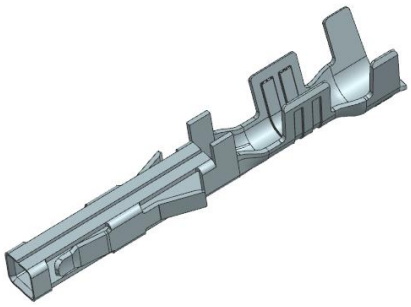
MINI-FIT TPA2

WIRE-TO-BOARD & WIRE-TO-WIRE INTER CONNECTOR SYSTEM

Receptacle Terminal	LMF Female Terminal
	
Series: 172718	Series: 221442

Receptacle Housing	
Dual Row	**Single Row**
	
Series: 172708	**Series:** 200453

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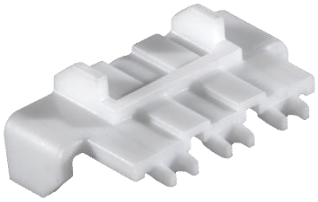
TABLE OF CONTENTSTOC

CPA

Series: 203603

Plug Terminal	TPA
	
Series: 172765	**Series:** 172709

Dual Row Plug Housing	
	
Series: 172767	**Series:** 172762

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TABLE OF CONTENTSTOC

Single Row Plug Housing	
	
Series: 200488	**Series:** 200471

www.molex.com/Mini-fit TPA2

TABLE OF CONTENTSTOC

Table of Contents

1.0 SCOPE

This Product Specification covers the performance requirements for the MINI-FIT TPA2 Wire-To-Board and Wire-To-Wire, 4.20mm pitch dual row and single row connector series using brass and phos bronze terminals with Tin plating terminated with 16 to 24 AWG wire using Molex crimp technology. The TPA Retainer (terminal position assurance) is intended to ensure the crimp terminals are fully seated and to prevent incidence of terminal back-out due to partially seated terminals.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBER (S)

WIRE-TO-BOARD			
Description	Series Number	UL / cUL (600 V)	IEC (250 V)
Mini-Fit TPA2, Receptacle Hsg, Dual Row	**172708**	**Yes**	**Yes**
Mini-Fit TPA2, Receptacle Hsg, Single Row	**200453**	**Yes**	**Yes**
Mini-Fit TPA2, Female Crimp Terminal	**172718**	**Yes**	**Yes**
LMF MINI-FIT SIGMA FEMALE TERMINAL	**221442**	**Yes**	**Yes**
Mini-Fit TPA2, TPA Retainer	**172709**	**Yes**	**Yes**
Mini-Fit TPA2, CPA	**203603**	**Yes**	**Yes**

MATES TO ⇩

Right Angle Hdr, Dual Row	35318	Yes	Yes	Yes
Right Angle Hdr, Dual Row	44130	Yes	Yes	Yes
Right Angle Hdr, Dual Row	87427	Yes	Yes	Yes
Right Angle Hdr, Dual Row, Glow Wire Capable	172448	Yes	Yes	Yes
Right Angle Hdr, Dual Row, Reflow Capable	46991	Yes	Yes	Yes
Right Angle Hdr, Single and Dual Row	5569	Yes	Yes	Yes
Right Angle Hdr, Single Row, Reflow Capable	172648	Yes	Yes	Yes
Test Plug	44281	n/a	n/a	n/a
Vertical Hdr, Dual Row	5566	Yes	Yes	Yes
Vertical Hdr, Dual Row	35317	Yes	Yes	Yes
Vertical Hdr, Dual Row	36633	Yes	Yes	Yes
Vertical Hdr, Dual Row	43460	Yes	Yes	Yes
Vertical Hdr, Dual Row	44482	Yes	Yes	Yes
Vertical Hdr, Dual Row	47254	Yes	Yes	Yes
Vertical Hdr, Dual Row	47256	Yes	Yes	Yes
Vertical Hdr, Dual Row	67120	Yes	Yes	Yes
Vertical Hdr, Dual Row	87427	Yes	Yes	Yes
Vertical Hdr, Dual Row Glow Wire Capable	172447	Yes	Yes	Yes
Vertical Hdr, Dual Row Reflow Capable	46207	Yes	Yes	Yes
Vertical Hdr, Single Row	172647	Yes	Yes	Yes

