TPS3700EVM-202 High voltage (18V) window voltage detector evaluation module for SON package

This user's guide describes the operational use of the TPS3700EVM-202 Evaluation Module (EVM) as a reference design for engineering demonstration and evaluation of the TPS3700EVM high voltage, over and under voltage supervisory circuit. Included in this user's guide are setup instructions, a schematic diagram, PCB layout drawings, and a bill of materials for the EVM.

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1 Introduction

TI's TPS3700EVM-202 EVM helps design engineers evaluate the operation and performance of the TPS3700 IC for possible use in their own circuit application. This particular EVM configuration contains an over and under voltage supervisory circuit with a wide supply range, independent open drain outputs, very low quiescent current, and high accuracy in a 1.5 mm × 1.5 mm DSE package. This document describes the configuration and set up of the TPS3700EVM-202 EVM board.

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the TPS3700EVM-202.

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2.1 Input/Output Connector and Jumper Descriptions

2.1.1 J1 – VDD

This connector is the power supply connection.

This also may be the signal that is being monitored by the TPS3700.

2.1.2 J2– GND

Return connector for the input power supply. This connector is also connected to J4 and J6 in the EVM.

2.1.3 J3 – SENSE

This connector is an additional voltage signal that can be monitored if VDD is not being monitored.

2.1.4 J4 – GND

Return connector for the SENSE voltage signal. This connector is also connected to J2 and J6 in the EVM.

2.1.5 J5 – OUTA

This connector is the under-voltage open drain output of the TPS3700 that pulls up to VPU through a 100-kΩ resistor in the EVM. Connect a voltage meter or oscilloscope probe from J5 to GND (J6).

2.1.6 J6 – GND

Return connector for the OUTA voltage signal. This connector is also connected to J2 and J4 in the EVM.

2.1.7 J7 – GNDOUTB

This connector is the over-voltage open drain output of the TPS3700 that pulls up to VPU through a 10-kΩ resistor in the EVM. Connect a voltage meter or oscilloscope probe from J7 to GND (J6).

2.1.8 JP1 – Monitor Sense and Monitor VDD Select

The TPS3700EVM-202 EVM is designed to monitor either the supply voltage VDD or an additional voltage signal SENSE.

A shorting jumper allows the choice of monitoring VDD or SENSE. Table 1 shows the connections for choosing between the two.

Table 1. Connector J10 Selections

Short Pins	Monitor
1 and 2	SENSE
2 and 3	VDD

2.1.9 J11 – VPU

The TPS3700EVM-202 EVM is designed for OUTA and OUTB to pull up to either VDD or an external voltage source. Table 2 shows the connections for choosing between the two.

Table 2. Connector J11 Selections

Short Pins	Pull-Up Voltage VPU
1 and 2	VDD
Open	External Voltage on Pin 1

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2.2 Equipment Setup

- Set the first power supply voltage between 1.8 V–18 V. Turn the power supply off. Connect the positive voltage lead from the power supply to J1 (VDD). Connect the ground lead from the power supply to J2 (GND).
- Set the second power supply voltage between 1.8 V–18 V. Turn the power supply off. Connect the positive voltage lead from the power supply to J3 (SENSE). Connect the ground lead from the power supply to J4 (GND).
- Use the shorting jumper on JP1 and select Monitor Sense
- Turn on all power supplies

3 Operation

This section provides information about the operation of the TPS3700EVM-202.

3.1 General Operation

The TPS3700EVM-202 is an over and under voltage supervisor. The device monitors a selected voltage signal (SENSE or VDD). INA+ triggers LOW when INA+ is below the 393.5 mV threshold and triggers HIGH (VPU) when OUTA goes above 400 mV. OUTB triggers LOW when INB– is above the 400 mV threshold and triggers HIGH (VPU) when INB– falls beneath 393.5 mV.

