# EVB-USB7056 Evaluation Board User's Guide

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ISBN: 978-1-5224-4535-7

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# Preface

## NOTICE TO CUSTOMERS

**All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.**

**Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.**

**For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.**

## INTRODUCTION

This chapter contains general information that will be useful to know before using the EVB-USB7056. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

## DOCUMENT LAYOUT

This document describes how to use the EVB-USB7056 Evaluation Board as a development tool for the USB7056 six-port USB smart hub controller. The manual layout is as follows:

- **Chapter 1. "Overview"** – This shows a brief description of the EVB-USB7056 Evaluation Board.
- **Chapter 2. "Getting Started"** – This includes instructions on how to get started with the EVB-USB7056 Evaluation Board.
- **Chapter 3. "Hardware Configuration"** – This provides information about the EVB-USB7056 Evaluation Board battery charging features.
- **Appendix A. "EVB-USB7056 Evaluation Board"** – This appendix shows the EVB-USB7056 Evaluation Board.
- **Appendix B. "Schematics"** – This appendix shows the EVB-USB7056 Evaluation Board schematics.

- **Appendix C. "Bill of Materials"** – This appendix includes the EVB-USB7056 Evaluation Board Bill of Materials (BOM).
- **Appendix D. "Silk Screens"** – This appendix shows the EVB-USB7056 Evaluation Board silk screen images.

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

**DOCUMENTATION CONVENTIONS**

| Description | Represents | Examples |
|---|---|---|
| **Arial font:** | | |
| Italic characters | Referenced books | *MPLAB® IDE User's Guide* |
| | Emphasized text | ...is the *only* compiler... |
| Initial caps | A window | the Output window |
| | A dialog | the Settings dialog |
| | A menu selection | select Enable Programmer |
| Quotes | A field name in a window or dialog | "Save project before build" |
| Underlined, italic text with right angle bracket | A menu path | *File>Save* |
| Bold characters | A dialog button | Click **OK** |
| | A tab | Click the **Power** tab |
| N'Rnnnn | A number in verilog format, where N is the total number of digits, R is the radix and n is a digit. | 4'b0010, 2'hF1 |
| Text in angle brackets < > | A key on the keyboard | Press <Enter>, <F1> |
| **Courier New font:** | | |
| Plain Courier New | Sample source code | `#define START` |
| | Filenames | `autoexec.bat` |
| | File paths | `c:\mcc18\h` |
| | Keywords | `_asm, _endasm, static` |
| | Command-line options | `-Opa+, -Opa-` |
| | Bit values | `0, 1` |
| | Constants | `0xFF, 'A'` |
| Italic Courier New | A variable argument | *`file`*`.o`, where *`file`* can be any valid filename |
| Square brackets [ ] | Optional arguments | `mcc18 [options]` *`file`* `[options]` |
| Curly brackets and pipe character: { \| } | Choice of mutually exclusive arguments; an OR selection | `errorlevel {0\|1}` |
| Ellipses... | Replaces repeated text | `var_name [, var_name...]` |
| | Represents code supplied by user | `void main (void) { ... }` |

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PIC-kit 2 and 3.

## CUSTOMER SUPPORT

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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support

## DOCUMENT REVISION HISTORY

| Revisions | Section/Figure/Entry | Correction |
|---|---|---|
| DS50002887A (05-21-19) | Initial release | |

# Chapter 1. Overview

## 1.1 GENERAL INTRODUCTION TO USB7056

The USB7056 hub controller is a six-port SuperSpeed smart hub controller with USB Power Delivery (PD) support. It is fully compliant with the USB3.1, USB2.0, and USB PD 3.0 specifications. The six-port hub supports 5 Gbps SuperSpeed (SS USB3.1 Gen1), 480 Mbps High-Speed (HS), 12 Mbps Full-Speed (FS), and 1.5 Mbps Low-Speed (LS) USB signaling.

The USB7056 has one USB3.1 Gen1 upstream port with PD and DisplayPort Alternate Mode support. PD support is enabled through a companion PD controller (UPD350), which operates as a PD PHY + MAC + GPIO expander. The PD firmware stack executes within the USB7056 hub's internal microcontroller (MCU). The DisplayPort Alternate Mode support is enabled through the use of an external 6:4 cross-bar switch. The USB7056 firmware supports up to 100W of power delivery on the upstream port.

**Note:** The EVB-USB7056 baseboard supports up to 100W of power delivery by design. However, the included power regulator is limited to 60W maximum capability. The default hub firmware load is hence also configured by default to offer 60W maximum to the device attached to the upstream USB Type-C PD port. The PD power regulator (abbreviated as PM-PD) is a plug-in daughter card, which can be exchanged to test with various DC/DC solutions. Different PM-PD solutions may extend or restrict the maximum power capability depending upon the capabilities of the individual daughter card, and the hub firmware load should be reconfigured accordingly when exchanging PM-PD daughter cards.

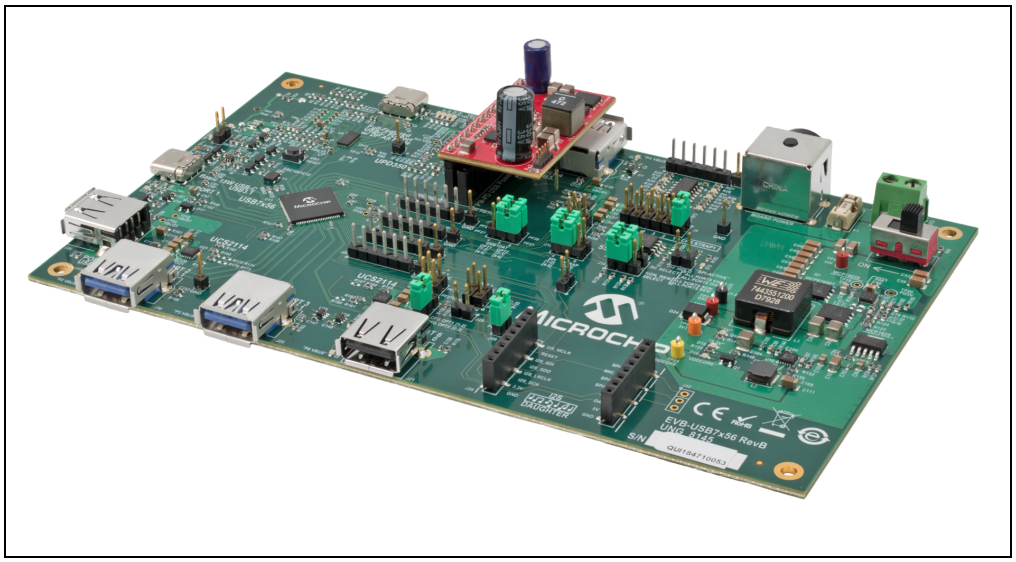
The USB7056 has one basic USB3.1 Gen1 downstream USB Type-C port (up to 15W, no PD), three USB3.1 Gen1 downstream ports, and two USB2.0 downstream Type-A ports. All downstream ports support battery charging. On these battery charging enabled downstream ports, the device provides automatic USB data line handshaking. The handshaking supports USB BC1.2 Charging Downstream Port (CDP), Dedicated Charging Port (DCP), and legacy devices.

The USB7056 is a smart hub with an embedded MCU for enabling advanced features. These features include hub configuration through the upstream USB interface, USB-to-$I^2C$ bridging, USB-to-SPI bridging, USB-to-GPIO bridging, USB-to-$I^2S$ audio bridging, and more.

## 1.2 EVB-USB7056 OVERVIEW

Figure 1-1 shows an image of the EVB-USB7056.

**FIGURE 1-1: EVB-USB7056 EVALUATION BOARD**



The EVB-USB7056 board is a six-layer RoHS-compliant evaluation board that utilizes the USB7056 to provide a fully functional six-port hub with battery charging capabilities. The EVB-USB7056 also features the UCS2114 two-channel USB port power controller. The USB7056 is configured to execute firmware from an external SST26VF016B SPI Flash device (U10). Many configurable options may be controlled through on-board jumper options or modified through the MPLAB® Connect Configurator tool. To allow maximum operational flexibility, all Programmable Function (PFx) pins are accessible through PCB headers. The EVB-USB7056 demonstrates driver compatibility with native Microsoft® Windows®, Mac OS®, and Linux® hub drivers.

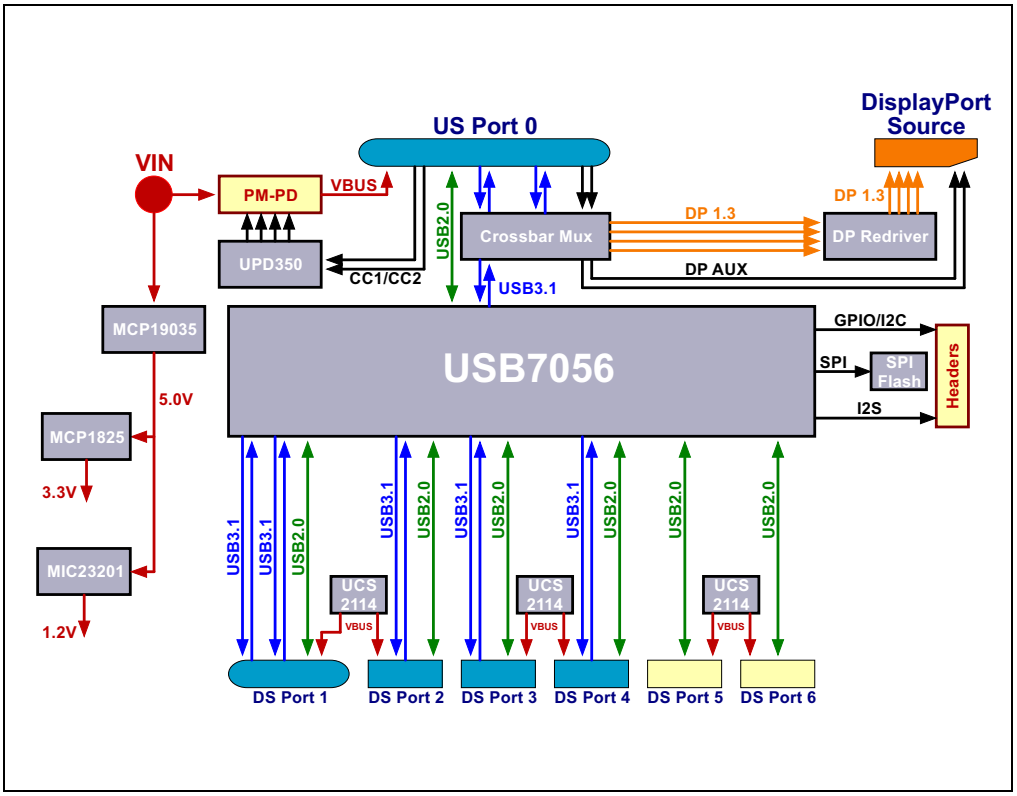
The EVB-USB7056 provides the following features:

- One USB7056 in a 100-pin QFN RoHS-compliant package
- One UPD350 in a 28-pin QFN RoHS-compliant package
- Three UCS2114 in a 20-pin QFN RoHS-compliant package
- One SST26VF016B in an 8-pin SOIC RoHS-compliant package
- USB2.0 compliant (HS, FS, and LS operation) and 5V-tolerant USB pins
- One USB3.1 Gen 1 upstream hub port that can source up to 60W (extendable up to 100W with capable PM-PD daughter card) USB PD and DisplayPort Alternate Mode support (pinout modes C and D)
- Self-powered operation
- One USB3.1 Gen 1 basic 15W USB Type-C downstream port (no PD)
- Three USB3.1 Gen 1 Type-A downstream ports
- Two USB2.0 Type-A downstream ports
- Battery Charging support (BC1.2 CDP and DCP) on all downstream ports
- Support for individual port power and overcurrent sense on all downstream ports
- Wide input supply range (12V-24V supported on baseboard, 24V required for default supplied PM-PD)
- DSC1001 25 MHz oscillator
- MCP1825 on-board +3.3V, 1A regulator

- MIC23201 single on-board +1.2V, 1A regulator
- MCP19035 on-board +5.0V, 6A switching regulator module
- +5.0V, +3.3V, and +VDD Core LED indicators
- LED voltage meter on upstream PD port for monitoring VBUS voltage
- Port power LED indicator for each downstream port VBUS
- Reset, SPI Chip Activity, and DisplayPort HPD LED indicator
- Optional GPIO LED drivers for development and debug use
- External Programmable Function (PFx/GPIOx) pin headers
- Battery Charging and Non Removable strap selection header
- Configuration mode selection headers
- Optional $I^2S$ daughter card for exercising USB-to-$I^2S$ feature (not included)

Figure 1-2 shows the block diagram of the EVB-USB7056.

**FIGURE 1-2: EVB-USB7056 BLOCK DIAGRAM**




## 1.3 REFERENCES

Concepts and materials available in the following documents may be helpful when reading this document. Visit www.microchip.com for the latest documentation.

- *USB7056 Data Sheet*
- *AN2810 - Configuration of USB7002/705x*

## 1.4 ACRONYMS AND DEFINITIONS

**TABLE 1-1: ACRONYMS AND DEFINITIONS**

| Acronym | Definition |
|---|---|
| BC1.2 | Latest USB-IF-specified USB battery charging standard |
| CDP | Charging Downstream Port. A type of port defined in the BC1.2 specification that is capable of delivering up to 1.5A of charging at 5V along with USB data. |
| DCP | Dedicated Charging Port. A type of port defined in the BC1.2 specification that is capable of delivering up to 1.5A of charging at 5V without USB data capabilities. |
| DFP | Downstream Facing Port. On a hub, this is the port where the device should be attached to. |
| DP | DisplayPort, an interface used to connect transit display and sound data from a video-capable device to a monitor or display. |
| EVB | Evaluation Board |
| Gen1 | USB 3.1 Specification 5 Gbps data rate speed |
| IC | Integrated Circuit |
| OTP | One-Time Programmable memory |
| PD | USB Power Delivery Specification |
| PM-PD | USB Power Delivery DC/DC plug in VBUS Supply daughter card |
| SDP | Standard Downstream Port. A type of port defined in the BC1.2 specification that is capable of delivering up to 500 mA of charging at 5V along with USB data. |
| Type-A | Non-reversible USB connector, used for DFP ports only |
| Type-C | Reversible USB Connector |
| USB2.0 | USB Specification version 2.0. An industry standard for cables, connectors, and protocol maintained by the USB-IF. |
| USB3.1 | USB Specification version 3.1. An industry standard for cables, connectors, and protocol maintained by the USB-IF. |
| USB | Universal Serial Bus, a communication technology specification developed by the USB-IF. |
| USB-IF | USB Integrators Forum, a collection of corporate sponsored members responsible for developing USB specifications |
| UFP | Upstream Facing Port. On a hub, this is the port where the USB host should be attached to. |
| VBUS | Refers to the 5V-20V power conductor inside of a Type-C cable, the power pins on a USB connector, or the USB power traces on a PCB. |

# Chapter 2. Getting Started

## 2.1 INTRODUCTION

The Microchip EVB-USB7056 is designed for flexible configuration solutions. It can be configured via the default internal register settings, via a downloadable external firmware to an on-board SPI Flash, via SMBus, or via the on-board jumper options. When configured with the default, preloaded SPI Flash firmware, the device operates as a USB3.1 Gen1 hub with a Type-C upstream port supporting USB PD, one downstream USB3.1 Gen1 Type-C port, three downstream USB3.1 Gen1 Type-A ports, and two downstream USB2.0 Type-A ports. The upstream port supports DisplayPort Alternate Mode and up to 60W of power sourcing to the attached PD-capable host.

Microchip provides a comprehensive software programming tool, MPLAB Connect (MPLABC), for configuring USB7056 functions, registers, and OTP memory. USB7056 requires MPLABC version 2.1.0 or greater.

For additional information on the MPLABC programming tool, refer to Software Libraries within the Microchip USB7056 product page at www.microchip.com/USB7056.

## 2.2 BOARD CONTENTS

The EVB-USB7056 Evaluation Board includes the basic equipment necessary for evaluation. The items included in the board are:

- EVB-USB7056
- 'PM-PD' Power Module (premounted to the EVB)
- Type-C-to-Type-C USB cable

## 2.3 QUICK START

### 2.3.1 Power Source

A power supply is not included with the EVB-USB7056. Connect a 24V (minimum 75W is recommended) power supply to the J5 terminal block.

