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1. SCOPE:

This specification covers performance, tests and quality requirements for Universal Serial Bus (USB) Type C series connectors. These connectors are cable mounted plug and PC Board mounted receptacle connectors

2. APPLICABLE STANDARDS:

EIA 364

MIL - STD - 202

Methods for test of connectors for electronic equipment

3. APPLICABLE SERIES NO.: **USB TYPE C Connector**

4. SHAPE, CONSTRUCTION AND DIMENSIONS

See attached drawings

5. MATERIALS

See attached drawings

6. ACCOMMODATED P.C.BOARD

6.1 P.C. Board Layout: See attached drawings



REVIEWED : Keny APPROVED : Kevin VERIFIED : Annie .

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#### 7. ELECTRICAL PERFORMANCE:

	ITEM	TEST CONDITION	REQUIREMENT
7.1	Appearance of Product	Visual inspection. EIA-364-18	Meets requirements of product drawing. No physical damage.
7.2	Contact resistance	EIA 364 – 23C The resistance of welding foot and contact elastomer was measured at 23 + 2 C and relative humidity less than 85%. Subject mated contacts assembled in housing to 20 mV max. open circuit at 100 mA max.	Initial: 40 mΩ max. After test: 50 mΩ change max.
7.3	Insulation resistance	EIA 364 – 21E Insulation between adjacent terminals in an environment of 23 + 2 C and relative humidity less than 85%. Testing conditions: 500V DC , 1 minutes Plug in test	100 MΩ min.
7.4	Dielectric strength	EIA 364 – 20E Test between adjacent contacts of mated and unmated connector assemblies Testing conditions: 100V AC , 1 minutes	Leakage current: 5mA Max. No flashover & spark over & excess leakage & breakdown
7.5	Temperature Rising	1. A current of 5.0 A shall be applied collectively to VBUS pins (pins A4, A9, B4, and B9) 2. 1.25 A applied to the VCONN pin (pins B5 of the plug connector) with the return path through the corresponding GND pins (pins A1, A12, B1, and B12). 3. A minimum current of 0.25 A shall also be applied individually to all the other contacts.	When the currents are applied to the contacts, the temperature rise shall not exceed 30 °C at any point on the USB Type-C mated plug and receptacle under test, when measured at an ambient temperature of 25 °C. Test reference standard : EIA -364-70 method B

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7.6	Differential ( Impedance )	<p>The mated connector impedance requirement is needed to maintain signal integrity. The differential impedance of a mated connector shall be within <math>85\Omega \pm 9\Omega</math>, as seen from a 40 ps (20% ~ 80%) rise-time of a differential TDR. Figure.1 illustrates the impedance limits of a mated connector.</p> <p>The impedance profile of a mated connector must fall within the limits shown in Figure.1 Note that the impedance profile of the mated connector is defined from the receptacle footprints through the plug cable termination area. In the case the plug is directly attached to a device PCB, the mated connector impedance profile includes the path from the receptacle footprints to the plug footprints.</p>	$85\Omega \pm 9\Omega$
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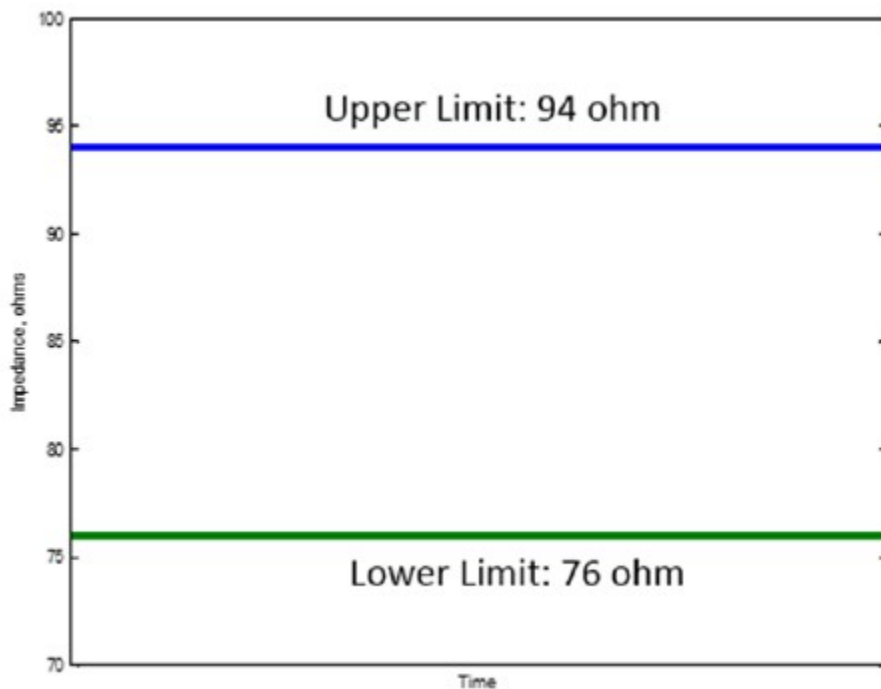


