TPS22918 Load Switch Evaluation Module

The TPS22918EVM evaluation module (EVM) allows the user to connect power to and control the 6-pin SOT-23 package load switch. Parameters such as the on-resistance, rise time, and output pull-down resistance can easily and accurately evaluated. Table 1 lists a short description of the TPS22918 load switch performance specifications; for additional details on load switch performance, application notes, and the datasheet, see www.ti.com/loadswitch.

Table 1. TPS22918 Rise Time, Output Current Rating, Enable, and Output Discharge Characteristics

EVM	Device	Rise Time Typical (µs)	V_{IN} (V)	Maximum Continuous Current (A)	Enable (ON Pin)	Quick Output Discharge
HVL140	TPS22918	Adjustable	1 to 5.5	2	Active High	Adjustable

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1 Introduction

1.1 Description

The TPS22918EVM is a two-layer PCB containing the TPS22918 load switch device. The VIN and VOUT connections to the device and the PCB layout routing are capable of handling high continuous currents and 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} measurements.

1.2 Features

This EVM has the following features:

- V_{IN} input voltage range: 1V to 5.5V
- Access to the VIN, VOUT, CT, QOD, GND, and ON pins of the TPS22918 load switch device
- Onboard C_{IN}, C_{OUT}, and CT capacitors
- 2-A maximum continuous current operation
- Ability to adjust the QOD resistance using jumpers

2 Electrical Performance

Refer to the data sheet SLVSD76 for detailed electrical characteristics of the TPS22918.

3 Schematic

Figure 1 illustrates the EVM schematic.

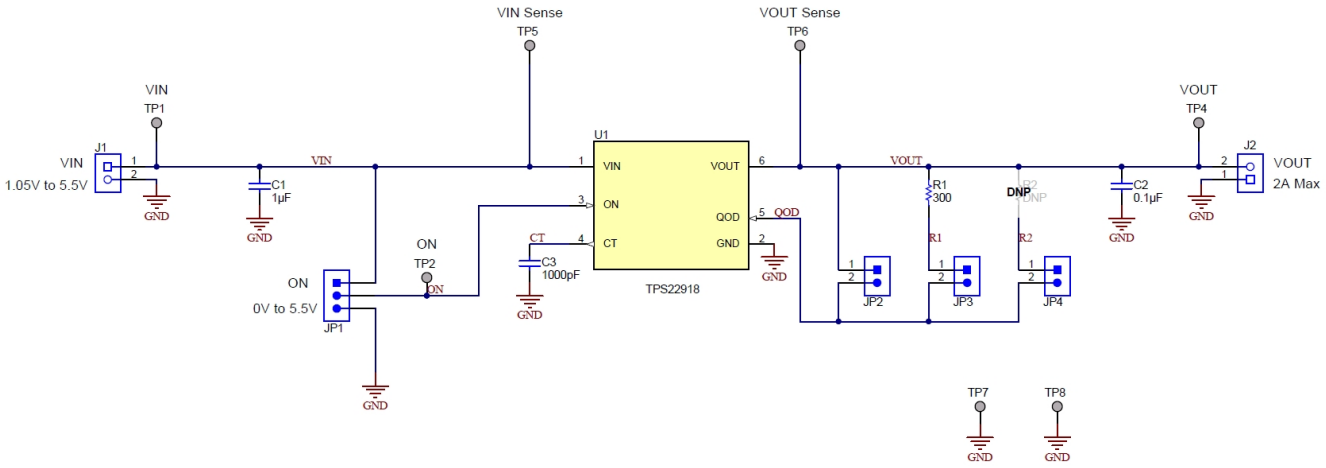

Figure 1. TPS22918EVM Schematic

4 Layout

Figure 2 and Figure 3 show the PCB layout images.