### 2.3.2 CFG_STRAP1 Jumper

A shunt must be installed on only one of the CFG_STRAP1 options on J9. Any one of the settings may be selected. Refer to the data sheet for the option that most closely matches the feature set desired.

### 2.3.3 Default Firmware

A firmware is loaded by default onto the on-board SPI Flash, and, hence, programming the SPI Flash before operating the EVB is unnecessary. The D12 LED indicator illuminates bright blue while the hub is executing the firmware from the external SPI Flash.

**Note:** If it is preferred to run from the internal hub ROM firmware image, install a shunt on J12 to disable access to the SPI Flash device. PD functionality is not supported when running the firmware from the internal hub ROM firm-

ware image. This mode of operation should only be used for debugging or for loading a new firmware image to the SPI Flash. (The shunt should be removed right before loading the new firmware image to the SPI Flash.)

### 2.3.4 Host Connection

A USB2.0 or USB3.1 host must be connected to the upstream Type-C port J2.

If connecting the hub to a Type-A host port, use a USB Type-A-to-Type-C cable. Note that advanced functionality enabled through USB PD cannot function when using a Type-A-to-Type-C adapter cable.

If connecting the hub to a Type-C host port, use a USB-IF-certified cable that supports USB3.1 data protocol to ensure the highest functionality is supported by the cable. If the host supported Power Delivery and requests power from the EVB-USB7056, the negotiated voltage can be observed by monitoring the VBUS diode voltmeter on D25-D28. If the host also supports DisplayPort Alternate Mode, then a display may optionally connected to the EVB-USB7056 via a DisplayPort cable connected to J31.

**Note:** Charge-only Type-C cables with missing USB data wires (either missing USB3.1 wires only or missing both USB2 and USB3.1 wires) do exist. Always ensure to use USB-IF certified, known good cables when testing with the EVB-USB7056.

### 2.3.5 Downstream Port Connections

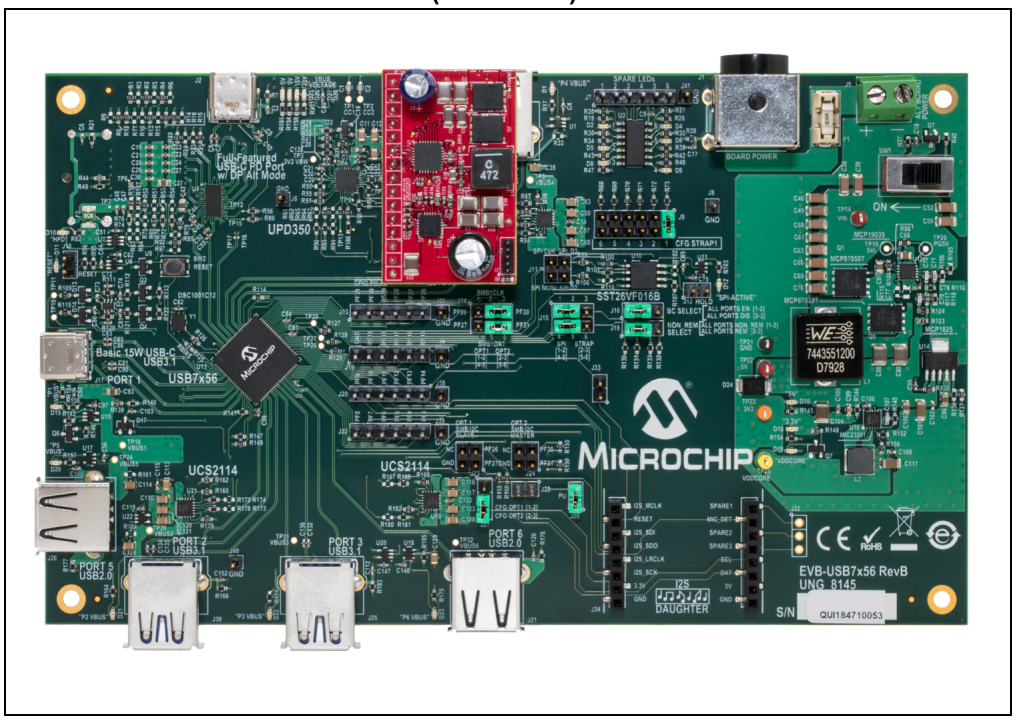
Once host connection is established on the upstream host port, devices may be connected to the downstream ports to begin operating with the USB host. The downstream port VBUS LEDs may be used to verify that power is properly applied to the downstream ports. Failure to illuminate indicates either a host connection failure (VBUS is enabled by the hub only when a command is received from the USB host) or a possible overcurrent condition on the downstream port.

# Chapter 3. Hardware Configuration

## 3.1 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of EVB-USB7056.

**FIGURE 3-1: EVB-USB7056 (TOP VIEW)**




### 3.1.1 Configuration

#### 3.1.1.1 CFG_STRAP1

The J9 2x6 header allows for different options to be selected for the CFG_STRAP1 configuration strap. In the standard firmware offering, only options 1 and 2 are supported. A shunt must be installed in either option 1 (J9, pins 1-2) or option 2 (J9, pins 3-4).

The CFG_STRAP1 option 1 special features are:

- USB-to-SMBus/$I^2C$ master bridge interface
- SMBus/$I^2C$ slave interface

The CFG_STRAP1 option 2 special features are:

- USB-to-SMBus/$I^2C$ master bridge interface
- USB-to-$I^2S$ audio interface

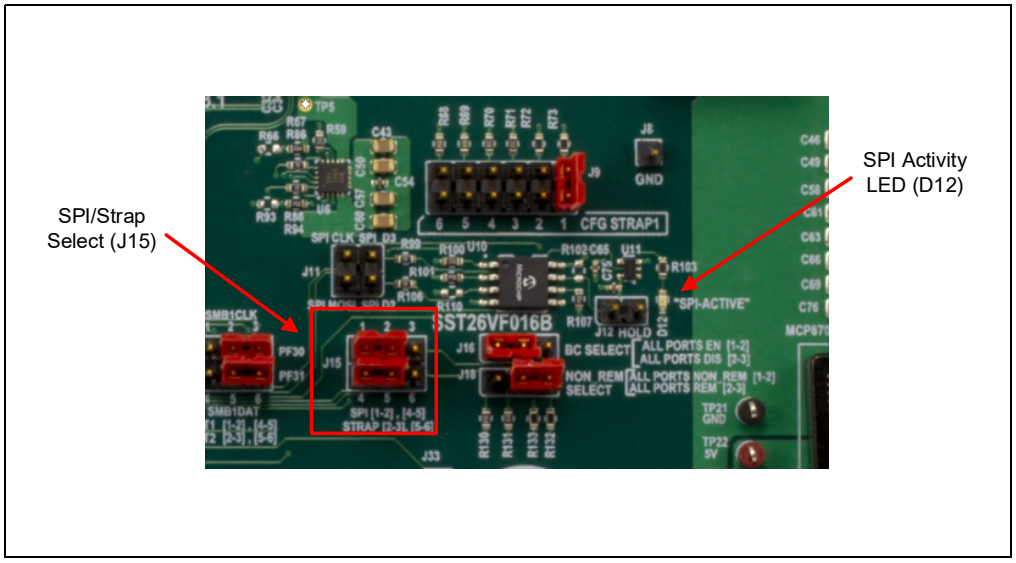
### 3.1.1.2 EXTERNAL SPI FLASH

The EVB-USB7056 requires an external firmware image loaded to the on-board SPI Flash. The external SPI Flash firmware is required to support USB PD functionality. The EVB-USB7056 is shipped with a firmware image preloaded to the on-board memory. The firmware revision can be quickly identified by enumerating the EVB-USB7056 to a USB host PC and inspecting the USB Device ID (bcdDevice) of the USB2.0 or USB3.1 hub.

To properly boot from the SPI Flash, the following conditions must be met:

- Shunts are installed on J15 across pins 1-2 and 4-5.
- Any shunt installed on J12 is removed.
- A valid firmware image is loaded onto the SPI Flash device.

**FIGURE 3-2: COMPONENTS CRITICAL FOR EXTERNAL SPI FLASH FIRMWARE EXECUTION**




The recommended sequence for reprogramming the SPI firmware is:

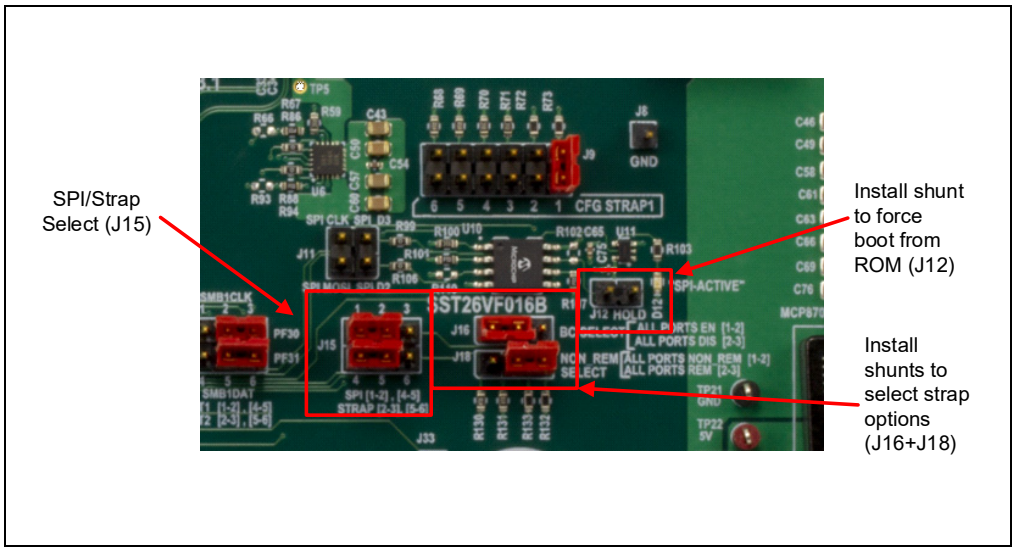
1. Install a shunt onto J12 to force booting from the internal ROM memory.
2. Reset the USB7056.
3. Connect the EVB-USB7056 to a USB host PC with a USB Type-A-to-Type-C cable.
4. Boot the MPLAB Connect software and select the new firmware image.
5. Remove the shunt on J12.
6. Click the program button on MPLAB Connect.

### 3.1.1.3 INTERNAL ROM FIRMWARE

A basic hub firmware is included within the USB7056 internal ROM memory that may be used as a boot-ROM for loading new firmware images into the external SPI Flash. When the firmware is run from the internal ROM memory, the USB7056 basic hub features will function, but the USB PD features will be non-functional. A USB Type-A-to-Type-C adapter cable is recommended when running in this mode to ensure that the attached host can reliably detect the USB hub and communicate with it.

To force the hub to boot from the internal ROM, install a shunt to J12 as shown in Figure 3-3. When the firmware is run from the internal ROM memory, the CFG_BC_EN and CFG_NON_REM configuration straps will also function, and the shunts installed to J15 should also be moved to short pins 2-3 and 5-6 for these strap configuration options to be sampled by the hub.

**FIGURE 3-3: COMPONENTS CRITICAL FOR INTERNAL ROM FIRMWARE EXECUTION**




3.1.1.3.1 BC Strap Select Jumper

A shunt must be installed on only one of the CFG_BC_EN BC1.2 battery charging strap options on J16. Select J16[1-2] to enable BC1.2 battery charging DCP and CDP on all downstream ports. Select J16[2-3] to disable BC1.2 battery charging on all downstream ports.

**Note:** If a different combination of battery charging enable/disable is desired than what is available on J16, select J16[2-3] to disable battery charging on all ports, and then configure the hub via the MPLAB Connect Configurator tool to enable battery charging support on only the desired subset of downstream ports.

3.1.1.3.2 Non-Removable Port Strap Select Jumper

A shunt must be installed on only one of the CFG_NON_REM non-removable port strap options on J18. Select J18[1-2] to set all downstream ports as non-removable. Select J18[2-3] to set all downstream ports as removable.

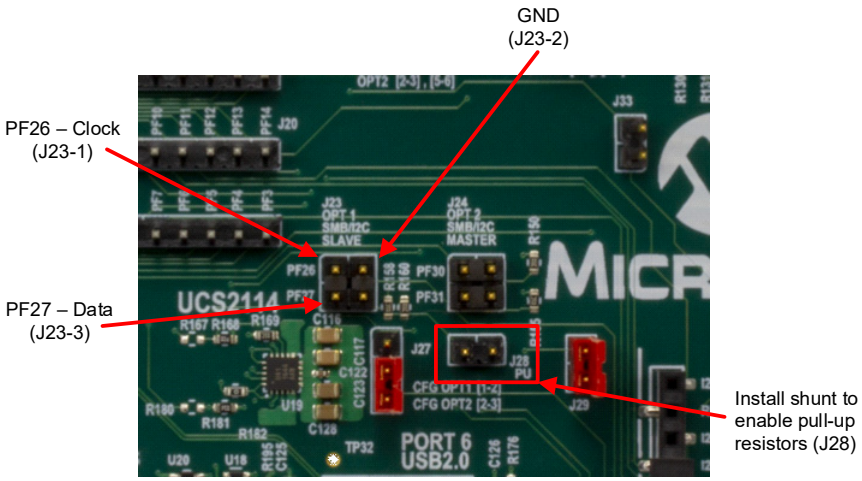
**Note 1:** If unsure with how USB non-removable port option works, it is recommended to select J18[2-3] to set all downstream ports as removable. This setting is just used as a reporting mechanism to describe the system to the host; the hub behavior is unchanged by changing this setting.

**2:** If a different combination of battery charging enable/disable is desired than what is available on J18, select J18[2-3] to set all downstream ports as removable, and then configure the hub via the MPLAB Connect Configurator tool to set only the desired subset of downstream ports as non-removable.

#### 3.1.1.4 SMBUS/I2C SLAVE

An SMBus/I2C slave interface is available for hub configuration in CFG_STRAP1 mode 2 only. Configuration via SMBus/I2C slave interface may be performed in both external SPI Flash or internal ROM memory firmware execution options. Pull-up resistors must be sensed by the hub at power-on in order for the SMBus/I2C slave interface to be active. If both SDA and SCL are not sensed as high upon power-on/reset, the SMBus/I2C slave interface is disabled on the hub. Install a shunt across J28. The locations of these headers are shown in Figure 3-4.

**FIGURE 3-4: SMBUS/I2C SLAVE HEADER LOCATIONS**




### 3.1.2 Power Source

The EVB-USB7056 must be powered externally through the J1 four-pin DIN connector, or through the J5 terminal block.

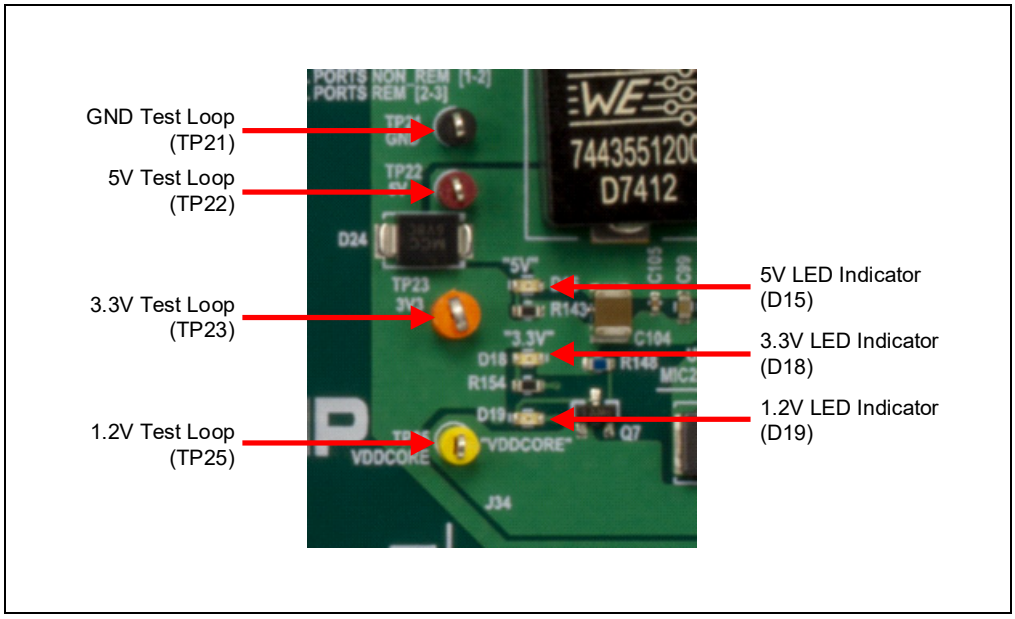
The supported input voltage range for the baseboard is 12V to 24V. By default, the supplied PM-PD requires an input of 24V to properly regulate up to 20V to the upstream PD ports. The recommended input voltage is 24V unless an alternate PM-PD, a specialized hub firmware, or both are used.

