PRODUCT SPECIFICATION

MINI-FIT TPA

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1.0 SCOPE

This Product Specification covers performance requirements for the MINI-FIT TPA 4.20 mm (.165 inch) centerline (pitch) printed circuit board (PCB) connector series with Tin or Gold plating in Wire-To-Wire, Wire-to-Board and terminated with 16 to 28 AWG wire using Crimp technology.

2.0 PRODUCT DESCRIPTION

2.1 NAMES AND SERIES NUMBER(S)

Table 1 – WIRE-TO-WIRE				
Description	Series Number	UL	CSA	TUV
Female Crimp Terminal	5556	N/A	N/A	N/A
Receptacle Housing, TPA	30067	Yes	Yes	Yes
Male Crimp Terminal	5558	N/A	N/A	N/A
Plug Housing, TPA	30068	Yes	Yes	Yes
CPA Key	30071	N/A	N/A	N/A
TPA Key	30072	N/A	N/A	N/A

Table 2 – WIRE-TO-BOARD				
Description	Series Number	UL	CSA	TUV
Female Crimp Terminal	5556	N/A	N/A	N/A
Receptacle Housing, TPA	30067	Yes	Yes	Yes
Vertical Header, TPA	30069	Yes	Yes	Yes
Right Angle Header, TPA	30070	Yes	Yes	Yes
Vertical Header, TPA	44482	Yes	Yes	No
Right Angle Header, TPA	44483	Yes	Yes	No
CPA Key	30071	N/A	N/A	N/A
TPA Key	30072	N/A	N/A	N/A

Other products conforming to this specification are noted on the individual drawings.

2.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKINGS

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

2.3 SAFETY AGENCY APPROVALS

UL File: E29179
CSA Certificate: LR19980
TUV Certificate: R72081037

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

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

4.0 RATINGS

4.1 VOLTAGE

600 Volts AC (RMS) (or 600 Volts DC)

4.2 APPLICABLE WIRES

Applicable Wire Gauges And Maximum Insulation Diameter	16 AWG: 3.10 / .122 MAXIMUM
	18-20 AWG: 3.10 / .122 MAXIMUM
	22-28 AWG: 1.80 / .071 MAXIMUM

4.3 MAXIMUM CURRENT RATING (Amperes)**

Table 3 – WIRE-TO-WIRE

Brass					Phosphor Bronze				
Ckt. Size / Wire	2-3	4 - 6	7 - 10	11 - 16	Ckt. Size / Wire	2-3	4 - 6	7 - 10	11 - 16
AWG #16	9	8	7	6	AWG #16	8	7	6	5
AWG #18	9	8	7	6	AWG #18	8	7	6	5
AWG #20	7	6	5	5	AWG #20	6	5	4	4
AWG #22	5	4	4	4	AWG #22	4	3	3	3
AWG #24	4	3	3	3	AWG #24	3	2	2	2
AWG #26	3	2	2	2	AWG #26	2	1	1	1
AWG #28	2	1	1	1	AWG #28	1	1	1	1

4.3 MAXIMUM CURRENT RATING (continued)

Table 4 – WIRE-TO-BOARD

Brass					Phosphor Bronze				
Wire \ Ckt. Size	2-3	4 - 6	7 - 10	11 - 16	Wire \ Ckt. Size	2-3	4 - 6	7 - 10	11 - 16
AWG #16	9	8	7	6	AWG #16	8	7	6	5
AWG #18	9	8	7	6	AWG #18	8	7	6	5
AWG #20	7	6	5	5	AWG #20	6	5	4	4
AWG #22	5	4	4	4	AWG #22	4	3	3	3
AWG #24	4	3	3	3	AWG #24	3	2	2	2
AWG #26	3	2	2	2	AWG #26	2	1	1	1
AWG #28	2	1	1	1	AWG #28	1	1	1	1

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

Operating: * - 40°C to + 105°C
Nonoperating: - 40°C to + 105°C
**Including 30°C terminal temperature rise at rated current*

4.5 WAVE SOLDER PROCESS TEMPERATURE

Headers with pegs: 240°C MAX.
Headers without pegs: 260°C MAX.

