Retail USB
USB PlusPower
USB +Power

Electro-Mechanical Specification
Version 0.8g

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1 Preface

1.1 Intellectual Property Disclaimer

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1.2 Revision History

Date	Version	Contents
040118	0.8g	Reorganized and Modified entire specification. Added connector pin-out to Figures 3 & 16. Figures 1, 5, 8, 9, 10, 11, 12, 14 & 17 redrawn for clarity. Cable Specification updated to conform to USB 2.0. Added Key 3 to Host-Side Connections. Added Keys 1, 2, & 3 to standard Peripheral-Side Connection.
990326	0.8e	Section 3.1.1.4 replaced (strange format) drawing. Section 3.1.2.3.2 Change voltage tolerance. Section 4.2.3 and 4.3.3, key position 2 current changes Section 4.3.4, phrase added: “clamping diode”.
990308	0.8d	Section 4: Power management section replaced. Section 3.1.2.3: Voltage tolerances modified. Section 3.1.1.7: TBD (Plug perspective) removed. Section 3.1.1.9: TBD (interface dimensions) removed. Section 2.1: Tertiary document reference removed. Section 1.4: TBD section removed.
981109	0.8	Updated illustrations Removed key positions 3 & 4 from Host connector description Added current specs to Power Mgmt section Removed “optional” from Power Mgmt section
981019	0.7D	Section 1.1, IP Disclaimer: Added statement. Section 3.1, Upstream Connection: Updated drawings. Section 3.2, Downstream Connection: Added Polarizing Information. Updated Table of Contents
981007	0.7C	Section 1.3, Revision History: Put table in reverse order per committee recommendation. Section 3.1, Upstream Connection: Added paragraph describing 2 versions of PoweredUSB connector. Section 3.1.1.2, Key Position Colors: Corrected color assignment table. Section 3.2, Downstream Connection: Updated drawings with metric dimensions. Section 3.2.2.3 Contact Assignments and Plugging Sequence: Added table Updated Table of Contents
980824	0.7B	Section 3.2, Downstream Connection: Added details of recommended device connector. Updated Table of Contents
980707	0.7A	Modified Outline Structure of Document. Section 3.1, Upstream Connection: Added basic PoweredUSB description. Section 3.1.1, Mechanical: Added information describing PoweredUSB connector including color information, retention latch description and placeholder for interface dimensions. Section 3.1.2.4, Electrical: Added Plugging Sequence. Section 3.2, Downstream Connection: Reworded paragraph Section 4.2.2, Safety Circuit: Reworded paragraph to reflect IEC 950 reqmts. Updated Table of Contents.
980629	0.6C	Section 3.1, Mechanical: Added plug illustration (more to be added at next revision). Section 3.1.2 Downstream (Device-Side) Connection: Added statement concerning captive cable assemblies. Section 3.2.3.1, Key Position 1 Voltage Table: Removed note allowing variable voltages for key position 1. Section 3.3, Power Management: Removed portion added for V 0.6B and added simplified revision.
980512	0.6B	Section 3.1, Mechanical: Added illustrations (more to be added at a later revision). Section 3.3, Power Management: Added definitions and details.
980415	0.6A	Section 2.1, Scope: Modified description of ASCSI documents. Section 3.2, Electrical: Added table showing voltage assignments. Section 3.3, Power Management: Added table describing power management
980128	0.6	Initial Revision

2 Introduction

2.1 References / Related Documents

- USB Specification 2.0 (or later) including all ECNs and errata as of May 28, 2002 (see www.usb.org).

2.2 Purpose

The purpose of this document is to publish the mechanical and electrical design characteristics of the PoweredUSB connectors and cable. This specification also defines power requirements of the host and peripheral-side devices. This document does not provide technical detail regarding USB communications as they are covered in the latest USB specification.

2.3 Terminology

PoweredUSB is also known as *Retail USB*, *USB PlusPower, and USB +Power.*

2.4 Overview

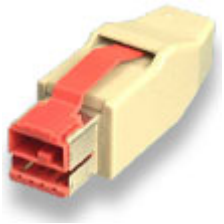
PoweredUSB provides a single cable connection that supplies both the standard USB communication signals and two additional wire pairs for extra power. The design of PoweredUSB and its connectors allow for hot-plugging. This combined with Plug-and-Play operating systems allows PoweredUSB to be easily maintained and supported in the retail environment.

One of the limitations of standard USB is the amount of +5V current available to supply attached peripherals. Normally, 500mA is available at each host port and each powered external hub port. This amount of current is sufficient for most PC type peripherals like mice and keyboards. When the power requirements exceed the 500mA limitation, external peripherals require the use of an external power supply (brick) to supply the necessary power requirements. This limitation takes away from the true "Plug-and-Play" idea conceived for USB peripherals.

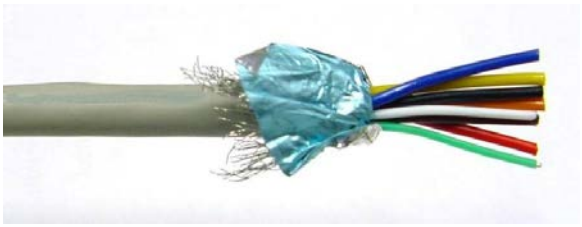
PoweredUSB components consist of the following:

1. Host-side PCB Connector

2. Host-side Cable-end Plug



3. PoweredUSB Cable, Bulk



4. Peripheral-side Cable-end Plug

5. Peripheral-side PCB Connector

3 Hardware Specifications

3.1 Host Side Connection

The PoweredUSB connector mated pair consists of a board-mounted receptacle and a mating cable-attached shielded plug. The PoweredUSB connector is fully compliant with the standard USB Type A host connector, but is designed to provide a significant new function. The primary new function is to provide additional power from the host or hub to devices that need more power than is available from the USB standard Type A connector. This additional power is supplied through another set of contacts contained within the PoweredUSB connector. The secondary new function provided by the PoweredUSB connector is a positive mechanical retention latch between the plug and receptacle. This feature prevents a device cable assembly from backing out of a PoweredUSB receptacle.

The PoweredUSB connector is specified in at least three versions; 24VDC power, 12VDC power and 5VDC power. One other keyed version may be made specified as needed. The different versions are mechanically polarized to prevent mis-plugging.

3.1.1 Mechanical

The PoweredUSB Host-side connection consists of two connectors portions integrated within a common shielded housing. The two portions are stacked vertically inside the common housing. The upper portion contains four contacts used for additional power. The lower portion is fully compliant with a USB Type A connector. The Type A section of the board-mounted PoweredUSB receptacle will mate with either a standard USB Type A plug or a PoweredUSB plug.

3.1.1.1 Polarizing Key Locations

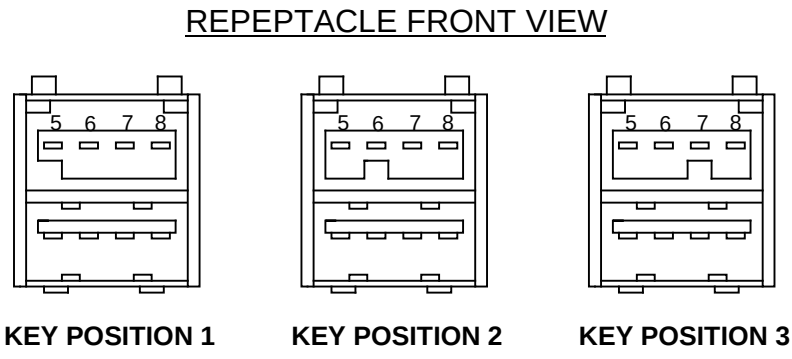


Figure 2 - Host-Side Key Position Location

3.1.1.2 Key Position Colors

The PoweredUSB connectors can be color-coded based on key position to provide a visual aid for the end user in connecting a PoweredUSB cable to the proper PoweredUSB receptacle. Color-coding is optional; however, if color-coding is used, the following specific colors are recommended. If color-coding is not used, black is the preferred color.

Key Position	PoweredUSB Plug Color	Voltage
1	Pantone Teal 3262C	12VDC
2	Pantone Red 032C	24VDC
3	Pantone Cool Gray 1C	5VDC

3.1.1.3 Retention Latch

Integrally molded into the power portion of the connector is a retention latch feature. The latch arm is molded into the plug and the receptacle has a mating slot. The latch will snap positively into position as the PoweredUSB cable assembly is mated with the PoweredUSB receptacle. The latch can be released with a simple one-handed operation.

3.1.2 Electrical

3.1.2.1 Current

The PoweredUSB contacts are rated to carry 3 amps DC (or better)
6 amps per connector maximum.

3.1.2.2 Voltage

Maximum allowed voltage between any two contacts is 250V.

3.1.2.3 Voltage Assignments

Tables describing the voltage assignments for the various key positions are shown below. Note that for any key position, Pins 6 and 7 constitute one supply with a total current carrying capacity of 6 amps. They are electrically bonded at the supply end and represent the same power supply. There is no requirement that they be bonded at the device end. However, the device must not attempt to draw more than 3 amps from either supply pin.

