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Index

1. Scope

2. Application Documents

2.1. ECT Electronics Documents

2.2. Commercial Standard

3. Requirements

3.1. Design & Construction

3.2. Material

3.3. Ratings

3.4. Performance Requirement & Test Description

3.5. Test Requirements & Procedures Summary

3.6. Product Qualification & Requalification Test

4.Appendices

A. Current Rating Test

1.SCOPE

This specification covers the requirements for product performance and test methods of ECT USB Type-C connectors of the part numbers specified as below Product shall be of the design structure and physical dimensions specified in the applicable product drawing.

2.Application 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. ECT Electronics Documents

1) 600-4338-01: Customer Drawing

2.2. Commercial Standard

1) MIL-STD-202: Military specification on test methods for electronic & electric parts.
2) EIA-364: Electrical connector test procedures including environmental classifications.

3.Requirements

3.1. Design & Construction

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

3.2. Material

Housing
Material: High Temperature Thermoplastics, Glass Filled, UL94 V-0, Black
Top Terminal
Material: Copper Alloy
Finish: Gold plating on contact area; Gold-Flash plating on solder area; All over Nickel under plating
Bottom Terminal
Material: Copper Alloy
Finish: Gold plating on contact area; Gold-Flash plating on solder area; All over Nickel under plating
Mid-Plate
Material: Stainless Steel
Finish: Nickel plating all over;
Shell
Material: Stainless Steel
Finish: Nickel plating all over;

3.3. Ratings:

A. Voltage: DC 30V
B. Current:
5 A Max. for GND & V_{BUS}Pin(A1,A12,B1,B12 & A4,A9,B4,B9);
0.25 A for other Pin
C. Temperature: -45℃~85℃

3.4. Performance Requirement & Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirement specified in chapter 3.5

3.5. Test Requirements

Item	Description	Test Procedure	Requirement
Electrical Performance			
3.5.1	Low Level Contact Resistance(LLCR)	EIA 364-23 The low level contact resistance (LLCR) measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. The test boards shall be provided with the connectors to be tested. • Measure at 20 mV (Max.) open circuit at 100 mA.	The following requirements apply to the power and signal contacts: -40 mΩ(Max.) initial f -Delta 10 mΩ (Max.) after initial measurement.
3.5.2	Dielectric Withstanding Voltage	EIA 364-20 Applicable to both receptacle and plug. • Measurement per Method B.	The dielectric shall withstand 100 VAC (RMS) for one minute at sea level after the environmental stress defined in Test Group D
3.5.3	Insulation Resistance	EIA 364-21 Applicable to both receptacle and plug. See Test Group D	A minimum of 100 MΩ insulation resistance is required between adjacent contacts of unmated and mated connectors.
3.5.4	Contact Current Rating (Temperature Rise)	See Appendix A EIA 364-70A When measured at an ambient temperature of 25°C.	When current is applied to the contacts, the temperature rise shall not exceed limit at the location defined in Appendix A.
Mechanical & Environmental Performance			
3.5.5	Critical Dimension Inspection	See Customer Drawing	Meet all critical dimension requirements defined in Customer Drawing
3.5.6	Insertion Force	EIA 364-13 The insertion force test shall be done at a maximum speed of 12.5 mm (0.492") per minute.	Within the range of 5N-20N. This requirement does not apply to the plugs that are used for direct docking without a cable
3.5.7	Extraction Force	EIA 364-13 The extraction force test shall be done at a maximum speed of 12.5 mm (0.492") per minute.	a) Within the range of 8N-20N, b) Within the range of 6N to 20N after 10,000 insertion/extraction cycles. This requirement does not apply to the plugs that are used for direct docking without a cable

