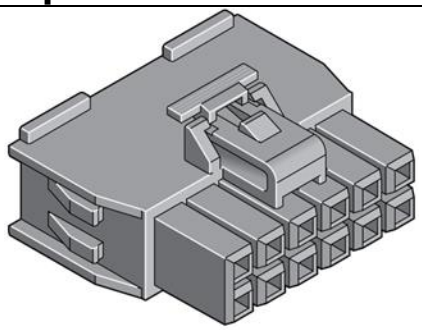
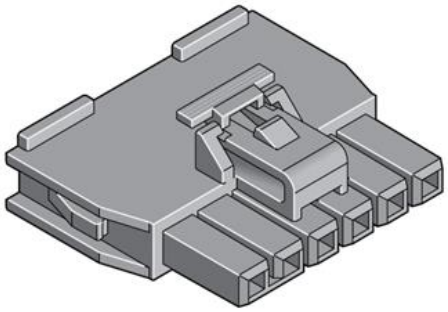
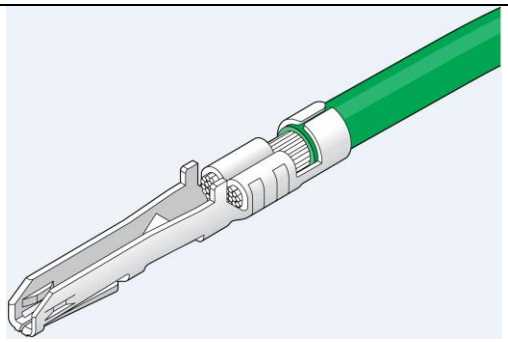
PRODUCT SPECIFICATION

NANO-FIT™

WIRE-TO BOARD

CONNECTOR SYSTEM

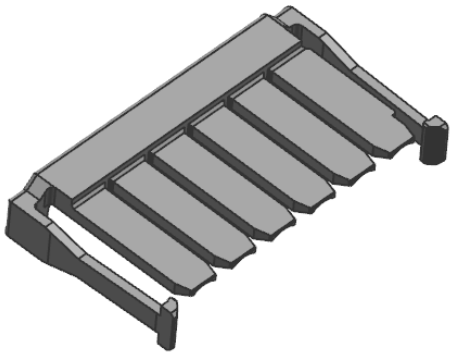
Receptacle

Housing	Dual row	 105308
	Single row	 105307
Terminal		 105300

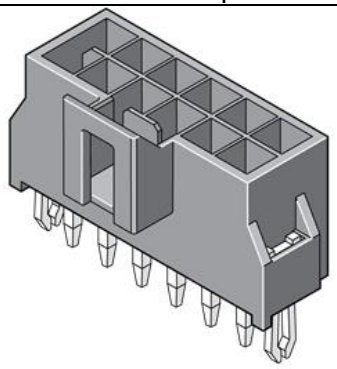
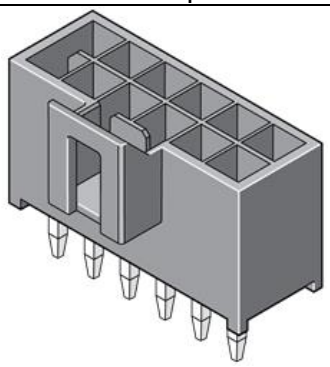
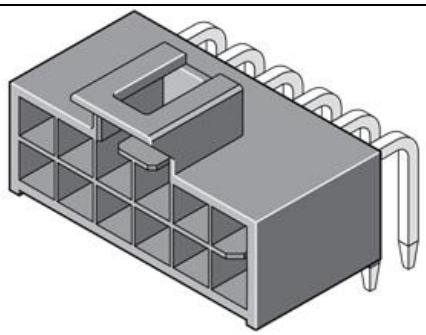
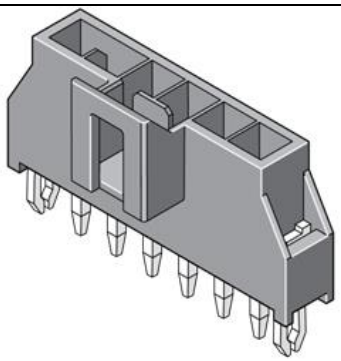
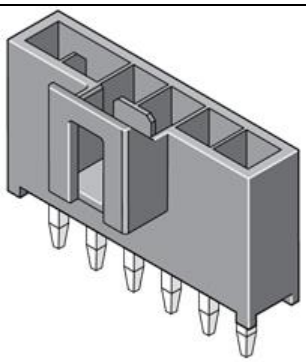
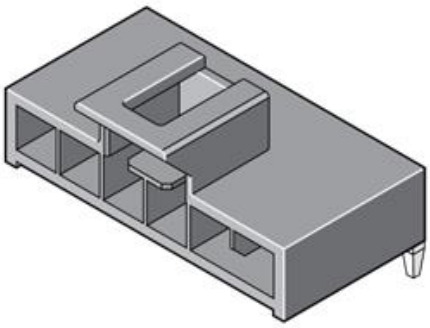
REVISION:	ECR/ECN INFORMATION:		TITLE:		SHEET No.
A	EC No:	**107957**		**PRODUCT SPECIFICATION FOR NANO-FIT™ & WIRE TO BOARD POWER CONNECTOR SYSTEM**	**1** of **13**
	DATE:	**2016/09/05**			

