

1.0 Scope:

1.1 Content:

This specification covers the requirements for product performance, test methods and quality assurance provisions of the Low Profile 5A Battery Connector.

2.0 Applicable Documents:

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 TE Connectivity Documents:

501-115107: Qualification Test Report

2.2 TE Connectivity Drawings:

C-2289817 Customer drawing of "Low profile 5A battery connector"

2.3 Commercial Standards and Specifications:

2.3.1 MIL-STD-202 : Test methods for electronic and electrical component parts.

2.3.2 EIA 364 : Test specification

3.0 Requirements:

3.1 Design and Construction:

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2 Material:

3.2.1 Contact: Copper alloy, Nickel-under plated all over. Gold plated at contact area. Gold flash plated at soldering area

3.2.2 Housing: Thermoplastic molding compound, black.

3.2.3 Solder peg: Metal alloy, Nickel-under plated all over. Tin plated overall.

3.3 Ratings:

A. Voltage rating: 30V DC

B. Current rating: 5A /Contact

C. Temperature rating: -40°C to $+85^{\circ}\text{C}$ High limit temperature includes raised temperature by operation.

3.4 Performance Requirements and Test Descriptions:

The product shall be designed to meet the electrical, mechanical and environmental performance requirements specified in **section 3.5**. All tests shall be performed in the room temperature, unless otherwise specified.

3.5 Test Requirements and Procedures Summary:

3.5.1 Examination:

Test Description	Requirement	Procedures
3.5.1 Visual examination of product	Meets requirements of product drawing and applicable instructions on customer drawing, and application specification.	Visual, dimensional and functional per applicable inspection plan. In according with IEC 60512-1-1 Magnification 10x

3.5.2 Electrical

Test Description	Requirement	Procedures
3.5.2.1 Contact resistance (LLCR)	30mΩ Max. at 1.0mm return stroke @ 25°C 30mΩ Max. at 1.0mm return stroke @ -30°C 30mΩ Max. at 1.0mm return stroke @ 85°C	Subject specimens to 20mV Max. Open circuit at 100mA. Need to exclude wire resistance from measurement. See fig. 1 Per EIA 364-23
3.5.2.2 Insulation resistance	1000 MΩ Min.	Subject specimens to 100VDC, 1 minute hold. Test between adjacent contacts. Per EIA 364-21
3.5.2.3 Withstanding Voltage	Neither creeping discharge nor flashover shall occur Current leakage: 1mA Max.	Unmated Connector with 500 VAC between adjacent terminals for 1 minute. Per EIA 364-20
3.5.2.4 Temperature rise	Rated current is applied to the contacts, the delta temperature shall not exceed +30 ° C.	A current of 5.0A shall be applied to power pin and its corresponding GND pin. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1 °C. Energize 100% of the circuit.(Refer to fig. 2) Per EIA 364-70,Method 2
3.5.2.5 Withstand current test	LLCR normal force meet 3.5.2.1 requirement Contact normal force meet 3.5.3.1	A current of 5.0A shall be applied to power pin and its corresponding GND pin. Duration: 12 hours. Lifting speed voltage: 500V / S

