TUSB1210 EVM

This user's guide details the hardware overview and setup, and the installation instructions for the TUSB1210 EVM. Also included are a top-layer layout image, schematics, and the bill of materials (BOM).

Contents

List of Figures

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1 Introduction

The TI TUSB1210EVM is a functional board design of a single device that implements a USB PHY with a ULPI interface. The EVM can support Host, Device, and On-the-Go (OTG) modes and also has output voltage support at the UTMI+ Low Pin Interface (ULPI) for +1.8 V. This EVM also acts as a hardware reference design for any implementation of the TUSB1210. Figure 1 shows the TUSB1210EVM top-layer layout.

Upon request, layout files for the EVM can be provided to illustrate techniques used to route the differential pairs, split power planes, and placement of filters.

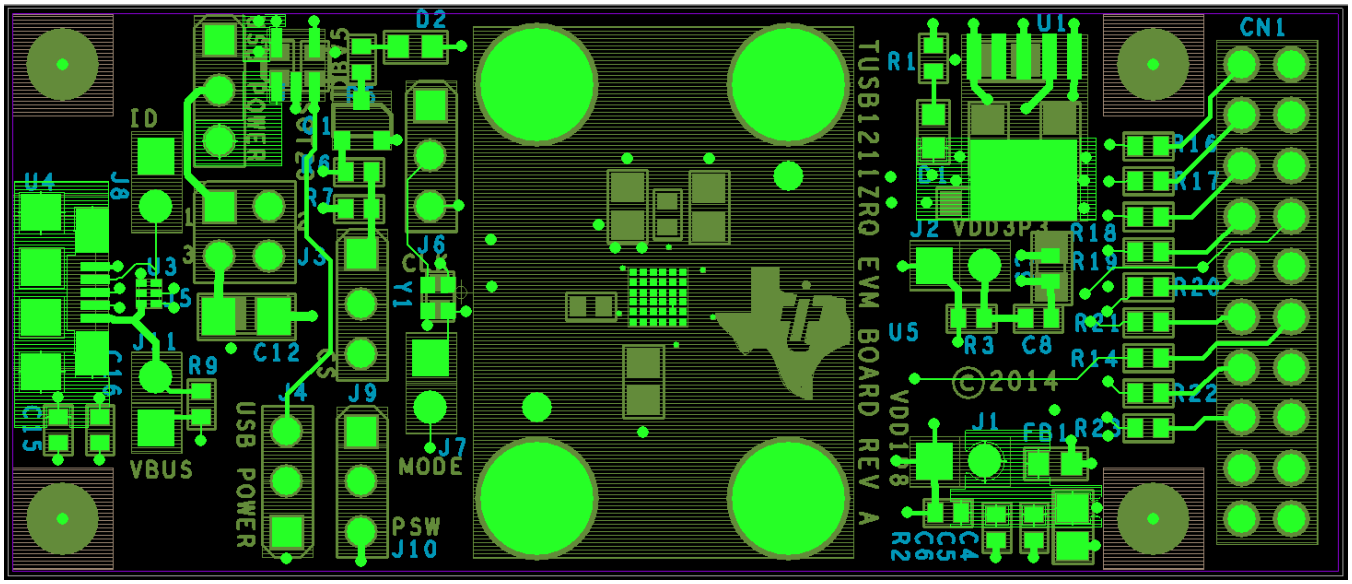

Figure 1. TUSB1210EVM Top Layer Layout

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2 Hardware Overview

The TUSB1210EVM (EVM) board hardware can be divided into three functional areas.

2.1 TUSB1210

The TUSB1210 on the EVM (U5 on the schematic) operates as a USB PHY with ULPI interface. It has several unique features, including DP/DM Line External Component Compensation, VBUS Overvoltage Protection Circuit, support for HS, FS and LS, OTG compliant, internal Power-on Reset and very low current consumption optimized for portable devices.