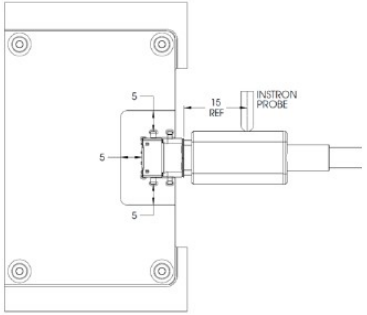
Figure.1 Impedance Limits of a Mated Connector

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#### 8.MECHANICAL PERFORMANCE:

	ITEM	TEST CONDITION	REQUIREMENT
8.1	Contact retain force in insulator	EIA 364 - 35 Retention speed $25 \pm 3$ mm per minute from insulator	5N Min.
8.2	Mating force	EIA 364 - 13 Measure force necessary to mate corresponding connector assemblies at maximum rate of 12.5 mm per minute	5N to 20N (1~10,000 Cycles)
8.3	Un-mating force	EIA 364 - 13 Measure force necessary to mate connector assemblies at maximum rate of 12.5mm/min.	Extraction force : 8N to 20N (6-1000cycles), measured after a preconditioning of five insertion/extraction cycles. After an additional 25 insertion/extraction cycles, the extraction force shall be measured again (i.e., the thirty-second extraction) and the extraction force shall be: a. within 33% of the initial reading, and b. within the range of 8 N to 20 N.
8.4	Durability or Insertion/extraction Cycles	The durability rating shall be 10,000 cycles minimum for the USB Type-C connector family .The durability test shall be done at a rate of $500 \pm 50$ cycles per hour . Each insertion/extraction of 2500 cycles rotating sockets or plugs $180^\circ$ . Test reference standard:EIA-364-09	No physical damage to any part of the connector and cable assembly shall occur

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8.5	4-Axis continuity test	<p>The receptacle shall be mounted on the PCB board , and receptacle PCB shall initially be placed in a horizontal plane, at a distance of 15mm form the mating edge of the receptacle shell, fixed a circular probe perpendicular to The male head and downward pressure</p> 	Products in the case of 20N force to bear the same time , receptacle and plug contact discontinuity less than 10s and no physical damage of the four orientations.
8.6	Vibration	<p>No evidence of physical damage. No discontinuities of 1 uS or longer duration when mated connector during test. Test reference standard : EIA-364-28, test condition VII</p>	<p>The connector must be mated test. Test condition: Duration: 15 minutes in each (Total of 45minutes) X, Y, Z axis. Amplitude : 1.52mm P-P or 147m/s2 {15G} Sweep time: 50-500-50Hz in 15 minutes.</p>

#### 9.Environmental Requirements:

	ITEM	TEST CONDITION	REQUIREMENT
9.1	Thermal shock	<p>Temperature range from -55°C to +85°C .Start from -55°C. After 30 min. change to +85°C, change time is no more than 5 minutes. Total 5 cycles. Test reference standard: EIA-364-32 test condition I</p>	Shall meet visual requirements, show no physical damage. Contact Resistance (Low Level) 50 mΩ max. Dielectric Strength should be OK, Insulation Resistance should be 100 MΩ min.
9.2	Cyclic temperature and humidity	<p>Test condition :25 °C ±3 °C at 80 % ±3% Relative Humidity and 65 °C ±3 °C at 50 % ±3% Relative Humidity . Ramp times should be 0.5 hour and dwell times should be 1.0 hour . Duration : 72Hours, Circulate test: 24 Cycles.</p>	Shall meet visual requirements, show no physical damage. Contact Resistance (Low Level) 50 mΩ max. Dielectric Strength should be OK, Insulation Resistance should be 100 MΩ min.

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9.3	Temperature Life	105° C without applied voltage for 120 hours Test reference standard:EIA-364-17C test condition A	No evidence of damage.
9.4	Temperature Life (Preconditioning)	105° C without applied voltage for 72 hours Test reference standard:EIA-364-17C test condition A	No evidence of damage.
9.5	Mixed flowing gas	The connector must be mated test. Test condition : 1.Gas concentration test condition: Cl <sub>2</sub> (10±3) ppb; NO <sub>2</sub> (200±50)ppb; H <sub>2</sub> S (10±5) ppb; SO <sub>2</sub> (100±20) ppb; 2.Test the Temperature must be control 30 ±1 °C, Relative Humidity must be control 70 ±2%. 3.Test duration is 7 days(168 hours) 4.Test reference standard: EIA-364-65 Class II A	Shall meet visual requirements, show no physical damage. Contact Resistance (Low Level) 50 mΩ max. Dielectric Strength should be OK, Insulation Resistance should be 100 MΩ min.
9.6	Solderability	Solder pot temperature: 250±5°C Soldering time: 3 to 5 Seconds Test reference standard: EIA 364-52	The inspected area of each lead must have 95% solder coverage Minimum.
9.7	Salt spray	Temperature: 35 ± 3°C Solution: 5 ± 1% Spray time: 48 ± 4 hours (Stamping before plated) Spray time: 24 ± 4 hours (Stamping after plated) 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 and dried naturally, after which the specified measurements shall be performed. The specimens shall be suspended from the top using waxed twine, string or nylon thread. The test only define the plating area, without plating area (as copper cross section) will not be defined. (EIA 364-26B / MIL-STD-202 Method 101)	Appearance: No damage on function Contact resistance: Less than twice of initial