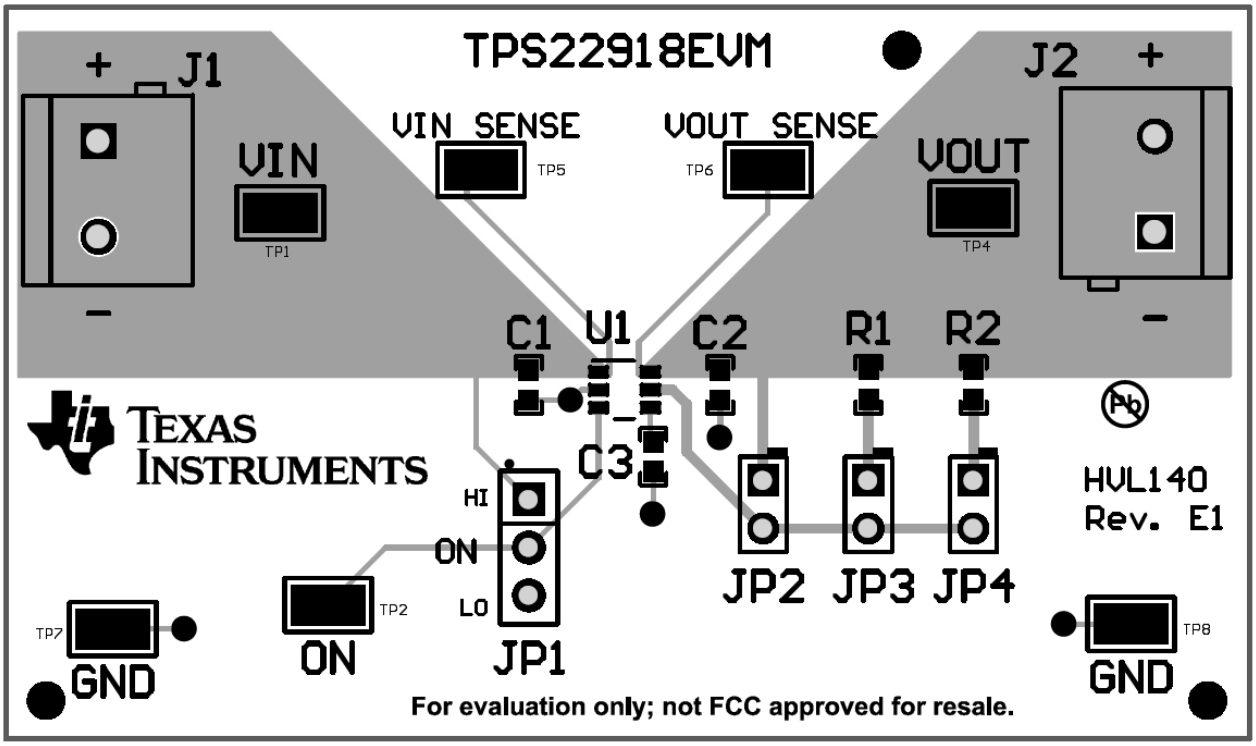

Figure 2. TPS22918EVM Top Layout

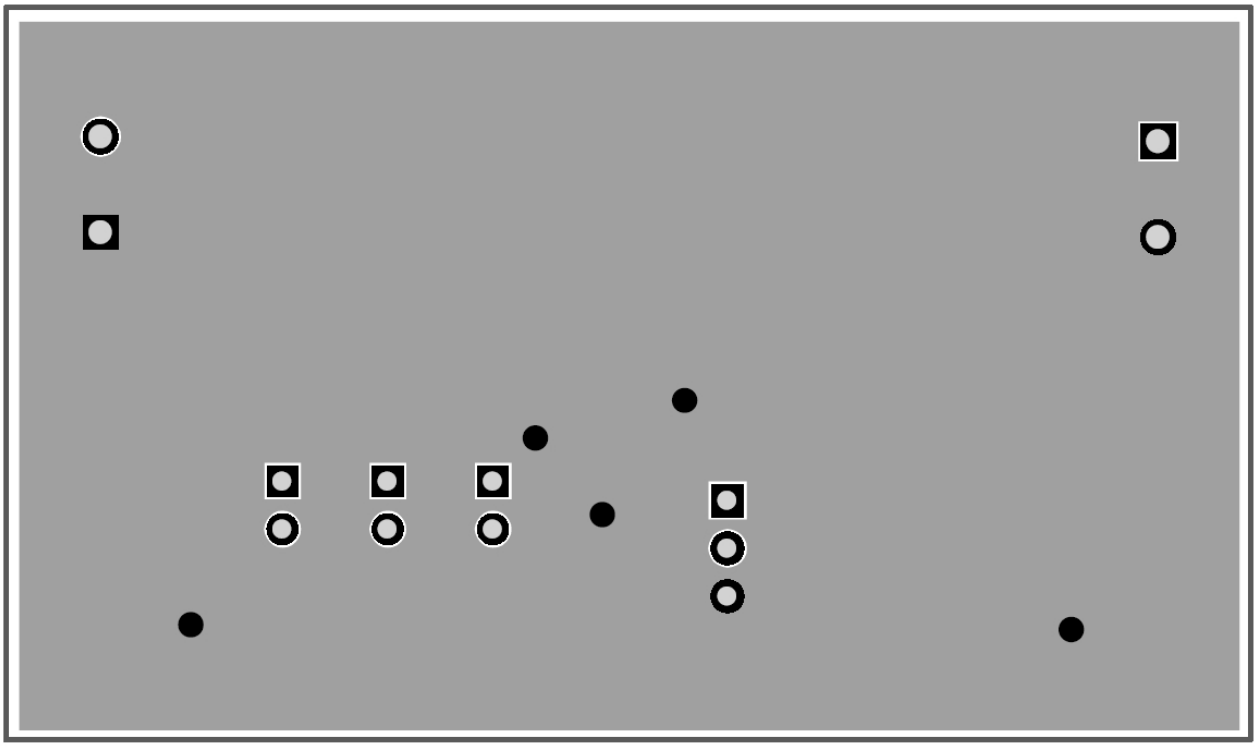

Figure 3. TPS22918EVM Bottom Layout

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, TP1 – Input Connection

This is the connection for the leads from the input source. Connect the positive lead to the + terminal (VIN) and the negative lead to the – terminal (GND).

4.1.2 J2, TP4 – Output Connection

This is the connection for the output of the EVM. Connect the positive lead to the + terminal (VOUT) and the negative lead to the – terminal (GND).

4.1.3 JP1, TP2 – 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 TPS22918 is active high, and 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 TP2. 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 JP2, JP3, JP4 - Quick Output Discharge (QOD) Resistance

During normal operation, a shorting jumper is placed on JP2. This connects the QOD pin to the VOUT pin of the device, enabling an internal resistance (R_{PD}) from VOUT to GND when the device is disabled. The value of R_{PD} for a specific VIN voltage can be found in the TPS22918 datasheet. If no output discharge is desired, then the shunt can be removed.

To adjust the QOD resistance, use the following equation:

$$R_{QOD} = R_{PD} + R_{EXT} \quad (1)$$

R_{QOD} is the total output discharge resistance, R_{PD} is the internal pull-down resistance, and R_{EXT} is an added external resistance placed between the QOD pin and VOUT pin. If a shunt is placed on JP3, then a 300-Ω external resistance is added in series with the QOD pin, enabling a total QOD resistance of R_{PD} + 300 Ω. If a shunt is placed on JP4, then the resistance R2 can be added in series to R_{PD}.

4.1.5 TP5 - VIN Sense, TP6 - VOUT Sense

These two connections are used when very accurate measurements of the input or output are required. Make R_{ON} measurements using these sense connections when measuring the voltage drop from VIN to VOUT.

4.1.6 TP7, TP8 – GND

These are connections to GND.

5 Operation

Connect the VIN power supply to the J1 terminal (VIN). The input voltage range of the TPS22918EVM is 1 V to 5.5 V.