The TPS3700EVM-202 is designed to sense a 12-V rail and trigger when the rail falls below 10% or rises above 10% of 12 V. Specifically, OUTA will trigger LOW during a –10% drop (10.8 V) while OUTB will trigger LOW during a +10% rise (13.2 V). In between this window, the outputs are pulled up to VPU. Figure 1 and Figure 2 show the rising and falling SENSE voltage and its corresponding OUTA and OUTB response for VDD = 1.8 V and the output pulled up to 5 V.

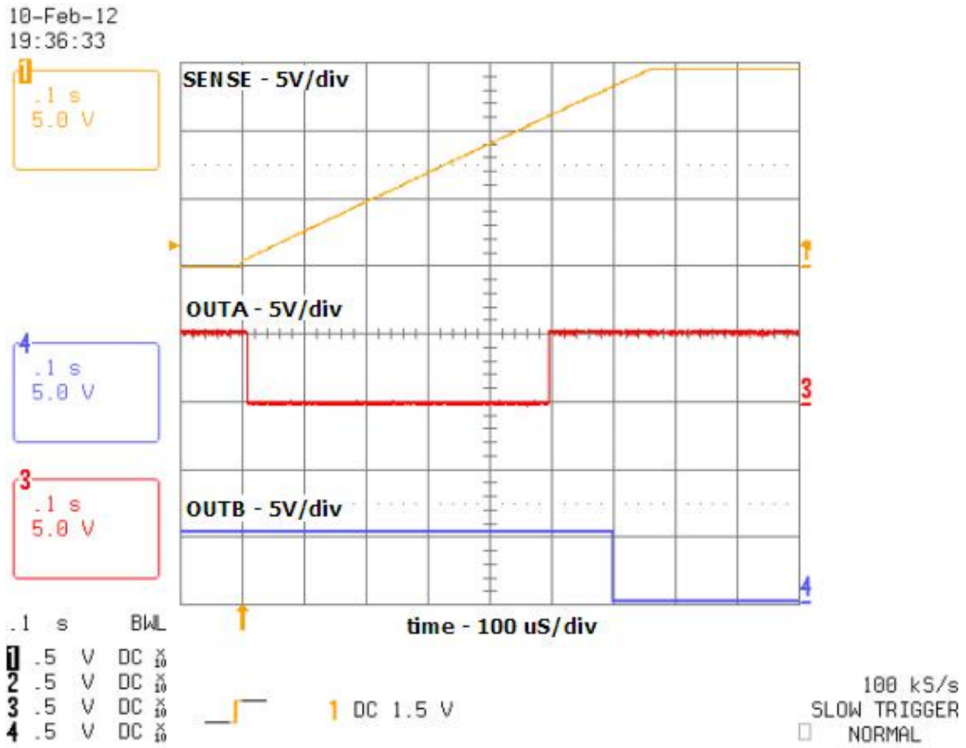


Figure 1. OUTA and OUTB Response for Sense Voltage Rising

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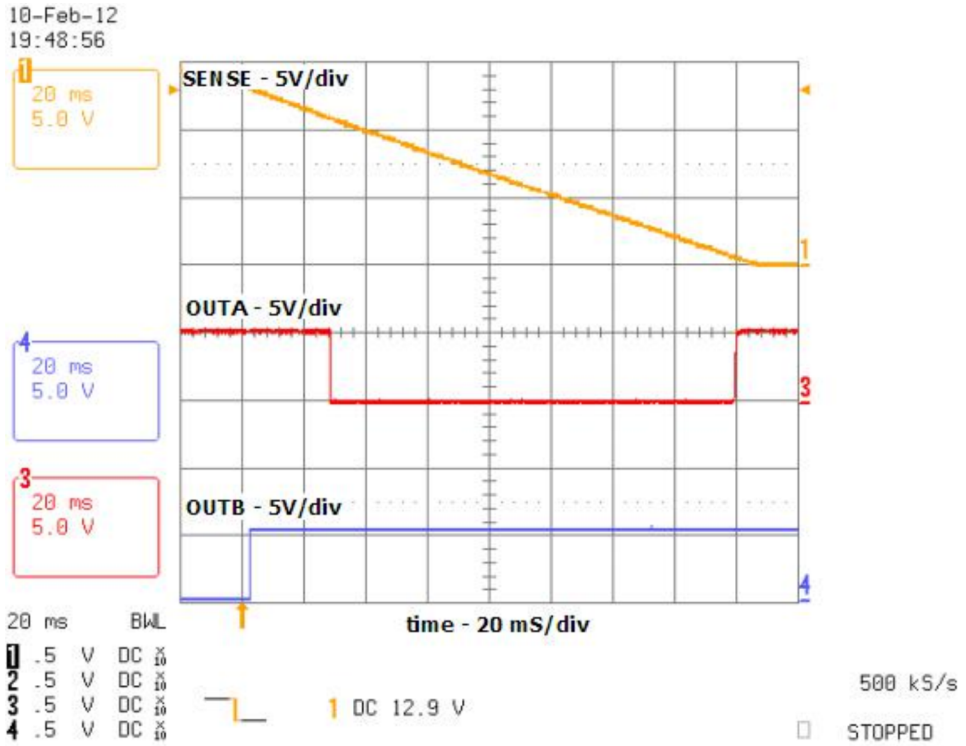


Figure 2. OUTA and OUTB Response for Sense Voltage Falling

Resistors R1, R2, and R3 can be replaced with different values to change the window at which OUTA and OUTB triggers HIGH and LOW.

