

## **HD3SS3220 UFP Dongle Evaluation Module**

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This document describes how to use the HD3SS3220 UFP dongle evaluation module (EVM).

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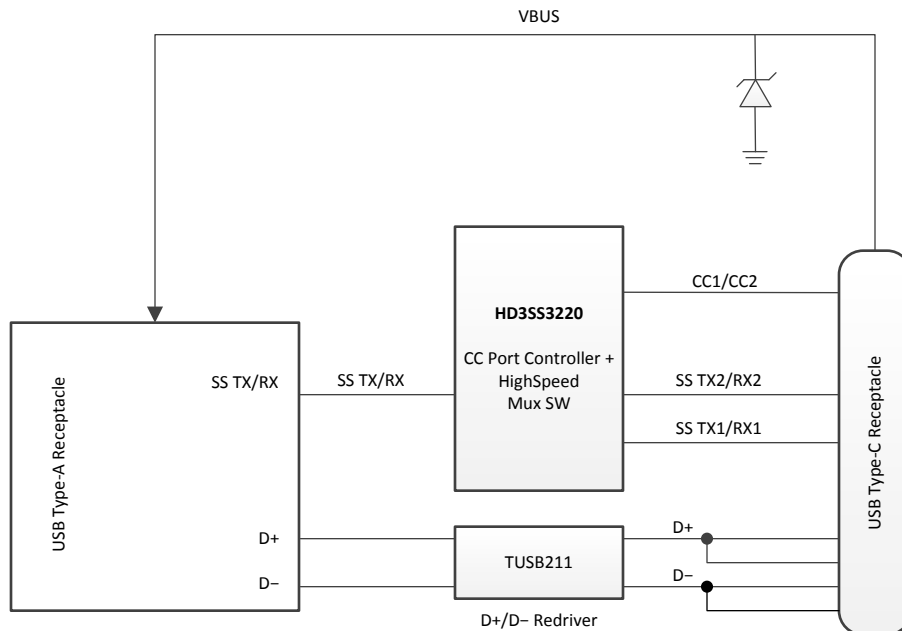
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## 1 What is the HD3SS3220 UFP Dongle EVM?

Figure 1 illustrates the EVM block diagram.



**Figure 1. EVM Block Diagram**

The HD3SS3220 UFP Dongle EVM is designed to evaluate HD3SS3220 devices for UFP 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. The layout files can be used as a guideline to implement the TUSB321A 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 UFP Dongle**

## 2 HD3SS3220 Dongle UFP EVM Features

### 2.1 Power

#### 2.1.1 VBUS

The EVM operates off of the 5-V VBUS from the USB Type-C connection. The VBUS from the legacy connection J2 is passed through to the Type-C connector. The end-user must make sure the Type-C VBUS is not hot or  $V_{safe}$  equals 0 V.

### 2.2 Connectors

The EVM has a USB Type-A and a USB Type-C receptacle. The Type-A receptacle can be used to connect to a USB legacy device. A USB Type-C device can be connected to the USB Type-C receptacle provided on the EVM. The EVM always present  $R_d$  on both CC pins via HD3SS3220.

### 2.3 Data Path

USB3 TX and RX signals are multiplexed through the HD3SS3220 to support both connection orientations on the USB Type-C port. HD3SS3220 detects the orientation of the USB Type-C connection and configures the high-speed MUX switch internal to the HD3SS3220.

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 data sheets for operation details of the HD3SS3220 ([SLLSES1](#)) and TUSB211 ([SLLSE00](#)).

### 2.4 AC Coupling Cap Placement

The EVM represents the AC coupling capacitor placement example to protect the HD3SS3220 switch from  $V_{cm}$  above 2 V. It also shows an example of how the pulldown resistor should be placed to bias the  $V_{cm}$  voltage in case there is another set of AC capacitors on the path.

The capacitors (C1 and C3) placed on the USB Type-A connector side (J1), protect the HD3SS3220 from  $V_{cm}$  voltage exceeding 2 V presented on the USB RX path. The recommended value of the capacitors is 0.5  $\mu$ F, as there would be another set of capacitors in series with the USB device connected through the Type-C connector J2. The pulldown resistors R10, R11, R6, and R7 (100 k $\Omega$ ) are placed with minimal stub to bias  $V_{cm}$ .

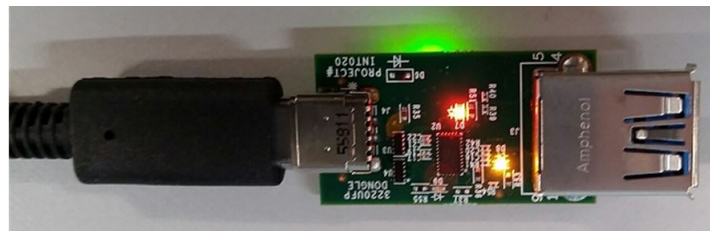
The capacitors C2 and C4, C3 and C5 are placed for the same reasons as previously described. The values of these capacitors are 0.5  $\mu$ F, as there would be another set of capacitors (0.1  $\mu$ F) in series with the USB TX path of the USB device. The pulldown resistors R10 and R11 (100 k $\Omega$ ) are placed with minimal stub to bias  $V_{cm}$ . In a system where the HD3SS3220 is to be connected to a host through an internal connection, only one set of 0.1- $\mu$ F capacitors are needed on the Type-C connector side, therefore no pulldown resistors are needed.