3.5.8	Durability	EIA 364-09	10,000 cycles minimum. Low level contact resistance and dielectric withstanding voltage shall be checked to be within spec after the 10,000 durability cycles according to Test Group D.
3.5.9	Temperature life	EIA-364-17 method A 105º C without applied voltage for 120 hours. 105º C without applied voltage for 72 hours when used as preconditioning.	Low level contact resistance meets spec before and after the Temperature Life test.
3.5.10	Vibration	EIA 364-28 Test Condition VII, Test Letter D	No evidence of physical damages and no discontinuity longer than 1 microsecond. Low level contact resistance meets spec before and after the Vibration test.
3.5.11	Cyclic Temperature and Humidity	EIA 364-31 +85℃,85%R.H for 96 hours	Low level contact resistance meets spec before and after the Cyclic Temperature and Humidity test.
3.5.12	Thermal Shock	EIA 364-32, Test Condition I 10 Cycles –55℃ and +85℃.	No evidence of any physical damage. Low level contact resistance meets spec before and after the Thermal Shock test.
3.5.13	Physical Shock	EIA-364-27 condition H Mate connectors , and subject to the following shock conditions. 3 shocks shall be applied along 3 mutually perpendicular axes, passing DC 100mA current during the test. (Total of 18 shocks) Test Pulse: Half Sine Peak Value: 294 m/s^2 {30G} Duration: 11ms	No mechanical damage Contact resistance not exceed 50 milliohms. Signal discontinuity < 1 μs
3.5.14	Dry Cold (Steady State)	EIA-364-17 Terminal loaded under minimum deflection -40±3°C for 96 hours Recovery: 2hours	No damage. Contact resistance not exceed 50 milliohms.
3.5.15	Dry Heat (Steady State)	EIA-364-17 Terminal loaded under minimum deflection 85±2°C for 96 hours Recovery: 2hours	No damage. Contact resistance not exceed 50 milliohms.

3.5.16	Salt spray	EIA 364-26 Mate connectors and expose to the following salt mist conditions. Upon completion of the exposure period, salt deposits shall be removed by a gentle wash or dip in running water, after which the specified measurements shall be performed. NaCl solution Concentration: 5 ±1 % Spray time : 48± 1 h Ambient Temperature: 35±2℃	No mechanical damage and visible corrosion. Contact resistance not exceed 50 milliohms.
3.5.17	Solderability	EIA 364-52 To be sipped in the solder bath 255±5℃ Coverage for 5 seconds.	All terminations shall exhibit a Continuous solder coating with 95%
3.5.18	Solder Heat Resistance	EIA 364-56A Infrared reflow soldering condition, see graphical below for detail of test condition 245℃ for 10 seconds Numbers of reflow cycles=2 times (Test profile see figure 3.6.2)	No degradation in performance of physical or mechanical damages after

NOTES:
1. Unless otherwise specified, all tests shall be done with mated connectors.
2. Legacy USB (mated) connectors mechanical and environmental compliance requirements are governed by the legacy USB connectors and cable assemblies compliance documents

3.6.Product Test Sequence

Test Item	Test Group / Test Description	A	B	C	D	E	F	G	H
3.5.1	LLCR	1,4,6	1,4,6,8	1,4,6,8	2,10			1,8	2,4
3.5.2	Dielectric Withstanding Voltage				1,11			3,10	
3.5.3	Insulation Resistance				12			2,9	
3.5.4	Contact Current Rating (Temperature Rise)						1		
3.5.5	Critical Dimension Inspection					1			
3.5.6	Insertion Force				4			4	
3.5.7	Extraction Force				5,7, 9			5	
3.5.8	Durability	2	2	2	3,6, 8				
3.5.9	Temperature life			3					
3.5.10	Vibration	3		5					
3.5.11	Cyclic Temperature and Humidity		5						
3.5.12	Thermal shock		3						
3.5.13	Physical Shock			7					
3.5.14	Dry Cold							6	
3.5.15	Dry Heat							7	
3.5.16	Salt spray								3
3.5.17	Solderability								
3.5.18	Solder heat Resistance								1
	Reseating *	5	7						
	Thermal disturbance								
	EMC Shielding Spring Inspection					2			
	Sample Quantity	5	5	5	5	5	5	5	5

NOTES:

1. Reseating: Manually unplug/plug the connector or socket. Perform 3 such cycles.

Group A

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Low Level Contact Resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
2	Durability (preconditioning)	EIA-364-09 Perform 50 unplug/plug cycles.		No evidence of physical damage
3	Temperature life	EIA-364-17, method A 105º C without applied voltage for 120 hours.	Mated	None
4	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1	Mated	50 milliohms Max.
5	Reseating	Manually unplug/plug the connector or socket. Perform 3 such cycles.		No evidence of physical damage
6	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.