3.1.2.3.1 Key Position 1 (+12 volt Peripheral devices) Voltage Assignments

Pin Number	5	6	7	8
Voltage	GND	12VDC±10%	12VDC±10%	GND

3.1.2.3.2 Key Position 2 (POS Printer Applications) Voltage Assignments

Pin Number	5	6	7	8
Voltage	GND	24VDC±10%	24VDC±10%	GND

3.1.2.3.3 Key Position 3 (+5 volt Peripheral devices) Voltage Assignments

Pin Number	5	6	7	8
Voltage	GND	5VDC±10%	5VDC±10%	GND

3.1.2.4 Contact Assignments and Plugging Sequence

The host end PoweredUSB contact plugging sequence is as follows. The unplugging sequence is the reverse of the plugging sequence.

Contact Number	Signal Name	Plugging Sequence
Shell	Shield	1
1	VBUS	2
2	D-	3
3	D+	3
4	USB Ground	2
5	PWR Ground	2
6	VPLUS	3
7	VPLUS	3
8	PWR Ground	2

3.2 Host Side PCB Connector

3.2.1 Perspective

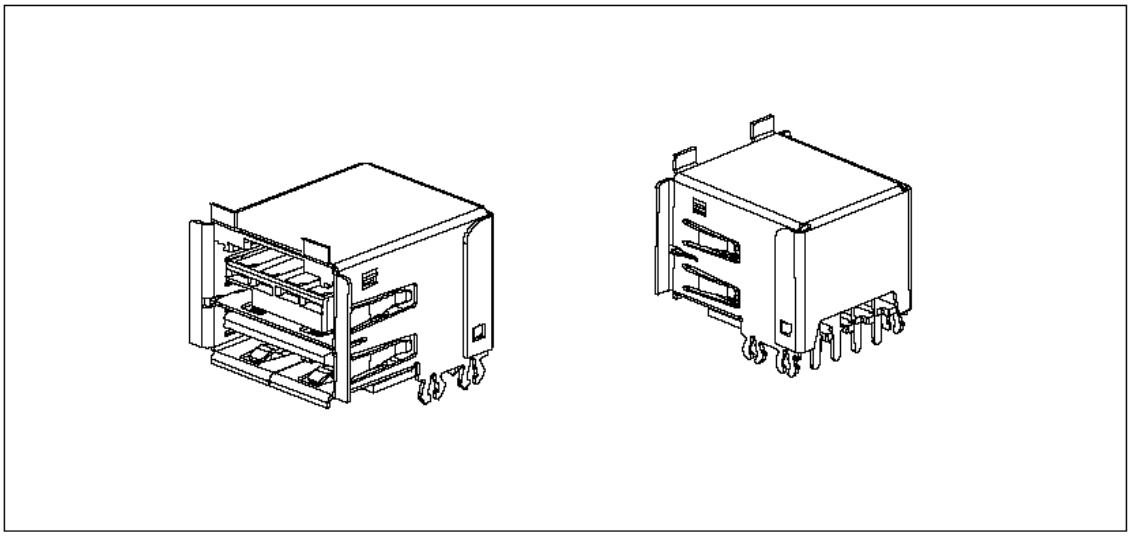


