THE DATASHEET OF

TPS22917EVM

User's Guide
SLVUB64–October 2017

TPS22917 Load Switch Evaluation Module

The TPS22917EVM 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 be easily and accurately evaluated. Table 1 lists a short description of the TPS22917 load switch performance specifications; for additional details on load switch performance, application notes, and the datasheet, see www.ti.com/loadswitch.

Table 1. TPS22917 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
HVL184	TPS22917	Adjustable	1 to 5.5	2	Active High	Adjustable

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1 Introduction

1.1 Description

The TPS22917EVM is a two-layer PCB containing the TPS22917 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: 1 V to 5.5 V
- Access to the VIN, VOUT, CT, QOD, GND, and ON pins of the TPS22917 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 *TPS22917 1 V–5.5-V, 2-A, 80-mΩ Ultra-Low Leakage Load Switch* for detailed electrical characteristics of the TPS22917.

3 Schematic

Figure 1 illustrates the EVM schematic.

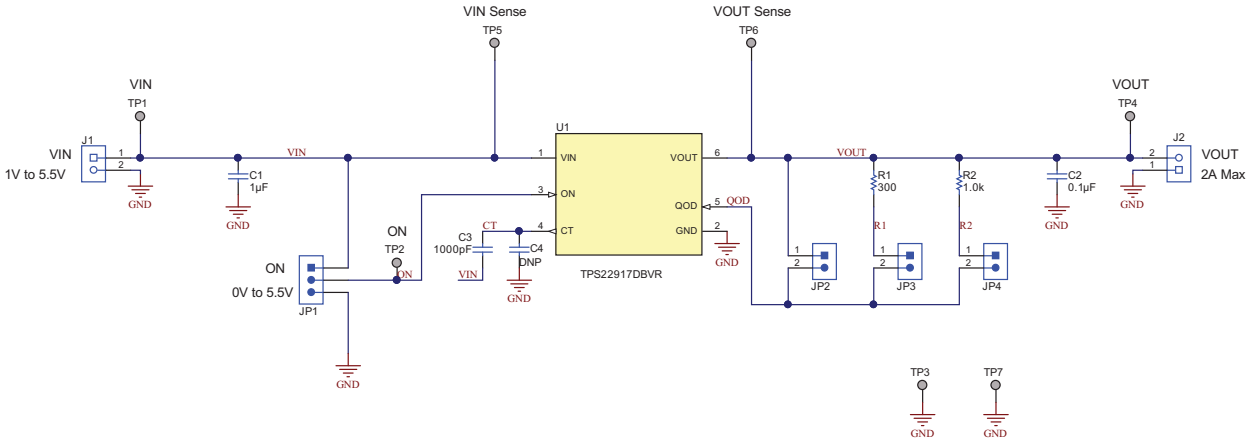

Figure 1. TPS22917EVM Schematic

4 Layout

Figure 2 and Figure 3 show the PCB layout images.