A power supply is not included with the EVB-USB7056.

### 3.1.3 Board Power

The board includes LED indicators to indicate if all board power nets are working and includes test loops for quick measurements. The location of these LEDs and test loops are shown in Figure 3-5.

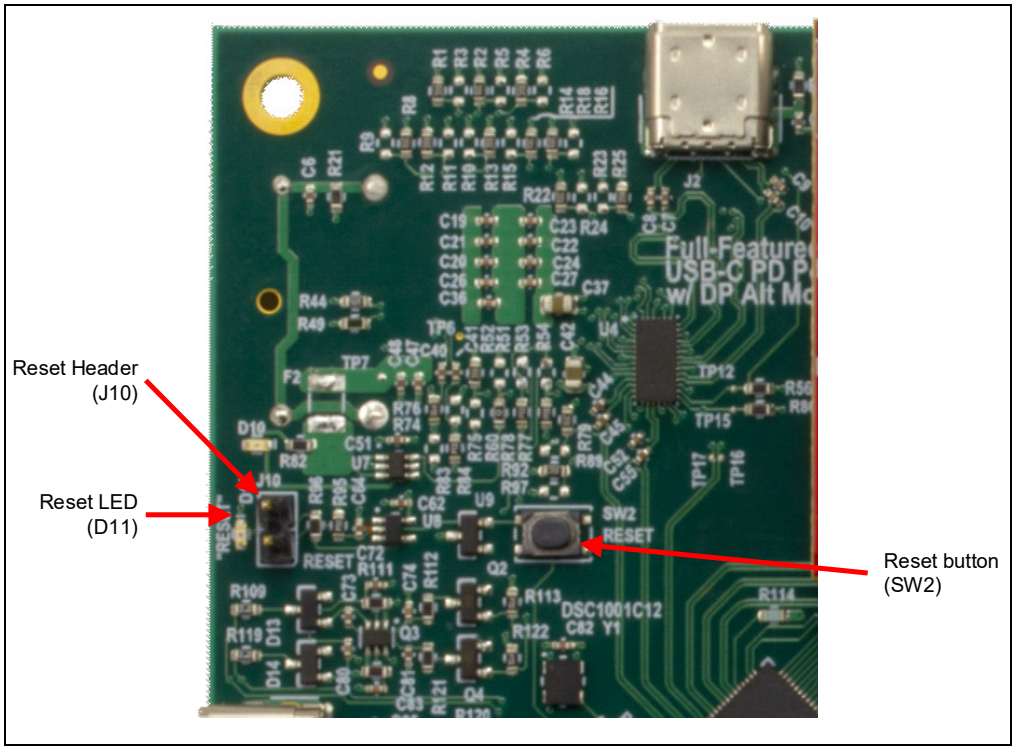
**FIGURE 3-5: BOARD POWER LEDS AND TEST LOOPS**




### 3.1.4 Reset

An on-board reset button is included which resets the USB7056 when pressed. A reset header (J11) is also included, which holds the USB7056 in reset when a shunt is installed across the header. A red LED indicator also illuminates when the reset signal is asserted (active low). The locations of these components are shown in Figure 3-6.

**FIGURE 3-6: RESET BUTTON LOCATION**



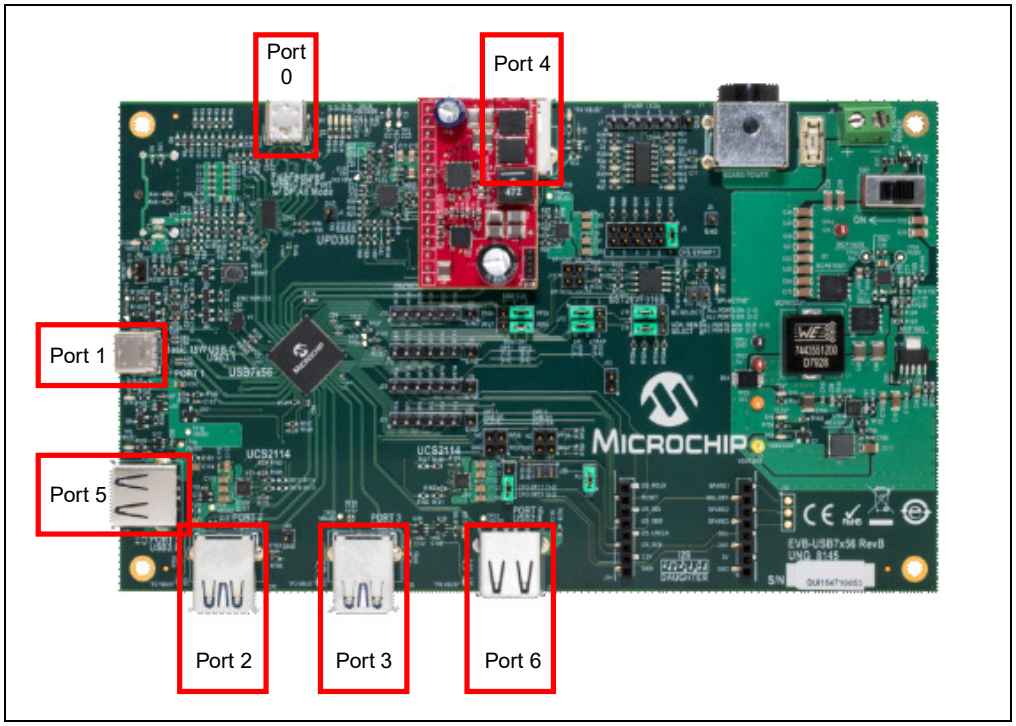
### 3.1.5 USB Ports

The following is a list of capabilities for each USB port on the EVB-USB7056:

- Port 0:
  - Data Upstream Port (connects to a USB host or a hub DFP)
  - USB3.1 Type-C receptacle
  - USB3.1 Gen1 and USB2.0 data connectivity
  - USB PD supporting up to 100W of power (depending on the PM-PD included)
  - DisplayPort Alternate Mode supporting up to four lanes at DP v1.3 speeds
- Port 1:
  - Data Downstream Port (connects to a USB device or a hub UFP)
  - USB3.1 Type-C receptacle
  - USB3.1 Gen1 and USB2.0 data connectivity
  - Basic USB-C charging at up to 15W (5V at 3A)
- Ports 2, 3, and 4:
  - Data Downstream Port (connects to a USB device or a hub UFP)
  - USB3.1 Type-A receptacle
  - USB3.1 Gen1 and USB2.0 data connectivity
  - BC1.2 charging at up to 7.5W (5V at 1.5A) if BC is enabled in hub configuration
- Ports 5 and 6:
  - Data Downstream Port (connects to a USB device or a hub UFP)
  - USB2.0 Type-A receptacle
  - USB2.0 data connectivity
  - BC1.2 charging at up to 7.5W (5V at 1.5A) if BC is enabled in hub configuration

Figure 3-7 shows the USB ports of EVB-USB7056.

**FIGURE 3-7: EVB-USB7056 USB PORTS**



### 3.1.6 DisplayPort Alternate Mode

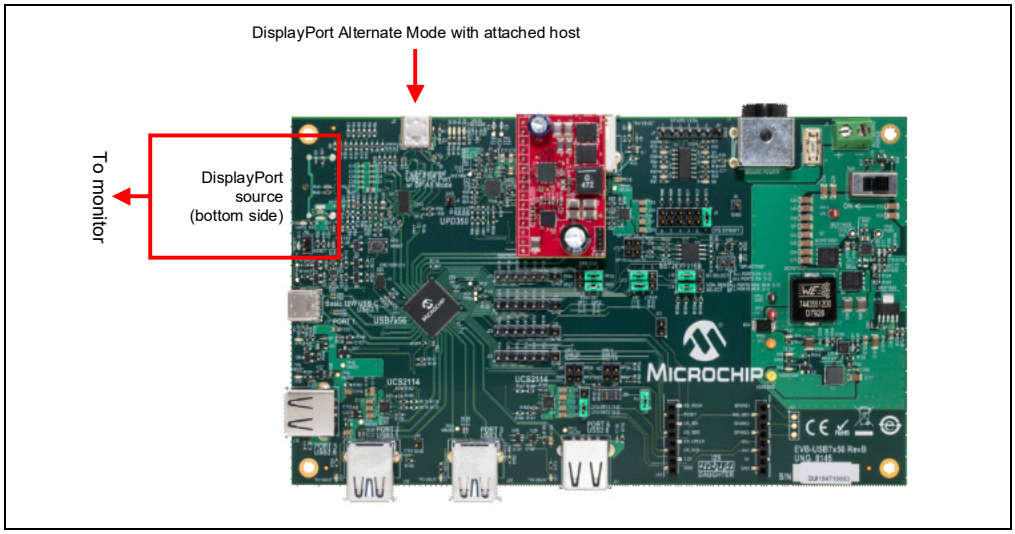
The EVB-USB7056 supports DisplayPort (DP) Alternate Mode on the upstream USB Type-C PD port. The on-board crossboard multiplexer and DP redriver ICs can support up to DisplayPort v1.3. The following DP Alternate Modes are supported:

- DisplayPort Mode C: 4-Lane DP Alternate Mode (no USB3.1)
- DisplayPort Mode D: 2-Lane DP Alternate Mode with USB3.1 Gen1

The USB host PC that is attached to the upstream Type-C port always determines which of the DP Alternate Modes (2-Lane or 4-Lane) will be entered. Note that a 4-Lane DP Alternate Mode uses all four SuperSpeed differential pairs of the Type-C cable and the USB3.1 Gen 1 connectivity is lost.

The DisplayPort signals are multiplexed and redriven to a standard DisplayPort Source receptacle. Any DisplayPort monitor display can be attached to the EVB-USB7056 via this connector. The J31 connector is located on the bottom side of the PCB.

**FIGURE 3-8: EVB-USB7056 DISPLAYPORT CONNECTOR**




### 3.1.7 'PM-PD' Plug-in Power Delivery Module

A 'PM-PD' module is a PD daughter card that includes a DC/DC regulator that provides the negotiated voltage to the upstream Port 0 PD port. The modular nature of this design allows for alternate DC/DC regulators of different architectures or capabilities to be developed and tested with the USB7056.

By default, the EVB-USB7056 includes a 60W-capable 'PM-PD' that is controlled using GPIOs (one voltage selection pin per voltage) to deliver 5V, 9V, 15V, or 20V at up to 3A.

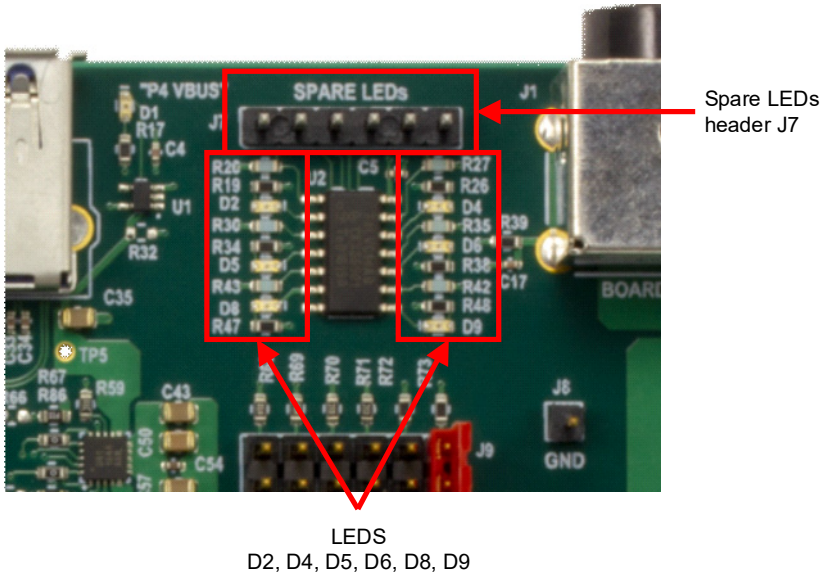
The EVB-USB7056 design can support a 'PM-PD' with up to 100W of power-sourcing capabilities. The EVB-USB7056 can also accommodate 'PM-PDs' that are controlled using GPIO or $I^2C$.

**Note:** If testing with any 'PM-PD' other than the one provided with the EVB-USB7056 is required, please contact Microchip customer support for assistance with ensuring that PM-PD technical requirements are satisfied. Alternate 'PM-PDs' may also require customized firmware to operate correctly.

### 3.1.8 Spare GPIOs

The EVB-USB7056 includes a six-channel buffer IC that drives six spare LEDs for general debug or development use. The inputs of these buffers are pinned out to J7 1x6 header. These header pins can be connected to any other board signal via fly wires. The locations of these components are shown in Figure 3-9.

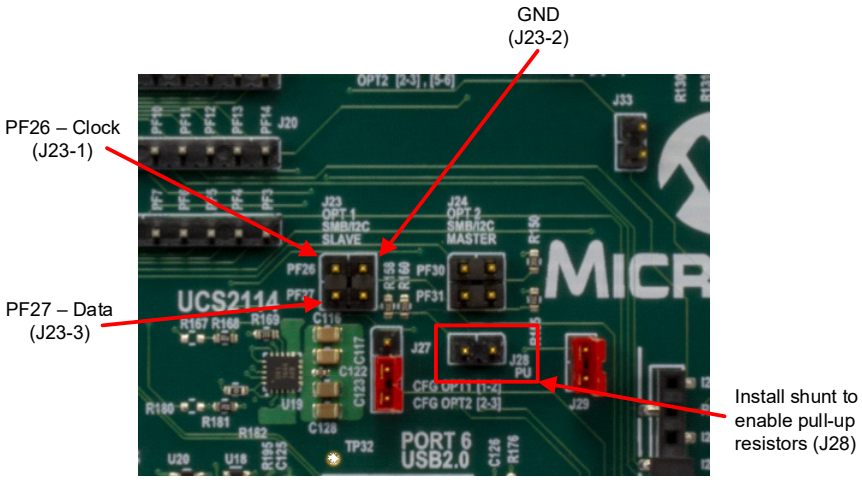
**FIGURE 3-9: SPARE LEDS**




### 3.1.9 USB-to-SMBus/I²C Master

An SMBus/I²C slave interface is available for hub configuration in CFG_STRAP1 mode 2 only. Pull-up resistors must be sensed by the hub at power-on in order for the SMBus/I²C slave interface to be active. If both SDA and SCL are not sensed as high upon power-on/reset, the SMBus/I²C slave interface is disabled in the hub. Install a shunt across J28. The locations of these headers are shown in Figure 3-4.

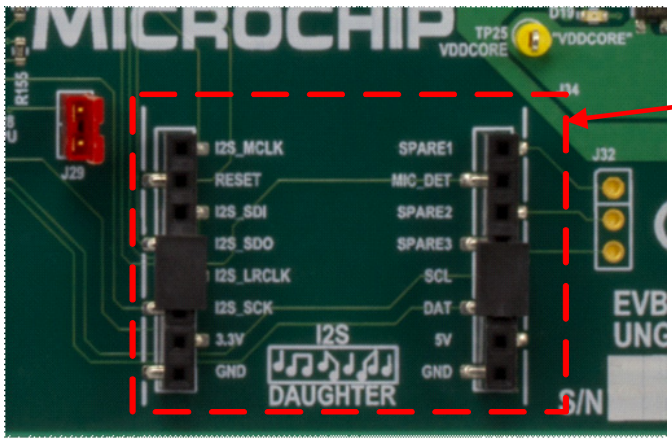
**FIGURE 3-10: USB-TO-SMBUS/I²C MASTER HEADER LOCATIONS**



### 3.1.10 USB-to-I²S

An optional I²S daughter card may be mated to the included I²S female headers as shown in Figure 3-11.

**FIGURE 3-11: I²S DAUGHTER CARD MATING LOCATION**




**Note:** Contact Microchip customer support for availability of premanufactured I²S daughter card availability, or for design guidelines for implementing your own daughter card design.