Group B

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
2	Durability (preconditioning)	EIA-364-09 Perform 50 unplug/plug cycles.		No evidence of physical damage
3	Thermal shock	EIA-364-32, test condition I 10 cycles with the exception of exposure times. Place a thermocouple in the center of the largest mass component of the connector that is in the center of the test chamber to insure that the contacts reach the temperature extremes before ramping to the other temperature.	Mated	None
4	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.

5	Cyclic temperature and humidity	EIA-364-31 Cycle the connector between 25 °C ±3 °C at 80 % ±3% RH and 65 °C ±3 °C at 50 % ±3% RH. Ramp times should be 0.5 hour and dwell times should be 1.0 hour. Dwell times start when the temperature and humidity have stabilized within the specified levels. Perform 24 such cycles.	Mated	None
6	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.
7	Reseating	Manually unplug/plug the connector or socket. Perform 3 such cycles.		No evidence of physical damage
8	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.

Group C

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Low Level Contact Resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
2	Durability (preconditioning)	EIA-364-09 Perform 50 unplug/plug cycles.		No evidence of physical damage
3	Temperature life (preconditioning)	EIA-364-17, method A 105º C without applied voltage for 72 hours when used as preconditioning	Mated	None
4	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.
5	Vibration	EIA-364-28, test condition VII, test condition letter D 15 minutes in each of 3 mutually perpendicular directions. Both mating halves should be rigidly fixed so as not to contribute to the relative motion of one contact against another. The method of fixturing should be detailed in the test report.	Mated	No evidence of physical damage. No discontinuities of 1 μS or longer duration when mated connector during test.

6	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.
7	Thermal Shock	EIA 364-32, Test Condition I 10 Cycles –55℃ and +85℃.	Mated	No evidence of any physical damage. Low level contact resistance meets spec before and after the Thermal Shock test.
8	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.

Group D

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Dielectric withstanding voltage	EIA-364-20, 100 VAC (RMS)	Mated	No disruptive discharge.
2	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
3	Durability (preconditioning)	EIA-364-09 Perform 4 unplug/plug cycles, followed by an unplug.		No evidence of physical damage
4	Insertion force	EIA 364-13 Perform the measurement at a maximum speed of 12.5 mm (0.492”) per minute.		Within the range of 5 N to 20 N.
5	Extraction force	EIA 364-13 Perform the measurement at a maximum speed of 12.5mm (0.492") per minute.		Within the range of 8 N to 20 N. Initial reading
6	Durability	EIA 364-9 Perform 25 plug/unplug cycles. Cycle rate of –500 ± 50 cycles per hour followed by a plug.		No evidence of physical damage

7	Extraction force	EIA 364-13 Perform the measurement at a maximum speed of 12.5mm (0.492") per minute		Within 6 N to 20 N.
8	Durability	EIA 364-9 Perform 2,468 plug/unplug cycles. Rotate the receptacle or plug 180º and perform 2,500 plug/unplug cycles. Rotate the receptacle or plug 180º and perform 2,500 plug/unplug cycles. Rotate the receptacle or plug 180º and perform 2,500 plug/unplug cycles. Cycle rate of 500 ± 50 cycles per hour (total of 10,000 plug/unplug cycles, flipping every 2,500 cycles).		No evidence of physical damage
9	Extraction force	EIA 364-13 Perform the measurement at a maximum rate of 12.5mm (0.492") per minute.		Within 6 N to 20 N.
10	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.
11	Dielectric withstanding voltage	EIA-364-20, 100 VAC (RMS)	Mated	No disruptive discharge
12	Insulation Resistance	EIA 364-21. Applicable to both receptacle and plug	Both unmated and mated	A minimum of 100 MΩ insulation resistance is required between adjacent contacts of unmated and mated connectors

NOTES
1. Separate sets of test specimens may be used to assess dielectric withstanding voltage and the change in low level contact resistance.
2. Dielectric withstanding voltage testing should involve different contacts than low level contact resistance testing.

