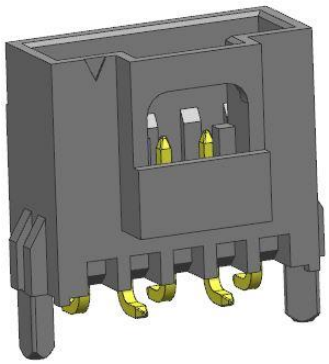
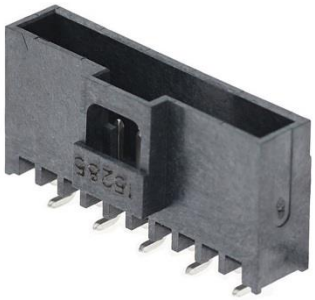
molex **PRODUCT SPECIFICATION**

MILLIGRID

Wire to Board

CONNECTOR SYSTEM

Female Crimp Terminal	Crimp Receptacle Housing
	
Series: 50394	Series: 151100

PCB Header Vertical, SMT with Peg	PCB Header Vertical, SMT w/o Peg
	
Series: 151062	Series: 151062

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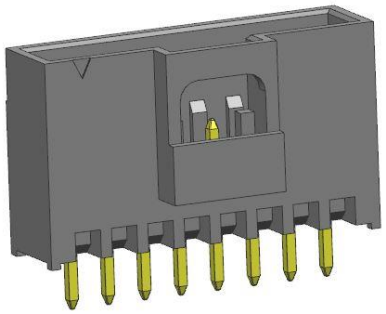
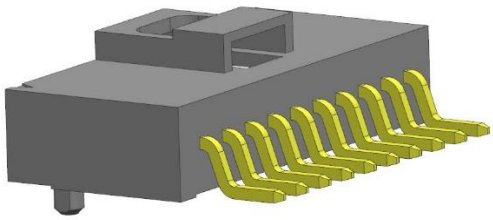
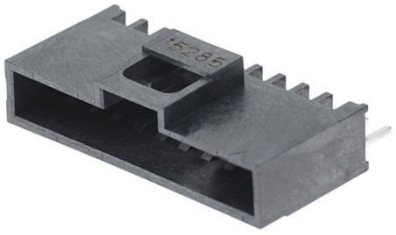
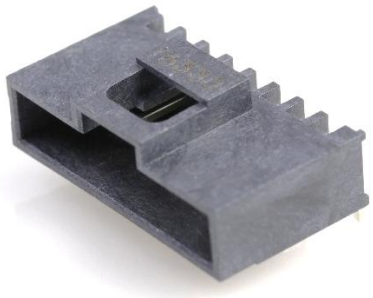
PCB Header Vertical, TH with Peg	PCB Header Vertical, TH w/o Peg
	
Series: 151063	Series: 151063

PCB Header RA, SMT with Peg	PCB Header RA, SMT w/o Peg
	
Series: 151064	Series: 151064

PCB Header RA, TH with Peg	PCB Header RA, TH w/o Peg
	
Series: 151065	Series: 151065

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1.0 SCOPE

This Product Specification covers the performance requirements for Wire to Board system of Single Row Milligrid™ in 2.00 mm pitch.

2.0 PRODUCT DESCRIPTION

2.1 DESCRIPTION, SERIES NUMBER, AND LINKS

DESCRIPTION	SERIES NUMBER
Female Crimp Terminal	50394
Crimp Receptacle Housing	151100
PCB Header, Vertical, SMT	151062
PCB Header, Vertical, TH	151063
PCB Header, Right Angle, SMT	151064
PCB Header, Right Angle, TH	151065

2.2 DIMENSIONS, MATERIALS, PLATINGS

See sales drawings for details on dimensions, materials and platings.

2.3 ENVIRONMENTAL CONFORMANCE

To fine product compliance information:
a. Go to molex.com
b. Enter the part number in the search field.
c. At the bottom of the page go to “Environmental” to see compliance status.

2.4 SAFETY AGENCY LISTINGS

UL Number: E29179
CSA Number: 1585720 (LR19980)

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.

Series 151062, 151063, 151064, 151065, rated 2.0 A, 125 V
Series 151100, rated 2.5 A (No. 24 AWG), 125 V

3.0 APPLICABLE DOCUMENTS AND SPECIFICATION

3.1 MOLEX DOCUMENTS

Single Row MilliGrid BMI Connectors Test Summary TS
Single Row MilliGrid BMI Connectors Application Specification 503940001-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 differs with Terminals. ATS shall be available in the respective Terminal part number page.*

3.2 INDUSTRY DOCUMENTS

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

4.0 ELECTRICAL PERFORMANCE RATINGS

4.1 VOLTAGE

125 VAC

4.2 APPLICABLE WIRES

Wire Gage(Stranded copper)	Insulation Diameter
#24 AWG - #30 AWG	1.40 mm Max.