### 3.1.11 LED Indicators

Table 3-1 describes the LEDs on the PCB.

**TABLE 3-1: EVB-USB7056 LED DESCRIPTIONS**

| Ref Des. | Label | Description |
|---|---|---|
| D1 | “P4 VBUS” | Downstream Port 4 VBUS indicator. Illuminates when VBUS on Port 4 is present. |
| D2 | 1 | Spare GPIO LED Indicator (for J7 Pin 1) |
| D4 | 6 | Spare GPIO LED Indicator (for J7 Pin 6) |
| D5 | 2 | Spare GPIO LED Indicator (for J7 Pin 2) |
| D6 | 5 | Spare GPIO LED Indicator (for J7 Pin 5) |
| D8 | 3 | Spare GPIO LED Indicator (for J7 Pin 3) |
| D9 | 4 | Spare GPIO LED Indicator (for J7 Pin 4) |
| D10 | “HPD” | DisplayPort HPD Indicator. Illuminates when an HPD signal from the DisplayPort sink (display/monitor) is asserted. |
| D11 | “RESET” | Reset Indicator LED. Illuminates when the RESET_N signal is asserted (pulled low). |
| D12 | “SPI-ACTIVE” | SPI Activity Indicator LED. Illuminates when the SPI Chip Enable signal is asserted (pulled low). |
| D15 | “P1 VBUS” | Downstream Port 1 VBUS Indicator. Illuminates when VBUS on Port 1 is present. |
| D16 | “5V” | Illuminates when board 5V net is powered on. |
| D18 | “3.3V” | Illuminates when board 3.3V net is powered on. |
| D19 | “VDDCORE” | Illuminates when board 1.2V net is powered on. |
| D20 | “P5 VBUS” | Downstream Port 5 VBUS Indicator. Illuminates when VBUS on Port 5 is present. |

**TABLE 3-1: EVB-USB7056 LED DESCRIPTIONS (CONTINUED)**

| Ref Des. | Label | Description |
|---|---|---|
| D21 | "P2 VBUS" | Downstream Port 2 VBUS Indicator. Illuminates when VBUS on Port 2 is present. |
| D22 | "P3 VBUS" | Downstream Port 3 VBUS Indicator. Illuminates when VBUS on Port 3 is present. |
| D23 | "P6 VBUS" | Downstream Port 6 VBUS Indicator. Illuminates when VBUS on Port 6 is present. |
| D25 | VBUS VOLTAGE 5V | Upstream Port 0 VBUS voltmeter. Illuminates when VBUWS on the upstream port is at least 5V. |
| D26 | VBUS VOLTAGE 9V | Upstream Port 0 VBUS voltmeter. Illuminates when VBUWS on the upstream port is at least 9V. |
| D27 | VBUS VOLTAGE 15V | Upstream Port 0 VBUS voltmeter. Illuminates when VBUWS on the upstream port is at least 15V. |
| D28 | VBUS VOLTAGE 20V | Upstream Port 0 VBUS voltmeter. Illuminates when VBUWS on the upstream port is at least 20V. |

### 3.1.12 Switches

Table 3-2 describes the switches on the PCB.

**TABLE 3-2: EVB-USB7056 SWITCH DESCRIPTIONS**

| Ref Des. | Label | Description |
|---|---|---|
| SW1 | ON | Main PCB power switch |
| SW2 | RESET | Hub reset push button |

### 3.1.13 Connector Descriptions

Table 3-3 describes the connectors on the PCB.

**TABLE 3-3: EVB-USB7056 CONNECTOR DESCRIPTIONS**

| Ref Des. | Type | Label | Description |
|---|---|---|---|
| J1 | 4-in DIN | BOARD POWER | Board power input |
| J2 | Type-C USB Receptacle | Port 0 | Upstream Port 0 USB Type-C connector |
| J3 | 1x15 Header | GPIO PM-PD | PM-PD Module connector (GPIO controlled) |
| J4 | USB Type-A Receptacle | PORT 4 USB3.1 | Downstream Port 4 USB Type-A connector |
| J5 | 1x2 Terminal block | ALT BOARD POWER | Board power input (alternate) |
| J6 | 1x1 Header | GND | Ground pin |
| J7 | 1x6 Header | SPEARE LEDs | Header for attaching fly wires to drive the spare GPIO LEDs |
| J8 | 1x1 Header | GND | Ground pin |
| J9 | 2x6 Header | CFG_STRAP1 | CFG_STRAP1 selection header. A shunt must be installed on only one of the options. |
| J10 | 1x2 Header | RESET | Reset jumper. Install shunt to hold the hub in reset. |

**TABLE 3-3: EVB-USB7056 CONNECTOR DESCRIPTIONS (CONTINUED)**

| Ref Des. | Type | Label | Description |
|---|---|---|---|
| J11 | 2x2 Header | SPI_CLK, SPI_D3, SPI MOSI, SPI D2 | SPI Data pin probe headers |
| J12 | 1x2 Header | HOLD | SPI Hold jumper. Install shunt to force access to SPI Flash off. |
| J13 | 1x6 Header | PF31 PF30 PF29 PF28 PF27 PF26 | Header probing or attaching fly wires to PF26-31 |
| J14 | 3x2 Header | SMB1CLK | Header for selecting SMB1 Option 1 or Option 2 (based on CFG_STRAP1 selection) |
| J15 | 3x2 Header | SPI STRAP | Selection for SPI operation or configuration strap operation. Under normal operating conditions (running firmware from SPI Flash), install shunts across 1-2 and 4-5. |
| J16 | 1x3 Header | BC SELECT | CFG_BC_EN strap option. A shunt selection option is only required from running firmware from internal ROM. |
| J17 | USB Type-C Receptacle | PORT 1 Basic 15W USB-C USB3.1 | Downstream Port 1 USB Type-C connector |
| J18 | 1x3 Header | NON_REM SELECT | CFG_NON_REM strap option. A shunt selection option is only required from running firmware from the internal ROM. |
| J19 | 1x6 Header | GND PF19 PF18 PF17 PF16 PF15 | Header probing or attaching fly wires to PF15-19 |
| J20 | 1x6 Header | PF9 PF10 PF11 PF12 PF13 PF14 | Header probing or attaching fly wires to PF9-14 |
| J21 | USB Type-A Receptacle | PORT 6 USB2.0 | Downstream Port 6 USB Type-A connector |
| J22 | 1x6 Header | PF8 PF7 PF6 PF5 PF4 PF3 | Header probing or attaching fly wires to PF3-8 |
| J23 | 2x2 Header | OPT1 SMB/I2C SLAVE | Header probing or attaching fly wires to SMBus slave interface |
| J24 | 2x2 Header | OPT2 SMB/I2C MASTER | Header probing or attaching fly wires to SMBus master interface |
| J25 | USB Type-A Receptacle | PORT 3 USB3.1 | Downstream Port 3 USB Type-A connector |
| J26 | USB Type-A Receptacle | PORT 5 USB2.0 | Downstream Port 5 USB Type-A connector |
| J27 | 1x3 Header | CFG OPT1 [1-2] CFG OPT2 [2-3] | Header for selecting Overcurrent Alert routing (based on CFG_STRAP1 selection) |
| J28 | 1x2 Header | n/a | Install a shunt to connect SMBus/$I^2C$ pull-ups to SMBus/$I^2C$ slave |
| J29 | 1x2 Header | PU | Install a shunt to connect SMBus/$I^2C$ pull-ups to SMBus/$I^2C$ master |
| J30 | USB Type-A Receptacle | PORT 2 USB3.1 | Downstream Port 2 USB Type-A connector |
| J31 | DisplayPort Receptacle | n/a | DisplayPort Source Receptacle. For attaching a monitor display. |

**TABLE 3-3: EVB-USB7056 CONNECTOR DESCRIPTIONS (CONTINUED)**

| Ref Des. | Type | Label | Description |
|---|---|---|---|
| J32 | 1x3 Header | n/a | Probing header to $I^2S$ spare signals |
| J33 | 1x2 Header | n/a | Install shunt to connect board reset net to $I^2S$ daughter card connector |
| J34 | 1x8 Female Header (x2) | I2S DAUGH-TER | Female header for attaching an optional $I^2S$ codec daughter card |
| J35 | 1x15 Header | I2C PM-PD | PM-PD Module connector ($I^2C$ controlled) |
| J36 | 1x1 Header | GND | Ground pin |
| J37 | 1x1 Header | GND | Ground pin |
| J38 | 1x1 Header | GND | Ground pin |
| J39 | 1x1 Header | GND | Ground pin |
| J40 | 1x1 Header | GND | Ground pin |
| J41 | 1x1 Header | GND | Ground pin |

### 3.1.14 Test Points

Table 3-4 describes the test points on the PCB.

**TABLE 3-4: EVB-USB7056 TEST POINT DESCRIPTIONS**

| Ref Des. | Label | Description |
|---|---|---|
| TP1 | CC1 | Upstream Port 0 CC1 pin test point |
| TP2 | CC2 | Upstream Port 0 CC2 pin test point |
| TP3 | VSW | UPD350 VSW net test point |
| TP4 | N/A | UPD350 PWR_DN test point |
| TP5 | VBUS4 | Downstream Port 4 VBUS test point |
| TP6 | N/A | PI3DPX1203 Pion 22 test point |
| TP7 | N/A | DisplayPort Connector Power Shield test point |
| TP8 | N/A | UPD350 PIO5 test point |
| TP9 | N/A | UPD350 PIO3 test point |
| TP10 | N/A | Downstream Port 1 CC1 pin test point |
| TP11 | N/A | Downstream Port 1 CC2 pin test point |
| TP12 | N/A | Upstream Port 0 SBU2 test point |
| TP13 | N/A | UPD350 PIO0 test point |
| TP14 | VIN | Power Input test loop |
| TP15 | N/A | Upstream Port 0 SBU1 test point |
| TP16 | N/A | Upstream Port 0 D+ test point |
| TP17 | N/A | Upstream Port 0 D- test point |
| TP18 | VBUS1 | Downstream Port 1 VBUS test point |
| TP19 | 5VL | MCP19035 5VL net test loop |
| TP20 | PG5V | MCP19035 Power Good net test loop |
| TP21 | GND | Board ground test loop |
| TP22 | 5V | 5V board power test loop |
| TP23 | 3V3 | 3.3V board power test loop |
| TP24 | VBUS5 | Downstream Port 5 VBUS test point |
| TP25 | VDDCORE | 1.2V board power test loop |
| TP26 | N/A | UPD7056 TEST1 pin test point |
| TP27 | N/A | UPD7056 TEST2 pin test point |

**TABLE 3-4: EVB-USB7056 TEST POINT DESCRIPTIONS (CONTINUED)**

| Ref Des. | Label | Description |
|---|---|---|
| TP28 | VBUS2 | Downstream Port 2 VBUS test point |
| TP29 | N/A | UPD7056 TEST3 pin test point |

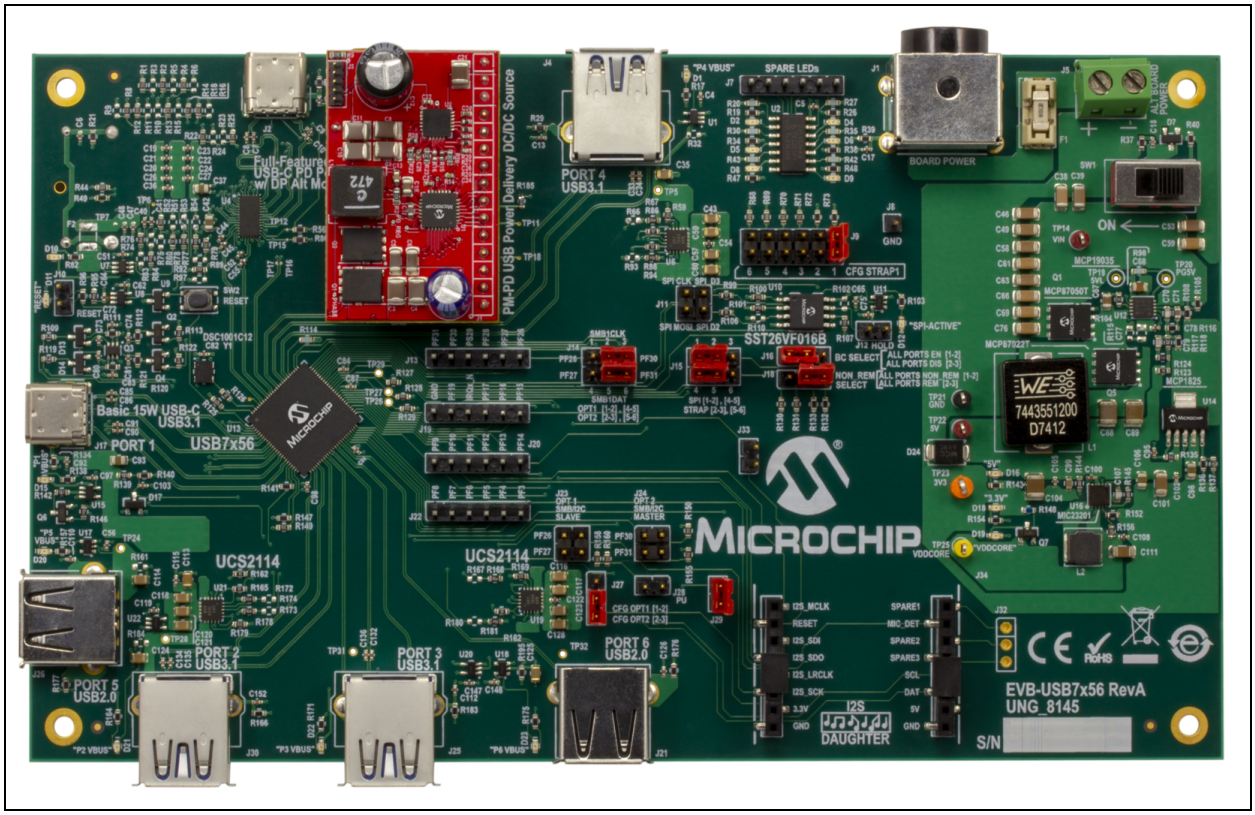
**NOTES:**

# Appendix A. EVB-USB7056 Evaluation Board

## A.1 INTRODUCTION

This appendix shows the EVB-USB7056 Evaluation Board.

**FIGURE A-1: EVB-USB7056 EVALUATION BOARD**



**NOTES:**

# Appendix B. Schematics

## B.1 INTRODUCTION

This appendix shows the EVB-USB7056 Evaluation Board schematics.

