Using the TPS22945EVM-082 Single Channel Current Limited Load Switch IC

The TPS22945EVM-082 evaluation module (EVM) allows the user to connect power to and control the 5-pin DCK package load switch. The features of the current limiting switch can be easily evaluated using the EVM connections. Table 1 lists a short description of the TPS22945 load switch performance specifications; for additional details on load switch performance, application notes, and the datasheet see ti.com/loadswitch.

Contents

1 Introduction 2
1.1 Description 2
1.2 Features 2
2 Electrical Performance 2
3 Schematic 2
4 Layout 3
4.1 Setup 4
5 Operation 5
6 Test Configurations 5
6.1 On-Resistance (R_{ON}) Test Setup 5
6.2 Timing Test Setup 6
6.3 Some Examples of TPS22945 Fault Detection Conditions 7
7 Bill of Materials (BOM) 8

List of Figures

1 TPS22945EVM-082 Schematic 2
2 TPS22945EVM-082 Top Assembly 3
3 TPS22945EVM-082 Top Layout 3
4 TPS22945EVM-082 Bottom Layout 4
5 R_{ON} Setup 5
6 Typical Timing Setup 6
7 TPS22945 Over Current Shutdown (V_{IN} = 3.3V) 7
8 TPS22945 Operating in Constant Current Mode with Auto Restart (V_{IN} = 3.3V) 7

List of Tables

1 TPS22945 Current Limit, Blanking Time, Enable, and Auto Restart Characteristics 2
2 TPS22945EVM-082 Bill of Materials 8

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1 Introduction

Table 1. TPS22945 Current Limit, Blanking Time, Enable, and Auto Restart Characteristics

EVM	Device	Current Limit Minimum	Current Limit Blanking Time	Auto Restart Time	Enable (ON Pin)
HVL082	TPS22945	100 mA	10 ms	80 ms	Active High

1.1 Description

The TPS22945EVM is a two sided PCB containing the TPS22945 load switch device. The VIN and VOUT connections to the device and the PCB layout routing provide a low resistance pathway into and out of the device under test. Test point connections allow the EVM User to control the device with user defined test conditions and make accurate R_{ON} and timing measurements.

1.2 Features

- VIN input voltage range: 1.62 V to 5.5 V.
- EVM allows access to the VIN, VOUT, GND, ON and OC pin of the TPS22945 Load Switch Device.
- On board C_{IN} and C_{OUT} capacitors.
- VIN Sense and VOUT Sense test points provide an accurate measurement point of contact to the device.

2 Electrical Performance

Refer to the datasheet for detailed electrical characteristics of the TPS22945 (SLVS832).