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4 Board Layout

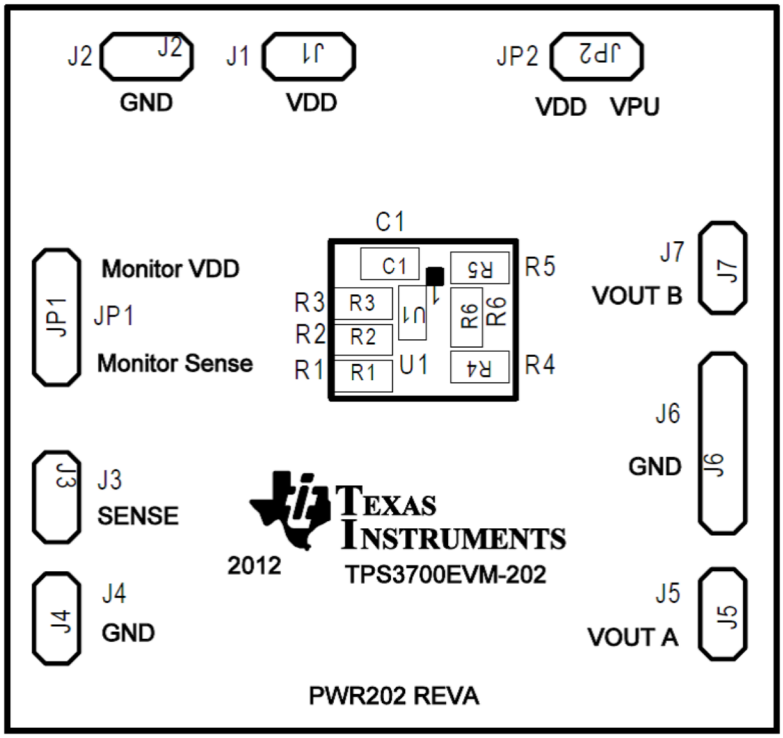


Figure 3. Assembly Layer

