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**USB Type-C Connector**

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**1 Scope :****1.1 Contents**

This specification covers the requirements for product performance, test methods and quality assurance provisions of TE Connectivity USB type C connector.

Applicable product description and part numbers are as shown in Appendix 1.

**2. 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 Specification:**

- A. 109-5000: Test Specification, General Requirements for Test Methods
- B. 501-115162: Qualification Test Report

**2.2 Commercial Standard and Specification:**

- A. ANSI/EIA 364-C
- B. Universal Serial Bus Type-C Connector and Cables Assemblies Compliance Document

**3. Requirements :****3.1 Design and Construction:**

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

**3.2 Materials:**

- A. Contact (Receptacle)  
Material: Copper alloy
- B. Housing (Receptacle)  
Thermo Plastic, UL 94 V-0
- C. Shell (Receptacle)  
Material: Stainless steel
- D. Middle plate (Receptacle)  
Material: Stainless steel

**3.3 Ratings :**

- A. Voltage Rating: 30 V Max.
- B. Current Rating:
  - (1). Connection in parallel between 4 pair VBUS pins and GND pins: 1.5A/pin Max, SBU1 and SBU2 1.0A/pin, Signal pins contact: 0.25A Min.
  - (2). Working with single circuit between pair VBUS pins and GND pins: 3A/pin Max, Signal pins contact: 0.25A Min.
- C. Temperature Rating: -40°C to 80°C (Including temperature rising)

## 3.4 Performance Requirements and Test Descriptions:

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

Temperature: 15°C ~ 35°C

Humidity : 25% ~ 85% R.H.

Pressure : 650mmHg ~ 800mmHg

## 3.5 Test Requirements and Procedures Summary

**Table.1**

	Test Item	Procedures	Requirements
	<b>Examination</b>		
1	Visual examination of product	EIA-364-18 Visual, dimensional and functional aspects meet requirements of product drawing and applicable instructions on customer drawing, and application specification.	Meets requirements of product drawing and no defects.
	<b>Electrical</b>		
2	Low Level Contact Resistance	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. Measure at 20 mV (max) open circuit at 100 mA	40 mΩ Max initial for VBUS, GND and all other contacts. Maximum change (delta) of 10 mΩ after environmental stresses.
3	Insulation resistance	EIA-364-21 Applicable to both receptacle and plug. Apply 500V DC. Apply the above specified voltage between adjacent contacts for 1 minute.	>100 MΩ insulation resistance between adjacent contacts of unmated and mated connectors.  100MΩ Min.
4	Dielectric withstanding voltage	EIA-364-20, Method B. Applicable to both receptacle and plug. 100V AC (rms) for 1 minute at sea level.	No break down shall occur when voltage is applied between adjacent contacts of unmated and mated connectors. Leakage of electricity is less than 0.5 mA.
5	Temperature rise	EIA-364-70, Method 1. , Current rating for signal and power Pin, 3 hours, 1. Connection in parallel between 4 pairs VBUS pins and GND pins, each single circuit 1.5 A(DC 9V), 2. Working with single circuit between pair VBUS pins and GND pins, 3 A (DC 9V) Min.	Temperature rise of the outside shell surface of the mated connector pair above the VBUS and GND contacts shall not exceed 30°C above ambient temperature. 30°C Max.
	<b>Mechanical</b>		
6	Durability	EIA-364-09 10,000 cycles Test speed:200 cycles/hour Max.	Meet insertion / extraction force, no evidence of physical damage.
7	Random vibration	EIA-364-28, Condition VII-D, 2 hours in each of 3 mutually perpendicular directions. Both mating halves should be fixed rigidly. (Power Spectral Density 0.02g <sup>2</sup> /Hz, Overall rms 3.10 g)	No evidence of physical damages and no discontinuity longer than 1 microsecond.

