

## **USB Type-C™ Mini Dock EVM**

This user's guide provides an overview and operating instructions for TI's *USB Type-C Mini Dock EVM*. A quick-start guide section and schematics are also included in the document. Throughout this document, the abbreviations *dock*, *EVM*, *EVM board*, and the term *evaluation module* are synonymous with *USB Type-C Mini Dock EVM*, unless otherwise noted.

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### 1 What is the TI USB Type-C Dock?

The USB Type-C and Power Delivery (PD) mini-dock evaluation module (EVM) provides a complete reference solution for a USB Type-C dock including audio, USB data, power, and video. The EVM has a small 2 in x 4 in form factor and supports both source and sink power capabilities over the primary USB Type-C PD port. Video output capabilities include both DisplayPort and HDMI

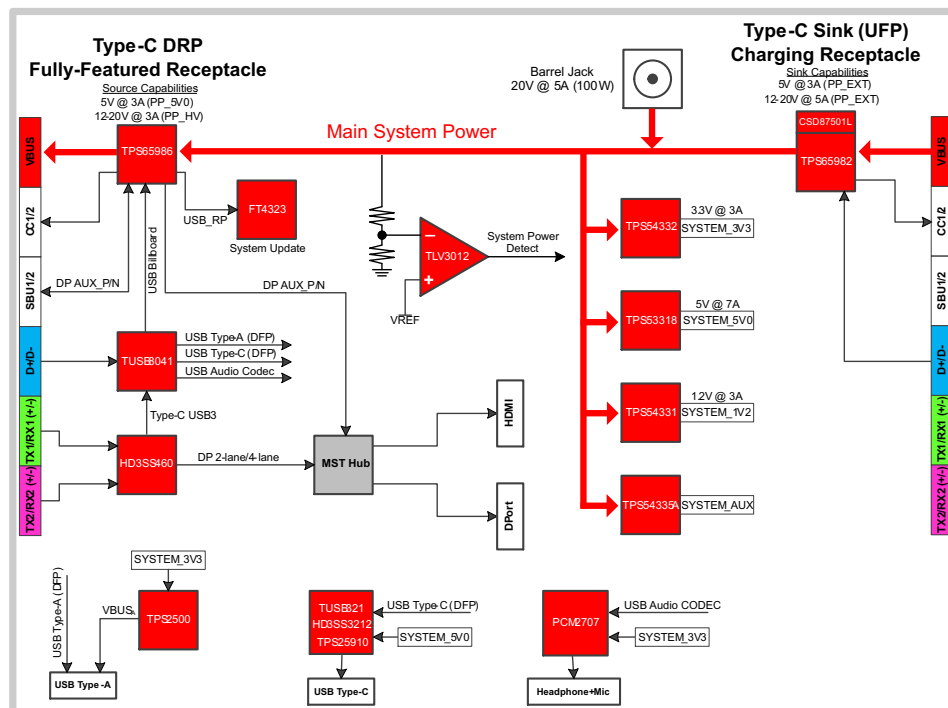
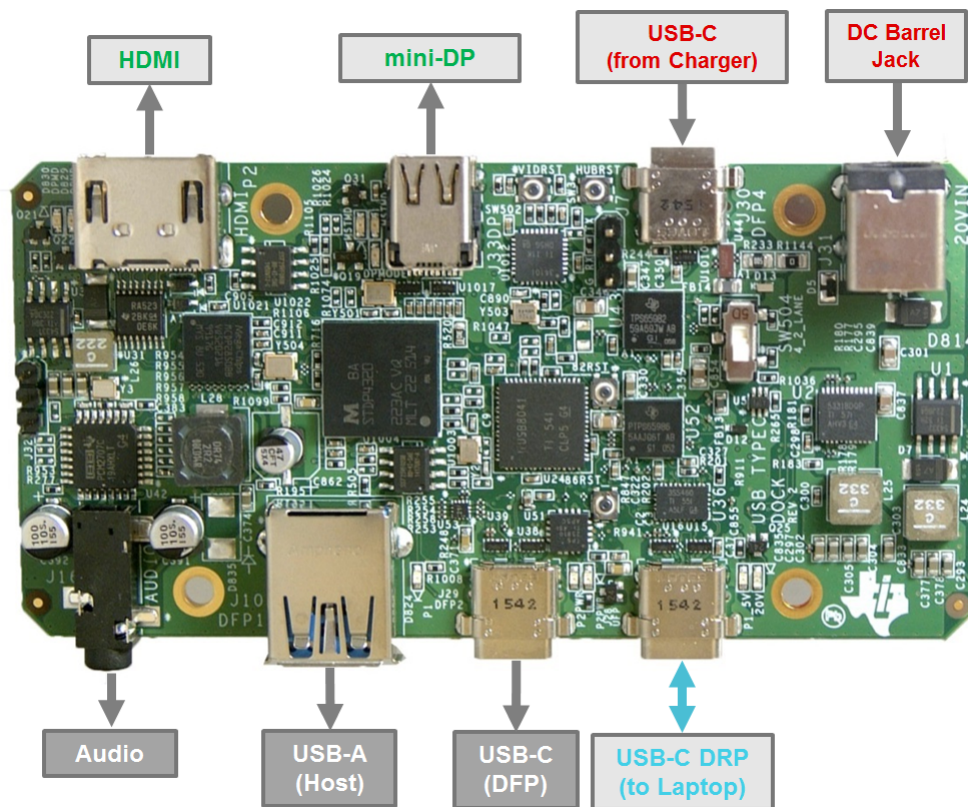


Figure 1. USB Type-C Mini Dock Block Diagram



**Figure 2. USB Type-C Mini Dock EVM**

## 2 TI USB Type-C Mini Dock Features

This section lists and details supported features of the EVM:

- Power
  - This EVM has the following bi-directional power capabilities:
    - Externally powered by 20-V DC barrel jack (J31). Upon successful power contract negotiation, the dock can source up to 20 V at 3 A.
    - Externally powered by a USB Type-C Charger (J30). Upon successful power contract negotiation, the dock can source 5 V at 3 A or 12–20 V at 5 A.
    - Bus-powered from USB Type-C laptop. Upon successful power contract negotiation, the dock can sink 5 V at 3 A or 12–20 V at 3 A.

D823 or D822 blue LED turns on to indicate if a 20-V or 5-V power input is connected.

- DRP Full-Featured USB-C and PD Port
  - TUSB8041 HUB with upstream connection via HD3SS460 alternate mode switch
  - USB-C DFP using TUSB321 and HD3SS3212
  - USB Type-A DFP
  - 3.5-mm audio jack
- Dual Video (up to 4K) via HDMI or miniDP
- Flash Update Over USB Type-C via USB 2.0 Endpoint

- LEDs
  - [Table 1](#) lists the LEDs provided for easier debug purposes.

**Table 1. LEDs for Debug**

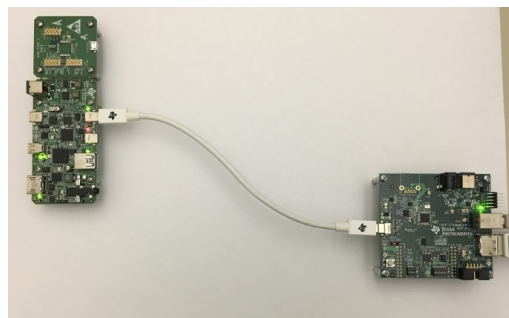
| Reference Designator | LED Name | Description                              |
|----------------------|----------|--|
| D820                 | DP Mode  |  |
| D822                 | 5V       | Illuminates when 5-V input is present    |
| D823                 | 20V      | Illuminates when 20-V input is present   |
| D824                 | DFP1     | Illuminates when Port 1 (J10) is enabled |
| D825                 | DFP2     |  |
| D826                 | DFP2     |  |
| D827                 | MS TMD   |  |
| D828                 | MS TMD   |  |
| D829                 | DP MD    |  |
| D830                 | DP MD    |  |

- Firmware (FW) Update
  - Contact Texas Instruments for details on FW updates and see the [USB Type-C Mini Dock Quick-Start Guide](#) section.

### 3 USB Type-C Mini Dock Quick-Start Guide

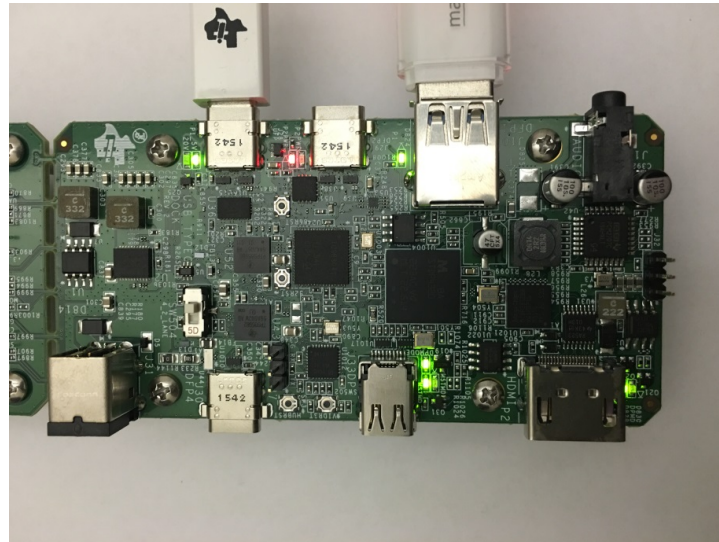
The following steps are provided for a quick-start using the EVM:

- Step 1. Connect the *USB Type-C Enabler Board* to the PC with a USB Type-A to USB-B cable and a DisplayPort Cable.
- Step 2. Connect the *USB Type-C Enabler Board* to the *USB Type-C Mini Dock EVM* with a USB Type-C cable.