Figure 2 – Host-Side PCB Connector Perspective

3.2.2 PCB Layout

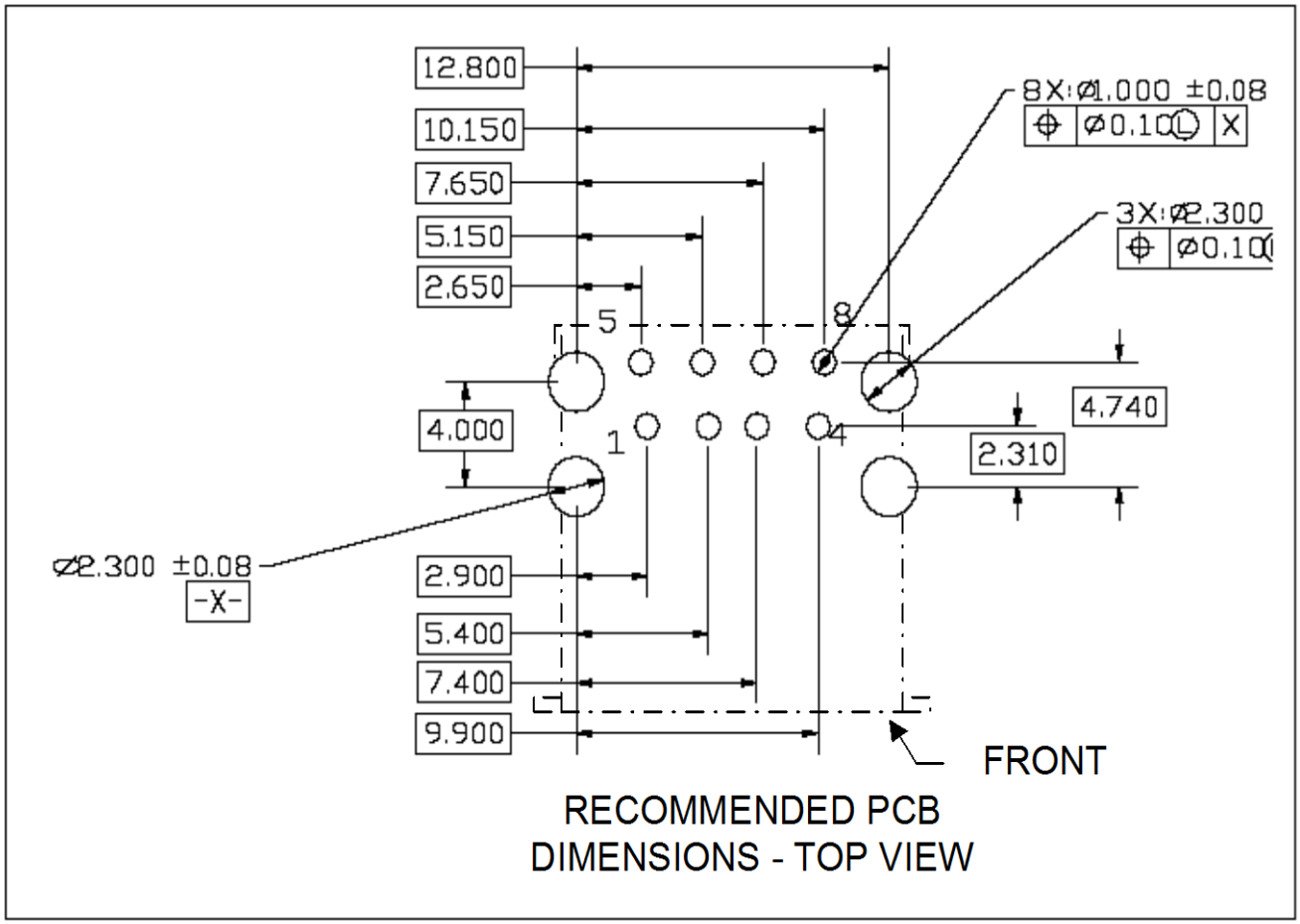


Figure 3 - Host Side PCB Connector Hole

3.2.3 Dimensions

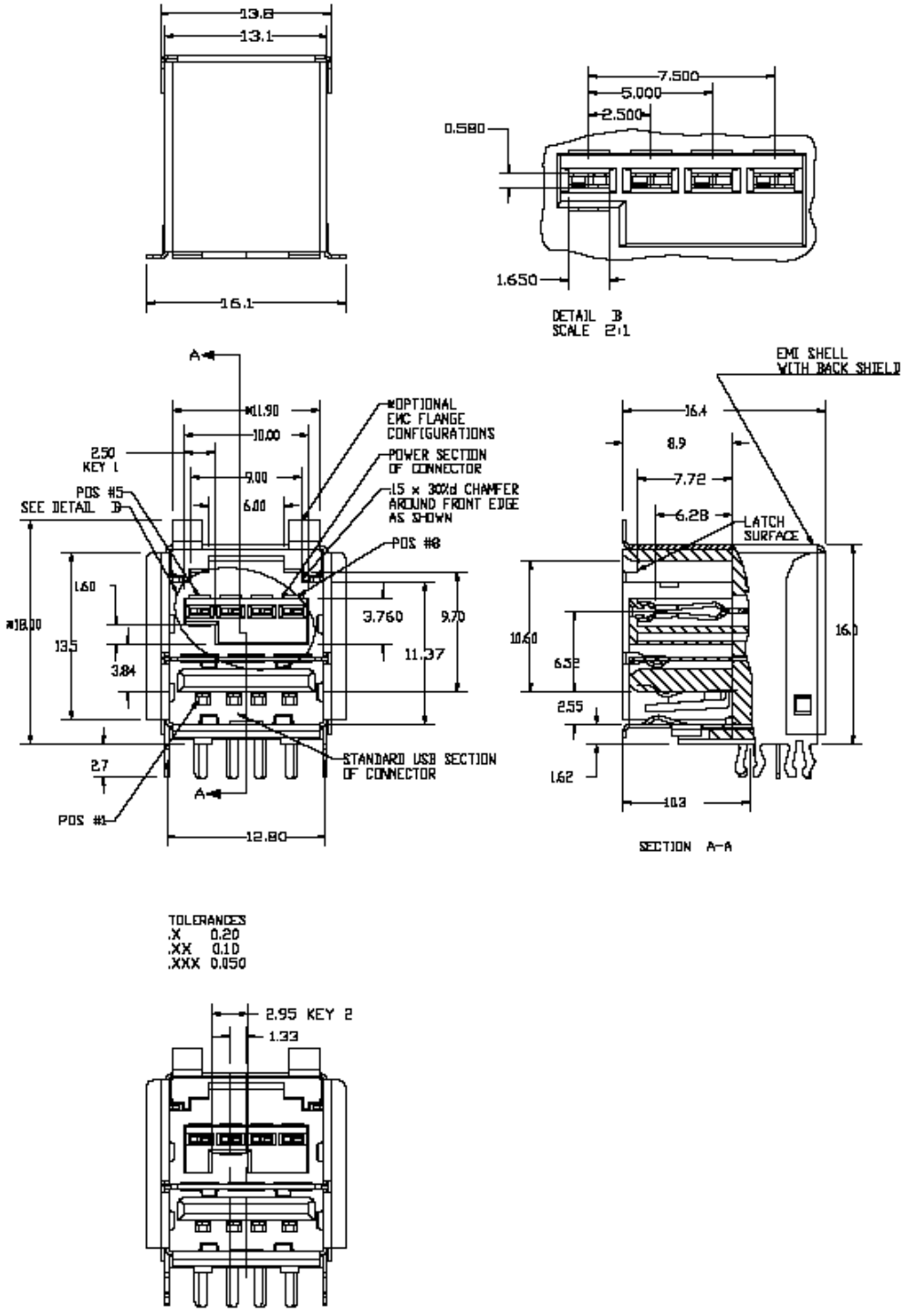


Figure 4 - Host Side PCB Connector Dimension
(For reference only)

3.3 Host-Side Cable-End Plug

3.3.1 Plug perspective

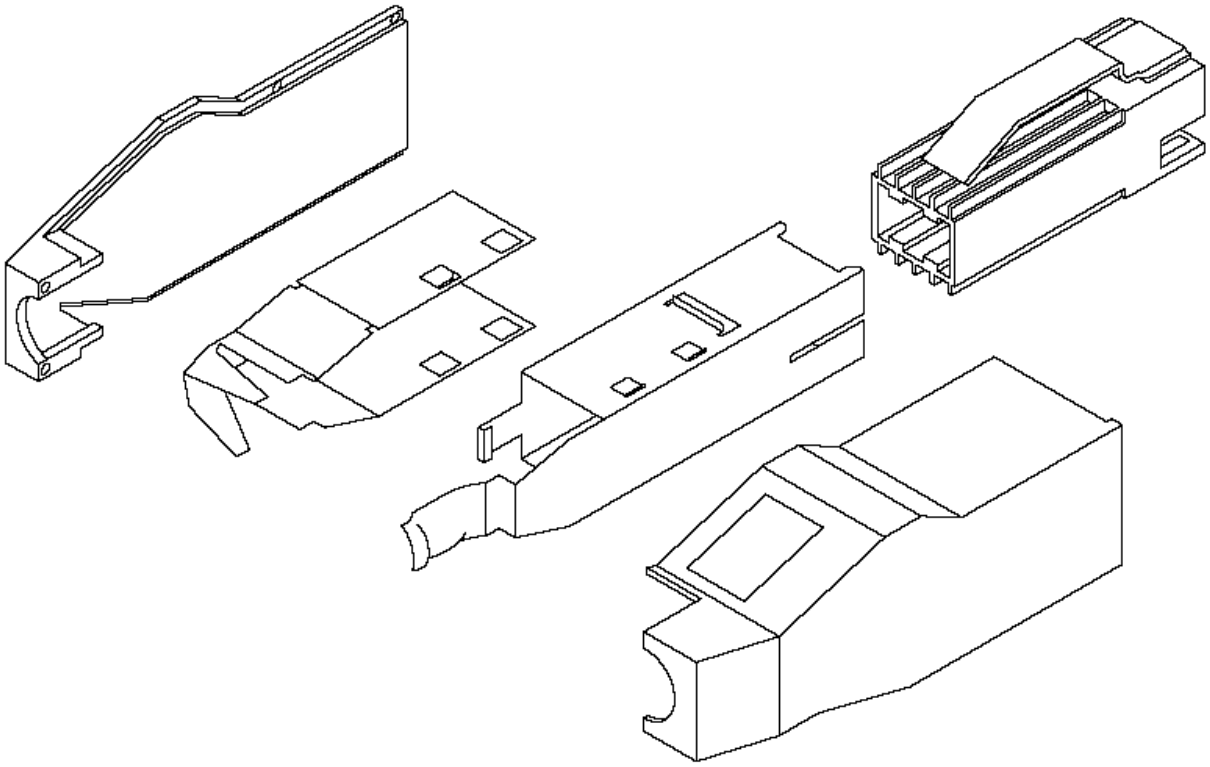


Figure 5 – Host-Side Plug Perspective

3.3.2 Dimensions

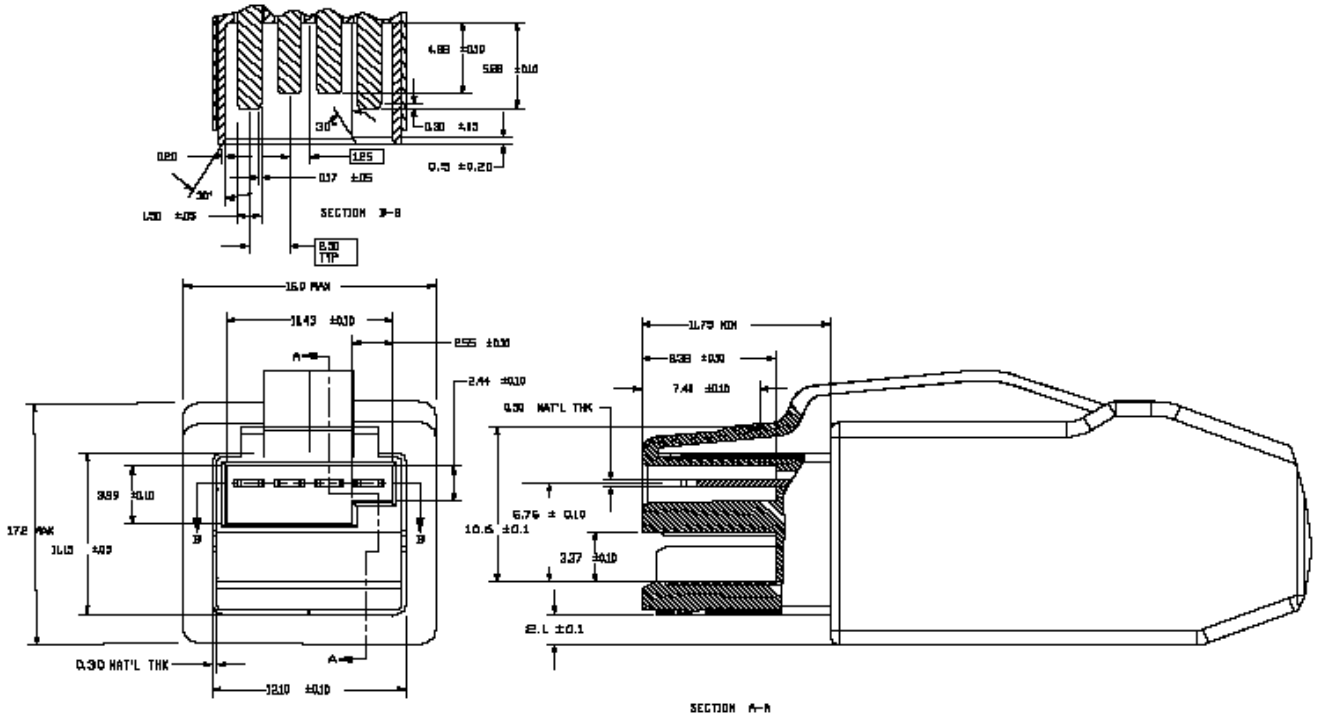


Figure 6 - Host-Side Plug Dimensions
All dimension in millimeters (mm)
(For reference only)

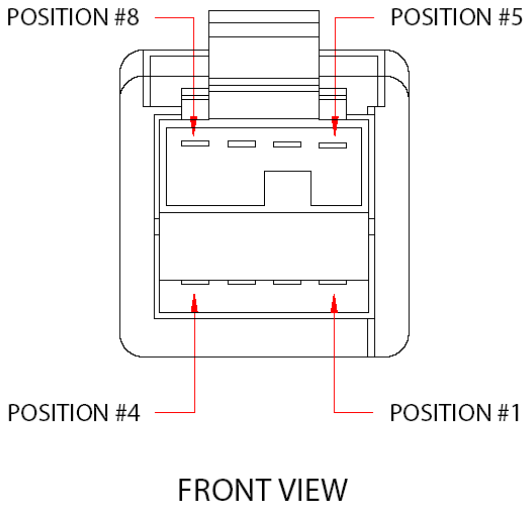


Figure 7 - Host-Side Plug Pin-Out
(Key position 2 shown)

3.4 Cable

The PoweredUSB cable consists of up to eight conductors. For a fully loaded cable, the following parameters apply.

