

TPS2513EVM-527 Dual Channel USB Dedicated Charging Port Controller

This user's guide describes the evaluation model (EVM) for the TPS2513. The TPS2513 is a dual channel USB dedicated charging port controller.

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1 Descriptions

The TPS2513EVM allows reference circuit evaluation of the TI TPS2513 dual channel USB dedicated charging port controller. This EVM also is available to evaluate the TPS2514, TPS2513A, and TPS2514A. Please note that USB 2 D+/D- is a cross connection to support the TPS2513 5-W application, but for the TPS2513A, due to D+/D- = 2.7 V/2.7 V, USB 2 still supports a 12-W application as USB 1. For TPS2513A dual port application, it is still recommended to use USB 2 as a normal connection and not a cross connection.

1.1 Features

- Supports USB dedicated charging port (DCP) shorting D+ line to D- line
- Supports USB DCP applying 2.0 V on D+ line and 2.7 V on D- line (or a USB DCP applying 2.7 V on D+ line and 2.0 V on D- line)
- Supports USB DCP applying 1.2 V on D+ and D- lines
- Automatically switch D+ and D- line connections for an attached device
- Dual-channel controller
- Operating Range: 4.5 V to 5.5 V
- Available in SOT23-6 package
- TPS2513EVM-527 is also available to evaluate the TPS2514, TPS2513A, and TPS2514A

1.2 Applications

- Vehicle USB power charger
- AC-to-DC adapter with USB port
- Other USB charger

2 EVM Block Diagram

Figure 1 is the block diagram for the EVM.

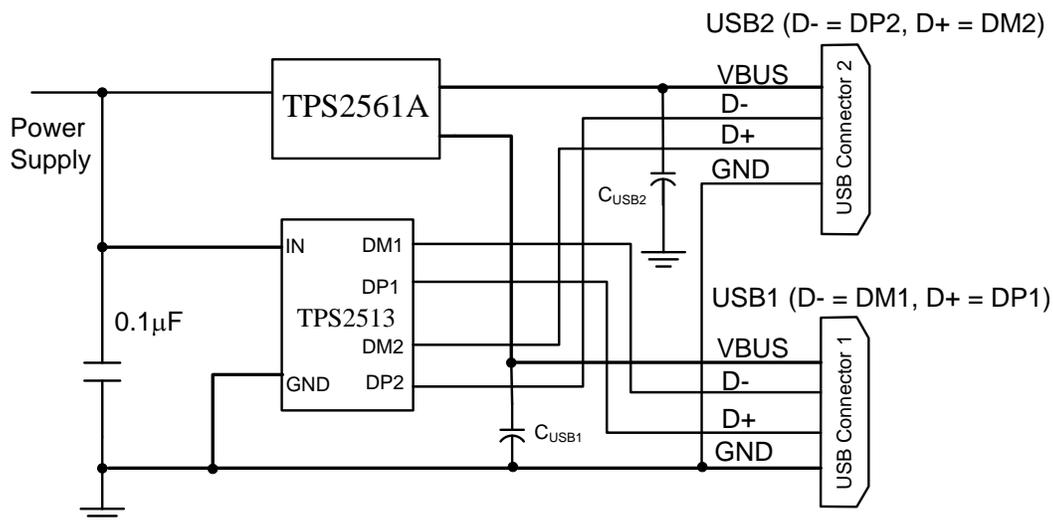


Figure 1. EVM Block Diagram

3 Glossary of Terms

- Charging downstream port (CDP)
 - A downstream port that complies with the USB 2.0 definition of a host or a hub, and additionally defines a handshake on DP and DM to identify a BC 1.1 compliant host to a BC 1.1 compliant portable device
 - BC 1.1 allows a high-speed portable device to draw 900 mA and a low-speed or full-speed device to draw 1500 mA
 - BC 1.2 intention is to allow all devices to draw 1500 mA
 - BC 1.2 corrects BC 1.1 to ensure the USB host provides 5 V at > 1500 mA
- Standard downstream port (SDP)
 - USB 2.0 defined port currently adopted by most USB ports
 - Portable device is allowed to draw 100 mA initially and request additional current over USB communications in 100-mA steps up to a maximum of 500 mA
 - USB host required to provide at least 500 mA at 5 V
 - Portable device must draw less than 2.5 mA when in USB suspend due to the absence of USB communication
- Dedicated charging port (DCP) as defined in BC 1.1
 - BC 1.1 defines a dedicated charging port as a downstream port on a device that outputs power through a USB connector, but is not capable of enumerating a downstream device
 - Wall adapter must source between 500 mA and 1500 mA
 - Portable device may attempt to draw 1800 mA in order to force the wall adapter into constant-current mode
 - BC 1.2 intention is to allow DCP to current limit above 1800 mA
- YD/T 1591-2006, updated 2009
 - PROC Telecommunications Standard
 - Defines wall-adapter requirements
 - Rated current between 500 mA–1500 mA with defined I-V curve

