
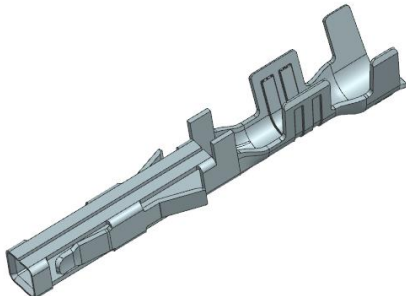

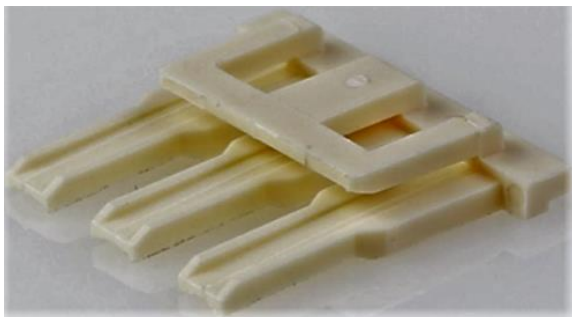


MINI-FIT SIGMA

WIRE-TO-BOARD WIRE-TO-WIRE CONNECTOR SYSTEM

Female Terminal	LMF Female Terminal
	
Series: 172718	Series: 221442

Male Terminal	TPA
	
Series: 172765	Series: 172709

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2131370000-PS	PS	000	GLLI	XQZHANG	XQZHANG	

Single Row Receptacle Housing



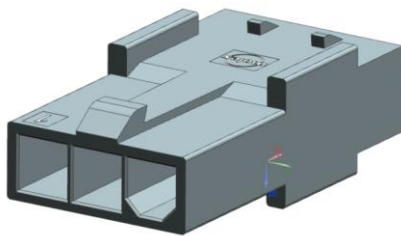
Series: [200453](#)

Dual Row Receptacle Housing



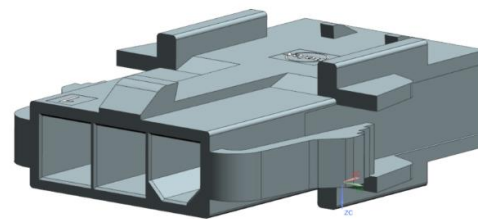
Series: [172708](#)

Single Row Free Hang Plug Housing



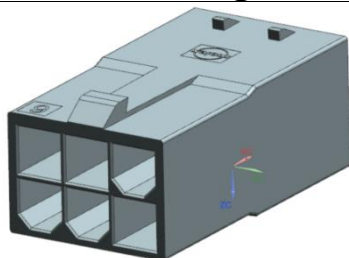
Series: [200471](#)

Single Row Panel Mount Plug Housing



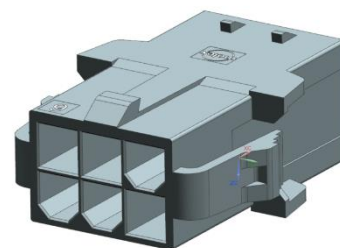
Series: [200488](#)

Dual Row Free Hang Plug Housing



Series: [172762](#)

Dual Row Panel Mount Plug Housing



Series: [172767](#)

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1.0 SCOPE

This Product Specification covers the performance requirements for the MINI-FIT SIGMA Wire-To-Board and Wire-To-Wire, 4.20mm pitch connector series using high conductive copper alloy terminals with Tin terminated with 16 to 24 AWG wire using Molex crimp technology. The TPA (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 DESCRIPTION, SERIES NUMBER, AND LINKS

WIRE-TO-BOARD			
DESCRIPTION	SERIES NUMBER	UL / cUL (600 V)	IEC (250 V)
Mini-fit Sigma, Receptacle Hsg, Dual Row	172708	Yes	Yes
Mini-fit Sigma, Receptacle Hsg, Single Row	200453	Yes	Yes
Mini-fit Sigma, Female Crimp Terminal	172718	Yes	Yes
LMF Mini-Fit Sigma Female Terminal	221442	Yes	Yes
Mini-fit Sigma, TPA	172709	Yes	Yes