TUSB1210 supports ULPI clock mode both input and output: input clock mode, in which case a square-wave 60-MHz clock is provided to TUSB1210 at the ULPI interface CLOCK pin; and output clock mode in which case TUSB1210 can accept a square-wave reference clock at REFCLK of either 19.2 MHz or 26 MHz. Frequency is indicated to TUSB1210 via the configuration pin, CFG. This can be useful if a reference clock is already available in the system.

2.2 Power Supply

The EVM operates from the power provided by the 20-pin header (CN1). The VDD5 (+5 V) terminal (pins 2 and 6) is used to generate the +3.3-V power supply needed by the TUSB1210 device. Also, VDD5 can be used to provide VBUS when the TUSB1210 is in Host mode. The BOARD_1P8V terminals (pins 19 and 20) are connected to the VDDIO of the TUSB1210 and must be in the range of +1.8 V ±10%.

2.3 USB Bus Connector

The EVM is equipped with a USB2 Micro B/AB connector (U4), through this the TUSB1210 can operate as Host, Device or OTG.

3 Hardware Set Up

3.1 Configuration Jumpers

This EVM has a set of jumpers to make configuration changes. Configuration inputs are read while the EVM is powered on and are always in effect. Please refer to Section 5 for additional information about the EVM's schematics. The switch definitions are in the following paragraphs.

3.1.1 REFCLK (J6 and J7)

The TUSB1210 has the REFCLK terminal to determine the clock mode either input or output. If the Mode Select jumper (J7) is left open and the OSC CTRL jumper (J6) is set on the 1-2 position, a +3.3-V 26-MHz clock signal is provided to the TUSB1210 in the REFCLK pin, setting it in output mode. If the Mode Select jumper is set on the 1-2 position, REFCLK pin is connected to ground, and setting the TUSB1210 in Input Mode.

3.1.2 CS (J9)

The TUSB1210 has a Chip Select (CS) terminal to set the device in power down. If the CS SEL jumper is set on the 2-3 position, the CS terminal is connected to VDD and the TUSB1210 is on normal operation. If the CS jumper is set on 1-2 position, the CS terminal is connected to VBUS; therefore, the device is on normal operation when VBUS is present, otherwise, it is on power down mode.

3.1.3 ID (J8)

The TUSB1210 has an ID terminal of the USB connector. If the ID jumper is set, the TUSB1210's ID pin is connected to the USB connector's ID pin as expected when the TUSB1210 is on HOST or OTG mode. If the ID jumper is left floating, a TUSB1210 acting as device is expected.

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3.1.4 VBUS (J11)

If the SHTDN jumper is left floating and if the R9 resistor is not populated, current consumption of the TUSB1210's VBUS pin can be taken.

3.1.5 USB POWER 1 (J3)

The TUSB1210 has a CPEN active-high digital output to control the external +5-V VBUS. If the USB POWER 1 jumper is set on bypass position, the USB Power pin is bypassed and the CPEN pin activity does not control VBUS. If the USB POWER 1 jumper is set on SWITCH position, the TUSB1210 CPEN pin is controlling the VBUS power.

3.1.6 Host Device (J5)

The TUSB1210 device can support Host, OTG, or Device functionality. If the J5 jumper is set on the 1-2 and 3-4 positions, VBUS according to the Host functionality is configuring. If the J5 jumper is set on 1-3 and 2-4 positions, VBUS according to the Device functionality is configuring. Finally if the J5 jumper is set on 1-2 position, VBUS according to the OTG functionality is configuring.

4 EVM Installation

Install the EVM with the following steps:

1. Configure the jumpers in the TUSB1210 EVM as follows:
   - J6 [1-2] Output mode
   - J7 [open] Output mode
   - J9 [2-3] CS connected to VDD1P8
   - J11 [open]
   - J8 [open]
   - J3 [1-2] External Power Switch Bypass
   - J5 [1-3 and 2-4] Device
2. Connect the USB link board with ULPI interface to the TUSB1210 EVM ULPI connector (CN1)
3. Configure the USB link as device
4. Connect a USB cable between the TUSB1210 EVM USB port and a computer's USB port
5. Connect the oscilloscope's probe to pin 1 in the J7 connector
6. Turn on USB Link

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5 TUSB1210EVM Schematics

Figure 2 and Figure 3 contain the schematics for this EVM.