5.0 WIRE-TO-WIRE PERFORMANCE

5.1 ELECTRICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Contact Resistance (Low Level)**	Mate connectors: apply a maximum voltage of 20 mV and a current of 100 mA. Wire resistance shall be removed from the measured value.	10 milliohms MAXIMUM [initial]
2	**Insulation Resistance**	Mate connectors: apply a voltage of 500 VDC between adjacent terminals and between terminals to ground.	1000 Megohms MINIMUM
3	**Dielectric Withstanding Voltage**	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
4	**Temperature Rise (via Current Cycling)**	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

5.2 MECHANICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Terminal Mate and Unmate Forces Per Circuit**	Insert and withdraw terminal (male to female) at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	14.7 N (3.30 lbf) MAXIMUM insertion force & 0.5 N (0.11 lbf) MINIMUM withdrawal force
2	**Crimp Terminal Retention Force (in Housing)**	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) MINIMUM retention force See SECTION 5.2.7 for Wire Crimp Pullout Forces
3	**Crimp Terminal Retention Force (in Housing With TPA Key)**	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	88.0 N (19.8 lbf) MINIMUM retention force See SECTION 5.2.7 for Wire Crimp Pullout Forces
4	**Durability**	Mate connectors up to 30 cycles at a maximum rate of 10 cycles per minute prior to Environmental Tests.	20 milliohms MAXIMUM (change from initial)
5	**Vibration (Random)**	Mate connectors and vibrate per EIA 364-28, test condition VII.	10 milliohms MAXIMUM (change from initial) & Discontinuity < 1 microsecond
6	**Shock (Mechanical)**	Mate connectors and shock at 50 g's with ½ sine wave (11 milliseconds) shocks in the ±X, ±Y, ±Z axes, (18 shocks total).	20 milliohms MAXIMUM (change from initial) & Discontinuity < 1 microsecond
7	**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 = 88.0 N (19.8 lbf) Min. 18 Awg = 88.0 N (19.8 lbf) Min. 20 Awg = 59.0 N (13.3 lbf) Min. 22 Awg = 39.0 N (8.78 lbf) Min. 24 Awg = 29.0 N (6.52 lbf) Min. 26 Awg = 19.0 N (4.27 lbf) Min. 28 Awg = 9.80 N (2.20 lbf) Min.
8	**Crimp Terminal Insertion Force (into Housing)**	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch).	15.0 N (3.37 lbf) MAXIMUM insertion force
9	**Normal Force**	Apply a perpendicular force.	0.49 N (50 grams) MINIMUM [Gold (noble) plating] OR 1.47 N (150 grams) MINIMUM [Tin (non-noble) plating]

5.2 MECHANICAL REQUIREMENTS (continued)

10	**Thumb Latch Operation Force**	Depress latch at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	16.67 N (3.75 LBF) MAX.
11	**Thumb Latch Yield Strength**	Mate loaded connectors fully. Pull connectors apart at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	68 N (15.29 LBF) MIN.
12	**Panel Insertion and Withdrawal Forces (for 30067 with 43130 Snap-on Ears installed)**	Insert and withdraw a connector at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	225 N (50.7 lbf) MAXIMUM insertion force & 157 N (35.3 lbf) MINIMUM withdrawal force

5.3 ENVIRONMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Thermal Shock**	Mate connectors: expose for 5 cycles Between temperatures –55 and 105° C; Dwell 0.5 hours at each temperature.	20 milliohms MAXIMUM (change from initial) Visual: No Damage Dielectric Strength per 5.1.5 Insulation Resistance per 5.1.4
2	**Thermal Aging**	Mate connectors; expose to: 96 hours at 105 ± 2°C	20 milliohms MAXIMUM (change from initial) & Visual: No Damage
3	**Humidity (Steady State)**	Mate connectors: expose to a temperature of 60 ± 2°C with a relative humidity of 90-95% for 96 hours.	20 milliohms MAXIMUM (change from initial) Dielectric Strength per 5.1.5 Insulation Resistance per 5.1.4 Visual: No Damage
4	**Mixed Flowing Gas**	EIA-364-65 with Class IIa Gas concentrations (Gold plated only)	20 milliohms MAXIMUM (change from initial) Visual: No Damage

6.0 WIRE-TO-BOARD PERFORMANCE

6.1 ELECTRICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Contact Resistance (Low Level)**	Mate connectors: apply a maximum voltage of 20 mV and a current of 100 mA. Wire resistance shall be removed from the measured value.	10 milliohms MAXIMUM [initial]
2	**Insulation Resistance**	Mate connectors: apply a voltage of 500 VDC between adjacent terminals and between terminals to ground.	1000 Megohms MINIMUM
3	**Dielectric Withstanding Voltage**	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
4	**Temperature Rise (via Current Cycling)**	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