MATES TO



Right Angle Hdr, Dual Row	35318
Right Angle Hdr, Dual Row	44130
Right Angle Hdr, Dual Row	87427
Right Angle Hdr, Dual Row, Glow Wire Capable	172448
Right Angle Hdr, Dual Row, Reflow Capable	46991
Right Angle Hdr, Single and Dual Row	5569
Right Angle Hdr, Single Row, Reflow Capable	172648
Test Plug	44281
Vertical Hdr, Dual Row	5566
Vertical Hdr, Dual Row	35317
Vertical Hdr, Dual Row	43460
Vertical Hdr, Dual Row	87427
Vertical Hdr, Dual Row Glow Wire Capable	172447
Vertical Hdr, Dual Row Reflow Capable	46207
Vertical Hdr, Single Row	172647

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WIRE-TO-WIRE			
DESCRIPTION	SERIES NUMBER	UL / cUL (600 V)	IEC (250 V)
Mini-fit Sigma, Dual Row, Receptacle Hsg	172708	Yes	Yes
Mini-fit Sigma, Single Row, Receptacle Hsg	200453	Yes	Yes
Mini-fit Sigma, Dual Row, Free Hang, Plug Hsg	172762	Yes	Yes
Mini-fit Sigma, Dual Row, Panel Mount, Plug Hsg	172767	Yes	Yes
Mini-fit Sigma, Single Row, Free Hang, Plug Hsg	200471	Yes	Yes
Mini-fit Sigma, Single Row, Panel Mount, Plug Hsg	200488	Yes	Yes
Mini-fit Sigma, Female Crimp Terminal	172718	Yes	Yes
Mini-fit Sigma, Male Crimp Terminal	172765	Yes	Yes
Mini-fit Sigma, TPA	172709	Yes	Yes

Note: Wire OD is $\phi 2.55\text{mm}$ Max for TPA application

2.2 DIMENSIONS, MATERIALS, PLATINGS

See the appropriate sales drawings for the information on dimensions, materials, platings and markings.

2.3 ENVIRONMENTAL CONFORMANCE

To find product compliance information:

- [Go to molex.com](#)
- Enter the part number in the search field.
- At the bottom of the page go to "Environmental" to see compliance status.

2.4 SAFETY AGENCY LISTINGS

UL File Number: [E29179](#)



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.

Note: *Certifications update is in progress.*

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3.0 APPLICABLE DOCUMENTS AND SPECIFICATION

3.1 MOLEX DOCUMENTS

Mini-Fit Sigma Fit Connector System Test summary 213137001-TS
 Mini-Fit Sigma Fit Connector System Test summary 213137002-TS
[Mini-Fit Sigma Fit Connector System Application summary 2131370000-AS](#)
[Mini-Fit Sigma Fit TPA Application Specification 1727090000-AS](#)
[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](#)
 ATS – Application Tooling Specification*

*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

EIA-364-1000
 UL-60950-1
 UL-1977
 IEC / EN 61984
 CSA STD. C22.2 NO. 182.3-M1987

4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE*

See Chart in Section 2.1

4.2 APPLICABLE WIRES

WIRE GAUGE	INSULATION DIAMETER
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")
0.75 mm ²	1.42mm (.056") – 2.85mm (.112")
0.50 mm ²	1.42mm (.056") – 2.85mm (.112")
0.35 mm ²	1.07mm (.042") – 2.38mm (.094")
0.25 mm ²	1.07mm (.042") – 2.38mm (.094")
0.22 mm ²	1.07mm (.042") – 2.38mm (.094")

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4.3 CURRENT RATINGS**

Brass											
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

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.

Note: 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

Operating Temperature Range* (includes T-Rise from applied current): - 40°C to + 105°C

Field Temperature and Field Life: 60° C for 10 years (based on EIA-364-1000, table 8)

Note: Temperature life test duration (section 6.3 item 1) is based on the assumption that the contact spends its entire life at the rated field maximum temperature (based on EIA-364-1000, table 8)

4.5 DURABILITY

Plating Type	Number of Cycles
Tin Plated	30

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Gold Plated	250
-------------	-----

*As tested in accordance with EIA-364-1000 test method (see section 6.2 of this specification).
Durability per EIA-364-09*

4.6 GLOW WIRE SERIES

The following series are glow capable:172708,172709,200453
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.

5.0 QUALIFICATION

Laboratory condition, sample selection and test sequences are in accordance with EIA-364-1000.

