TUSB211 Pico Evaluation Module

This user's guide describes the characteristics, operation, and use of the TUSB211 Pico Evaluation Module (EVM). A complete schematic diagram and bill of materials are included in this document.

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1 Introduction

The TUSB211 is a high-speed (HS) signal conditioner designed to compensate for ISI signal loss in a transmission channel. The TUSB211 Pico EVM is designed to provide a simple means of demonstrating the signal conditioning capability of the TUSB211 on an existing board designed without the TUSB211 footprint. The EVM is pre-configured and simply connects DP and DM signals (likely at the connector) with wires soldered from the EVM to traces or connector pins. The TUSB211 Pico EVM is powered from VBUS or an external 3.3-V supply both connected via headers on the EVM. An LED is available to indicate when a device is connected at HS and the TUSB211 is enabled.

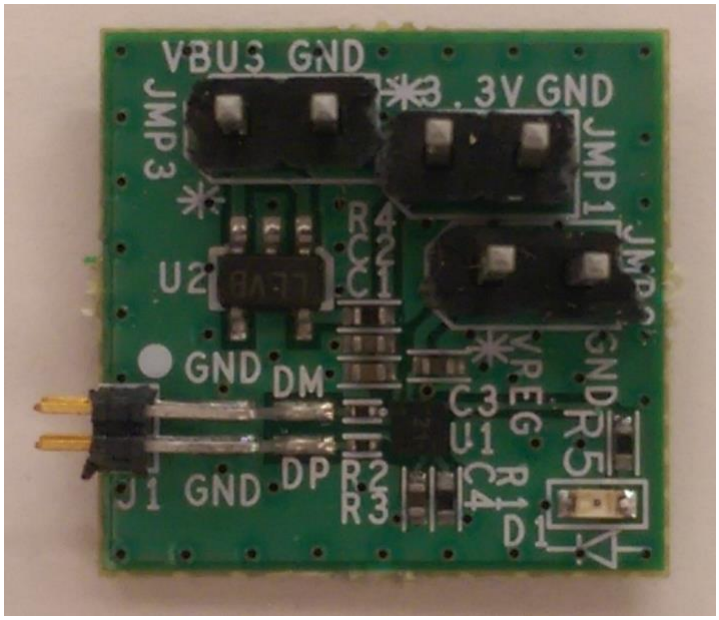

Figure 1. TUSB211 Pico EVM Top View

2 Hardware Set Up

2.1 Configuration

The TI TUSB211 Pico EVM is pre-configured to an EQ setting of level 1, changing the EQ configuration is done by changing the value of resistor R1. Changing the EQ setting without a complete understanding of the result is not recommended. See the TUSB211 data sheet (SLLSEO0) for detailed pin descriptions and functionality along with the *EVM schematic* for additional information.

2.2 Test Headers

The TUSB211 Pico EVM includes headers for different power options to provide power to the device.

NOTE: It is important to include common GND connections from main board to the TUSB211 Pico EVM.

Header JMP1:

This header is included to directly provide 3.3 V to power the TUSB211. Do not apply VBUS to header JMP3 when using this header to power the device.

Header JMP2:

This header is included to monitor the VREG pin of the TUSB211.

Header JMP3:

This header is included to provide power to the device by using VBUS from the main board. Connect VBUS and GND to this header to enable the LDO providing 3.3 V to the device. When using this header, there should be no voltage provided to header JMP1.

2.3 DP/DM Pin Interface Header

Header J1 is used to interface the TUSB211 Pico EVM to the DP/DM signals on the existing board. The most practical place to interface is the USB connector pins as they are typically the most accessible. Two signal wires and GND wires, recommended, can be soldered to the pins of header J1 (or J1 can be removed and wires soldered directly to those pads) on the TUSB211 Pico EVM.