DOCUMENT NUMBER:	CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:
PS-105300-100	**Dixon Li**	**Anson Yin**	**Anson Yin**

PRODUCT SPECIFICATION

TPA	 105325

Header

	Vertical		Right angle
	Solder clip	Kinked pins	
Dual row	 105312	 105310	 105314
Single row	 105311	 105309	 105313

PRODUCT SPECIFICATION

Table of Contents

1.0 SCOPE

This Product Specification covers the mechanical, electrical and environmental performances requirements and test methods of Nano-fit 2.50 mm pitch wire to board power connector series products terminated with 20, 22, 24 and 26 AWG stranded wire using crimp technology with tin or gold plating.

2.0 PRODUCT DESCRIPTION

2.1 product name and series number

Product name & Series number		
	Description	**Series Number**
Receptacle	Housing of receptacle single row	105307
	Housing of receptacle dual row	105308
	Crimp terminal of receptacle	105300
	TPA of receptacle	105325
Header	Vertical single row, kinked pin	105309
	Vertical single row with solder clip	105311
	Vertical dual row, kinked pin	105310
	Vertical dual row with solder clip	105312
	Right angle single row	105313
	Right angle dual row	105314

2.2 Dimensions, materials, platings and markings
Dimensions & Platings: See individual sales drawings.
Material: RoHS compliant materials.

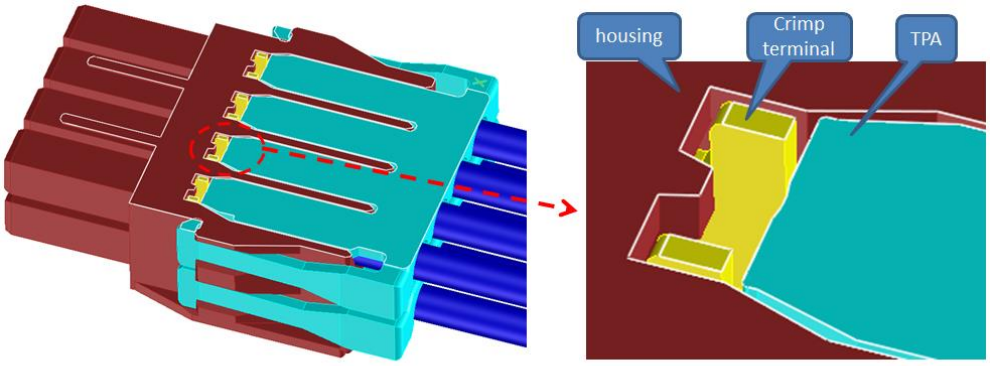
2.3 Safety agency approvals

a) UL-1977 recognition file number: E29179.
b) CSA approval file number: LR 19980

WIRE TO BOARD:

CSA	**Per UL**
4 Amps @ 250V (20-26 AWG WIRE)	4 Amps at 250V (20-26 AWG WIRE)

2.4 TPA function



Section view of assembly

a) Make sure crimp terminal is properly seated.
b) Increase crimp terminal retention force to receptacle, the spec is defined in section 6.2.2 and 6.2.3.