6.0 PERFORMANCE

6.1 ELECTRICAL PERFORMANCE

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PRODUCT SPECIFICATION

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.1.1	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]
6.1.2	Insulation Resistance	Per EIA-364-21 Mate connectors: apply a voltage of 500 VDC between adjacent terminals and between terminals to ground.	1000 Mega Ohm MINIMUM
6.1.3	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 Current leakage <5 mA
6.1.4	Temperature Rise (via current profiling)	Mate connectors, measure T- Rise @ Rated Current Per EIA-364-70, Method 2	Temperature rise: 30° C MAXIMUM
6.1.5	Steady State Voltage Drop (at rated current)	Per EIA 364-70B Mate connectors. Apply the rated current.	30 millivolt MAX (change from initial)
6.1.6	Steady State Temperature Rise (via (18day) current cycling at rated current)	Per EIA 364-55 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

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6.2 MECHANICAL PERFORMANCE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.1	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)
6.2.2	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
6.2.3	Crimp Terminal Retention Force (in Housing with & w/o TPA)	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	With TPA: 60 N (13.50 lbf) MIN. W/o TPA: 30 N (6.74 lbf) MIN.
6.2.4	Thumb Latch Yield strength (Initial)	Mate loaded connectors fully. Pull connectors apart at a rate of 25.4 +/- 6 mm per minute.	50N (11.25 lbf) Min.
6.2.5	Durability (w/o thumb latch) Tin Plating	Per EIA-364-09C, mate/Un-mate connectors 30 cycles at a maximum rate of 10 cycles per minute.	20 milliohms MAX. (change from initial) Visual: No Damage
6.2.6	Durability (w/o thumb latch) Gold Plating	Per EIA-364-09C, Mate and un-mate connectors 250 cycles at a rate of 10 cycles per minute.	20 milliohms MAX. (change from initial) Visual: No Damage
6.2.7	Durability (pre-conditioning) Tin Terminals	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)
6.2.8	Durability (pre-conditioning) Gold Terminals	Per EIA-364-09 Mate/un-mate connectors 50 cycles at a maximum rate of 10 cycles per minute	20 milliohms MAX. (change from initial)
6.2.9	Vibration (Random) + Mechanical Shock (Test Group 3)	Per EIA-364-28, test condition VII, Letter D (Acceleration 3.1 g) Mechanical Shock- Per EIA-364-27C Test Condition H	20 milliohms MAX (change from initial) & Discontinuity < 1 microsecond
6.2.10	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 MIN. 18 Awg = 88 N MIN. 20 Awg = 59 N MIN. 22 Awg = 39 N MIN. 24 Awg = 29 N MIN.

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6.2 MECHANICAL PERFORMANCE CONTINUE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.11	Panel Withdrawal Forces (Single Row Panel Mount Plug Hsg)	Insert a connector at a rate of 25.4 ± 6 mm (1 ± ¼ inch) per minute.	150N (33.72 lbf) MINIMUM withdrawal force
6.2.12	Panel Withdrawal Forces (Dual Row Panel Mount Plug Hsg)	Insert a connector at a rate of 25.4 ± 6 mm (1 ± ¼ inch) per minute.	220N (49.46 lbf) MINIMUM withdrawal force

6.3 ENVIRONMENTAL PERFORMANCE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.3.1	Temperature Life. (60 °C field temperature life time year 10)	Per EIA-364-17 Mate Connectors expose to 108 hours at 105 °C	20 milliohms MAX. (change from initial)
6.3.2	Temperature Life (pre-conditioning)	Per EIA-364-17 Mate Connectors expose to 66 hours at 105 °C	20 milliohms MAX. (change from initial)
6.3.3	Thermal Shock (Test group-2)	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
6.3.4	Cyclic Temperature and Humidity (Test group 2)	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)
6.3.5	Mixed Flow Gas EIA-364-1000 Test Group 4	Per EIA-364-35 – Test Group 4	20 milliohms MAX. (change from initial)

