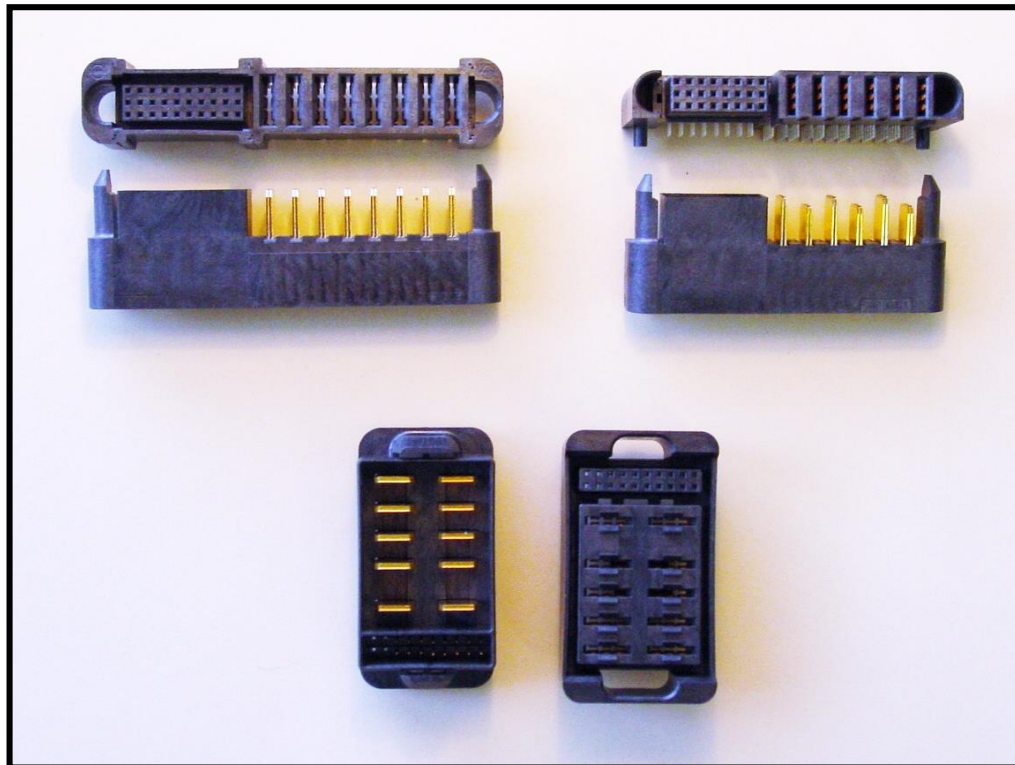


**PRODUCT SPECIFICATION FOR
 EXTreme Ten60Power™
 BOARD TO BOARD
 INTERCONNECT SYSTEMS**



<u>REVISION:</u> D7	<u>ECM INFORMATION:</u> EC No: 602464 DATE: 2018/08/23	<u>TITLE:</u> PRODUCT SPECIFICATION FOR Ten60Power BOARD TO BOARD INTERCONNECT SYSTEMS	<u>SHEET No.</u> 1 of 21
<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG
		<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM



RA Power Plug Modules (1-10 ckt)



RA Power Receptacle Modules (1-10 ckt)



Vertical Power Receptacle Modules (1-10 ckt)

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.

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DOCUMENT NUMBER: PS-46436-100	DOC TYPE: PS	DOC PART: 001	CREATED / REVISED BY: EANG
		CHECKED BY: CGOH	APPROVED BY: KHLIM



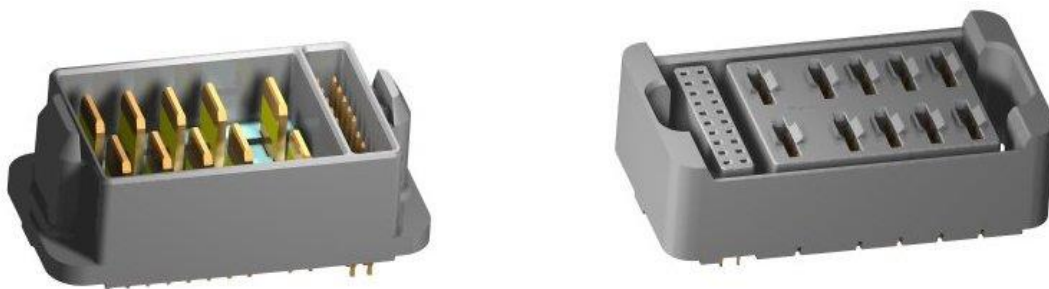
RA Signal Plug Modules (6-36 ckt) or RA HDS Plug Module (10-40 ckt)



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



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



Vertical Plug and Receptacle Assembly (Mezzanine)

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	CHECKED BY: CGOH	APPROVED BY: KHLIM	

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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)

46436-XXXX	RA Receptacle Side Assembly
46437-XXXX	RA Plug Side Assembly

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

46562-XXXX	Vertical Receptacle Side Assembly
46437-XXXX	RA Plug Side Assembly

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

76541-XXXX	Vertical Receptacle Side Assembly
76546-XXXX	Vertical Plug Side Assembly

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.