**FIGURE B-1: EVB-USB7056 EVALUATION BOARD SCHEMATIC 1**

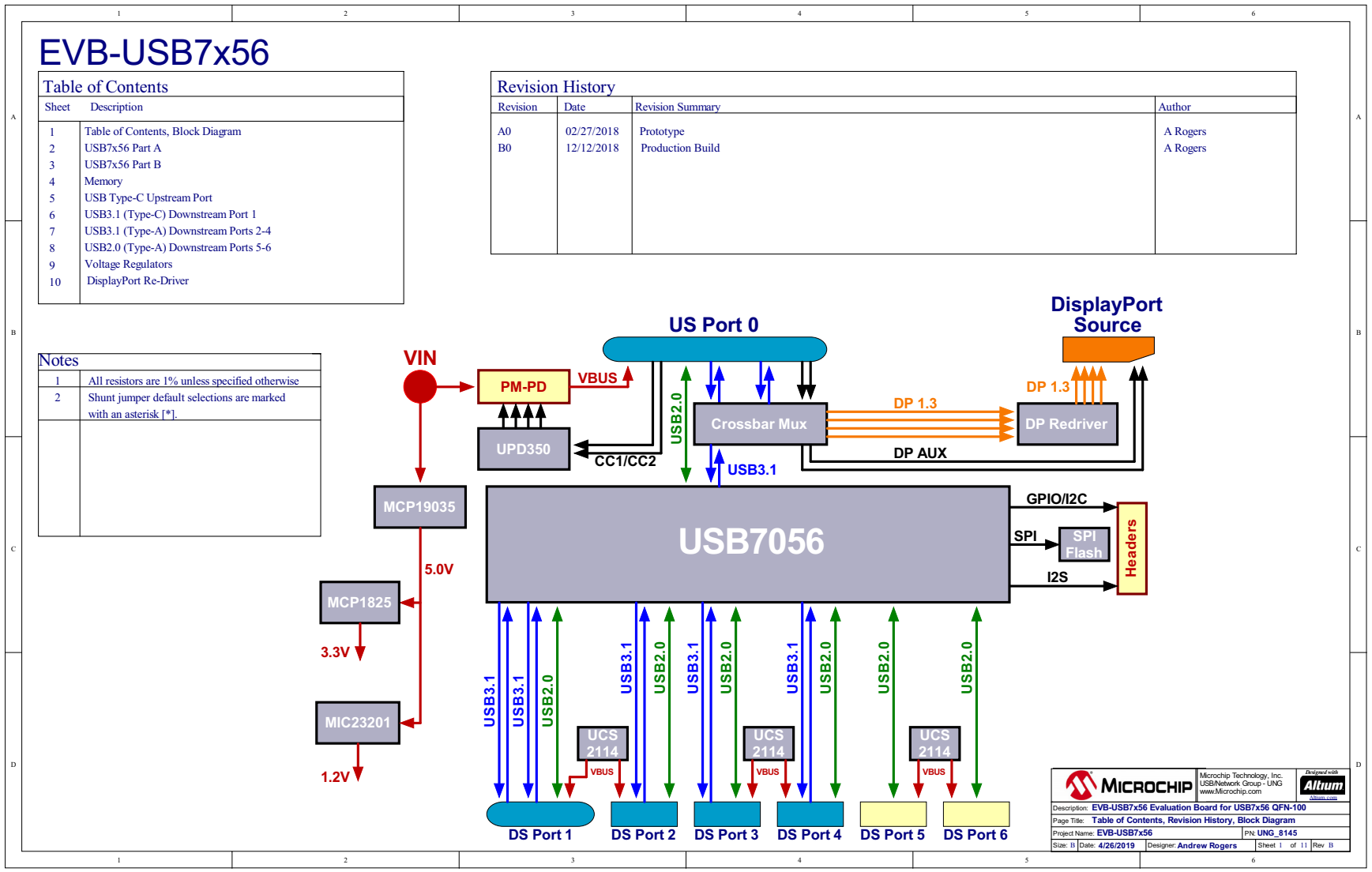


**FIGURE B-2: EVB-USB7056 EVALUATION BOARD SCHEMATIC 2**

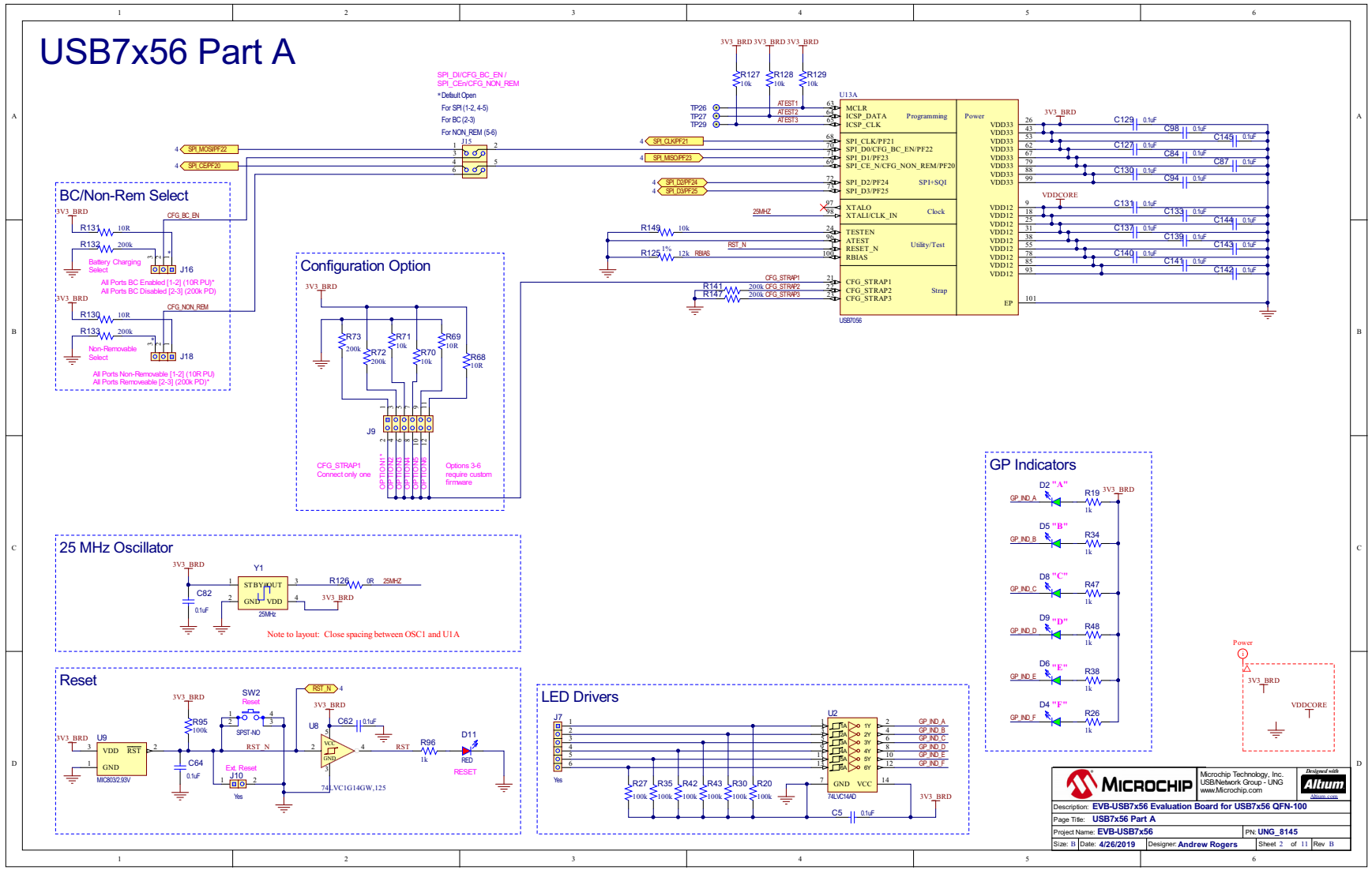
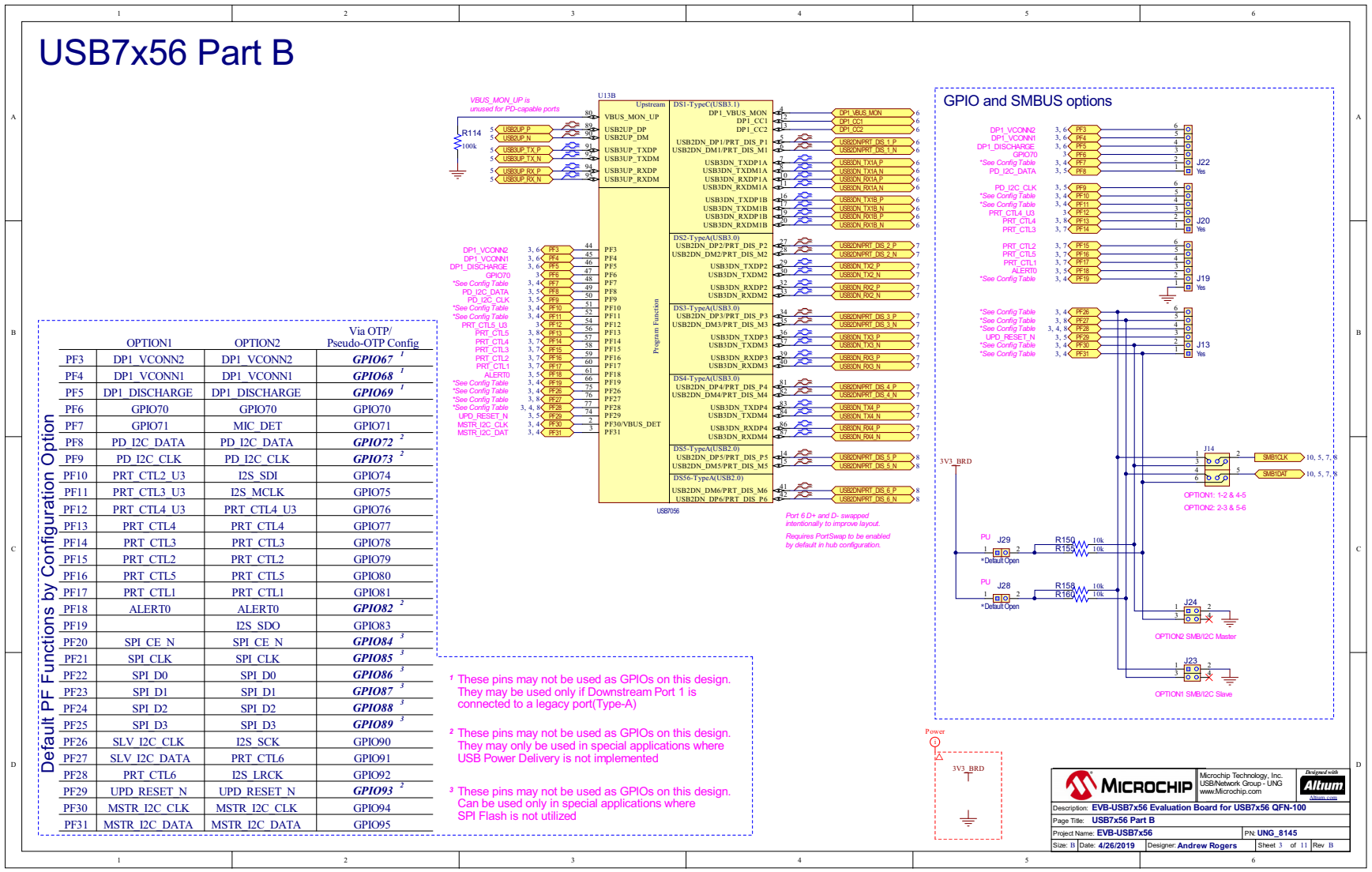


**FIGURE B-3: EVB-USB7056 EVALUATION BOARD SCHEMATIC 3**




| | OPTION1 | OPTION2 | Via OTP/ Pseudo-OTP Config |
|---|---|---|---|
| PF3 | DP1_VCONN2 | DP1_VCONN2 | ***GPIO67*** [1] |
| PF4 | DP1_VCONN1 | DP1_VCONN1 | ***GPIO68*** [1] |
| PF5 | DP1_DISCHARGE | DP1_DISCHARGE | ***GPIO69*** [1] |
| PF6 | GPIO70 | GPIO70 | GPIO70 |
| PF7 | GPIO71 | MIC_DET | GPIO71 |
| PF8 | PD_I2C_DATA | PD_I2C_DATA | ***GPIO72*** [2] |
| PF9 | PD_I2C_CLK | PD_I2C_CLK | ***GPIO73*** [2] |
| PF10 | PRT_CTL2_U3 | I2S_SDI | GPIO74 |
| PF11 | PRT_CTL3_U3 | I2S_MCLK | GPIO75 |
| PF12 | PRT_CTL4_U3 | PRT_CTL4_U3 | GPIO76 |
| PF13 | PRT_CTL4 | PRT_CTL4 | GPIO77 |
| PF14 | PRT_CTL3 | PRT_CTL3 | GPIO78 |
| PF15 | PRT_CTL2 | PRT_CTL2 | GPIO79 |
| PF16 | PRT_CTL5 | PRT_CTL5 | GPIO80 |
| PF17 | PRT_CTL1 | PRT_CTL1 | GPIO81 |
| PF18 | ALERT0 | ALERT0 | ***GPIO82*** [2] |
| PF19 | | I2S_SDO | GPIO83 |
| PF20 | SPI_CE_N | SPI_CE_N | ***GPIO84*** [3] |
| PF21 | SPI_CLK | SPI_CLK | ***GPIO85*** [3] |
| PF22 | SPI_D0 | SPI_D0 | ***GPIO86*** [3] |
| PF23 | SPI_D1 | SPI_D1 | ***GPIO87*** [3] |
| PF24 | SPI_D2 | SPI_D2 | ***GPIO88*** [3] |
| PF25 | SPI_D3 | SPI_D3 | ***GPIO89*** [3] |
| PF26 | SLV_I2C_CLK | I2S_SCK | GPIO90 |
| PF27 | SLV_I2C_DATA | PRT_CTL6 | GPIO91 |
| PF28 | PRT_CTL6 | I2S_LRCK | GPIO92 |
| PF29 | UPD_RESET_N | UPD_RESET_N | ***GPIO93*** [2] |
| PF30 | MSTR_I2C_CLK | MSTR_I2C_CLK | GPIO94 |
| PF31 | MSTR_I2C_DATA | MSTR_I2C_DATA | GPIO95 |

[1] These pins may not be used as GPIOs on this design. They may be used only if Downstream Port 1 is connected to a legacy port(Type-A)

[2] These pins may not be used as GPIOs on this design. They may only be used in special applications where USB Power Delivery is not implemented

[3] These pins may not be used as GPIOs on this design. Can be used only in special applications where SPI Flash is not utilized