4.3 CURRENT RATING (MAXIMUM AMPERES)

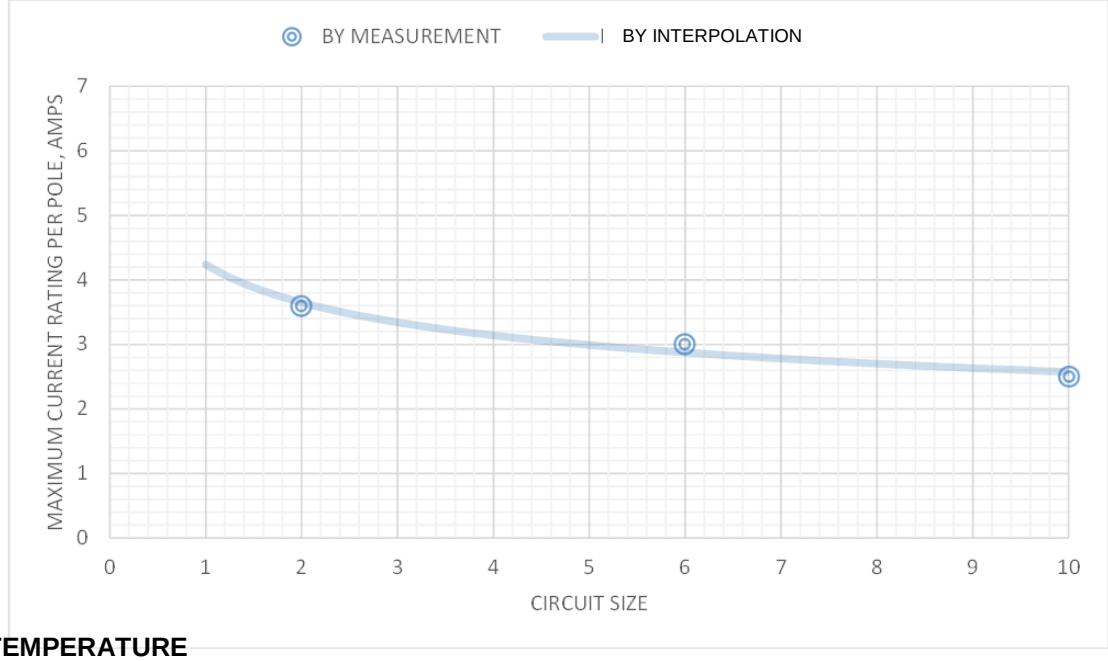
AWG #24: 2.5 A (with 10 contacts powered up)
AWG #26: 2.0 A (with 10 contacts powered up)
AWG #28: 1.5 A (with 10 contacts powered up)
AWG #30: 1.0 A (with 10 contacts powered up)

Current rating is application dependent and 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, AWG WIRE, gross heating from adjacent modules / components and other factors that influence connector performance. Wire size, insulation thickness, stranding, tin coated or bare copper, wire length & crimp quality are other factors that influence current rating.

Tested with AWG24 Wire and PCB with 1oz. Copper Traces. *Extrapolated from test data.

	CIRCUIT SIZE (NUMBER OF CONTACTS POWERED UP) Wire to Board (15106* with 151100)									
	1*	2	3*	4*	5*	6	7*	8*	9*	10
Current Rating per Pole (Amps, Max)	4.20	3.60	3.40	3.20	3.00	3.00	2.80	2.70	2.60	2.50

Wire to Board (15106* with 151100 Series)



4.4 TEMPERATURE

Operating Temperature Range : - 40 °C to + 70 °C
Storage (with packaging) : - 40 °C to + 70 °C

Field Temperature and Field Life: 65°C for 3 years (based EIA-364-1000, table 8)

Note: Temperature life test duration (section 6.3. item 2) 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
Gold Plated	50
Tin Plated	25

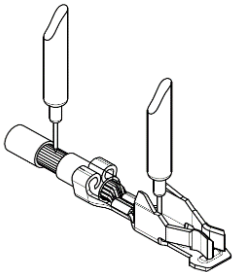
As tested in accordance with EIA-364-1000 test method (see Sec. 6.2 item 3 of this specification). Durability per EIA-364-09.

5.0 QUALIFICATION

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

6.0 PERFORMANCE

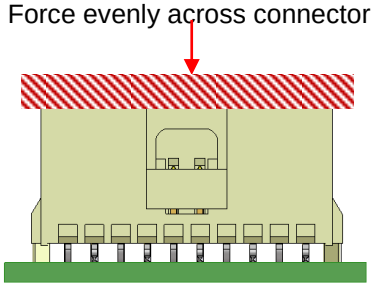
6.1 ELECTRICAL PERFORMANCE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.1.1	Low Level Contact Resistance (LLCR)	Mate connectors: apply a maximum voltage of 20 mV and a current of 100 mA (EIA-364-23) Note: Wire resistance and traces shall be removed from the measured value.	30 milliΩ [Initial] [Maximum]
6.1.2	Contact Resistance on Crimped Portion 	Crimp the wire to the terminal, apply a maximum voltage of 20 mV and a current of 100 mA to measure crimp resistance (EIA-364-23) Note: Wire resistance shall be removed from the measured value.	5 milliΩ [Initial] [Maximum]
6.1.3	Insulation Resistance	Mate connectors; apply a voltage of 500 VDC between adjacent terminals. (EIA-364-21)	1000 MegaΩ [Minimum]
6.1.4	Dielectric Withstanding Voltage	Mate connectors; apply a voltage of 500 VAC for 1 minute between adjacent terminals. (EIA-364-20)	No voltage breakdown
6.1.5	Temperature Rise	Mate connectors and measure the temperature rise of contact when the maximum DC rated current is passed. (EIA-364-70, Method 1)	Temperature Rise +30°C [Maximum]

6.2 MECHANICAL PERFORMANCE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.1	Connector Insertion	Engage latch and mate connectors at a rate of 25.4 mm / min until latch engagement was achieved. Disengage latch and mate connectors at a rate of 25.4 mm / min until fully mated. (EIA-364-13D, Method A)	Latch engaged 35 N (2 ckt ~ 10 ckt) [Maximum] Latch disengaged 3.5 N per ckt [Maximum]
6.2.2	Connector Retention	Engage latch and unmate connectors at a rate of 25.4 mm/min until latch defeat occur. Disengage latch and unmate connectors at a rate of 25.4 mm/min. (EIA-364-13D, Method A)	Latch engaged 45 N (2 ckt ~ 10 ckt) [Minimum] Latch disengaged 0.3 N per ckt [Minimum]
6.2.3	Durability	Disengage latch; mate and unmate connectors with rate of 500 ± 50 cycles / hr for 50 cycles for gold plated connector and 25 cycles for tin plated connector. (EIA-364-09)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial]
6.2.4	Extensive Durability (30µ" Gold Plated)	Disengage latch; mate and unmate connectors for 500 cycles with rate of 500 ± 50 cycles/hr. (EIA-364-09)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial]
6.2.5	Reseating	Manually mate and unmate the connector with mating half for 3 cycles with rate of 5 cycles / min maximum. (EIA-364-09)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial]

