



## ABSTRACT

The TUSB1004 is a 10 Gbps USB 3.2 quad channel linear redriver for USB Type-A applications. This document goes over how to use and configure the TUSB1004EVM as well as recommendations for system hardware implementation is described in this document. 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 TUSB1004EVM?

The TUSB1004EVM is a PCB created to help for customers to evaluate the TUSB1004. The EVM has two Micro-B USB receptacles and a stacked dual port USB-A receptacle. The user of the EVM can insert a standard Micro-B USB cable into the TUSB1004EVM board then connect the cable to a motherboard or system. The user can then insert an USB device directly or through a standard USB cable into the USB-A receptacle side of the EVM board.

### 1.2 What is Included in the TUSB1004EVM?

The following are the major components of the EVM:

- TUSB1004 device
- Two Micro-B USB receptacle
- Dual Port USB-A receptacle
- Headers for configuring various TUSB1004 features.

### 1.3 What Does the EVM Look Like?

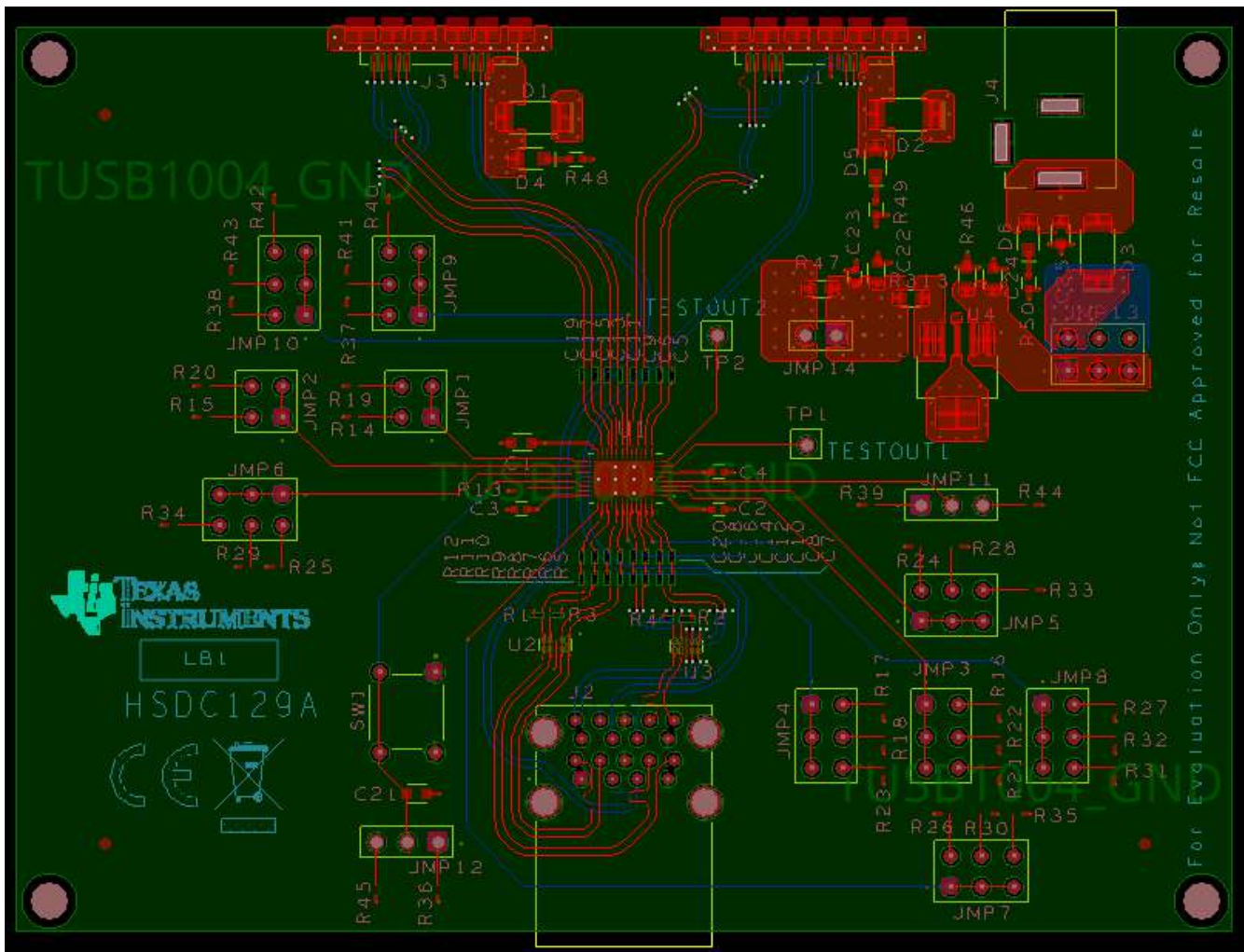


Figure 1-1. EVM Board

## 2 Hardware Configuration

### 2.1 Power

The EVM board can be powered from either Micro-B VBUS pin or from an external power supply through the barrel jack (J4). The EVM defaults to being powered from a Micro-B Receptacle VBUS (J3).