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

3.1 Molex documents

See series specific sales drawings and the other sections of this specifications for the necessary referenced documents and specifications.

Nano-fit test summary.
Molex solderability specification SMES-152.
Molex heat resistance specification ES-40000-5013.

3.2 Industrial documents

EIA-364-1000.01
UL-60950-1
CAS STD: C22.2 No. 182.3-M1987.

4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE *

250 Volts AC (RMS).
* This connector voltage rating meets the connector level provided by the safety agency.

4.2 APPLICABLE WIRES

Maximum Insulation Diameter and Applicable Wire Gauges	Stranded copper 26 AWG: 1.27 mm MAXIMUM
	Stranded copper 24 AWG: 1.27 mm MAXIMUM
	Stranded copper 22 AWG: 1.57 mm MAXIMUM
	Stranded copper 20 AWG: 1.57 mm MAXIMUM

4.3 MAXIMUM CURRENT RATING

Current rating is application dependent and may be affected by the wire rating as listed in UL-60950-1, table 3B. Each application should be evaluated by the end user for compliance to specific safety agency requirements. The ratings listed in the chart below are per Molex test method based on a 30° C maximum temperature rise over ambient temperature and are provided as a guideline. Appropriate de-rating is required based on circuit size, ambient temperature, copper trace size on the PCB, gross heating from adjacent modules/components and other factors that influence connector performance. Wire size & stranding, tin coated or bare copper, wire length & crimp quality are other factors that influence current rating.

Wire to Board Current Rating (Amp Max.)

*(As tested with **tinned** copper wire and tin or gold plated terminals)*

Connector fully loaded with all circuits powered

AWG Wire Size	Ckt Size(Single row)							Ckt Size(Dual row)						
	2	3	4	5	6	7	8	4	6	8	10	12	14	16
20	6.5	*6.2	*6.0	*5.7	*5.5	*5.2	5.0	6.0	*5.7	*5.5	*5.2	*5.0	*4.7	4.5
22	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1) Values are for REFERENCE ONLY.
2) Current deratings are based on not exceeding 30° C Temperature Rise.
3) PCB trace design can greatly affect temperature rise results in Wire-to-Board applications.
4) Data is for all circuits powered.
5) * indicates interpolated information.

4.4 TEMPERATURE

Operating temperature (including T-rise from applied current) is rated -40°C to 105°C(for tin) or 115°C(for gold)
Field temperatures and field life: Tested per EIA 364-1000.01 to meet field temperature of 65°C for 10 years life per table-8.

4.5 DURABILITY

Tin plated: 25 cycles*
Gold plated: 50 cycles*

** When tested in accordance with EIA-364-1000.01 test method (see Sec. 7.0 of this specification). Durability per EIA-364-09*

5.0 QUALIFICATION.

Laboratory conditions and sample selection are in accordance with EIA-364-1000.01.

6.0 PERFORMANCE.

6.1 ELECTRICAL PERFORMANCE.

	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.1.1	Contact Resistance (LLCR) 	EIA 364-23 Subject mated contacts assembled in housing to 20 mV maximum open circuit at 100 mA maximum. Wire resistance shall be removed from the measured value. * Never cross mate gold plated terminals to tin plated terminals.	10 milliohms Max(initial)
6.1.2	Insulation Resistance	EIA 364-21 After 500 VDC for 1 minute, measure the insulation resistance between the adjacent contacts of mated and unmated connector assemblies.	1000 Mega ohms MINIMUM
6.1.3	Glow Wire Test (TBD)	IEC 60695-2-12 & IEC 60695-2-13 Test at temperature of 750˚C & 850˚C	Flames or glowing of the test specimen extinguish within 30 s after removal of the glow-wire, and there is no ignition of the wrapping tissue placed underneath the test specimen
6.1.4	Dielectric Withstanding Voltage	EIA 364-20 Method B Apply 1500 & 1800V DC for 1minute between adjacent terminals.	No breakdown current leakage <5mA
6.1.5	Temperature Rise & Voltage drop(via current cycling)	EIA 364-70 Method B 96hr steady state, 240hr current cycling, 96hr steady state using 2ckt with 20awg at rated current	Temperature rise: 30˚C Max.
6.1.6	Current profile, see chart for detail.		