3 Schematic

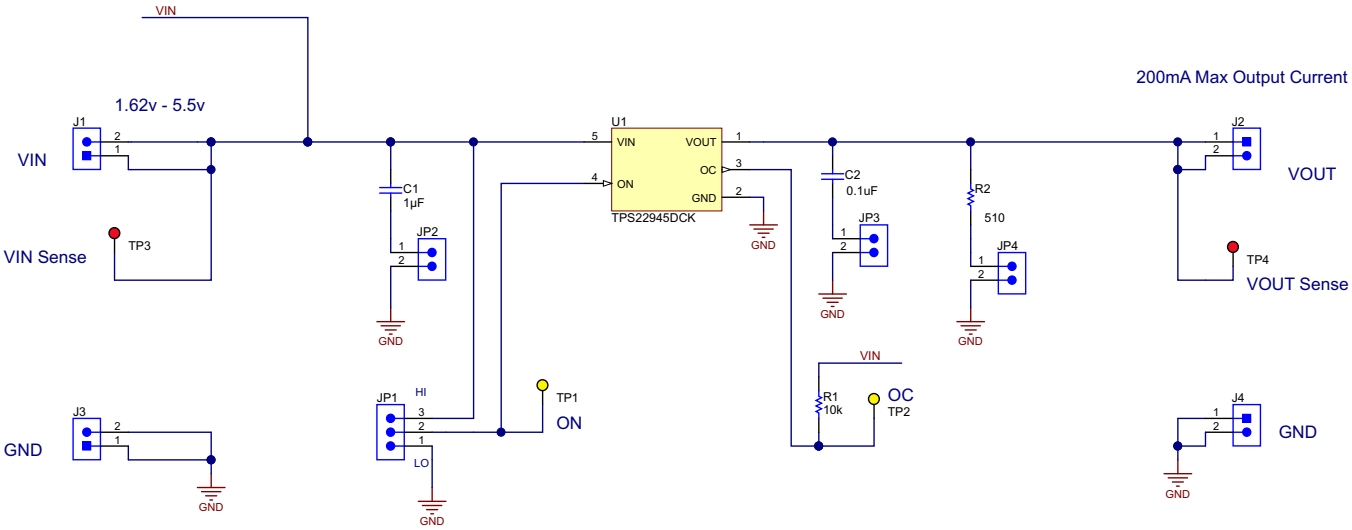


Figure 1. TPS22945EVM-082 Schematic

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4 Layout

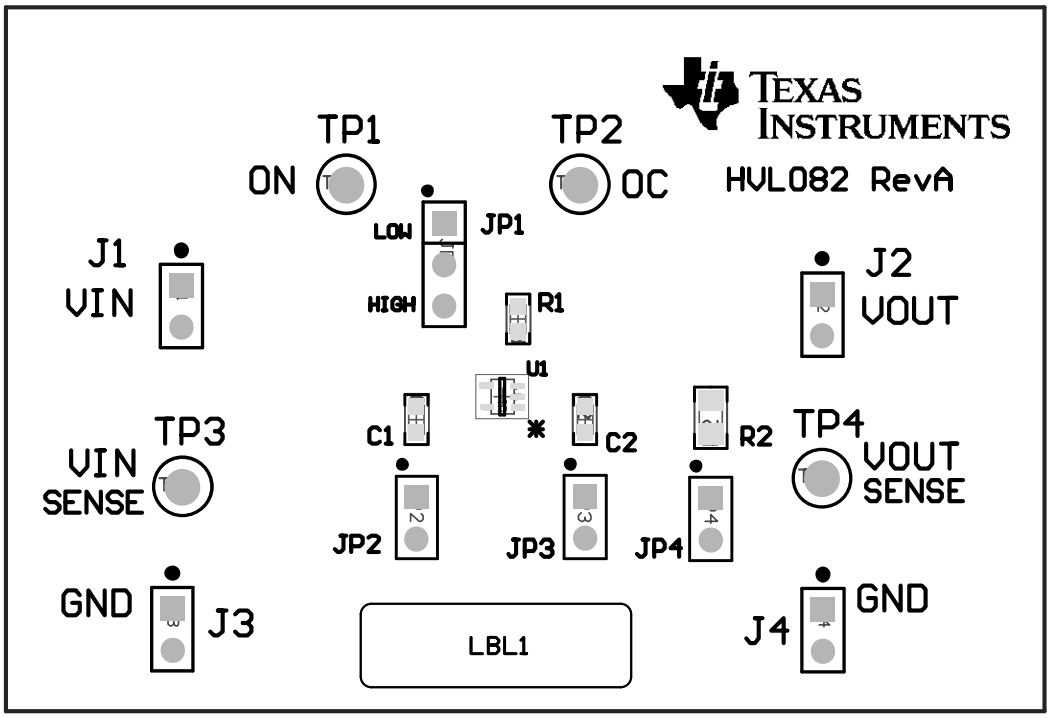


Figure 2. TPS22945EVM-082 Top Assembly

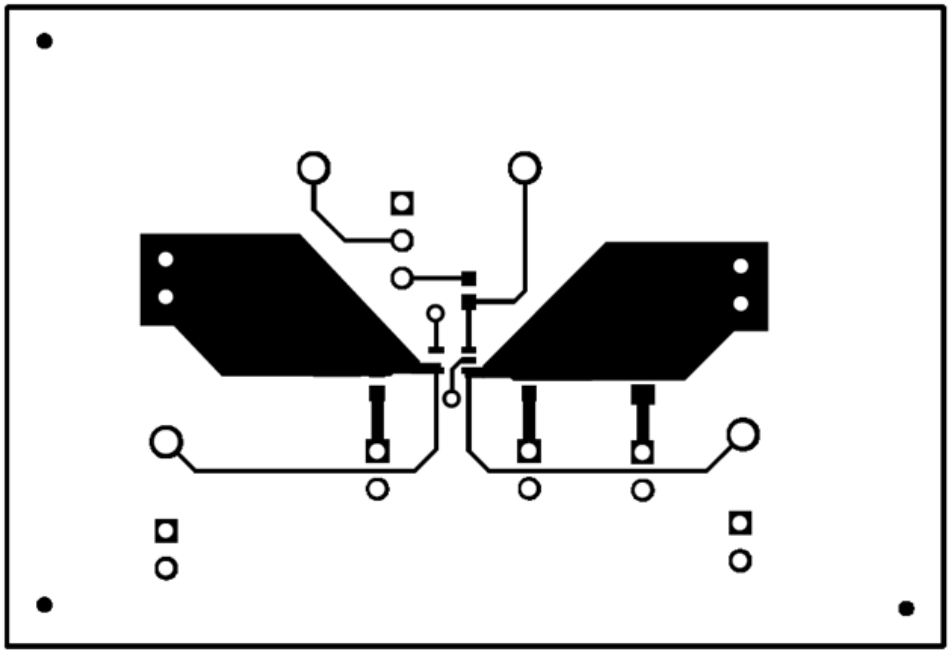


Figure 3. TPS22945EVM-082 Top Layout

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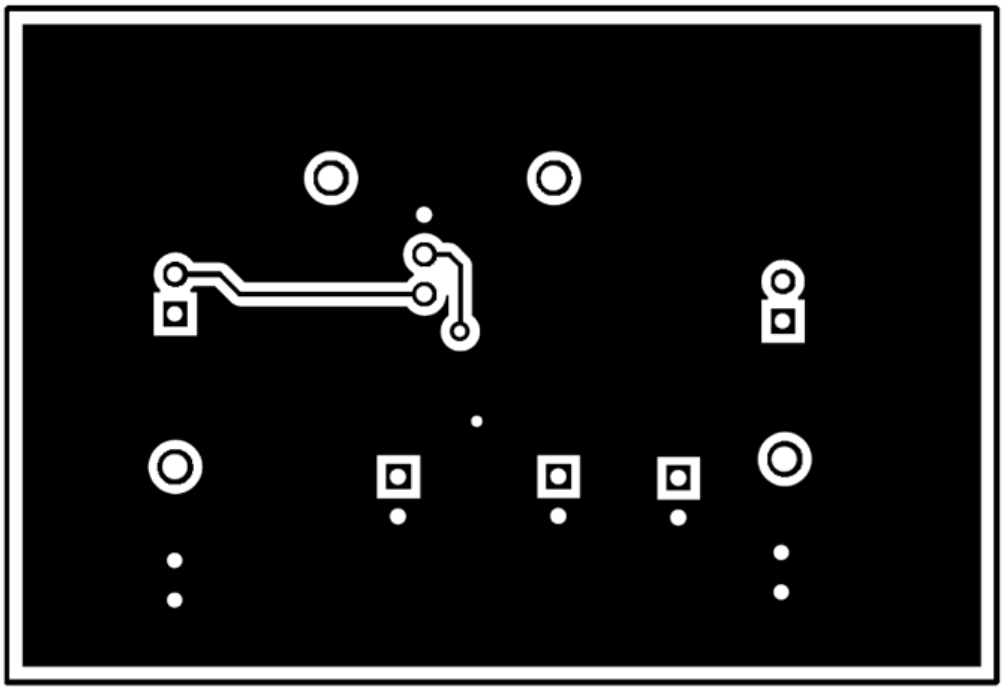


Figure 4. TPS22945EVM-082 Bottom Layout

4.1 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the EVM.

4.1.1 J1 – VIN Connection

This is the connection for the positive lead from the input source

4.1.2 J2 – VOUT Connection

This is the connection point for the output of the device.

4.1.3 JP1 – ON

This is the enable input for the device. A shorting jumper must be installed on JP1 in either the High or Low position. The TPS22945 is active High. ON must not be left floating. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to TP1. Refer to the datasheet for proper ON and OFF voltage level settings. A switching signal may also be used and connected at this point.

4.1.4 TP3 - VIN Sense, TP4 - VOUT Sense

These two connections are used when very accurate measurements of the input or output are required. RON measurements should be made using these sense connections when measuring the voltage drop from VIN to VOUT to calculate the resistance.

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4.1.5 JP2 - Input Capacitor

During normal operation a shorting jumper is placed on JP2 this connects C1 capacitor from the input of the device to ground. Refer to the Applications Section of the datasheet for additional information on selecting the input capacitor.

