User's Guide
TUSB1142 EVM User's Guide

TEXAS INSTRUMENTS

ABSTRACT

The TUSB1142 is a 10 Gbps USB 3.2 linear redriver with 1:2 DeMUX or 2:1 Mux function for USB Type-C™ applications. The TUSB1142 is intended to reside between a USB Type-A Host and a USB Type-C receptacle or between a USB device and a USB Type-C receptacle. This document describes how to use and configure the TUSB1142EVM along with recommendations for system hardware implementation. These recommendations are only guidelines and it is the designer's responsibility to consider all system characteristics and requirements. Engineers should refer to the data sheet for technical details such as device operation, terminal description, and so forth.

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1 Overview

1.1 What is the TUSB1142 EVM?

The TUSB1142EVM is a PCB created to help for customers to evaluate the TUSB1142. The EVM has a USB Type-B receptacle and a USB Type-C receptacle. The user of the EVM can insert a USB 3 Micro-B cable to the TUSB1142EVM board then connect to a USB 3 Gen 1/2 motherboard or system with a USB Type-A receptacle. The user can insert a USB device directly or thru a USB Type-C cable into the receptacle side of the EVM board.

1.2 What is Included in the TUSB1142 EVM?

The major components of the EVM are as follows:

• TUSB1142 device
• USB Micro-B receptacle connector
• USB Type-C receptacle connector
• Headers for configuring various TUSB1142 features