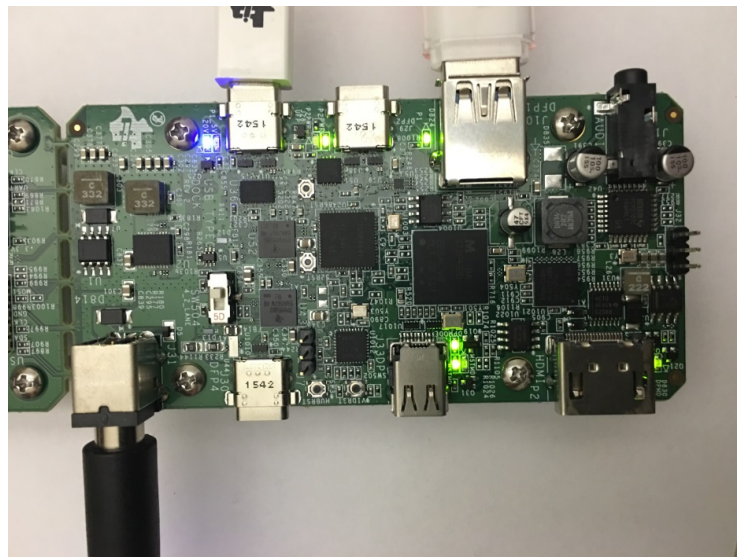


**Figure 3. USB Type-C Dock Example Setup**

- Step 3. Confirm that D822, D826, D824, D827, D820, D829 are lit.



**Figure 4. USB Type-C Dock Example Setup**



**Figure 5. USB Type-C Dock Example Setup**

- Step 4. Connect the Dell power adapter and confirm that the D823, D825, D824, D827, D820, D829 are lit.
- Step 5. Connect a USB flash drive to the USB Type-C Mini Dock EVM and confirm that data can be transferred to and from the USB flash drive.
- Step 6. Connect the HDMI cable to the USB Type-C Mini Dock EVM and to a monitor, confirm PC video is displayed on the monitor.
- Step 7. Disconnect the HDMI cable and connect a miniDP cable to the USB Type-C Mini Dock EVM and to a monitor, confirm PC video is displayed on the monitor.

4 Schematics

Figure 6 through Figure 24 illustrate the EVM schematics.

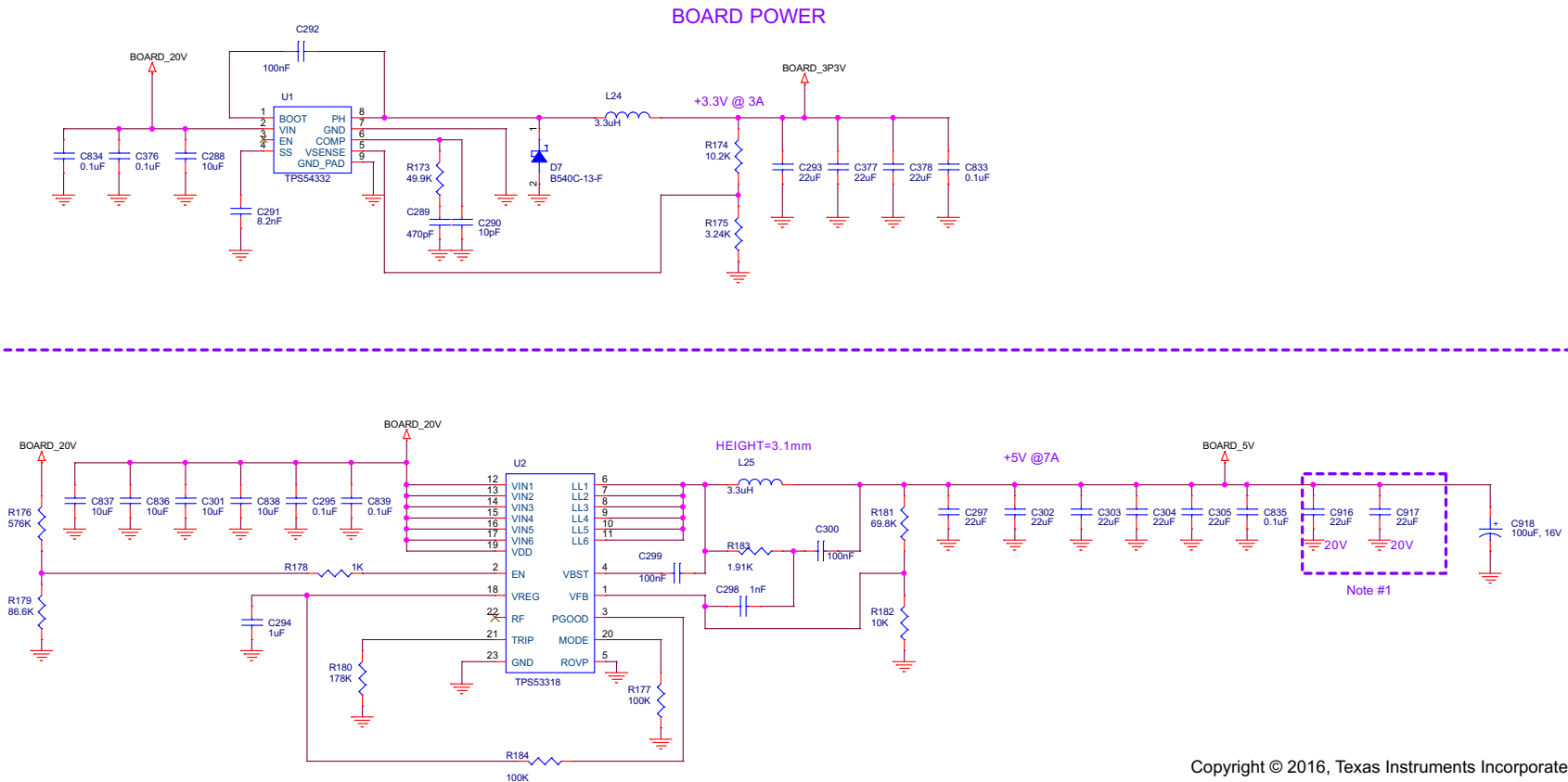
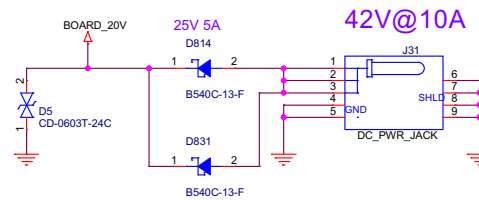
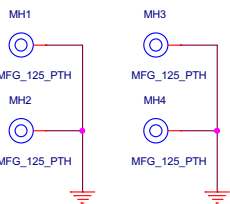
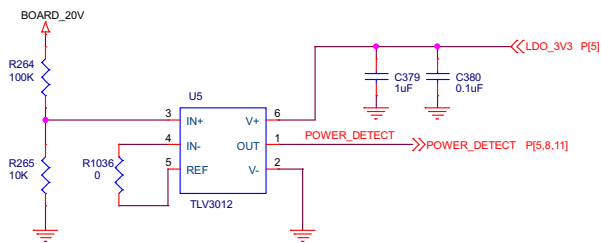
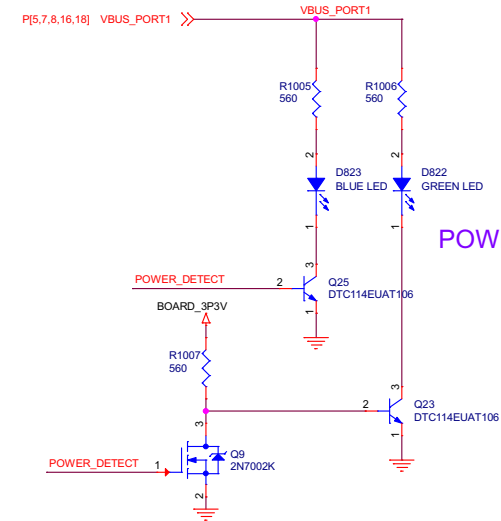
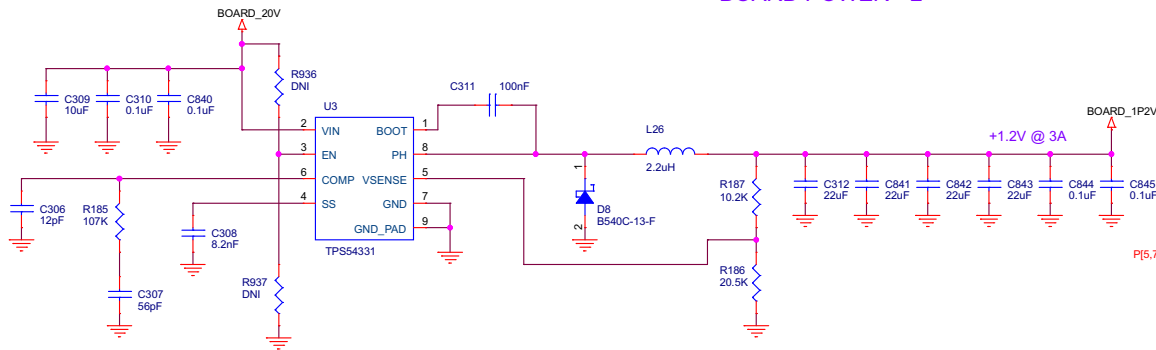