6.2 MECHANICAL PERFORMANCE.

	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.1	Visual and dimensional inspections	EIA-364-18 Visual, dimensional and functional per applicable quality inspection plan.	Meet product drawing requirements.
6.2.2	Crimp Terminal Retention Force to housing (Without TPA)	EIA-364-37 Axial pullout force on the terminal in the housing at a rate of 25+/-6 mm per minute.	20N Min.
6.2.3	Crimp Terminal Retention Force (With TPA)	EIA-364-37 Axial pullout force on the terminal in the housing at a rate of 25+/-6 mm per minute. (only populate 1 terminal per housing)	40N Min
6.2.4	Crimp Terminal Insertion Force (into housing)	EIA-364-37 Apply an axial insertion force on the terminal at rate of 25+/-6 mm per minute	15.0N Max
6.2.5	Durability	EIA-364-09 Mate connectors at a Max rate of 10 cycles per minute prior to environmental tests. 25 cycles for tin, 50 cycles for gold.	10 milliohms Max change from initial. Visual : no damage.
6.2.6	Vibration (Random)	EIA-364-28 Mate connectors and vibrate per test condition VII-D, 15 minutes per axis for tin, 1.5hrs for gold.	10 milliohms Max change from initial. discontinuity <1 microsecond
6.2.7	USCAR Vibration	USCAR-2 Rev 6, Vibration Test sequence M per section 5.9.6, Classification: V1, S1, T2: Exception: Voltage drop – test with terminals in the housings, do not remove	10 milliohms Max change from initial. discontinuity <1 microsecond
6.2.8	Header Engagement Force to PCB(normal size)	Apply a PCB perpendicular force on connector, mounting it on PCB. Nominal PCB hole diameter and location	Vertical : 20 N Max Right angle : 10 N Max
6.2.9	Header retention force to PCB(normal size, do not solder)	Pull header off PCB at speed of 25+/-6mm per minute	Solder clip : 10N Min Kinked : 2N Min

6.2.10	Header solder clip Retention Force (in housing)	Apply a PCB perpendicular force on connector with only two clips, until push out the clip.	50 N Min
6.2.11	Header Terminal Retention Force to housing	EIA-364-37 Push from mating side and Push from PCB side per 25+/-6 mm per minute.	Push from mating side 25N Min Push from PCB side 9.8 N Min
6.2.12	Wire retention force (wire to crimp terminal, by application tooling)	EIA-364-37 Apply an axial pullout force on the wire at a rate of 25+/-6 mm per minute	20 AWG, 50N Min 22 AWG, 40N Min 24 AWG, 32N Min 26 AWG, 26N min
6.2.13	Connector Mating/Unmating force (receptacle to header W/O latch)	EIA 364-13 Insert and withdraw at a rate of 25+/-6mm per minute.	Mating spec : 1.50Xn N Max for Tin, 1.25Xn Max for gold, 'n' is circuits number. Take tin for example, 1.5X8=12 N Max for 8 circuits product. Unmating spec : 0.6Xn N Min for Tin, 0.5Xn Min for gold.
6.2.14	latch mating-unmating force(header to receptacle, W/O TML)	EIA 364-13 Insert/withdraw receptacle at a rate of 25+/-6mm per minute.	Mating force : 10 N Max. Unmating force : 35N Min.
6.2.15	Latch unmating force after durability (header to receptacle, W/O TML)	EIA 364-13 Insert/withdraw receptacle at a rate of 25+/-6mm per minute.	200 cycles, without damage and meet the spec : unmating force : 35 N Min after 20 cycles, 30 N Min after 200 cycles
6.2.16	Reseating	Unmate/Mate connectors by hand three cycles	Maximum Change from Initial: 10 mΩ

6.3 ENVIRONMENTAL PERFORMANCE.

	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.3.1	Durability with Environment (precondition)	Mate connectors 3 cycles for tin plated and 5 cycles for gold plated connecters at a maximum rate of 10 cycles per minute. Per EIA-364-09, test method per Sec. 7	Visual: No damage 10 milliohms Max change from initial.
6.3.2	Cyclic Temperature and Humidity	EIA-364-31 Mate connectors: expose to 24 cycles from 25℃/80% RH to 65℃/50% RH. Ramp time: 0.5hr; dwell time: 1.0hr.	10 milliohms Max change from initial.