1.3 What Does the EVM Look Like?
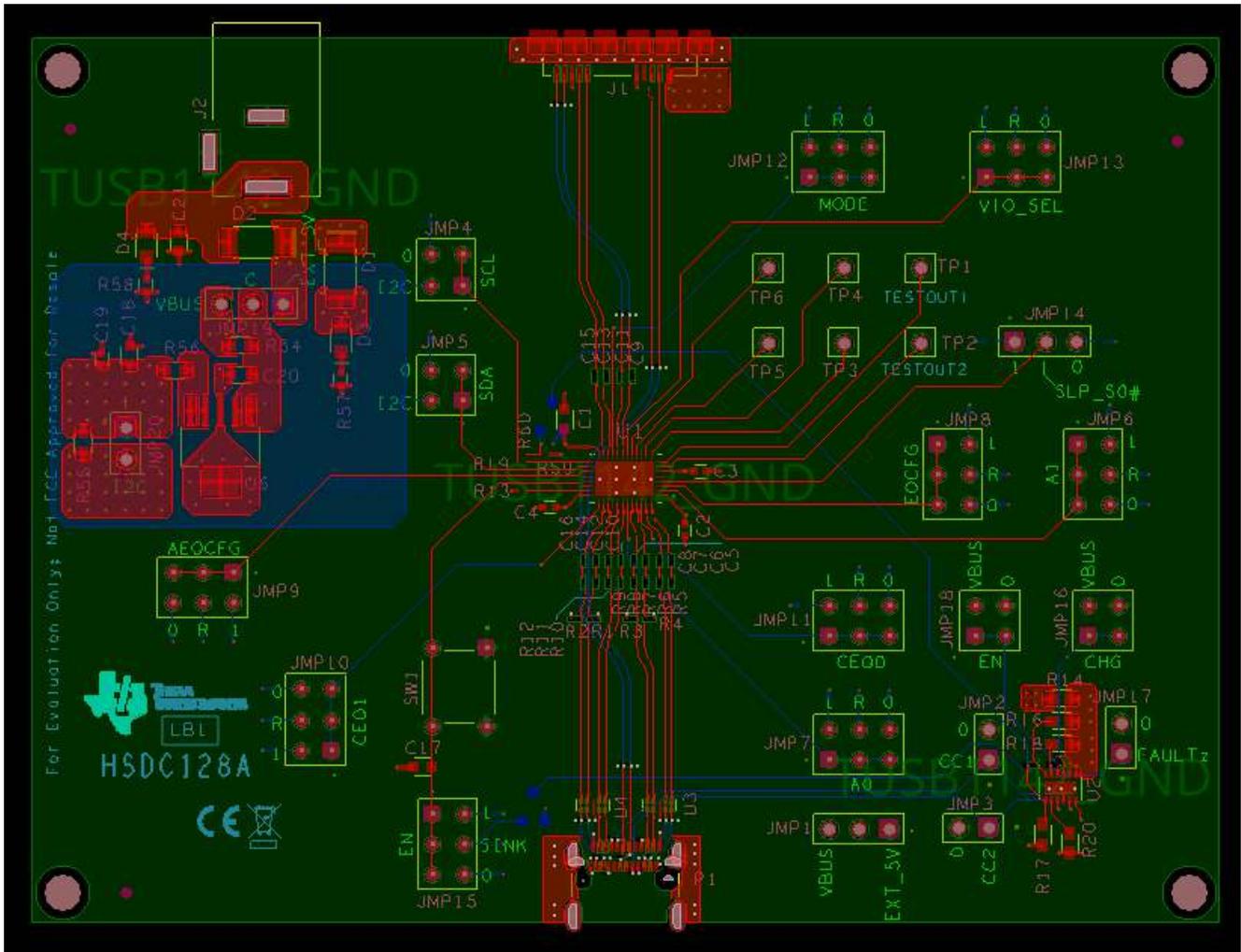
Figure 1-1. EVM Board

2 Hardware Configuration

2.1 Power

The EVM board can be powered from either the Micro-B receptacle (J1) VBUS or from an external power supply through the barrel jack (J2). The EVM defaults to being powered from the Micro-B receptacle VBUS.

If powering EVM from barrel jack, make sure R54 is unpopulated. Once removed, a jumper will need to be placed across JMP19 pins 1 and 2.

The USB Type-C receptacle VBUS uses TPS25820 as the VBUS power switch needed for USB Type-C systems. Power is sourced from the Micro-B receptacle VBUS by default. JMP1 can be used to change the power source at the USB Type-C receptacle VBUS pins.

If powering USB Type-C VBUS from barrel jack or other source, make sure R14 is unpopulated. Once removed, a jumper will need to be placed across JMP1 pins 1 and 2 to use power form the barrel jack. If a different external power source is used, connect the source directly to JMP 1 pin 2.

Note

Limit VBUS voltage and voltage from barrel jack to no more than 6 V.

2.2 Configuration Jumpers

Multiple jumpers are provided on the EVM for configuration of TUSB1142 and also for probe points.

The following is a list of 4-level jumpers which are used to configure the TUSB1142: JMP6, JMP7, JMP8, JMP9, JMP10, JMP11, JMP12, and JMP13. The jumper position to select between the different levels is detailed in 4-level Configuration Jumper Settings Table.

Note

4-level pins are sampled on rising edge of EN pin. Therefore, a change in any 4-level pin state will not be applied until after EN pin is toggled from low to high.

Table 2-1. 4-Level Configuration Jumper Settings

Jumper Position	4-level State
Short 5 to 6	0
Short 3 to 4	R
Open	F
Short 1 to 2	1

Table 2-2. Jumpers

Jumper	Default Position	Description
JMP2	Open	CC1. Pin 1 is probe point for CC1
JMP3	Open	CC2. Pin 1 is probe point for CC2
JMP4	Short 3 to 4	FLIP/SCL. If TUSB1142 is configured for I2C mode (MODE pin (JMP13)) is floating, then jumper is clock for local I2C. Ensure R19 is populated. If TUSB1142 is configured for pin-strap mode, then this jumper controls the internal 2:1 mux. • By default this pin is controleld be U2 based on the CC pin configuration. If manual control is desired, ensure that R19 is populated : • Short 1 to 2: CRX1 -> SSRX and SSTX -> CTX1. • Short 3 to 4: CRX2 -> SSRX and SSTX -> CTX2

Table 2-2. Jumpers (continued)