Figure 6. EVM Board Power Schematic

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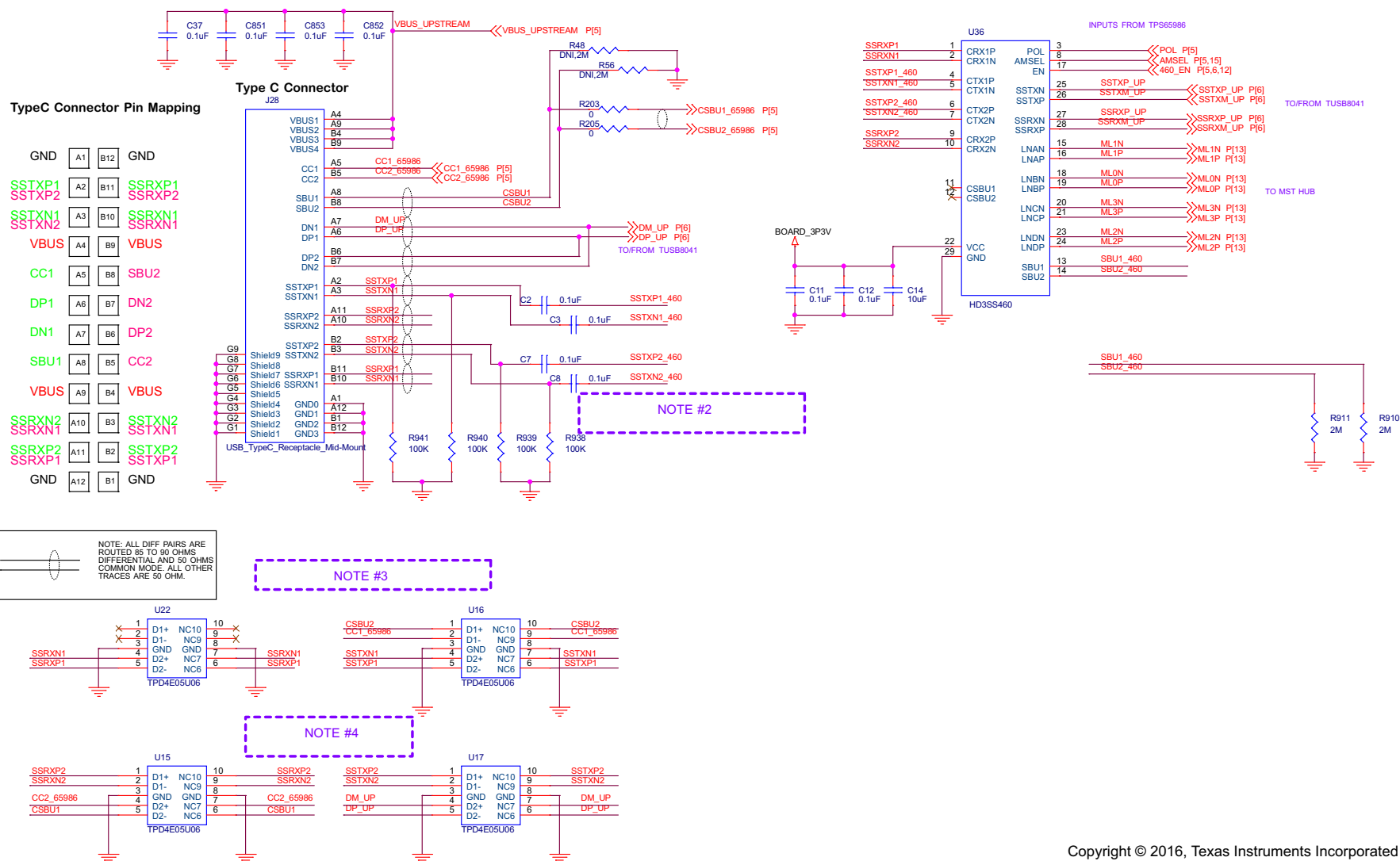
BOARD POWER - 2



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Figure 7. EVM Board Power 2 Schematic

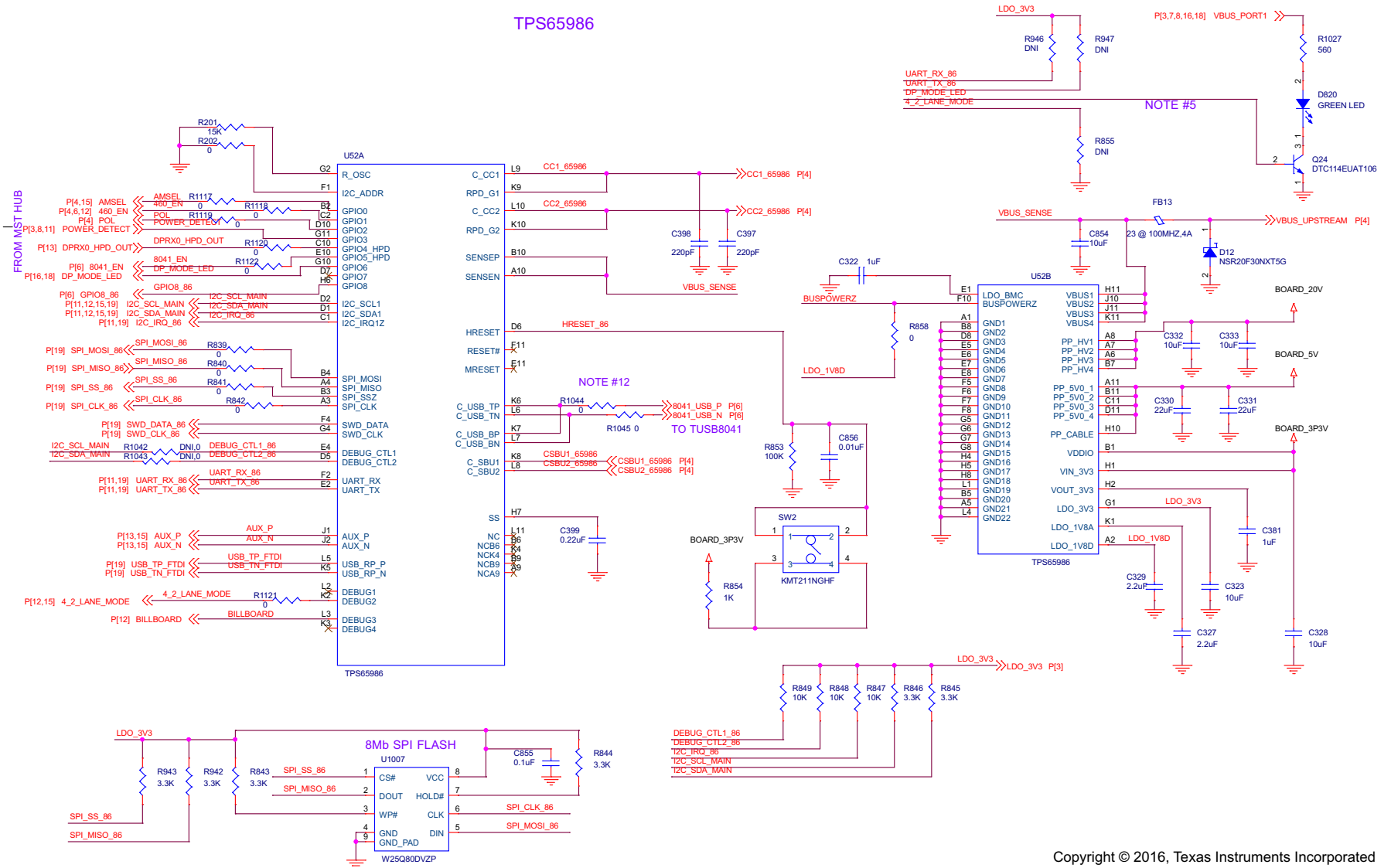
USB TYPE C FRONT END



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Figure 8. USB Type-C Front End Schematic

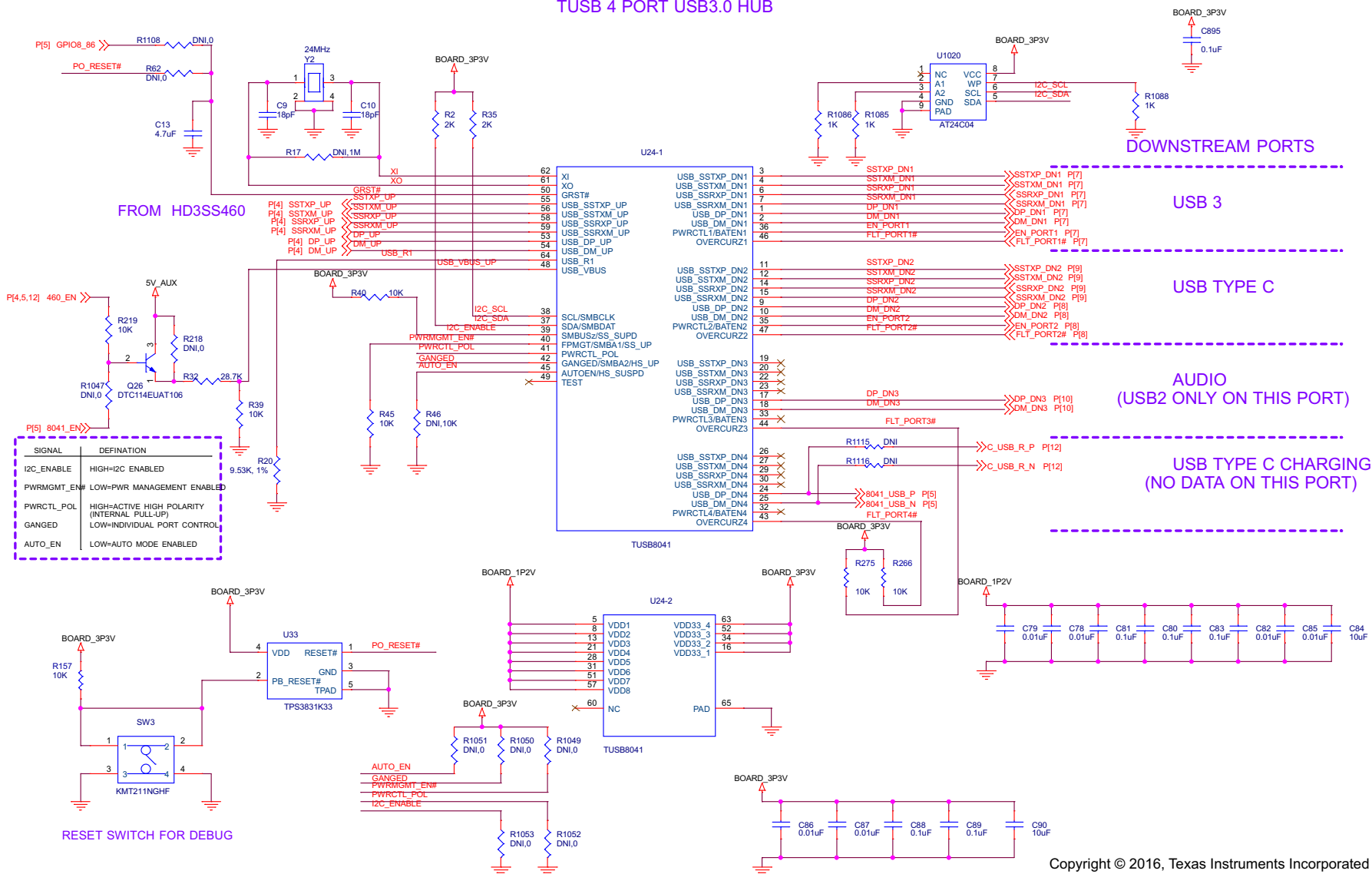




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Figure 9. TPS65986 Schematic

TUSB 4 PORT USB3.0 HUB



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Figure 10. TUSB8041 Schematic

