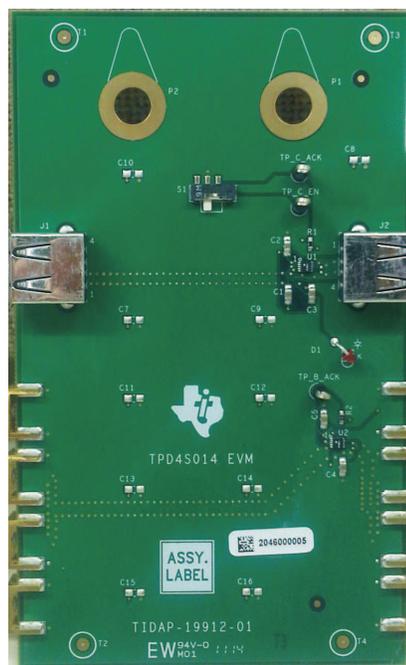


TPD4S014 EVM

Introduction

The TPD4S014 is a single-chip solution for USB charger port protection. This device offers low capacitance TVS type ESD clamps for the D+, D– and standard Capacitance for the ID pin. On the VBUS pin, this device can handle over-voltage protection up to 28V. The over voltage lock-out feature ensures that, if there is a fault condition at the VBUS line, the TPD4S014 is able to isolate the VBUS line and protect the internal circuitry from damage.

Similarly, the under voltage lock out feature ensures that there is no power drain from the internal VCC plane to external VBUS side in case there is short to GND. There is a 16ms turn-on delay after VBUS crosses the under voltage lockout threshold, in order to let the voltage stabilize before closing the switch. This function acts as a deglitch filter and prevents unnecessary switching if there is any ringing on the line during connection.



Highlighted Features

- Over-voltage protection functionality
- Under voltage lockout functionality
- USB connectors used for ease of use
- LED indicating fault condition
- Test point for EN and ACK signals
- D+, D– lines are routed as differential pair
- Bottom section of board can be used for measurement of bandwidth and ESD performance.

EVM Description and Configuration

The TPD4S014EVM consists of two separate sections, the TOP section and the BOTTOM section. Both these sections are powered up by a 1.8V – 3.3V supply. This supply is used for three purposes:

1. To provide the HI and LO logic levels for the EN signal
2. To provide a pullup voltage for the open drain ACK signal
3. To power the fault indicator LED

The TOP section consists of the USB connectors. The connector on the Left (marked INPUT) connects to the VBUS of the TPD4S014 and the one of the right (marked OUTPUT) connects to the VCC of the

TPD4S014. The TOP section has a switch to toggle the polarity of the EN signal. There are labels indicating the HI and LO positions on the switch. There are also test points that can be used to determine the logic level of EN and ACK signals. The TOP section also has an LED that indicates a fault condition. Please note that the LED lights up when the ACK signal is at logic LO. The TOP section is intended to illustrate the functionality of the device without any additional test equipment.

The BOTTOM section consists of the SMB connectors. The connectors are connected to VBUS, VCC, D+, D- and ID pins. There is a test point for the ACK signal. The EN signal on the bottom section is tied to ground i.e. the device is always enabled. The BOTTOM section is intended to be used to measure the performance of the device such as ESD performance, Bandwidth and capacitance measurements, timing characteristics etc.

Setup Procedure

1. Connect a 1.8V – 3.3V power supply between the Vin and GNC connectors of the board. The fault indication LED should light up when this power is applied.
2. Connect a USB cable to the Input connector (left) of board. Connect a variable power supply to the VBUS line on the other end of the cable. Set the Voltage on the power supply to <2V.
3. Connect another USB cable to the output connector (right) of the board. Connect a variable load to the VBUS line on the other end of the cable. Set the load to >25 ohms.
4. Slowly increase the Voltage on the input. The LED should turn OFF when the Voltage crossed 3V.
5. Continue to increase the voltage past 6V. When the voltage crosses 6V the LED should turn ON again indicating a fault (condition).

