TPS22965WDSGQ1EVM 5.7-V, 4-A, 16-mΩ On-Resistance Load Switch

The TPS22965WDSGQ1EVM evaluation module (EVM) allows the user to connect power to and control the TPS22965W-Q1 and TPS22965NW-Q1 5.7-V, 4-A, 16-mΩ on-resistance load switches. Table 1 summarizes the available EVMs and package options; refer to the device datasheet SLVSCI3 for more details.

Table 1. Device and Package Configurations

EVM Orderable	Device	Device Package	Maximum Voltage	Maximum Continuous Current	Quick Output Discharge
TPS22965WDSGQ1EVM	U1	TPS22965QWDSG-Q1	5.7 V	4 A	Yes
	U2	TPS22965NQWDSG-Q1	5.7 V	4 A	No

Contents

1 Introduction

The TPS22965WDSGQ1EVM evaluation module (EVM) allows the user to connect power to and control the both versions of the TPS22965W-Q1 5.7-V, 4-A, 16-mΩ on-resistance load switch. This allows for easy evaluation of on-resistance and adjustable slew rate.

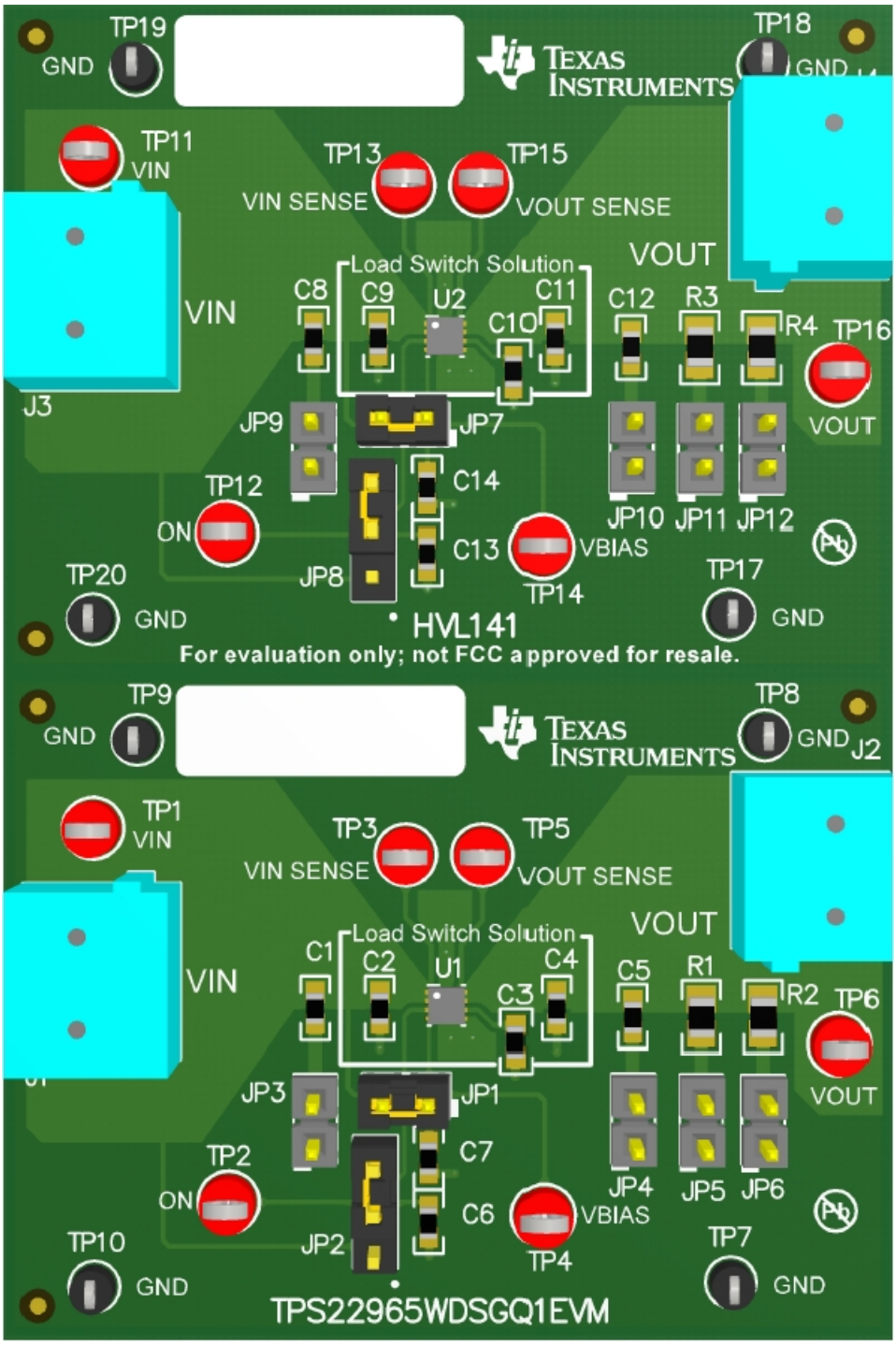

Figure 1. 3D Rendering of EVM

1.1 Typical Applications

- Automotive Electronics
- Infotainment
- ADAS (Advanced Driver Assistance Systems)

1.2 Features

- External capacitors for configurable rise time
- Connection points to VIN, VOUT, VBIAS, ON pins as well as SENSE connections for accurate measurement of VIN and VOUT voltages
- High current connection terminals available for 4 A maximum continuous switch current operation
- VIN input voltage range: 0.8 V to 5.7 V
- VBIAS voltage range: 2.5 V to 5.7 V

2 Electrical Performance

Refer to the datasheet SLVSCI3 for detailed electrical characteristics of the TPS22965W-Q1.

3 Schematic

The schematic for the TPS22965WDSGQ1EVM is shown in Figure 2.