If powering the EVM from barrel jack, make sure R46 is unpopulated. When removed, a jumper will need to be placed across JMP13 pins 1 and 2.

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#### Note

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

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### 2.2 Configuration Jumpers

Multiple jumpers are provided on the EVM for configuration of TUSB1004 and also for probe points.

Following is a list of 4-level jumpers which are used to configure the TUSB1004: JMP3, JMP4, JMP5, JMP6, JMP7, JMP8, JMP9, and JMP10. The jumper position to select between the different levels is detailed in [4-Level Configuration Jumper Settings Table](#).

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#### Note

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

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**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	TEST2/SCL. If TUSB1004 is configured for I2C mode (MODE pin (JMP13) is floating), then this jumper is the clock for the local I2C. If TUSB1004 is configured for pin-strap mode, then Short 3 to 4.
JMP2	Short 3 to 4	AEQENZ/SDA. If TUSB1004 is configured for I2C mode (MODE pin (JMP13) is floating), then this jumper is the data for the local I2C. If TUSB1004 is configured for pin-strap mode, then this jumper selects whether the AEQ is enabled or not. <ul style="list-style-type: none"> <li>Short 1 to 2: AEQ disabled.</li> <li>Short 3 to 4: AEQ enabled.</li> </ul>
JMP3	Short 3 to 4	SSEQ1/A1. If TUSB1004 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 the TUSB1004 data sheet for details on the available I2C target address options. If TUSB1004 is configured for pin-strap mode, then this jumper along with JMP6 selects EQ settings for SSTX receivers. Refer to the TUSB1004 data sheet for details on the EQ settings.
JMP4	Short 3 to 4	SSEQ0/A0. If TUSB1004 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 the TUSB1004 data sheet for details on the available I2C target address options. If TUSB1004 is configured for pin-strap mode, then this jumper along with JMP5 selects EQ settings for SSTX receivers. Refer to the TUSB1004 data sheet for details on the EQ settings.

**Table 2-2. Jumpers (continued)**

Jumper	Default Position	Description
JMP5	Open	EQCFG. If TUSB1004 is configured for I2C mode (MODE pin (JMP13) is floating), then this jumper must be left floating for normal operation. If TUSB1004 is configured for pin-strap mode, then this jumper will select EQ options for SSTX receivers and CRX receivers. Refer to the TUSB1004 data sheet for details.
JMP6	Open	AEQCFG. Selects upper limit for AEQ. Refer to the TUSB1004 data sheet for details.
JMP7	Open	CEQ1. If TUSB1004 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to the TUSB1004 data sheet for details on the EQ settings.
JMP8	Open	CEQ0. If TUSB1004 is configured for pin-strap mode, then this jumper along with JMP10 selects EQ settings for CRX receivers. Refer to the TUSB1004 data sheet for details on the EQ settings.
JMP9	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.
JMP10	Short 1 to 2	MODE. Selects between pin-strap and I2C mode. The default is pin-strap mode. <ul style="list-style-type: none"> <li>Short 1 to 2: Pin-strap mode</li> <li>Open: I2C mode.</li> </ul>
JMP11	Open	SLP_S0#.
JMP12	Open	EN. The EN will enable or disable the TUSB1004.
JMP13	Open	Power for TUSB1004. Selects whether TUSB1004 is powered from J1 VBUS, J3 VBUS or 5 V barrel jack. The default is power from J3 USB VBUS. Shorting between position 1 and 2 will select the 5 V barrel jack.
JMP14	Open	The local I2C voltage pull-up option. The default is local I2C pull-ups are connected to TUSB1004s 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 TUSB1004s local I2C signals is provided through the JMP1 and JMP2 connectors. The TUSB1004 supports either 1.8 V and 3.3 V LVCMOS levels. The TUSB1004 VIO\_SEL pin (JMP9) is used to select which voltage level is used. It is important that the I2C signalling levels meet the TUSB1004 LVCMOS levels when I2C interface is accessed through the connector.

When the MODE pin (JMP10) is floating, TUSB1004 will be enabled for I2C mode. The TUSB1004 I2C target address is determined by sampled state of SSEQ0/A0 (JMP3) and SSEQ1/A1 (JMP4).

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. TUSB1004 I<sup>2</sup>C 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 J3 VBUS.

