HD3SS3220 DFP Dongle Evaluation Module

This document describes how to use HD3SS3220 DFP dongle EVM.

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1 What is the HD3SS3220 DFP Dongle EVM?

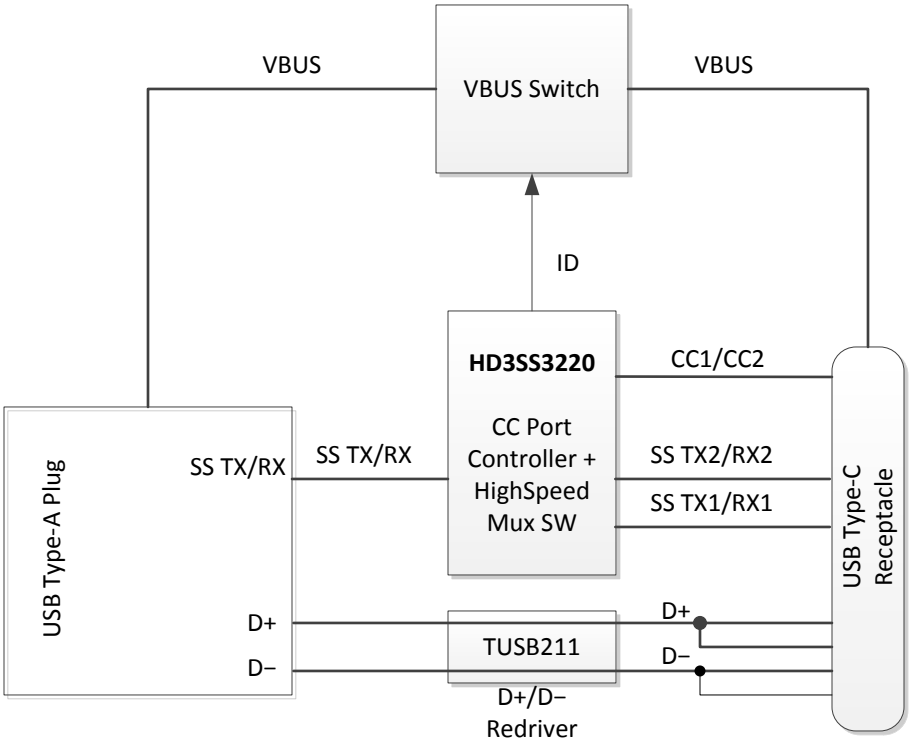

Figure 1. HD3SS3220 Block Diagram

The HD3SS3220 DFP Dongle EVM is designed to evaluate HD3SS3220 devices for DFP implementations. This EVM can also be used as a hardware reference design for any implementation using the HD3SS3220 with a USB Type-C™ connector. PCB design files can be provided upon request to aid PCB design with the HD3SS3220. Use the layout files as a guideline to implement the HD3SS3220 with illustrations of the routing and placement rules. Please note that the EVM design may include test components for evaluation purposes not applicable for production. The EVM includes an on-board USB Type-A plug to connect to legacy USB systems.