WIRE-TO-WIRE			
Description	Series Number	UL / cUL (600 V)	IEC (250 V)
Mini-Fit TPA2, Female Crimp Terminal	**172718**	**Yes**	**Yes**
Mini-Fit TPA2, Receptacle Hsg, Dual Row	**172708**	**Yes**	**Yes**
Mini-Fit TPA2, Receptacle Hsg, Single Row	**200453**	**Yes**	**Yes**
Mini-Fit TPA2, TPA Retainer	**172709**	**Yes**	**Yes**
Mini-Fit TPA2, Male Crimp Terminal	**172765**	**Yes**	**Yes**
Mini-Fit TPA2, Plug Hsg, Dual Row	**172762**	**Yes**	**Yes**
Mini-Fit TPA2, Plug Hsg, Panel Mount, Dual Row	**172767**	**Yes**	**Yes**
Mini-Fit TPA2, Plug Hsg, Single Row	**200471**	**Yes**	**Yes**
Mini-Fit TPA2, Plug Hsg, Panel Mount, Single Row	**200488**	**Yes**	**Yes**

ALSO, MATES TO

Male Crimp Terminal	5558	Yes	Yes	Yes
Plug Hsg, Dual Row, Glow Wire Capable	46993	Yes	Yes	Yes
Plug Hsg, Dual Row, Glow Wire Capable	172646	Yes	Yes	Yes
Plug Hsg, Single and Dual Row, Panel Mount	5559	Yes	Yes	Yes
Female Crimp Terminal	5556	Yes	Yes	Yes
Receptacle Hsg, Single and Dual Row	5557	Yes	Yes	Yes
Receptacle Hsg, Dual Row, Glow Wire Capable	46992	Yes	Yes	Yes
Receptacle Hsg, Single Row, Glow Wire Capable	46994	Yes	Yes	Yes
Receptacle Hsg. Single Row	36633	Yes	Yes	Yes

2.2 DIMENSIONS, MATERIALS, PLATING AND MARKINGS

Dimensions, Materials & Plating: See individual sales drawings.
Material: RoHS compliant materials*

**Refer to the "Product Environmental Compliance" section in Molex.com to know the individual Part Number RoHS compliance status.*

2.3 SAFETY AGENCY APPROVALS

UL File Number: E29179 (ECBT2 & ECBT8)

Note: UL 1977, Component Connectors for Use in Data, Signal, Control and Power Applications.
CAN/CSA C22.2 No. 182.3-M1987, Special use attachment plugs, receptacles, and connectors.

Certification Informs, Ref No. I13-128 Wiring Devices No. 76.

IEC 61984 Certification:

Tested to and found in compliance with IEC 61984. NRTL type examination certificate available from Molex upon request. Contact Molex Safety Agency team for questions regarding certification on specific part numbers.

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.

Mini-Fit TPA2-Fit Application Specification AS-172718-0000-001
Mini-Fit TPA2 Test Specification TS – 172718-0002 (Wire to Wire)
Mini-Fit TPA2 Test Specification TS – 172718-0001 (Wire to Board)
Molex Quality Crimping Handbook Order No. 63800-0029
Molex Solderability Specification SMES-152
Molex Heat Resistance Specification AS-40000-5013
Molex Moisture Technical Advisory AS-45499-001
Molex Package Handling Specification 454990100-PK
Application Tooling Specification (ATS)*

* *Application Tooling Specification for terminals is not provided in this document. ATS for terminals can be available from respective terminal part number page in Molex.com*

3.2 INDUSTRY DOCUMENTS

UL-1977.
CSA STD. C22.2 NO. 182.3-M1987.
IEC / EN 61984.
EIA-364-1000.