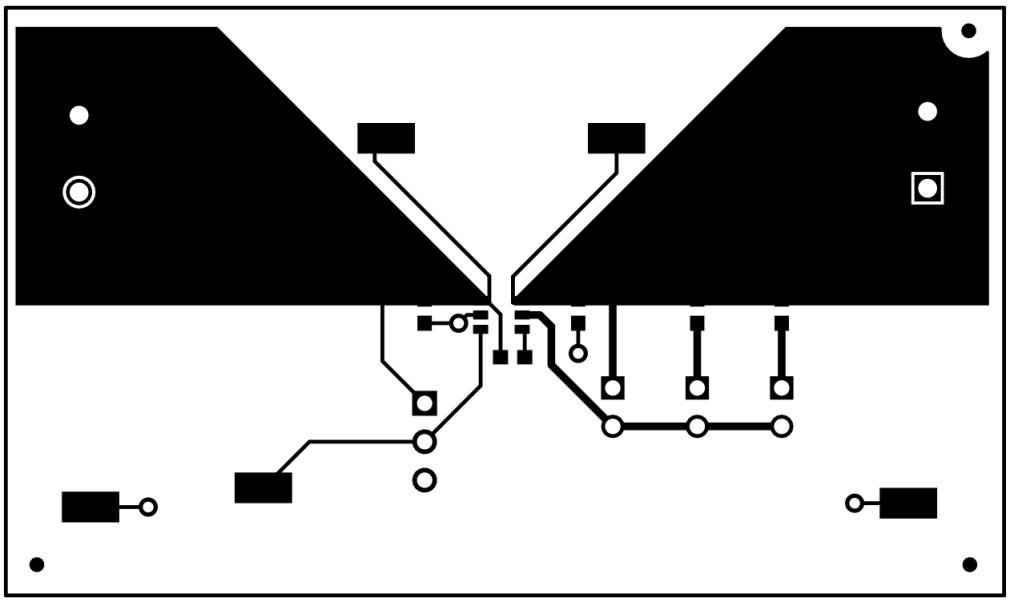

Figure 2. TPS22917EVM Top Layout

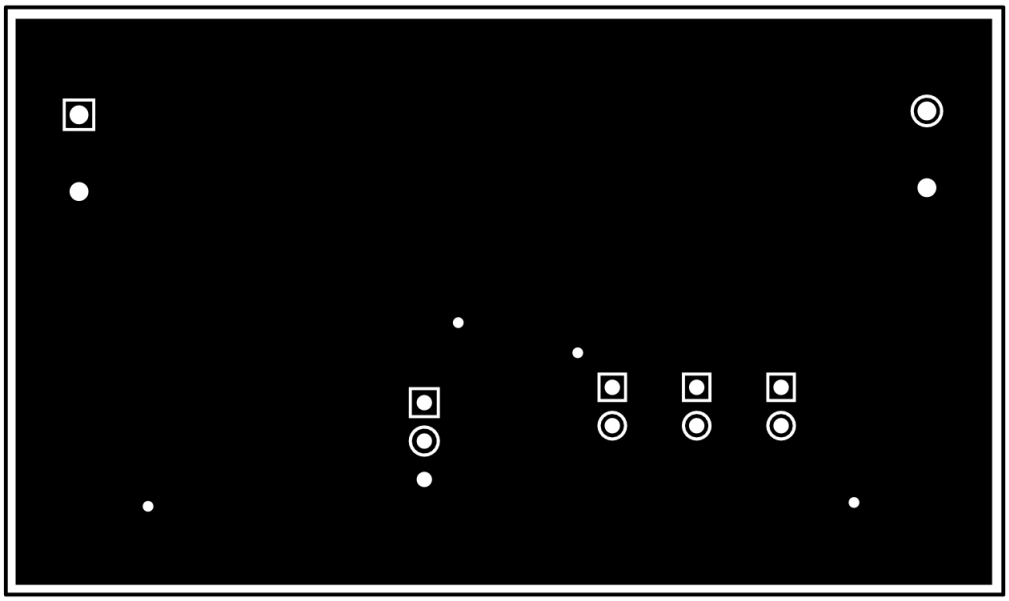

Figure 3. TPS22917EVM Bottom Layout

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 can be installed on JP1 in either the high or low position. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to TP2. Refer to the data sheet 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 is found in the TPS22917 data sheet. 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 TPS22917EVM is 1 V to 5.5 V.

External output loads can be applied to the switch by using the J2 terminal (VOUT). The TPS22917EVM 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 TPS22917 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.