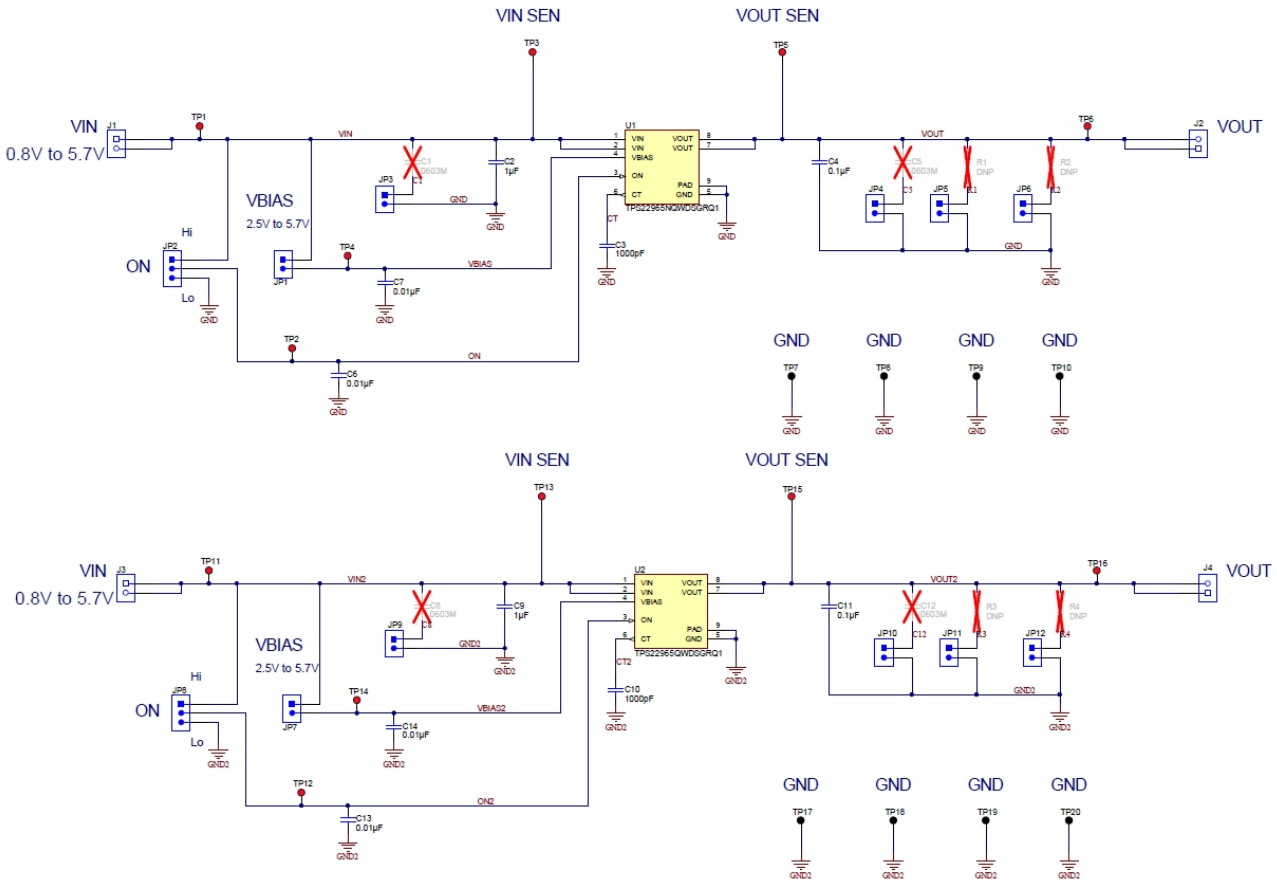

Figure 2. Schematic

4 EVM Connections

This section describes the connectors, jumpers, and test points on the EVM.

4.1 J1/J3 – VIN Power Connections

These are the high current input connections from the power supply. Connect the positive lead to the top (+) thermal and the negative lead to the bottom (–) terminal.

4.2 J2/J4 – VOUT Power Connections

These are the high current output connections for loading the EVM. Connect the positive lead of the load to the top (+) terminal and the GND of the load to the bottom (–) terminal.

4.3 JP1/JP7 – VBIAS Power

These jumpers connect VBIAS to the respective VIN voltage source. VBIAS must be maintained between 2.5 V–5.7 V for proper operation on the TPS22965W-Q1 devices. If testing conditions involve taking the VIN voltage below 2.5 V, remove the shunt across JP1/JP7 and connect VBIAS voltage at TP4/TP14.

4.4 JP2/JP8 – EN Control

These three pin jumpers connect the EN sense resistors either to VIN or to GND. This allow for quickly enabling/disabling the device after power is present.

4.5 TP3/TP13 – VIN Sense

These connects provide and low current path to the input pins of the device for accurate voltage measurements. These sense connections should be used when measuring the voltage drop from VIN to VOUT which is used to calculate the ON resistance. In cases where there is a large load current, it is recommended configure the power supply to use sense connections. Connect the positive sense lead to the VIN sense point to overcome voltage drop in cabling.