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<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM

2.3 SAFETY AGENCY APPROVALS



2.3.1 **CSA[®] US** 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.

CSA NON-current interruption	CSA Current interruption
2.5 Amps @ 250V for Legacy Signal ckt 4.5 Amps @ 75V for HDS Signal ckt 60 Amps @ 600V for power ckt	2.5 Amp at 28V for Legacy Signal ckt 4.5 Amps @ 28V for HDS Signal ckt 50 Amps at 60V for power ckt

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.

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<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM

2.3.3 UL File Number: E29179

UL
NON-current interruption
2.5 Amps @ 250V for Legacy signal ckt
4.5 Amps @ 120V for HDS signal ckt
80 Amps @ 600V for power ckt

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.

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<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM



PRODUCT SPECIFICATION

4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE *

Legacy Signal Module: 250 Volts
 HDS Signal Module: 120 Volts
 Power Module: 250 or 600 Volts (Ref. to pads layout in section 7.2)

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 ≥ 250 volt; 3.2 mm for ≤ 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 **

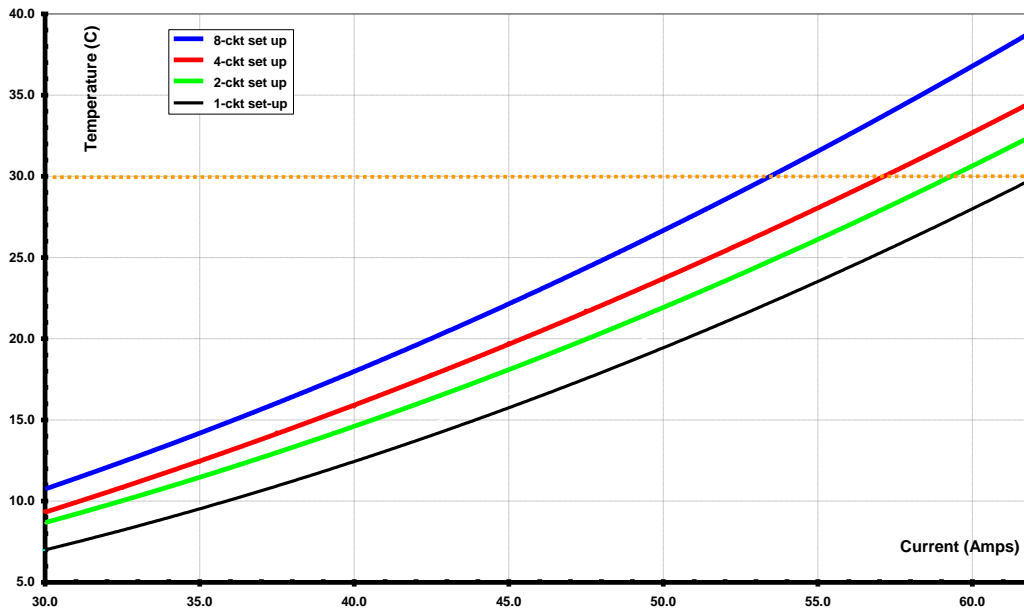
Signal Contact: 2.5 Amps
 HDS Signal Contact: 4.5 Amps
 Power Contact: 60 Amps (see charts on page 8)