4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE

See Chart in Section 2.1

4.2 APPLICABLE WIRES

Applicable Wire Gauges And Insulation Diameter Range	16 AWG: 1.98mm (.078") – 3.14mm (.124")
	18-20 AWG: 1.42mm (.056") – 2.85mm (.112")
	22-24 AWG: 1.07mm (.042") – 2.38mm (.094")
	0.75mm^2: 1.42mm (.056") – 2.85mm (.112")
	0.50mm^2: 1.42mm (.056") – 2.85mm (.112")
	0.35mm^2: 1.07mm (.042") – 2.38mm (.094")
	0.25mm^2: 1.07mm (.042") – 2.38mm (.094")
	0.22mm^2: 1.07mm (.042") – 2.38mm (.094")

4.3 MAXIMUM CURRENT RATING**

Terminal 172718(brass) & 221442											
Wire AWG	Ckt Size										
	2	3	4	5	6	7	8	9	10	11	12
16	11.5	10.5*	10*	9*	8.5	8*	7.5*	7.5*	7.5*	7.5*	7.5
18	10*	9*	8.5*	7.5*	7	6.5*	6*	6*	6*	6*	6*
20	8.5	8*	7.5*	7*	7	6.5*	6.5*	6*	6	6*	6
22	7*	7*	6.5*	6*	6	5.5*	5.5*	5*	5	5*	5
24	6	5.5*	5.5*	5*	5	4.5*	4.5*	4.5*	4.5*	4.5*	4.5

Terminal 172718(phosphor bronze)											
Wire AWG	Ckt Size										
	2	3	4	5	6	7	8	9	10	11	12
16	11	10*	9.5*	8.5*	8*	7.5*	7*	7*	7*	7*	7
18	9.5*	8.5*	8*	7*	6.5*	6*	5.5*	5.5*	5.5*	5.5*	5.5*
20	8	7.5*	7*	6.5*	6.5*	6*	6*	5.5*	5.5*	5.5*	5.5
22	6.5*	6.5*	6*	5.5*	5.5*	5*	5*	4.5*	4.5*	4.5*	4.5*
24	5.5	5*	5*	4.5*	4.5*	4*	4*	4*	4*	4*	4

* Extrapolated from test data

Note: PCB trace design may greatly affect temperature rise results.

**Ratings shown represent *MAXIMUM* current carrying capacity of a fully loaded connector with all circuits powered. Ratings are based on a 30°C maximum temperature rise limit over ambient (room temperature). Above charts are intended as a guideline. Current rating is application dependent. Appropriate de-rating is required depending on factors such as higher ambient temperature, smaller copper weight of PCB traces, gross heating from adjacent modules or components and other factors that influence connector performance.

4.4 TEMPERATURE RATING

Operating temperature range (including T-rise from applied current): - 40°C to + 105°C
Non-operating Range: - 40°C to + 105°C

Field temperatures and field life: 60°C for 10 years (based EIA-364-1000)

Note: Temperature life test duration is based on the assumption that the contact spends its entire life at the rated field maximum temperature (based on EIA-364-1000, Section 7).

4.5 DURABILITY

Tin plated: 30 mating cycles.

As tested in accordance with EIA-364-1000 test method (see Sec. 7.0 of this specification). Durability per EIA-364-09.

4.6 Glow Wire

The following series are glow capable:172708,172709, 172767, 203603.
Representative samples were tested and found compliant with EN 60695-2-11-2001 / IEC 60695-2-11-2000 Glow Wire Test Methods for End-Products. These were additionally investigated for compliance with EN 60335-1 / IEC 60335-1 750C/2 sec with no flaming. VDE Test report available upon request.

5.0 QUALIFICATION

Laboratory conditions and sample selection are in accordance with EIA-364-1000.

6.0 PERFORMANCE

6.1 ELECTRICAL PERFORMANCE

DESCRIPTION	TEST CONDITION	REQUIREMENT
Initial Contact Resistance (Low Level)	Per EIA-364-23 Mate connectors apply a maximum voltage of 20 mV and a current of 100mA Wire resistance shall be removed from the measured value.	10 milliohms MAXIMUM [initial]
Insulation Resistance	Per EIA-364-21 Mate connectors: apply a voltage of 500 VDC between adjacent terminals and between terminals to ground.	1000 Megohms MINIMUM
Dielectric Withstanding Voltage	Per EIA 364-20 (initial only) Mate connectors: apply a voltage of 2200 VAC for 1 minute between adjacent terminals and between terminals to ground.	No breakdown. Curent leakage < 5 mA
Temperature Rise (via current profiling)	Per EIA 364-70B	Temperature rise: +30°C MAXIMUM
Steady State Temperature Rise (via current cycling at rated current)	Per EIA 364-55B Mate connectors. Measure the temperature rise at the rated current after 96 hours, during current cycling (45 minutes ON and 15 minutes OFF per hour) for 240 hours, and after final 96-hour steady state.	Temperature rise: +30°C MAXIMUM