**Table.1(cont.)**

	Test Item	Procedures	Requirements
8	Sine vibration	EIA-364-28B  Amplitude: 1.52 mm(0.06 inch);  Frequency: 10 Hz up to 50 Hz in 1 minute, then 55 Hz down to 10 Hz;  2 hours in each of 3 mutually perpendicular directions (X、Y、Z).	No evidence of physical damages and no discontinuity longer than 1 microsecond.
9	Mechanical shock	EIA-364-27B, half sine, 30 G, duration 11 ms; X, Y, Z,3 times each direction, total 18 times.	No evidence of physical damages and no discontinuity longer than 1 microsecond.
10	Insertion force	EIA-364-13 Maximum rate 12.5mm/min	Between 5 N and 20 N before and after durability.
11	Extraction force	EIA-364-13 Maximum rate 12.5mm/min	Extraction force: I: no less than 8 N and no more than 20 N before and after 1,000 cycles durability. II: no less than 6 N and no more than 20 N before and after 10,000 cycles durability.
12	Wrenching strength (Reference)	Apply a force on plug inserted into receptacle at a distance of 15 mm from the edge of the receptacle, five directions (left, right, up, down and insertion directions), speed : 25 mm/min, Refer to Appendix 1 for test fixture	$\geq 75\text{N}$ ; (left, right, up, down ) $\geq 65\text{N}$ ; (insertion direction) 10,000 cycles  No evidence of physical damages.
13	Strength durability	Test force: F3=F4=2kgf Applied to a plug when inserted at a distance of 15 mm from the edge of the receptacle. Apply 15 N force for 3,000 cycles . Speed : 15 times/min. Refer to Appendix 2 for test fixture.	No evidence of physical damages.
14	360° rotation	Apply additional 800 g weight at a distance of 10 cm from the edge of receptacle,hold 10 seconds separately in degree 90,180, 270 and 360.	No discontinuity during rotation.
15	Tongue strength	Test method: 45° insertion into receptacle,until tongue of receptacle is destroyed.	70 N Min.
16	Slant insertion	Test method: 5-10° insertion into receptacle. 2,500 times per direction. Total four directions [as shown in Appendix 3].	No mechanical damage. Contact resistance: $\Delta R = 10\text{m}\Omega$ Max Scrape damage on surface allowed.
<b>Environmental</b>			
17	Thermal shock	EIA-364-32, Method A, Condition I, duration A-4 (-55°-+85°C, 10 cycles) Recovery: 2 hours at ambient atmosphere. -55°C+0/-3°C: 30 minutes, 25°C+/-10°C: 5 minutes Max 85°C+3/-0°C: 30 minutes 25°C+/-10°C: 5 minutes Max	No mechanical damage.  Contact resistance: $\Delta R = 10\text{m}\Omega$ Max. Insulation resistance >100M $\Omega$

**Table.1(cont.)**

	Test Item	Procedures	Requirements
18	Thermal disturbance	EIA-364-32 Cycle the mated connector pair 10 times between 15°C and 85°C. Ramp > 2°C/min Dwell > 5 mins (ensure contacts reach extreme temperature) Humidity not controlled.	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
19	Thermal cycling	EIA-364-32 Cycle the mated connector pair 500 times between 15°C and 85°C.Ramp > 2°C/min Dwell > 5 mins (ensure contacts reach extreme temperature).Humidity not controlled.	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
20	Salt spray	EIA-364-26B, temp. 35+/-2°C, 100% RH, Salt NaCl mist 5%.Clean and brush after 48 hours continuous spray on samples, , 35 degree baking within no more than 16 hours.	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max.
21	Cyclic temperature and humidity	EIA-364-31B, Method IV, 25°C~65°C; 95% RH, total 240 hours S.1 25°C~65°C,90-98%RH, 2.5 hours S.2 65°C, 90-98%RH, 3 hours S.3 65°C~25°C,80-98%RH, 2.5 hours S.4 25°C~65°C,90-98%RH, 2.5 hours S.5 65°C, 90-98%RH, 3 hours S.6 65°C~25°C,80-98%RH, 2.5 hours S.7 25°C, 2 hours, 90-98%RH S.7a -10°C, 3 hours S.7 25°C, 3 hours, 90-98%RH S.1 – S.7 1 cycle 24 hours 10 cycles (240 hours)	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
22	Temperature life	EIA-364-17A, Method A, condition 4  105°C, 120 hours, mated condition	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
23	Temperature life (preconditioning)	EIA-364-17A, Method A, condition 4  105°C, 72 hours, mated condition.	No mechanical damage.  Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
24	Mixed flowing gas	EIA-364-65, class IIA, 120 hours unmated, 120 hours mated (240 hours total).  RH% 70+/-2, Temp. 30+/-1°C, Cl2: 10+/-3 ppb, NO2: 200+/-50 ppb, H2S: 10+/-5 ppb, SO2: 100+/-20 ppb	No mechanical damage. No change to performance. Contact resistance: $\Delta R = 10m \Omega$ Max.
25	Resistance to soldering heat	EIA-364-56, Reflow cycles: 3 260°C for 30 seconds	No evidence of physical damages
26	Solderability	EIA-364-52,  Temperature: 260+/-5°C  Immersion time: 5+/-0.5 seconds	Solderable area shall have a minimum of 95% solder coverage.