7.0 TEST SEQUENCE

Reliability Test Sequences Per EIA-364-1000

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PRODUCT SPECIFICATION

Group 1 Temperature Life	Group 2 Thermal Shock	Group 3 Vibration	Group 4 Mixed Flow Gas	Group 7A Durability	Group 7B Durability
Initial Contact Resistance EIA-364-23	Initial Contact Resistance EIA-364-23	Initial Contact Resistance EIA-364-23	Initial Contact Resistance EIA-364-23	Dielectric Withstand Voltage EIA-364-20	Initial Contact Resistance EIA-364-23
Durability (Pre-conditioning) 50x for Gold & 20x for Tin EIA-364-09	Durability (Pre-conditioning) 50x for Gold & 20x for Tin EIA-364-09	Durability (Pre-conditioning) 50x for Gold EIA-364-09	Durability (Pre-conditioning) EIA-364-09	Durability EIA-364-09	Durability EIA-364-09
Contact Resistance	Contact Resistance	Contact Resistance	Contact Resistance	Dielectric Withstand Voltage EIA-364-20	Contact Resistance
Temperature Life EIA-364-17	Thermal Shock EIA-364-32	Temperature Life (Pre-conditioning) EIA-364-17	Temperature Life (Pre-conditioning) EIA-364-17		
Contact Resistance	Contact Resistance	Contact Resistance	Contact Resistance		
Reseating 3 cycles	Cyclic Temperature and Humidity EIA-364-31	Random Vibration EIA-364-28 Condition VIID	Mixed Flow Gas Unmated exposure 80 hours		
Contact Resistance	Contact Resistance	Contact Resistance	Contact Resistance		
	Reseating 3 cycles	Mechanical shock	Mixed Flow Gas mated exposure 40 hours		
	Contact Resistance	Contact Resistance	Contact Resistance		
		Reseating 3 cycles	Thermal Disturbance		
		Contact Resistance	Contact Resistance		
			Reseating 3 cycles		
			Contact Resistance		

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Individual Tests

Connector Mate and Un-mate
Forces per circuit

Crimp Terminal Insertion Force

Crimp Terminal Retention
Force

Thumb Latch Yield Strength

Wire Crimp Pullout Force

Panel Ear Retention Force

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8.0 SOLDER INFORMATION

Per SMES-152 and AS-40000-5013

*These specifications establish standard solderability test methods used to evaluate a products ability to accept molten solder. Solder Process Temperatures and Reflow Solder Profiles will vary based on application, equipment, solder paste, PCB thickness, etc.

8.1 SOLDER PROCESS TEMPERATURES *

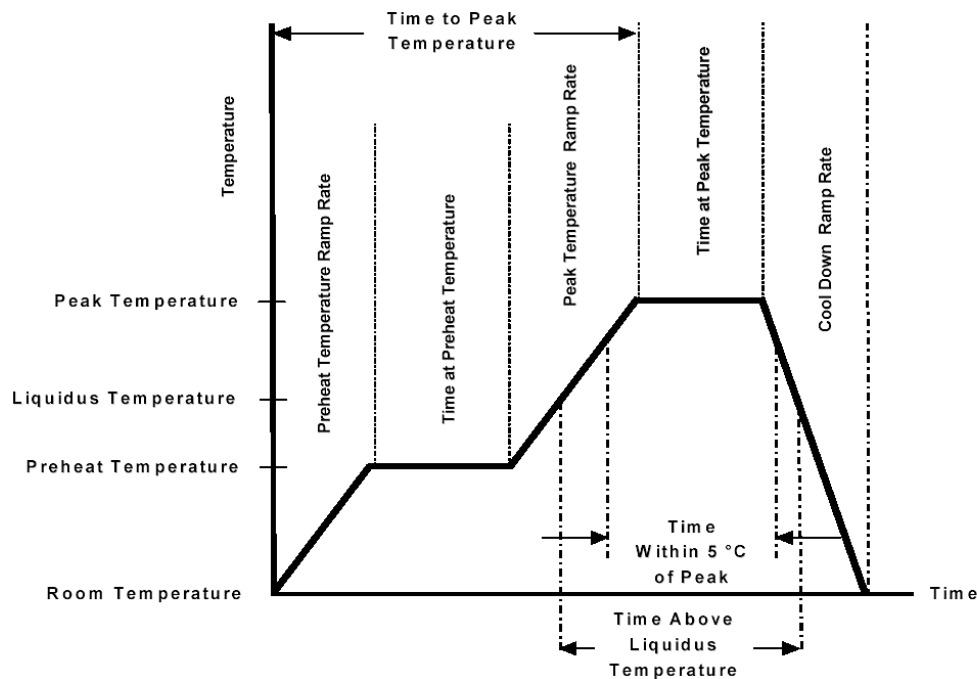
Wave Solder Temperature: 265°C Maximum
 Reflow Solder Temperature: 260°C Maximum

[Molex Solderability Specification SMES-152 \(Click Here\)](#)

8.2 SOLDERING PROFILE

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

[Molex Connector Heat Resistance Specification AS-40000-5013 \(Click Here\)](#)



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DOCUMENT NUMBER: 2131370000-PS	DOC TYPE: PS	DOC PART: 000	CREATED / REVISED BY: GLLI
		CHECKED BY: XQZHANG	APPROVED BY: XQZHANG

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

9.0 PACKAGING

Parts shall be packaging to protect the parts from damage during standard shipping, storage, and handling. Refer Molex.com specific part number webpage to get the exact packaging document for that item.