3.5.3 Mechanical

Test Description	Requirement	Procedures
3.5.3.1 Contact normal force	80gf Min. at 0.70 mm return stroke 100gf Min. at 1.00mm return stroke 120gf~280gf at 1.30mm return stroke	Measure force necessary to mate samples at rate of 10.0mm a minute. Refer to Fig 3. Per EIA-364-13 ,Method A
3.5.3.2 Durability	No physical damage to any part of the connectors. Contact resistance : 50mΩ Max. at 1.0mm stroke(Final) Contact normal force change <20% from initial status:	Mating/un-mating samples for 5000 cycles at maximum rate of 10~20 cycles per minute with 1.0mm stroke. Record the value of at 1000, 3000, 5000 cycles. Per EIA-364-09
3.5.3.3 Contact strength	LLCR normal force meet 3.5.2.1 requirement Contact normal force meet 3.5.3.1 requirement; The permanent deformation of contact 0.20mm max. in 4 direction.	Apply 8N force with the push pole in X1,X2,Z1,Z2 4 direction on the contact at rate of 10.0mm a minute.(the connector must soldered on the test board) refer to fig. 4
3.5.3.4 Solder pegs retention force	Solder peg without any loosing; Connector without any damage; And the solder pegs dimension meet the drawing specification.	Apply 5N force with the push the solder pegs as at rate of 10.0mm a minute(the connector must soldered on the test board) refer to fig. 5
3.5.3.5 Drop test	No electrical discontinuities greater than 50us shall occur. No evidence of physical damage. LLCR normal force meet 3.5.2.1 requirement Contact normal force meet 3.5.3.1	Drop height:1.2 meter Drop the 3 times in every surface if the fixture(total 6 surface,18 times) (the connector must soldered on the test board which fixed on the test fixture) Refer to fig. 6
3.5.3.6 Vibration(sinusoidal)	In vibration process, the voltage increasing of the oscilloscope does not exceed 1.2V. No evidence of physical damage. LLCR normal force meet 3.5.2.1 requirement	Sine Sweep: 5 ~ 9Hz, 1.2mm/s ² ; 9 ~ 200Hz; 4m / s ² sweep rate: 1oct / min. Three axis, each axis 5 cycles.

	Contact normal force meet 3.5.3.1	Logarithmic sweep mode Sinusoidal vibration: a) Mated connector will be subject to another three cycles five minutes sinusoidal vibration peak to peak 0.76mm. In a period of two and a half minutes from 10Hz to 30Hz, then in two and a half minutes from 30Hz reduced to 10Hz. b) then samples will be subject to another three cycles five minutes sinusoidal vibration peak to peak 0.38mm. In a period of two and a half minutes from 30Hz to 60Hz, then the decrease in 2 and a half from 60Hz to 30Hz. these vibration a) and b) must be subjected to each axial. Refer to fig.6 and fig. 7
3.5.3.7 Vibration(Random)	In vibration process, the voltage increasing of the oscilloscope does not exceed 1.2V. No evidence of physical damage. LLCR normal force meet 3.5.2.1 requirement Contact normal force meet 3.5.3.1	Mated connectors subject to : Frequency range: 20-2000HZ; Acceleration: 20-1000HZ 0.04g2 / HZ 1000-2000HZ -6dB / Oct Vibration time: each axis (X, Y, Z) for 1 hour Refer to fig.6
3.5.3.8 Physical shock	No electrical discontinuities greater than 50us shall occur. No evidence of physical damage. LLCR normal force meet 3.5.2.1 requirement Contact normal force meet 3.5.3.1	Accelerated Velocity: 400m/s2 Waveform: Half sin Duration: 11m sec. Number of drops: 3 drops each to normal and reversed directions of X, Y and Z axes, totally 18 drops. 100mA applied Per EIA 364-27 Method A Refer to fig.6
3.5.3.8 Peeling strength	No visible physical damage shall be noticed to a soldered connector when it is pulled up from the PCB in the 4 directions with a minimum force of 30N.	Solder connectors onto PCB, Press the connector from 4 directions at rate of 10.0mm a minute. Refer to fig. 8.

3.5.4 Environmental

Test Description	Requirement	Procedures
3.5.4.1 Low temperature storage test	No mechanical damage, no performance change. Contact resistance : 30m Ω Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min.	Subject mated samples to temperature of -40°C 96 hours or longer (Connector should soldered on the testing board. Cool down from ambient temperature to -40°C with speed 1 °C/minute , keep the temperature at -40°C or lower for 96 hours or longer, then temperature rise to 25°C with 1 °C/minute speed),Recovery 1 hours at ambient atmosphere. (JIS-C0020)
3.5.4.2 High temperature storage test	No mechanical damage, no performance change. Contact resistance : 30m Ω Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min.	Subject mated samples to temperature of 85°C 96 hours or longer (Connector should soldered on the testing board. Temperature up from ambient temperature to 85°C with speed 1 °C/minute , keep the temperature at 85°C or lower for 96 hours or longer, then cool down to 25°C with 1 °C/minute speed),Recovery 1 hours at ambient atmosphere. (JIS-C0021)
3.5.4.3 Salt spray	No corrosion that damages function of connector allowed. Contact resistance : 30m Ω Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min	Subject mated connectors with 5 %, 35°C concentration for 48 hours; drying 2 hours Per EIA 364-26 Condition B
3.5.4.4 High-temperature high-humidity test	No mechanical damage, no performance change. Contact resistance : 30m Ω Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min.	Subject mated samples to continuously for 168 hours or longer at 65°C and 95% relative humidity. (Connector should soldered on the testing board. Temperature and humidity up time: 1 hour, Temperature and humidity: 1 hour, recovery time: 1hour). Refer to fig. 9
3.5.4.5 Thermal shock	No mechanical damage, no performance change. Contact resistance : 30m Ω Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min	Subject mated samples to 24 cycles between -40°C and +85°C (transfer time <25s),Duration:2hours for each cycles; then cool to ambient temperature.