**FIGURE B-4: EVB-USB7056 MEMORY**

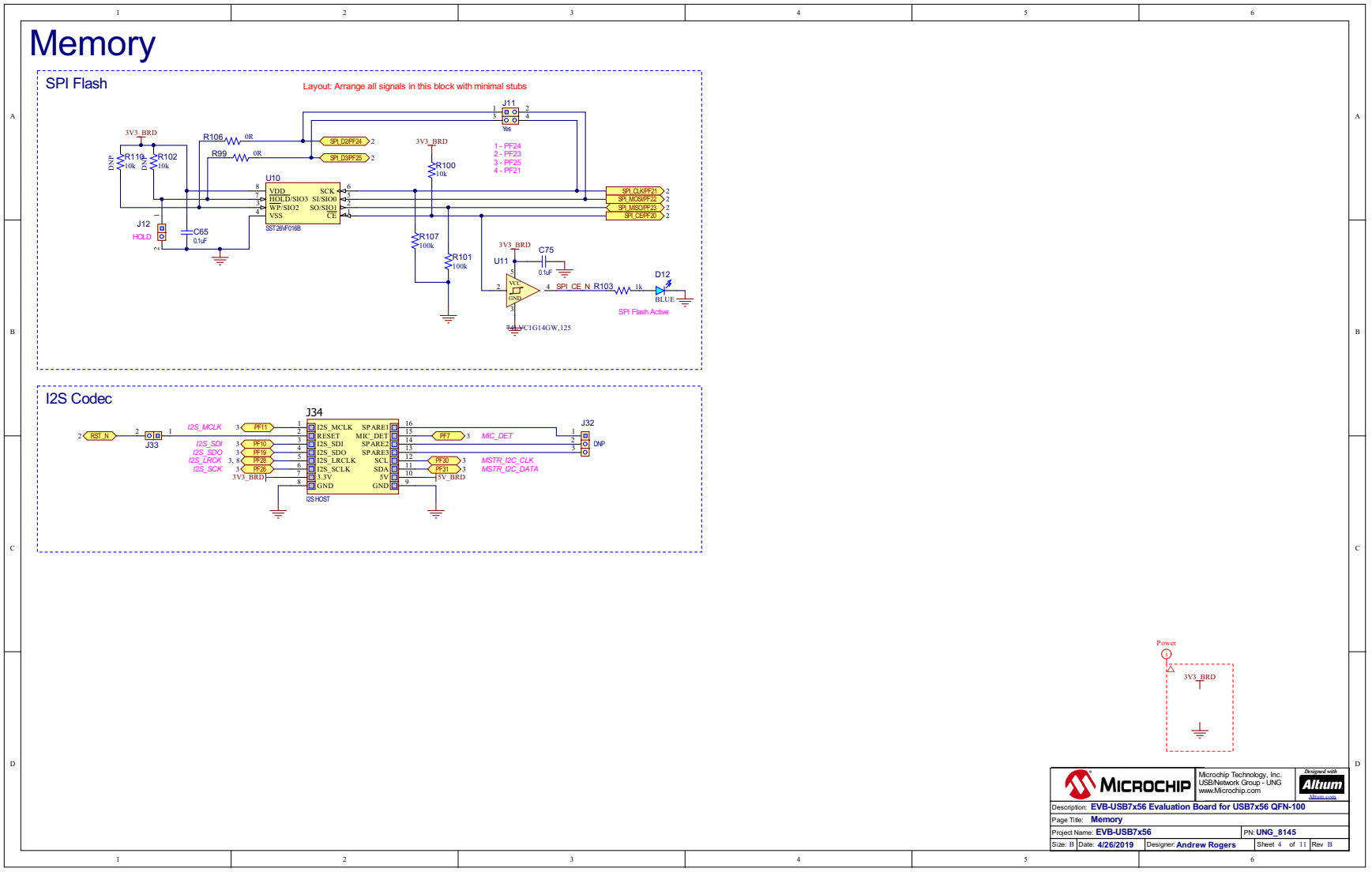


**FIGURE B-5: EVB-USB7056 USB TYPE-C UPSTREAM PORT**

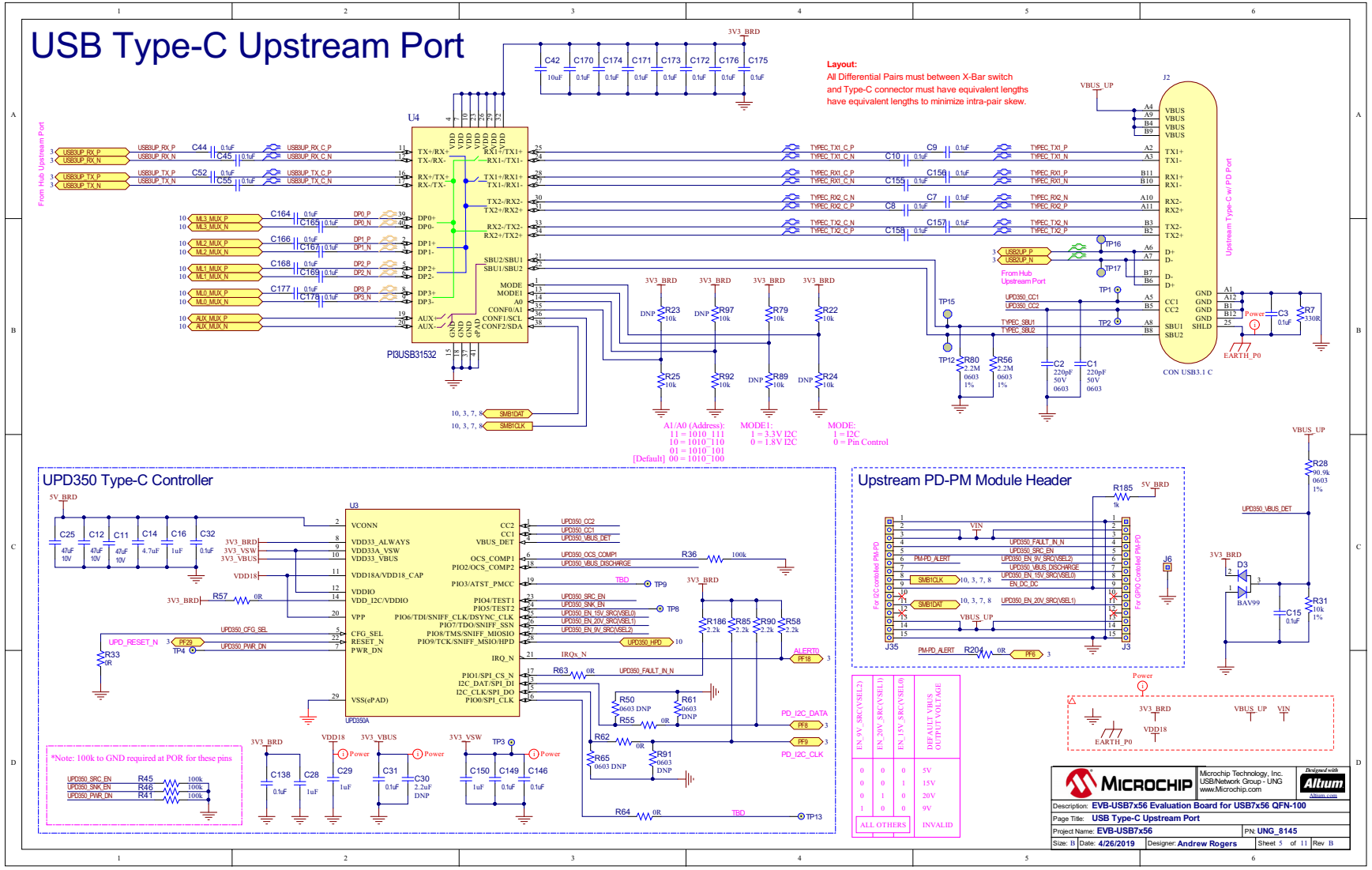


**FIGURE B-6: EVB-USB7056 USB3.1 (TYPE-C) DOWNSTREAM PORT 1**

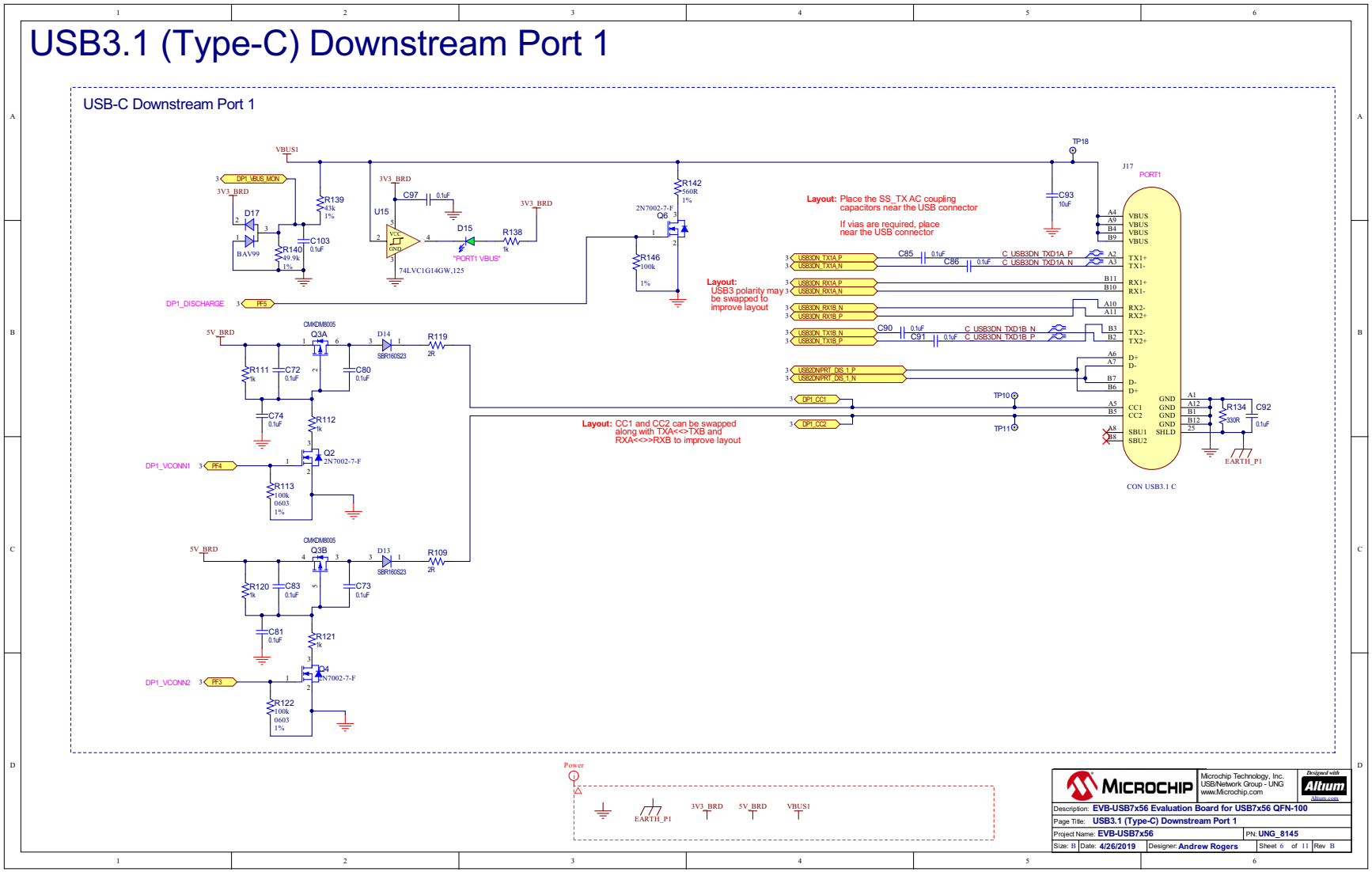


**FIGURE B-7: EVB-USB7056 USB3.1 (TYPE-A) DOWNSTREAM PORTS 2-4**

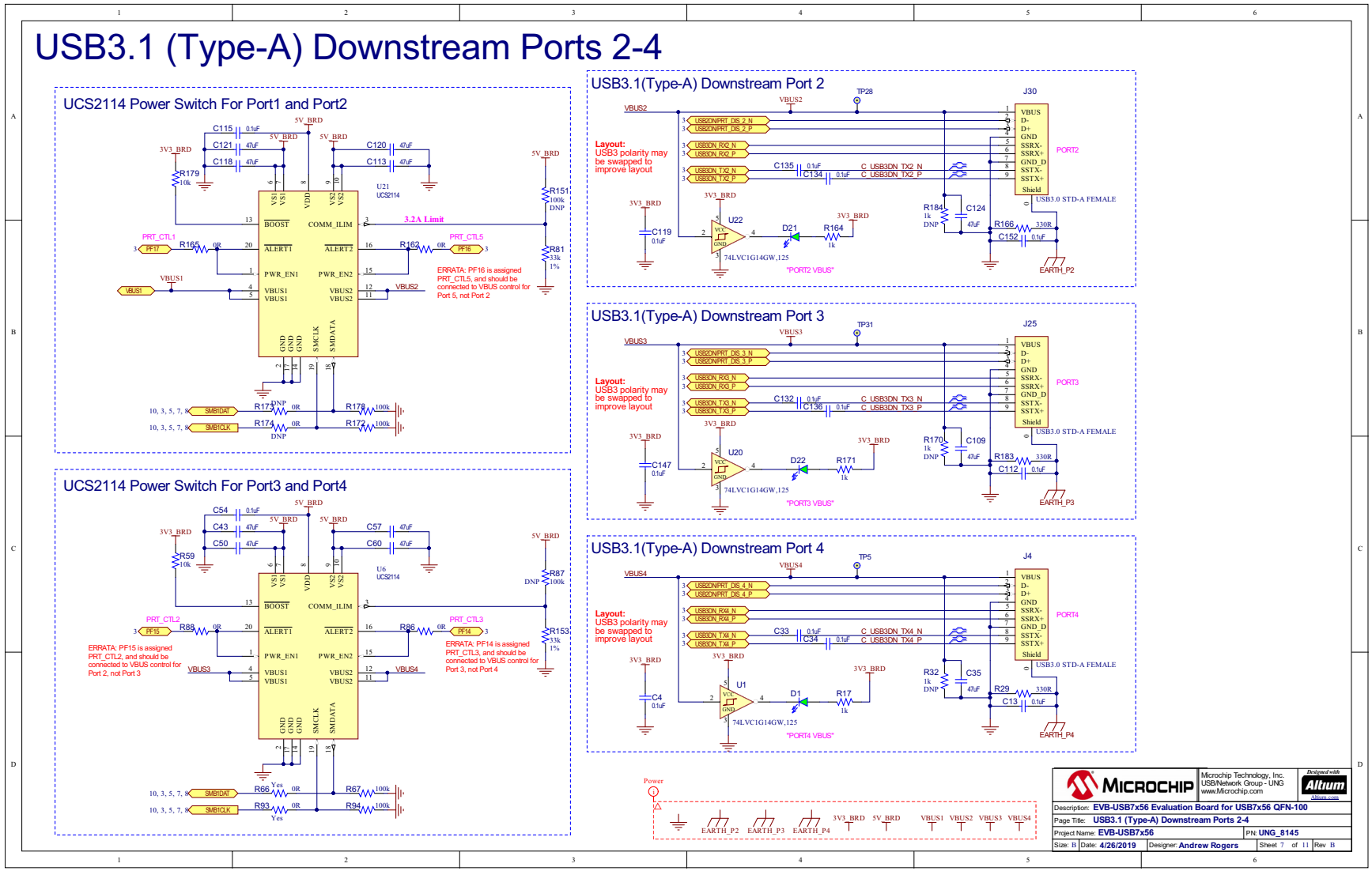


**FIGURE B-8: EVB-USB7056 USB2.0 (TYPE-A) DOWNSTREAM PORTS 5-6**

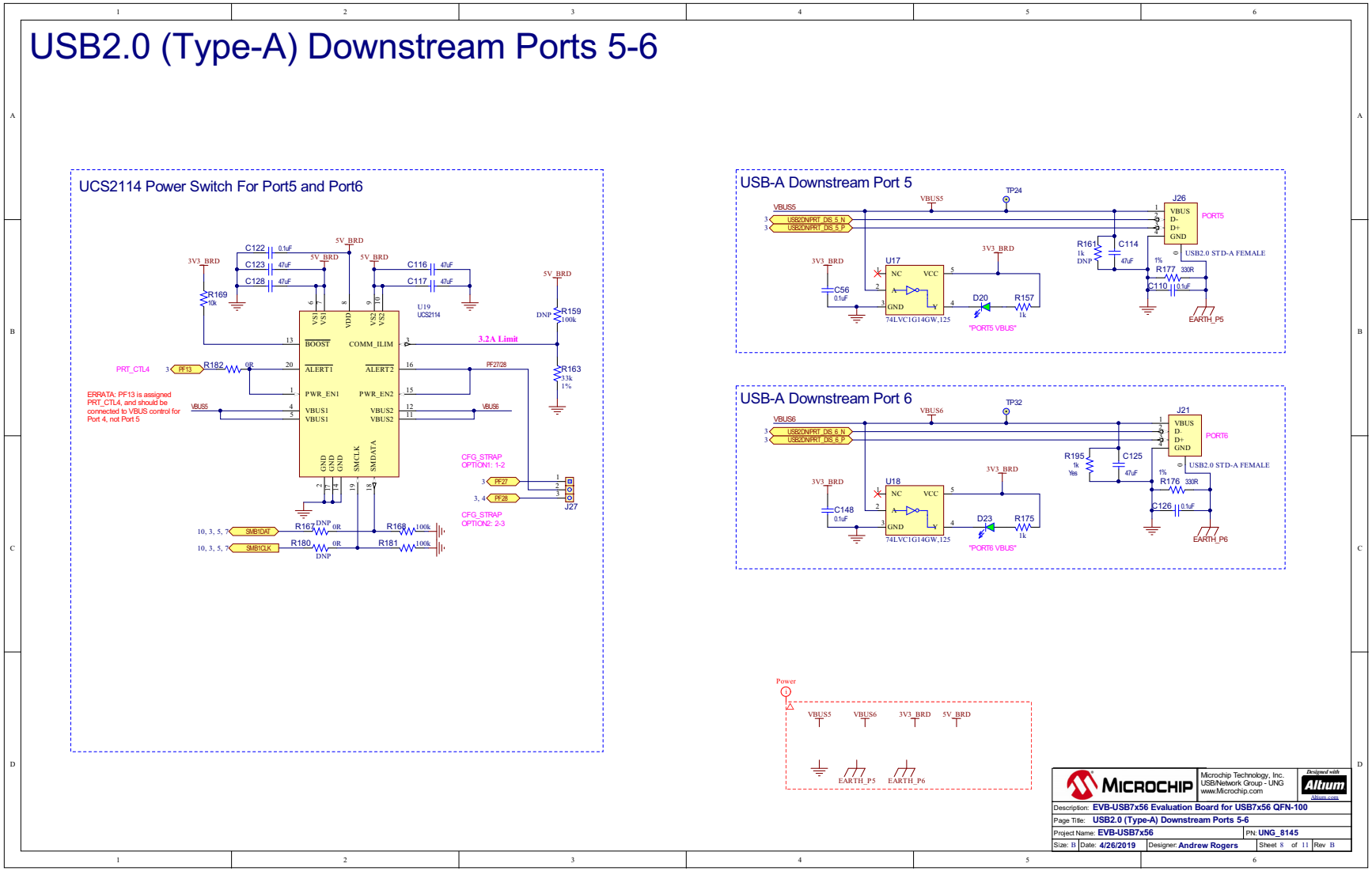


**FIGURE B-9: EVB-USB7056 VOLTAGE REGULATORS**

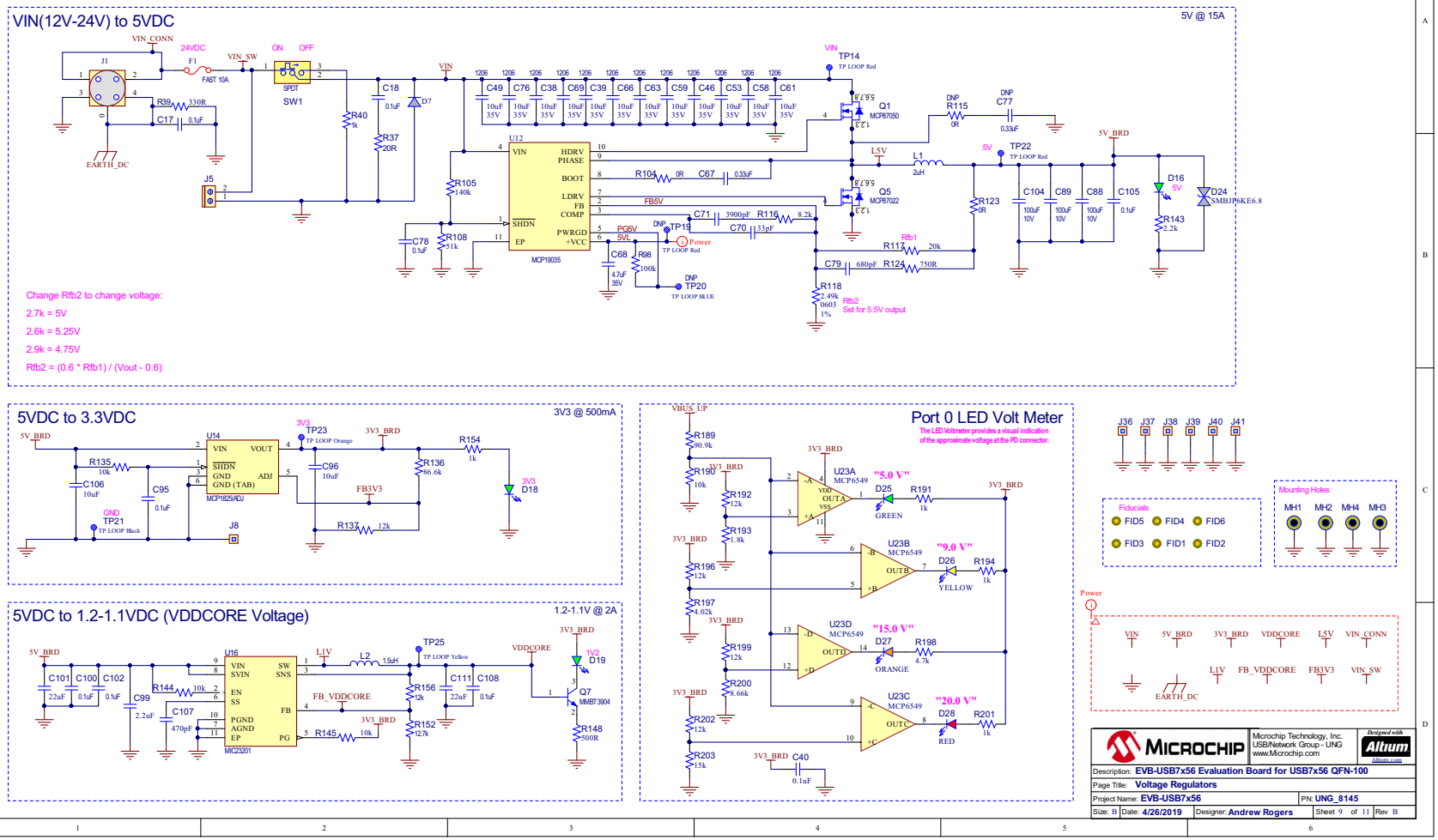
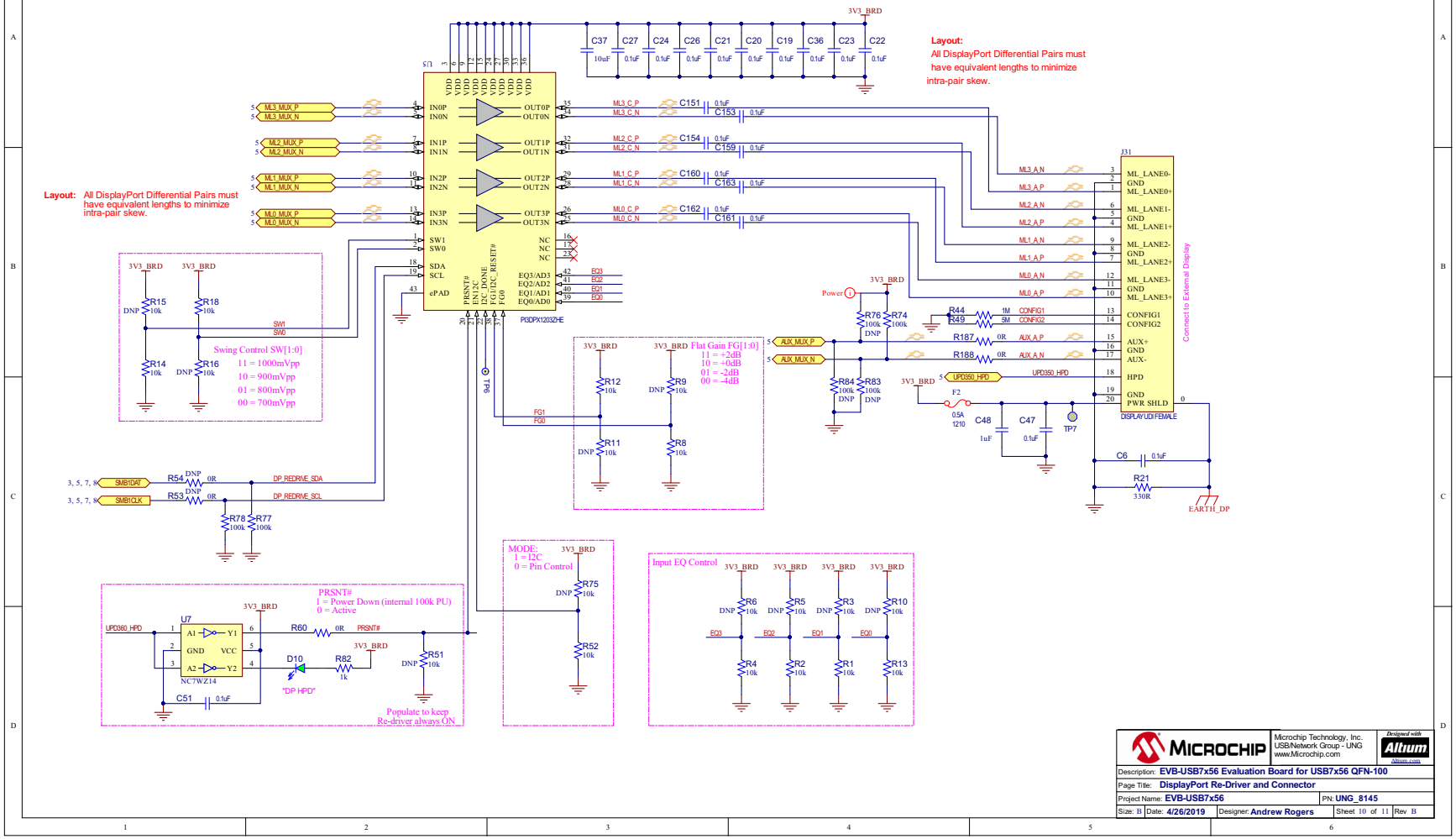


**FIGURE B-10: EVB-USB7056 DISPLAYPORT RE-DRIVER AND CONNECTOR**



**NOTES:**

# Appendix C. Bill of Materials

## C.1 INTRODUCTION

This appendix includes the EVB-USB7056 Evaluation Board Bill of Materials (BOM).

**TABLE C-1: EVB-USB7056 BILL OF MATERIALS**

| Item | Qty | Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|---|
| 1 | 2 | C1, C2 | CAP CER 220pF 50V 10% X7R SMD 0603 | TDK | C1608X7R1H221K |
| 2 | 118 | C3, C4, C5, C6, C7, C8, C9, C10, C13, C15, C17, C18, C19, C20, C21, C22, C23, C24, C26, C27, C31, C32, C33, C34, C36, C40, C44, C45, C47, C51, C52, C54, C55, C56, C62, C64, C65, C72, C73, C74, C75, C78, C80, C81, C82, C83, C84, C85, C86, C87, C90, C91, C92, C94, C95, C97, C98, C100, C102, C103, C105, C108, C110, C112, C115, C119, C122, C126, C127, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170, C171, C172, C173, C174, C175, C176, C177, C178 | CAP CER 0.1uF 35V 10% X7R SMD 0402 | TDK Corporation | CGA2B3X7R1V104K050BB |
| 3 | 20 | C11, C12, C25, C35, C43, C50, C57, C60, C109, C113, C114, C116, C117, C118, C120, C121, C123, C124, C125, C128 | CAP CER 47uF 10V 20% X5R SMD 0805 | TDK Corporation | C2012X5R1A476M125AC |
| 4 | 1 | C14 | CAP CER 4.7uF 16V 10% X5R SMD 0603 | TDK Corporation | C1608X5R1C475K080AC |
| 5 | 4 | C16, C28, C29, C150 | CAP CER 1uF 10V 10% X5R SMD 0402 | Murata Electronics North America | GRM155R61A105KE15D |
| 6 | 5 | C37, C42, C93, C96, C106 | CAP CER 10uF 16V 10% X5R SMD 0805 | Wurth Electronics Inc | 8.85E+11 |
| 7 | 12 | C38, C39, C46, C49, C53, C58, C59, C61, C63, C66, C69, C76 | CAP CER 10uF 35V 10% X5R SMD 1206 | Taiyo Yuden | GMK316BJ106KL-T |
| 8 | 1 | C48 | CAP CER 1uF 35V 10% X5R SMD 0402 | Murata Electronics North America | GRM155R6YA105KE11D |
| 9 | 1 | C67 | CAP CER 0.33uF 50V 10% X7R SMD 0805 | TDK Corporation | CGJ4J2X7R1H334K125AA |
| 10 | 1 | C68 | CAP CER 4.7uF 35V 10% X7R SMD 0805 | TDK Corporation | C2012X7R1V475K125AC |
| 11 | 1 | C70 | CAP CER 33pF 50V 5% NP0 SMD 0603 | Cal-Chip | GMC10CG330J50NTLF |
| 12 | 1 | C71 | CAP CER 3900pF 50V 5% C0G SMD 0603 | TDK | C1608C0G1H392J080AA |
| 13 | 1 | C79 | CAP CER 680pF 50V 5% NP0 SMD 0603 | Panasonic | ECJ-1VC1H681J |
| 14 | 3 | C88, C89, C104 | CAP CER 100uF 10V 20% X5R SMD 1210 | Murata Electronics North America | GRM32ER61A107ME20L |
| 15 | 1 | C99 | CAP CER 2.2uF 10V 10% X7R SMD 0603 | Murata | GRM188R71A225KE15D |
| 16 | 2 | C101, C111 | CAP CER 22uF 10V 10% X7R SMD 1206 | "Samsung Electro-Mechanics America, Inc" | CL31B226KPHNNNE |
| 17 | 1 | C107 | CAP CER 470pF 25V 5% NP0 SMD 0603 | AVX | 06033A471JAT2A |
| 18 | 16 | D1, D2, D4, D5, D6, D8, D9, D10, D15, D16, D18, D19, D20, D21, D22, D23 | DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603 | Lite-On Inc | LTST-C191KGKT |
| 19 | 1 | D3 | DIO RECTARR BAV99 1V 215mA 70V SOT-23-3 | Comchip Technology | BAV99-G |