10.0 GAGES AND FIXTURES

It is recommended that test plugs 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.

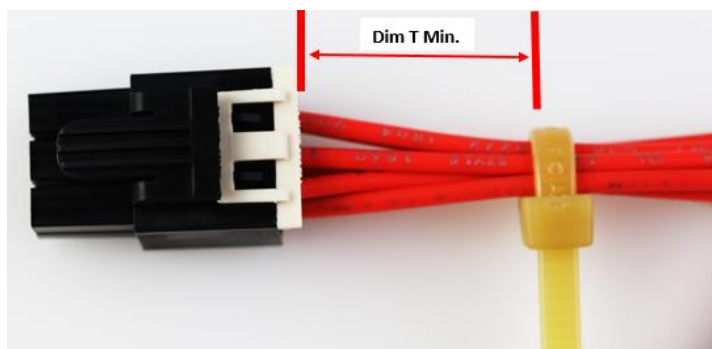
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11.0 CABLE TIE AND / OR TWIST TIE LOCATION

CKT Size	Dim T Min.
2-6	.50" (12.7 mm)
8	.75" (19.1 mm)
10-12	1.00" (25.4 mm)
14-16	1.34" (34.0 mm)
18-20	1.45" (37.0 mm)
22-24	1.57" (40.0 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.

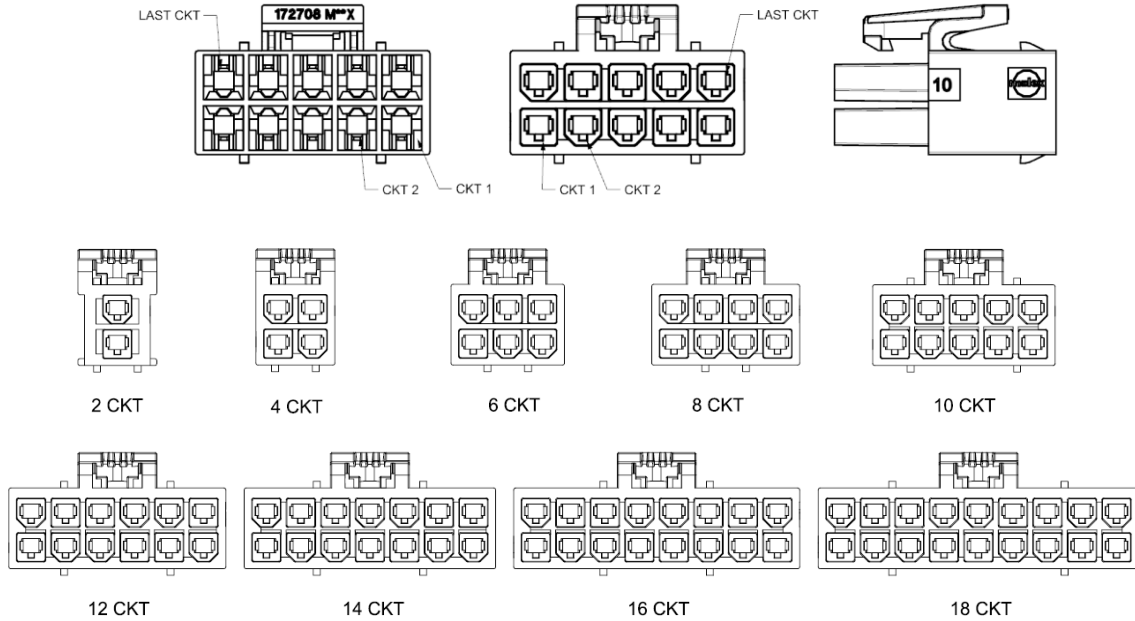
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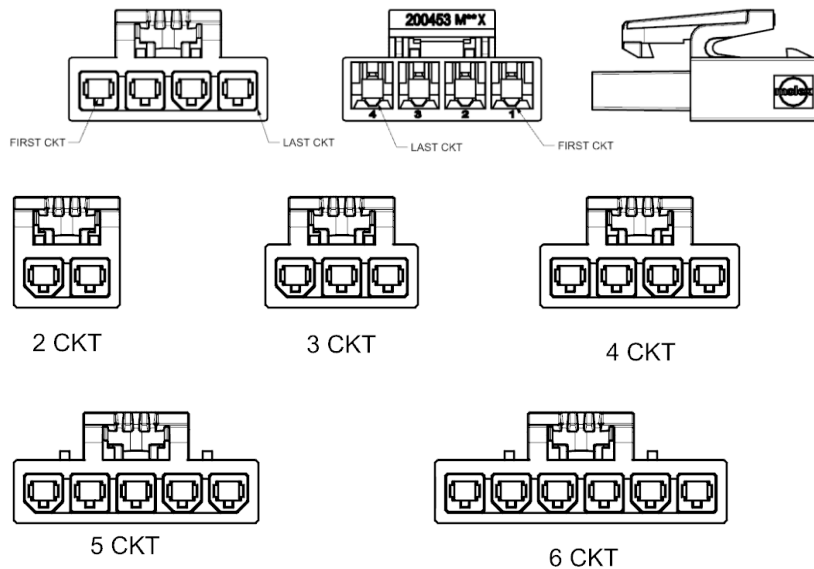
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12.0 POLARIZATION AND KEYING OPTIONS