## 2.5 LED

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

**Table 1. LED Descriptions**

| Reference Designator | LED_COLOR  | LED Status Description                                                                                                                                                                |
|----------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D3                   | LED_Orange | Illuminates when a USB Type-C DFP device with default current advertisement is connected.<br>D2 illuminates when a USB Type-C DFP device with 3-A current advertisement is connected. |
| D2                   | LED Yellow | Illuminates when a USB Type-C DFP device with 1.5-A current advertisement is connected.<br>D3 illuminates when a USB Type-C DFP device with 3-A current advertisement is connected.   |
| D1                   | LED Red    | Connected upon OUT3 driven low.                                                                                                                                                       |
| D5                   | LED_GRN    | Illuminates when 5-V VBUS is supplied through USB Type-C plug.                                                                                                                        |



**Figure 3. LED Status Example With 3-A Current Advertisement**

### 3 HD3SS3220 UFP EVM Quick Start Guide

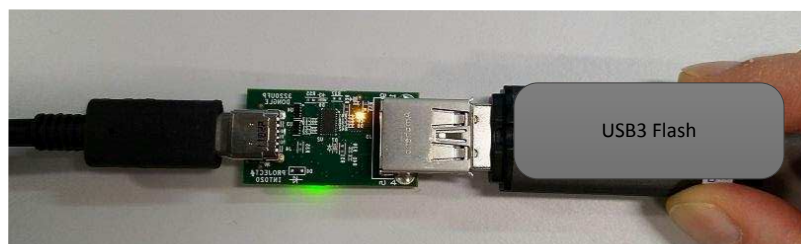
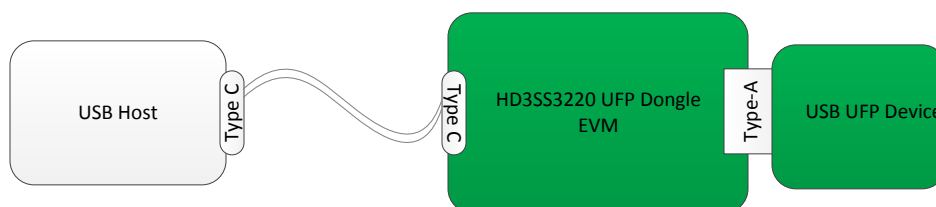
#### 3.1 USB Connection

Use the following steps to connect the USB:

1. Connect the HD3SS3220 UFP dongle to a DFP through the USB Type-C connector of the HD3SS3220 UFP dongle EVM. VBUS from the DFP system must not exceed vSafe5V.
2. Upon connection, the green LED (D5) should illuminate.
3. Connect a USB device to the Type-A receptacle port of the dongle EVM. Upon connection to a Type-C UFP device, LEDs D3, D2, or D1 should illuminate per the mode of operation defined in [Section 2.5](#).

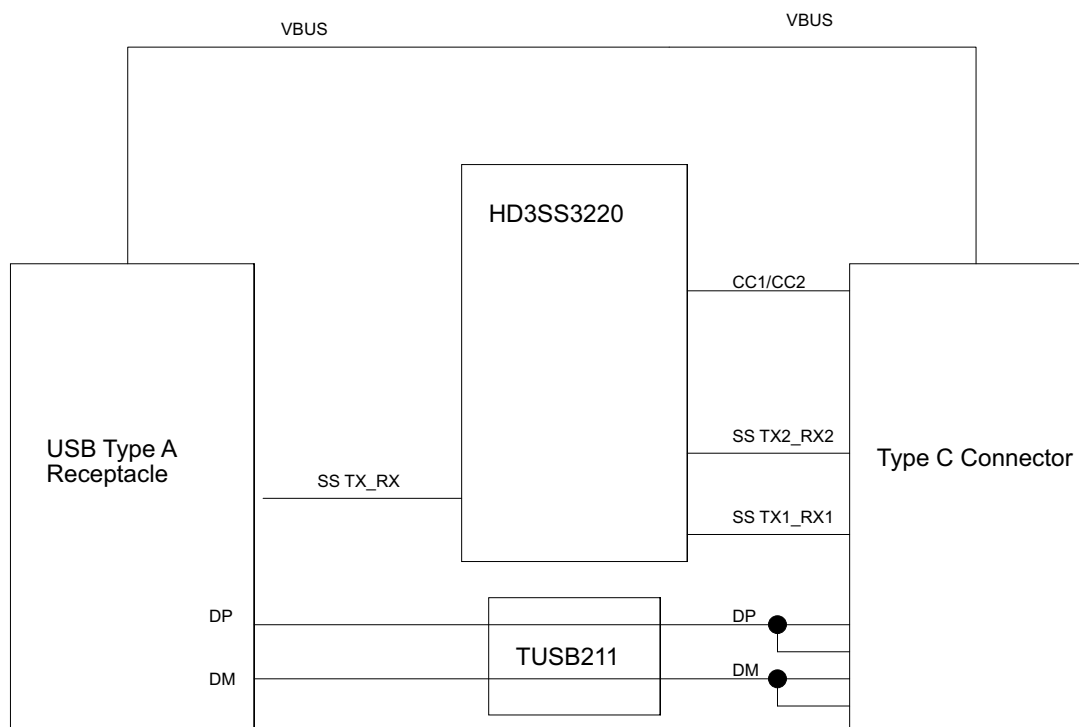
[Figure 4](#) illustrates an example configuration.