4.1.6 JP3 - Output Capacitor

During normal operation a shorting jumper is placed on JP3 this connects C2 capacitor from the output of the device to ground. Refer to the Applications Section of the datasheet for additional information on selecting the output capacitor.

4.1.7 J3 – J4– GND

These are connections to GND.

5 Operation

Connect the positive input of the VIN power supply to VIN at J1. Connect the negative lead of the power supply to GND at J3. The input voltage range of the TPS22945EVM-082 is 1.62 V to 5.5 V.

External output loads can be applied to the switch by using J2 VOUT and J4 GND. Configure JP1 as required. JP1 must be installed for proper operation. When the ON pin is asserted high, the output of the TPS22945 will be enabled.

6 Test Configurations

6.1 *On-Resistance (R_{ON}) Test Setup*

Figure 5 shows a typical setup for measuring On-Resistance. The voltage drop across the switch is measured using the sense connections then divided by the current into the load yielding the RON resistance.

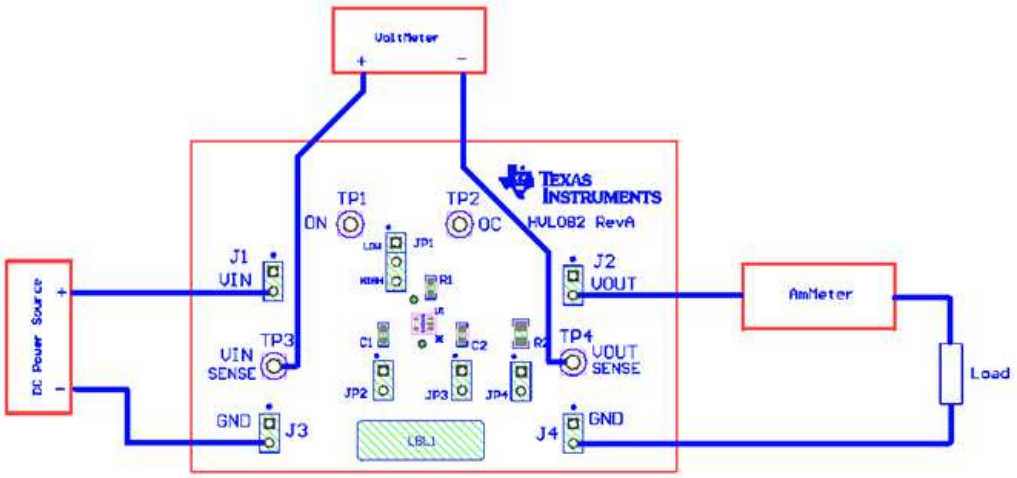


Figure 5. R_{ON} Setup

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6.2 Timing Test Setup

Figure 6 shows a test setup for measuring some of the typical timing features of the TPS22945 load switch. The OC output pin will switch to a low state when an overload condition or other fault conditions are encountered by the device. Connecting the switch as shown below will allow the user to capture these fault conditions with an oscilloscope.

