TUSB2E22EVM-CAT User's Guide

This is the User's Guide for the evaluation module (EVM) of the TUSB2E22 dual eUSB2 to USB 2.0 repeater. The purpose of the user guide is to facilitate easy set up for validation and development of the TUSB2E22 device. This user's guide provides an overview of the TUSB2E22EVM-CAT, which includes highlighting its key features, operating conditions, and how to adjust the EVM for use in various systems.

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1 Introduction

The TUSB2E22EVM-CAT is designed for the TUSB2E22 device which is a USB Compliant eUSB2 to USB 2.0 repeater supporting both device and host modes. TUSB2E22 supports USB Low Speed (LS) and Full Speed (FS) signals and High Speed (HS) signals.

1.1 Features

This EVM kit contains the following items:

- TUSB2E22EVM-CAT board
- This user's manual

The user will need to provide one or two micro USB cables and one or two sets of SMP cables, as well as a 5V power source for the EVM.

1.2 Applications

The TUSB2E22EVM-CAT can be used to support device mode or host mode applications. No hardware configuration changes are necessary for the TUSB2E22 to support different modes. However, in order for the EVM to adhere to the USB 2.0 specification, when in host mode the active USB port should supply VBUS and when in device mode the active USB port should monitor VBUS.

1.3 Description

The TUSB2E22EVM-CAT incorporates two Micro-AB USB 2.0 ports that can be used to connect the USB signals of the repeaters to standard USB hosts, hubs or devices. The EVM also has two sets of SMP connectors for connecting eUSB2 signals to eUSB2 phys or test equipment.

The TUSB2E22EVM-CAT incorporates a switch to set the CROSS feature of the TUSB2E22, as well as an external reset push button.

Depending on the switch settings, the EVM can be powered from an external 5VDC wall supply, bench power supplies, or even through one of the USB connectors.

2 Test Setup

The EVM can be powered in a variety of ways to support different applications and test set-ups. Two of the most common set-ups are explained below.

2.1 TUSB2E22EVM-CAT - Wall Power

Wall power is used for standalone EVM testing.

- A 5VDC 1A or greater power supply is attached to J1.
- Jumper J5 is installed to route 5V to the entire EVM.
- Jumper J14 is installed to connect the output of the 5V to 3.3V LDO to the 3.3V supply of the EVM.
- Jumper J16 [1,2] is installed to route 3.3V to TUSB2E22 and the 1.8V LDO.
- Jumper J15 is installed to provide 1.8V to the TUSB2E22 and the IO of the EVM.
- SW2 is pulled high (SW 2 to 3) prior to power on / reset.
- Jumpers J2 and J9 can be installed as needed if VBUS is to be provided to one of the USB ports (host mode)
- Jumpers not installed: J16[2,3]

2.2 TUSB2E22EVM-CAT - Bench Power

Bench power is used for power measurements and checking operation at voltage corners.

- 3.3V power supply is supplied to J14_1
- 1.8V power supply is supplied to J15_1
- Jumper J16 [1,2] is installed to route 3.3V to TUSB2E22
- SW2 is pulled high (SW 2 to 3) prior to power on / reset.
- 5V power supply is supplied to J5_1 to provide VBUS on the USB ports.
- Jumpers J2 and J9 can be installed as needed if VBUS is to be provided to one of the USB ports (host mode) or sensed from one of the ports (device mode)
- Jumpers not installed: J14, J15, J16[2,3]

NOTE: The 1K ohm latch-up protection resistors, R28 and R27, will have a noticeable impact on power measurements and should not be installed.

3 Board Layout

The TUSB2E22EVM-CAT was laid out with the following considerations:

- USB 2.0 signals impedance controlled 90 ohms differential +/- 5%
- eUSB2 signals impedance controlled 45 ohms signal ended +/- 5%
- USB 2.0 and eUSB2 signal pairs routed with matched trace lengths and minimal vias.
- All other signals to be impedance controlled 45 ohms +/- 10% or 50 ohms +/- 10%
- Separate ground plane for TUSB2E22 connected by 0 ohm resistor, ground to ground vias added to minimize parasitic inductance.