1 Bill of Materials (BOM)

Count	RefDes	Value	Description	Size	Part Number	MFR
4	C2, C3, C4, C5	10uF	Capacitor, Ceramic, 10 μ F, 6.3V, 10%	0805	Std	Std
1	C1	10uF	Capacitor, Ceramic, 10 μ F, 6.3V, 10%	0805	Std	Std
1	R1	1k Ω	Resistor, Chip, 1 k Ω , 1/8W, 5%	0603	Std	Std
1	R2	10k Ω	Resistor, Chip, 10 k Ω , 1/8W, 5%	0603	Std	Std
1	D1		LED DOME 645NM RD DFF AXL LO CUR	2.08mm x 2.21mm (axial, Flat lead)	HLMP-Q150	Avago
1	S1		SPDT switch 12V , 100 mA, 70 m Ω ON-resistance	8.85mm x 3mm	CSS-1210TB	Copal Electronics
8	TP_C_ACK, TP_B_ACK, TP_C_EN	Test Point	Test Point 5011 Series	63 mil in diameter	5011	Keystone Electronics
2	U1, U2		IC, 10-pin DSQ package	2mm x 2mm	TPD4S014	Texas Instruments
8	SMA1 to SMA8		Sidemount SMB conn. For 0.062 board width		131-3701-801	Emerson Network Power Connectivity Solutions
2	J1,J2	--	USB Right Angle Recpt. Type A		292303-1	Tyco electronics

2 Schematics

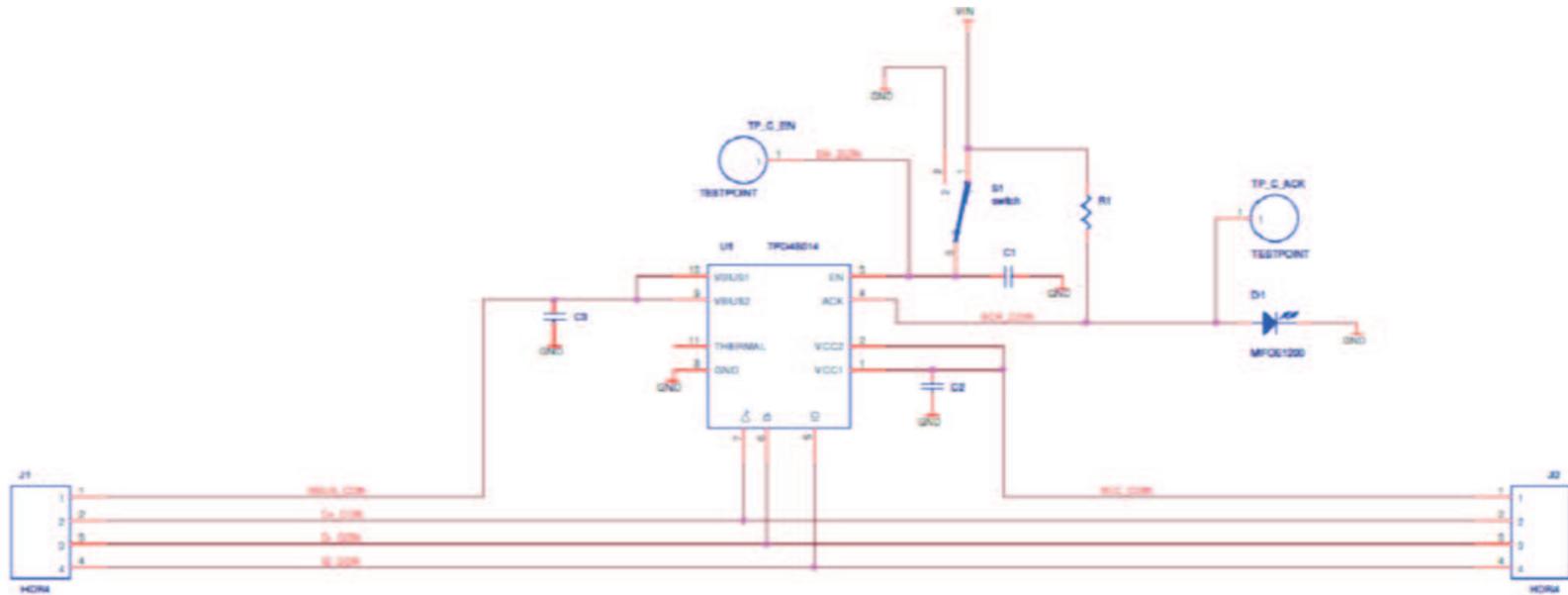


Figure 1. Schematic (Page 1 of 2)