		Recovery 2hours at ambient atmosphere.
3.5.4.6 Cyclic temperature & Humidity	No mechanical damage, no performance change. Contact resistance : 30mΩ Max. at 1.0mm stroke. Insulation resistance: 1000 MΩ Min	Subject mated samples to 25~55°C, 95% R.H. 24 hours for 2 cycles. Then recovery to 25°C, 95% R.H. in an hour; and keep 1 hour for recovery. (Connector should soldered on the testing board) .Refer to fig. 10
3.5.4.7 Solder-ability	Contact solder pad shall have a Min. 95% solder coverage	Dip solder tails into the molten solder (held at 245±5°C) up to 0.5mm from the tip of tails for 3 ±0.5 seconds. Flux: Alpha 100 Per EIA 364-52
3.5.4.8 Resistance to soldering heat	No physical damage shall occur	Soldering iron temperature: 380±10°C 5sec. Max. No pressurize a tine Per EIA 364-56
3.5.4.9 Resistance to reflow heat	No physical damage shall occur The co-planarity less than 0.08 (initial) The co-planarity less than 0.10 (Final)	Temperature profile; Refer to fig. 11 Per EIA 364-56

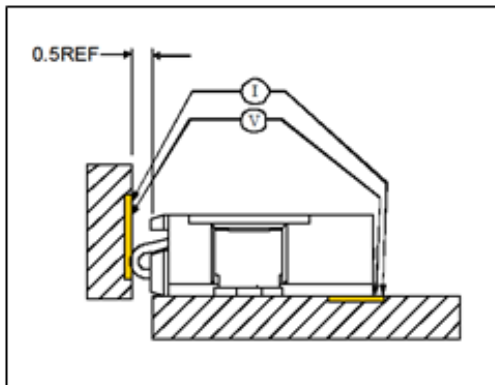


Fig. 1: Contact resistance measuring points

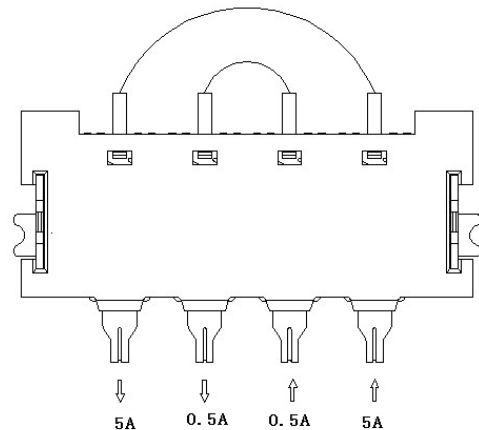


Fig. 2: Temperature rise measurement method

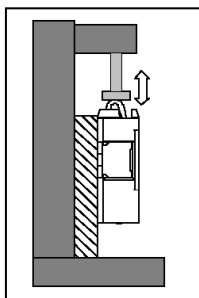


Fig. 3: Contact normal force measuring method