1. Insert a Micro-B USB cable into J3 on the EVM. Connect the other end of the USB cable to the motherboard.
2. Insert a USB device or USB cable into the lower USB-A receptacle of the EVM.
3. The USB device should enumerate. If the USB device does not enumerate, then check that VBUS is at the appropriate level at D1 pin 1.
4. Insert a Micro-B USB cable into either J1 on the EVM. Connect the other end of the USB cable to the motherboard.
5. Insert a USB device or USB cable into the upper USB-A receptacle of the EVM.
6. The USB device should enumerate. If the USB device does not enumerate, then check that VBUS is at the appropriate level at D2 pin 1.

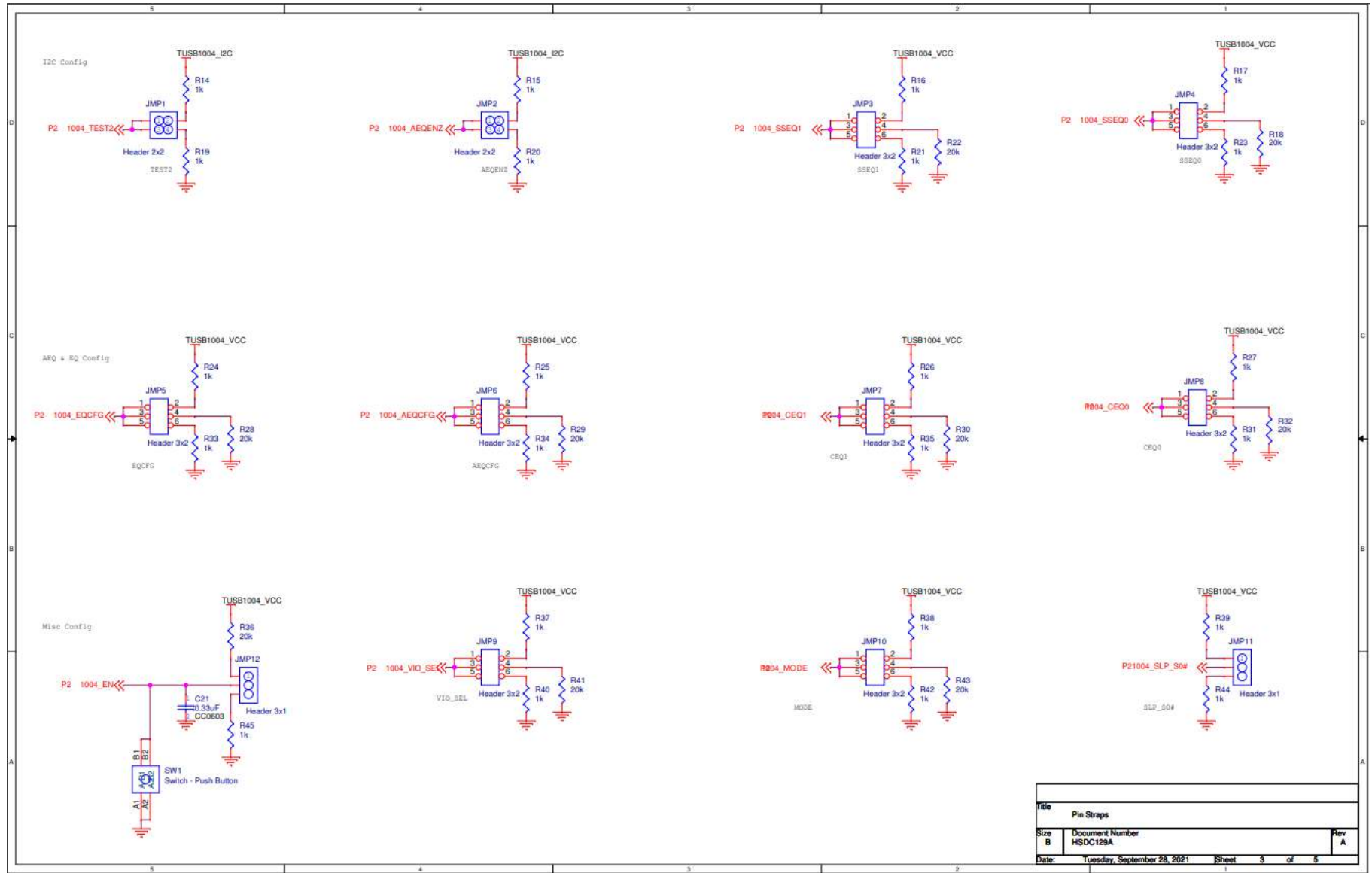
The following instructions assume the EVM is configured for the I2C mode and is powered from the barrel jack.