5 Physical Access

[Table 1](#) defines the TPS2513EVM-527 connector functionality, [Table 2](#) defines the test point availability and [Table 3](#) describes the jumper functionality.

Table 1. Connector Functionality

Connector	Functionality
J1	4.5-V to 5.5-V power-input polarity screened on the EVM
J2	USB power input connector
J9	USB power output connector
J10	USB power output connector

Table 2. Test Points

Test Point	Label
TP1	VIN
TP2	FAULT2
TP3	FAULT1
TP4	EN2
TP5	EN1
TP6	VBUS2
TP7	DM2
TP8	DP2
TP9	VBUS1
TP10	DM1
TP11	DP1
TP12	GND
TP13	GND
TP14	GND
TP15	GND

Table 3. Jumpers

Jumper	Label	Description
J3	VIN	Connects VIN to TPS2561A input
J4	EN2	Enable VBUS2
J5	EN1	Enable VBUS1
J6	VIN	Connects VIN to TPS2513 input
J7	VBUS2	Connects VBUS2 to USB2 output connector
J8	VBUS1	Connects VBUS1 to USB1 output connector

6 Test Setup

Figure 3 shows a typical test setup for the TPS2513EVM.

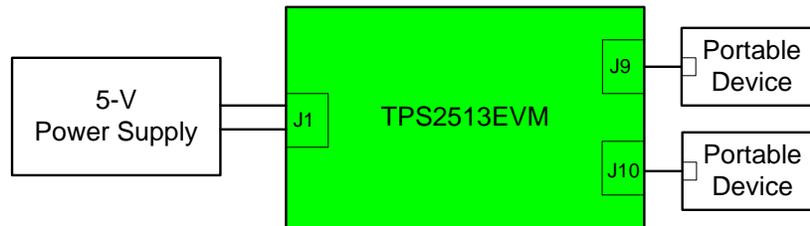


Figure 3. Test Setup

Set the input voltage power supply to 5 V, ± 0.1 V and the current limit to 5 A. Turn off the power supply. Connect the input-power supply to J1; + and – positions are noted on the PWR527 circuit-board silkscreen. Install jumpers J3, J6, J7, and J8. Turn on the 5-V power supply, The VBUS1 LED (D1) and the VBUS2 LED (D2) is on. VIN (TP1) measures 5.0 V, ± 0.1 V. Then connect the portable device to the USB connector.

7 EVM Assembly Drawing and Layout Guidelines

Figure 4 through Figure 6 illustrate the PCB layouts for this EVM.

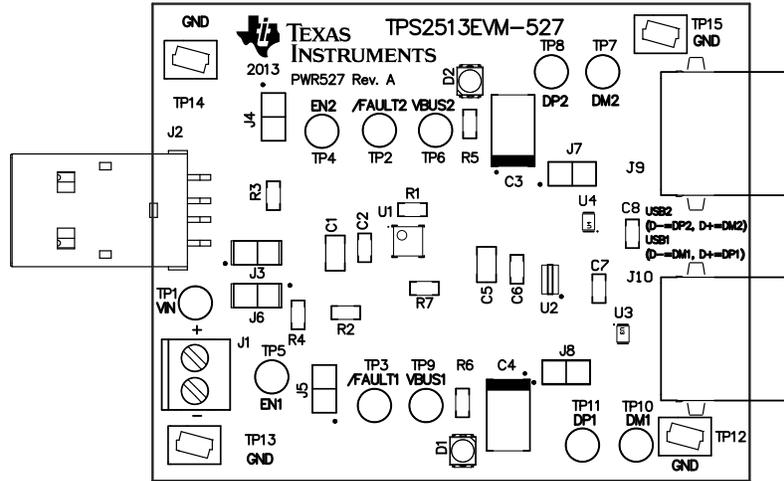


Figure 4. Top Layer Assembly (Top View)