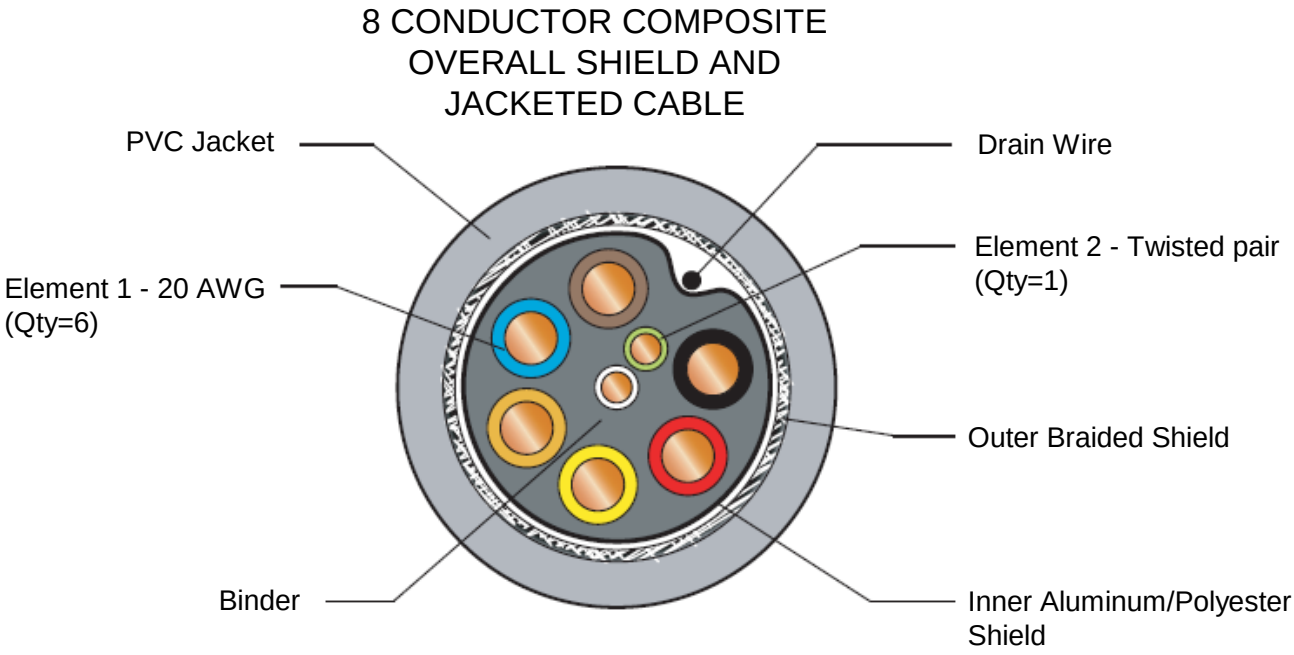


Figure 8 - Bulk Cable Cross Section

Cable Specifications

Overall cable
6.7 ± 0.25 mm (.264" ±.010") diameter (Nominal)

Element 1: 6 Primaries
Element 2: 1 Pair
Filler: Optional
Inner Shield: Metalized Polyester Tape, facing outward, 25% Overlap
28 AWG (7x36) Tinned copper drain wire over tape

Braided Outer Shield:
36 AWG Interwoven Tinned copper
≥ 65% coverage

Jacket: Polyvinyl chloride or Flexible XPbT

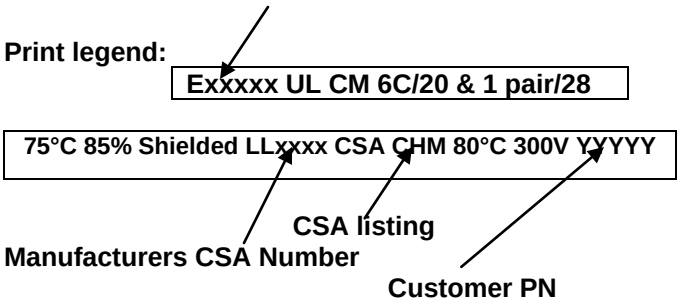
Element 1:
20 AWG (19 X 32) Tinned copper
Semi-rigid Polyvinyl Chloride, 55% min coverage
0.58" ±0.002 dia.
Number of primaries: 6
Color code:

1. **Red**
2. **Black**
3. **Brown**
4. **Blue**
5. **Orange**
6. **Yellow**

Element 2:
26-28 AWG (7x36) Tinned copper
Polypropylene 0.032" ± 0.002" dia.
Twisted pair: One full twist every 60 to 80mm
Number of pairs: 1

Conductor name	Color	Element
USB Data +	Green	2
USB Data -	White	2
USB VBUS(Vcc)	Red	1
USB Power Gnd	Black	1
Ext Power V	Brown	1
Ext Power Gnd	Blue	1
Ext Power V	Orange	1
Ext Power Gnd	Yellow	1

Cable Markings (example)



For raw cable - UL Listing Type CM or equal per Article 800 of the National Electrical Code and CSA Certified as Type CMH or CMG (UL or BSA)

For assemblies - Cables should conform to UL standards for Listed Computer Interconnection Cable Assemblies (DVPJ)

Flammability: UL 94 V-0
Electrical requirements:
Impedance (Differential): 90±15% Ohms-Nominal
Impedance (Commom Mode): 30±30% Ohms-Nominal
Capacitance (Mutual): 20pf/ft Max. 10 Khz
Time delay (Max): 18nS for Low Speed, 26nS for Full Speed/High Speed
Insulation resistance: 1000 MOhms Max. 20° C
Conductor resistance: 70 mOhms/ft Max 20° C
Conductor resistance unbalanced: 5% Max
Pair-ground capacitance unbalanced: 1000 pf per 1000 ft Max. 1 KHz

Maximum Cable Attenuation:

Frequency (MHz)	Attenuation (dB)
0.064	0.08
0.256	0.11
0.512	0.13
0.772	0.15
1.000	0.20
4.000	0.39
8.000	0.57
12.000	0.76
24.000	0.95
48.000	1.35
96.000	1.9
200.00	3.2
400.00	5.8

The DC resistance from plug shell to plug shell must be less than 0.6 ohms

3.5 Peripheral-Side Connection

The PoweredUSB 2X4 Keyed connectors defined in this specification are the approved connectors for devices attached to a peripheral-side device by means of a PoweredUSB cable assembly.

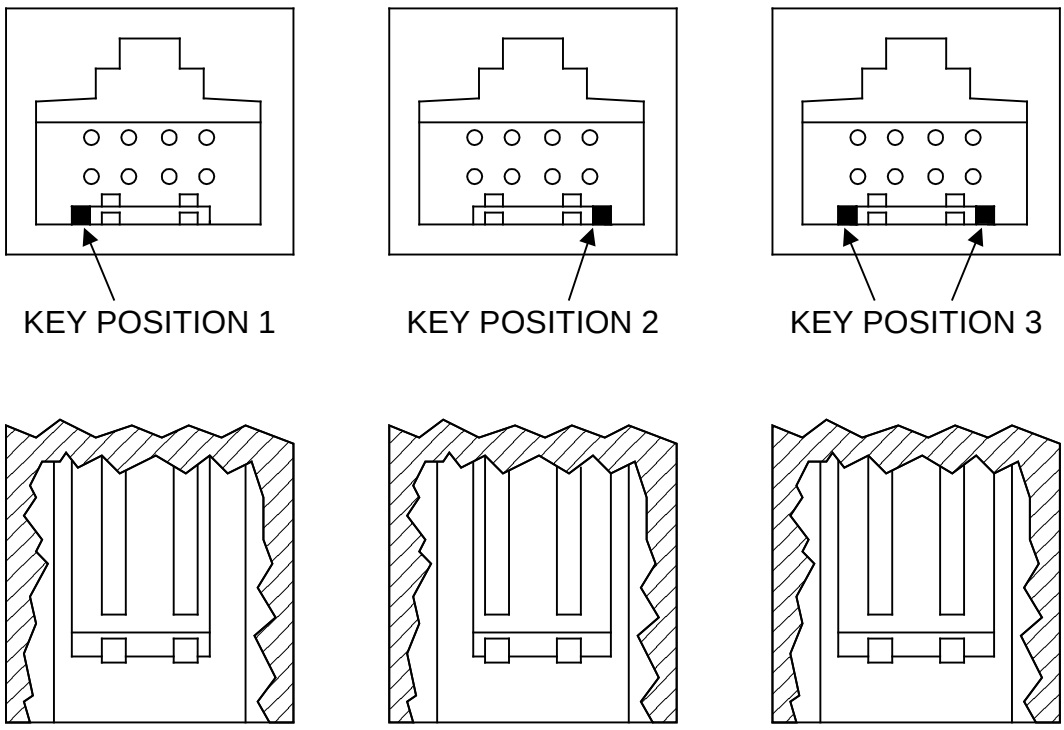
3.5.1 Mechanical

The Peripheral-Side PoweredUSB connector defined in this specification consists of an 8-position connector in a 2-row by 4-position (2X4) configuration.