6.2 MECHANICAL PERFORMANCE CONTINUED

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.6	Pin Retention (in housing)	Axial pull terminal in the housing at a rate of 25.4 mm / min maximum until the terminal dislodge from housing. (EIA-364-29, Method C)	Before reflow and after reflow: 5 N [Minimum]
6.2.7	Peg Insertion Force (in PCB) (Not applicable to PCB Peg hole > Ø 1.65 mm)	Recommended minimum hole size (1.60 ± 0.05 mm). Insert connector at a rate of 25.4 mm / min. Force evenly across connector 	35 N [Minimum] 45 N [Maximum]
6.2.8	Peg Retention Force (in PCB) (Not applicable to PCB Peg hole > Ø 1.65mm)	Recommended maximum hole size (1.60 ± 0.05 mm). Remove connector at a rate of 25.4 mm / min.	5 N [Minimum]
6.2.9	Latch Durability (Receptacle housing)	Fully deflect latch and release for 500 cycles with rate of 500 ± 50 cycles/hr.	Appearance: No Damage Connector Insertion Force: 35 N [Maximum] Connector Retention Force 45 N [Minimum]
6.2.10	Crimp Terminal Insertion Force (into housing)	Axial insert crimped terminal into the housing at a rate of 25.4 mm / min maximum until the terminal is latched into housing.	15 N [Maximum]
6.2.11	Crimp Terminal Retention Force (in Housing)	Axial pull crimped terminal in the housing at a rate of 25.4 mm/min maximum until the terminal dislodge from housing. (EIA-364-29, Method C)	15 N [Minimum]

6.2 MECHANICAL PERFORMANCE CONTINUED

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.2.12	Vibration	Mate connectors and subject to the following vibration conditions, for a period of 2 hours in each 3 mutually perpendicular axis. Amplitude: 1.52 mm (.060 inch) peak to peak Sweep: 10->55->10 Hz in 1 minute Duration: 2 hours in each X-Y-Z axis. (EIA-364-28, Test Condition I)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial] Discontinuity: 1.0 µs [Maximum]
6.2.13	Mechanical Shock	Mate connectors and subject to the following shock conditions, 3 shocks shall be applied along 3 mutually perpendicular axis. (Total of 18 shocks) Peak value: 490 m/s sq. (50G) Test pulse : Half Sine Duration : 11 ms in each X-Y-Z axis (EIA-364-27B Condition A)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial] Discontinuity: 1.0 µs [Maximum]

6.3 ENVIRONMENTAL PERFORMANCE

<table>
<tr><th>ITEM</th><th>DESCRIPTION</th><th>TEST CONDITION</th><th>REQUIREMENT</th></tr>
<tr><td>6.3.1</td><td>Thermal Shock</td><td>Mate connectors, expose to
5 cycles of:-
<table><tr><th>Temp °C</th><th>Duration (Minutes)</th></tr><tr><td>-55 + 0/-5</td><td>30</td></tr><tr><td>Transfer time from cold to hot</td><td>5 Maximum</td></tr><tr><td>+105 + 3/-0</td><td>30</td></tr><tr><td>Transfer time from hot to cold</td><td>5 Maximum</td></tr></table>(EIA-364-32G Method A, Condition VII)</td><td>Appearance: No Damage
Contact Resistance:
10 milliΩ
[Maximum]
[Change from Initial]</td></tr>
<tr><td>6.3.2</td><td>Temperature Life</td><td>Mate Connectors, expose to:-
Temperature: 105 ± 2 °C
Duration: 96 hours.
(EIA-364-17, Method A, condition 4)</td><td>Appearance: No Damage
Contact Resistance:
10 milliΩ
[Maximum]
[Change from Initial]</td></tr>
<tr><td>6.3.3</td><td>Cyclic Temperature and Humidity</td><td>Mate connector and expose to:-
Temperature: 25 °C + 10 / -2 °C
to +65 °C ± 2 °C
Humidity: 90% to 98% RH
Duration: 10 cycles (240 hours)
(EIA-364-31B, method III)</td><td>Appearance: No Damage
Contact Resistance:
10 milliΩ
[Maximum]
[Change from Initial]
Dielectric Withstanding Voltage:
No Breakdown
Insulation Resistance:
1000 MegaΩ Minimum</td></tr>
<tr><td>6.3.4</td><td>Low Temperature Test</td><td>Mate connectors and expose to:
Temperature: -40 °C ± 3 °C
Duration: 96 + 5/-0 Hours
(EIA-364-59A)</td><td>Appearance: No Damage
Contact Resistance:
10 milliΩ
[Maximum]
[Change from Initial]</td></tr>
<tr><td>6.3.5</td><td>SO_2 Gas
(Gold Plated only)</td><td>Mate connectors and expose to:
SO_2 gas density: 50 ± 5 ppm
Temperature: 40 ± 2 °C
Duration: 24 hours</td><td>Appearance: No Damage
Contact Resistance:
10 milliΩ
[Maximum]
[Change from Initial]</td></tr>
</table>

6.3 ENVIRONMENTAL PERFORMANCE CONTINUED

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.3.6	Thermal Cycling (Tin Plated only)	Cycle the connector between 15 °C ± 3°C. and 85 °C ± 3 °C, as measured on the part. Ramps should be a minimum of 2 °C per minute, and dwell times should ensure that the contacts reach the temperature extremes (a minimum of 5 minutes). Humidity is not controlled. Perform 500 such cycles. (EIA-364-110)	Appearance: No Damage Contact Resistance: 10 milliΩ [Maximum] [Change from Initial]
6.3.7	Salt Spray	Expose the mated connectors to the following salt mist condition: Concentration : 5 ±1% Temperature : 35 + 1/-2 °C Test time : 48 hour (Note: Immediately after exposure, the test specimens shall be dipped in running tap (≤ 38 °C) for 5 mins max and dried for 16 hour max in a circulating air oven at 38 °C ± 3 °C. Sample examination done in room temperature. (EIA-364-26C, Condition B)	Appearance: No Damage Contact Resistance: 10mili Ω [Maximum] [Change from Initial]
6.3.8	Resistance to Solder Heats	Convection reflow: Sample to be passed through reflow over according to temperature profiles (shown in section 10.2) (EIA-364-56C, Procedure 6) Dip & wave solder terminations Sample to be mounted on PCB and terminals to be immersed so that bottom of PCB rests on molten solder. Duration: 10 ± 2 seconds Solder temperature: 260 ± 5 °C (EIA-364-56C, Procedure 3)	Appearance: No Damage

