User's Guide

TUSB1104 EVM User's Guide

ABSTRACT

The TUSB1104 is a 10 Gbps USB 3.2 x2 linear redriver for USB Type-C™ applications enabling up to 20 Gbps total data throughput. The TUSB1104 is intended to reside between 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 TUSB1104EVM 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 datasheet for technical details such as device operation, terminal description, etc.

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1 Overview

1.1 What is the TUSB1104 EVM?

The TUSB1104EVM is a PCB created to help for customers to evaluate the TUSB1104. The EVM has a USB Type-C plug and a USB Type-C receptacle. The user of the EVM can insert plug side of the TUSB1104 EVM board into a USB Type-C enabled motherboard or system. The user can insert a USB device directly or through a USB Type-C cable into the receptacle side of the EVM board.

1.2 What is included in the TUSB1104 EVM?

The major components of the EVM are as below:

- TUSB1104 device
- USB Type-C plug connector
- USB Type-C receptacle connector
- Headers for configurating various TUSB1104 features

1.3 What does the EVM look like?

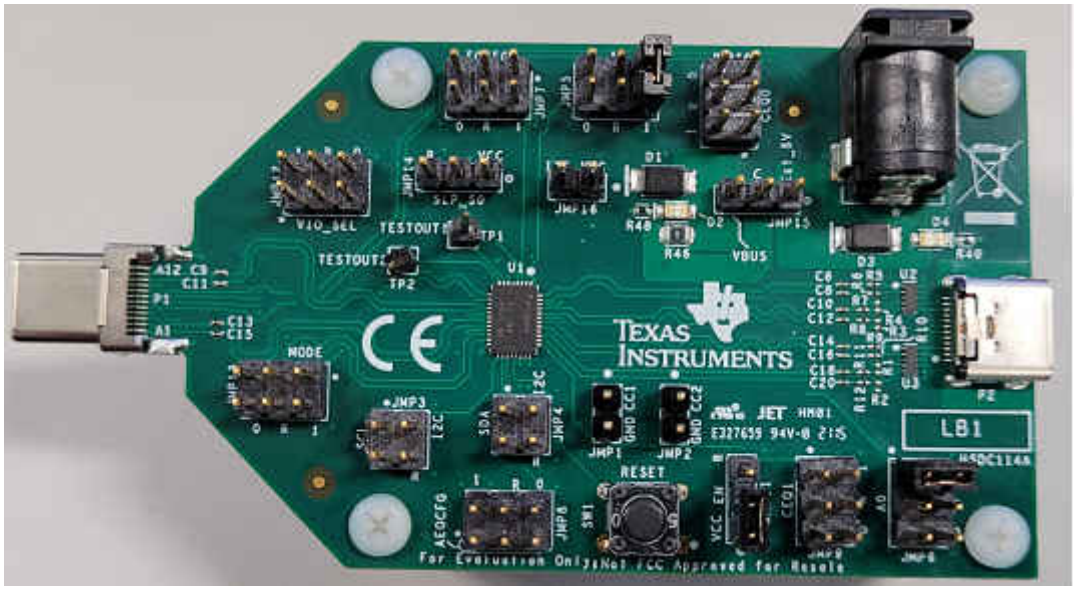

Figure 1-1. EVM Board

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2 Hardware Configuration

2.1 Power

The EVM board can be powered from either VBUS or from an external power supply via the barrel jack (J1). The EVM defaults to being powered from VBUS via a zero ohm resistor (R46).

If powering EVM from barrel jack, make sure R46 is unpopulated. Once removed, a jumper will need to be placed across JMP15 pins 1 and 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 TUSB1104 and also for probe points.

Following is a list of 4-level jumpers which are used to configure the TUSB1104: JMP5, JMP6, JMP7, JMP8, JMP9, JMP10, 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
JMP1	Open	CC1. Pin 1 is probe point for CC1
JMP2	Open	CC2. Pin 1 is probe point for CC2
JMP3	Short 3 to 4	FLIP/SCL. If TUSB1104 is configured for I2C mode (MODE pin (JMP13)) is floating, then jumper is clock for local I2C. If TUSB1104 is configured for pin-strap mode, then this jumper selects which lane is the config lane. • Short 1 to 2: CRX2->SSRX2 and SSTX2->CTX2 is config lane. • Short 3 to 4: CRX1->SSRX1 and SSTX1->CTX1 is config lane.
JMP4	Short 1 to 2	AEQENZ/SDA. If TUSB1104 is configured for I2C mode (MODE pin (JMP13)) is floating, then jumper is data for local I2C. If TUSB1104 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.
JMP5	Open	SSEQ1/A1. If TUSB1104 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 TUSB1104 datasheet for details on available I2C target address options. If TUSB1104 is configured for pin-strap mode, then this jumper along with JMP6 selects EQ settings for SSTX receivers. Refer to TUSB1104 datasheet for details on EQ settings.