Group E

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Critical Dimensions Continuity	EIA-364-18 See customer drawing		All dimensions for component level qualification and overmold only for cable and adaptor assemblies.

2	EMC Shielding Spring Inspection	Visual inspection for compliance with Figure 3.6.2		No EMC shielding spring finger tip of the USB Full-Featured Type-C plug or USB 2.0 Type-C plug shall be exposed in the plug housing opening of the unmated Type-C plug

Group F

Test Order	Test	Test Procedure	Condition of Test Specimes	Test Criteria
1	Contact Current Rating (Temperature rise)	See Appendix A	Mated	When current is applied to the contacts, the temperature rise shall not exceed 30°C at the outside surface of the shell. This requirement applies to the USB Type-C connector mated pair only

Group G

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
2	Insulation Resistance	EIA 364-21. Applicable to both receptacle and plug	Both unmated and mated	A minimum of 100 MΩ insulation resistance is required between adjacent contacts of unmated and mated connectors
3	Dielectric withstanding voltage	EIA-364-20, 100 VAC (RMS)	Mated	No disruptive discharge.
4	Insertion force	EIA 364-13 Perform the measurement at a maximum speed of 12.5 mm (0.492”) per minute.		Within the range of 5 N to 20 N.
5	Extraction force	EIA 364-13 Perform the measurement at a maximum speed of 12.5mm (0.492") per minute.		Within the range of 8 N to 20 N. Initial reading

6	Dry Cold (Steady State)	EIA-364-17 Terminal loaded under minimum deflection -40±3°C for 96 hours Recovery: 2hours		None
7	Dry Heat (Steady State)	EIA-364-17 Terminal loaded under minimum deflection 85±2°C for 96 hours Recovery: 2hours		None
8	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	50 milliohms Max.
9	Insulation Resistance	EIA 364-21. Applicable to both receptacle and plug	Both unmated and mated	A minimum of 100 MΩ insulation resistance is required between adjacent contacts of unmated and mated connectors
10	Dielectric withstanding voltage	EIA-364-20, 100 VAC (RMS)	Mated	No disruptive discharge

Group H

Test Order	Test	Test Procedure	Condition of Test Specimens	Test Criteria
1	Solder Heat Resistance	EIA 364-56A Infrared reflow soldering condition, see graphical below for detail of test condition 245℃ for 10 seconds Numbers of reflow cycles=2 times (Test profile see figure 3.6.2)	No degradation in performance of physical or mechanical damages after 2 times reflow test	No degradation in performance of physical or mechanical damages after
2	Low Level Contact Resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1.	Mated	40 milliohms max for all contacts. Baseline measurement
3	Salt Spray	EIA 364-26 Mate connectors and expose to the following salt mist conditions. Upon completion of the exposure period, salt deposits shall be removed by a gentle wash or dip in running water, after which the specified measurements shall be performed. NaCl solution Concentration: 5 ±1 % Spray time : 48± 1 h Ambient Temperature: 35±2℃		No evidence of physical damage

4	Low level contact resistance	EIA-364-23 The measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. See Figure 3.6.1	Mated	50 milliohms Max.

