TPS3803x-Q1EVM Voltage Supervisors User 's Guide

This user's guide describes initialization and timing supervision for the TPS3803x-Q1EVM evaluation module (EVM). The EVM can be used to test the TPS3803G15-Q1, TPS3805H33-Q1, and TPS3803-01-Q1 voltage detectors. This guide contains the EVM schematic, bill of materials (BOM), assembly drawing, and top and bottom board layouts.

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Trademarks

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1 Introduction

The TPS3803x-Q1EVM is for evaluating a group of voltage detectors that provide circuit initialization and timing supervision. The voltage detectors are used primarily in digital signal processing and processor-based systems. The EVM supports a supply voltage range between 1.3 V and 6 V and an input voltage range between 0 V and (V_{DD} + 0.3) V. Additionally, each voltage detector has its own independent circuit for evaluation on the EVM. The open-drain voltage detectors are also provided with a pullup resistor option to enable evaluation of these devices.

Figure 1. TPS3803X-Q1 EVM Board

1.1 Related Documentation

TPS3803x-Q1 Voltage Detectors data sheet, SGLS228

1.2 TPS3803x-Q1 Applications

- Automotive ECU Supply Rail Power Distribution and Switching
- Precision Current Limiting
- USB Ports and Hubs

2 Schematic, Bill of Materials, and Layout

This section provides a detailed description of the TPS3803X-Q1EVM Schematic, bill of materials (BOM), and layout.