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

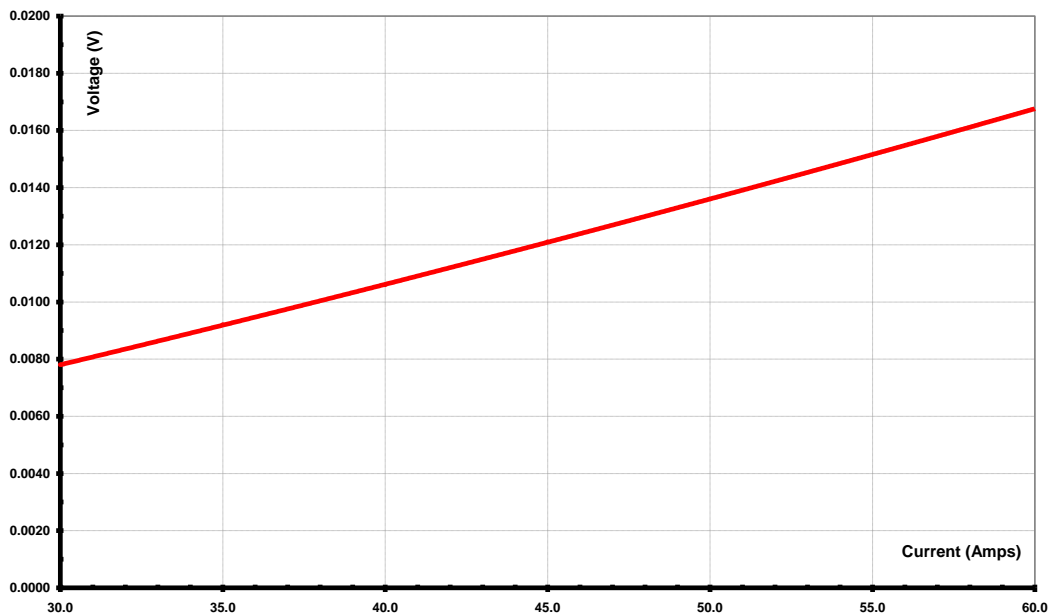
Current rating is application dependent and should be used as a guideline. Appropriate rating is required per ckt size, ambient conditions, copper trace size on the PCB, gross heating from adjacent modules/components and other factors that influence connector performance.

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Temperature Rise vs. Current per EIA-364-70



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



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	CHECKED BY: CGOH	APPROVED BY: KHLIM	

4.3 TEMPERATURE*

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

Temperature life tested per EIA 364-17 Method A for 240 hrs@105° per table 8 to meet field temperature of 65° 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 30° 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

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	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM	



PRODUCT SPECIFICATION

6.0 PERFORMANCE

6.1 ELECTRICAL PERFORMANCE

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

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<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM



PRODUCT SPECIFICATION

6.2 MECHANICAL PERFORMANCE

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

* HDS: High Density Signal (5 Row Signal Design)

** Mate/Unmate Data is for 1st Cycle

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<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG
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PRODUCT SPECIFICATION

ITEM	TEST CONDITION	REQUIREMENT
Max Insertion force in to PCB for Terminals with Compliant Pins	Insert contact at a rate of 25.4±6 mm per minute	MAX: 12.54 lbs/pin (5.7 Kg/ckt) (Legacy Signal Module)
		MAX: 10.02 lbs/pin (4.54 kg/ckt) (HDS module)
Min Extraction force for Terminals with Compliant Pins	Pull-out contacts at a rate of 25.4±6 mm per minute	MAX: 18.5 lbs/pin (8.41 kg/pin) (Vertical Pwr Receptacle)
		MAX: 17.6 lbs/pin (7.98 kg/pin) (R/A Pwr Plug)
Solderability Dip Test	Molex test method:	MIN: 1.10 lbs. (0.5 Kg/pin) (Legacy Signal Module)
		MIN: 1.00 lbs. (0.45 Kg/pin) (HDS Module)
Resistance to soldering heat from rework	Per EIA-364-61, Test procedure 4 for compliant pin retention force	MIN: 2.37 lbs/pin (1.08 Kg/pin) Vertical Power Receptacle
Resistance to soldering heat from rework	Per EIA-364-61, Test procedure 2 (Test Condition II)	MIN: 2.4 lbs/pin (1.09 Kg/pin) R/A Power Plug
		Solder area shell have Min of 95% solder coverage
		22.5 lbs. (10.2 Kg) Per Power contact extraction force from PCB
		No dimensions change No physical damage

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PRODUCT SPECIFICATION

6.3 ENVIRONMENTAL PERFORMANCE*

ITEM	TEST CONDITION	REQUIREMENT
VIBRATION (EIA-364-1000.01)	Mate connectors and vibrate per EIA-364-28 test condition VII-D 15 minutes each axis.	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
MECHANICAL SHOCK (EIA-364-1000.01)	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	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
THERMAL SHOCK (EIA-364-1000.01)	Mate connectors, expose to 10 cycles from -55°C to 85°C Per EIA-364-32	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
TEMPERATURE LIFE (EIA-364-1000.01)	Mate Connectors, expose to 240 hours at 105°C Per EIA-364-17	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
CYCLIC TEMPERATURE AND HUMIDITY (EIA-364-1000.01)	Mate connectors: expose to 24 cycles from 25 °C / 80% RH to 65 °C / 50% RH Per EIA-364-31	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
DUST (EIA-364-1000.01)	Un-mated 1 hour duration 25°C/50% RH dust mass of 9 g/ft ³ at rate of 300 m/min. Per EIA-364-91	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ
MIXED FLOWING GAS (EIA-364-1000.01)	168 hours un-mated, 168 hours mated, Per EIA-364-65 Class II-A	Maximum Change: Signal Contact: 10 mΩ Power Contact: 0.50 mΩ