**NOTE:** (1) Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Prequalification Test Sequence shown in table 2.

## 3.6 Product Qualification Test Sequence

Table.2

Item/Test group	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1 Visual inspection	1, 6	1,	1, 18	1	1	1	1, 7	1, 7	1, 3	1, 6	1	1	1, 3	1, 9	1, 3
2 Contact resistance	2, 5	2, 5, 7, 9	3, 15	4, 7	2, 5, 7, 9	2, 8	2, 4	2, 4		2, 5	2, 5, 7	2, 5, 7, 9, 11		2, 6	
3 Insulation resistance			17			9	5	5						3, 7	
4 Dielectric withstanding voltage			2, 16			10	6	6						4, 8	
5 Temperature rise	4														
6	Reseating (3 cycles)	8			8						6	10			
	Durability (50 cycles)	3	3	2	3					3	3	3			
	Durability (1,000 cycles)			6											
	Durability (10,000 cycles)			9											
7 Random vibration			12	5											
8 Sine vibration			13	6											
9 Mechanical shock			14												
10 Insertion force			4, 7, 10			3, 6									
11 Extraction force			5, 8, 11			4, 7									
12 Wrenching strength						5									
13 Strength durability							3								
14 360° rotation								3							
15 Tongue strength									2						
16 Slant insertion														5	
17 Thermal shock	4														
18 Thermal disturbance												8			
19 Thermal cycling					6										
20 Salt spray										4					
21 Cyclic temperature and humidity	6														
22 Temperature life											4				
23 Temperature life (preconditioning)				3	4							4			
24 Mixed flowing gas												6			
25 Resistance to soldering heat													2		
26 Solderability															2
Sample size (PCS)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

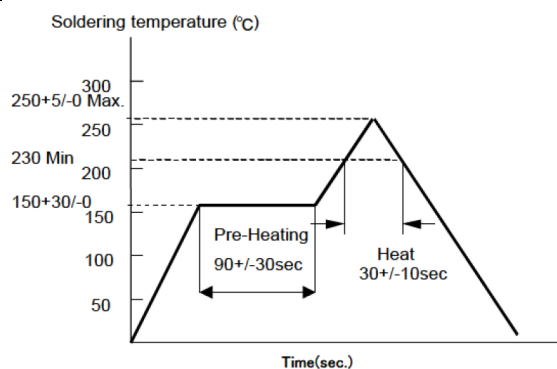
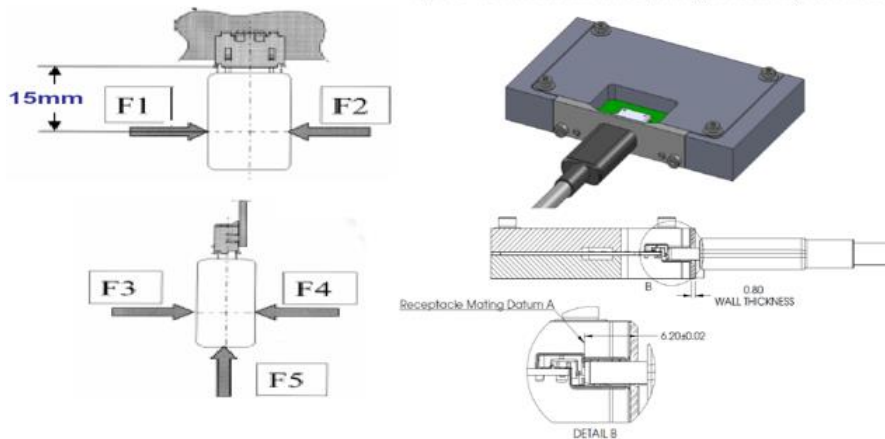


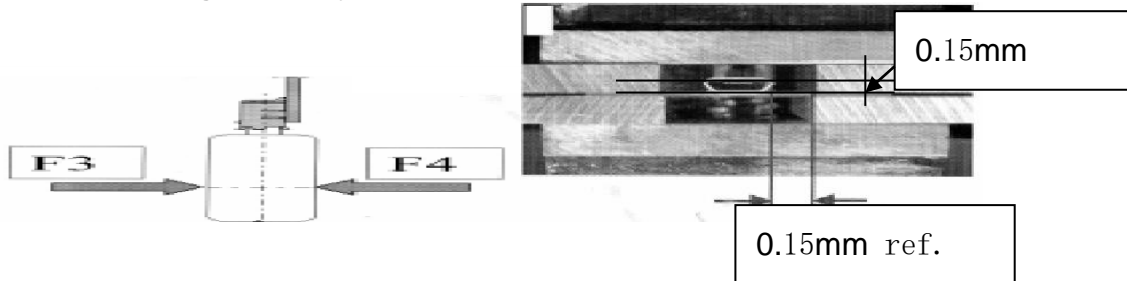
Figure 2. Recommended reflow temp profile

## Appendix 1: Wrenching strength test fixture: F1, F2, F3, F4, F5 directions.

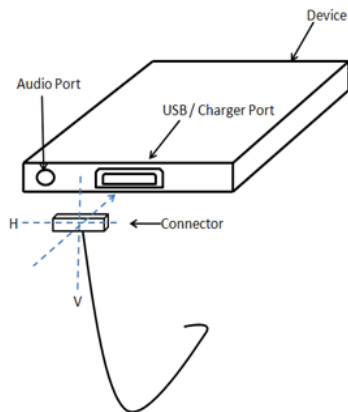
Figure 3-61 Reference Wrenching Strength Continuity Test Fixture



## Appendix 2: Strength durability test fixture: F3, F4 directions.



## Appendix 3: Slant insertion strength test fixture:



The applicable product descriptions and part numbers are as shown in Appendix.4.

Product Part No.	Description
2337857-1	USB Type-C Receptacle, Dual row SMT, Vertical Type

Appendix.4