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Table 2-2. Jumpers (continued)

Jumper	Default Position	Description
JMP6	Open	SSEQ0/A0. If TUSB1104 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 TUSB1104 datasheet for details on available I2C target address options. If TUSB1104 is configured for pin-strap mode, then this jumper along with JMP5 selects EQ settings for SSTX receivers. Refer to TUSB1104 datasheet for details on EQ settings.
JMP7	Open	EQCFG. If TUSB1104 is configured for I2C mode (MODE pin (JMP13)) is floating, then this jumper must be left floating for normal operation. If TUSB1104 is configured for pin-strap mode, then this jumper will select EQ options for SSTX receivers and CRX receivers. Refer to TUSB1104 datasheet for details.
JMP8	Open	AEQCFG. Selects upper limit for AEQ. Refer to TUSB1104 datasheet for details.
JMP9	Open	CEQ1. If TUSB1104 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to TUSB1104 datasheet for details on EQ settings.
JMP10	Open	CEQ0. If TUSB1104 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to TUSB1104 datasheet for details on EQ settings.
JMP11	Open	EN. The EN will enable or disable the TUSB1104.
JMP12	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.
JMP13	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.
JMP14	Open	SLP_S0#.
JMP15	Open	Power for TUSB1104. Selects whether TUSB1104 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.
JMP16	Open	The local I2C voltage pull-up option. The default is local I2C pull-ups are connected to TUSB1104's 3.3 V VCC supply. Removing R47 allows for feeding external DC supply for local I2C.

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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

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2.5 Local I2C Access

Access to TUSB1104's local I2C signals is provided via the JMP3 and JMP4 connectors. The TUSB1104 supports either 1.8 V and 3.3 V LVCMOS levels. The TUSB1104 VIO_SEL pin (JMP12) is used to select which voltage level is used. It is important that the I2C signalling levels meet the TUSB1104 LVCMOS levels when I2C interface is accessed through the connector.

When the MODE pin (JMP13) is floating, TUSB1104 will be enabled for I2C mode. The TUSB1104 I2C target address is determined by sampled state of SSEQ0/A0 (JMP6) and SSEQ1/A1 (JMP5).

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. TUSB1104 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

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3 Quick Start Guide

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

1. Insertion USB-C plug side of EVM into the USB-C receptacle of the motherboard.
2. Insertion 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, suggest checking to make sure FLIP pin (JMP3) is set based on the CC pin orientation.

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

1. Insertion +5 V DC Power source into barrel jack (J1).
2. Configure TUSB1104 through the I2C interface via JMP4 and JMP5.
3. Insertion USB-C plug side of EVM into the USB-C receptacle of the motherboard.
4. Insertion USB-C cable or USB device into the USB-C receptable side of the EVM.
5. The USB Device should enumerate. If USB device does not enumerate, suggest checking to make sure FLIP_SEL register is set based on the CC pin orientation.

Note

The TUSB1104 does not have a CC or PD controller. The CC pins from EVM's USB-C plug is routed directly to EVM's USB-C receptacle. It is important to make sure FLIP (JMP3), if in pin-strap mode, or FLIP_SEL register, if in I2C mode, is properly set.