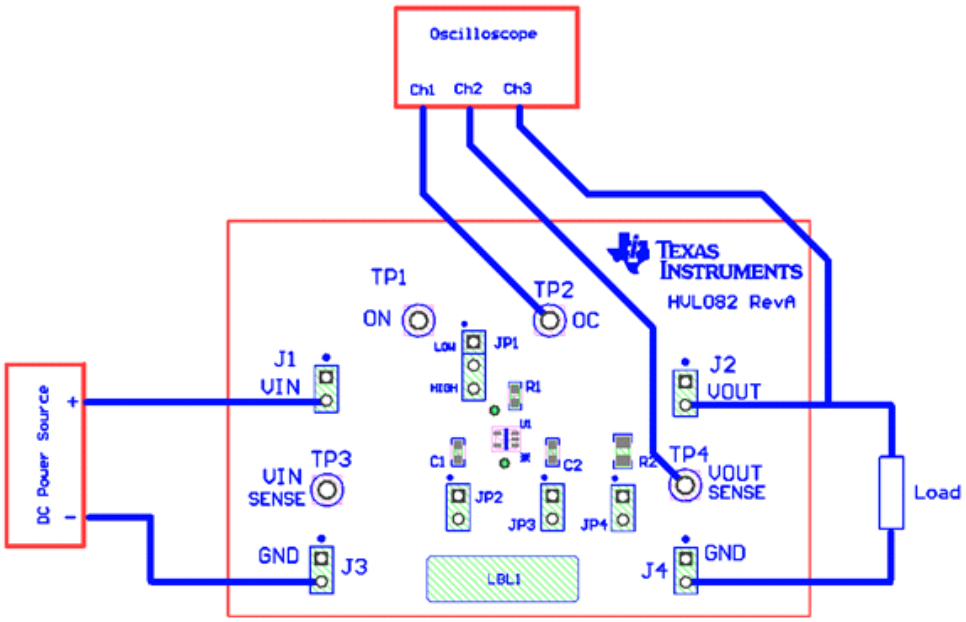


Figure 6. Typical Timing Setup

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6.3 Some Examples of TPS22945 Fault Detection Conditions

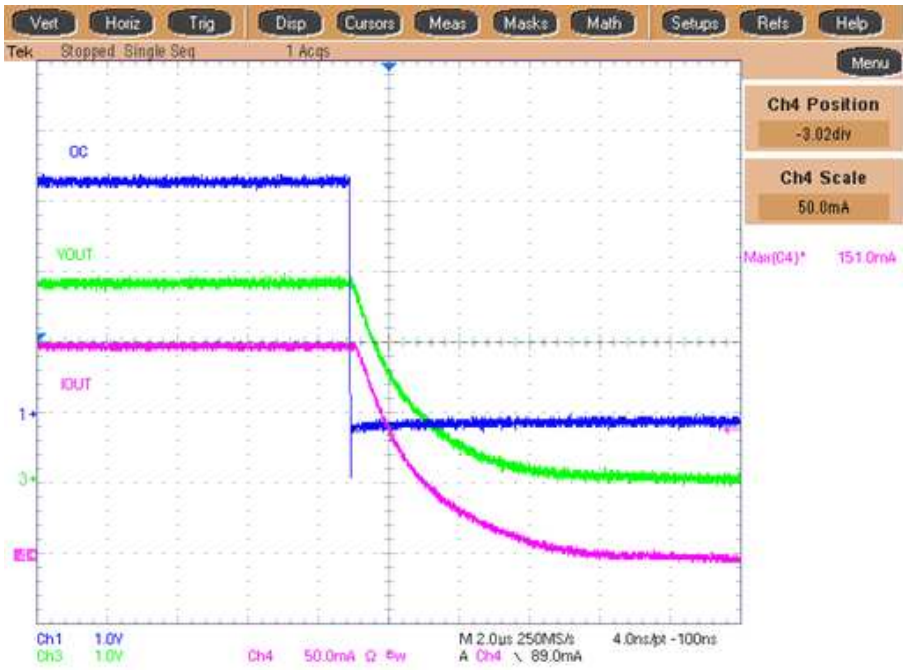


Figure 7. TPS22945 Over Current Shutdown (V_{IN} = 3.3V)



Figure 8. TPS22945 Operating in Constant Current Mode with Auto Restart (V_{IN} = 3.3V)

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7 Bill of Materials (BOM)

Table 2. TPS22945EVM-082 Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
PCB1	1		Printed Circuit Board		HVL082	Any
C1	1	1µF	CAP, CERM, 1µF, 25V, ±10%, X7R, 0603	0603	GRM188R71E105KA12D	Murata
C2	1	0.1µF	CAP, CERM, 0.1µF, 100V, ±10%, X7R, 0603	0603	GRM188R72A104KA35D	Murata
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
J1, J2, J3, J4	4		Header, 100mil, 2x1, Gold, TH	Header, 2x1, 100mil	5-146261-1	TE Connectivity
JP1	1		Header, 100mil, 3x1, Tin plated, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions
JP2, JP3, JP4	3		Header, 100mil, 2x1, Tin plated, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650"H x 0.200"W	THT-14-423-10	Brady
R1	1	10k	RES, 10kΩ, 5%, 0.1W, 0603	0603	CRCW060310K0JNEA	Vishay-Dale
R2	1	510	RES, 510 Ω, 5%, 0.125W, 0805	0805	ERJ-6GEYJ511V	Panasonic
TP1, TP2	2	Yellow	Test Point, Multipurpose, Yellow, TH	Yellow Multipurpose Testpoint	5014	Keystone
TP3, TP4	2	Red	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
U1	1		Low-input-voltage current-limited load switches with shut off and auto-restart feature, DCK0005A	DCK0005A	TPS22945DCK	Texas Instruments
NOTE: Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.						

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