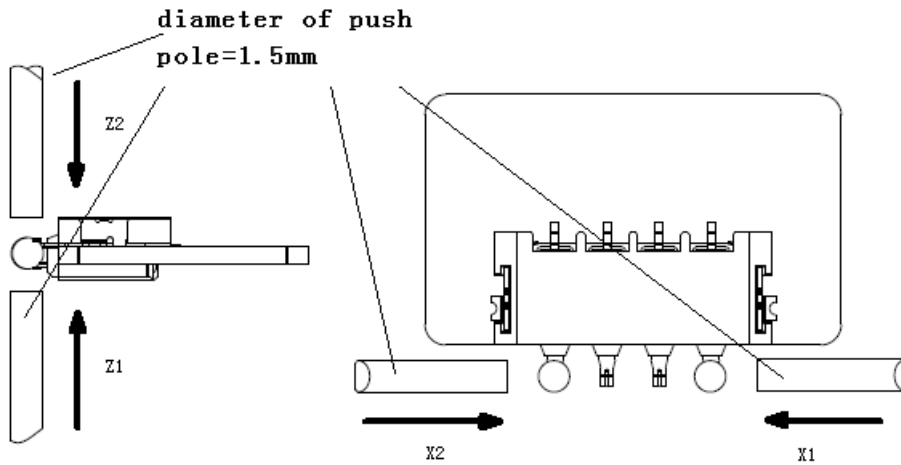


Fig. 4: Contact strength test

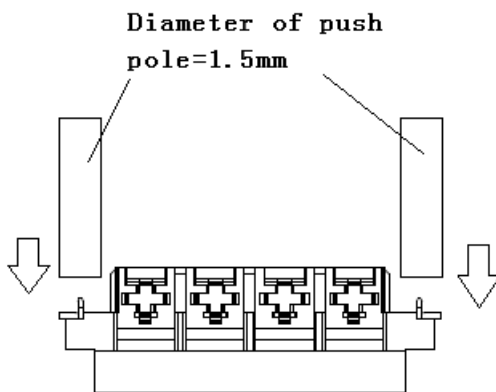


Fig. 5: Solder peg retention force test

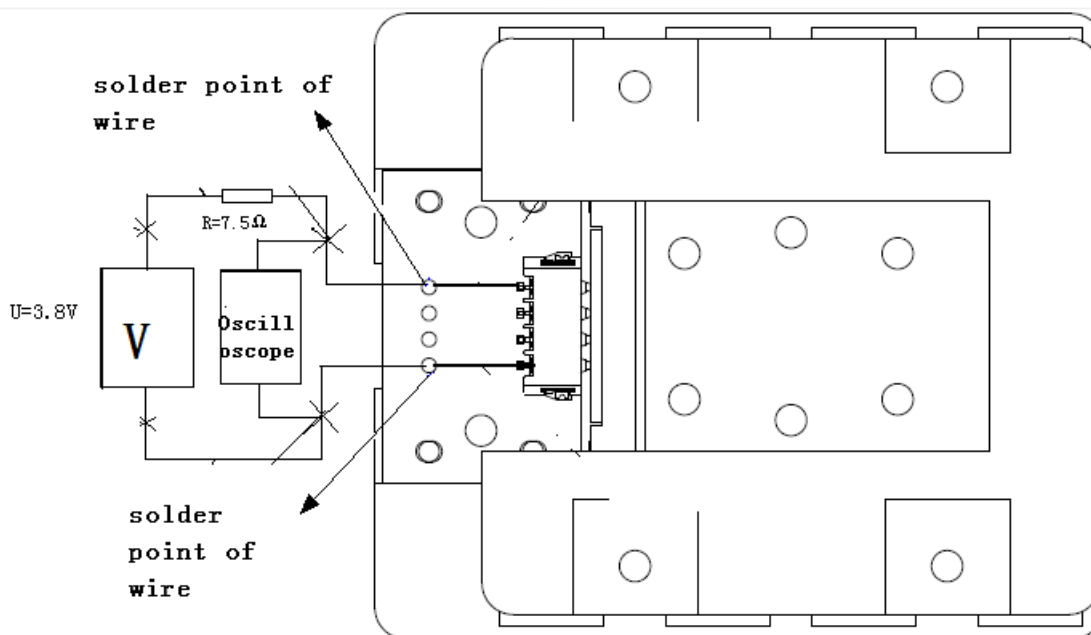


Fig. 6: Drop test, vibration, Physical shock test method

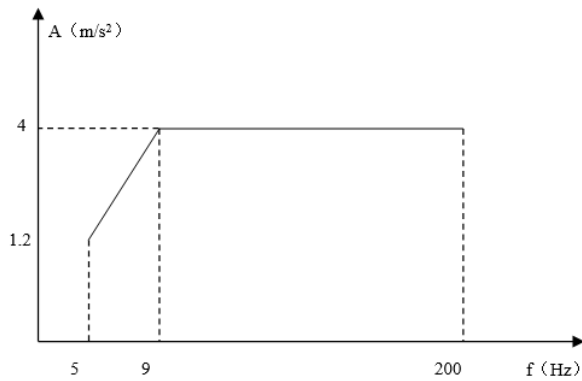


Fig. 7: Vibration (sinusoidal) test curve

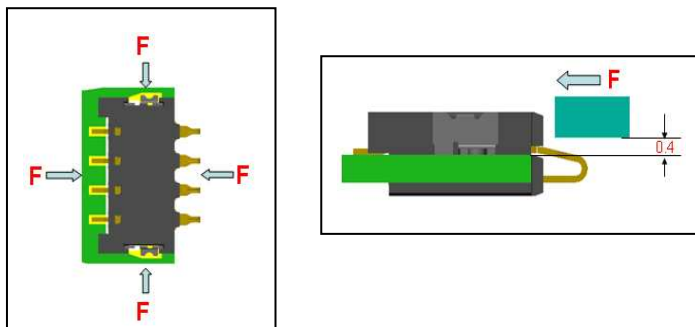


Fig. 8: Peeling strength measurement method

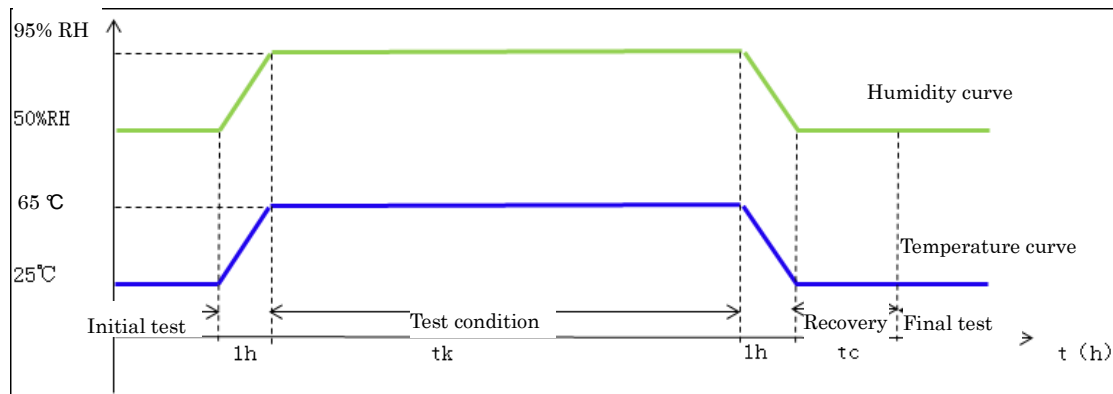


Fig. 9: High-temperature high-humidity test

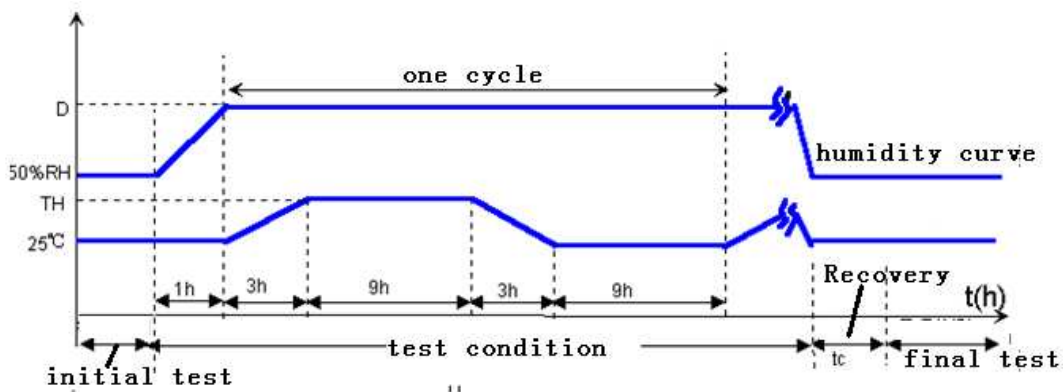
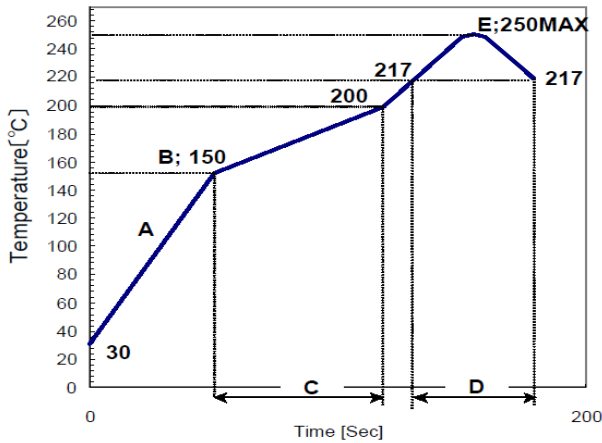