Steady State Voltage Drop (at rated current)	Per EIA 364-70B Mate connectors. Apply the rated current.	30 millivolt MAX (change from initial)

6.2 MECHANICAL PERFORMANCE

ITEM	TEST CONDITION	REQUIREMENT
Connector Mate and Un-mate Forces Per Circuit	Insert and withdraw (male to female) at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. *(Does not include thumb latch)*	MAX mate force: 14.7 N (3.30 lbf) for female terminal; 7.0 N(1.58 lbf) For LMF female terminal. MIN un-mate force: 1.0 N (0.22 lbf)
Crimp Terminal Insertion Force (into Housing)	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch).	15 N (3.4 lbf) MAX insertion force
Crimp Terminal Retention Force (in Housing w/ TPA)	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	30 N (6.74 lbf) MIN retention force
Durability (w/o thumb latch)	Per EIA-364-09 Mate/un-mate connectors 30 cycles at a maximum rate of 10 cycles per minute	20 milliohms MAX (change from initial)
Durability (pre-conditioning)	Per EIA-364-09 Mate/un-mate connectors 20 cycles at a maximum rate of 10 cycles per minute	20 milliohms MAX (change from initial)

Vibration	Per EIA-364-28 test condition VII-D Mate connectors and vibrate for 15 minutes each axis.	20 milliohms MAX (change from initial) & Discontinuity < 1 microsecond
ITEM	**TEST CONDITION**	**REQUIREMENT**
Wire Crimp Pullout Force (Axial)	Apply an axial pullout force on the wire at a rate of 25 ± 6 mm (1 ± ¼ inch).	16 Awg = 88 N (19.8 lbf) MIN 18 Awg = 88 N (19.8 lbf) MIN 20 Awg = 59 N (13.3 lbf) MIN 22 Awg = 39 N (8.8 lbf) MIN 24 Awg = 29 N (6.5 lbf) MIN
Thumb Latch Operation Force	Depress latch at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	16 N (3.6 lbf) MAX
Thumb Latch Yield Strength	Mate loaded connectors fully. Pull connectors apart at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	60 N (13.5 lbf) MIN (V-0) 45 N (10.1 lbf) MIN (V-2)

6.3 ENVIRONMENTAL PERFORMANCE

ITEM	TEST CONDITION	REQUIREMENT
Temperature Life	Per EIA-364-17 Mate Connectors expose to 108 hours at 105°C	20 milliohms MAX (change from initial)
Temperature Life (pre-conditioning)	Per EIA-364-17 Mate Connectors expose to 66 hours at 105°C	20 milliohms MAX (change from initial)
Thermal Shock	Per EIA-364-32 Mate connectors: expose for 5 cycles Between temperatures –55 and 105° C; Dwell 0.5 hours at each temperature.	20 milliohms MAX (change from initial) Visual: No Damage
Cyclic Temperature and Humidity	Per EIA-364-31 method 3 Mate connectors: expose to 24 cycles from 25 °C / 80% RH to 65 °C / 50% RH	20 milliohms MAX (change from initial)