Jumper	Default Position	Description
JMP5	Short 1 to 2	AEQENZ/SDA. If TUSB1142 is configured for I2C mode (MODE pin (JMP13)) is floating, then jumper is data for local I2C. If TUSB1142 is configured for pin-strap mode, then jumper selects whether AEQ is enabled or not. • Short 1 to 2: AEQ disabled. • Short 3 to 4: AEQ enabled.
JMP6	Open	SSEQ1/A1. If TUSB1142 is configured for I2C mode (MODE pin (JMP13)) is floating, then this jumper along with JMP6 will select the 7-bit I2C target address. Refer to TUSB1142 data sheet for details on available I2C target address options. If TUSB1142 is configured for pin-strap mode, then this jumper along with JMP6 selects EQ settings for SSTX receivers. Refer to TUSB1142 data sheet for details on EQ settings.
JMP7	Open	SSEQ0/A0. If TUSB1142 is configured for I2C mode (MODE pin (JMP13)) is floating, then this jumper along with JMP5 will select the 7-bit I2C target address. Refer to TUSB1142 data sheet for details on available I2C target address options. If TUSB1142 is configured for pin-strap mode, then this jumper along with JMP5 selects EQ settings for SSTX receivers. Refer to TUSB1142 data sheet for details on EQ settings.
JMP8	Open	EQCFG. If TUSB1142 is configured for I2C mode (MODE pin (JMP13)) is floating, then this jumper must be left floating for normal operation. If TUSB1142 is configured for pin-strap mode, then this jumper will select EQ options for SSTX receiver and CRX receivers. Refer to TUSB1142 data sheet for details.
JMP9	Open	AEQCFG. Selects upper limit for AEQ. Refer to TUSB1142 data sheet for details.
JMP10	Open	CEQ1. If TUSB1142 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to TUSB1142 data sheet for details on EQ settings.
JMP11	Open	CEQ0. If TUSB1142 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to TUSB1142 data sheet for details on EQ settings.
JMP12	Short 1 to 2	MODE. Selects between pin-strap and I2C mode. The default is pin-strap mode. • Short 1 to 2: Pin-strap mode • Open: I2C mode.
JMP13	Open	VIO_SEL. Selects whether local I2C interface is at 1.8 V or 3.3 V signalling levels. The default is 3.3 V. Short pins 1 and 2 to select 1.8 V.
JMP14	Open	SLP_S0#.
JMP15	Short 3 to 4	EN. The EN will enable or disable the TUSB1142. By default this jumper is configured for confrim from U2
JMP16	Open	TPS25820 CHG pin. Used to select between standard USB or 1.5-A Type-C current sourcing ability.
JMP17	Open	TPS25820 Faultz pin. Used to montior fualt condition on USB Type-C receptacle VBUS.
JMP18	Open	TPS25820 EN pin. Logic input to turn TPS25820 (U2) device on and off
JMP19	Open	Power for TUSB1142. Selects whether TUSB1142 is powered from VBUS or 5 V barrel jack. The default is power from USB VBUS. Shorting between position 1 and 2 will select the 5 V barrel jack.
JMP20	Open	The local I2C voltage pull-up option. The default is local I2C pull-ups are connected to TUSB1142's 3.3 V VCC supply. Removing R47 allows for feeding external DC supply for local I2C.

2.3 CEQ Configuration

There are sixteen EQ settings with 0 being the lowest and Fh being the highest.

Table 2-3. USB Connector Facing Port Receiver (CRX1 and CRX2 pins) Equalization Control

Register(s): CEQ1_SEL or CEQ2_SEL Equalization Setting #	CEQ1 PIN Level	CEQ0 PIN Level	EQ Gain at 5 GHz minus Gain at 100 MHz (dB)
0	0	0	Lowest EQ setting.
1	0	R	
2	0	F	
3	0	1	
4	R	0	
5	R	R	
6	R	F	
7	R	1	
8	F	0	
9	F	R	
10	F	F	
11	F	1	
12	1	0	
13	1	R	
14	1	F	
15	1	1	Highest EQ setting

2.4 SSEQ Configuration

There are sixteen EQ settings with 0 being the lowest and Fh being the highest.