6.3.4	Thermal Shock	EIA-364-32 Test Condition I. Subject mated connectors to 5 cycles between -55℃ and +85℃.	10 milliohms Max change from initial. Visual: no damage;
6.3.5	Thermal Aging(temperature life)	EIA-364-17, Method A, mate connectors, expose to 240 hours at 105℃ for tin, 115℃ for gold.	10 milliohms Max change from initial.
6.3.6	Thermal Aging (Precondition)	EIA-364-17, Method A, mate connectors, expose to 120 hours at 105℃ for tin, 115℃ for gold.	10 milliohms Max change from initial.
6.3.7	Thermal Cycling (tin plated only)	Cycle mated connector between 15℃+/-3℃ and 85℃+/-3℃ as measured on the part. Ramps should be minimum of 2℃ per minute, and dwell times should insure contacts reach the temperature extremes(minimum of 5 minutes). Humidity is not controlled. Perform 500 cycles.	10 milliohms Max change from initial.
6.3.8	Solderability dip test	Dip solder tails into the molten solder (held at 245 +5℃/-5℃) up to 0.5mm from the tip of tail for 5±0.5sec.(EIA-364-52, SMES-152)	Solder coverage: 95% Min.
6.3.9	Reflow Solder Resistance	Convection reflow solder process 260℃ Max per ES-40000-5013	Visual: No damage.
6.3.10	Wave Solder Resistance	Dip connector terminals tail in solder. Solder Duration: 5+/-0.5 seconds; Solder temperature: 260+/-5℃	Visual: No damage.
6.3.11	Mixed Flowing Gas (gold plated only)	EIA-364-65 with Class IIa Gas concentrations(gold plated only) 240 hours unmated, 96 hours mated.	10 milliohms Max change from initial. Visual: no damage;
6.3.12	Thermal disturbance (gold plated only)	EIA-364-1000.01 test group 4, cycle mated connector between 15℃ and 85℃ for 10 cycles at a rate of 2℃/min. humidity is not controlled.	10 milliohms Max change from initial. Visual: no damage;

7.0 TEST SEQUENCE GROUPS (reliability test sequences per 364-1000.01)

No.	Group I Temperature Life 160 contacts tin 160 contacts gold (0.38 um & 0.76um)	Group II Thermal Shock 160 contacts tin 160 contacts gold(0.38 um & 0.76um)	Group III Vibration 160 contacts tin 160 contacts gold(0.38 um & 0.76um)	Group V Thermal Cycling 160 contacts tin	Group VI(A) Durability 160 contacts tin 160 contacts gold(0.38 um & 0.76um)	Group VI(B) Durability 160 contacts tin 160 contacts gold(0.38 um & 0.76um)
01	Initial Contact Resistance(6.1.1)	Initial Contact Resistance(6.1.1)	Initial Contact Resistance(6.1.1)	Initial Contact Resistance(6.1.1)	Dielectric Withstanding Voltage(6.1.4)	Initial Contact Resistance(6.1.1)
02	Durability(6.3.1)	Durability(6.3.1)	Durability(6.3.1)	Durability(6.3.1)	Durability(6.2.5)	Durability(6.2.5)
03	Contact resistance	Contact resistance	Contact resistance	Contact resistance	Insulation Resistance(6.1.2)	Contact resistance
04	Thermal Aging(6.3.5)	Thermal shock(6.3.4)	Thermal Aging(6.3.6)	Thermal Aging(6.3.6)	Dielectric Withstanding Voltage(6.1.4)	
05	Contact resistance	Contact resistance	Contact resistance	Contact resistance		
06	Reseating(6.2.16)	Cyclic Temperature and Humidity(6.3.2)	Vibration(6.2.6)	Thermal Cycling(6.3.7)		
07	Contact resistance	Contact resistance	Contact resistance	Contact resistance		
08		Reseating(6.2.16)		Reseating(6.2.16)		
09		Contact resistance		Contact resistance		