3.5.1.1 Polarizing Key Locations

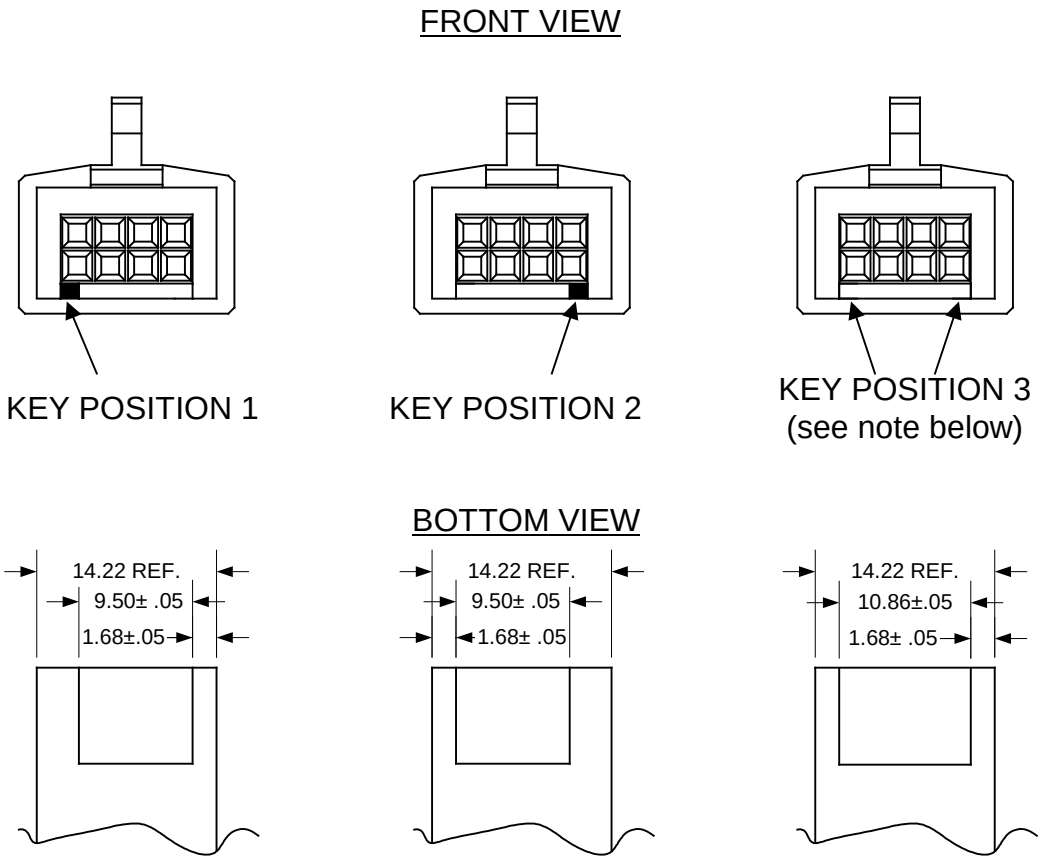
Integrally molded into the connector is a polarizing key. The key can be in one of three possible positions as shown below. Each key position corresponds to a specific PoweredUSB voltage as specified for the host end connector in section 3.5.1.2. Although the contact number assignments are different for the host and device ends of a PoweredUSB cable assembly, the PoweredUSB voltage used for Key Position 1 on the host end connector will also be used for the Key Position 1 version of the Device end connector. It should be noted that either polarized plug would mate with a non-polarized receptacle. Host side and Peripheral side keying is required to be the same on both ends of the cable.

RECEPTACLE FRONT VIEW



RECEPTACLE TOP CUTOUT VIEW

Figure 9– Peripheral-Side PCB Connector Polarizing Key Positions



Note: Key position 3 Plug can potentially mate with Receptacle Key Positions 1 & 2. However, since Key Position 3 is 5V, no damage to 12V or 24V peripherals should occur.

Figure 10 – Peripheral-Side Plug Polarizing key location
All dimension in millimeters (mm)

3.5.1.2 Key Positions Assignments

Color of peripheral side connector is at the discretion of the user. However, the color of the peripheral side connector should not contradict the color of the Host side. Ideally, the Peripheral-Side Connectors should match the color of the Host side connectors.

Key Position	Voltage
1	12 VDC
2	24 VDC
3	5 VDC

3.5.1.3 Retention Latch

Integrally molded into the Series “B” PoweredUSB connector is a retention latch feature. The latch arm is molded into the plug and the receptacle has a mating slot. The latch will snap positively into position as the cable assembly is mated with the receptacle. The latch can be released with a simple one-handed operation.

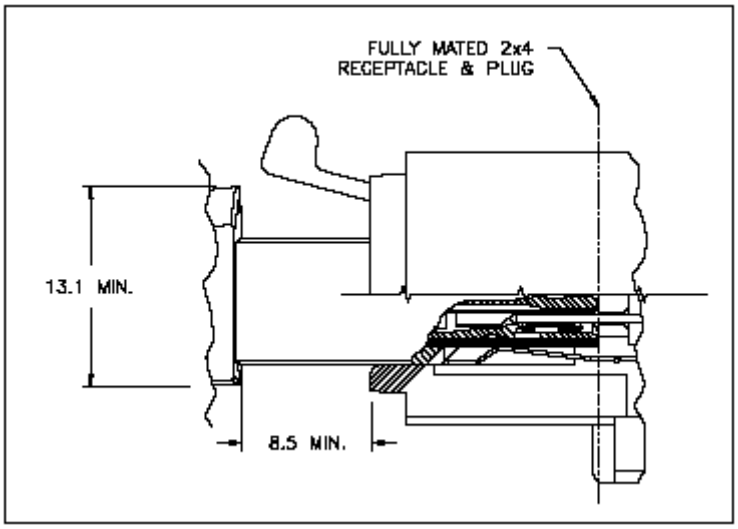


Figure 11 – Peripheral-Side Interface Dimensions
(For Reference Only)

3.5.2 Electrical

3.5.2.1 Current

The PoweredUSB contacts are rated to carry 3 amps DC.
6 amps per connector maxium.

3.5.2.2 Voltage

Maximum allowable voltage between two contacts is 250V.

3.5.2.3 Voltage Assignments

Tables describing the voltage assignments for the various key positions are shown below.

Note: For any key position, Pins 2 and 8 constitute one supply with a total current carrying capacity of 6 amps. They are electrically bonded at the supply end and represent the same power supply. There is no requirement that they be bonded at the device end. However, the device must not attempt to draw more than 3 amps from either supply pin.

3.5.2.3.1 Key Position 1 (+12 volt Peripheral devices) Voltage Assignments

Pin Number	1	2	8	7
Voltage	GND	12VDC±10%	12VDC±10%	GND

3.5.2.3.2 Key Position 2 (POS Printer Applications) Voltage Assignments

Pin Number	1	2	8	7
Voltage	GND	24VDC±10%	24VDC±10%	GND

3.5.2.3.3 Key Position 3 (+5 volt Peripheral devices)) Voltage Assignments

Pin Number	1	2	8	7
Voltage	GND	5VDC±10%	5VDC±10%	GND

3.5.2.4 Contact Assignments and Plugging Sequence

In the plugging sequence shown in the chart below, the top row of contacts (second in the sequence) mates before the bottom row of contacts (third in the sequence). This plugging sequence matches the one on the host end connector.

Contact Number	Signal Name	Plugging Sequence
Shell	Shield	1
1	PWR Ground	2
2	VPLUS	3
3	VBUS	2
4	D+	3
5	USB Ground	2
6	D-	3
7	PWR Ground	2
8	VPLUS	3

3.5.2.5 Alternate Peripheral-Side

The Peripheral side connection shall not be or appear to be a PoweredUSB Host side connector, nor shall it be or appear to be a USB Type A or Type B connector, with the following two exceptions:

1. It is permitted that the peripheral-side connection consist of a USB Type B connector and a separate vendor-specific connector that carries the PoweredUSB additional power or,
2. The following peripheral-side connector may be used in order to combine the USB and power portions of the interface:

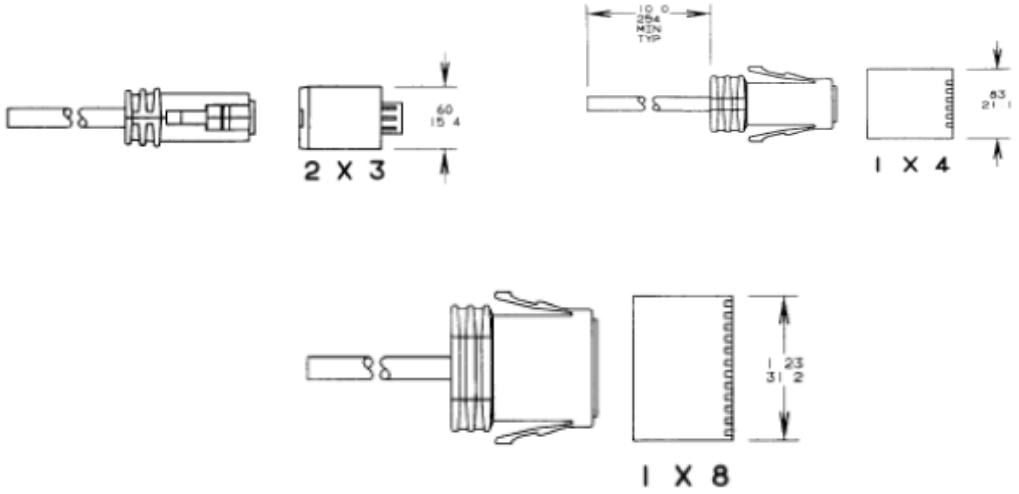


Figure 12 – Peripheral-Side Alternate Peripheral-Side Connectors
(For reference only)

Other style connectors may be used for other application-specific products, i.e. 24V POS printer connectors are standardized 1x8 Latch-n-Loc, 12V POS Pole display are 2x3, and 5V Keyboard are 1x4 (see Figure 8). The connector-mated pair consists of a board-mounted shielded receptacle and a mating cable-attached shielded plug. The connector has a positive mechanical latch to assure retention of the plug to the receptacle.

The selection of an alternate Peripheral-side connector must follow the proper mating sequence as shown in Table below:

Pin Connection **Sequence**	Function		
1	**Shield**		
2	**VBUS**	**P.GND**	**USB.GND**
3	**VPLUS**	**D+**	**D-**

Note: Peripheral-Side Connectors that do not incorporate the above features must not be hot-plugged otherwise, electrical arching may damage connector contacts and equipment.

3.6 Peripheral-Side Cable-End Plug

3.6.1 Plug- Perspective

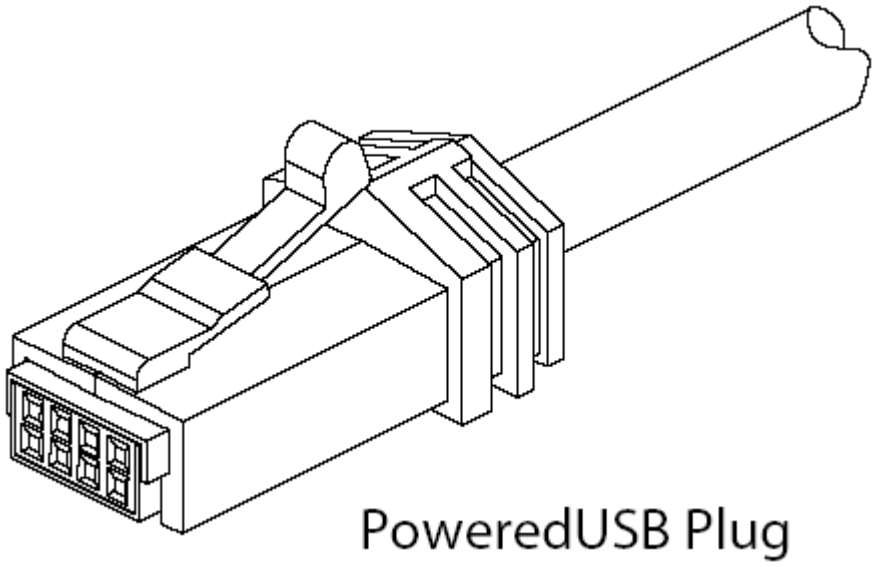


Figure 13 - Peripheral-Side Plug Perspective

3.6.2 Plug – Dimensions

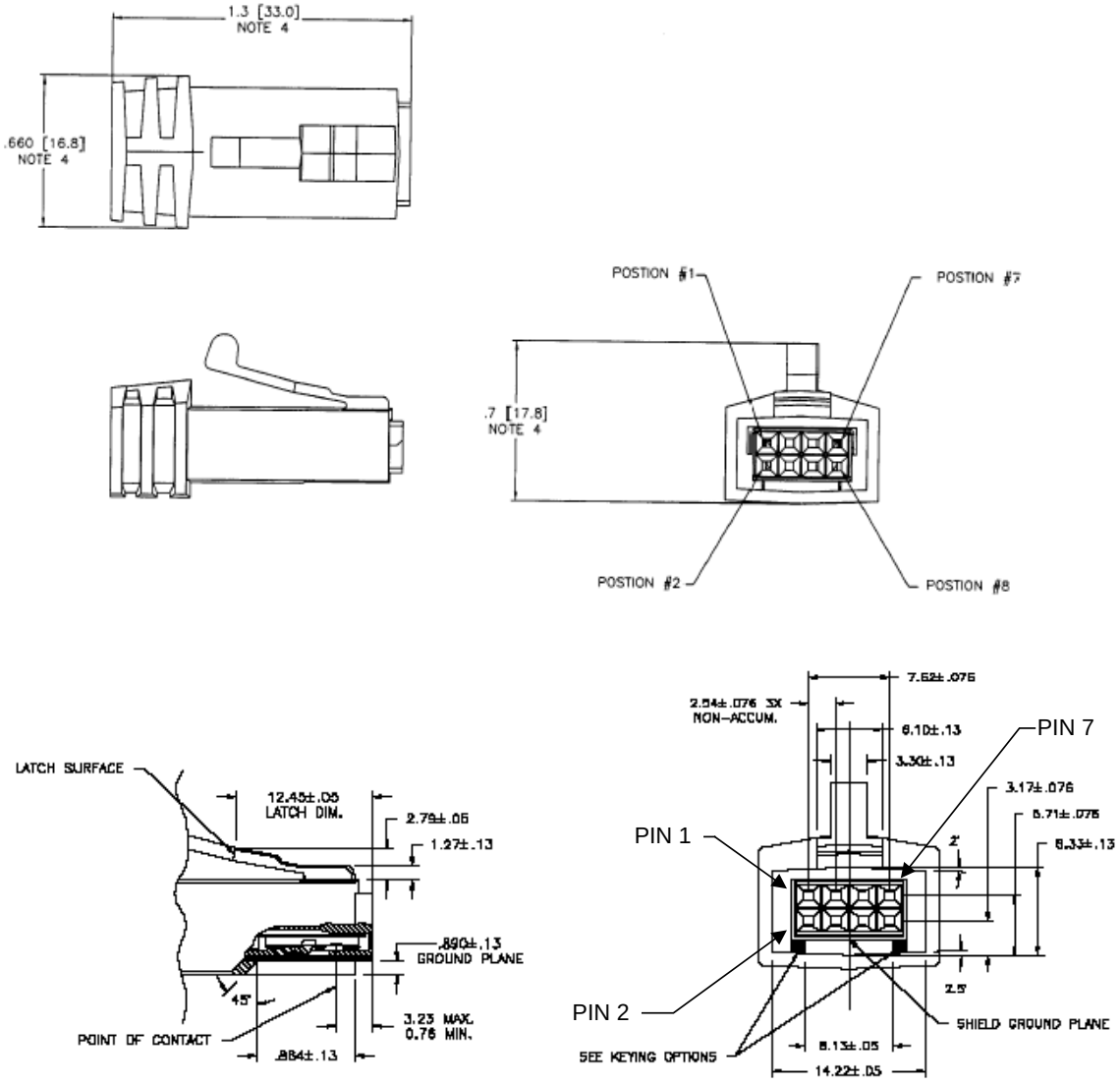


Figure 14 - Peripheral-Side Plug Dimension

All dimension in millimeters (mm)

(For reference only)