12.1 DUAL ROW RECAPTACLE (SERIES: [172708](#))



12.2 SINGLE ROW RECEPTACLE (SERIES: [200453](#))

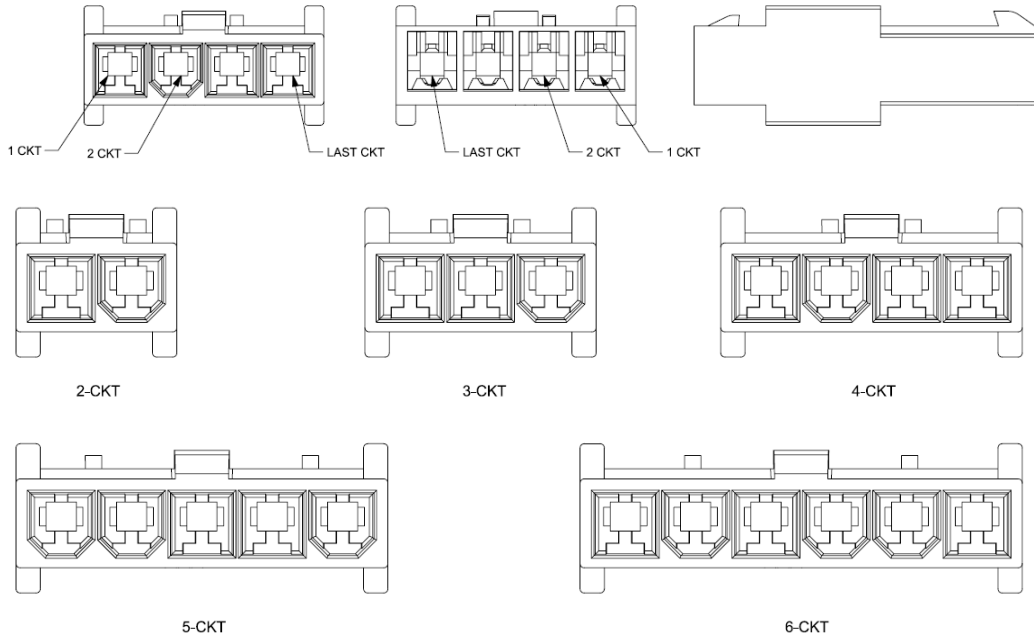


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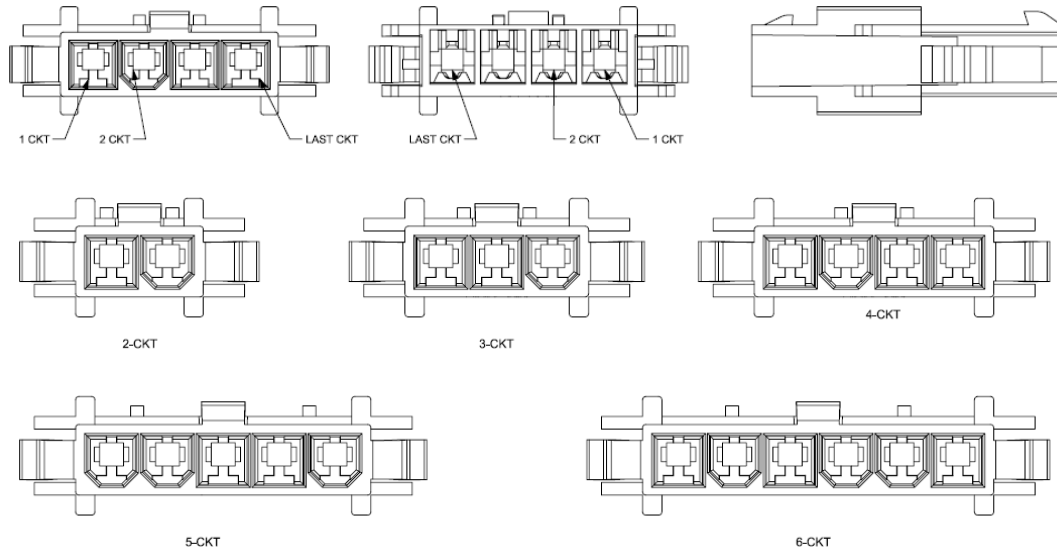
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12.3 SINGLE ROW FREE HANG PLUG (SERIES:200471)