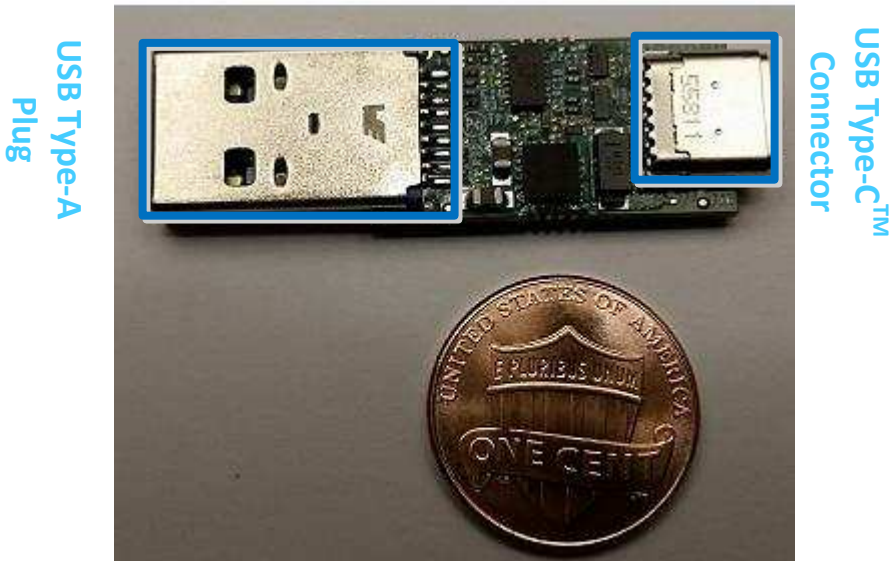

Figure 2. HD3SS3220 DFP Dongle

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2 HD3SS3220 EVM Features

2.1 Power

2.1.1 VBUS

The EVM operates off of the 5-V VBUS from the legacy USB Type-A connection. The VBUS from the USB legacy connection J3 is passed through onto the USB Type-C connector (J4) through the power switch U7 which is enabled only if the ID is driven low by the HD3SS3220. The user can supply VBUS externally via J2 to test higher than legacy USB current (500 mA or 900 mA) delivery over a USB Type-C connection. R7 **must** be removed if VBUS is provided via J2.

The current mode advertisement is configured as default on the board. Different current advertisement can be selected via R37: 10 kΩ for 3 A, 510 kΩ for 1.5 A.

Current limiting over Type-C VBUS is configurable by changing the value of R26. Refer to TPS25910 datasheet (SLUSAR6) for configuration details.

2.1.2 VCONN

The EVM can provide VCONN over a CC pin based upon USB Type-C plug orientation and Ra detection. The HD3SS3220 determines the plug orientation and enables VCONN over the unused CC pin upon detection of Ra. The default voltage for VCONN is 5 V.

2.2 Connectors

The EVM has a USB Type-A plug and a USB Type-C receptacle. The Type-A plug can be connected to a USB legacy Type-A receptacle for host side connection. A USB Type-C device can be connected to the USB Type-C receptacle provided on the EVM.

2.3 Data Path

USB3 TX and RX signals are multiplexed through HD3SS3220 to support both connection orientations on the USB Type-C port. The HD3SS3220 detects the orientation of the USB Type-C connection and outputs control signals to the on-board VBUS switch (TPS25910). It also configures and the high-speed mux switch internal to the HD3SS3220. HD3SS3220 ID is connected to TPS25910 EN# for evaluation purposes. The direct connection from the ID to the TPS25910 does not represent all application scenarios using the HD3SS3220 and power switches.

USB2 D+1 and D+2, D-1 and D-2 are shorted on the Type-C connector to support both connection orientations. The TUSB211 redriver can be enabled to improve the D+ D– signal integrity, if needed. Refer to device datasheets for operation details of the HD3SS3220 and TUSB211.

2.4 AC Coupling Cap Placement

The EVM represents the AC-coupling capacitor placement example to protect the HD3SS3220 switch from Vcm above 2 V. It also shows an example of how the pull-down resistor should be placed to bias the Vcm voltage in case there is another set of AC capacitors on the path.

The capacitors (C18 and C20) placed on the USB Type-A connector side (J3) is to protect the HD3SS3220 from Vcm voltage exceeding 2 V presented on the USB RX path. The recommended value of the capacitors is a standard capacitor value around 0.5 µF (that is, 0.47 µF or 0.56 µF) as there would be another set of capacitors in series with the USB device connected through the Type-C connector J4. The pull-down resistors R41 and R42 (100 kΩ) are placed with minimal stub to bias Vcm.

The capacitors C17 and C19, C20 and C21 are placed for the same reasons as previously described. The values of these capacitors are around 0.5 µF (that is, 0.47 µF or 0.56 µF) as there would be another set of capacitors (0.1 µF) in series with the USB TX path of the host system. The pull-down resistors R39 and R40 (100 kΩ) are placed with minimal stub to bias Vcm. In a system where the HD3SS3220 is to be connected to a host through internal connection, only one set of capacitors with a value of 0.1 µF are needed on the Type-C connector side, therefore, there is no need for pull-down resistors.