7.0 TEST SEQUENCE GROUPS (Reliability Test Sequences Per 364-1000.01)

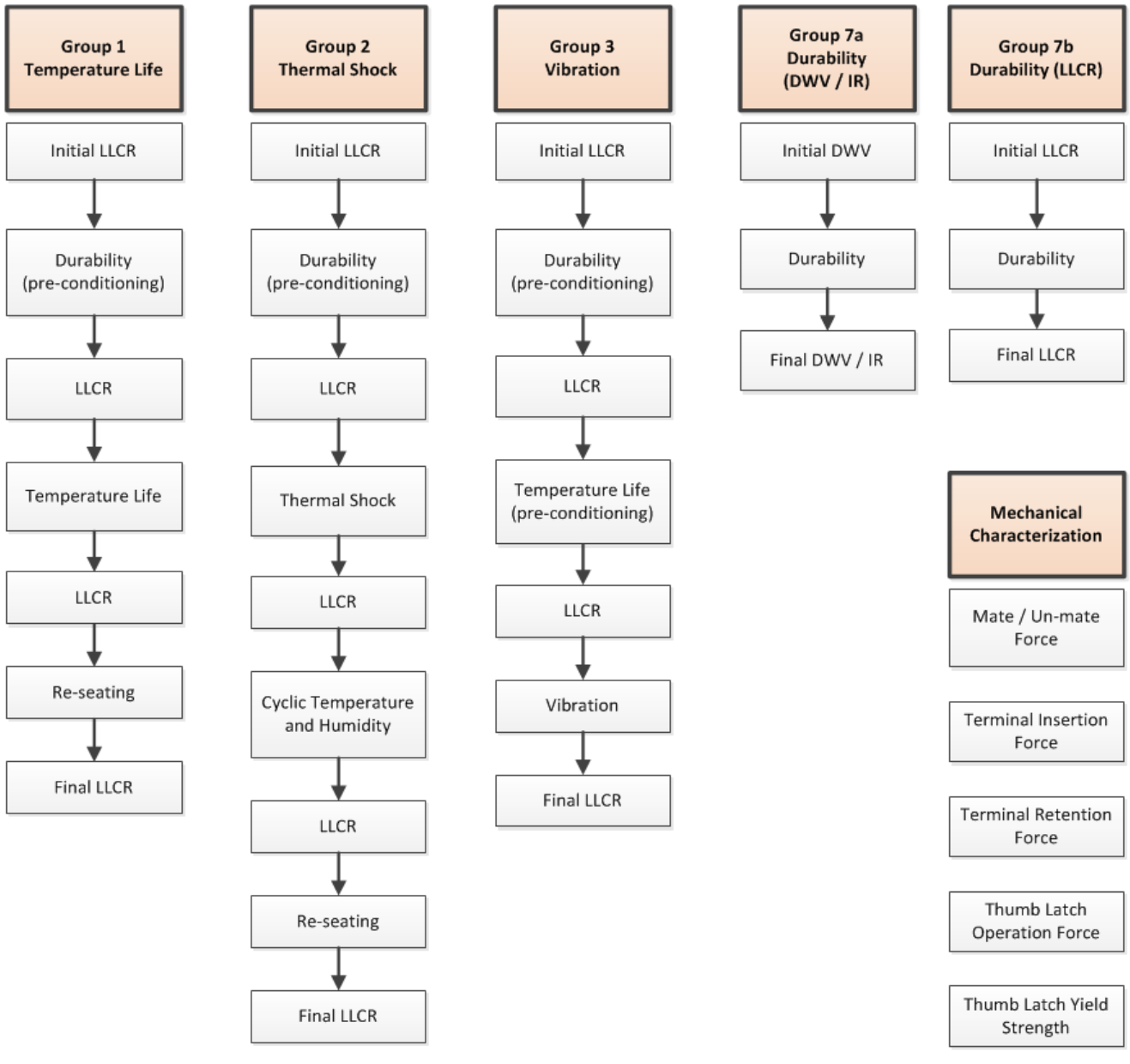

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TABLE OF CONTENTSTOC

8.0 SOLDER INFORMATION

Molex Solderability Specification SMES-152
(Click Here)