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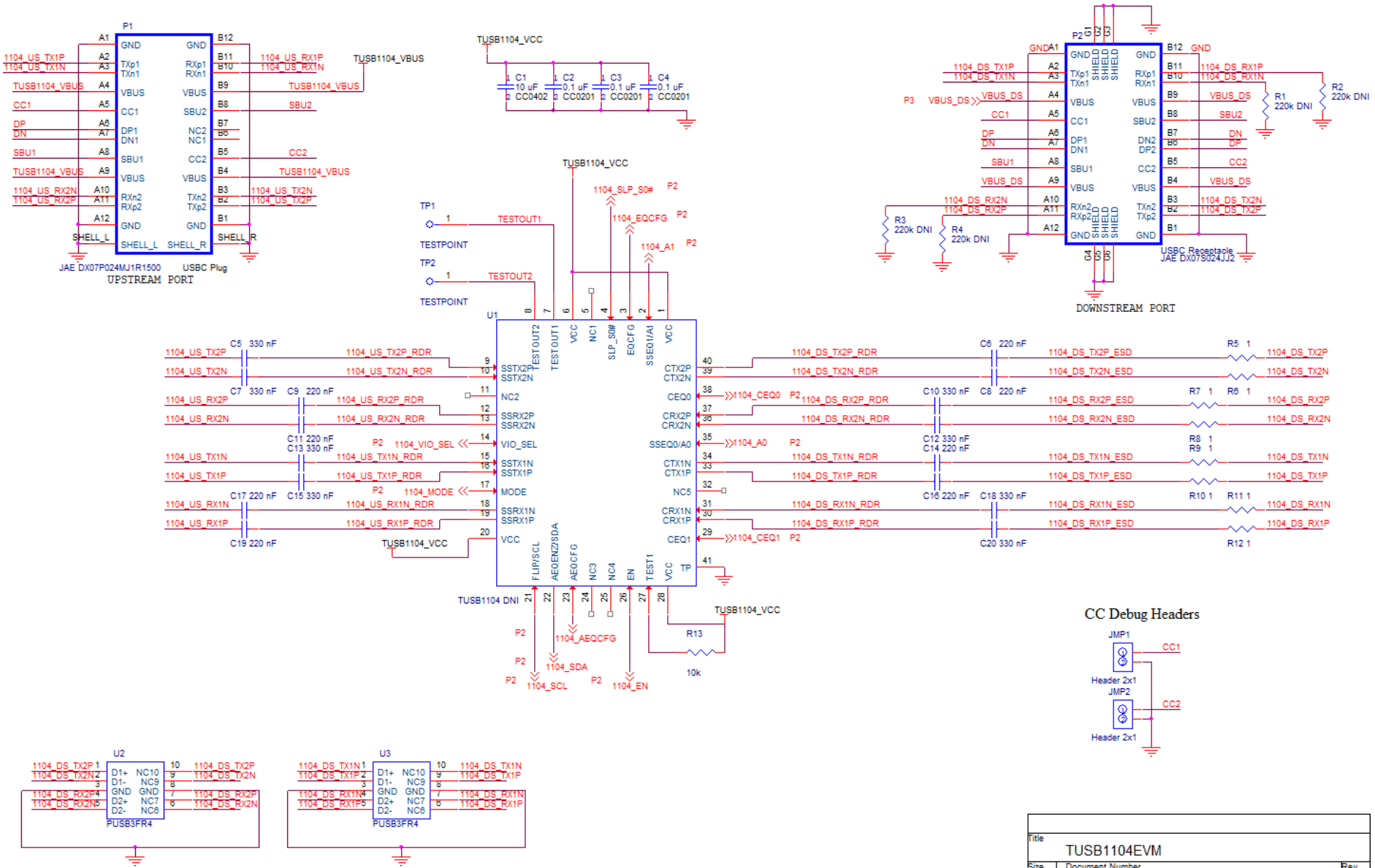
4 Schematics