| 20 | 1 | D7 | DIO RECT MMBD914-7-F 1.25V 200mA 75V SMD SOT-23-3 | Diodes Incorporated | MMBD914-7-F |
| 21 | 1 | D11 | DIO RED 2V 20mA 54mcd CLEAR SMD 0603 | Lite-On Inc. | LTST-C191KRKT |
| 22 | 1 | D12 | DIO LED BLUE 2.8V 20mA 15mcd Clear SMD 0603 | Lite-On | LTST-C193TBKT-5A |
| 23 | 2 | D13, D14 | DIO SBAR SBR160S23-7 SBR 530mV 900mA 60V SMD SOT23-3 | Diodes Incorporated | SBR160S23-7 |

**TABLE C-1: EVB-USB7056 BILL OF MATERIALS (CONTINUED)**

| Item | Qty | Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|---|
| 24 | 1 | D17 | DIO RECTARR BAV99 1.25V 200mA 70V SOT-23-3 | Fairchild | BAV99 |
| 25 | 1 | D24 | DIO TVS SMBJP6KE6.8CA 5.8V 600W DO-214AA_SMB | Micro Commercial Co | SMBJP6KE6.8CA-TP |
| 26 | 1 | D25 | DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603 | Lite-On | LTST-C190KGKT |
| 27 | 1 | D26 | DIO LED YELLOW 2.1V 20mA 6mcd Clear SMD 0603 | Lite-On | LTST-C190YKT |
| 28 | 1 | D27 | DIO LED ORANGE 2V 30mA 90mcd Clear SMD 0603 | Lite-On | LTST-C190KFKT |
| 29 | 1 | D28 | DIO LED RED 2V 30mA 2mcd Clear SMD 0603 | Lite-On | LTST-C190EKT |
| 30 | 1 | F1 | RES FUSE 10A 125VAC/VDC FAST SMD 2-SMD | Littelfuse Inc. | 0154010.DR |
| 31 | 1 | F2 | RES FUSE RESETTABLE 0.5A 13.2V Fast PTC SMD 1210 | Littelfuse Inc. | MICROSMD050F-2 |
| 32 | 1 | J1 | CON CIRCULAR DIN Female 4P TH R/A | CUI Inc. | PD-40S |
| 33 | 2 | J2, J17 | CON USB3.0 TYPE-C FEMALE SMD R/A | Advanced-Connectek Inc. | NBR25-AK5322 |
| 34 | 2 | J3, J35 | CON HDR-2.54 Female 1x15 Gold TH VERT | 3M | 929974-01-15-RK |
| 35 | 3 | J4, J25, J30 | CON USB3.0 STD-A FEMALE TH R/A | Wurth Electronics Inc | 6.92E+11 |
| 36 | 1 | J5 | CON TERMINAL 5.08mm 1X2 Female 16-30AWG 13.5A TH RA | TE Connectivity | 282836-2 |
| 37 | 7 | J6, J36, J37, J38, J39, J40, J41 | CON HDR-2.54 Male 1x1 Gold 5.84MH TH VERT | Samtec Inc. | TSW-101-07-S-S |
| 38 | 5 | J7, J13, J19, J20, J22 | CON HDR-2.54 Male 1x6 Tin 5.84MH TH VERT | Sullins | PEC06SAAN |
| 39 | 1 | J8 | CON HDR-2.54 Male 1x1 Gold 5.84MH TH VERT | TE Connectivity | 5-146280-1 |
| 40 | 1 | J9 | CON HDR-2.54 Male 2x6 Gold 5.84MH TH VERT | Samtec | TSW-106-07-G-D |
| 41 | 5 | J10, J12, J28, J29, J33 | CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT | FCI | 77311-118-02LF |
| 42 | 3 | J11, J23, J24 | CON HDR-2.54 Male 2x2 Gold 5.84MH TH VERT | Samtec | TSW-102-07-G-D |
| 43 | 2 | J14, J15 | CON HDR-2.54 Male 3x2 Gold 5.84MH TH VERT | Samtec Inc. | TSW-102-07-G-T |
| 44 | 3 | J16, J18, J27 | CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT | FCI | 68000-103HLF |
| 45 | 2 | J21, J26 | CON USB2.0 STD-A FEMALE TH R/A | TE Connectivity AMP Connectors | 292303-1 |
| 46 | 1 | J31 | CON DISPLAY UDI Female SMD R/A | Molex<br>Molex, LLC | 472720001 |
| 47 | 2 | J34 | SOCKET I2S HOST DIP 16 TH | 3M | 963108-2000-AR-PR |
| 48 | 1 | L1 | INDUCTOR 2uH 23A 20% SMD L12.8W12.8H6.2 | Wurth Electronics Inc. | 7443551200 |
| 49 | 1 | L2 | INDUCTOR 1.5uH 3A 20% SMD L5W5H2.2 | Murata Electronics North America | LQH5BPN1R5NT0L |
| 50 | 3 | Q2, Q4, Q6 | TRANS FET N-CH 2N7002-7-F 60V 170mA 370mW SOT-23-3 | Diodes Inc | 2N7002-7-F |
| 51 | 1 | Q1 | MCHP ANALOG MOSFET N-CH 25V 100A 0.006R MCP87050-U/MF PDFN-8 | Microchip | MCP87050T-U/MF |
| 52 | 1 | Q3 | TRANS FET DUAL P+P CMKDM8005 20V 650mA .360R 0.350W SOT-363 | Central Semiconductor Corp | CMKDM8005 TR |
| 53 | 1 | Q5 | MCHP ANALOG MOSFET N-CH 25V 100A 0.0026R MCP87022T-U/MF PDFN-8 | Microchip Technology | MCP87022T-U/MF |
| 54 | 1 | Q7 | TRANS BJT NPN MMBT3904 40V 200mA 310mW SOT-23-3 | Diodes Incorporated | MMBT3904-7 |