3 EVM Operation

Install the EVM by performing the following steps:

1. Attach a wires from Header J1 to DP and DM signals (preferably with GND also).
2. Attach VBUS or VCC and GND to corresponding header pins as indicated in the *Test Headers* section.
   - When LED D1 is lit, this indicates a USB high-speed connection with the TUSB211 active.

4 USB 2.0 High-Speed Eye Diagram Testing

When performing USB 2.0 compliance eye-diagram testing with a host or the downstream port of a HUB with the TUSB211, a scenario can occur where the TUSB211 signal boosting is not enabled. This can occur when the test packets are being transmitted before the USB Test Fixture is connected to the TUSB211. This scenario does not occur during device compliance eye-diagram testing as the USB test fixture must always be connected while testing a device. This scenario only occurs during the compliance testing with the USB test fixtures and does not affect normal operation with a host, HUB or device.

Closely following the test procedures provided by the scope equipment vendor and USB-If (links provided in this section) will avoid this scenario. Specifically, the USB HS test fixture should be connected prior to executing the test packets using the HSETT test tool. Alternatively, if the test fixture is hot-plugged to the host or downstream HUB port after the command to send test packets has already been entered using the HSETT tool, it is necessary to select TEST PACKETS and click “Execute” again after the test fixture is connected to ensure the TUSB211 detects a compliance test set-up.

The following generic procedure can be used to take the USB 2.0 compliance eye-diagrams (see the following test procedure documents for details):

1. Connect the USB test fixture to the host, downstream HUB (+ TUSB211) port, or device under test.
2. Configure the host or HUB or device using xHSETT or HSETT to send test packets using the procedure detailed in the HSETT documentation.
3. Start sending test packets.
4. Capture test packets on a scope to display eye (running compliance software on the scope)

USB 2.0 compliance eye-diagrams can be taken on host, device and HUB platform ports configured with the TUSB211 using the EHCI and xHCI high-speed electrical test tool application provided by the *USB Implementers Forum*.

Details for setting up and running the application are explained in *EHCI and xHCI High-speed Electrical Test Tool Setup Instruction*, provided by the USB-IF at the following link:

http://www.usb.org/developers/tools/HSETT_Instruction_0_4_1.pdf

xHCI (USB 3.0 Host) – XHSETT test application:

http://www.usb.org/developers/tools/

EHCI (USB 2.0 Host) – EHSETT test application:

http://www.usb.org/developers/tools/usb20_tools/

Vendor-specific test procedures:

http://www.usb.org/developers/compliance/electrical_tests/

5 TUSB211 EVM Schematics

Figure 2 illustrates the EVM schematic.