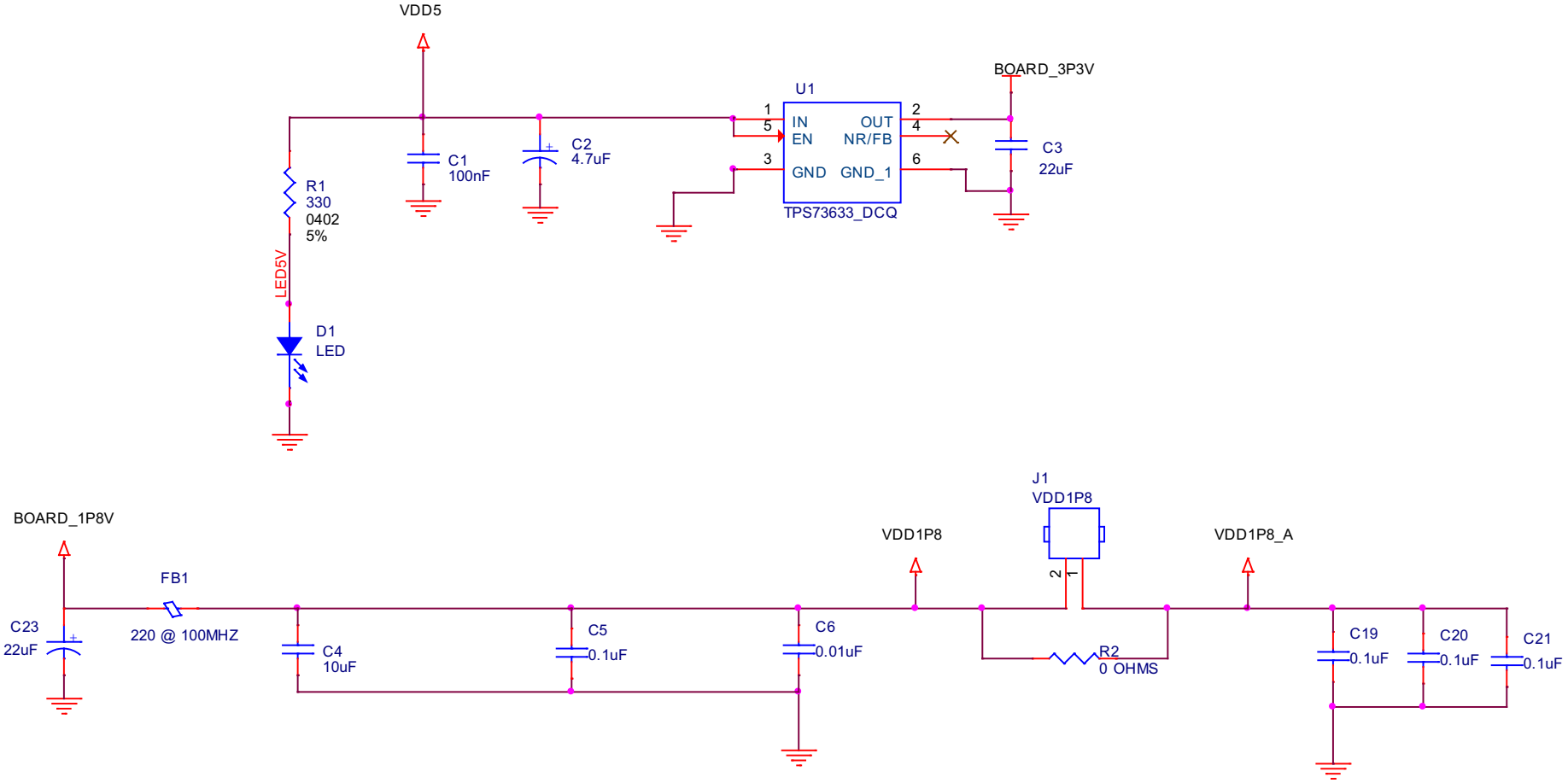

Figure 2. Power Supply

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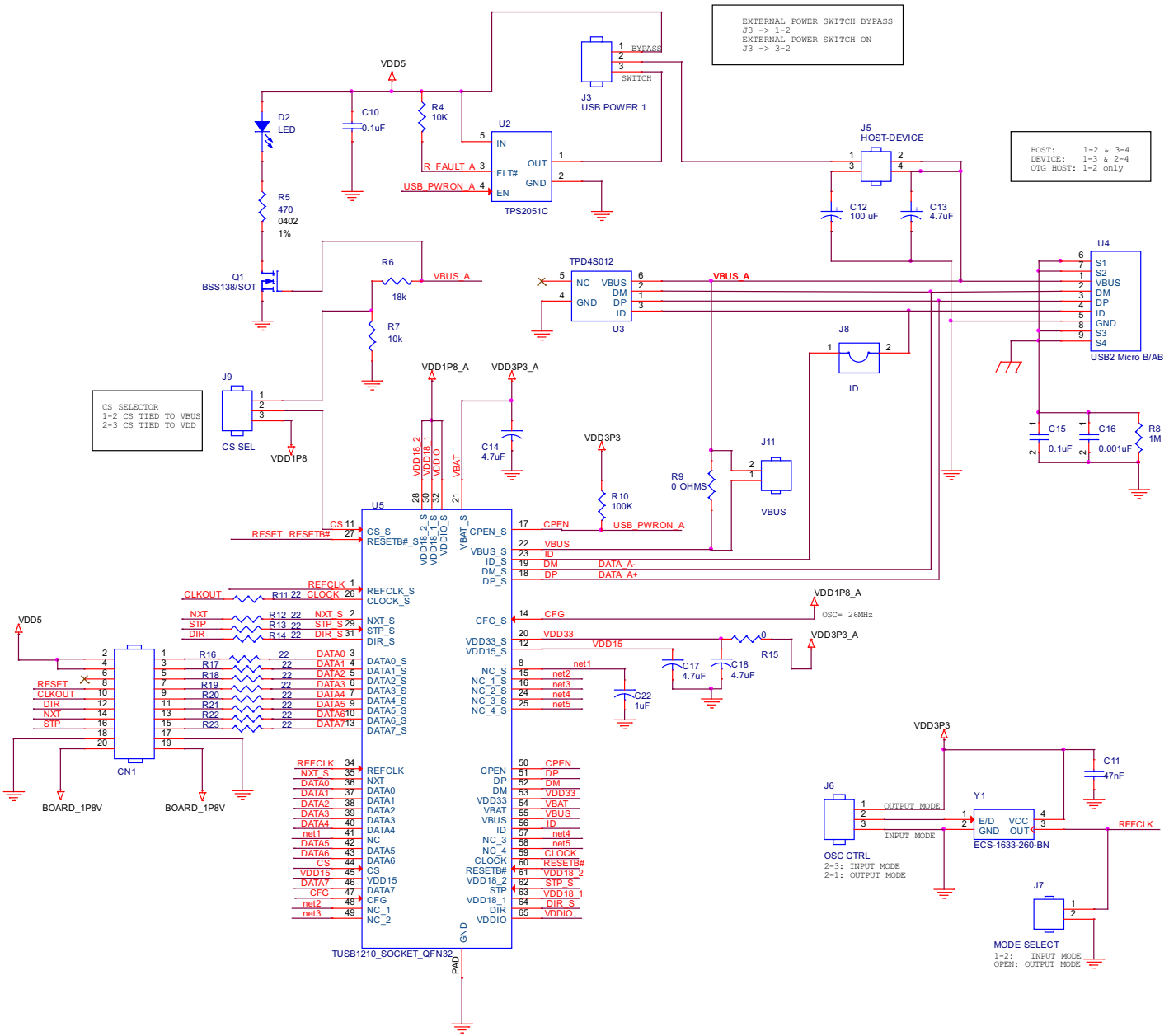

Figure 3. TUSB1210 Device

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6 TUSB1210EVM Bill of Materials

Table 1 lists the TUSB1210EVM BOM.