4.6 TP5/TP15 – VOUT Sense

These connects provide and low current path to the output pins of the device for accurate voltage measurements. These sense connections should be used when measuring the voltage drop from VIN to VOUT which is used to calculate the ON resistance.

4.7 TP2/TP12 – EN

These test points can be used to drive the EN pin independently when JP2/JP8 is removed.

4.8 TP7/TP8/TP9/TP10/TP17/TP18/TP19/TP20 – GND

These are the GND connection points to the EVM.

4.9 List of Connections

The EVM Connections are summarized in Table 2.

Table 2. EVM Connection Points

Connection	Name	Description
J1, J3	VIN	DC input to VIN
J2, J4	VOUT	Load connection for VOU
JP1, JP7	VBIAS Power	Connects VBIAS to VIN
JP2, JP8	EN Control	Connects EN resistors to VIN or GND
TP3, TP13	VIN Sense	Sense connection to VIN
TP4, TP14	VBIAS	VBIAS connection

Table 2. EVM Connection Points (continued)

Connection	Name	Description
TP2, TP12	EN	EN connection
TP5, TP15	VOUT Sense	Sense connection to VOUT
TP7, TP8, TP9, TP10, TP17, TP18, TP19, TP20	GND	Connection to board ground

5 Test Setup

This section will describe how to take key parameter measurements on the EVM.