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

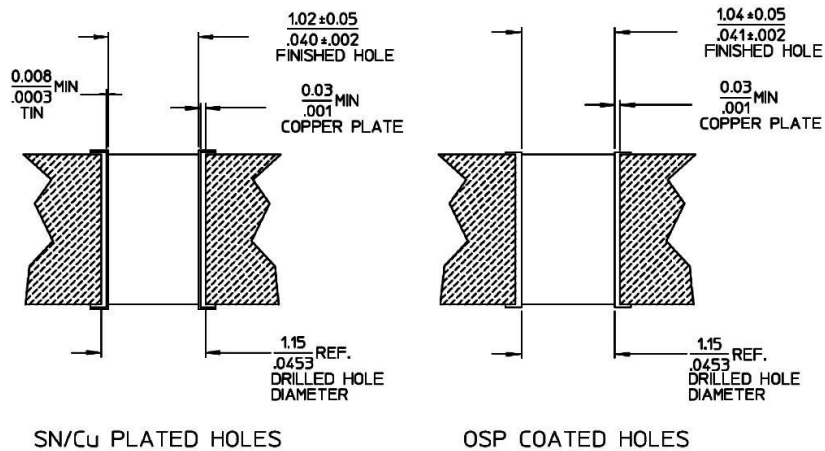
<u>REVISION:</u> D7	<u>ECM INFORMATION:</u> EC No: 602464 DATE: 2018/08/23	<u>TITLE:</u> PRODUCT SPECIFICATION FOR Ten60Power BOARD TO BOARD INTERCONNECT SYSTEMS	<u>SHEET No.</u> 14 of 21		
<u>DOCUMENT NUMBER:</u> PS-46436-100	<u>DOC TYPE:</u> PS	<u>DOC PART:</u> 001	<u>CREATED / REVISED BY:</u> EANG	<u>CHECKED BY:</u> CGOH	<u>APPROVED BY:</u> KHLIM

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

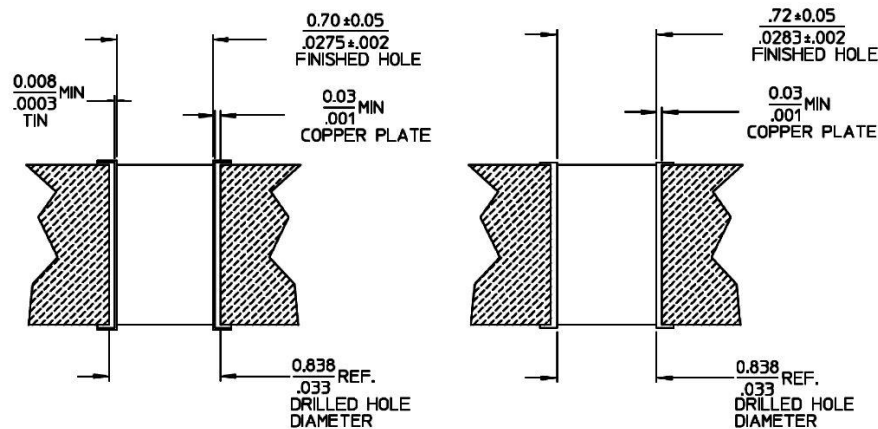


SN/Cu PLATED HOLES

OSP COATED HOLES

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

TIN PLATED OR OSP HOLE DIMENSIONS IN MM/IN



SN/Cu PLATED HOLES

OSP COATED HOLES

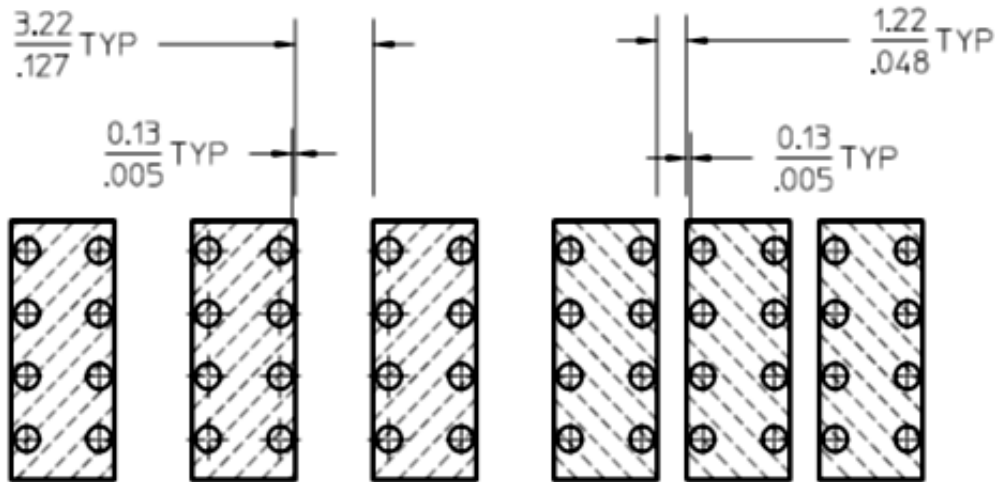
Notes:

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.