Table 2-4. USB Host Facing Port Receiver (SSTX1 and SSTX2 pins) Equalization Control

Register(s): SSEQ1_SEL or SSEQ2_SEL Equalization Setting #	SSEQ1 PIN LEVEL	SSEQ0 PIN LEVEL	EQ Gain at 5 GHz minus Gain at 100 MHz (dB)
0	0	0	Lowest Setting
1	0	R	
2	0	F	
3	0	1	
4	R	0	
5	R	R	
6	R	F	
7	R	1	
8	F	0	
9	F	R	
10	F	F	
11	F	1	
12	1	0	
13	1	R	
14	1	F	
15	1	1	Highest Setting

2.5 Local I2C Access

Access to TUSB1142's local I2C signals is provided through the JMP4 and JMP5 connectors. The TUSB1142 supports either 1.8 V and 3.3 V LVCMOS levels. The TUSB1142 VIO_SEL pin (JMP13) is used to select which voltage level is used. It is important that the I2C signalling levels meet the TUSB1142 LVCMOS levels when I2C interface is accessed through the connector.

When the MODE pin (JMP12) is floating, TUSB1142 will be enabled for I2C mode. The TUSB1142 I2C target address is determined by sampled state of SSEQ0/A0 (JMP7) and SSEQ1/A1 (JMP6).

A standalone external I2C host can be connected for debug and control purposes. An example of an external I2C Host controller is the Total Phase Aardvark I2C/SPI Host Adapter (Total Phase Part#: TP240141).

Table 2-5. TUSB1142 I²C Target Address

SSEQ1/A1 PIN LEVEL	SSEQ0/A0 PIN LEVEL	7-bit Address	Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (W/R)
0	0	44h	1	0	0	0	1	0	0	0/1
0	R	45h	1	0	0	0	1	0	1	0/1
0	F	46h	1	0	0	0	1	1	0	0/1
0	1	47h	1	0	0	0	1	1	1	0/1
R	0	20h	0	1	0	0	0	0	0	0/1
R	R	21h	0	1	0	0	0	0	1	0/1
R	F	22h	0	1	0	0	0	1	0	0/1
R	1	23h	0	1	0	0	0	1	1	0/1
F	0	10h	0	0	1	0	0	0	0	0/1
F	R	11h	0	0	1	0	0	0	1	0/1
F	F	12h	0	0	1	0	0	1	0	0/1
F	1	13h	0	0	1	0	0	1	1	0/1
1	0	Ch	0	0	0	1	1	0	0	0/1
1	R	Dh	0	0	0	1	1	0	1	0/1
1	F	Eh	0	0	0	1	1	1	0	0/1
1	1	Fh	0	0	0	1	1	1	1	0/1

3 Quick Start Guide

The following instructions assume the EVM is configured for pin-strap mode and is powered from the VBUS.

1. Insert Micro-B USB cable into the Micro-B receptacle (J1) and connect the Type-A receptacle of the motherboard to the EVM through the same cable.
2. Insert a USB-C cable or USB device into the USB-C receptable side of the EVM.
3. The USB device should enumerate. If USB device does not enumerate, check to ensure the FLIP pin (JMP4) is set based on the CC pin orientation.

The instructions below assume the EVM is configured for I2C mode and is powered from the barrel jack.

1. Insertion +5 V DC Power source into barrel jack (J1).
2. Configure TUSB1142 through the I2C interface, JMP4, and JMP5.
3. Insert the Micro-B USB cable into the Micro-B receptacle (J1) and connect the Type-A receptacle of the motherboard to the EVM through the same cable.

Note

For I2C operation, ensure that R19 is populated.

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4. Insert a USB-C cable or USB device into the USB-C receptable side of the EVM.
5. The USB device should enumerate. If the USB device does not enumerate, check to ensure the FLIP pin (JMP4) is set based on the CC pin orientation.