3.6.3 Plug Assembly

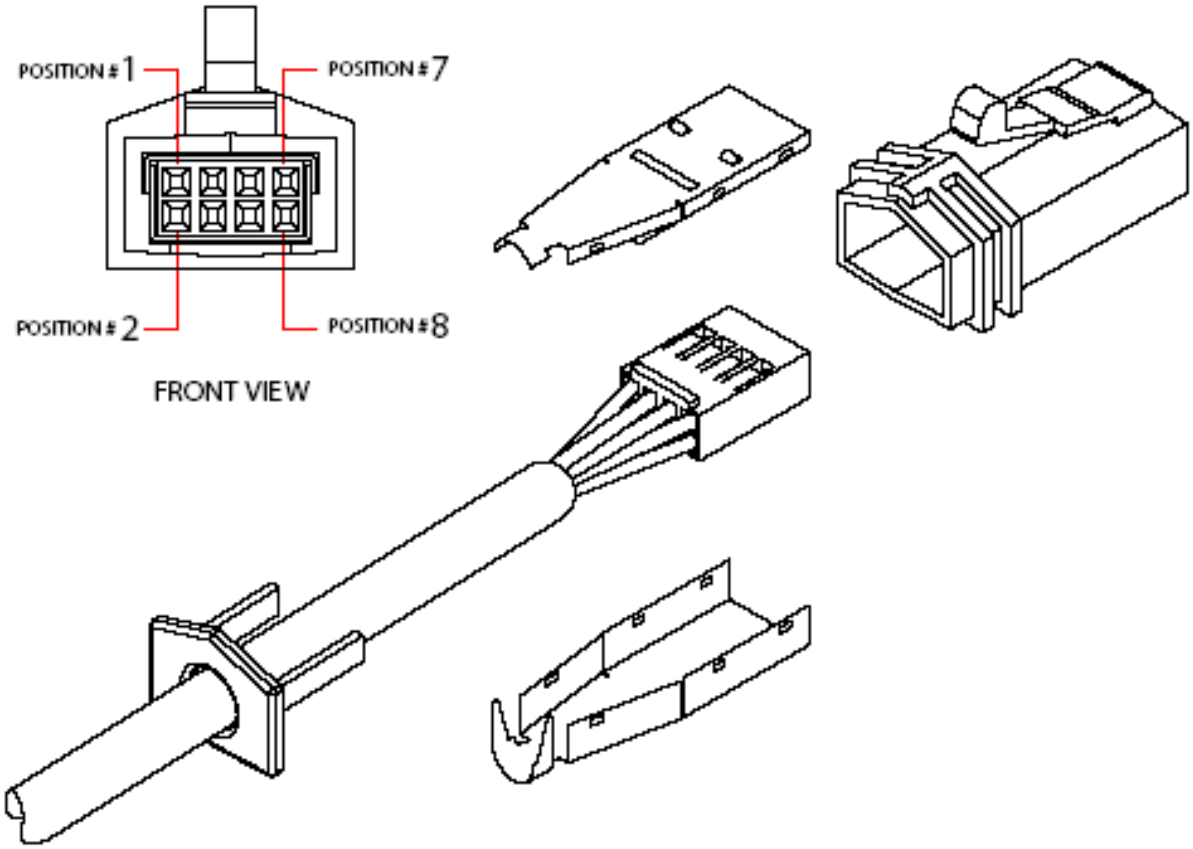


Figure 15 – Peripheral-Side Plug Assembly

3.7 Peripheral-Side PCB Connector

3.7.1 Peripheral-Side PCB Connector - Perspective

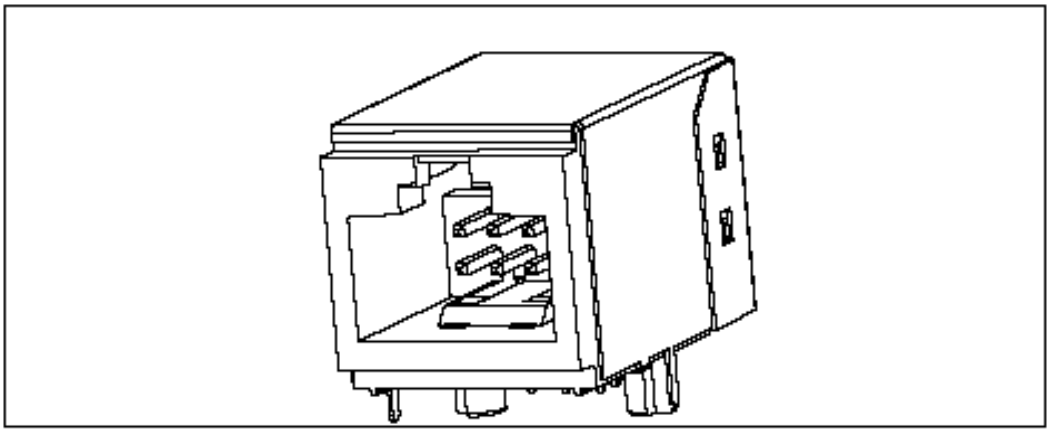


Figure 16 - Peripheral-Side PCB Connector

3.7.2 Peripheral-Side PCB Connector - Hole Pattern

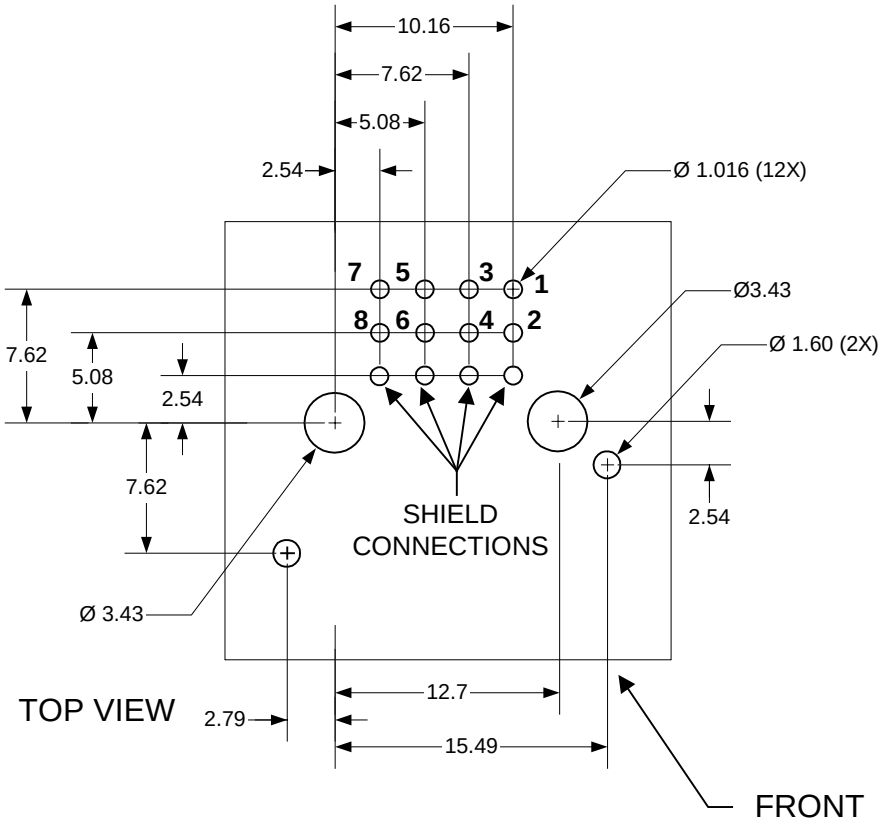


Figure 17 - Peripheral-Side PCB Connector
All dimension in millimeters (mm)
(For reference only)

3.7.3 Peripheral-Side PCB Connector – Dimensions

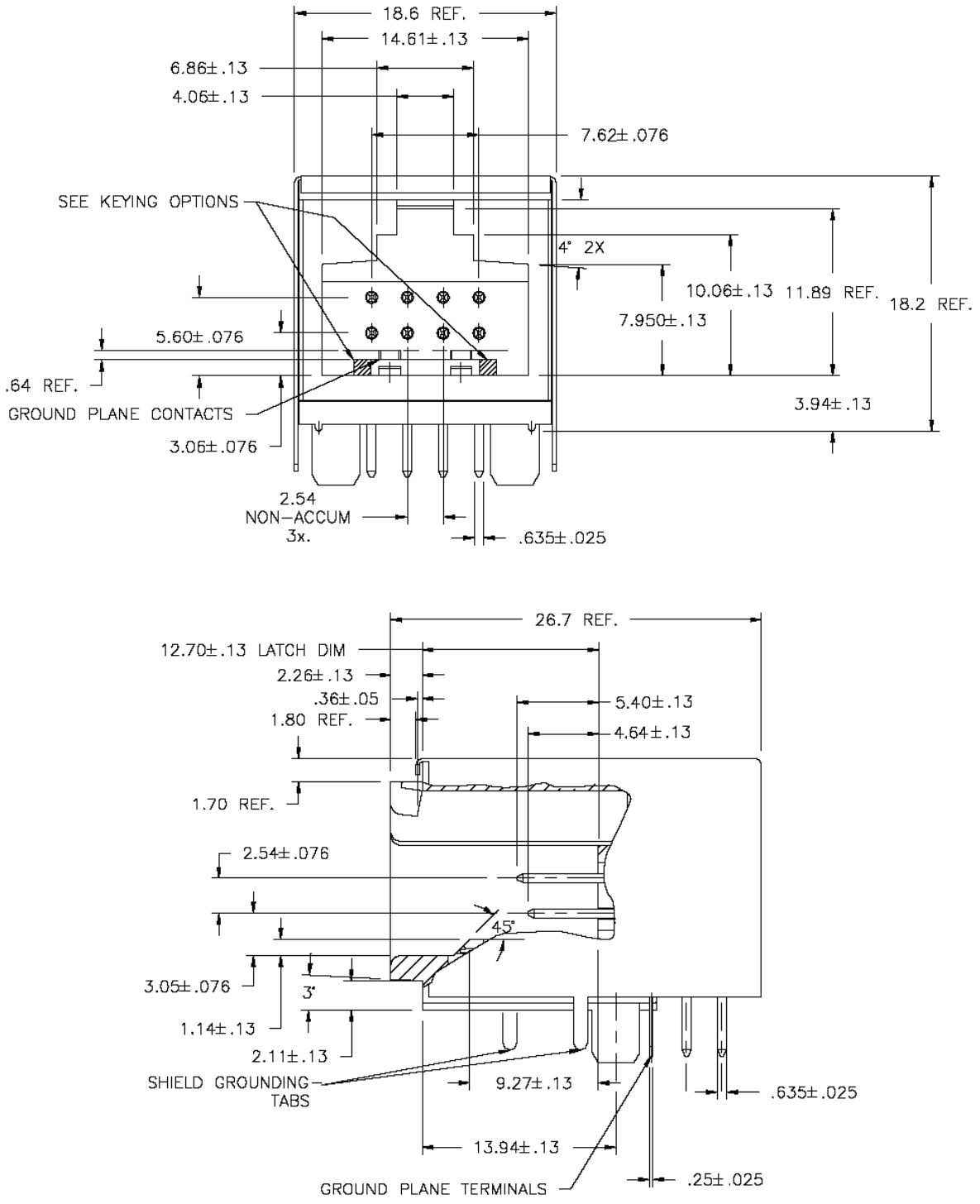


Figure 18 - Peripheral-Side PCB Connector
All dimension in millimeters (mm)
(For reference only)