6.3 ENVIRONMENTAL PERFORMANCE CONTINUED

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.3.9	Solderability	Unmate connector. Steam age for 8 hour ± 15 min. (Precondition: Condition C) Surface Mount Process Simulation test Solder paste is deposited onto screen (e.g. ceramic plate) via stencil. The connectors are placed onto the solder paste print. Subject the substrate and component to the reflow process through a convection oven. Refer to section 10.2 for temperature profile. Flux type: ROL0 OR Dip and look test Dip solder tails into solder pot at a temperature of 245 ± 5 °C for 5 ± 0.5 sec. Emersion Rate: 25.4 +/- 6.4 mm /sec Flux type: ROL1 (JESD22-B-102E; Method 1 and 2)	95% of the immersed area must show no voids, pin holes

7.0 TEST SEQUENCE GROUPS

Sequential Tests Group →	Grp1	Grp2	Grp3 (disengage latch)	Grp4	Grp5 (disengage latch)	Grp6	Grp7	Grp8	Grp9	Grp10	Grp11
Test or Examination ↓											
Sample size	5	5	5	5	5	5	5	5	5	5	5
Resistance to Soldering Conditions	1	1	1	1	1	1	1	1	1	1	1
Low Level Contact Resistance (LLCR)	2, 5, 7	2, 5, 7, 9	2, 5, 7, 9		3, 6	2, 4	2, 5, 7, 9	2, 4	2, 4	2, 4	
Insulation Resistance				2, 6							
Dielectric Withstanding Voltage				3, 7							
Connector Insertion					2, 7						2, 5(b)
Connector Retention					4, 8						3, 6(b)
Durability	3(a)	3(a)	3(a)		5		3(a)				
Latch Durability											4(b)
Extensive Durability (30µ" Gold Plated)								3			
Reseating	6	8					8				
Vibration			6								
Mechanical Shock			8								
Thermal Shock		4		4							
Temperature Life	4		4(a)				4(a)				
Cyclic Temperature & Humidity		6		5							
Low Temperature Test						3					
Thermal Cycling (Tin plated)							6				
SO_2 gas (Gold plated)									3		
Salt Spray										3	

Note:
(a) Preconditioning
- Durability: 20cycles for gold plated and 5cycles for tin plated.
- Temperature life: duration is 48 hours.

(b) Use different set of sample for before and after test.

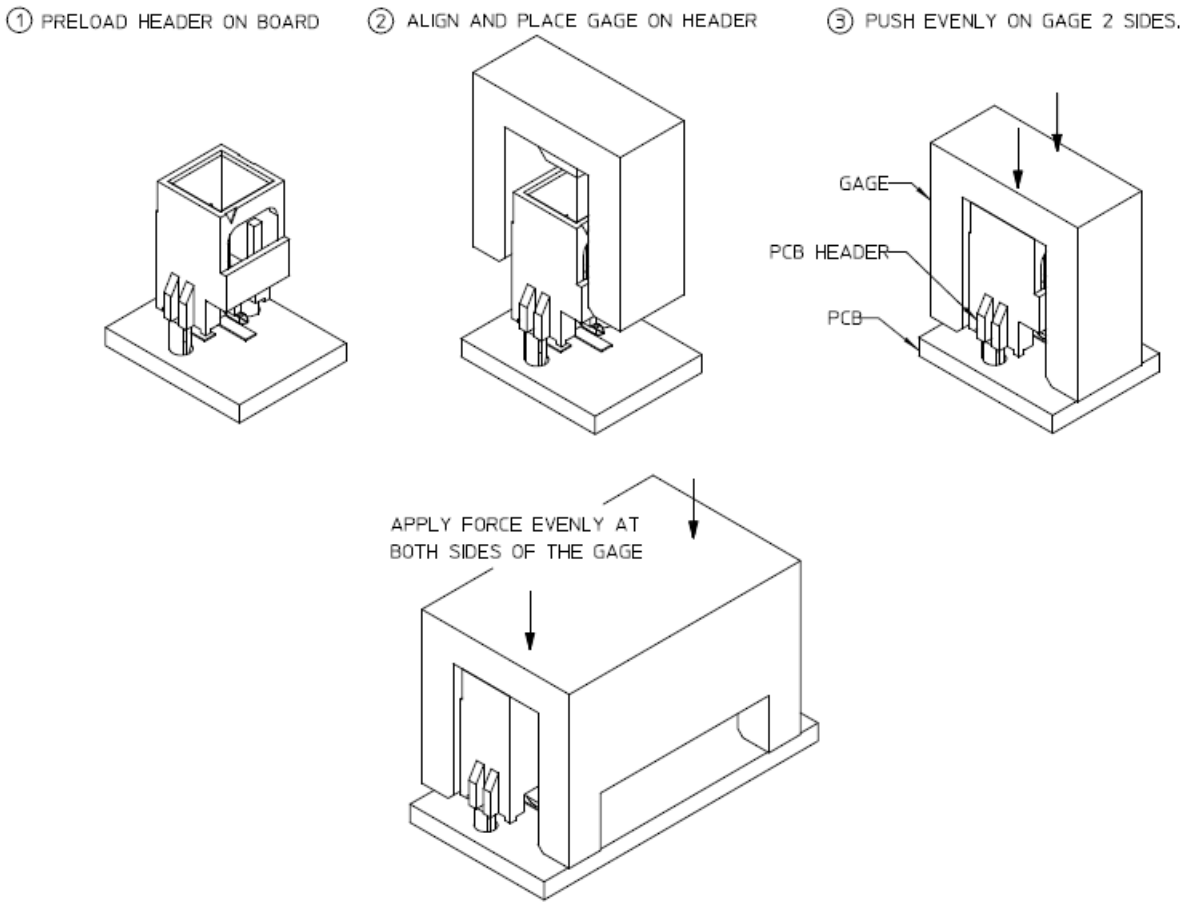
Individual Test	Grp12	Grp13	Grp14	Grp15	Grp16	Grp17	Grp18	Grp19
Test or Examination ↓								
Sample size	5	5	5	5	5	5	5	5
Resistance to Soldering Conditions		2(c)						
Contact Resistance on Crimp Portion	1							
Pin Retention (in housing)		1, 3(c)						
Peg Insertion Force (in PCB)			1					
Peg Retention Force (in PCB)				1				
Crimp Terminal Insertion Force					1			
Crimp Terminal Retention Force						1		
Solderability							1	
Temperature Rise								1

