
PCB Layout and Design Considerations for CH7231A

1.0 Introduction

The CH7231A is a device targeting the USB Type-C Electronically Marked Cable (E-Marker). The device is designed to follow the USB Type-C Specification 1.2 and the USB Power Delivery Specification Revision 2.0, Version 1.2. The power delivery should support a maximum 5A current. The size of a PCB has a limitation based on E-Marked USB cable assembly.

This application note focuses only on the basic PCB layout and design guidelines for CH7231A, USB Type-C Plug and cable solder line-pads. Since the mechanical design of USB Type-C Plug and the pin sequence of cable solder line-pads are manufactory related, guidelines in component placement, power supply decoupling, grounding, input/output signal interface are generally discussed in this document.

The guidelines discussed here are intended to optimize the PCB layout and applications for this product. They are only for reference. Designers are urged to implement the configurations and evaluate the performance of the E-Marked USB cable prior to bringing the design to production.

2.0 Component Placement

Components associated with CH7231A, USB Type-C Plug and cable solder line-pads should be placed as close as possible to the respective pins. The following discussion will describe guidelines on how to connect critical pins, component placement, and layout associated with these pins.

2.1 CH7231A placement

Since VCONN1 and VCONN2 of CH7231A are interchangeable, a flexibility of CH7231A placement is given for PCB optimum routing according to different pin sequence of cable solder line-pads from different cable manufactory.

2.2 Power Supply Pins and De-coupling

According to USB Type-C Cable Connection Specification, all VBUS pins shall be connected together within the USB Type-C plug. A 10 nF capacitor (minimum voltage rating of 30V) is required for the VBUS pins in the full – featured cable at each end of the cable. The bypass capacitor should be placed as close as possible to the power supply pad. All VBUS pins should be connected to a VBUS power plane.

Vconn is a Type-C cable plug power. It is independent of VBUS and, unlike VBUS which can use USB-PD to support higher voltage. Vconn voltage is fixed at 5V.

2.3 Ground Pins

The ground pin of CH7231A, USB Type-C Plug and cable solder line-pads should be connected to a common ground plane to provide a low impedance return path for the supply currents.

2.4 Plug Configuration Detection Pins

CC is used for USB – PD communication. CC pin is connected through the cable to establish signal orientation. All the CC pins from CH7231A, USB Type-C Plug and cable solder line-pads should be connected together. CC trace shall have characteristic impedance of 32 Ω to 53 Ω .

2.5 Data path of differential signal pairs

There are five pairs of USB differential signals going through the PCB board. These data paths must meet USB Differential Pairs Impedance requirement. Additionally, routing of each pair of differential signals must be delay matching.

D+/D- traces shall have differential characteristic impedance of 90 $\Omega \pm 15 \Omega$.

The USB SuperSpeed traces should be as short as possible and have a nominal differential characteristic impedance of 85 $\Omega \pm 9 \Omega$.

The differential pairs should have a minimum pair-to pair separation of 0.5 mm.

The intra-pair skew for a differential pair is recommended to be less than 10 ps/m.

2.6 Auxiliary Signals

SBU1 and SBU2 are for sideband use. The wire shall have characteristic impedance of 32 Ω to 53 Ω .

3.0 Reference Design Example

Figure 1 is the reference schematic of CH7231A TSOT23-5.