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		CHECKED BY: CGOH	APPROVED BY: KHLIM

7.2 TYPICAL PCB PADS LAY-OUT AND SIGNAL HOLES LAY-OUT FOR REF. ONLY

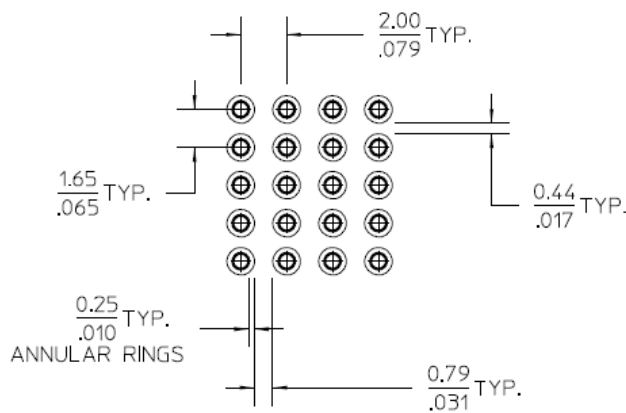
DIMENSIONS ARE MM/IN



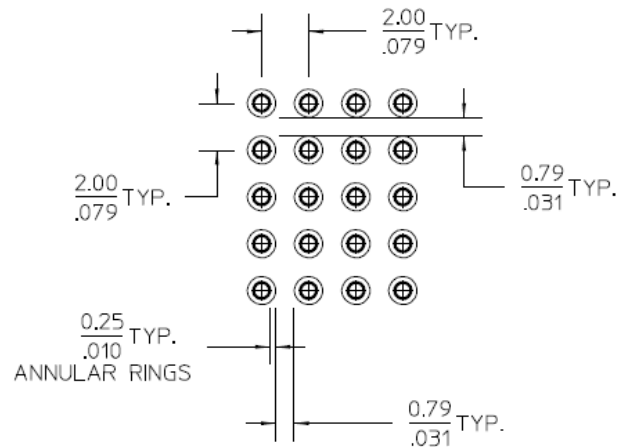
Pads lay-out for power modules with 7.5 mm pitch for high voltage

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)



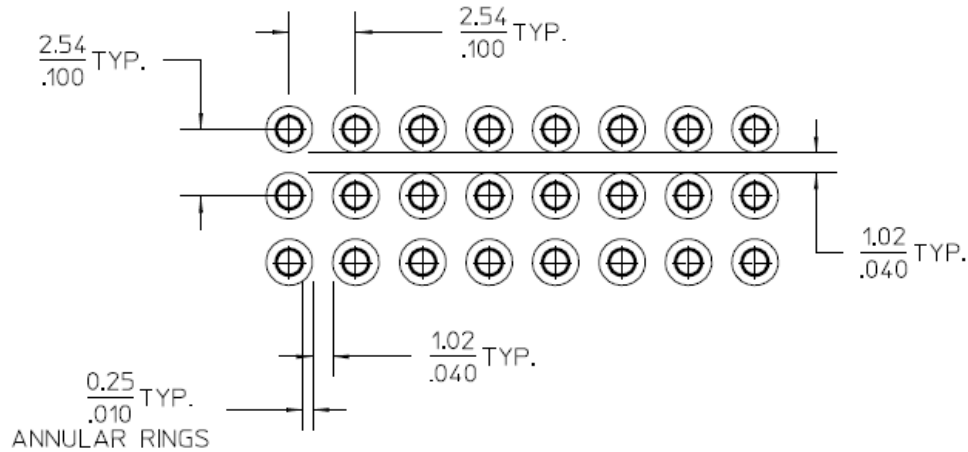
PCB lay-out for HDS modules Vertical conf. only