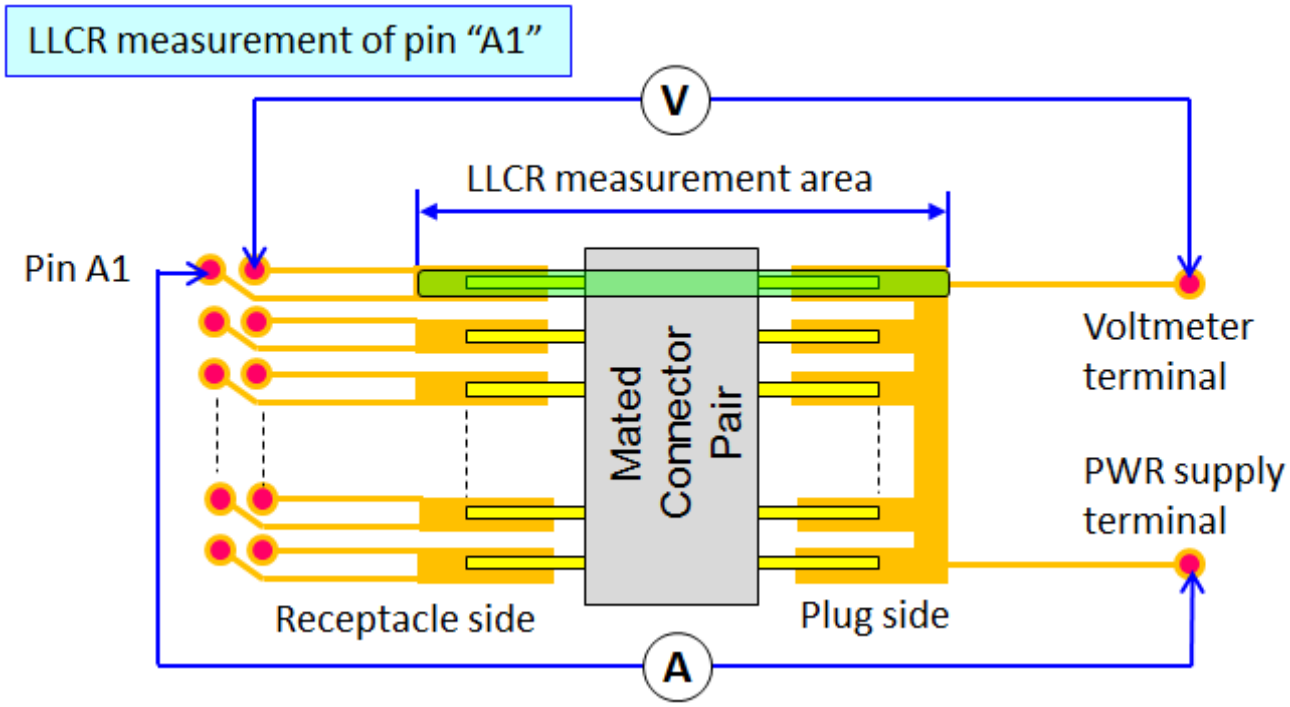


Figure 3.6.1 Typical Contact Resistance Measurement

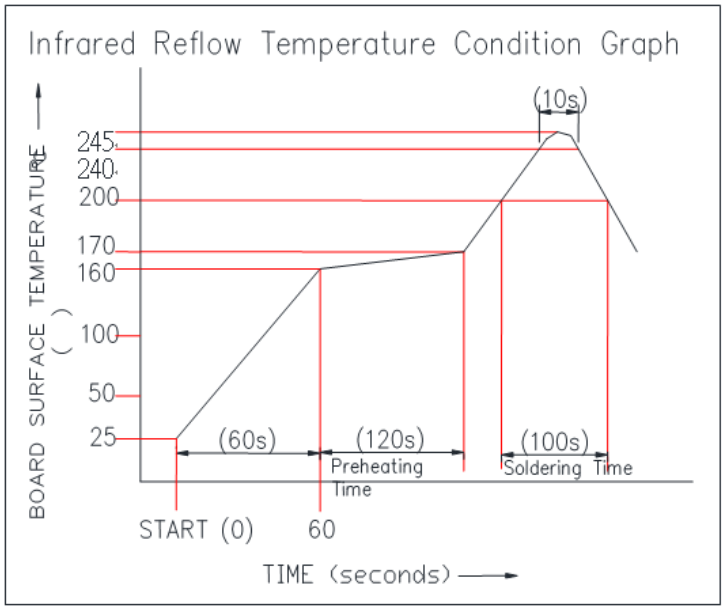


Figure 3.6.2 Solder heat Resistance

4.Appendices

A. Current Rating Test

A current of 1.8 A shall be applied to VBUS pin and its corresponding GND pin (pin 1 and pin 4 of the USB 3.0 Standard-A and Standard-B/Powered-B connectors; pin 1 and pin 5 of the USB 3.0 Micro connector family). Additionally, a minimum current of 0.25 A shall be applied to all the other contacts. When the current is applied to the contacts, the delta temperature shall not exceed +30 °C at any point on the USB 3.0 connectors under test, when measured at an ambient temperature of 25 °C.