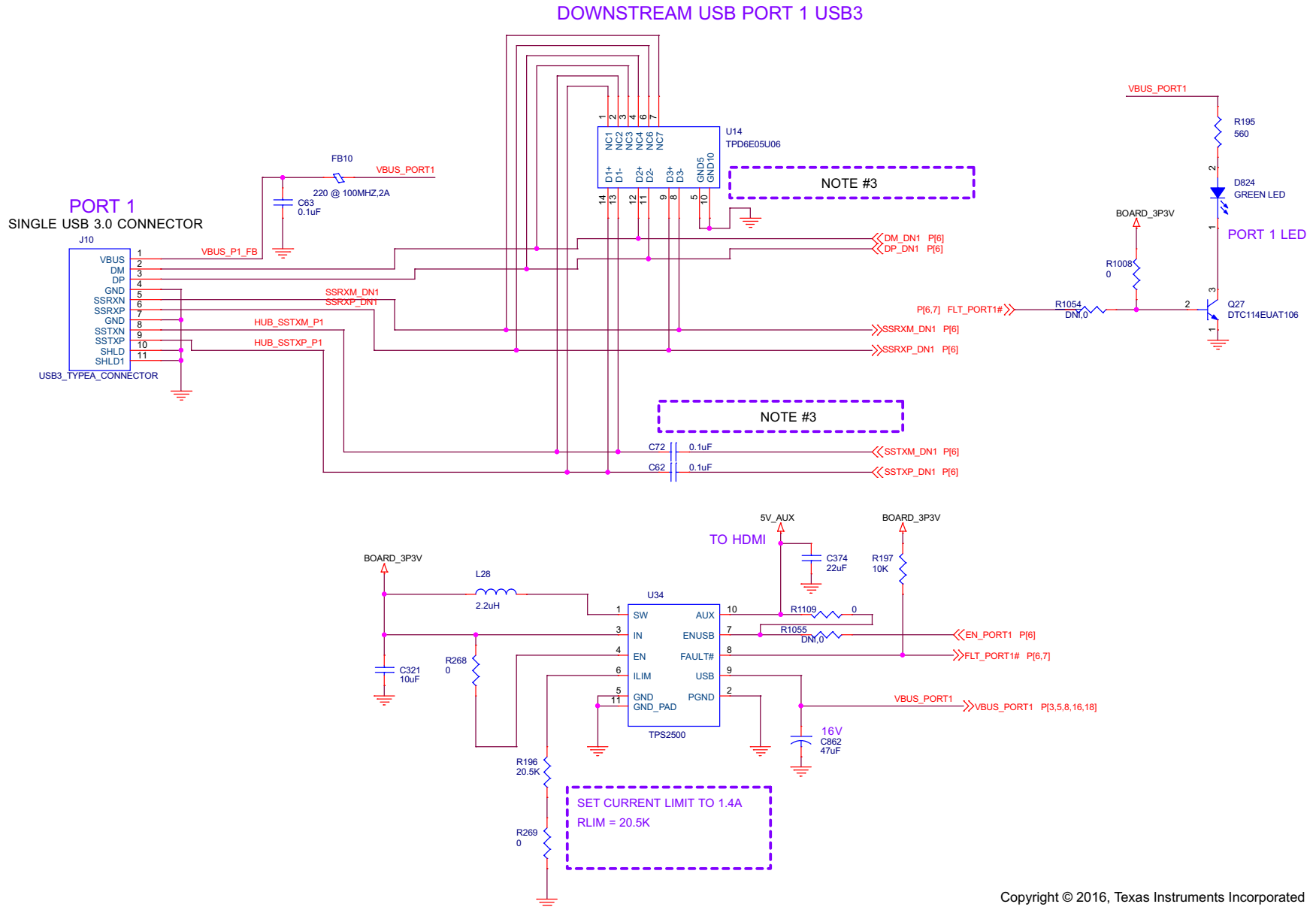
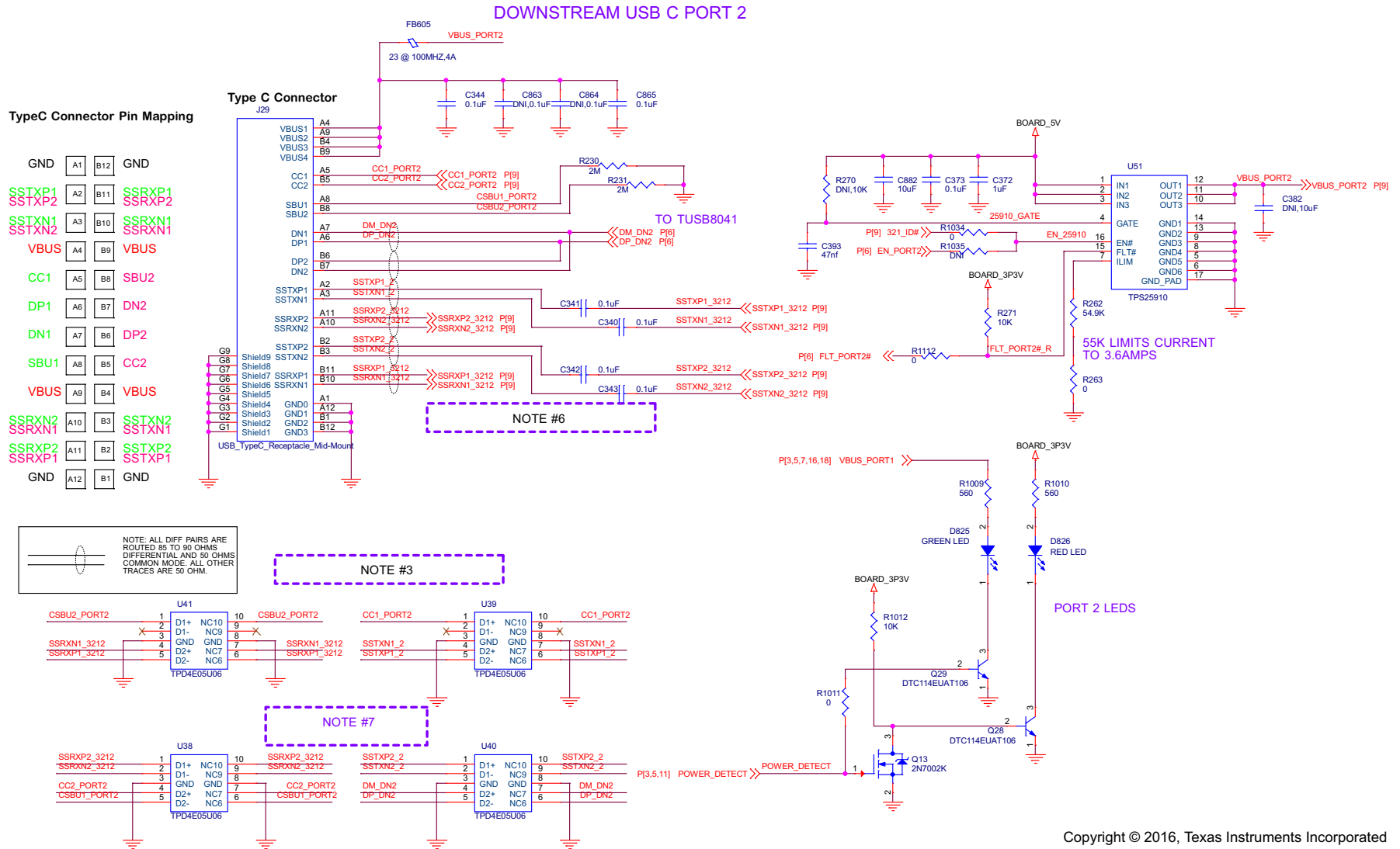


Figure 11. Port 1 Downstream USB Schematic

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Figure 12. Port 2 Downstream USB Type-C Schematic