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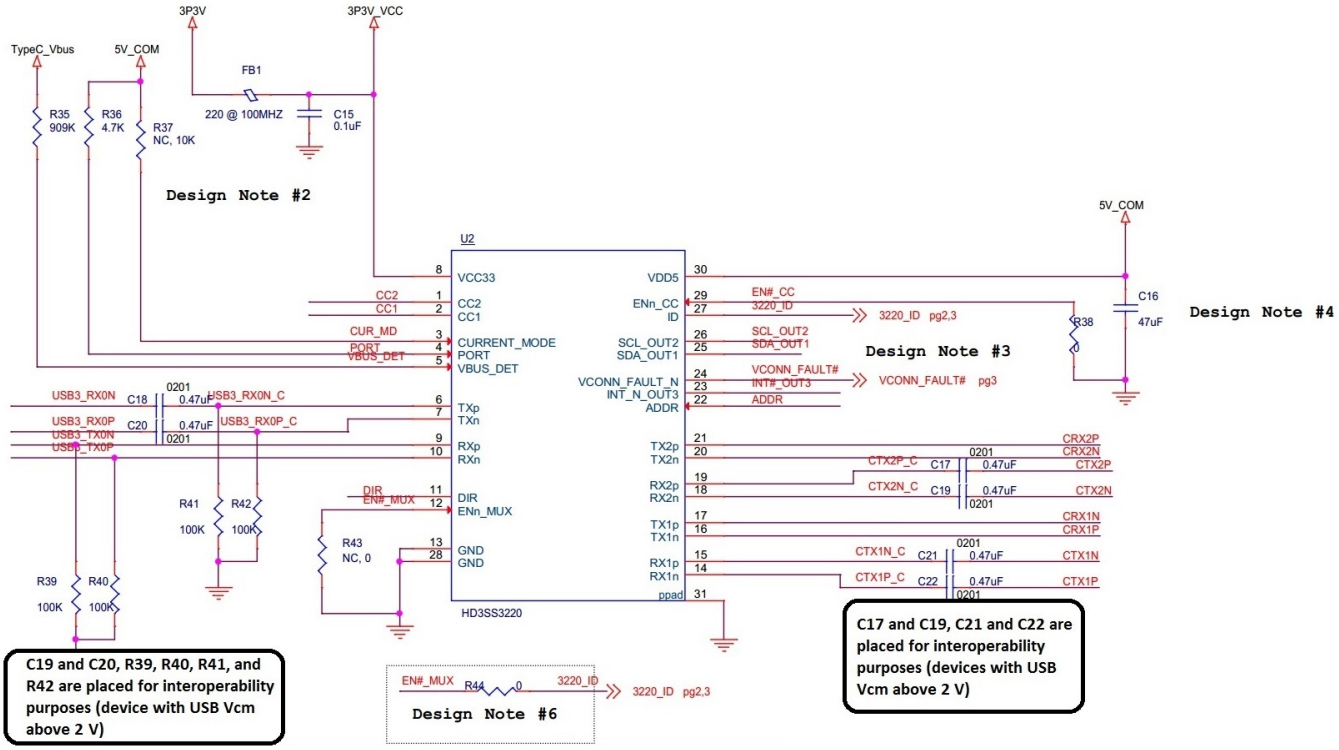

Figure 3. Capacitor Placement

2.5 LED

An LED is provided to indicate the connection status of the DFP dongle.

Table 1. LED Description

Reference Designator	LED_COLOR	LED Status Description
D7	LED_Orange	Illuminates when a USB Type-C device is connected
D2	LED_GRN	Illuminates when 5-V VBUS is supplied through USB Type-A plug

3 HD3SS3220 DFP Dongle EVM Quick Start Guide

3.1 USB Connection

1. Connect the HD3SS3220 DFP dongle to the Type-A receptacle port of a USB host system.
2. Upon connection, the green LED(D2) should illuminate.
3. Connect a USB device through the Type-C receptacle port of the HD3SS3220 DFP dongle. Upon connection to a USB Type-C UFP device, orange LED (D7) should illuminate.

Two configurations are possible. One connecting to a USB Type-C™ UFP device directly to the Type-C™ receptacle port(J4) of the HD3SS3220 DFP dongle EVM. The other connecting to a legacy USB UFP device through a USB Type-C™ to Type-A adapter.

Figure 4 and Figure 5 illustrate example configurations.