PCB lay-out for HDS modules R/A conf. only

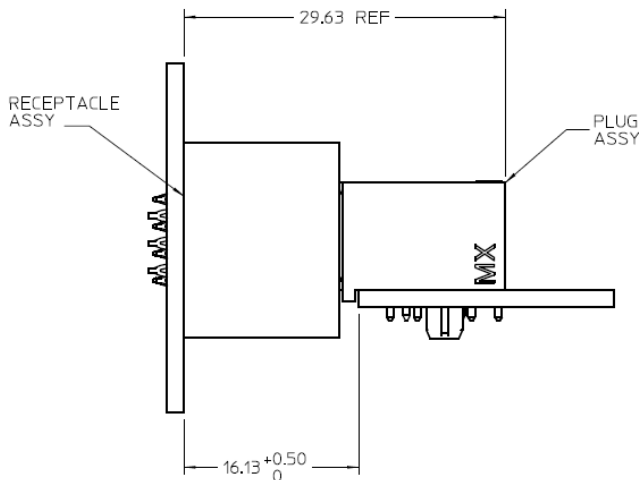
REVISION: D7	ECM INFORMATION: EC No: 602464 DATE: 2018/08/23	TITLE: PRODUCT SPECIFICATION FOR Ten60Power BOARD TO BOARD INTERCONNECT SYSTEMS	SHEET No. 16 of 21
DOCUMENT NUMBER: PS-46436-100	DOC TYPE: PS	DOC PART: 001	CREATED / REVISED BY: EANG
		CHECKED BY: CGOH	APPROVED BY: KHLIM

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 2.4 mm nominal wipe

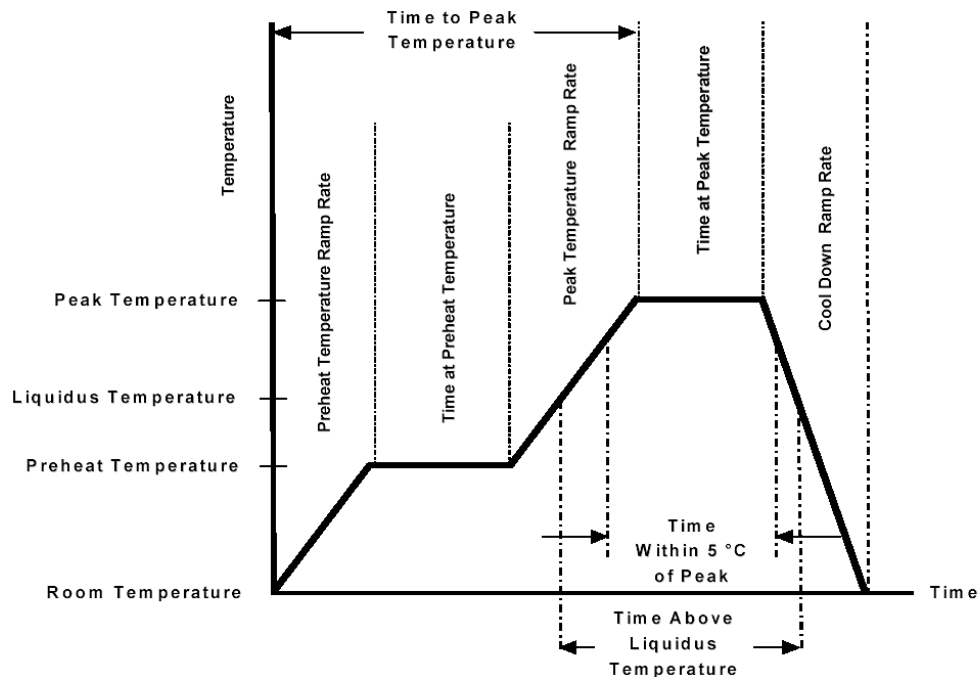
Final position/fully seated HDS Modules (2.00mmx1.65mm):

1. Long Pin has 3.20 nominal wipe
2. Short Pin has 2.20 nominal wipe

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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)



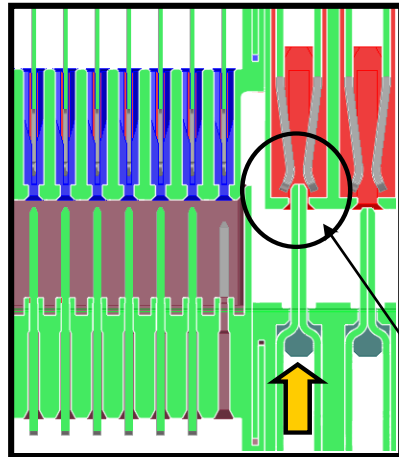
Description	Requirement
Average Ramp Rate	3°C/sec Max
Preheat Temperature	150°C Min to 200°C Max
Preheat Time	60 to 180 sec
Ramp to Peak	3°C/sec Max
Time over Liquids (217°C)	60 to 150 sec
Peak Temperature	260 +0/-5°C
Time within 5°C of Peak	20 to 40 sec
Ramp - Cool Down	6°C/sec Max
Time 25°C to Peak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