2.1 TPS3803X-Q1EVM Schematic

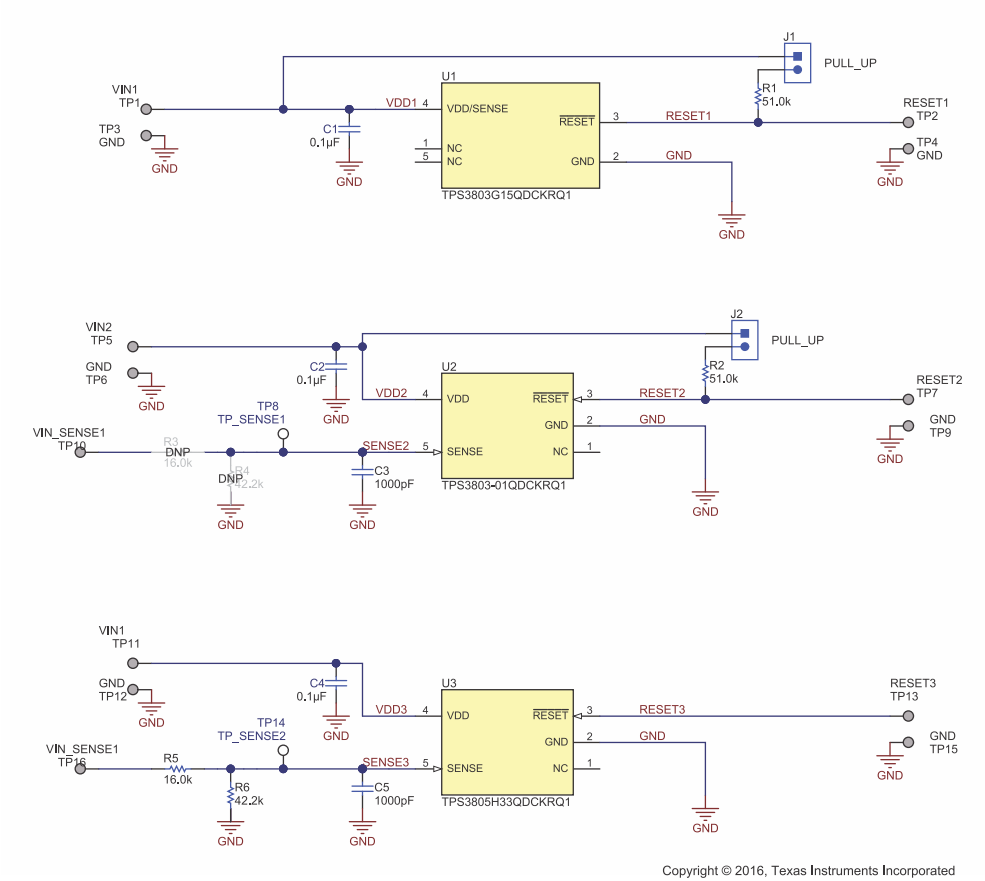

Figure 2. TPS3803X-Q1EVM Schematic

2.2 TPS3803X-Q1EVM Bill of Materials

Table 1. BOM

DESIGNATOR	QUANTITY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
!PCB1	1		Printed Circuit Board		MSA021	Any
C1, C2, C4	3	0.1 µF	CAP, CERM, 0.1 µF, 100 V, ±10%, X7R, AEC-Q200 Grade 1, 0805	0805	CGA4J2X7R2A104K125AA	TDK
C3, C5	2	1000 pF	CAP, CERM, 1000 pF, 100 V, ±10%, X7R, AEC-Q200 Grade 1, 0603	0603	CGA3E2X7R2A102K080AA	TDK
GND, GND, GND, GND, GND, GND, RESET1, RESET2, RESET3, VDD1, VDD2, VDD3, VIN_SENSE2, VIN_SENSE3	14		PCB Pin, Swage Mount, TH	PCB Pin(2505-2)	2505-2-00-44-00-00-07-0	Mill-Max
J1, J2	2		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
R3, R6	2	51.0 kΩ	RES, 51.0 k, 0.1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERA-6AEB513V	Panasonic
R4	1	16.0 kΩ	RES, 16.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-163-B-T5	Susumu Co Ltd
R5	1	42.2 kΩ	RES, 42.2 k, 0.1%, 0.1 W, 0603	0603	RG1608P-4222-B-T5	Susumu Co Ltd
TP1, TP2	2	SMT	Test Point, Miniature, SMT	Testpoint_Keystone_Miniature	5015	Keystone
U1	1		Voltage Detector, DCK0005A	DCK0005A	TPS3803G15QDCKRQ1	Texas Instruments
U2	1		VOLTAGE DETECTOR, DCK0005A	DCK0005A	TPS3803-01QDCKRQ1	Texas Instruments
U3	1		VOLTAGE DETECTOR, DCK0005A	DCK0005A	TPS3805H33QDCKRQ1	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
R1	0	16.0 kΩ	RES, 16.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-163-B-T5	Susumu Co Ltd
R2	0	42.2 kΩ	RES, 42.2 k, 0.1%, 0.1 W, 0603	0603	RG1608P-4222-B-T5	Susumu Co Ltd

2.3 Layout and Component Placement

Figure 3 and Figure 4 top and bottom assemblies of the printed circuit board (PCB) show the component placement on the EVM.

Figure 5 and Figure 6 show the top and bottom layout of the EVM. Figure 7 and Figure 8 show the top and bottom layers of the EVM. Figure 9 and Figure 10 show the top and bottom solder masks.