DOWNSTREAM USB C PORT 2

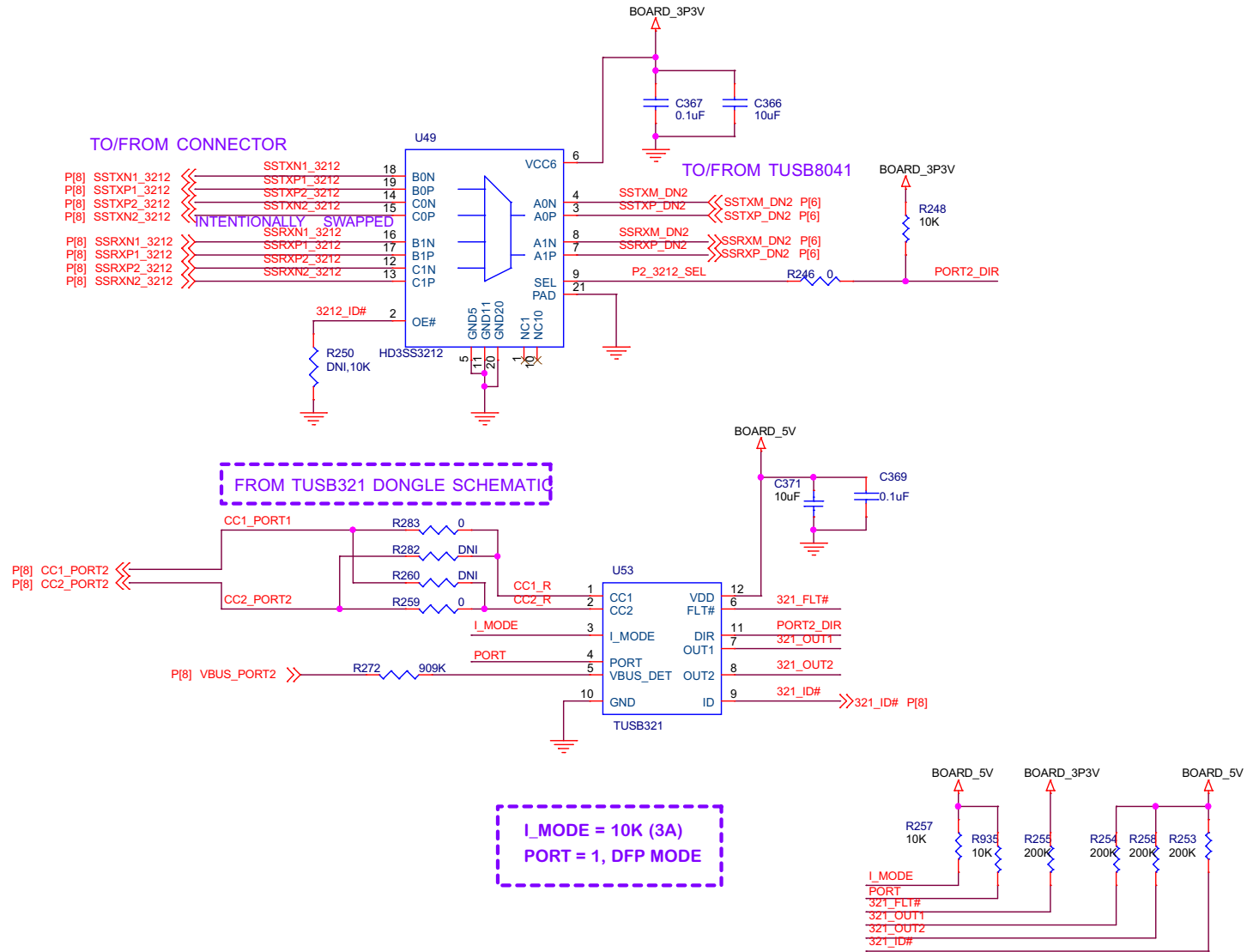


Figure 13. Port 2 USB Type-C Schematic

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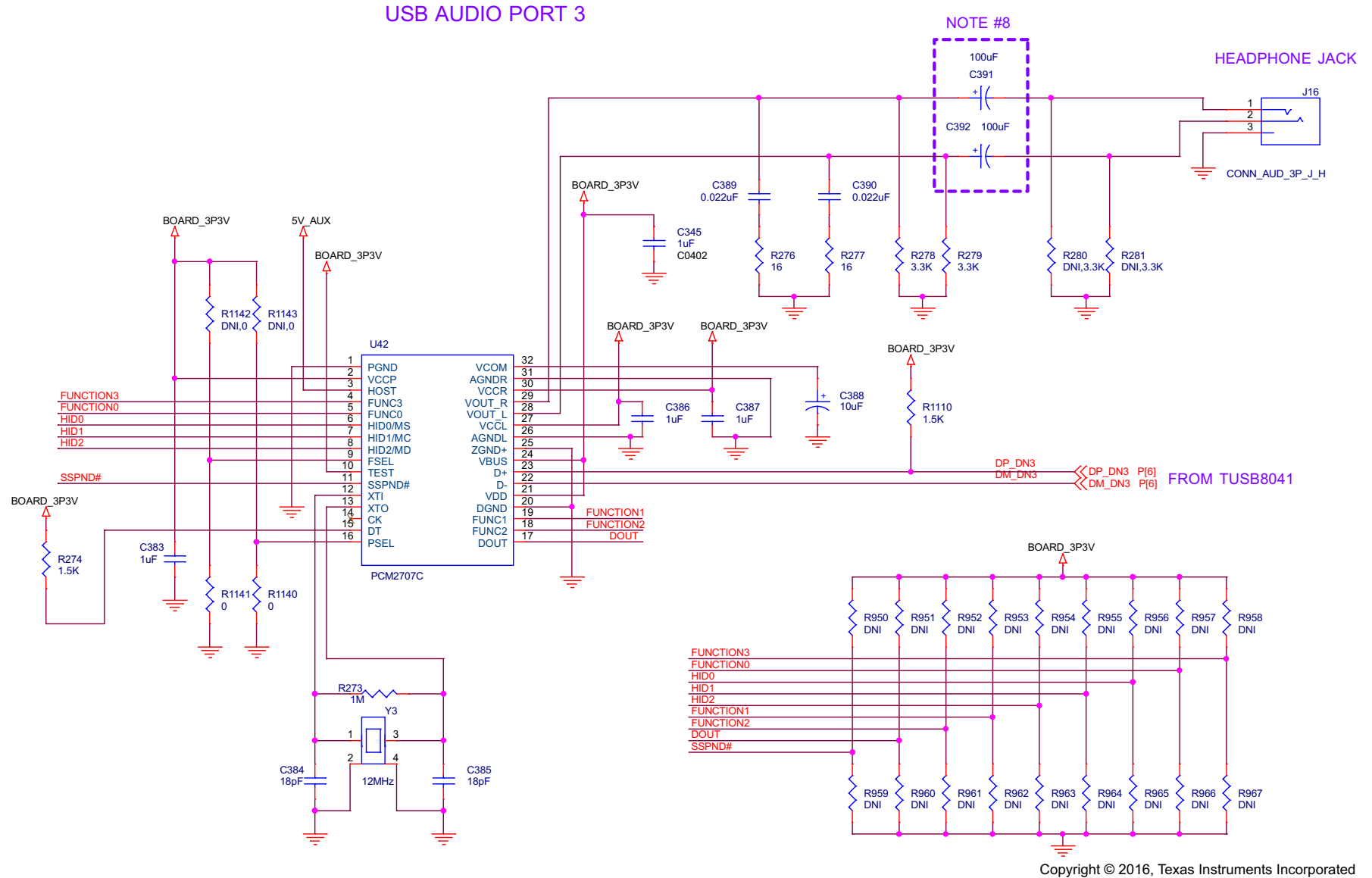
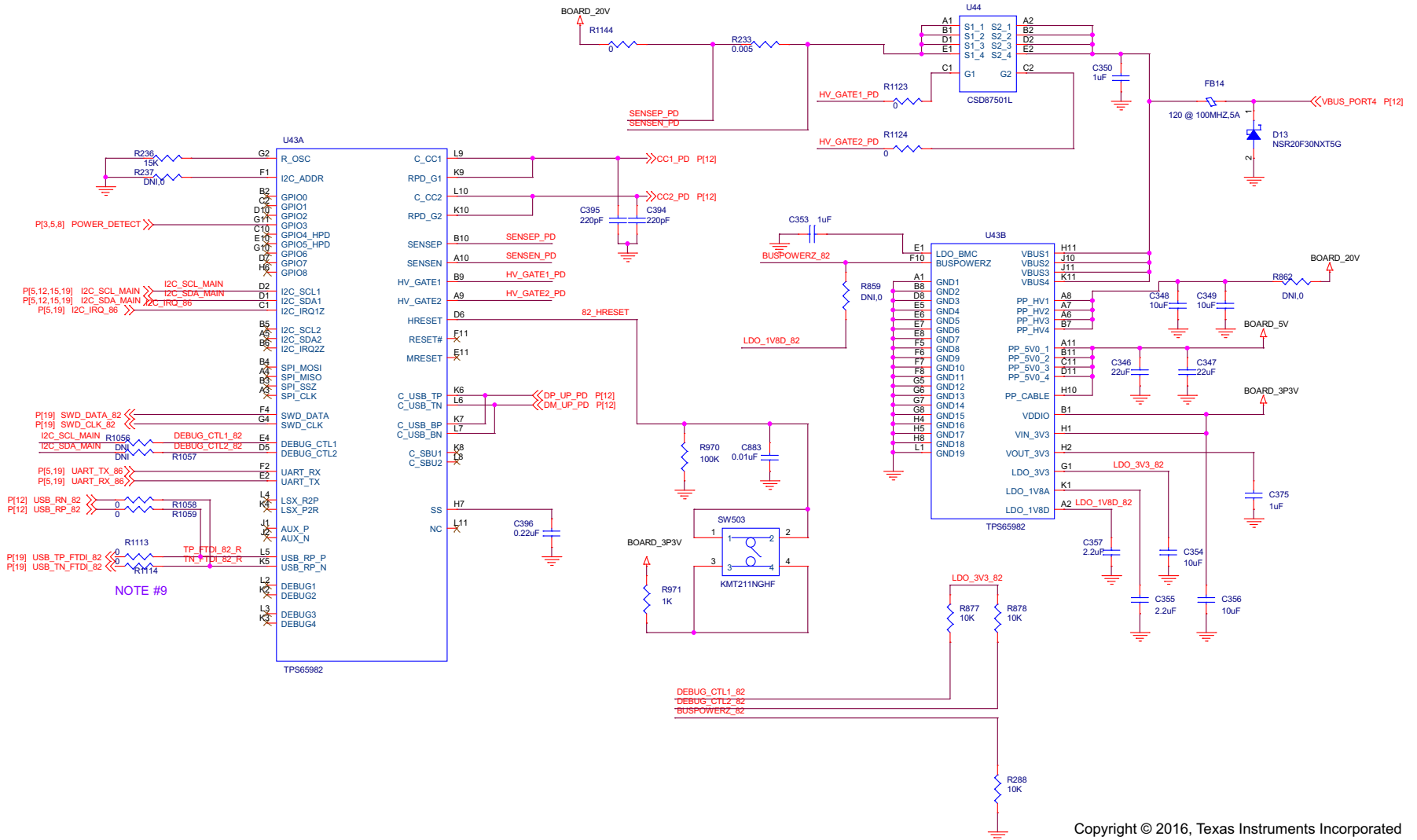


Figure 14. Port 3 USB Audio Schematic

PORT 4 - TPS65982



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Figure 15. Port 4 USB Type-C Charging Schematic