Notes:

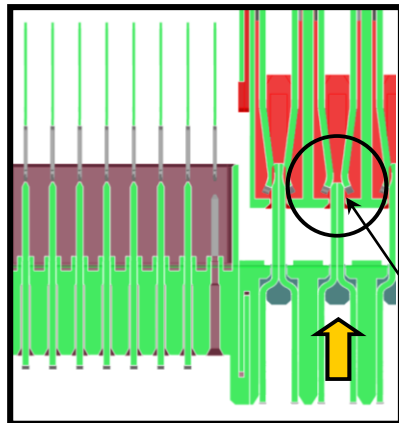
1. Temperature indicated refers to the PCB surface temperature at solder tail area.
2. Connector can withstand up to 3 reflow cycles with a cool-down to room temperature in-between.
3. Actual reflow profile also depends on equipment, solder paste, PCB thickness, and other components on the board. Please consult your solder paste & reflow equipment manufacturer for their recommendations to adopt a suitable process.

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	CHECKED BY: CGOH	APPROVED BY: KHLIM	

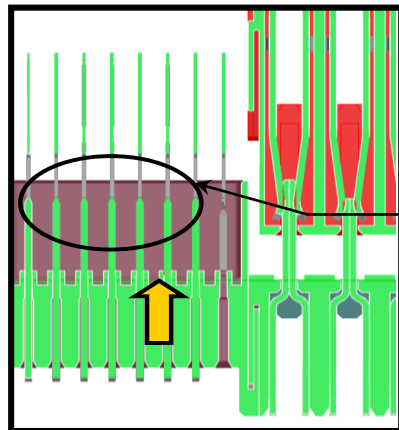
7.5 TYPICAL MATING SEQUENCE: Power & 3 Row Signal



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



2: Short power blades are next



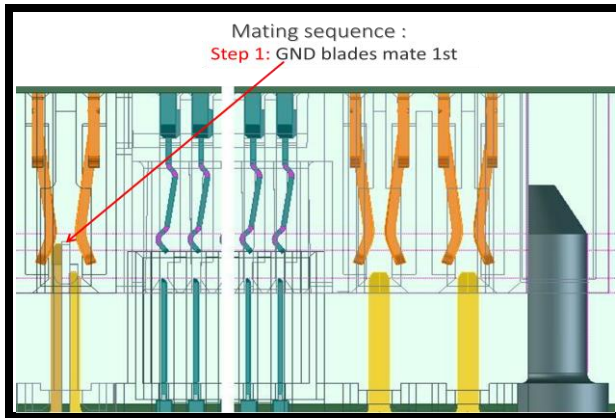
3: After short power blade (s) the long signal pins (typically the top row) mate

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

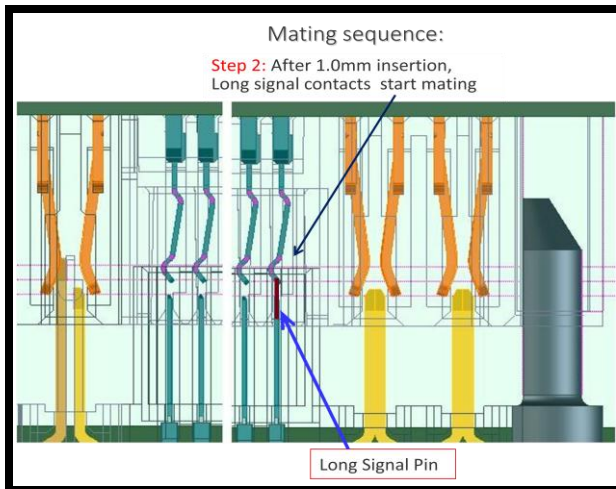
(Shown mating sequence is typical, custom configurations available on request)

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		CHECKED BY: CGOH	APPROVED BY: KHLIM

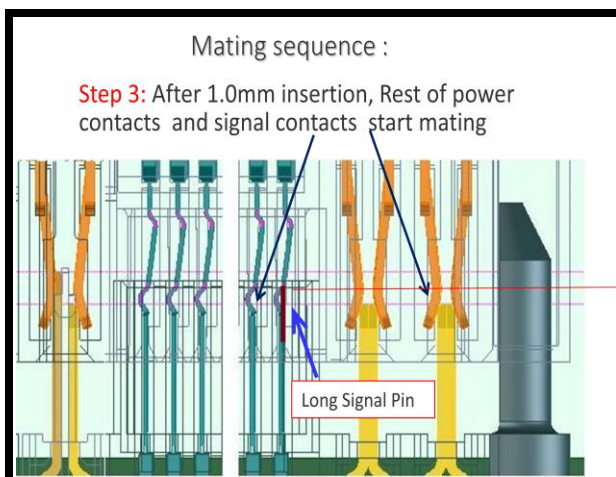
7.6 TYPICAL MATING SEQUENCE: Power & 5 Row Signal