General information about the PCB is provided below:

- Finished board thickness: .062 +/- 10% - necessary for socket
- Copper weight: 1oz start internal, 1/2 oz start external
- Laminate material: FR4 Polyclad 370 or equivalent

A six layer stack-up was used for the EVM to account for the small BGA breakout in addition to some added lab use only test capabilities. TUSB2E22 would typically be designed onto a 4 layer board.

Drill notes on board stack up:

1. L1 -L2 (laser drill) used for small pitch BGA break out
2. L2 - L5 (mechanical drill) completes the small pitch BGA breakout

4 Schematic

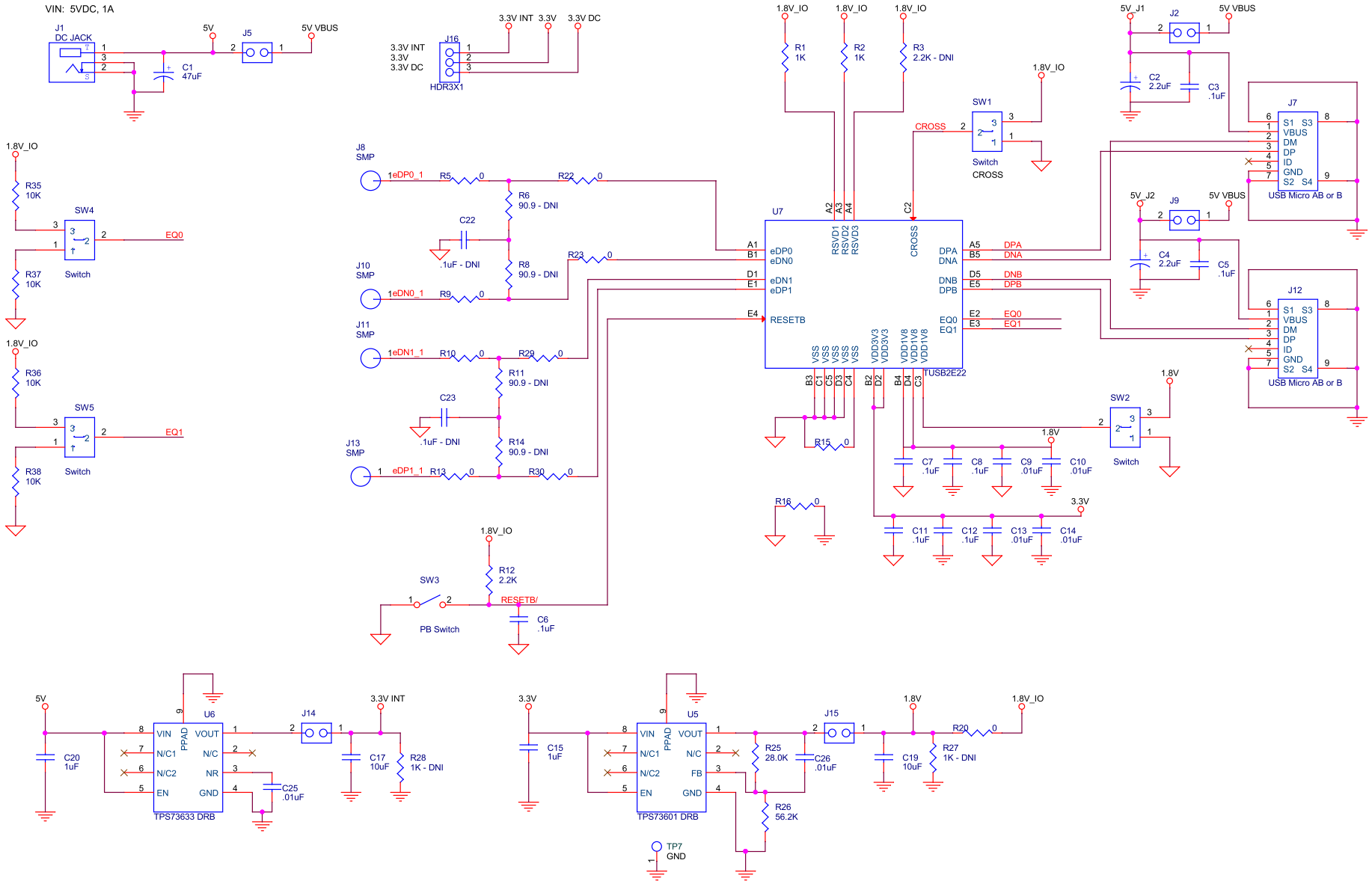

Figure 1. TUSB2E22EVM-CAT

5 Bill of Materials

The default devices installed on the TUSB2E22EVM-CAT are listed in this section.

Table 1. Bill of Materials

DESIGNATOR	QTY	VALUE	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
C1	1	47uF	cap_1210	C3225X5R1A476M250AC	TDK
C2,C4	2	2.2uF	cap_0805	CGA4J3X7R1C225K125AB	TDK
C3,C5,C6,C7,C8,C11,C12	7	.1uF	cap_0402	CC0402KRX5R6BB104	Yageo
C9,C10,C13,C14,C25,C26	6	.01uF	cap_0402	C0402C103K3RACTU	Kemet
C15,C20	2	1uF	cap_0805	0805YC105KAT2A	AVX
C17,C19	2	10uF	cap_0805	C0805C106K8PACTU	Kemet
C22,C23	0	.1uF - DNI	cap_0402	CC0402KRX5R6BB104	Yageo
J1	1	DC JACK	JACK_SMRT	PJ1-022-SMT-TR	CUI
J2,J5,J9,J14,J15	5	HDR2X1	HDR_THVT_1X	PEC02SAAN	Sullins