5.1 R_{ON} Test Procedure

1. Setup the EVM per Figure 3.
2. Set SOURCE1 level to 5.0 V.
3. Turn on SOURCE1.
4. Record the voltage reading from METER1 as well as the input current reading from SOURCE1.
5. Turn SOURCE1 off.
6. Calculate the Resistance of the switch by dividing the voltage reading from METER1 by the current reading from SOURCE1.

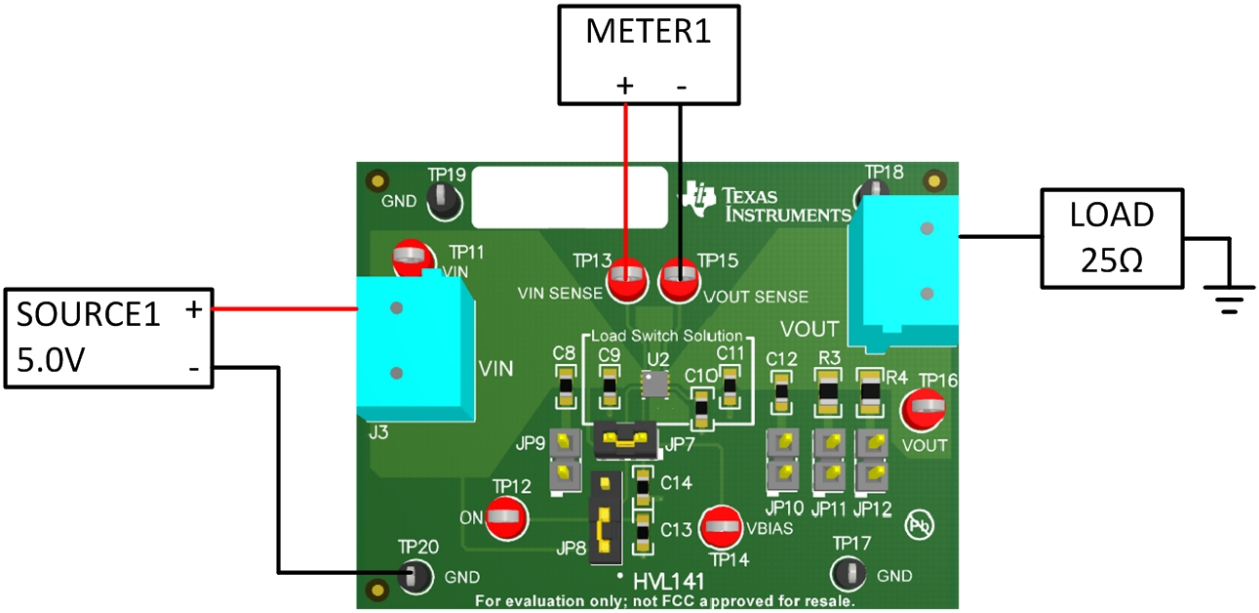

Figure 3. R_{ON} Test Setup

5.2 AC Parameter Test Procedure (t_R, t_{ON}, t_F, t_{OFF}, t_D)

1. A detailed description of t_R, t_{ON}, t_F, t_{OFF}, and t_D are listed in the TPS22965W-Q1 Datasheet under the Switching Characteristics Section.
2. The rise time (tR) is selected by the CT capacitor value on each switch channel. The EVM is shipped with a default CT value of 1 nF.
3. Set up the EVM per Figure 4.
4. Set SOURCE1 level to 5.0 V.

5. Set Signal Generator output to 0–2 Vpp, 10–100 Hz, and 25% duty cycle.
6. Turn SOURCE1 on.
7. Enable the Signal Generator output.
8. Rise time (t_R), turn-on time (t_{ON}), and delay time (t_D) can be observed with a Oscilloscope sync the scope trigger on the rising edge of the on signal.
9. Fall time (t_F) and turn-of time (t_{OFF}) can be observed from the oscilloscope by charging the scope triggering to sync with the falling edge of the ON signal.
10. Turn SOURCE1 off and disable the signal generator output.