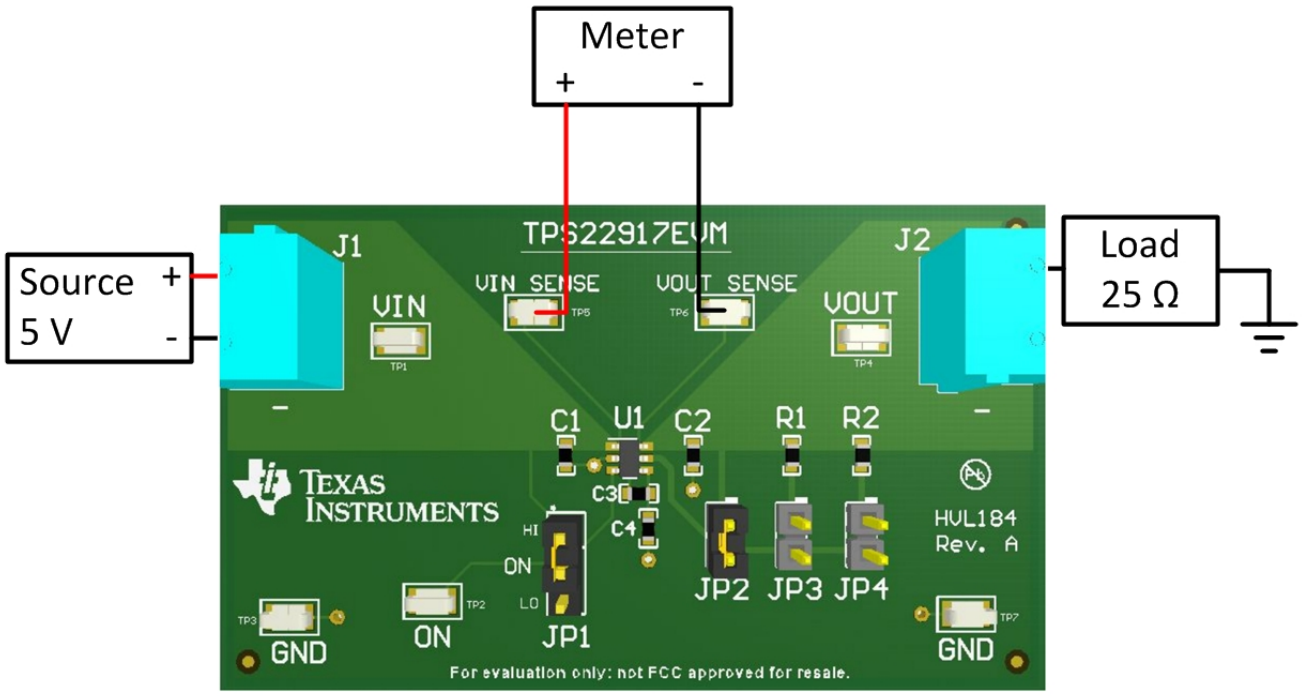

Figure 4. R_{ON} Test Setup

6.2 Rise Time Test Setup

Figure 5 shows the test setup for measuring the rise time of the TPS22917. 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 *TPS22917 1 V–5.5-V, 2-A, 80-mΩ Ultra-Low Leakage Load Switch*.

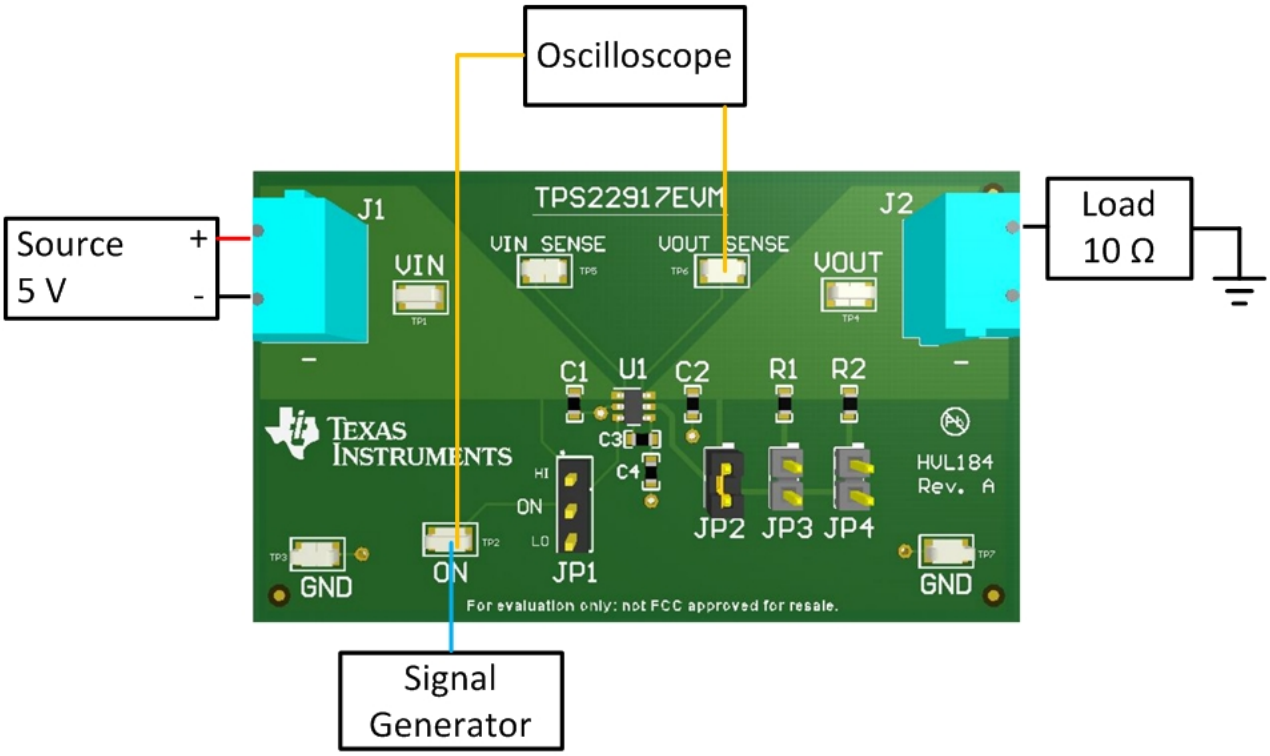

Figure 5. Rise Time Test Setup

7 Bill of Materials (BOM)

Table 2 lists the EVM BOM.

Table 2. TPS22917EVM Bill of Materials

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, 80mohm On-Resistance Load Switch, DBV0006A	DBV0006A	Texas Instruments	TPS22917DBVR
0	FID1, FID2, FID3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A

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      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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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.*

3.2 *Canada*

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(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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