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



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



3. Standard Power & Signal Blades (LMFB) mates third

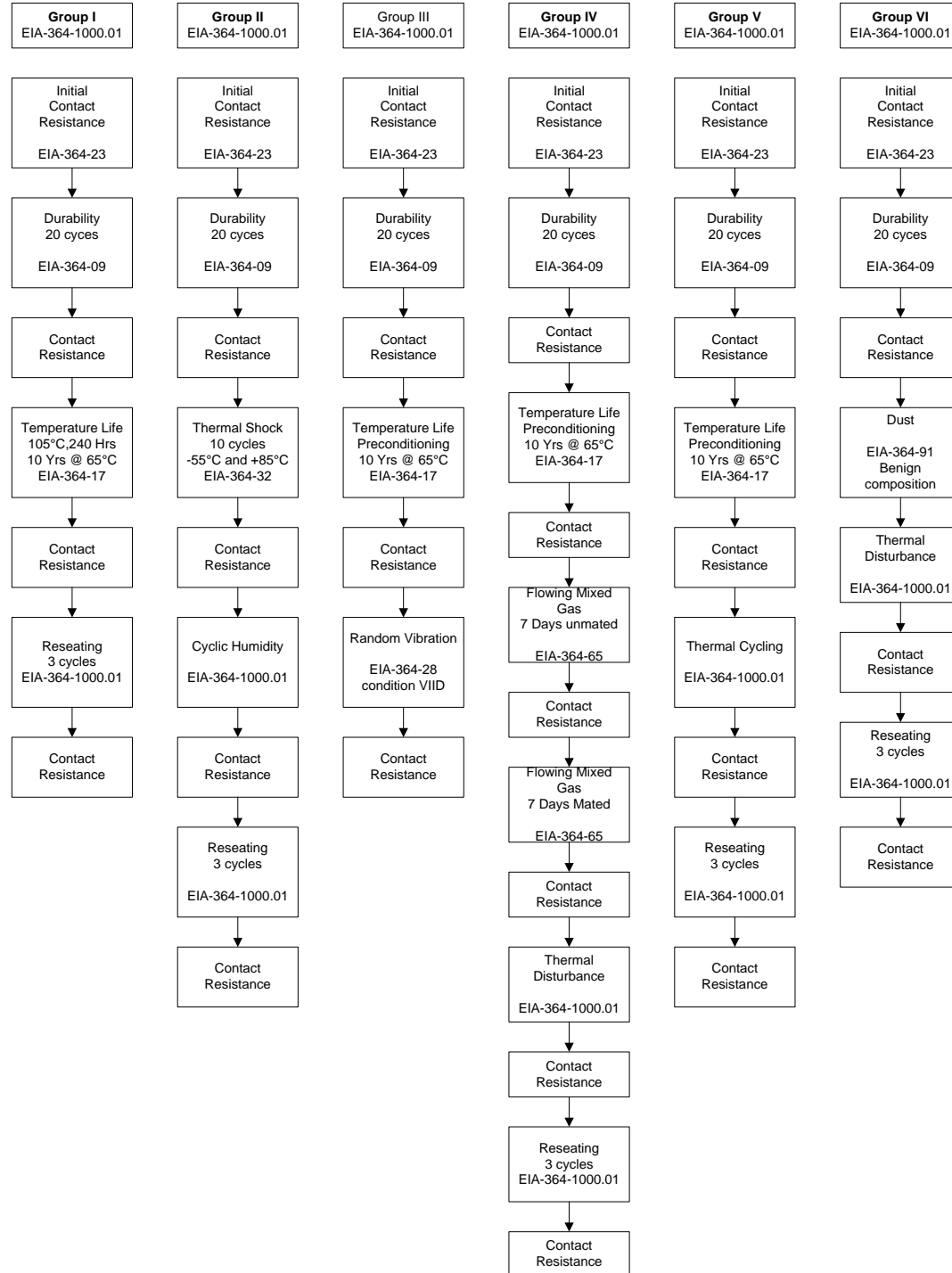
REVISION: D7	ECM INFORMATION: EC No: 602464 DATE: 2018/08/23	TITLE: PRODUCT SPECIFICATION FOR Ten60Power BOARD TO BOARD INTERCONNECT SYSTEMS	SHEET No. 20 of 21
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PRODUCT SPECIFICATION

8.0 TEST SEQUENCE

Reliability Test Sequences (per -364-1000.01):



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