Table 1. TUSB1210EVM Bill of Materials

Item	Qty	Reference	Part	MFG	Part number	Digikey Part Number	Pkg
1	1	CN1	HEADER 10X2	FCI	68021-220HLF	609-3347-ND	0.1x0.1"
2	1	C1	100nF	TDK	C2012X5R1H104M085AA	Q445-14436-1-ND	805
3	3	C3,C23, C24	22uF	TDK	C2012X5R1A226M125AB	445-7665-1-ND	805
4	2	C4,C7	10uF	TDK	C2012X5R1A106M125AB	445-7661-1-ND	805
5	7	C5,C9,C10,C15,C19,C20,C21	0.1uF	TDK	C1005X5R1A104M050BA	445-4984-1-ND	402
6	1	C6	0.01uF	AVX	UT026D103MAC2F	478-6239-1-ND	402
7	2	C8, C22	1.0uF	TDK	C1005X5R1A105M050BB	445-4991-1-ND	402
8	1	C11	47nF	Kemet	C0402C473K9PACTU	399-3020-1-ND	402
9	1	C12	100 uF	TDK	C3216X5R1A107M160AC	445-6007-1-ND	1206
10	5	C2, C13,C14,C17,C18	4.7uF	TDK	C2012X5R1C475M125AC	445-7641-1-ND	805
11	1	C16	0.001uF	Kemet	C0402C102K5RACTU	399-1032-1-ND	402
12	2	D1,D2	LED	Panasonic	LNJ312G83RA	P11480CT-ND	603
13	2	FB1,FB2	220 @ 100MHZ	Murata	BLM18EG221TN1D	490-5979-1-ND	603
14	5	J1, J2, J7, J8, J11	HEADER 2X1				hdr_2x1, 0.100"
15	3	J3, J6, J9	HEADER 3X1				hdr_3x1, 0.100"
16	1	J5	HEADER 2X2				hdr_2x2, 0.100"
17	1	Q1	BSS138/SOT	Fairchild	BSS138	BSS138CT-ND	SOT-23
18	1	R1	330 ohm	Panasonic	ERJ-2GEJ331X	P330JCT-ND	402
19	4	R2,R3,R9,R15	0 OHMS	Panasonic	ERJ-2GE0R00X	P0.0JCT-ND	402
20	2	R4,R7	10k	Panasonic	ERJ-2GEJ103X	P10KJCT-ND	402
21	1	R5	470 ohm	Panasonic	ERJ-2GEJ471X	P470JCT-ND	402
22	1	R6	18k	Panasonic	ERJ-2GEJ183X	P18KJCT-ND	402
23	1	R8	1M	Panasonic	ERJ-2RKF1004X	P1.00MLCT-ND	402
24	1	R10	100K	Panasonic	ERJ-2GEJ104X	P100KJCT-ND	402
25	12	R11,R12,R13,R14,R16,R17,R18,R19,R20,R21,R22,R23	22 ohm	Panasonic	ERJ-2GEJ220X	P22JCT-ND	402
26	1	U1	TPS73633_DCQ	TI	TPS73633DCQ	296-16914-1-ND	SOT223
27	1	U2	TPS2051C	TI	TPS2051CDBVT	296-29537-1-ND	SOT23-5
28	1	U3	TPD4S012	TI	TPD4S012DRYR	296-24244-1-ND	6-SON
29	1	U4	USB2 Micro B/AB	HRS	ZX62R-B-5P	H11574CT-ND	SMT, RA, SH SMT
30	1	U5	TUSB1210BRHB	TI	TUSB1210BRHB		QFN-32
31	1	U5	QFN32 SOCKET (OPTIONAL)	3M	232-5205-01	3M10830-ND	CONN SOCKET QFN 32
32	1	Y1	CRYSTAL 26 MHz	ECS	ECS-1633-260-BN	XC1934CT-ND	4-SMD

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- *Increase the separation between the equipment and receiver.*
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