External output loads can be applied to the switch by using the J2 terminal (VOUT). The TPS22918EVM is rated for a maximum continuous current of 2 A. A shunt on JP1 must be installed for proper operation. When the ON pin is asserted high, the output of the TPS22918 is enabled.

6 Test Configurations

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

Figure 4 shows the typical setup for measuring on-resistance. The voltage drop across the switch is measured using the sense connections, and this can be divided by the load current to calculate the R_{ON} resistance.

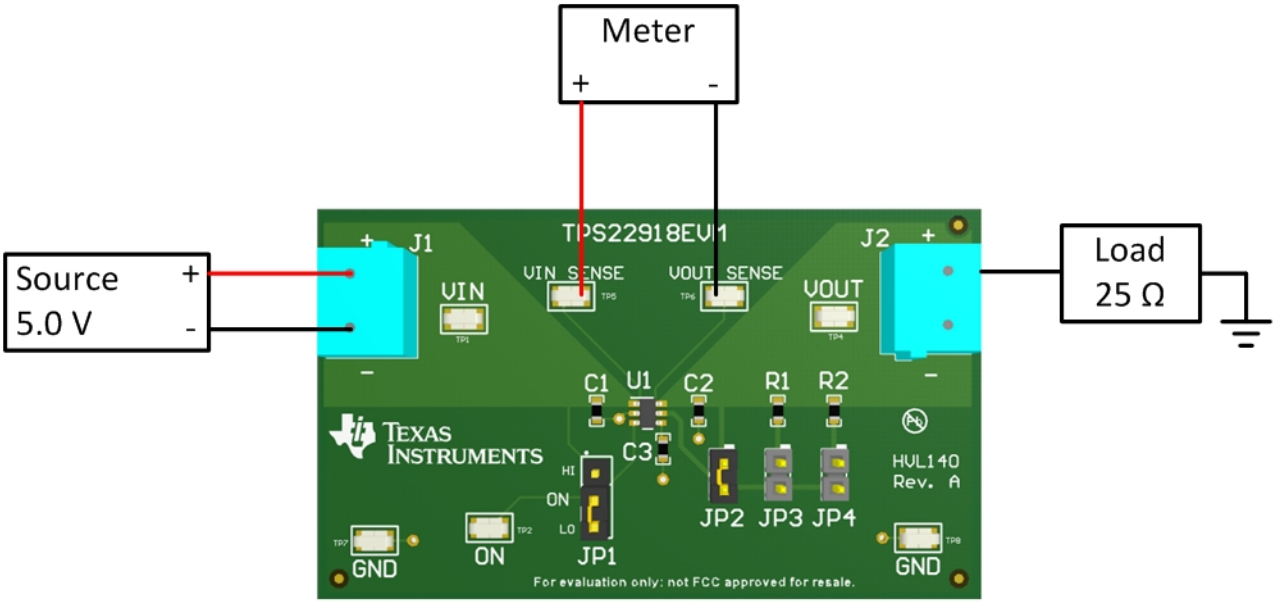

Figure 4. R_{ON} Test Setup

6.2 Rise Time Test Setup

Figure 5 shows the test setup for measuring the rise time of the TPS22918. Apply a square wave to the ON pin of the switch using a function generator and apply a voltage to the VIN terminal using a power supply. Observe the waveform at VOUT Sense (TP6) with an oscilloscope to measure the slew rate and rise time of the switch with a given input voltage. To vary the output voltage rise time, change the default 1000-pF CT capacitor (C3). For more information on the rise time variance with CT capacitor value, refer to the TPS22918 data sheet (SLVSD76).