Note:
(a) Use different set of sample for before and after reflow test.

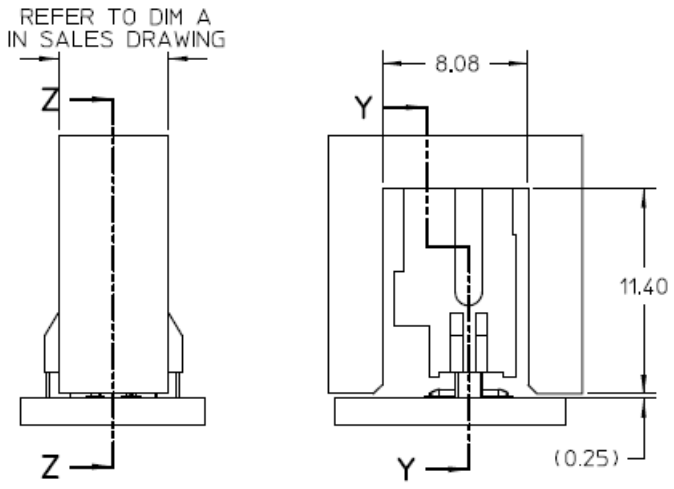
8.0 GAGES AND FIXTURE

8.1 PEG MOUNTING GAGE

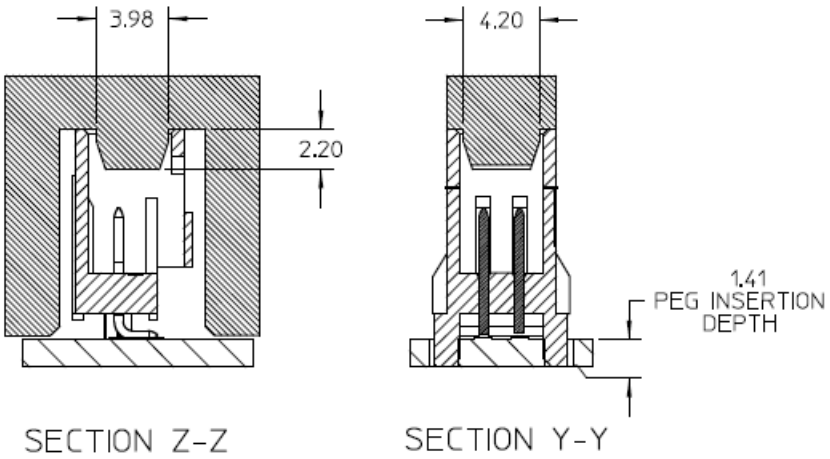
For series 151062, when connector with retention peg is mounted on PCB manually, it is recommended to use a mounting gage to ensure retention peg is properly inserted into PCB hole and avoid over press and cause damage to the solder tail.