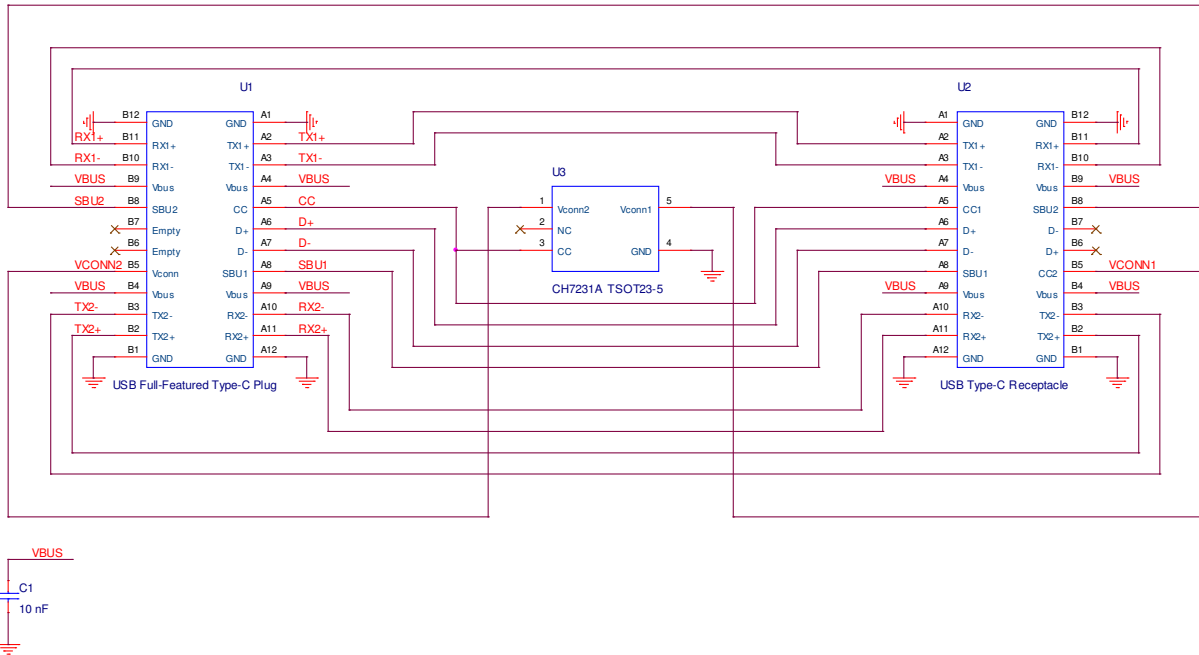


Figure 1: CH7231A TSOT23-5 Reference Schematic

Figure 2 is the reference schematic of CH7231A DFN-6.

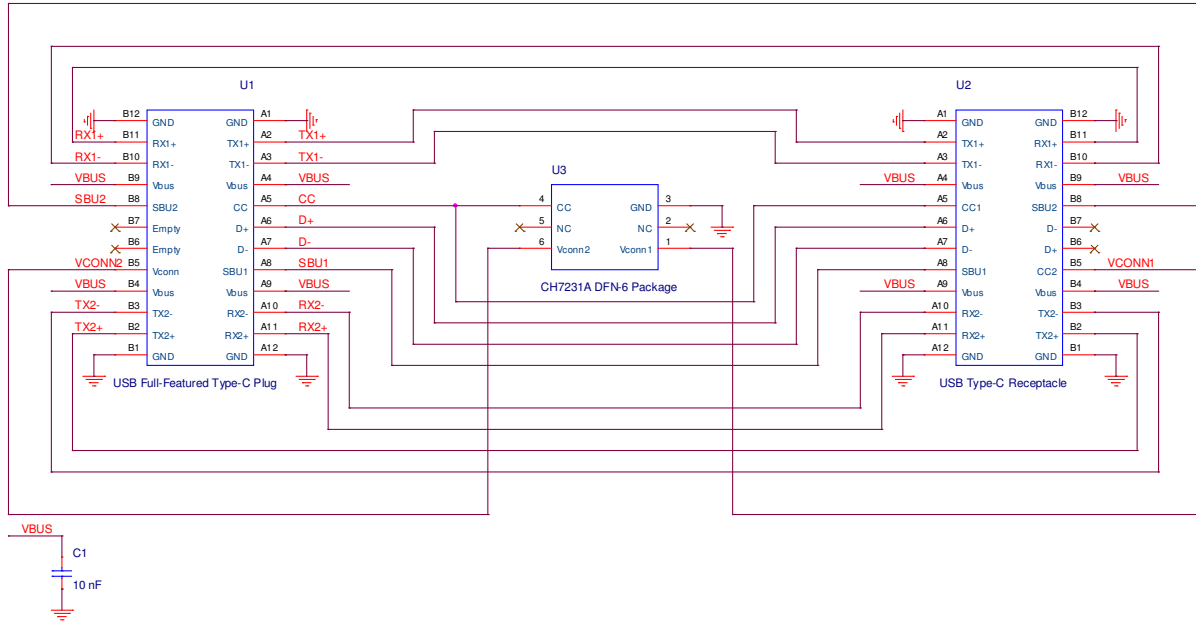


Figure 2: CH7231A DFN-6 Reference Schematic



4.0 Revision History

Table 1: Revisions

Revision #	Date	Section	Description
1.0	9/9/2015	All	Original draft
1.1	5/9/2016	1.0	Change USB Type-C Spec. version to 1.2 Change USB Power Delivery Spec. to version 1.2
1.2	5/9/2016	3.0	Add reference schematic of CH7231A DFN-6
2.0	4/17/2017	All	Change CH7231 to CH7231A

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