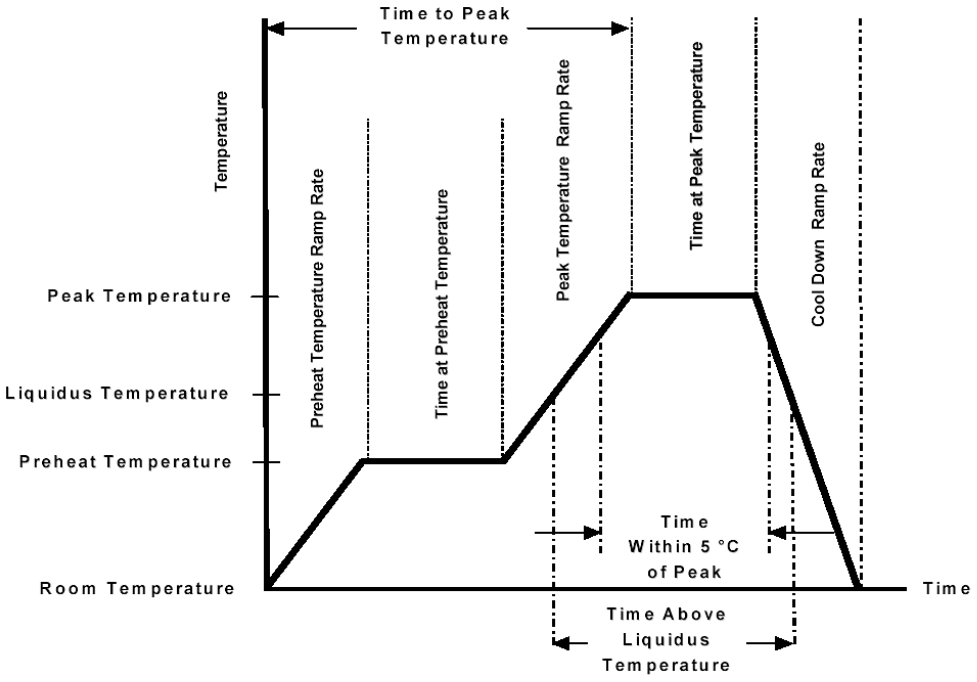
8.1 SOLDER PROCESS TEMPERATURES

Wave Solder: 265°C Max
Reflow Solder: 260°C Max

8.2 REFLOW SOLDERING PROFILE

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

Molex Connector Heat Resistance Specification AS-40000-5013
(Click Here)



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 Liquidus (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 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.

9.0 PACKAGING

Parts shall be packaged to protect against damage during handling, transit and storage. Nylon parts should remain in their original packaging until ready for use. Refer to Molex specification AS-45499-001 for moisturizing nylon connector parts.

10.0 OTHER INFORMATION

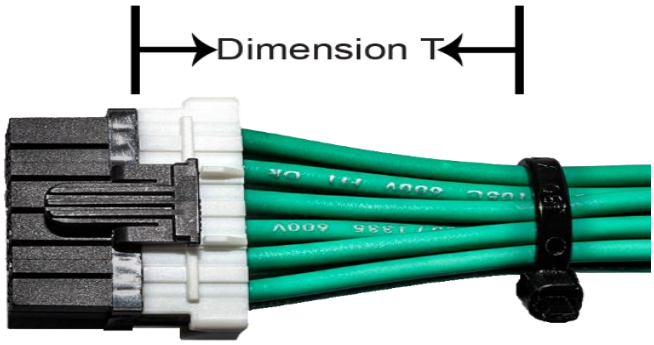
10.1 GAGES AND FIXTURES

It is recommended that test plugs (Series-172767/172762/200488/200471) be used for continuity testing of receptacles. Standard mating parts should not be used for harness testing.

NOTE: The use of unauthorized testing devices and/or probes with a Molex product may cause damage to and affect functionality of the Molex product, and such use may void any and all warranties, expressed or implied.

10.2 CABLE TIE AND OR WIRE TWIST LOCATION

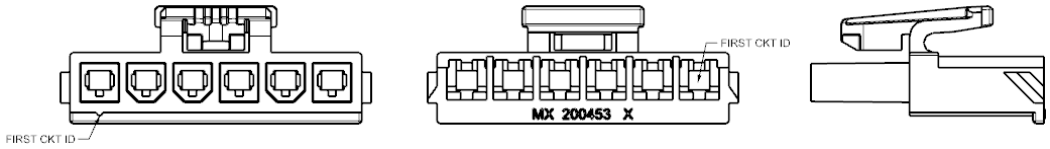
CKT Size	Dim T Min.
2-6	.50” (12.7 mm)
8	.75” (19.1 mm)
10-12	1.00” (25.4 mm)