4 Power Management

4.1 Overview

This section defines the required power management environment for equipment using the PoweredUSB connector. Minimum requirements are defined by enabling the inter-operability of PoweredUSB 'Hosts' and 'Peripherals', first for the Host and then for Peripherals. The system components involved in defining the power management requirements are defined as follows:

PoweredUSB voltage - Vplus, a specific voltage level assigned to a particular PoweredUSB connector key position.

Host - upstream side power sourcing equipment typically a system unit. The Host supplies PoweredUSB voltage for devices at a particular current. The 'Host', as defined in this document could also be a USB self-powered hub.

Peripheral - a unit that requires PoweredUSB voltage, possibly in addition to normal USB Vbus; if Vbus is not used the device can be considered 'self-powered" under existing USB terminology.

4.2 Requirements for all PoweredUSB Hosts

This section defines the required power management environment for the Host side acting as a power provider.

4.2.1 Power Supply Specification

Each of the PoweredUSB connectors shall provide the power mentioned below as determined by the connector Key. In order to ensure that all PoweredUSB Hosts can properly provide power to attached devices during power up, each port shall establish power in a sequence in contrast to all at the same time. The period of the sequencing should be between 100ms to 500ms per port. If the Power Supply can sustain the current peaks described below, sequencing may gang ports together or sequence them 2 by 2. PoweredUSB ports must be able to provide +5V BUS for the USB according to the USB 2.0 Specifications regardless of the state of the VPlus Port. During standby operation, Vplus power MUST be removed from Powered Ports to provide low power standby systems. In that state, the standard +5VBus must also be in compliance with USB Specifications.

4.2.1.1 +5VDC - Key position 3

Each Key Position3 PoweredUSB connector should provide +5VDC ±10% with a minimum sustainable current of 1.5A RMS. During Power up, ports should be able to withstand and limit peak inrush currents as high as 20A for 100us with a decay of 20mA/us. This is equivalent to the live connection of a pure RC circuit where R represents the connectors+cable+capacitor(ESR) resistances and C a 2200uF capacitor. The 20A limit can be on a per-port basis or a global ganged limit.

4.2.1.2 +12VDC - Key position 1

Each Key Position1 PoweredUSB port should provide +12VDC ±10% with a minimum sustainable current of 1.5A RMS. A +12V Port should be able to deliver as much as 5A for 5-10 seconds without generating an Over Current Protection. Because of the large number of +12V Ports usually available in higher-end retail hosts, it is acceptable to place a global cap on the total current for these ports as long as it guarantees 1.5A Continuous per ports. For example an OEM may chose to connect a peripheral to a +12V port that often demands up to 5A currents as long as the total current consumption of all +12V peripherals does not exceed the number of ports multiplied by 1.5A. In contrast, each port shall be able to sustain 4A peaks for periods of 10ms with a duty cycle of 1/6. Additionally, during power-up, each port should be able to sustain 20A peaks for 100us with a current decay assumed of 20mA/us.

4.2.1.3 +24VDC - Key Position 2

Each Key Position2 PoweredUSB connector should provide +24VDC ±10% with a minimum sustainable current of 2.3A RMS. Each 24V Port should be able to withstand the following peak current conditions:
- 5A peak for 100ms duty cycle 800ms (2A RMS assumed).
- 8A peak for 2ms duty cycle 1/14 (2A RMS assumed).
- 20A peak for 100us duty cycle 1/40 (2A RMS assumed).
  20A surges must fall down quickly at a rate of 20mA/us.

4.3 Over-current Protection

Surges are instantaneous in nature and do decay quickly. When high currents are drained for sustained periods in the order of 20ms, the Hosts should immediately stop providing the VPlus power and place that port in a Over Current Protection mode (OCP). OCP should be provided on a per-port basis but can alternatively affect all PoweredUSB ports on the Host. The interruption of the VPlus power must not affect the +5V on the standard USB VBus power. The +5VBus must remain on and maintain it's own independent OCP protection at 500mA as per USB specifications.

4.4 Safety Circuit

All PoweredUSB Equipment must adhere to the regulatory laws of the country of use. For example, for Information Technology Equipment (ITE) that must comply with the product safety standard IEC 60950-1, the host must use a Safety Extra Low Voltage (SELV) circuit to supply power to the PoweredUSB connector. The maximum energy that may be present on any specific PoweredUSB connector on the host is 240VA as per IEC 60950-1 requirements.

4.5 Requirements for all PoweredUSB Peripheral Devices

4.5.1 VPlus Power Consumption

A PoweredUSB Peripheral may draw current as specified herein from the moment of initial Power ON. The current drawn by a PoweredUSB Peripheral shall be no greater than the following, per key position:

4.5.1.1 +5VDC - Key Position 3

The Power circuitry of a +5V PoweredUSB device should not drain more than 1.5A RMS continuous during normal operation. Peak current demands should remain short (under 10ms) and assume a RMS of 1.5A if repetitive. When VPlus is initially applied, the peripheral should limit the current rise time to limit the surge current. It is recommended to limit the rise time to 10mA/us or less. If the peripheral does not limit di/dt, it's dynamic impedance should be the same as a Capacitor of 2200uF with an ESR of 80 milli-ohms or more. (Note1)

4.5.1.2 +12VDC - Key Position 1

The Power circuitry of a +12V PoweredUSB device should not drain more than 1.5A RMS continuous during normal operation. Peak current demands should remain short (under 5ms) and be non repetitive. When VPlus is initially applied, the peripheral should limit the current rise time in an attempt to limit the surge current. It is recommended to limit the rise time to 10mA/us. If the peripheral does not limit di/dt, it's dynamic impedance should be the same as a Capacitor of 1000uF with an ESR of 40 milli-ohms or more. (Note1)

4.5.1.3 +24VDC - Key Position 2

The Power circuitry of a +24V PoweredUSB device should not drain more than 2A RMS during normal operation. When VPlus is initially applied, the peripheral must limit the current rise time to 10mA/us or less as to limit the peak surge current. The peak surge is not to exceed 20A. If the peripheral does not limit the di/dt rise time, then it's dynamic impedance should be equivalent to a capacitor of 500uF with an ESR of 60 milli-ohms or more (note1).

Note-1: The ESR impedance figure does not include that of the connectors and cables which is counted on by this specification to further limit the surge current.

4.5.2 Removal of Device Voltage

VPlus power can be withdrawn at any time from a Peripheral without warning and shall not result in any unrecoverable device behavior. It is especially important for a peripheral to be able to communicate with the host regardless of the presence of the VPlus power. As soon as the +5V VBus power from the standard USB connections is present, a peripheral must forego the enumeration process with the host as per USB specifications and maintain functional USB communication for as long as VBus is present as per the USB specifications 1.1. Alternatively, if VPlus is present but VBus is not, a device's USB communication to the host must cease as if the device was not connected (no pull-up).

4.5.3 In-Rush Current Control

For peripherals with large capacitance on Vplus, it is recommended that the device employ current control to prevent power supply shutdown or blown fuses if the PoweredUSB connector is hot plugged.

4.5.4 Hot-Plugging/Hot-Unplugging Considerations

The PoweredUSB connector is not rated to withstand any specific number of arcs, which may occur during hot plugging or hot unplugging. Since equipment users will associate USB with hot plugging and hot unplugging, is recommended that devices be designed to avoid connector degradation or electronic component failure that could occur if arcing is not suppressed. PoweredUSB ground makes contact before Vplus; this feature allows for electrical suppression of arcing to be designed into the connection. Adherence to the in-rush current control compatibility specification may also have the effect of eliminating arcing during hot-plugging in many applications. Devices with large inductive loads should consider voltage control circuitry such as a clamping diode to prevent arcing during hot-unplugging.

Reader Comment:

Every effort has been made to ensure the accuracy of this specification. However, if you have any reservations and would like to address accuracy, clarity, and/or completeness of this document please communicate your comment(s) to the author (see contact below). If you would like additional information please see www.PoweredUSB.org or contact author. Your suggestion and recommendations would be greatly appreciated.

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