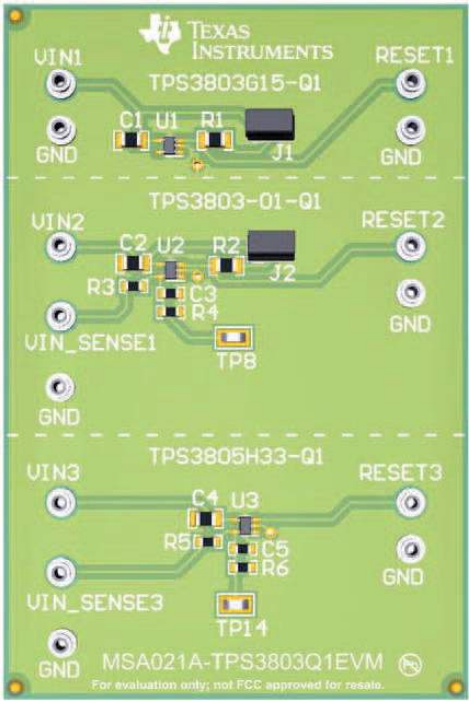

Figure 3. Component Placement—Top Assembly

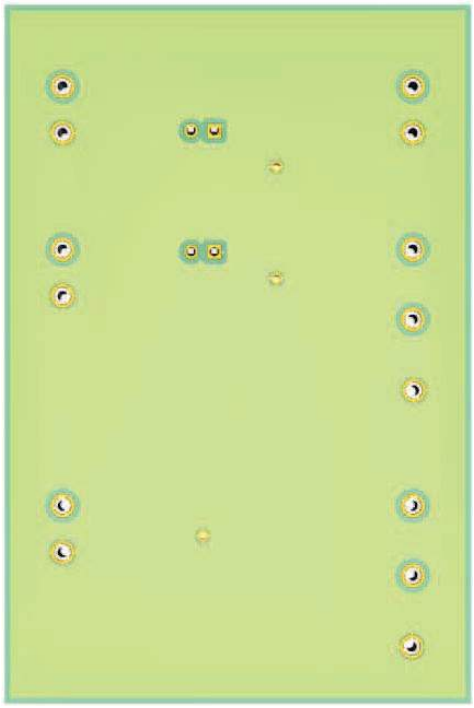

Figure 4. Component Placement—Bottom Assembly

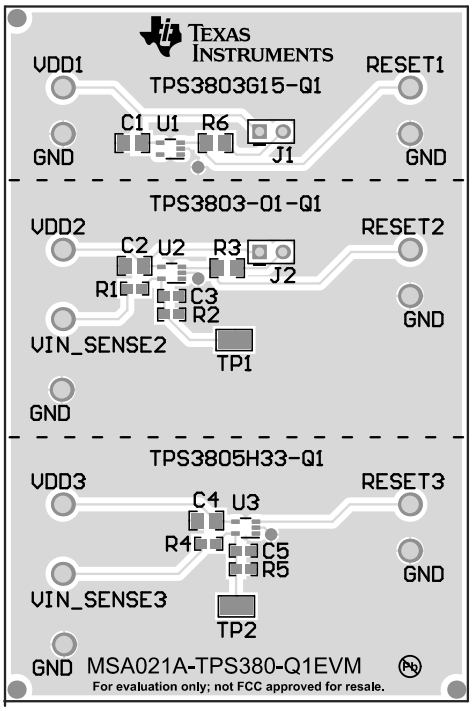

Figure 5. Layout—Top

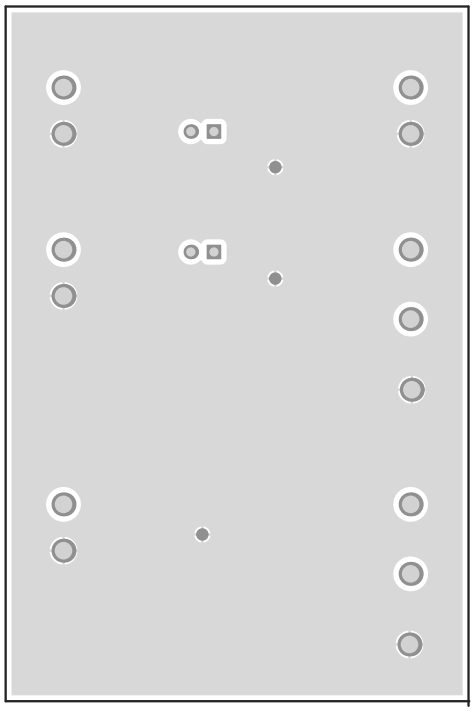

Figure 6. Layout—Bottom

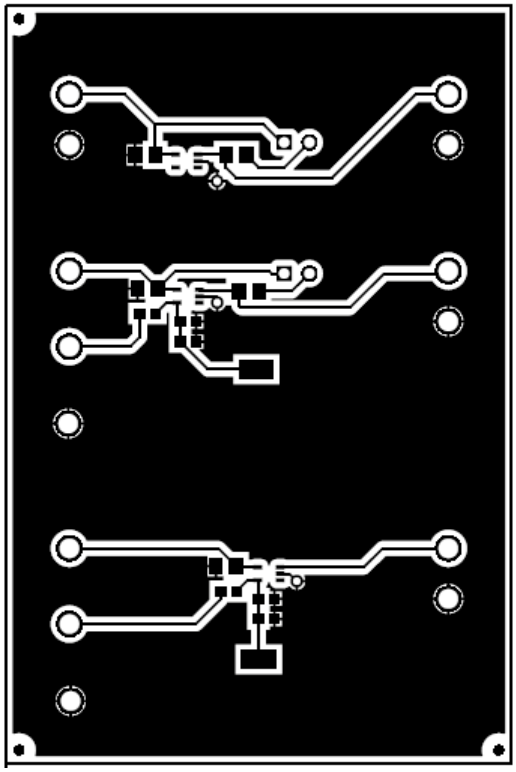

Figure 7. Top Layer

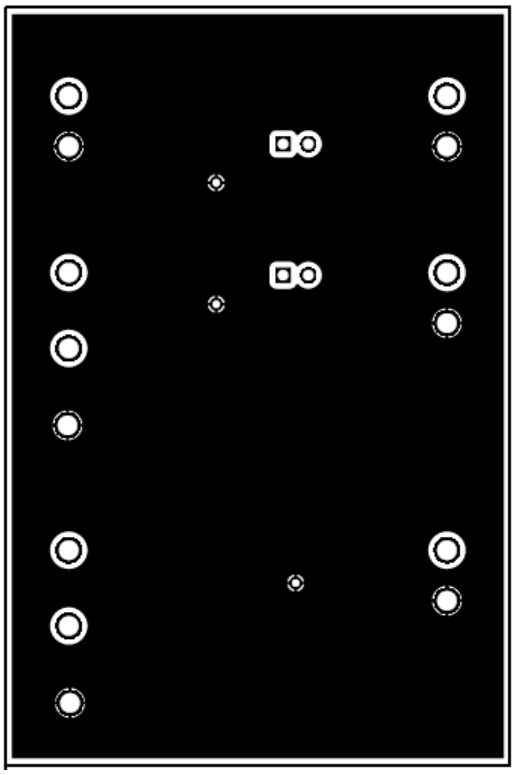

Figure 8. Bottom Layer

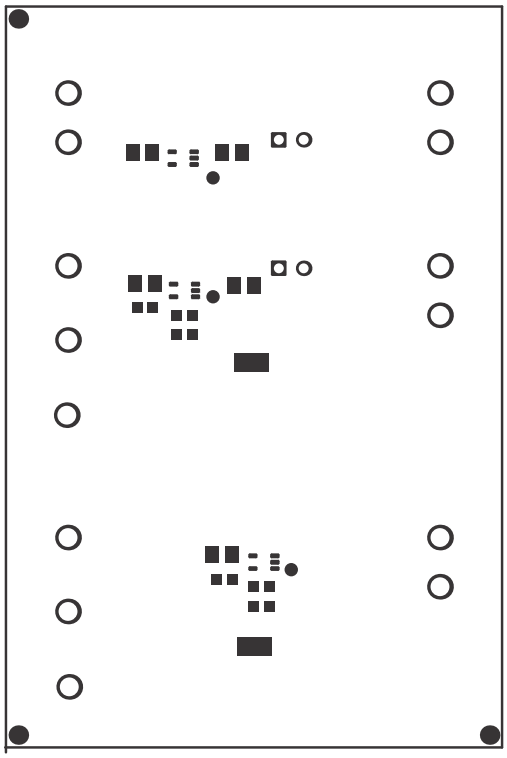

Figure 9. Top Solder Mask

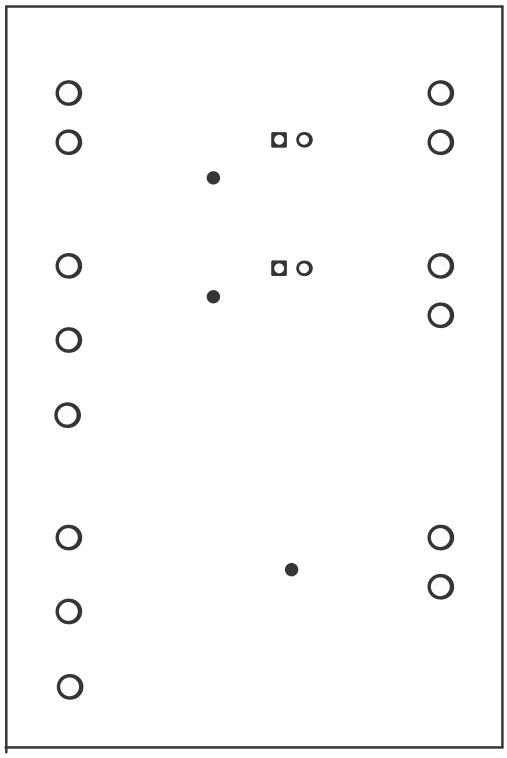

Figure 10. Bottom Solder Mask

3 Setup and Operation

3.1 Input and Output Connectors

There are several methods and types of input and output (I/O) connections on the EVM including:

- Input/Output Turret Connections: For both positive and negative (GND) input and output supplies
- Test Points: For SENSE pins
- Two-Pin Jumpers: For manual pullup voltages

Table 2 lists the test points and functional descriptions.