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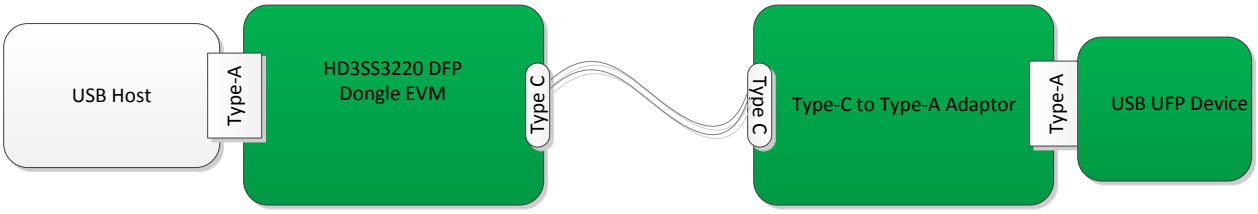

Figure 4. Configuration Using HD3SS3220 DFP Dongle EVM and USB Type-C UFP Device

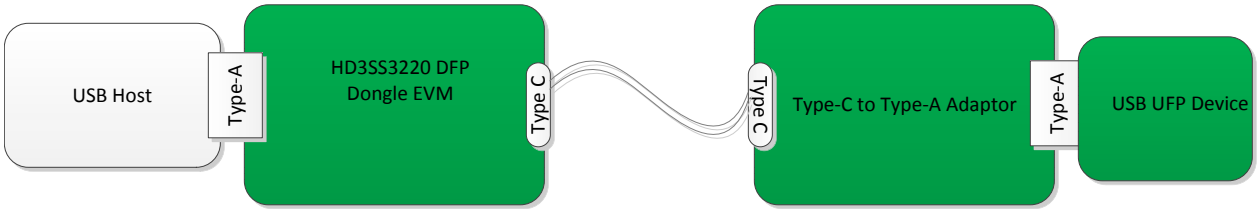

Figure 5. Configuration Using HD3SS3220 DFP Dongle EVM and USB Type-C to USB Type-A Adaptor

Figure 6. Set Up Example

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4 Schematics

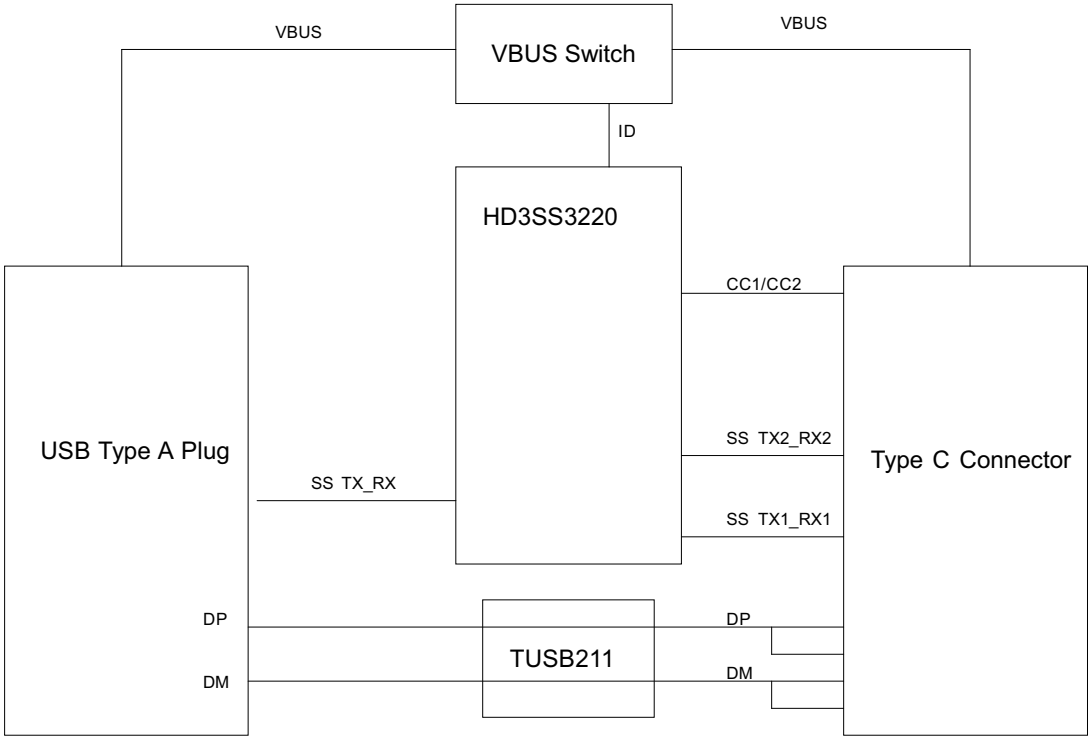

Figure 7. Schematic (page 1)