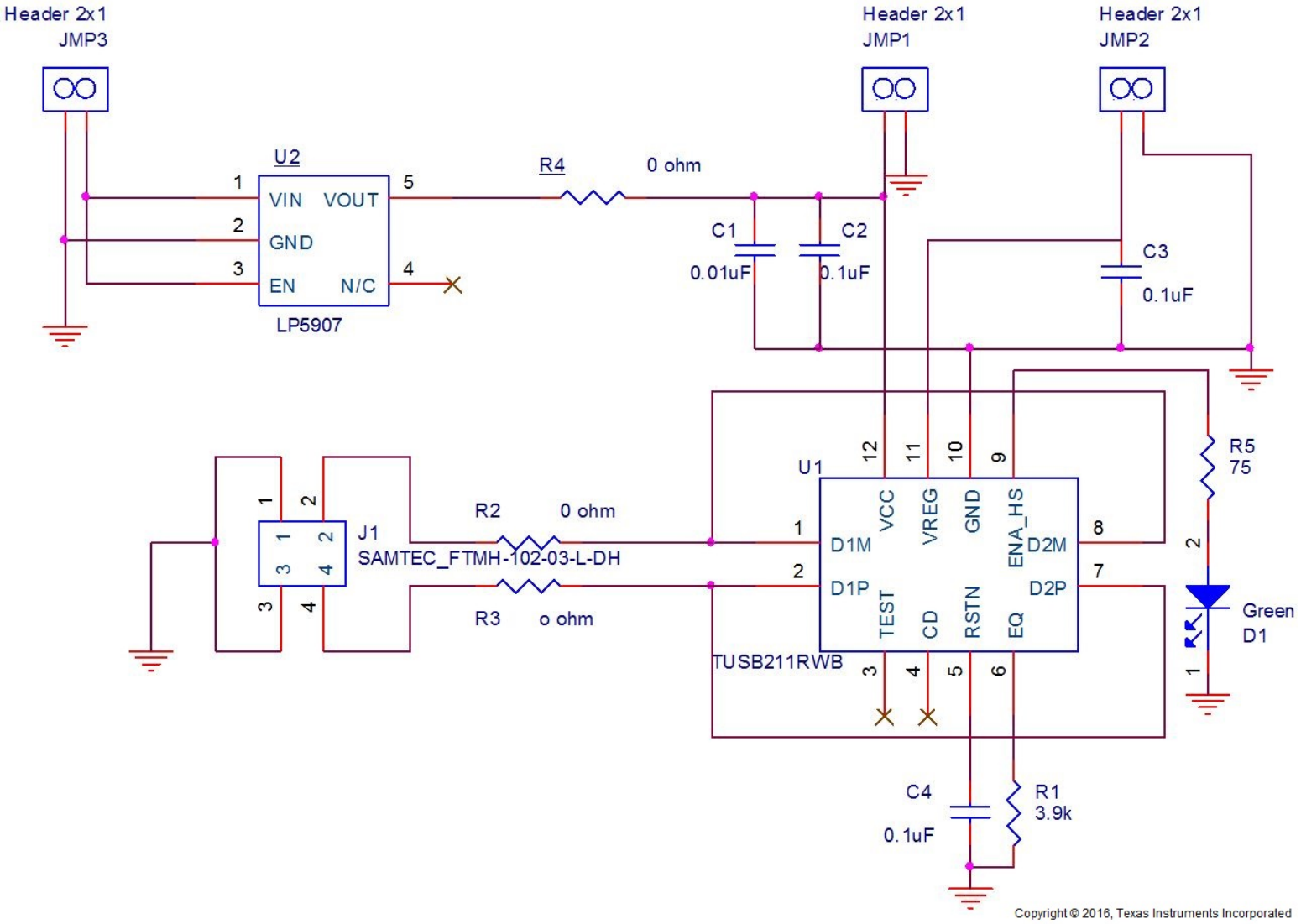

Figure 2. TUSB211 EVM Schematics

6 TUSB211 EVM Bill of Materials

Table 1 displays the EVM bill of materials.

Table 1. TUSB211 EVM Bill of Materials

Item	Qty	Reference	Part	Manufacturer	Digikey Part#
1	1	C1	0.01uF	TDK	445-7387-1-ND
2	3	C2,C3,C4	0.1uF	TDK	445-1265-6-ND
3	3	JMP1,JMP2,JMP3	Header 2x1	Sullins Connector Solutions	S1012E-02-ND
4	1	J1	SAMTEC_FTMH-102-03-L-DH	Samtec	SAM1130-02-ND
5	1	R1	3.9k	Panasonic Electronic Components	P3.9KJCT-ND
6	2	R2, R3	0 Ohm	Panasonic Electronic Components	P15979CT-ND
7	1	R4	0 Ohm	Panasonic Electronic Components	P0.0JCT-ND
8	1	R5	75 ohm	Panasonic Electronic Components	P75.0LCT-ND
9	1	D1	Green LED 0603	Lite-On	160-1435-1-ND
10	1	U1	TUSB211RWB	Texas Instruments	TUSB211
11	1	U2	LP5907	Texas Instruments	LP5907MFX-3.3/NOPD-ND

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      CAUTION

      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.

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      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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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.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

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Concernant les EVMs avec appareils radio:

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Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

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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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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Interface	interface.ti.com	Medical	www.ti.com/medical
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