12.4 SINGLE ROW PANEL MOUNT PLUG (SERIES:200488)

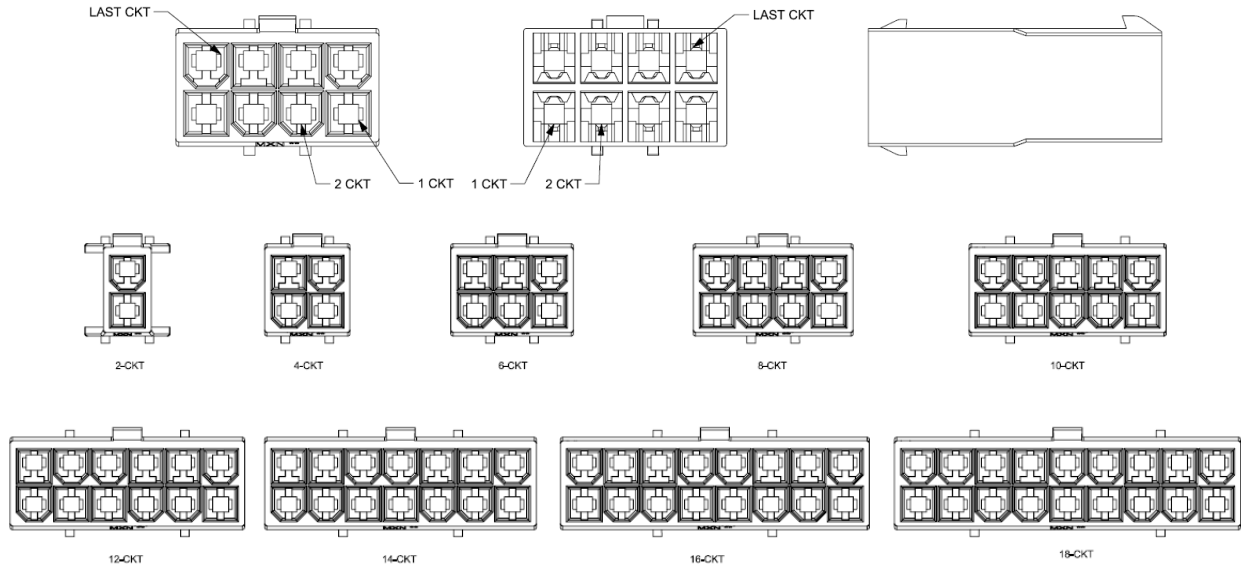


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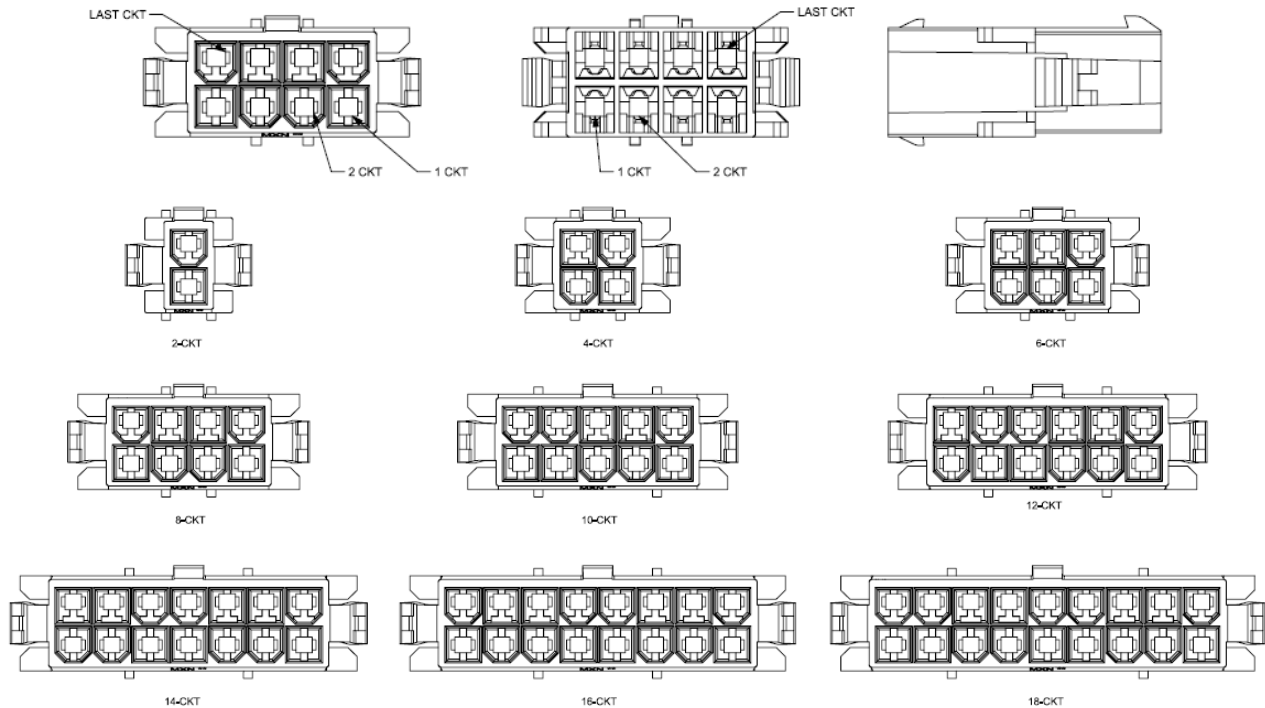
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12.5 DUAL ROW FREE HANG PLUG (SERIES:172762)



12.6 DUAL ROW PANEL MOUNT PLUG (SERIES:172767)

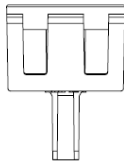


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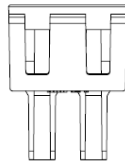