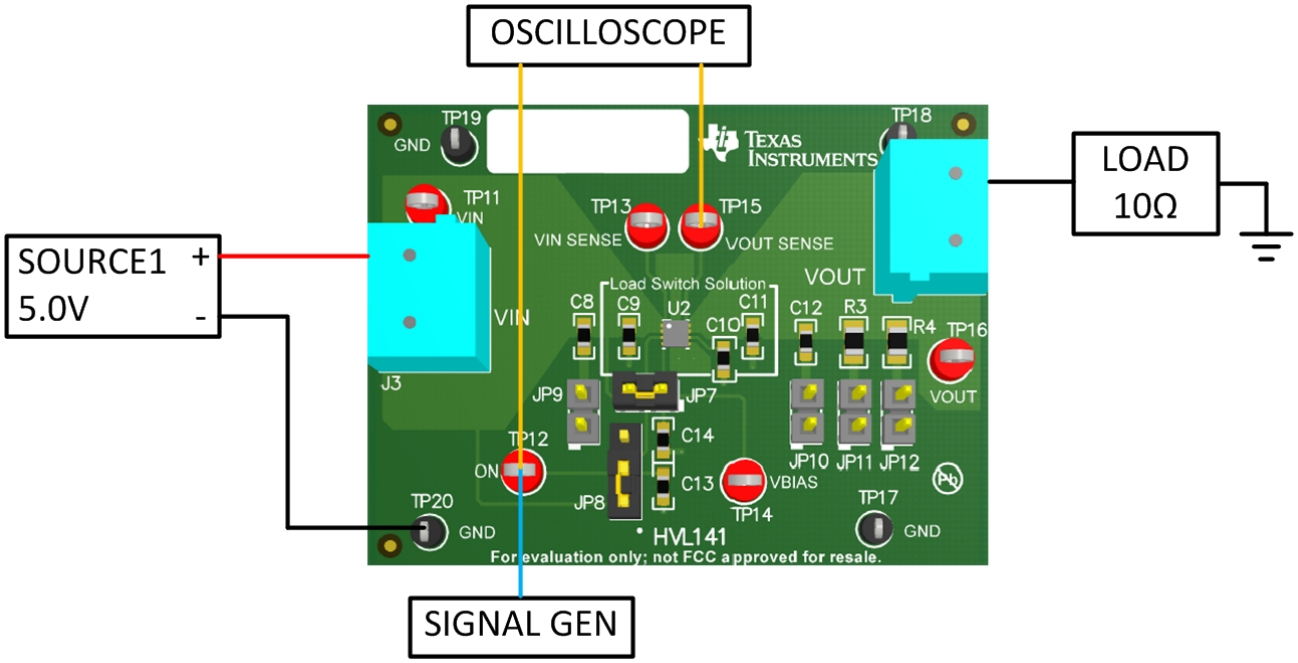

Figure 4. AC Parameter Test Setup

6 Board Assembly and Layout

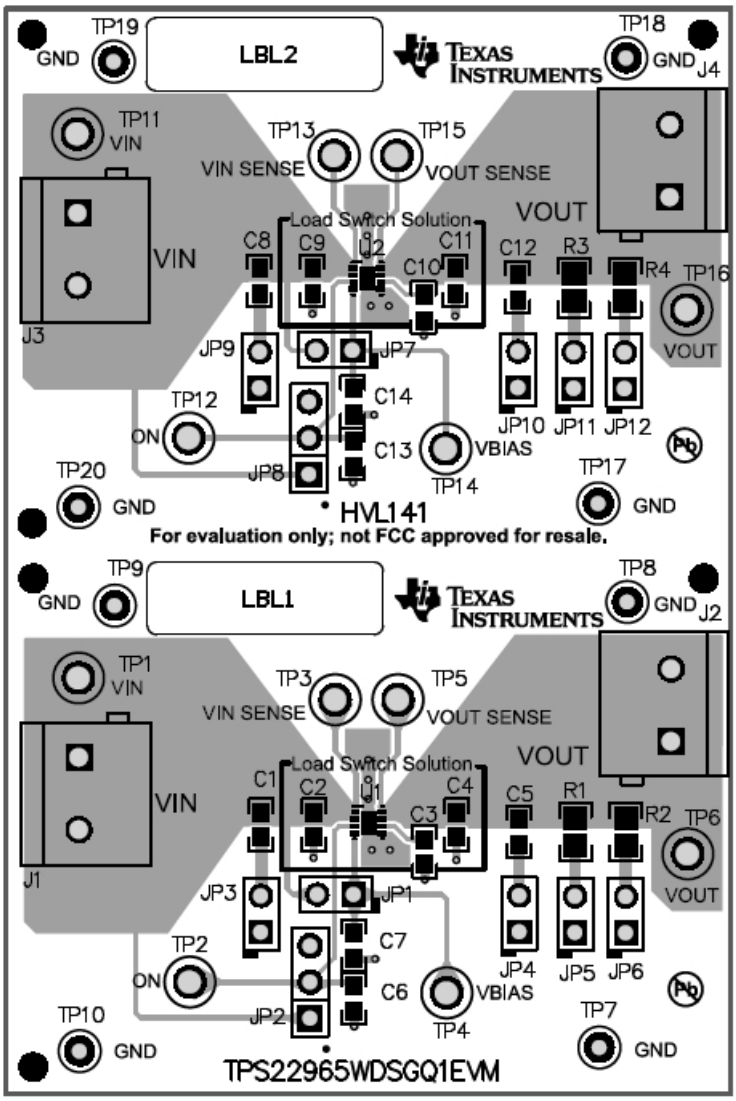

Figure 5. Top Side

7 TPS22965WDSGQ1EVM Bill of Materials

This section contains details on the bill of materials for the TPS22965WDSGQ1EVM. Unpopulated items have a quantity of 0.

Table 3. TPS22965WDSGQ1EVM Bill of Materials

Designator	Qty	Description	Package Reference	Part Number	Manufacturer
C2, C9	2	CAP, CERM, 1 µF, 16 V, ±10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C6, C7, C13, C14	4	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	0603	C0603C103J5RACTU	Kemet
C3, C10	2	CAP, CERM, 1000 pF, 50 V, ±10%, X7R, 0603	0603	C0603C102K5RACTU	Kemet
C4, C11	2	CAP, CERM, 0.1 µF, 25 V, ±10%, X7R, 0603	0603	C1608X7R1E104K	TDK
J1, J2, J3, J4	4	TERMINAL BLOCK 5.08MM VERT 2POS, TH	TERM_BLK, 2pos, 5.08mm	ED120/2DS	On-Shore Technology
JP1, JP3, JP4, JP5, JP6, JP7, JP9, JP10, JP11, JP12	10	Header, 100mil, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	HMTSW-102-07-G-S-240	Samtec
JP2, JP12	2	Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
R1, R2, R3, R4	0	RES, 1.0 k, 5%, 0.125 W, 0805	0805	CRCW08051K00JNEA	Vishay-Dale
SH-JP1, SH-JP2, SH-JP7, SH-JP8	4	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6, TP11, TP12, TP13, TP14, TP15, TP16	12	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP7, TP8, TP9, TP10, TP17, TP18, TP19, TP20	8	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone
U2	1	'5.7V, 4A, 16mΩ On-Resistance Load Switch	DSG0008A	TPS22965QWDSG-Q1	Texas Instruments
U1	1	'5.7V, 4A, 16mΩ On-Resistance Load Switch	DSG0008A	TPS22965NQWDSG-Q1	Texas Instruments
C1, C5, C8, C12	0	CAP, CERM, 1 µF, 16 V, ±10%, X5R, 0603	0603	C1608X5R1C105K	Vishay-Dale

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