1. Insert +5 V DC power source into the barrel jack (J4).
2. Configure the TUSB1004 through the I2C interface (JMP1 and JMP2).
3. Insert a Micro-B USB cable into either J3 or J1 on the EVM. Connect the other end of the USB cable to the motherboard.
4. Insert a USB device or USB cable into either USB-A receptacle of the EVM. Be sure to connect that the USB device/cable into the corresponding USB-A receptacle (J3 = lower receptacle, J1 = upper receptacle)
5. The USB device should enumerate. If the USB device does not enumerate, check that VBUS is at the appropriate level at the corresponding USB-A receptacle, pin1 of D1 or D2.

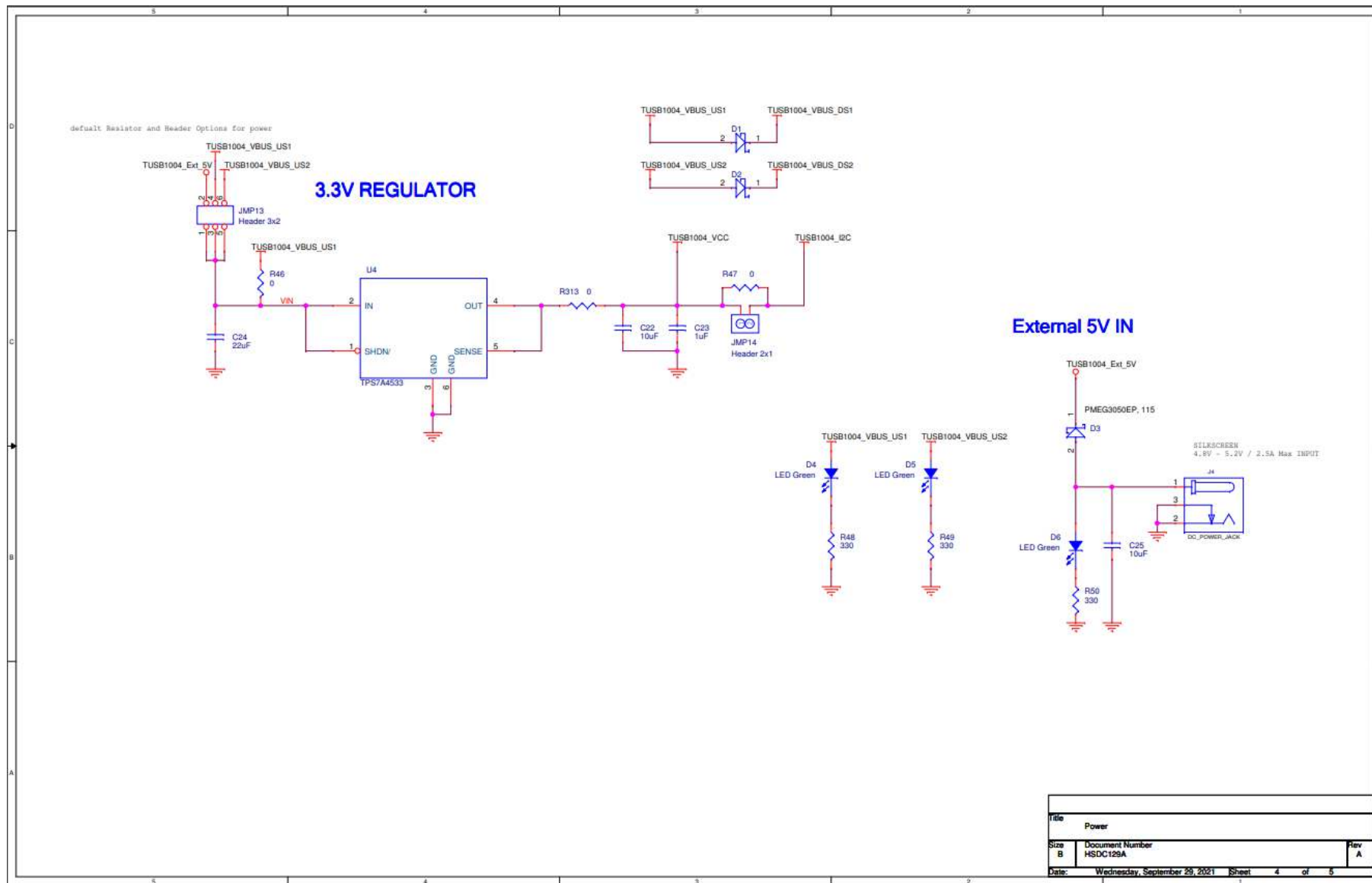








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