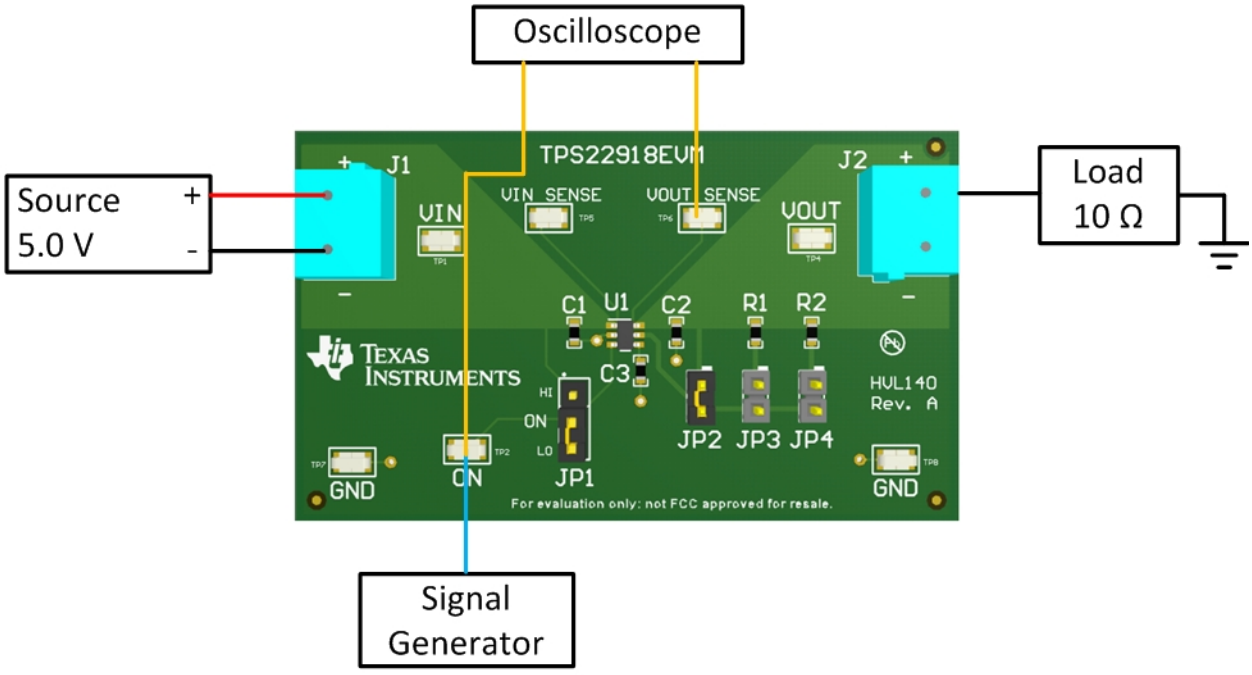

Figure 5. Rise Time Test Setup

6.3 V_{OUT} Rise Time Example

Figure 6 shows an example of a rise time measurement taken on the TPS22918EVM.