**TABLE C-1: EVB-USB7056 BILL OF MATERIALS (CONTINUED)**

| Item | Qty | Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|---|
| 55 | 29 | R1, R2, R4, R8, R12, R13, R14, R18, R22, R25, R31, R52, R59, R70, R71, R79, R92, R100, R127, R128, R129, R135, R149, R150, R155, R158, R160, R169, R179 | RES TKF 10k 1% 1/10W SMD 0603 | ROHM | MCR03EZPFX1002 |
| 56 | 9 | R7, R21, R29, R39, R134, R166, R176, R177, R183 | RES TKF 330R 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF3300V |
| 57 | 25 | R17, R19, R26, R34, R38, R40, R47, R48, R82, R96, R103, R111, R112, R120, R121, R138, R154, R157, R164, R171, R175, R191, R194, R195, R201 | RES TKF 1k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF1001V |
| 58 | 8 | R20, R27, R30, R35, R42, R43, R98, R114 | RES TF 100k 1% 1/8W SMD 0603 | Vishay | MCT06030C1003FP500 |
| 59 | 2 | R28, R189 | RES TKF 90.9k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF9092V |
| 60 | 22 | R33, R55, R57, R60, R62, R63, R64, R66, R86, R88, R93, R99, R104, R106, R123, R126, R162, R165, R182, R187, R188, R204 | RES TKF 0R 1/10W SMD 0603 | Panasonic | ERJ-3GSY0R00V |
| 61 | 19 | R36, R41, R45, R46, R67, R74, R77, R78, R94, R95, R101, R107, R113, R122, R146, R168, R172, R178, R181 | RES TKF 100k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF1003V |
| 62 | 1 | R37 | RES TKF 20R 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF20R0V |
| 63 | 1 | R44 | RES TKF 1M 5% 1/10W SMD 0603 | Panasonic | ERJ-3GEYJ105V |
| 64 | 1 | R49 | RES TKF 5M 1% 1/10W SMD 0603 | Ohmite | HVC0603T5004FET |
| 65 | 2 | R56, R80 | RES TKF 2.2M 1% 1/10W SMD 0603 | Panasonic Electronic Components | ERJ-3EKF2204V |
| 66 | 5 | R58, R85, R90, R143, R186 | RES TKF 2.2k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF2201V |
| 67 | 4 | R68, R69, R130, R131 | RES TKF 10R 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF10R0V |
| 68 | 6 | R72, R73, R132, R133, R141, R147 | RES TKF 200k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF2003V |
| 69 | 3 | R81, R153, R163 | RES TKF 33k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF3302V |
| 70 | 1 | R105 | RES TKF 140k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF1403V |
| 71 | 1 | R108 | RES TKF 51k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF5102V |
| 72 | 2 | R109, R119 | RES TKF 2R 1% 1/4W SMD 0603 | Vishay Dale | CRCW06032R00FKEAHP |
| 73 | 1 | R116 | RES TKF 8.2k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF8201V |
| 74 | 1 | R117 | RES TKF 20k 1% 1/10W SMD 0603 | Yageo | 9C06031A2002FKHFT |
| 75 | 1 | R118 | RES TKF 2.49k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF2491V |
| 76 | 1 | R124 | RES TKF 750R 1% 1/10W SMD 0603 | Vishay | CRCW0603750RFKEA |
| 77 | 6 | R125, R137, R192, R196, R199, R202 | RES TKF 12k 1% 1/10W SMD 0603 | Yageo | RC0603FR-0712KL |
| 78 | 1 | R136 | RES TKF 86.6k 1% 1/10W SMD 0603 | Panasonic Electronic Components | ERJ-3EKF8662V |
| 79 | 1 | R139 | RES TKF 43k 1% 1/10W SMD 0603 | Yageo | 9C06031A4302FKHFT |
| 80 | 1 | R140 | RES TKF 49.9k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF4992V |
| 81 | 1 | R142 | RES TKF 560R 1% 1/10W SMD 0603 | Yageo | RC0603FR-07560RL |
| 82 | 3 | R144, R145, R190 | RES TKF 10k 1% 1/10W SMD 0603 | Vishay | CRCW060310K0FKEA |
| 83 | 1 | R148 | RES TKF 500R 5% 1/10W SMD 0603 | Stackpole Electronics Inc | RMC 1/16 500 5% R |
| 84 | 1 | R152 | RES TF 12.7k 0.1% 1/10W SMD 0603 | Panasonic | ERA-3AEB1272V |

**TABLE C-1: EVB-USB7056 BILL OF MATERIALS (CONTINUED)**

| Item | Qty | Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|---|
| 85 | 1 | R156 | RES TKF 12k 1% 1/10W SMD 0603 | Stackpole Electronics Inc | RMCF0603FT12K0 |
| 86 | 1 | R185 | RES TF 1k 0.1% 1/10W SMD 0603 | Panasonic - ECG | ERA-3AEB102V |
| 87 | 1 | R193 | RES TKF 1.8k 1% 1/10W SMD 0603 | Panasonic | ERJ-3EKF1801V |
| 88 | 1 | R197 | RES TKF 4.02K 1% 1/10W SMD 0603 | Stackpole Electronics Inc | RMCF0603FT4K02 |
| 89 | 1 | R198 | RES TKF 4.7k 1% 1/10W SMD 0603 | ROHM | MCR03EZPFX4701 |
| 90 | 1 | R200 | RES TKF 8.66k 1% 1/10W SMD 0603 | Yageo | RC0603FR-078K66L |
| 91 | 1 | R203 | RES TKF 15k 1% 1/10W SMD 0603 | Stackpole Electronics Inc | RMCF0603FT15K0 |
| 92 | 1 | SW1 | SWITCH SLIDE SPDT 120V 6A 1101M2S3CQE2 TH | C&K Components | 1101M2S3CQE2 |
| 93 | 1 | SW2 | SWITCH TACT SPST 16V 50mA PTS810 SJM 250 SMTR LFS SMD | C&K Components | PTS810 SJM 250 SMTR LFS |
| 94 | 8 | U1, U8, U11, U15, U17, U18, U20, U22 | “74LVC1G14GW,125 SCHMITT-TRG INVERTER” | NXP | “74LVC1G14GW,125” |
| 95 | 1 | U2 | “IC BUFFER 74LVC14AD,118 SOIC-14” | Nexperia USA Inc. | “74LVC14AD,118” |
| 96 | 1 | U3 | MCHP INTERFACE USB3.1 PORT CONTROLLER UPD350A QFN-28 | Microchip Technology | UPD350A |
| 97 | 1 | U4 | IC INTERFACE PI3USB31532 USB3.1 CROSSBAR SWITCH TQFN-40 | Pericom | PI3USB31532ZLEX |
| 98 | 1 | U5 | IC INTERFACE PI3DPX1203ZHE Redriver DISPLAYPORT TQFN-42 | Pericom | PI3DPX1203ZHE |
| 99 | 3 | U6, U19, U21 | MCHP INTERFACE USB Power Controller UCS2114 QFN-20 | Microchip | UCS2114-1-V/LX |
| 100 | 1 | U7 | IC INVERTER UHS DUAL SCHM SC70-6 | Fairchild Semiconductor | NC7WZ14P6 |
| 101 | 1 | U9 | MCHP ANALOG SUPERVISOR 2.93V MIC803-29D4VM3-TR SOT-23-3 | Microchip Technology | MIC803-29D4VM3-TR |
| 102 | 1 | U10 | MCHP MEMORY SERIAL FLASH 16M 104MHz SST26VF016B-104I/SM SOIJ-8 | Microchip Technology | SST26VF016B-104I/SM |
| 103 | 1 | U12 | MCHP ANALOG PWM CONTROLLER 600kHz MCP19035-BAABE/MF DFN-10 | Microchip | MCP19035-BAABE/MF |
| 104 | 1 | U13 | MCHP INTERFACE USB 3.1 TYPE-C HUB CTLR QFN-100 | Microchip Technology | USX7056/KDX. |
| 105 | 1 | U14 | MCHP ANALOG LDO ADJ MCP1825T-ADJE/DC SOT-223-5 | Microchip | MCP1825T-ADJE/DC |
| 106 | 1 | U16 | MCHP ANALOG SWITCHER Buck 0.95V to 3.6V 2A MIC23201YML-TR MLF-10 | Microchip Technology | MIC23201YML-TR |
| 107 | 1 | U23 | MCHP ANALOG COMPARATOR 4-CH MCP6549-I/ST TSSOP-14 | Microchip Technology | MCP6549-I/ST |
| 108 | 1 | Y1 | MCHP CLOCK OSCILLATOR SINGLE 25MHZ DSC1001-CI2-025.0000T CDFN-4 | Microchip Technology | DSC1001CI2-025.0000T |

**NOTES:**

# Appendix D. Silk Screens

## D.1 INTRODUCTION

This appendix shows the EVB-USB7056 top and bottom silk screen and copper layer images.

**FIGURE D-1: TOP-LEVEL SILK SCREEN AND COPPER LAYERS**

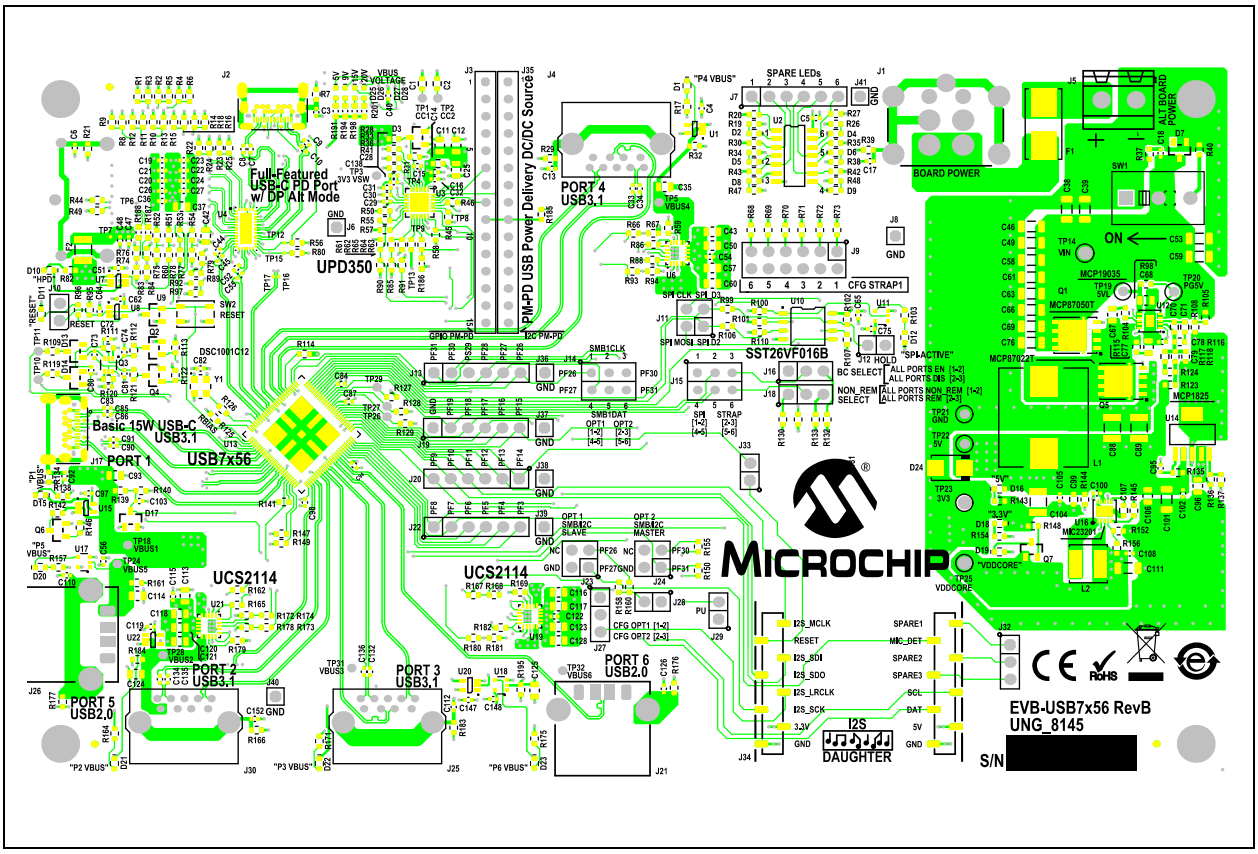
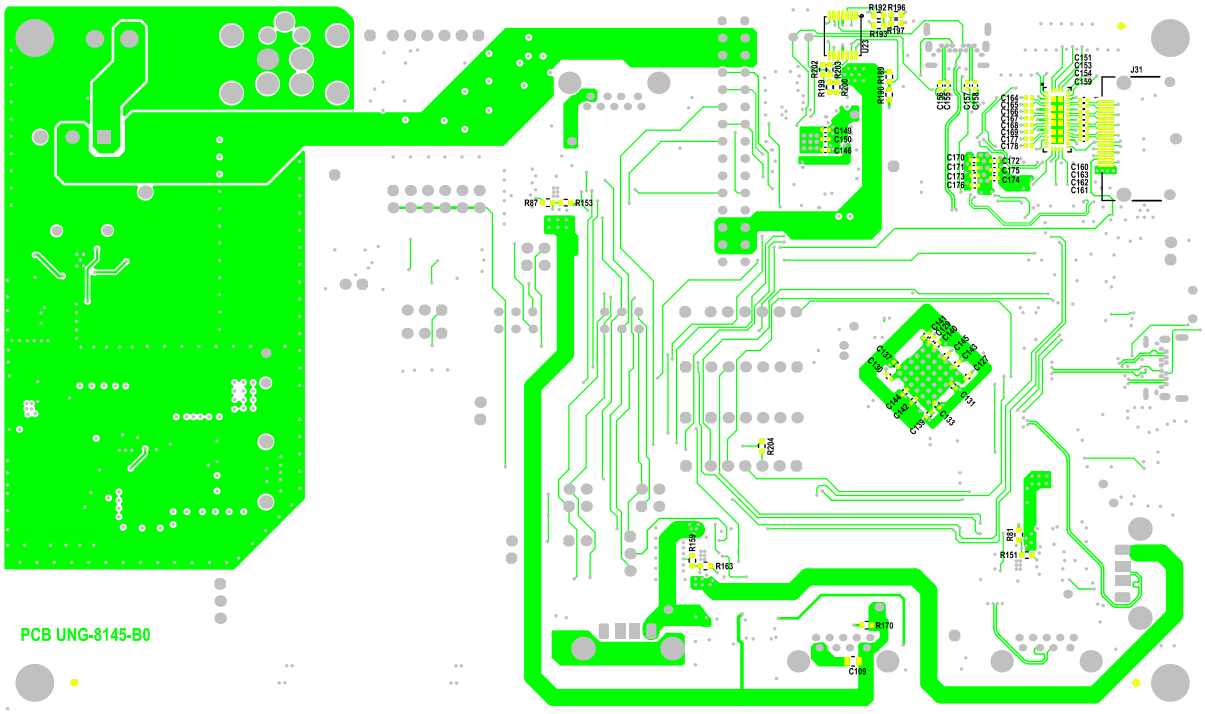


**FIGURE D-2: BOTTOM-LEVEL SILK SCREEN AND COPPER LAYERS**



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