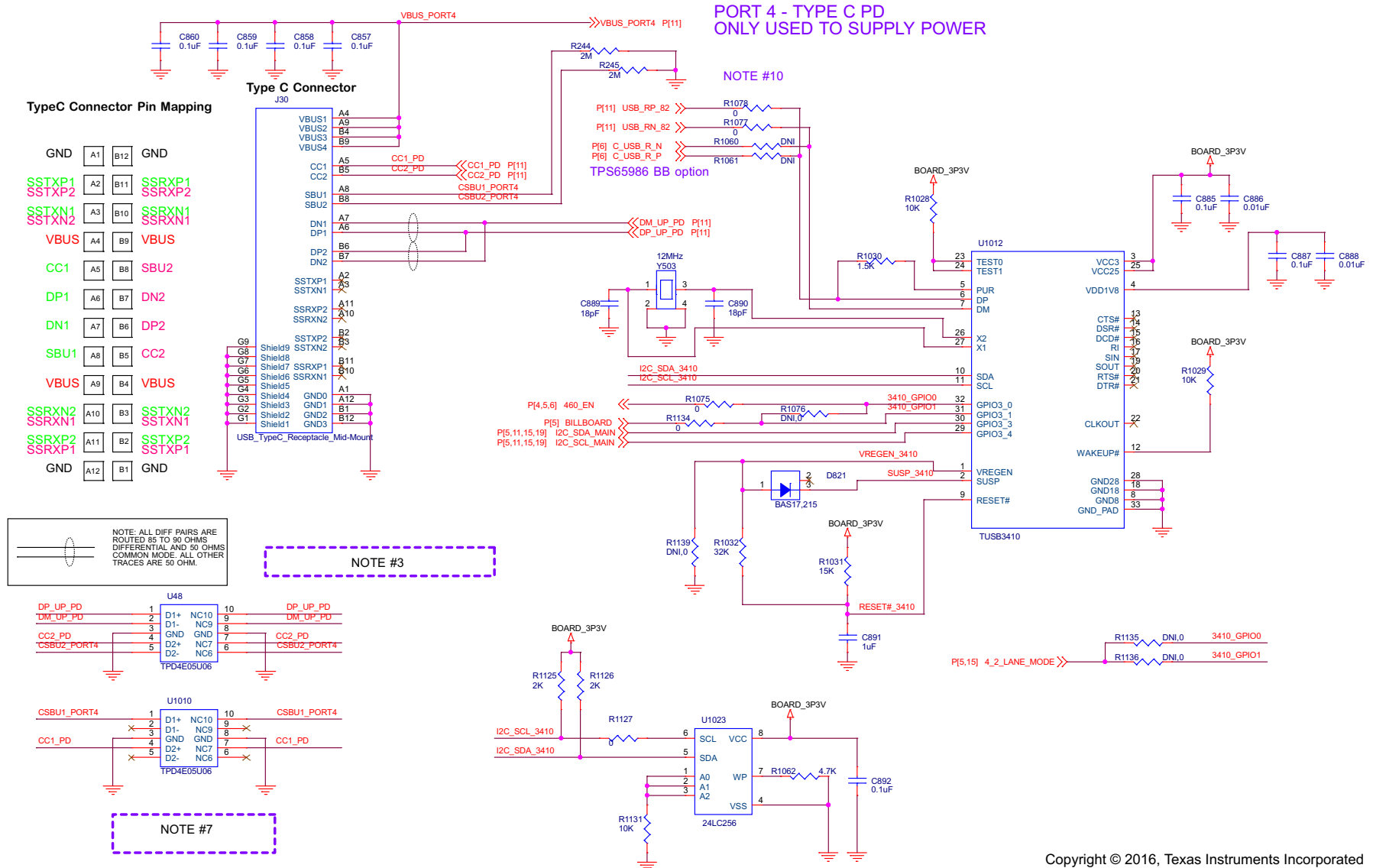
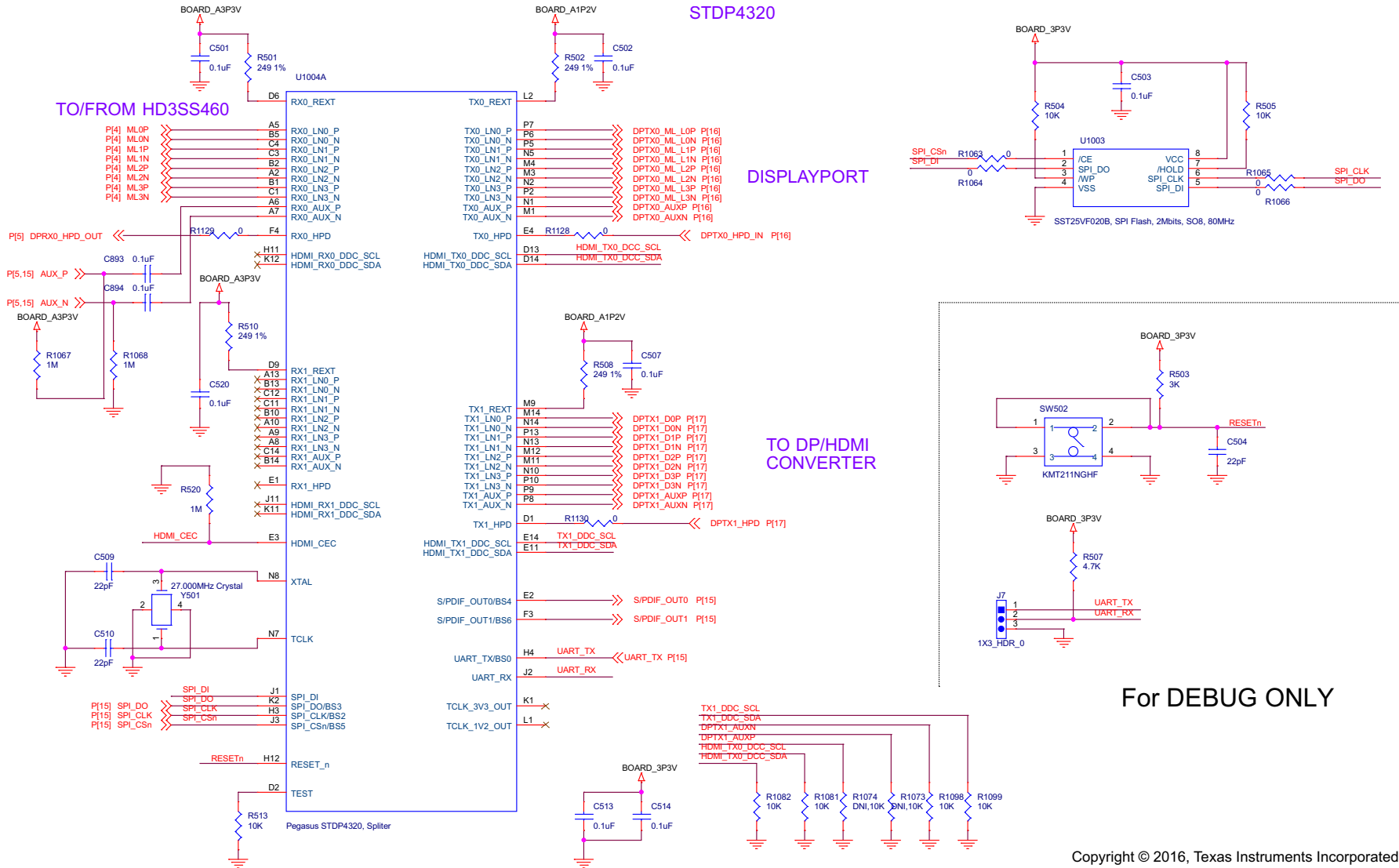


Figure 16. Port 4 USB Type-C Connector Schematic

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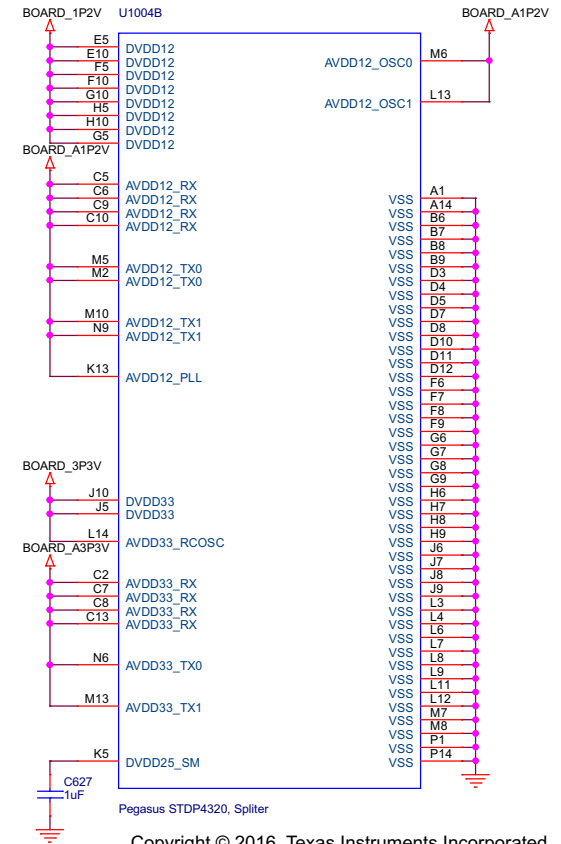
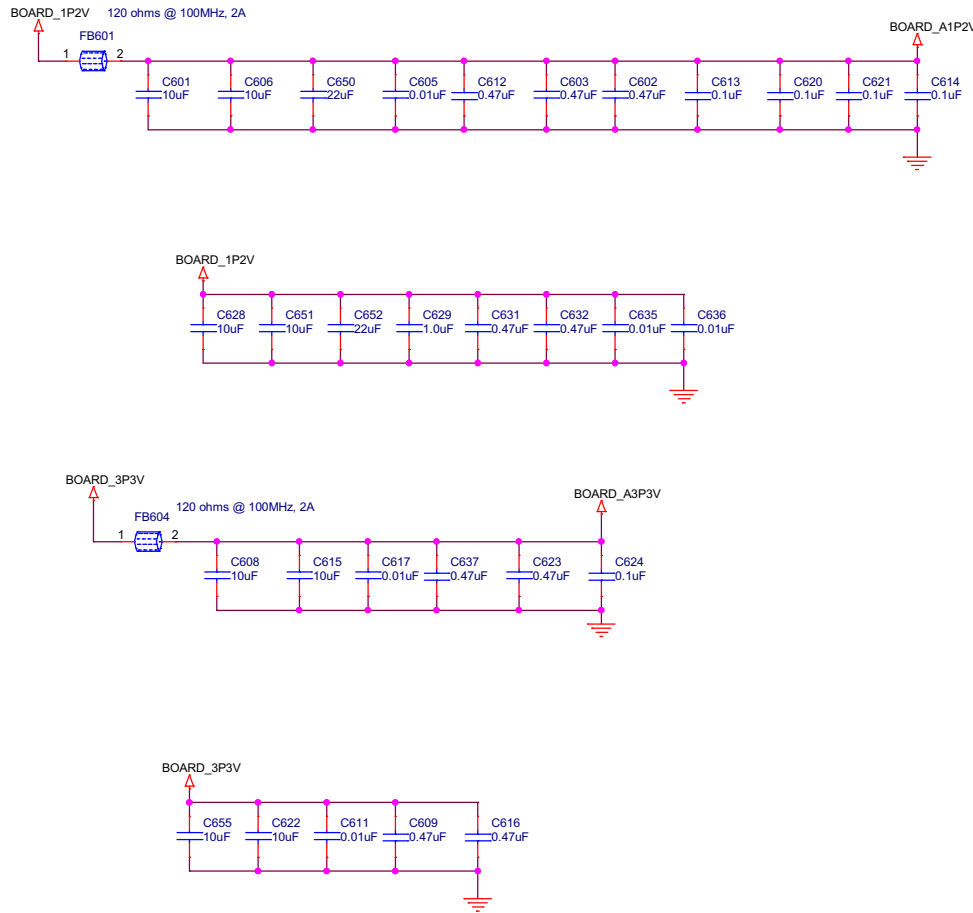