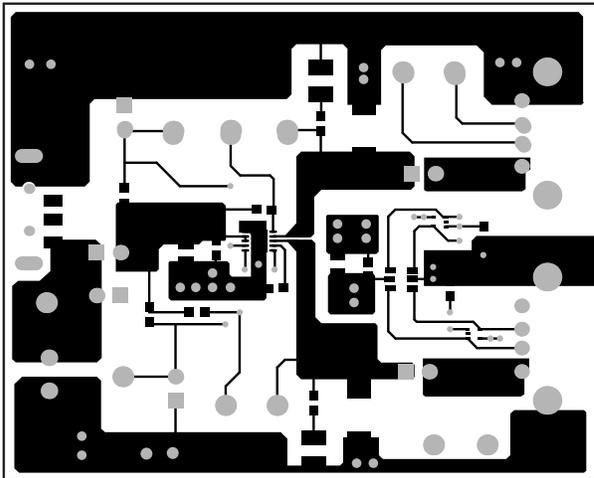


Figure 5. Top Side Routing

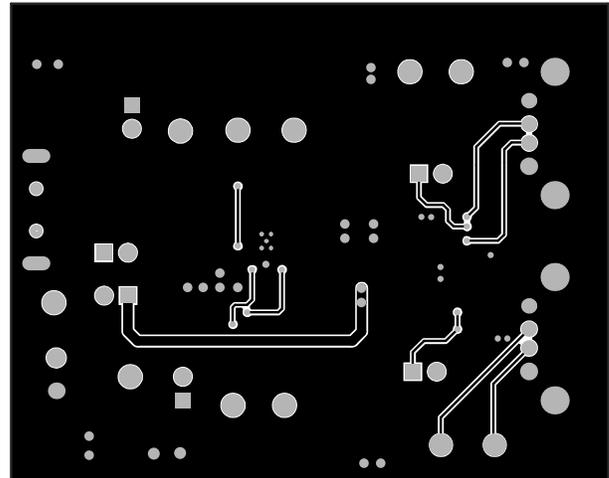


Figure 6. Bottom Side Routing

8 Bill of Materials

Table 4 is the bill of materials for this EVM.

Table 4. TPS2513EVM-527 Bill of Materials

QTY	Designator	Description	Part Number	Manufacturer
2	C1, C5	CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805	C0805C106K8PACTU	Kemet
4	C2, C6, C7, C8	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	C0603X104K3RACTU	Kemet
2	C3, C4	CAP, TA, 150uF, 10V, +/-10%, 0.1 ohm, SMD	TPSD157K010R0100	AVX
2	D1, D2	LED, Amber, SMD	VLMH3100-GS08	Vishay-Semiconductor
1	J1	Conn Term Block, 2POS, 3.5mm, TH	1751248	Phoenix Contact
1	J2	Connector, USB Type A, 4POS R/A, SMD	48037-1000	Molex
6	J3, J4, J5, J6, J7, J8	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	TSW-102-07-G-S	Samtec, Inc.
2	J9, J10	Connector, USB Type A, Receptacle, R/A, TH	292303-4	TE Connectivity
4	R1, R2, R3, R4	RES, 10.0k ohm, 1%, 0.1W, 0603	GRCW060310K0FKEA	Vishay-Dale
2	R5, R6	RES, 2.00k ohm, 1%, 0.1W, 0603	GRCW06032K00FKEA	Vishay-Dale
1	R7	RES, 20.0k ohm, 1%, 0.1W, 0603	GRCW060320K0FKEA	Vishay-Dale
4	SH-J3, SH-J6, SH-J7, SH-J8	Shunt, 100mil, Gold plated, Black	969102-0000-DA	3M
11	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11	Test Point, TH, Multipurpose, White	5012	Keystone
4	TP12, TP13, TP14, TP15	Test Point, SMT, Compact	5016	Keystone
1	U1	DUAL CHANNEL PRECISION ADJUSTABLE CURRENT-LIMITED POWER SWITCHES, DRC0010A	TPS2561ADRC	Texas Instruments
1	U2	DUAL CHANNEL USB DEDICATED CHARGING PORT CONTROLLER, DBV0006A	TPS2513DBV	Texas Instruments
2	U3, U4	Low-Capacitance ±15 kV ESD-Protection Array for High-Speed Data Interfaces, 2 Channels, -40 to +85°C, 5-pin SOT (DRL), Green (RoHS and no Sb/Br)	TPD2E001DRLR	Texas Instruments

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