4 Schematics
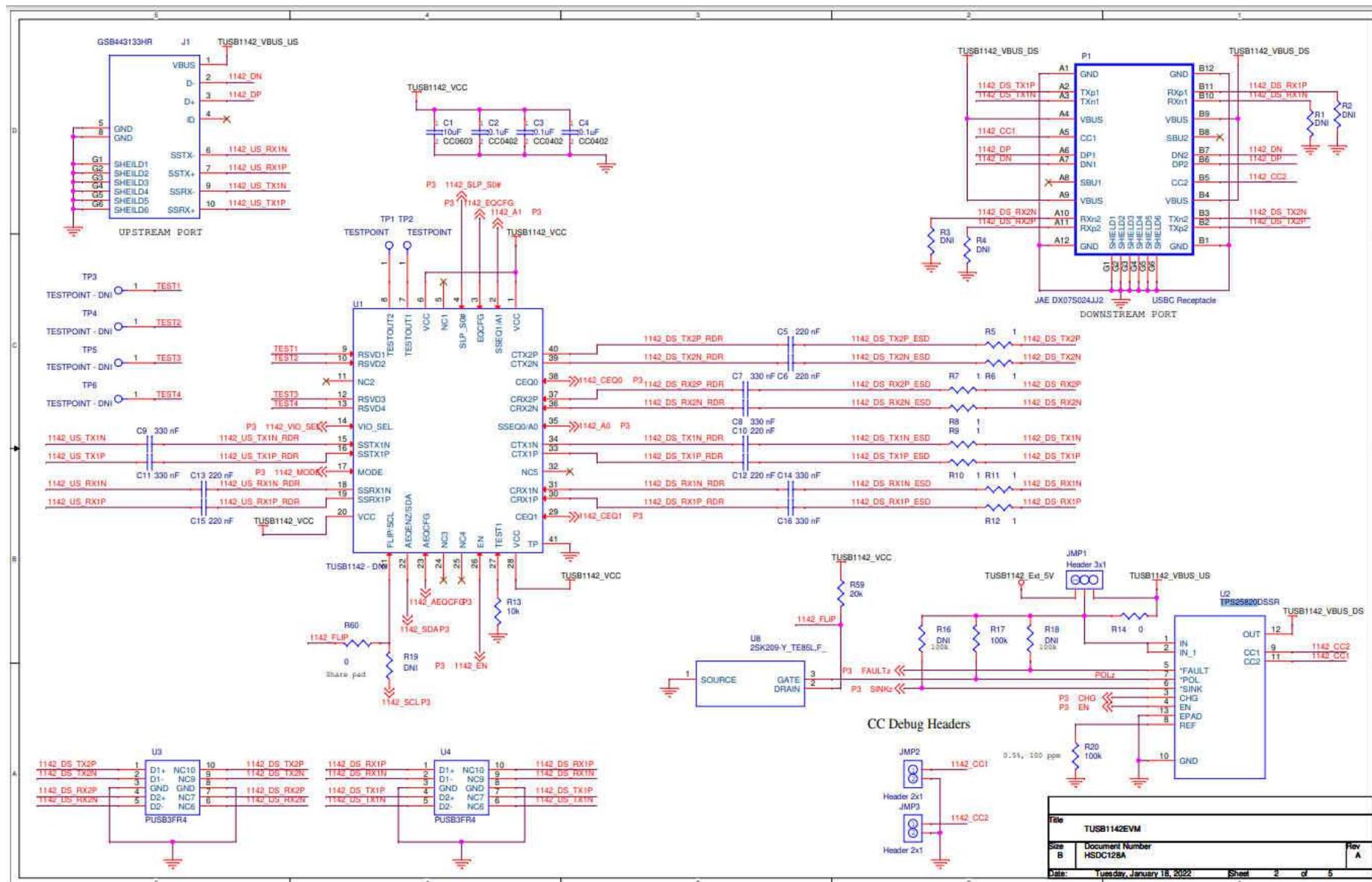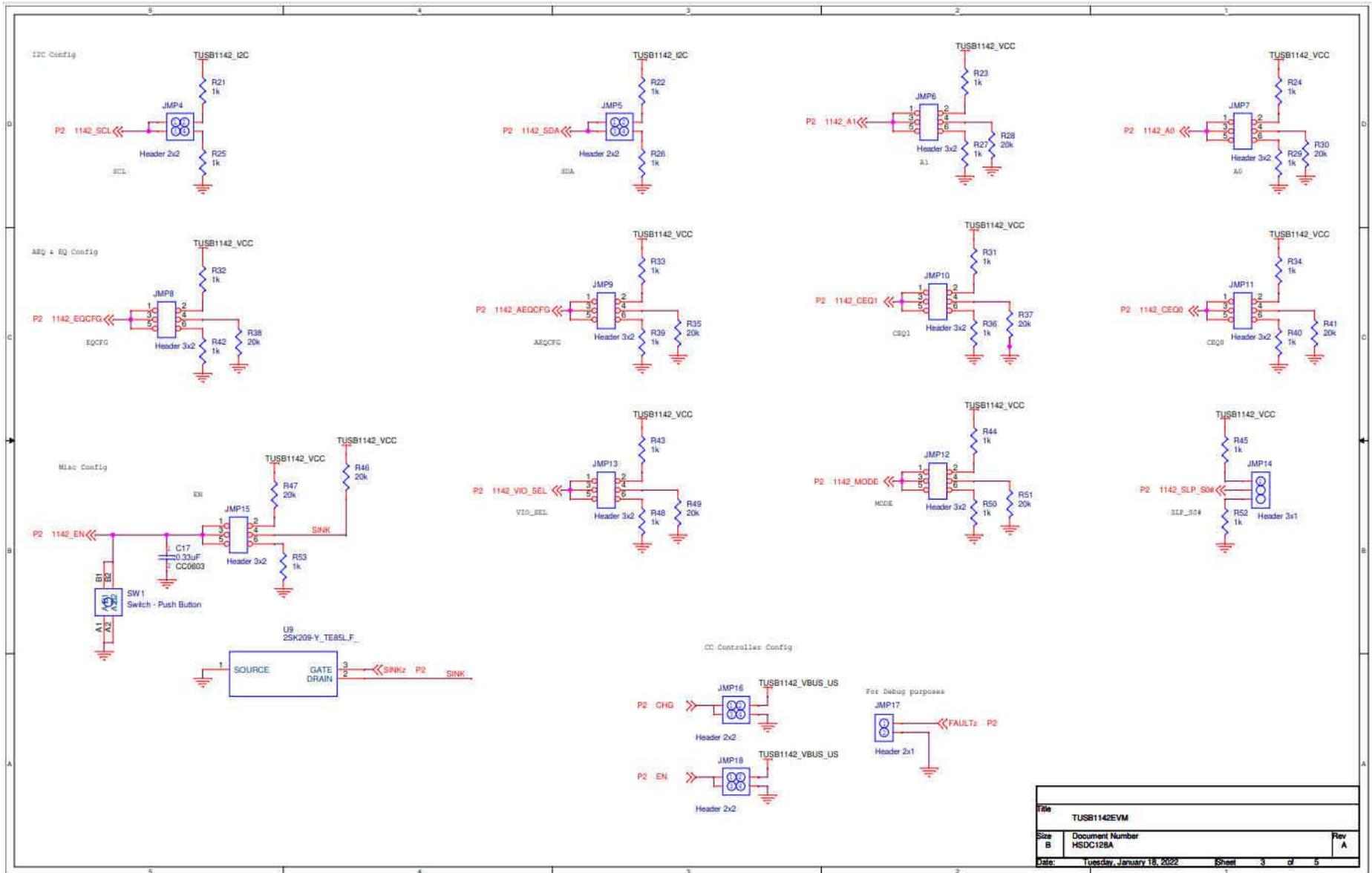
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3.3V REGULATOR