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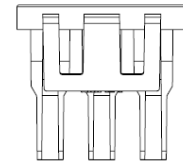
12.7 TPA (SERIES: [172709](#))



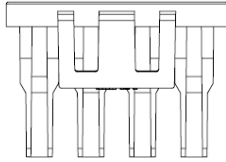
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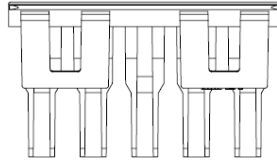
2 CKT



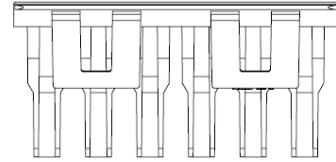
3 CKT



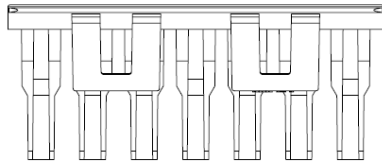
4 CKT



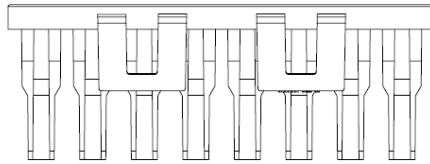
5 CKT



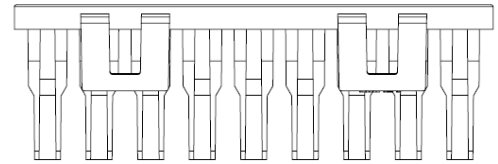
6 CKT



7 CKT



8 CKT



9 CKT

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