  - 100°C, 240 Hrs
  - 10 Yrs @ 65°C
  - EIA-364-17
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23

**Group II**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Thermal Shock
  - 10 cycles
  - 55°C and +85°C
  - EIA-364-32
- Cyclic Humidity
  - EIA-364-1000.01
- Random Vibration
  - EIA-364-28
  - condition VIID
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23

**Group III**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Temperature Life Preconditioning
  - 10 Yrs @ 65°C
  - EIA-364-17
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23

**Group IV**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Temperature Life Preconditioning
  - 10 Yrs @ 65°C
  - EIA-364-17
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23

**Group V**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Temperature Life Preconditioning
  - 10 Yrs @ 65°C
  - EIA-364-17
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23

**Group VI**
- Initial Contact Resistance
  - EIA-364-1000.01
- Durability
  - 20 cycles
  - EIA-364-09
- Contact Resistance
  - EIA-364-23
- Dust
  - EIA-364-91
  - Benign composition
- Thermal Disturbance
  - EIA-364-1000.01
- Reseating
  - 3 cycles
  - EIA-364-1000.01
- Contact Resistance
  - EIA-364-23