External 5V IN

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4.8V – 5.2V / 2.5A Max INPUT

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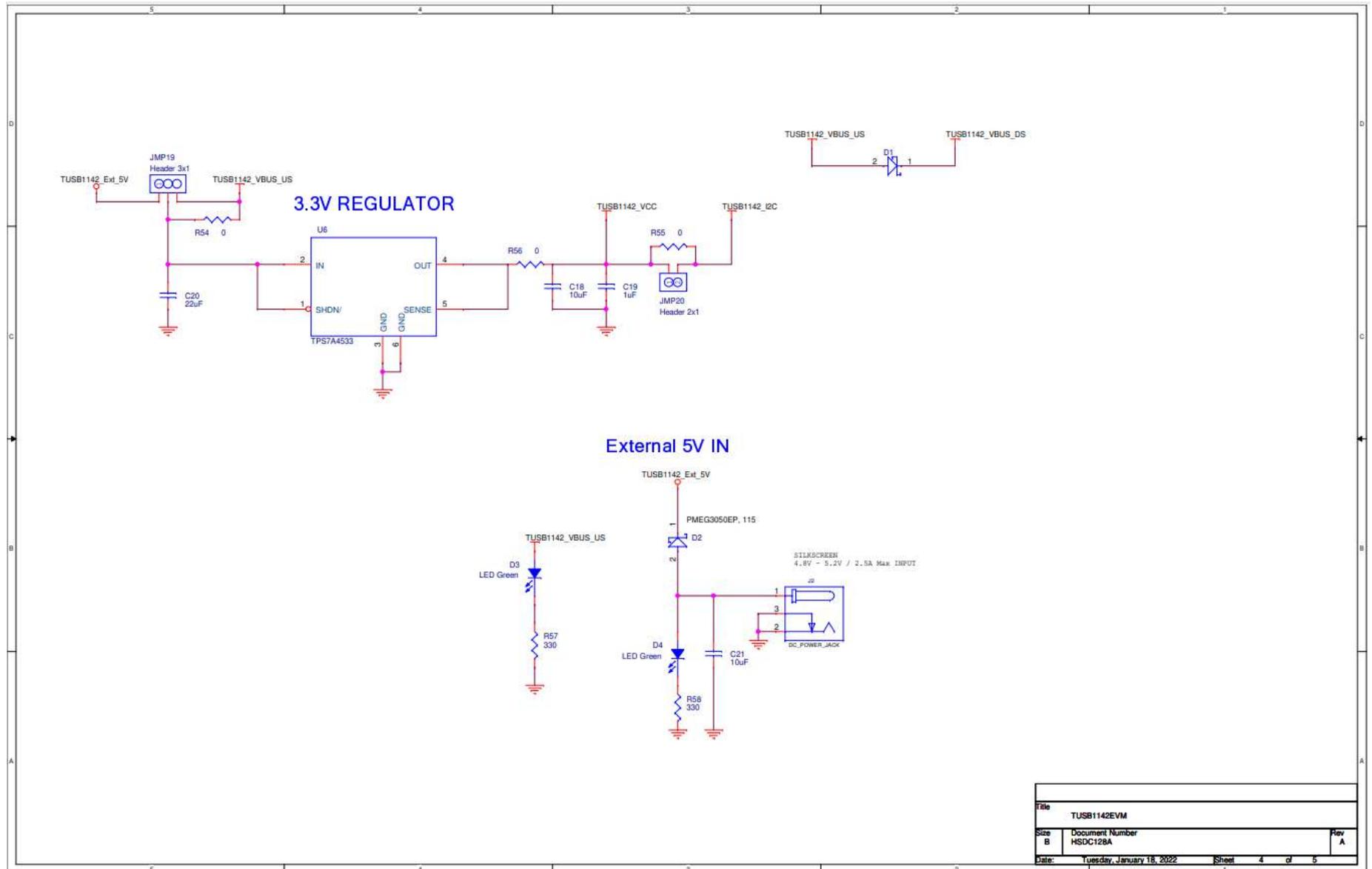
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