J7,J12	2	USB Micro AB	USB-uAB_SMRT	10104111-0001LF	Amphenol FCI
J8,J10,J11,J13	4	SMP	CON_SMRT	19S201-40ML5	Rosenberger
J16	1	HDR3X1	HDR_THVT_1X3	PEC03SAAN	Sullins
R1,R2	2	1K	res_0402	RT0402BRE071KL	Yageo
R3	0	2.2K - DNI	res_0402	RC0402FR-072K2L	Vishay Dale
R5,R9,R10,R13,R22,R23,R29,R30	8	0	res_0201	CRCW02010000Z0ED	Yageo
R6,R8,R11,R14	0	90.9 - DNI	res_0201	RMCF0201FT90	Stackpole
R12	1	2.2K	res_0402	RC0402FR-072K2L	Vishay Dale
R15	1	0	res_0402	RC0402JR-070RL	Yageo
R16	1	0	res_0805	RC0805JR-070RL	Yageo
R20	1	0	res_0603	RC0603JR-070RL	Yageo
R25	1	28.0K	res_0402	RC0402FR-0728KL	Yageo
R26	1	56.2K	res_0402	RT0402BRD0756K2	Yageo
R27,R28	0	1K - DNI	res_0402	RT0402BRD07100RL	Yageo
R35, R36, R37, R38	4	10K	res_0402	RT0402BRD071	Yageo
SW1,SW2 , SW4, SW5	4	Switch	SW_SMVT	CJS-1201TB	Nidec Copal
SW3	1	PB Switch	SW_SMVT	B3U-1000P	OMRON
TP7	1	TEST POINT	HDR_THVT_1X1	PEC01SAAN	Sullins
U5	1	TPS73601 DRB	DRB0008BA	TPS73601DRB	Texas Instruments
U6	1	TPS73633 DRB	DRB0008BA	TPS73633DRB	Texas Instruments
U7	1	TUSB2E22	25-YCG	TUSB2E22YCG	Texas Instruments

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (August 2019) to A Revision	Page
• Initial Public Release	2

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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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