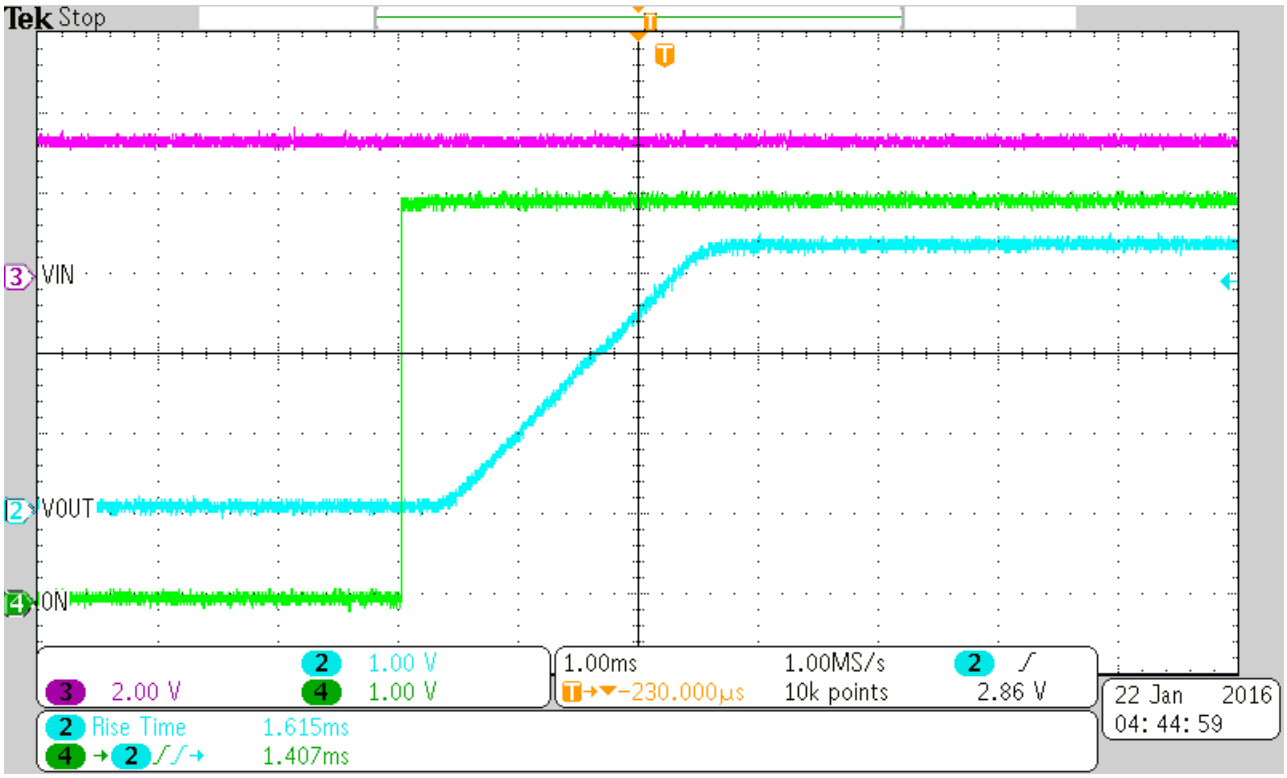

Figure 6. TPS22918 V_{OUT} t_R Example (V_{IN} = 3.3 V, CT = 1000 pF, R_L = 10 Ω)

7 Bill of Materials (BOM)

Table 2 lists the EVM BOM.

Table 2. Bill of Materials TPS22918EVM

Qty	Designator	Value	Description	Package Reference	Manufacturer	Part Number
1	!PCB		Printed Circuit Board		Any	HVL140
1	C1	1uF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0603	0603	TDK	C1608X5R1C105K
1	C2	0.1uF	CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0603	0603	TDK	C1608X7R1E104K
1	C3	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0603	0603	Kemet	C0603C102K5RACTU
2	J1, J2	PEC02SAAN	TERMINAL BLOCK 5.08MM VERT 2POS, TH	TERM_BLK, 2pos, 5.08mm	On-Shore Technology	ED120/2DS
1	JP1		Header, 100mil, 3x1, Gold, TH	3x1 Header	Samtec	TSW-103-07-G-S
3	JP2, JP3, JP4		Header, 100mil, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	Samtec	HMTSW-102-07-G-S-240
1	R1	300	RES, 300, 5%, 0.1 W, 0603	0603	Vishay-Dale	CRCW0603300RJNEA
1	R2	1k	RES, 1.0 k, 5%, 0.1 W, 0603	0603	Vishay-Dale	CRCW06031K00JNEA
2	SH-J1, SH-J2	1x2	Shunt, 100mil, Gold plated, Black	Shunt	3M, Alternate: Samtec	969102-0000-DA, Alternate: SNT-100-BK-G
7	TP1, TP2, TP4, TP5, TP6, TP7, TP8		Test Point, Miniature, SMT	Test Point, Miniature, SMT	Keystone	5019
1	U1		5.5-V, 2-A, 54mohm On-Resistance Load Switch, DBV0006A	DBV0006A	Texas Instruments	TPS22918QDBV
0	FID1, FID2, FID3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A

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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.*

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