For DEBUG ONLY

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Figure 17. DP4320 Schematic

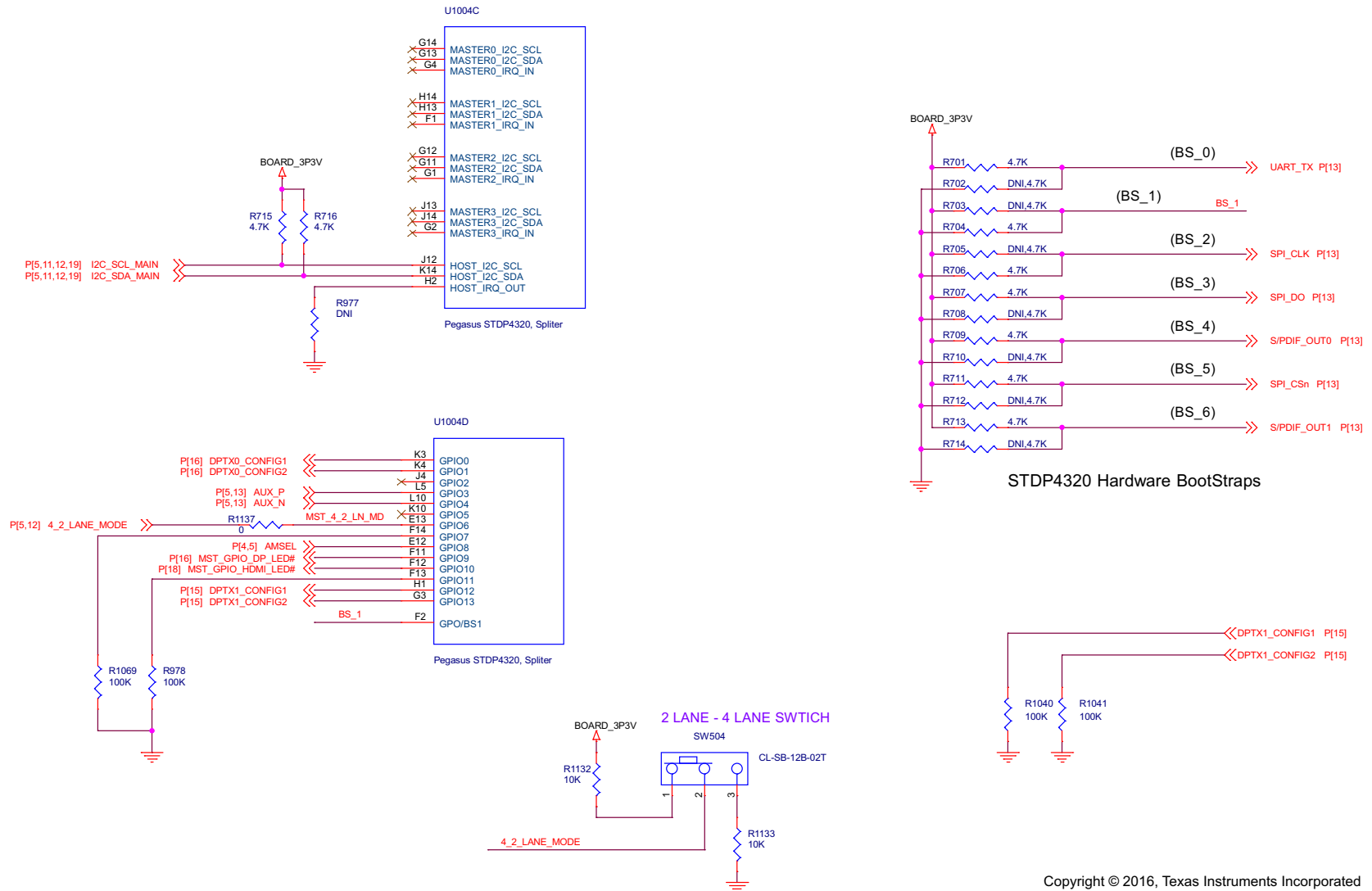
STDP4320 POWER



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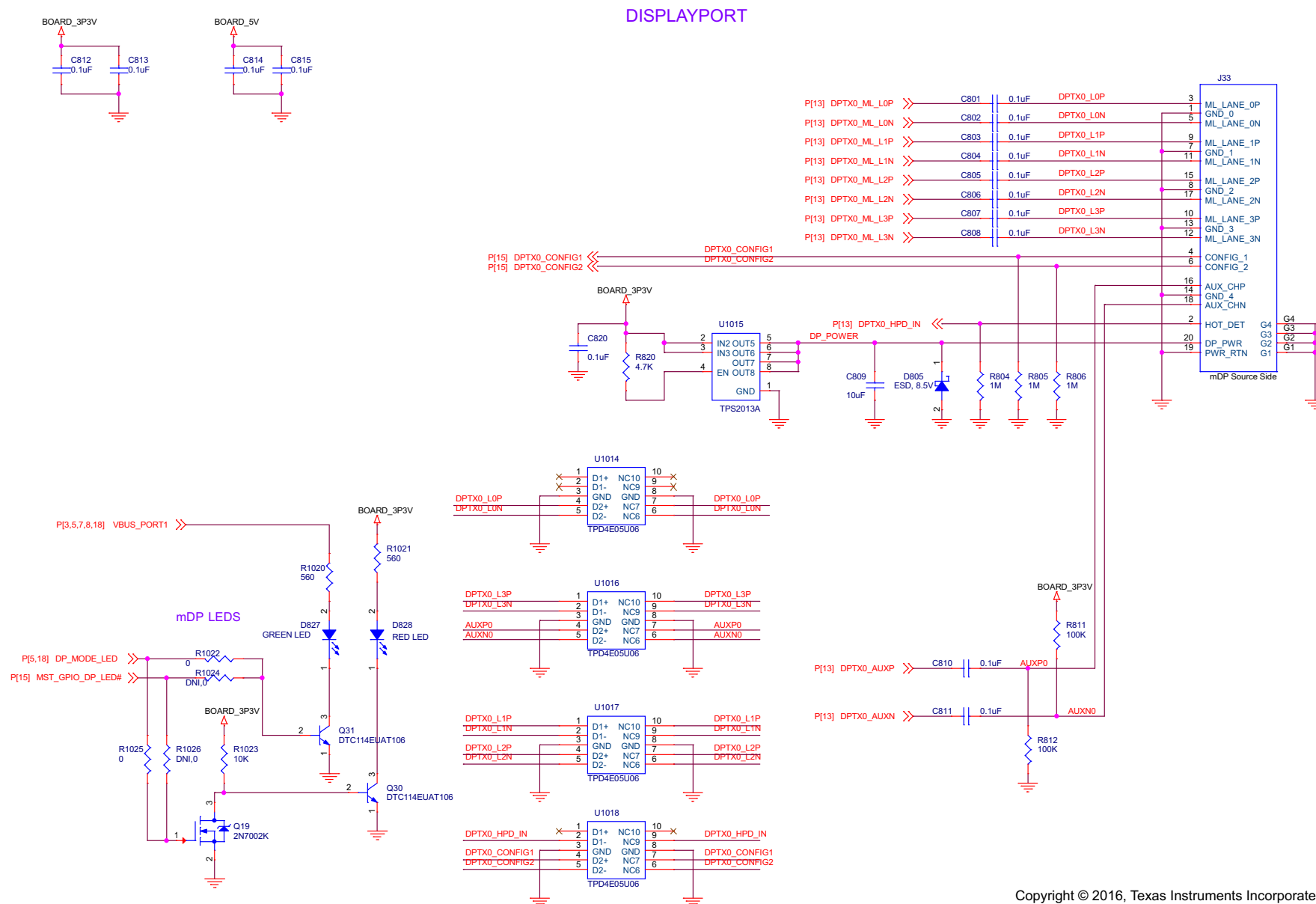
Figure 18. DP4320 Power Schematic

STDP4320 BOOTSTRAPS



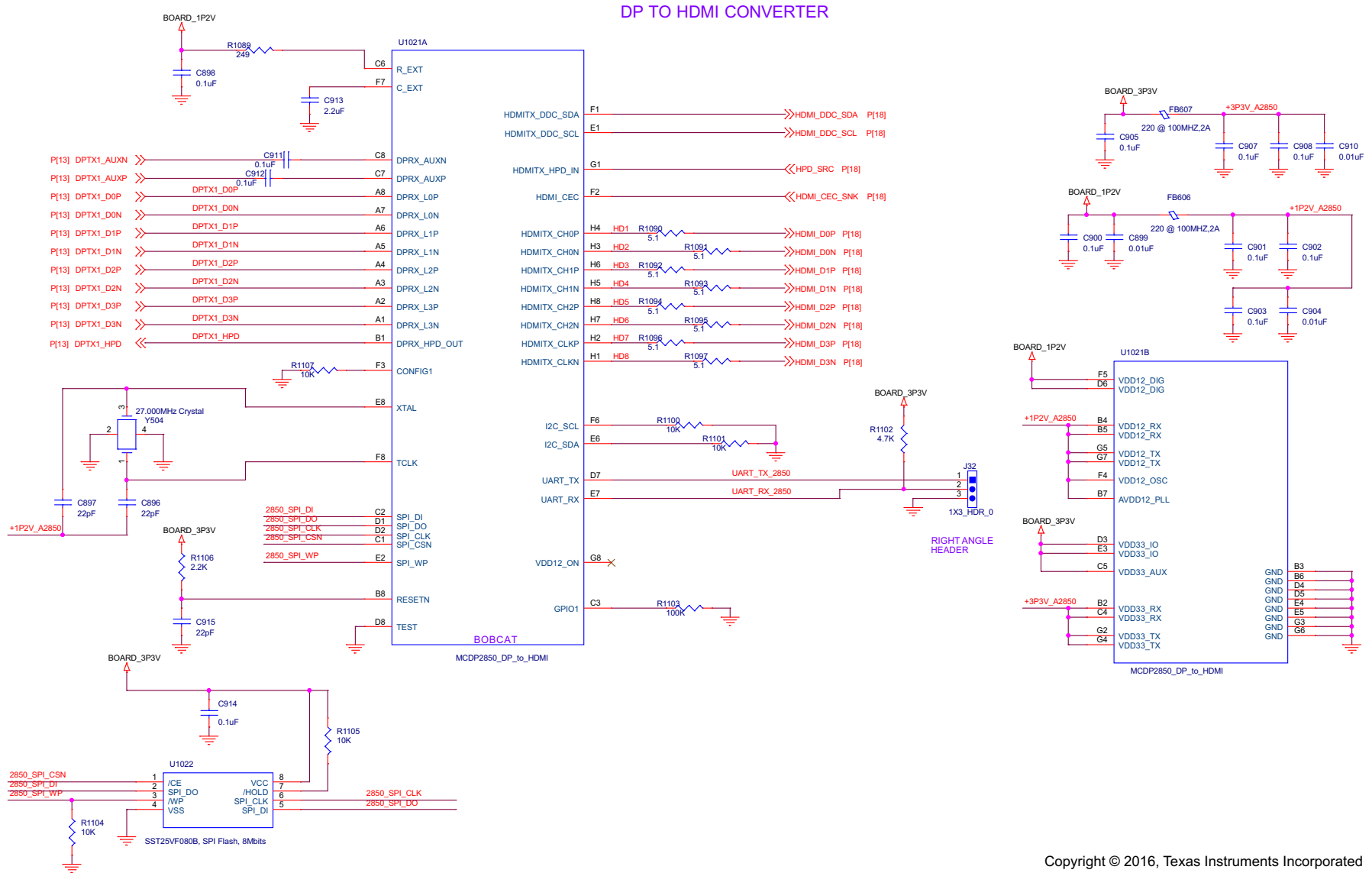
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Figure 19. DP4320 Bootstrap Schematic