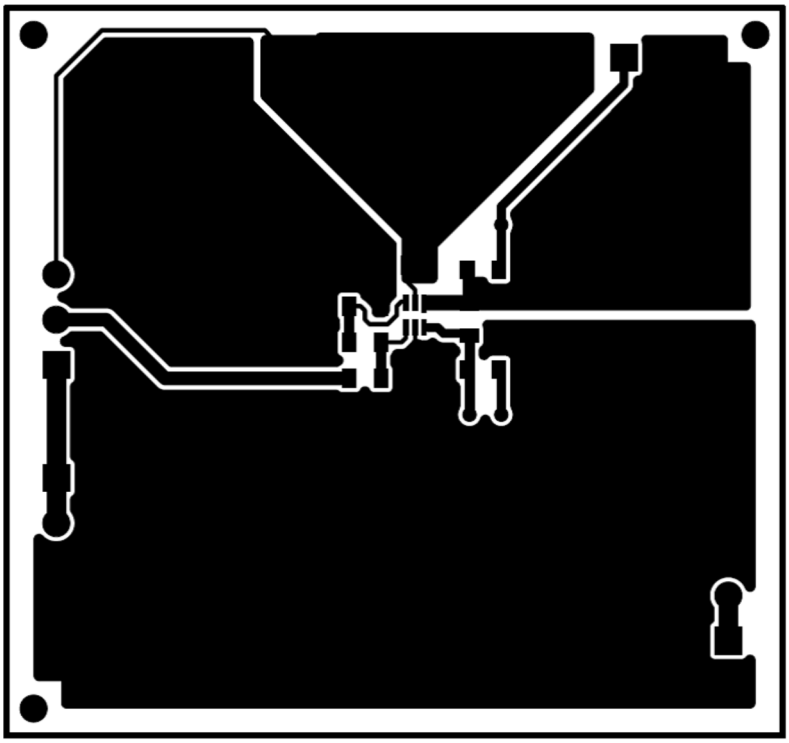


Figure 4. Top Layer Routing

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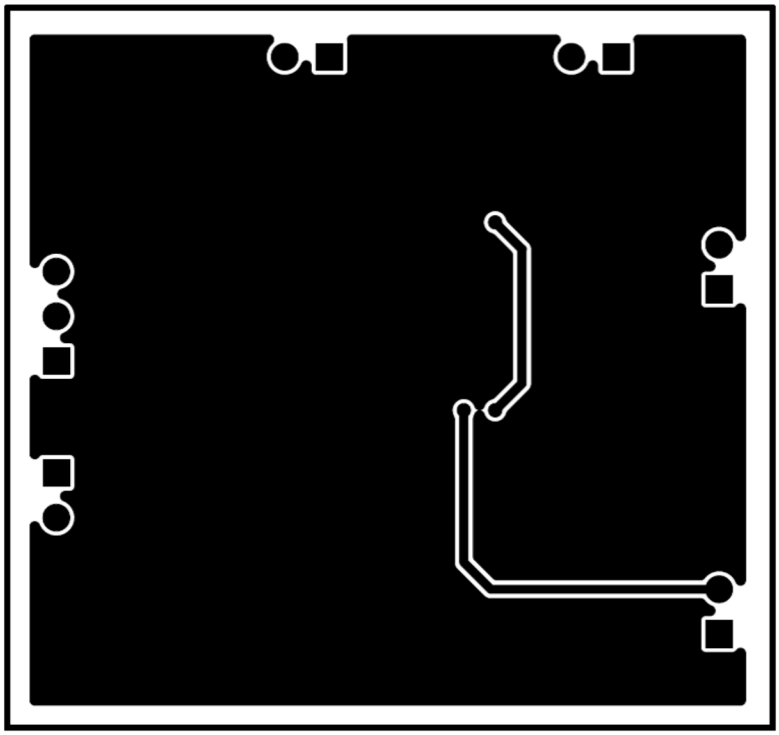