A Type-C DFP device is connected to the dongle EVM via a cable through the USB Type-C receptacle port (J2). A USB device is connected to the USB Type-A receptacle port (J1).



**Figure 4. Example Configuration**

## 4 Schematics



**Figure 5. Schematic (page 1)**

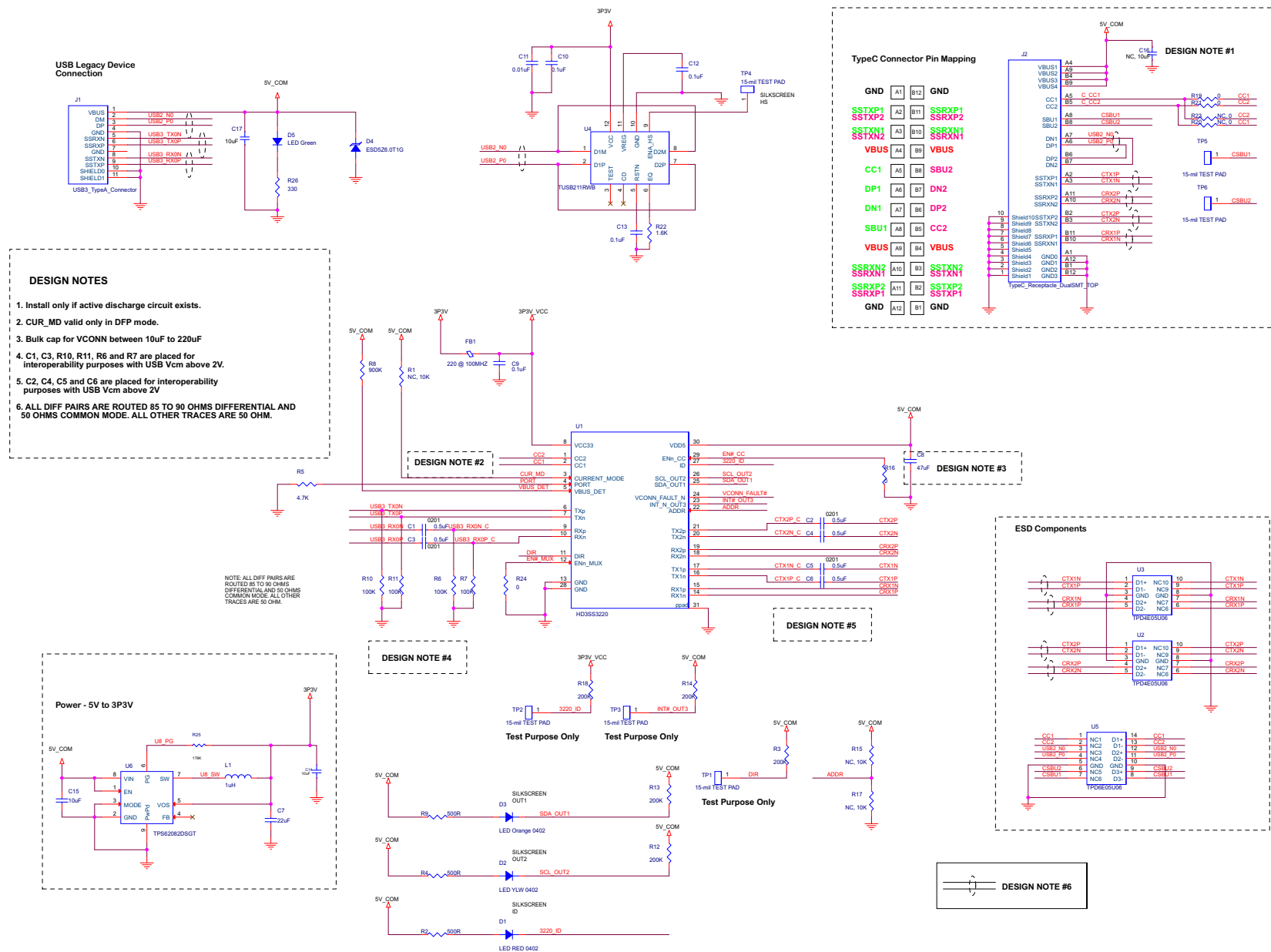


Figure 6. Schematic (page 2)

## Revision History

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

| Changes from Original (May 2016) to A Revision | Page |
|------------------------------------------------|------|
|------------------------------------------------|------|

- |                                 |   |
|---------------------------------|---|
| • Added <i>Schematics</i> ..... | 6 |
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- *Reorient or relocate the receiving antenna.*
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- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
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