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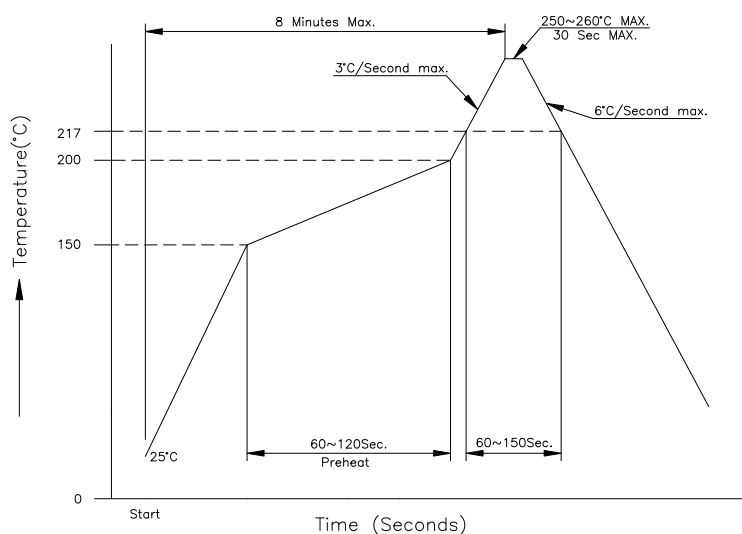
9.8	Resistance to soldering heat	Lead-Free wave flow process: Pre-heat: 80 °C/60Sec. Soldering time: 10 ± 1.0 second Soldering pot: 260 ± 5 °C	No damage
		Lead-Free IR reflow process: Pre-heat: 150~200 °C , 60~120Sec. Soldering time: 30 ± 1.0 second Soldering pot: 255 ± 5 °C Refer Reflow temperature profile(11.1)	
		Hand Soldering Soldering time: 3.5 ± 0.5 second Temperature : 350 ± 10 °C	
9.9	Thermal Cycling	10 cycle consists of Temperature High:+85°C± 3°C Temperature High:+15°C± 3°C Ramp Rate:2°C/min Dwell Time: 5 minutes at High and Low temperatures	Appearance: No Damage

#### 10. AMBIENT TEMPERATURE RANGE:

Storage: -20 °C to 60 °C; operating : -40 °C to 80 °C; nominal: +20 °C

#### 11. Recommended IR Reflow Temperature Profile:

##### 11.1. Using Typical Solder Paste:



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12. IPX7 Waterproofing test (IEC60529)

A. Test Method

1. The qualification samples are mated and sealed connectors.
2. The samples are immersed into 1m of water for a period of 30 minutes.
3. The samples are blown dry with pressurized air and unmated.

B. Requirements

No sign of moisture inside the cavities or connector interior, Insulation resistance and withstand voltage meet requirement (refer to 7.3 & 7.4).

13. IPX8 Waterproofing test (IEC60529)

Continuous diving test , Test equipment, test conditions and test time: agreed by both parties, the severity of which shall be higher than ipx7





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#### 14. Test Sequence:

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**Note:**

- a. Samples shall be prepared in accordance with applicable manufacturer's instructions and shall be selected at random from current production.
- b. The numbers in the table indicate sequence in which tests are performed.
- c. Precondition samples with 5 cycles durability. (Durability Preconditioning)
- d. Manually mating / unmating the connector 3 such cycle. (Reseating)
- e. All the tests shall be performed in the sequence, indicated by the number in the columns.
- f. Precondition samples with 50 cycles durability.
- g. Manually unplug/plug the connector or socket. Perform 3 such cycle.
- h. All the tests shall be performed in the sequence, indicated by the number in the columns.
- i. Each test groups shall consist of minimum of Five connectors. A minimum of 30 contacts shall be selected and identified. Unless otherwise specified, these contacts shall be used for all measurements.
- j. Select different groups according to different products: Regular: A-J, IPX7: A-K, IPX8: A-J + L.

**Quality Assurance Provisions :**

Unless otherwise specified, in the contract or purchase order, we will be responsible for the quality of the part as it is delivered to client. We will be responsible for having controlled processes to ensure product is in total compliance with this specification. Failing lots shall be subject to return or other corrective action. Further, CviLux will not substitute components of the assembly (connector, cable, etc.) without prior written approval from client. Any such substitutions shall be submitted to client for approval prior to implementation. Substitution shall be deemed as any change in CviLux different than those previously submitted to and approved by client.

- a. **Inspection Data :** Inspection and test data shall be recorded, evaluated, and maintained as evidence of performance to these provisions.