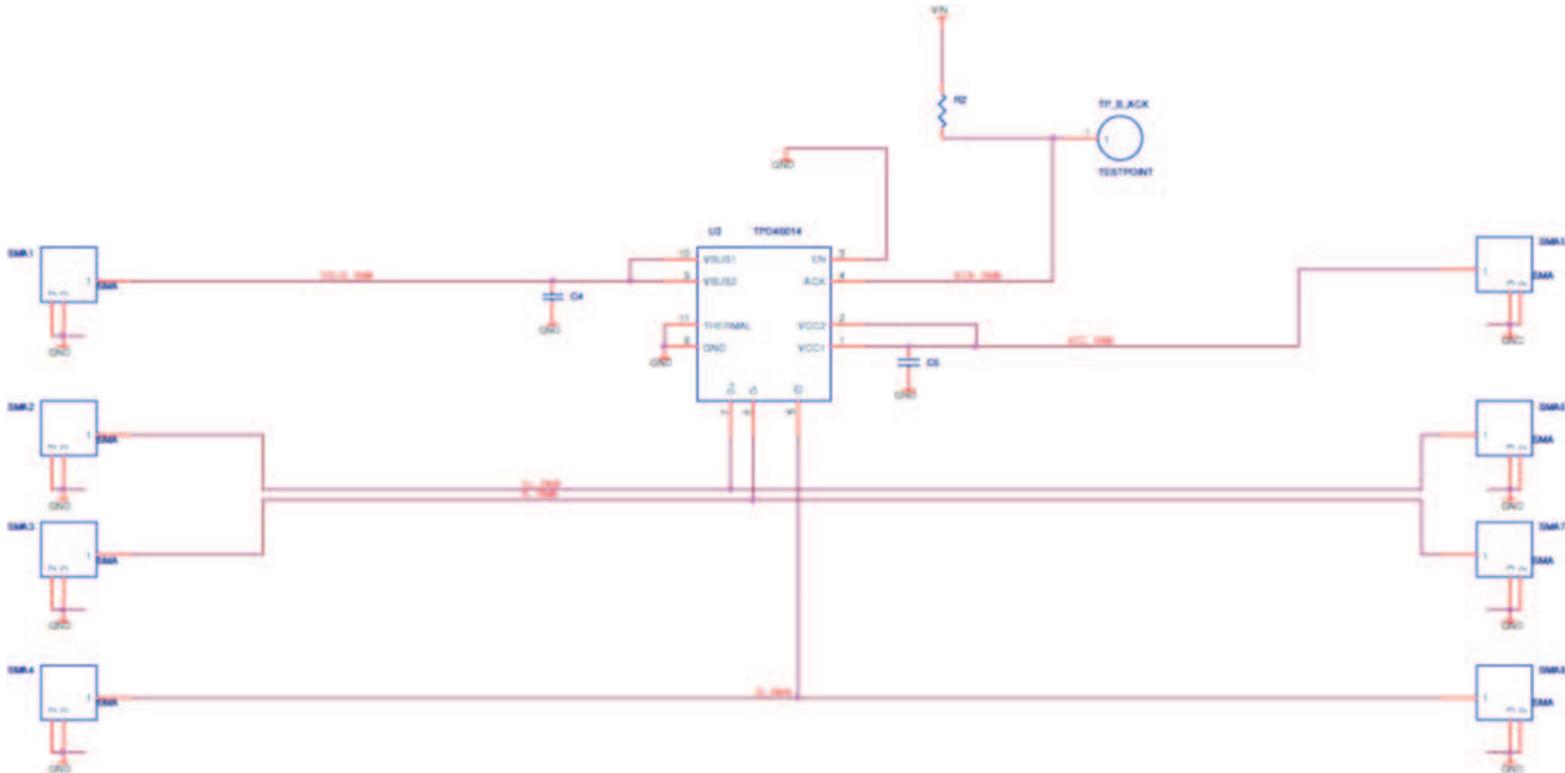


Figure 2. Schematic (Page 2 of 2)

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