GAGE MATERIAL: METAL

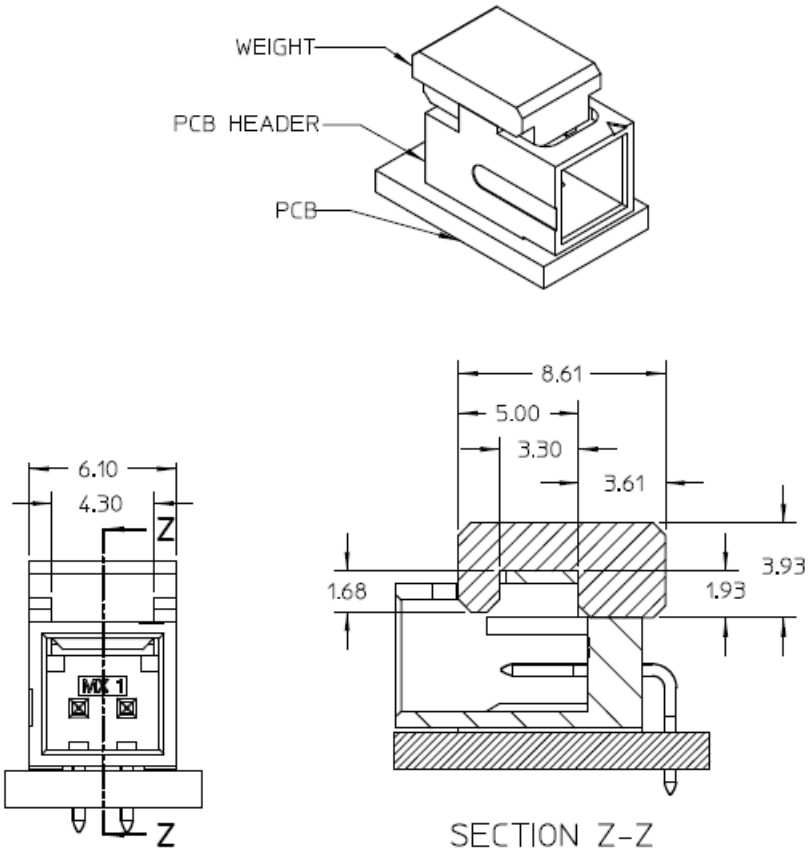


THE GAGE IS SYMMETRICAL



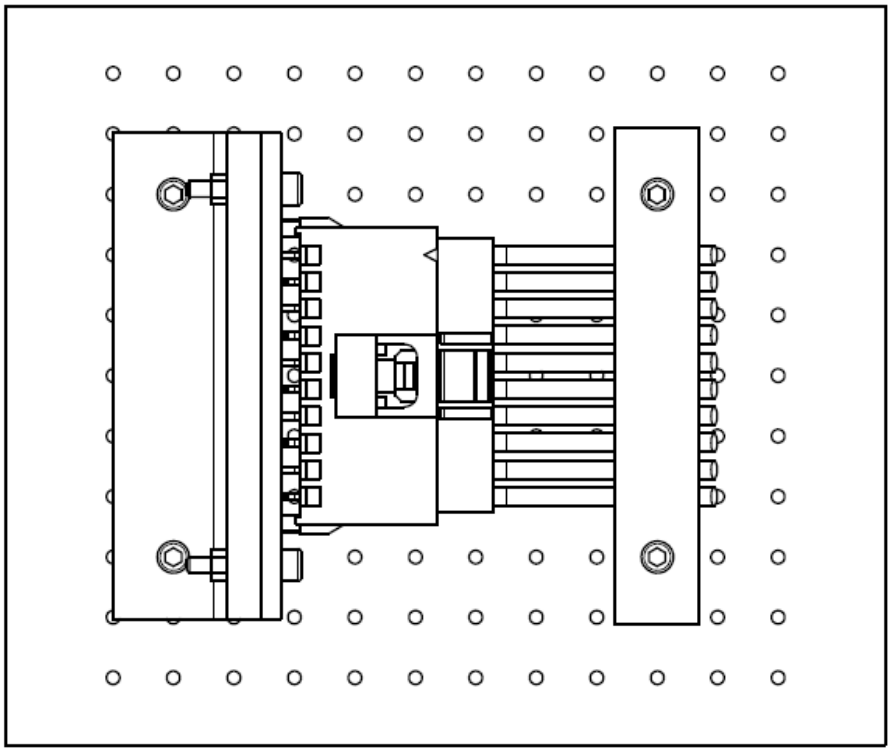
8.2 MOUNTING WEIGHT

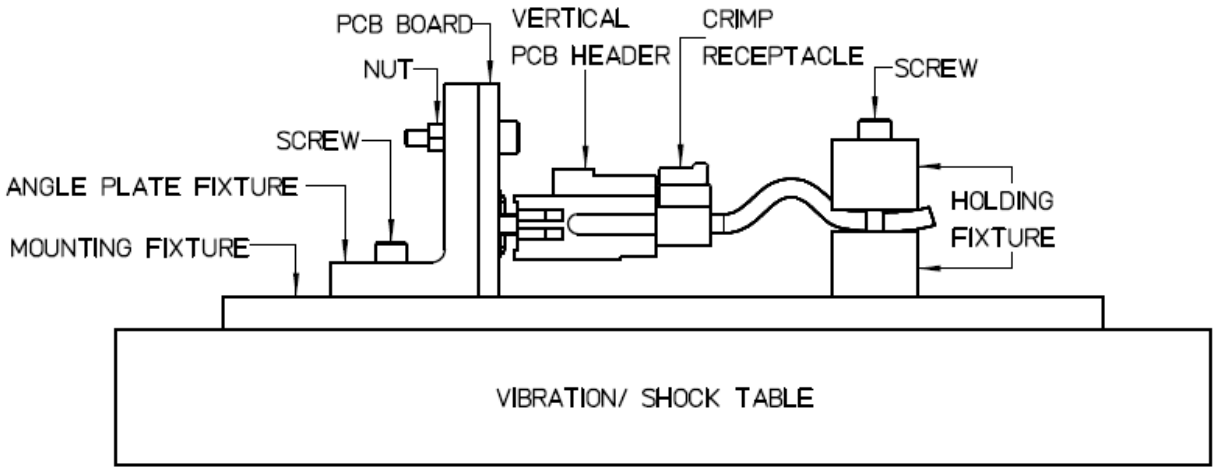
For series 151065, especially when small circuit size used, it is recommended to place a weight (approximately 1g) on connector to minimize the lifting of light weight connector by surface tension of solder paste.