6.2 MECHANICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Terminal Mate and Unmate Forces Per Circuit**	Insert and withdraw terminal (male to female) at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	14.7 N (3.30 lbf) MAXIMUM insertion force & 0.5 N (0.11 lbf) MINIMUM withdrawal force
2	**Crimp Terminal Retention Force (in Housing)**	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) MINIMUM retention force
3	**Crimp Terminal Retention Force (in Housing With TPA Key)**	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	SEE SECTION 6.2.9
4	**Solid PC Tail Header Pin Retention Force (in Housing)**	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute.	4.45 N (1.00 lbf) MINIMUM retention force
5	**Stamped PC Tail Terminal Retention Force (in Housing)**	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) MINIMUM retention force
6	**Durability**	Mate connectors up to 30 cycles at a maximum rate of 10 cycles per minute prior to Environmental Tests.	20 milliohms MAXIMUM (change from initial)
7	**Vibration (Random)**	Mate connectors and vibrate per EIA 364-28, test condition VII.	10 milliohms MAXIMUM (change from initial) & Discontinuity < 1 microsecond
8	**Shock (Mechanical)**	Mate connectors and shock at 50 g's with ½ sine wave (11 milliseconds) shocks in the ±X, ±Y, ±Z axes, (18 shocks total).	20 milliohms MAXIMUM (change from initial) & Discontinuity < 1 microsecond
9	**Wire Pullout Force (Axial)**	Apply an axial pullout force on the wire at a rate of 25 ± 6 mm (1 ± ¼ inch).	16 Awg = 88.0 N (19.8 lbf) Min. 18 Awg = 88.0 N (19.8 lbf) Min. 20 Awg = 59.0 N (13.3 lbf) Min. 22 Awg = 39.0 N (8.78 lbf) Min. 24 Awg = 29.0 N (6.52 lbf) Min. 26 Awg = 19.0 N (4.27 lbf) Min. 28 Awg = 9.80 N (2.20 lbf) Min.

6.2 MECHANICAL REQUIREMENTS (continued)

10	**Crimp Terminal Insertion Force (into Housing)**	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch).	15.0 N (3.37 lbf) MAXIMUM insertion force
11	**Normal Force**	Apply a perpendicular force.	0.49 N (50 grams) MINIMUM [Gold (noble) plating] OR 1.47 N (150 grams) MINIMUM [Tin (non-noble) plating]
12	**PCB Peg Engagement and Separation Forces**	Engage and separate a connector at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. (Applies to parts with PCB retention features only with PCB holes at nominal diameter)	98.0 N (22.0 lbf) MAXIMUM insertion force & 10.0 N (2.24 lbf) MINIMUM withdrawal force
13	**Thumb Latch Operation Force**	Depress latch at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	16.67 N (3.75 LBF) MAX.
14	**Thumb Latch Yield Strength**	Mate loaded connectors fully. Pull connectors apart at a rate of 25 ± 6mm (1 ± ¼ inch) per minute.	68 N (15.29 LBF) MIN.

6.3 ENVIRONMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Thermal Shock**	Mate connectors: expose for 5 cycles Between temperatures –55 and 105° C; Dwell 0.5 hours at each temperature.	20 milliohms MAXIMUM (change from initial) Visual: No Damage Dielectric Strength per 5.1.5 Insulation Resistance per 5.1.4
2	**Thermal Aging**	Mate connectors; expose to: 96 hours at 105 ± 2°C	20 milliohms MAXIMUM (change from initial) & Visual: No Damage
3	**Humidity (Steady State)**	Mate connectors: expose to a temperature of 60 ± 2°C with a relative humidity of 90-95% for 96 hours.	20 milliohms MAXIMUM (change from initial) Dielectric Strength per 5.1.5 Insulation Resistance per 5.1.4 Visual: No Damage
4	**Solderability**	Per SMES-152	Solder coverage: 95% MINIMUM (per SMES-152)
5	**Solder Temperature Heat Transfer Resistance**	Dip connector terminals tail in solder: Solder Duration: 5 ± 0.5 seconds; Solder Temperature: 260 ± 5°C	Visual: No Damage to the insulator where the terminal or pin locks to the connector housing
6	**Mixed Flowing Gas**	EIA-364-65 with Class IIa Gas concentrations (Gold plated only)	20 milliohms MAXIMUM (change from initial) Visual: No Damage

7.0 TEST SEQUENCES

Testing sequences to be performed in accordance with EIA-364-1000.01

8.0 PACKAGING

Parts shall be packaged to protect against damage during normal handling, transit and storage.