In the case of the USB 3.0 Powered-B connector, a current of 2.0 A shall be applied to the DPWR pin and its corresponding DGND pin (pin 10 and pin 11 for USB 3.0 Powered-B connector). Additionally, a minimum current of 0.25 A shall be applied to all the other contacts. When current is applied to the contacts, the delta temperature must not exceed +30 °C at any point in the USB 3.0 connectors under test, when measured at an ambient temperature of 25 °C.

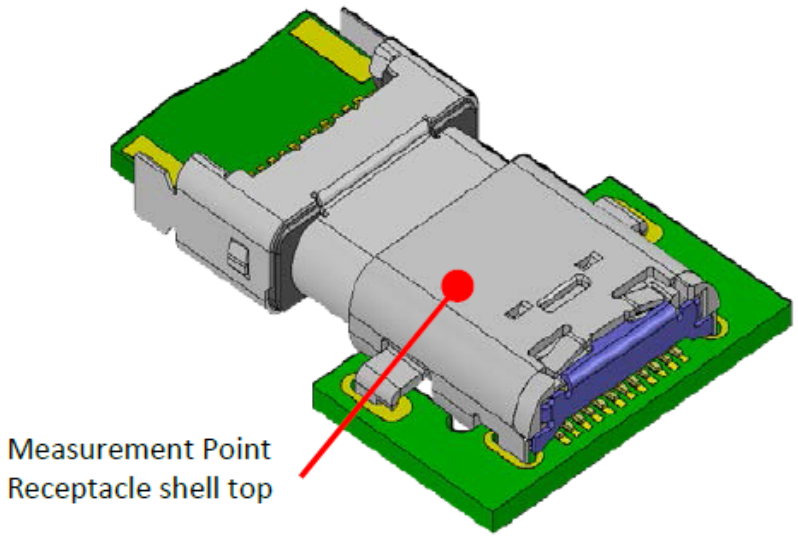


Figure A-1 Temperature Measurement Point

Item	Trace width (mm)	Trace length (mm) on each PCB	Thickness
Signal trace	0.25 max.	13 max.	35 µm (1 oz. copper)
Ground trace	1.57 max.	38 max.	35 µm (1 oz. copper)
V_{BUS} and V_{CONN}	1.25 max.	30 max.	35 µm (1 oz. copper)
PCB	N/A	N/A	0.80 – 1.20 mm

Table A-1 Current Rating Test PCB

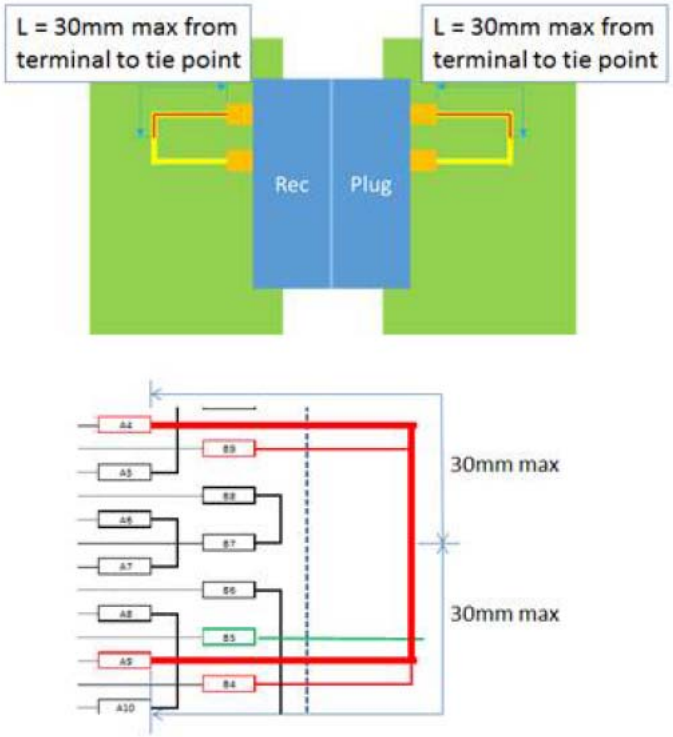


Figure A-2 Example Current Rating Test Fixture Trace Configuration