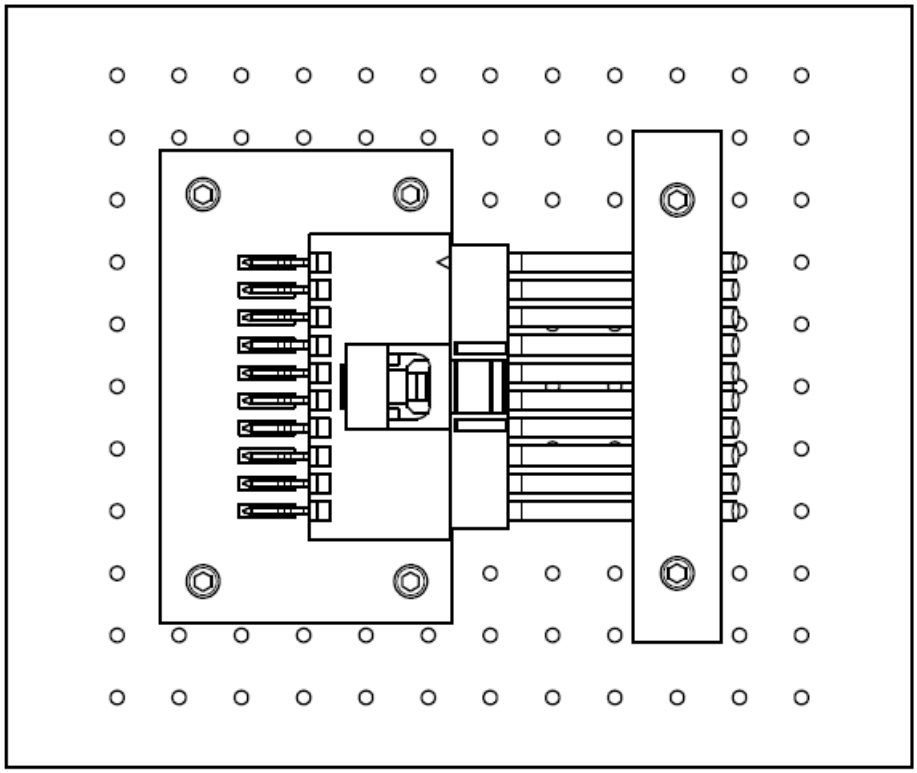
9.0 VIBRATION / SHOCK TEST SETUP

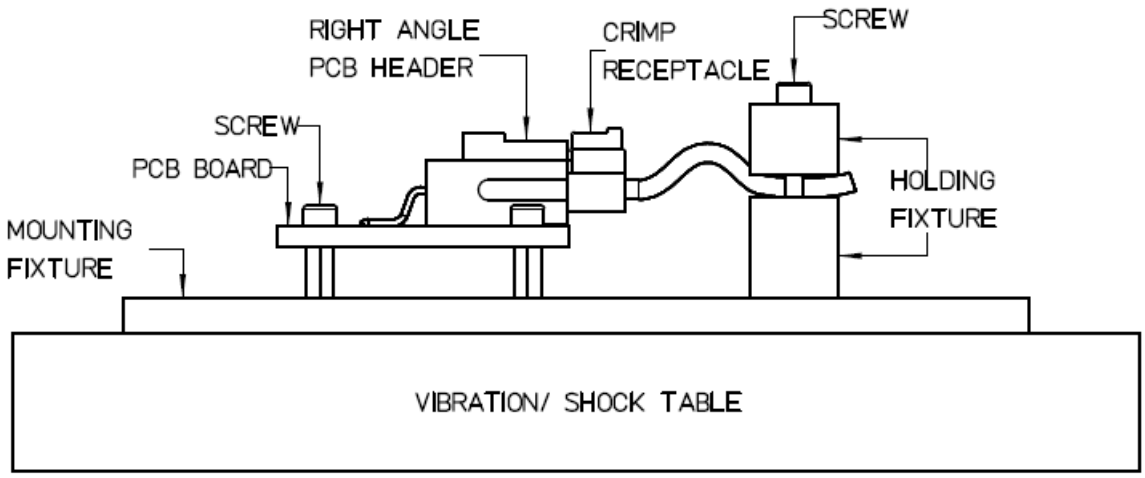
Single row Milligrid receptacle mated with Vertical PCB header. (For reference only)





Single row Milligrid receptacle mated with Right Angle PCB header. (For reference only)





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10.0 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.

10.1 SOLDER PROCESS TEMPERATURE

Processing Temperature for Headers:

Wave Solder : 245 °C Max. for thru Hole Wave Solder only
Reflow Solder : 260 °C Max. for SMT and Thru Hole

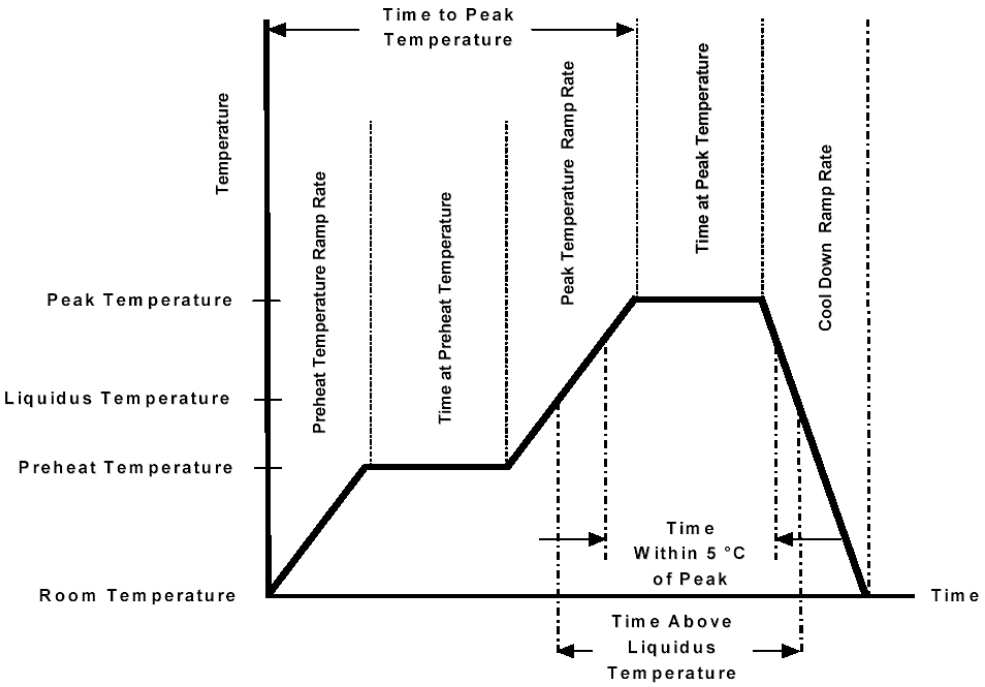
Molex Solderability Specification SMES-152
(Click Here)