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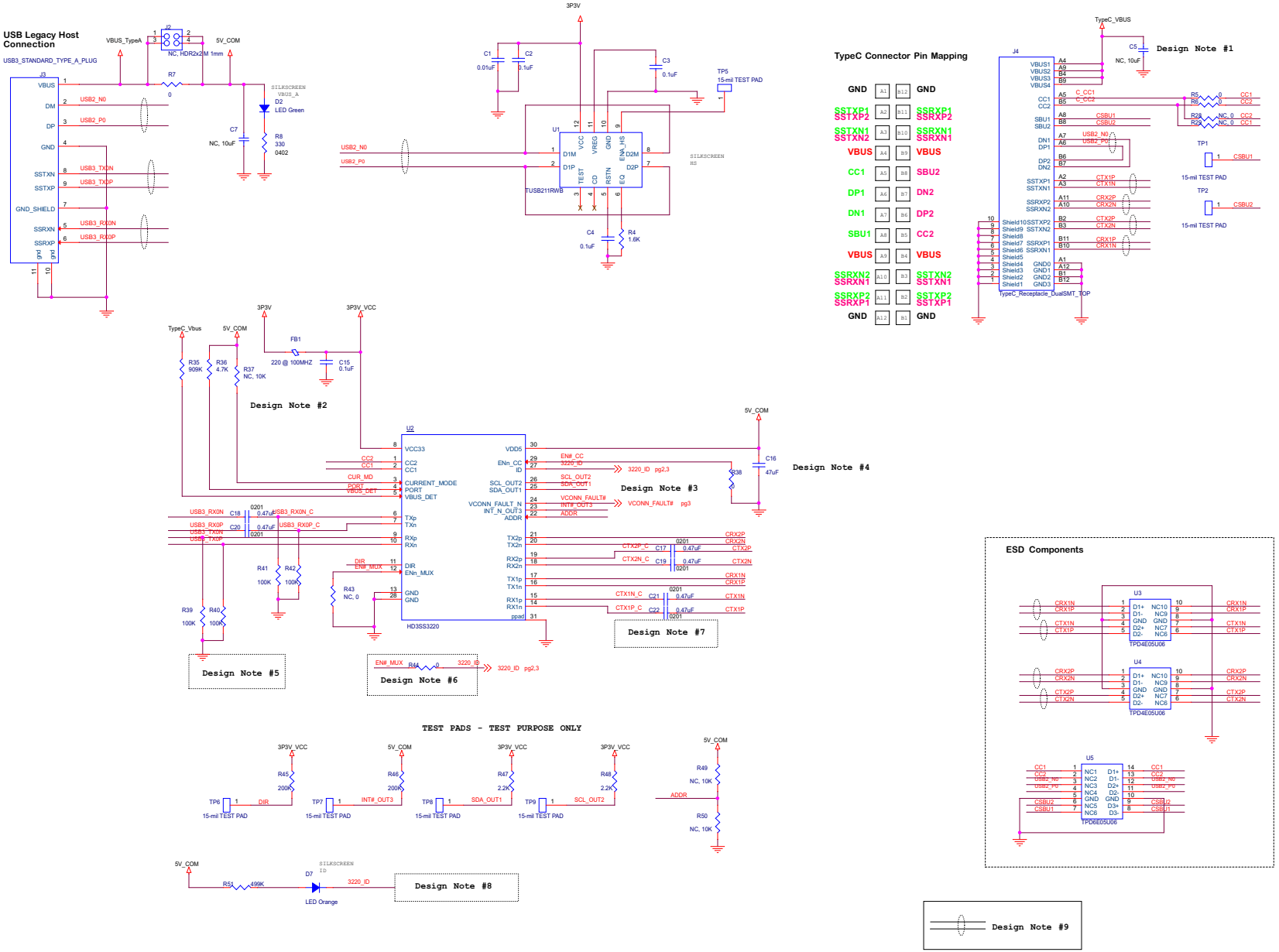

Figure 8. Schematic (page 2)