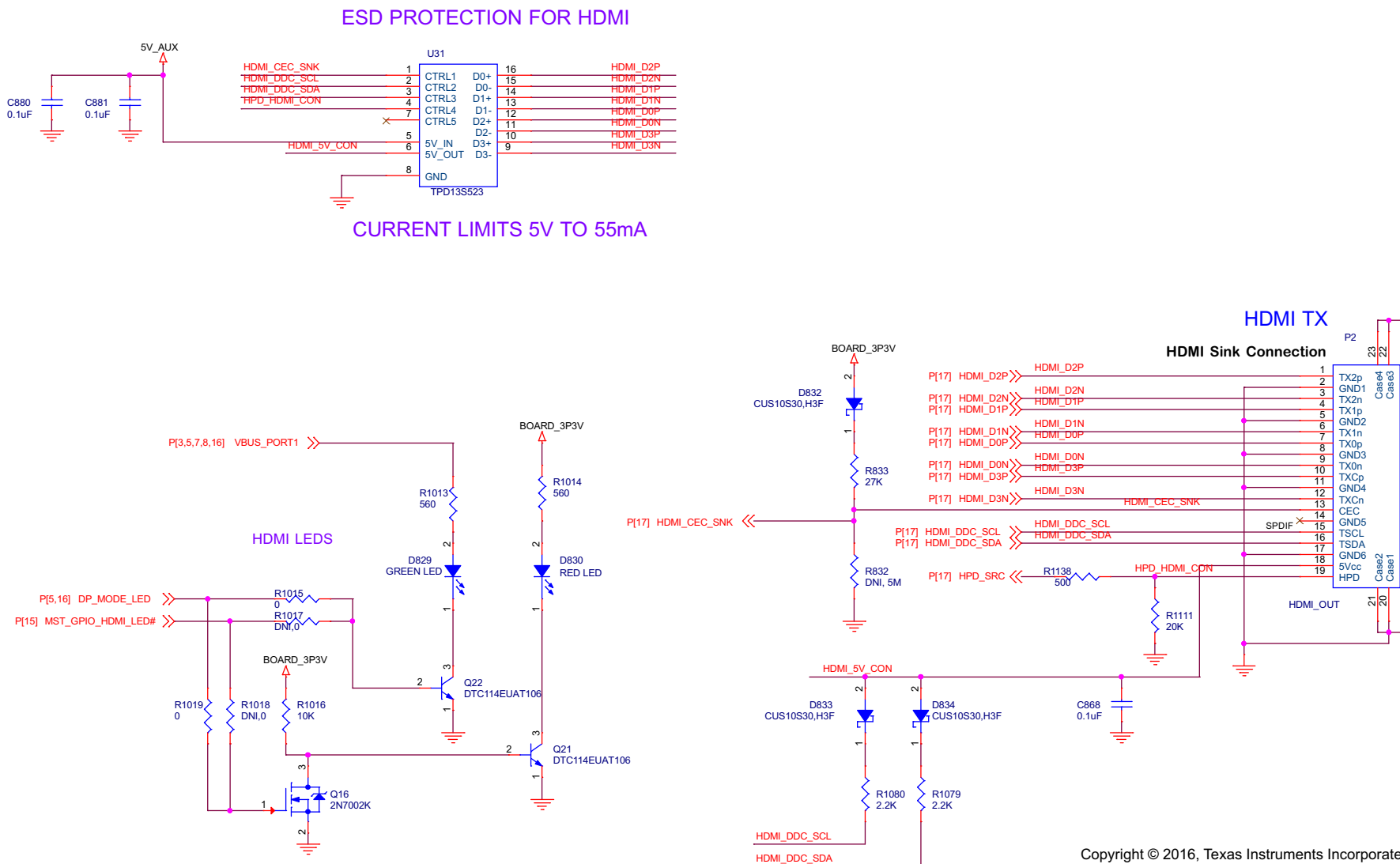
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Figure 20. EVM Display Port Schematic



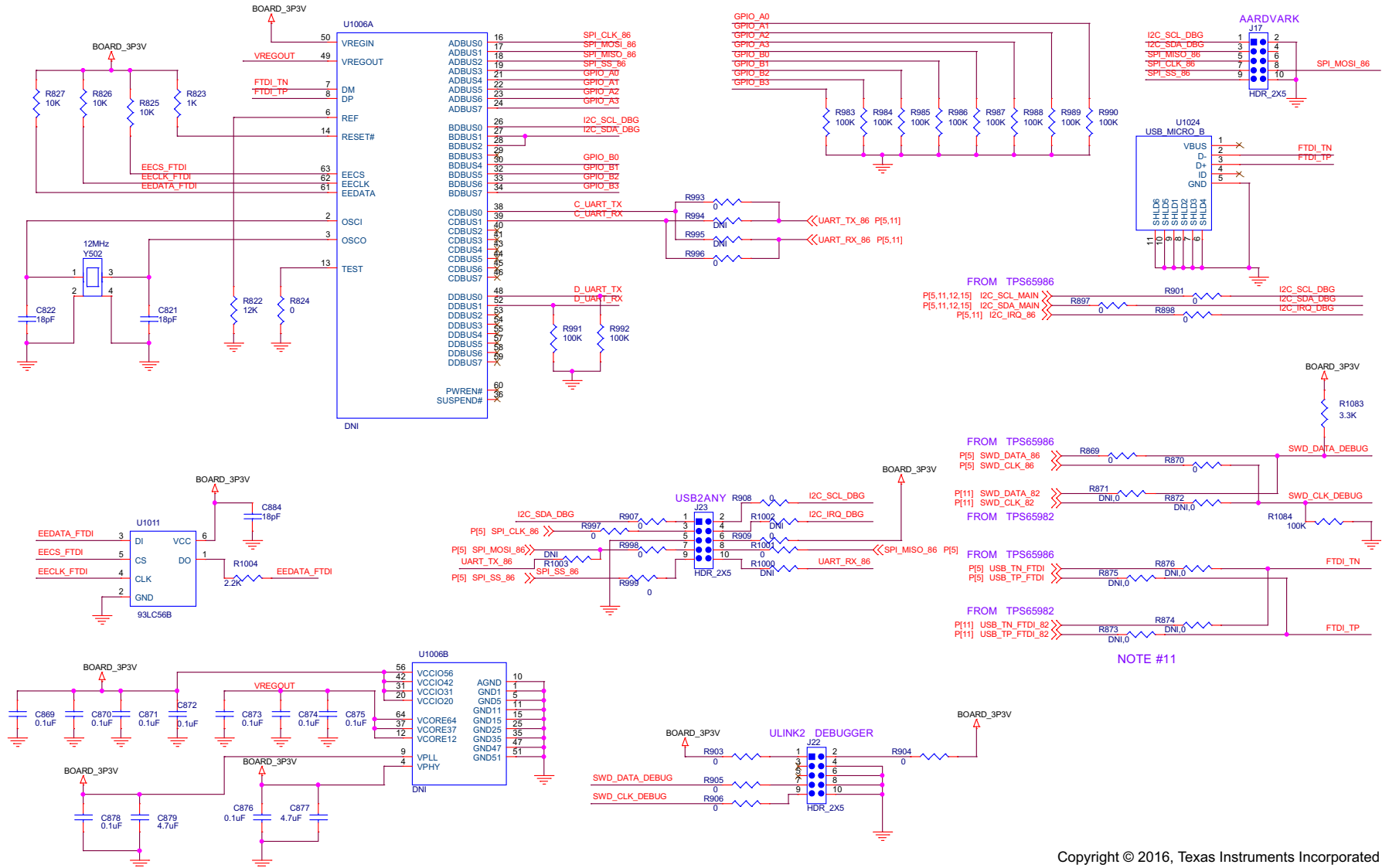
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Figure 21. DP to HDMI Schematic



**Figure 22. EVM HDMI Connector Schematic**

DEBUG BOARD - FTDI - USB - I2C/SPI/UART



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Figure 23. Debug Board Schematic

- 1- PLACE C916 C917 ANY WHERE ON THE BOARD
- 2- KEEP C2, C3, C7, C8 CAPS CLOSE TO CONNECTOR LET RESISTORS SHARE PADS
- 3- KEEP ESD CLOSE TO CONNECTOR
- 4- THESE CONNECTIONS ARE FOR FLOW THROUGH ROUTING
- 5- DP MODE LED PLACE NEAR DP/HDMI
- 6- KEEP C340, C341, C342, C343 CAPS CLOSE TO CONNECTOR LET RESISTORS SHARE PADS
- 7- THESE CONNECTIONS ARE FOR FLOW THROUGH ROUTING
- 8- C291 AND C192 MUST BE 5.4mm TALL
- 9- PAD SHARING R1058 AND R1114, R1059 AND R1113
- 10- Place R1077 and R1078 as close as possible to R1060 and R1061
- 11- PAD SHARING R873 AND R875, R874 AND 876
- 12- Pad sharing with R1060 and R1061 on page 12

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**Figure 24. EVM Schematic Fab Notes**



## Revision History

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

| <b>Changes from A Revision (August 2016) to B Revision</b> | <b>Page</b>       |
|--|-------------------|
| • Changed description of USB Type-C Dock. ....             | <a href="#">2</a> |

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