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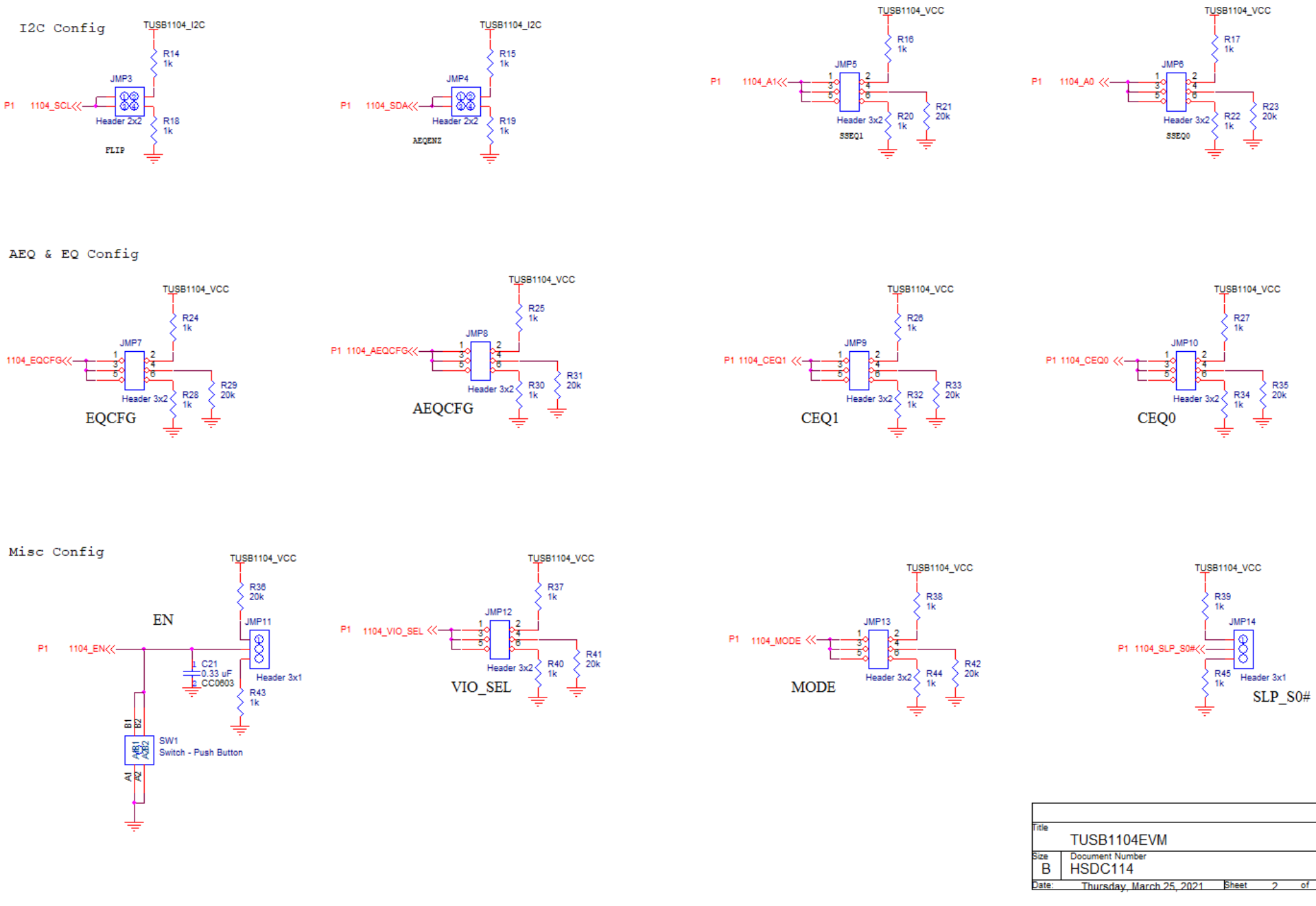

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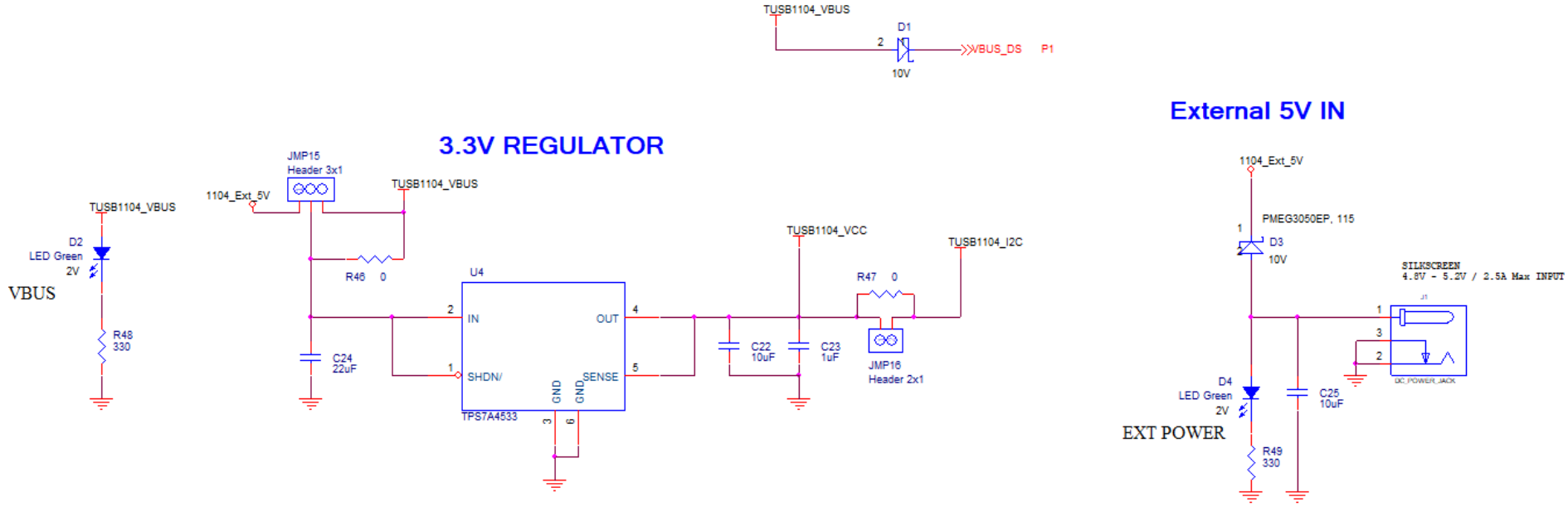

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