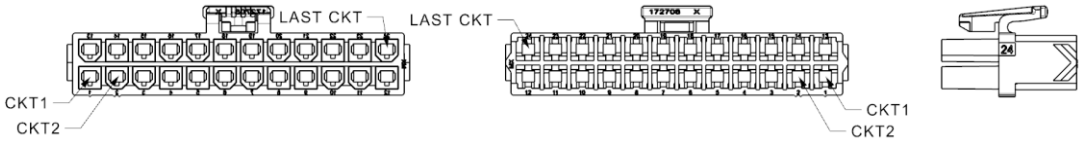
The “T” dimension defines a “free” length of wire, or a length of wire that is not subject to significant bias by external factors such as a wire tie, wire twisting, or other means of bending or deforming of the wires that repositions them from their natural relaxed state or location where they enter the housing. Wires are to be dressed in such a manner to allow the terminals to float freely in the pocket. This dimension is general recommendation and may need to be adjusted for different wire gauges and wire type and insulation thickness and insulation material.

11.0 POLARIZATION AND KEYING OPTIONS

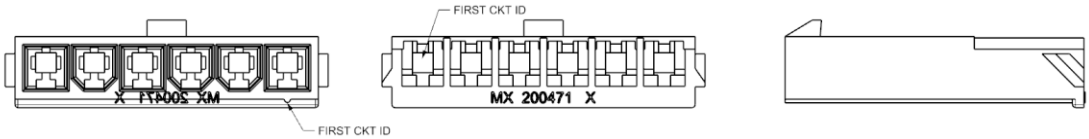
11.1 Single Row Receptacle (Series:200453)



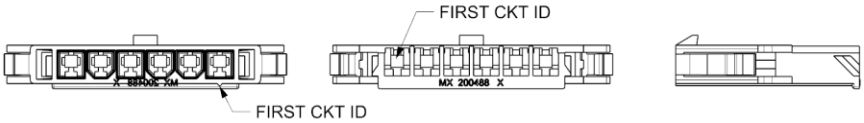
11.2 Dual Row Receptacle (Series:172708)



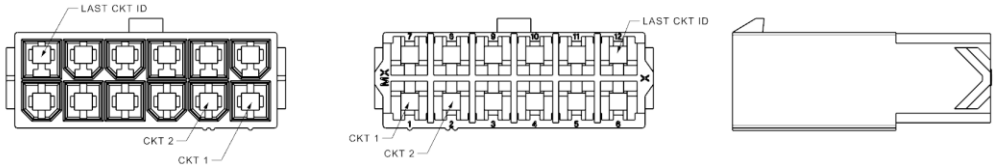
11.3 Single Row Plug (Series:200471)



11.4 Single Row Panel Mount Plug (Series:200488)



11.5 Dual Row Plug (Series:172762)



11.6 Dual Row Panel Mount Plug (Series:172767)

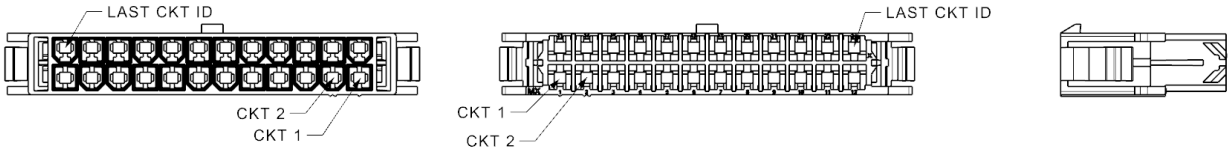


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TABLE OF CONTENTSTOC

REVISION:	ECR/ECN INFORMATION:	TITLE:	SHEET No.
D	EC No: **795223** DATE: **2024/08/14**	**PRODUCT SPECIFICATION FOR MINI-FIT TPA2 & LMF CONNECTOR SYSTEM**	**19** of **19**

DOCUMENT NUMBER:	CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:
PS-172718-0000	**GLLI**	**XQZHANG**	**XQZHANG**