7.1 Individual Tests:

01	02	03	04	05	06	07	08
Connector Mating/Unmating force(6.2.13)	Temperature Rise(6.1.5)	Wire retention force (6.2.12)	Header pin Retention force(6.2.11)	Crimped Terminal Retention force(6.2.2)	Wave/Reflow Solder Resistance(6.3.9/6.3.10)	Solderability(6.3.8)	Header Engagement forces on PCB(6.2.8)
09	10	11	12	13	14	15	16
Thumb Latch lock/unlock force(6.2.14)	Thumb Latch durability(6.2.15)	USCAR Viberation (6.2.7)	Header retention force(6.2.9)	Glow wire test(6.1.3)	Crimped Terminal Retention force(with TPA)(6.2.3)	Crimp terminal insertion force(6.2.4)	Header solder clip retention force(6.2.10)

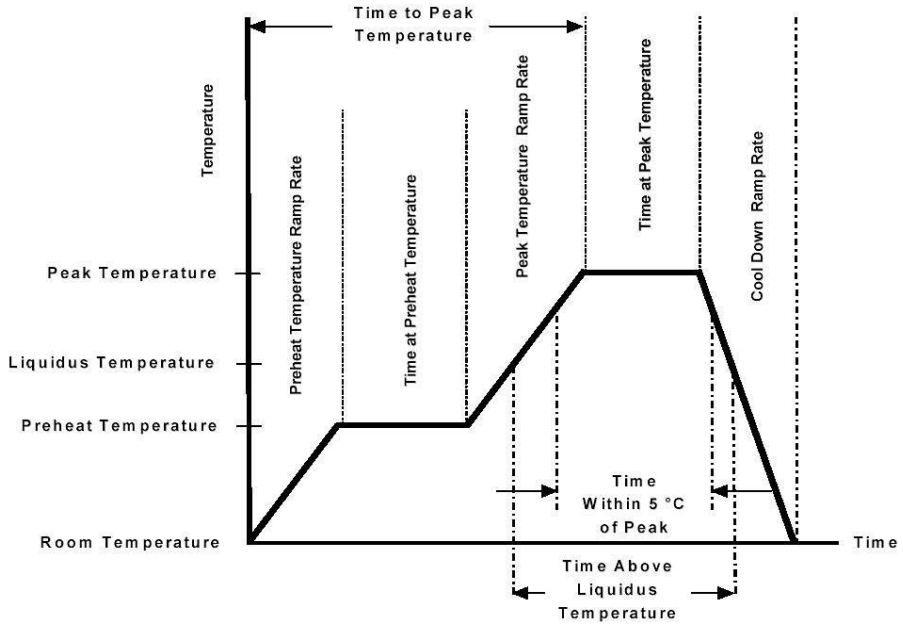
8.0 SOLDER INFORMATION:

8.1 SOLDER PROCESS TEMPERATURES

Wave solder: 265℃ Max
Reflow solder: 260℃ Max

8.2 REFLOW SOLDERING PROFILE

(Below profile is per AS-40000-5013 and is provided as a guideline only. Please see notes for additional information)



Description	Requirement
Average Ramp Rate	3℃/sec Max
Preheat Temperature	150℃ Min to 200℃ Max
Preheat Time	60 to 180 sec
Ramp to peak	3℃/sec Max
Time over Liquidus (217℃)	60 to 150 sec

Peak Temperature	260 +0/-5℃
Time within 5℃ of Peak	20 to 40 sec
Ramp – Cool Down	6℃/sec Max
Time 25℃ to Peak	8 min Max

Notes:

1. Temperature indicated refers to the PCB surface temperature at solder tail area.
2. Connector can withstand 1 reflow cycle.
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.