10.2 REFLOW SOLDERING PROFILE

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

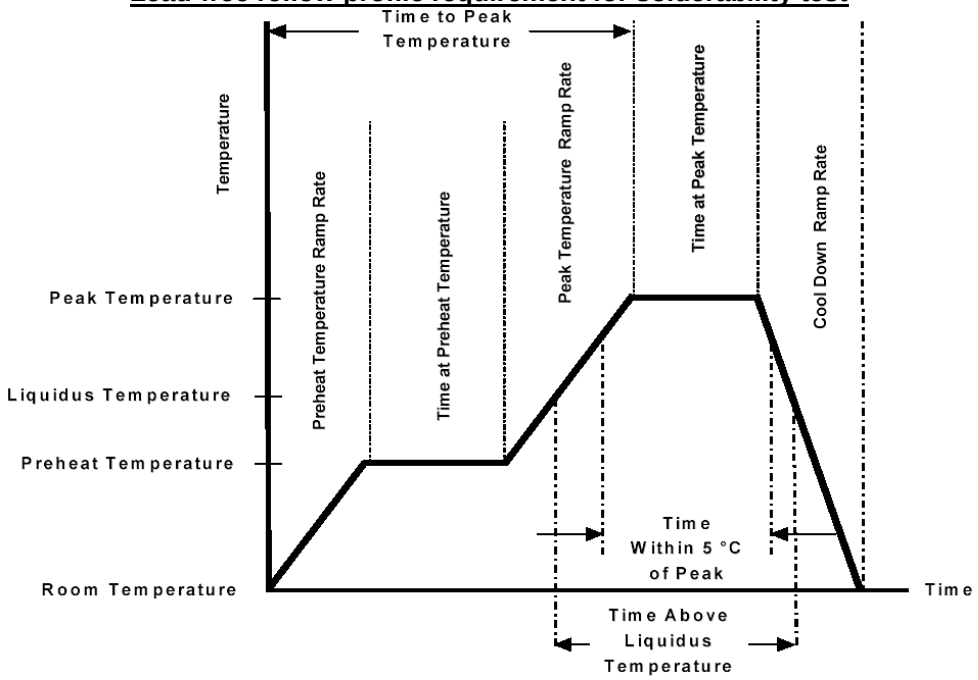
Molex Connector Heat Resistance Specification
AS-40000-5013
(Click Here)

Lead-free reflow profile requirement for soldering heat resistance testing



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

Lead-free reflow profile requirement for solderability test

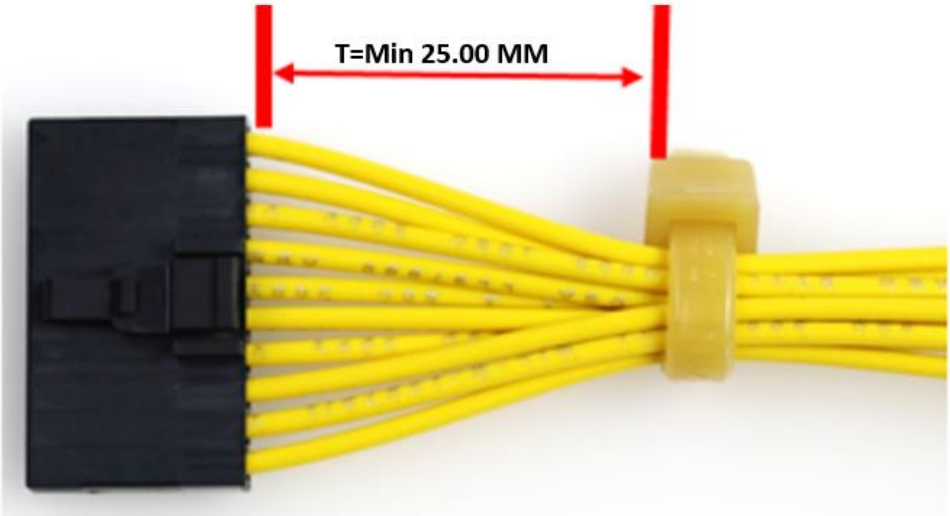


Description	Requirement
Preheat Temperature	160 °C Min to 180 °C Max
Preheat Time	50 to 70 sec
Peak Temperature	230 ~ 245 °C
Time within 5°C of Peak	50 to 70 sec

11.0 PACKAGING

Parts shall be packaging to protect the parts from damage during standard shipping, storage, and handling. Parts are packaged in bulk, tape and reel or tube. Refer Molex.com specific part number webpage to get the exact packaging document for that item

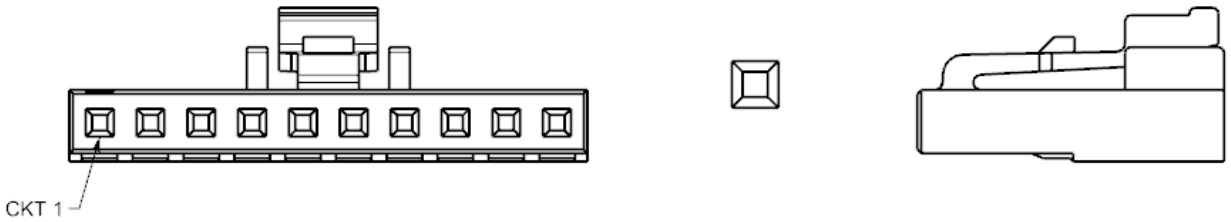
12.0 CABLE TIE AND / OR TWIST TIE LOCATION



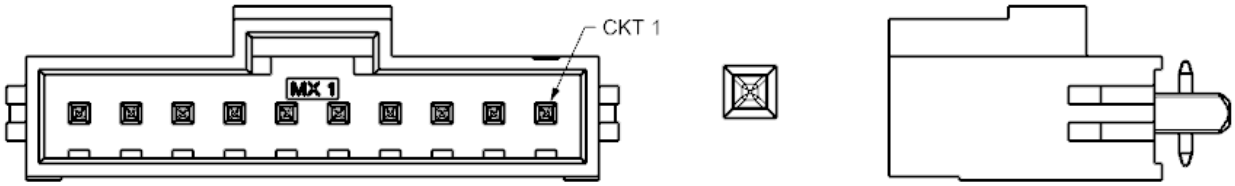
The “T” dimension defines a “free” length of wire, or a length of wire that is not subject to significant bias by external factors such as a wire tie, wire twisting, or other means of bending or deforming of the wires that repositions them from their natural relaxed state or location where they enter 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.

13.0 POLARIZATION AND KEYING OPTIONS

13.1 RECEPTACLE HOUSING (Series: 151100)



13.2 VERTICAL PCB HEADER, SMT (Series: 151062)



13.3 VERTICAL PCB HEADER, TH (Series: 151063)

13.4 RA PCB HEADER, SMT (Series: 151064)

13.5 RA PCB HEADER, TH (Series: 151065)