Figure 5. Bottom Layer Routing

5 Schematic

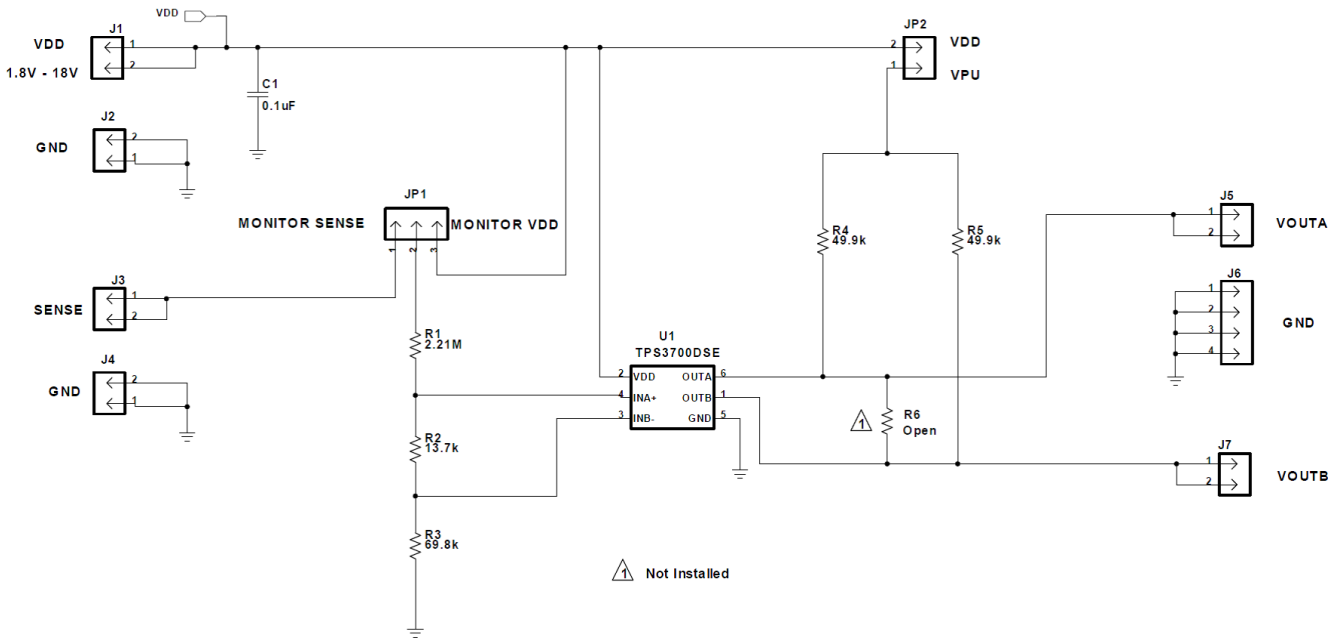


Figure 6. TPS3700EVM-202 Schematic

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6 Bill of Materials

Table 3. TPS3700EVM-202 Bill of Material

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	0.1µF	Capacitor, Ceramic, 25V, X7R, 10%	603	C0603C104K3RACTU	Kemet
1	R2	13.7k	Resistor, Chip, 1/16W, 1%	603	CRCW060313K7FKEA	Vishay
1	R1	2.21M	Resistor, Chip, 1/16W, 1%	603	CRCW06032M21FKEA	Vishay
2	R4, R5	49.9k	Resistor, Chip, 1/16W, 1%	603	CRCW060349k9FKEA	Vishay
1	R3	69.8k	Resistor, Chip, 1/16W, 1%	603	CRCW060369k8FKEA	Vishay
0	R6	0	Resistor, Chip, 1/16W, 1%	603	CRCW06030000Z0KEA	Vishay
1	U1	TPS3700DSE	IC, Window Voltage Detector for Over- and Under-voltage Monitoring	SON-6	TPS3700DSE	TI
2		15-29-1025	Shunt, 2POs .100 Gold		15-29-1025	Molex

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (August 2013) to A Revision **Page**

- Changed title of document 1
- Changed Comparator to Voltage Detector 7

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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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

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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This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(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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