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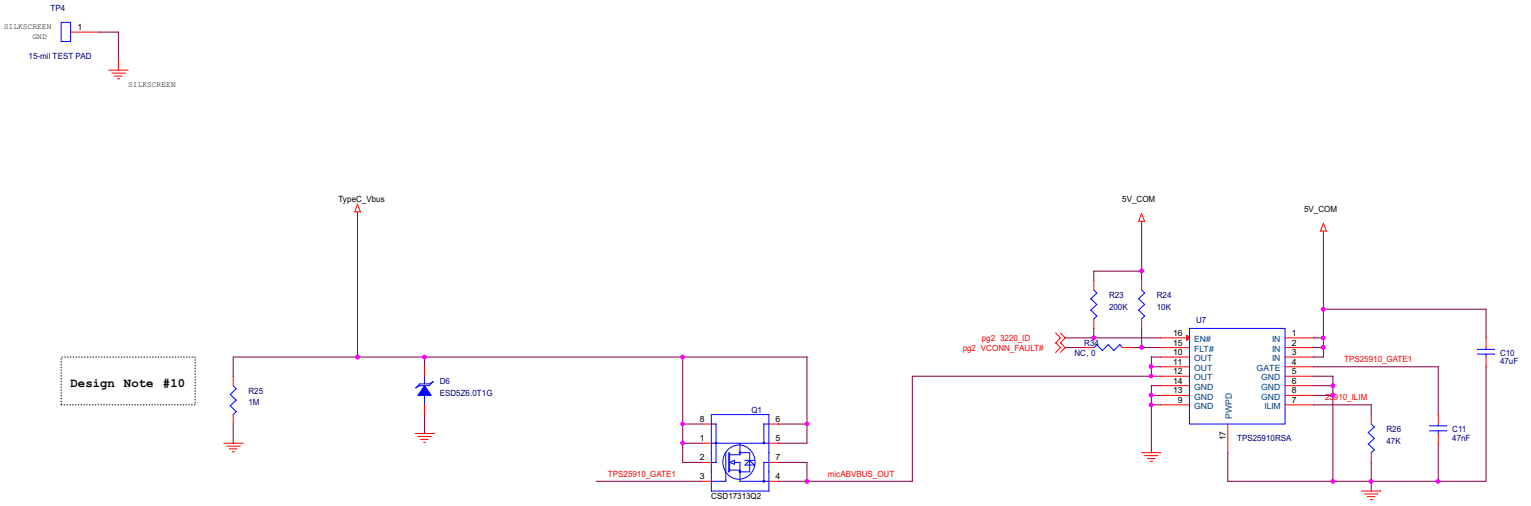

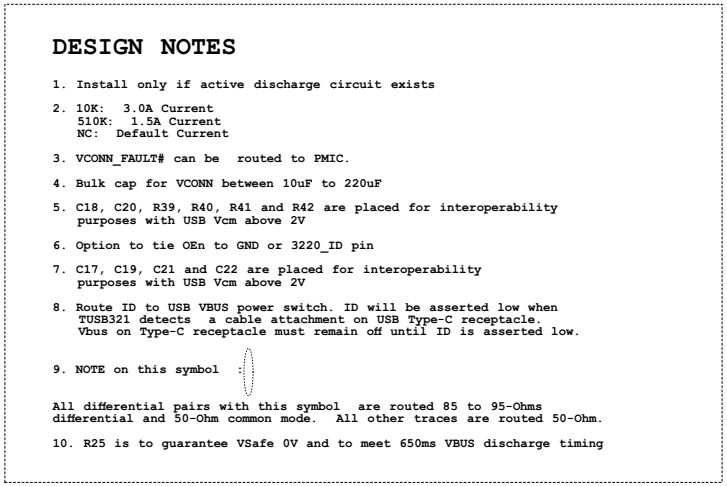

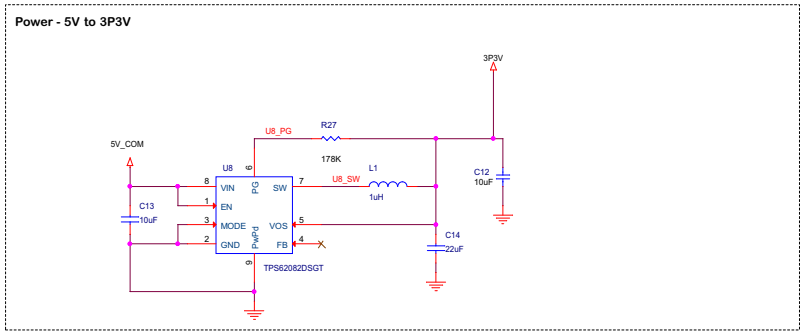

Figure 9. Schematic (page 3)

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Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (March 2016) to A Revision	Page
• Added *Schematics*	6

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