Fig. 10: Cyclic temperature & Humidity test

3.5.5 Resistance to Soldering Reflow Heat Test Condition:

Resistance to soldering-heat test shall cover the IR-soldering heat-curve as indicated in figure 3. Ref. IPC/JEDEC J-STD-020B with increased T peak.



	Condition
A : The speed of temperature rising	3.0 °C /s Max
B: The start temperature of pre-heating	150~200 °C
C: Time of pre-heating	60~ 180sec
D: Time of up to 217 °C	60~150sec
E: Temperature of peak point	250°C

Number of reflow times; 2 times.

Fig 11: Temperature profile for IR reflow

3.6 Product Qualification Test Sequence

Item	Group	1	2	3	4	5	6	7	8	9	10	11	12
	Sample size	5	5	10	16	5	5	5	10	5	5	5	5
Resistance to soldering reflow heat		1	1	1	1	1	1	1	1	1		1	1
Visual examination of product		2,6	2,6	2,6	2,6	2,6	2,6	2	2,8	2,4	1,3	2,4	2,4
Contact resistance (LLCR)		3,7	3,7	3,7	3,7	3,7	3,7		3,6	6		6	6
Insulation resistance		4,8	4,8	4,8	4,8	4,8	4,8						
Withstanding Voltage													
Temperature rise													
Withstand current test													
Contact normal force								3	4,7	5		5	5
Durability									5				
Contact strength										3			
Solder pegs retention force											2		
Drop test												3	
Vibration(sinusoidal)													3
Vibration(Random)													
Physical shock													
Peeling strength													
Low temperature storage test		5											
High temperature storage test			5										
Salt spray				5									
High-temperature high-humidity test					5								
Thermal shock						5							
Cyclic temperature & Humidity							5						
Solder-ability													
Resistance to soldering heat													

Item	Group	13	14	15	16	17	18	19	20	21	22
	Sample size	5	5	5	10	5	5	10	5	5	5
Resistance to reflow heat		1	1	1	1	1	1	1		1	
Visual examination of product		2,4	2,4	2,4	2	2	2	2	1	2	1
Contact resistance (LLCR)		6		6		3				5	
Insulation resistance							3				
Withstanding Voltage								3			
Temperature rise					3						
Withstand current test										3	
Contact normal force		5		5						4	
Durability											
Contact strength											
Solder pegs retention force											
Drop test											
Vibration(sinusoidal)											
Vibration(Random)		3									
Physical shock			3								
Peeling strength				3							
Low temperature storage test											
High temperature storage test											
Salt spray											
High-temperature high-humidity test											
Thermal shock											
Cyclic temperature & Humidity											
Solder-ability									2		
Resistance to soldering heat											2

(a).Numbers indicate sequence in which the tests are performed.

4. Quality assurance Provisions

4.1 Qualification Testing

A. Sample selection

Connector shall be selected at random from current production.

B. Sample preparation:

All test samples must be subjected 2 times reflow soldered on the test board before the test excluding the 3.5.3.4, 3.5.4.7, 3.5.4.8 and 3.5.4.9.