Table 2. Test Points

Test Point		Function	Description
Number	Silkscreen Label		
TP1	TP1	Probe SENSE pin	Allows monitoring of the SENSE input pin for the TPS3803-01-Q1
TP2	TP2	Probe SENSE pin	Allows for monitoring of the SENSE input pin for the TPS3805H33-Q1

The jumpers onboard the TPS3803X-Q1EVM allows the user to define the output voltage. When the jumpers are enabled, the RESET value has a voltage level of V_{DD} when in the HIGH state. If the jumpers are disabled, the jumper pins can apply the desired voltage for the HIGH state of the RESET pin. Table 3 includes jumper settings for the EVM.

Table 3. Manual Enable or Auto-Retry Jumpers

Jumper	Device	Enabled	Disabled
J1	TPS3803G15-Q1	RESET1 gets pulled up to V_{DD}	Manual pull-up voltage must be applied to RESET1
J2	TPS3803-01-Q1	RESET2 gets pulled up to V_{DD}	Manual pull-up voltage must be applied to RESET2

3.2 EVM Setup

The EVM setup section details what test equipment the user needs to use the EVM and how to properly setup the EVM environment.

3.2.1 Recommended Test Equipment

The following is the recommended test equipment:

- Two-channel storage oscilloscope
- Current probe
- Voltage Probe
- Adjustable DC power supply with at least 2.5-V to 6.5-V output and a 10-A current limit
- Digital Multimeter or a Volt-Ohmmeter
- A passive or active load capable of handling up to 3 A

3.3 Basic Operation

3.3.1 Measuring Propagation Delay

The user should read and be familiar with the TPS3803X-Q1 datasheet contents before using the EVM. To test the propagation delay, the user must monitor the RESET pin using an oscilloscope. Additionally, the user can monitor the SENSE and input voltages using an oscilloscope. A power supply is necessary to supply the board with the desired supply voltage. Additionally, a multimeter can probe test points.

Figure 11 shows the high-to-low delay of the TPS3803G15-Q1 device with jumper J1 enabled. Figure 12 shows the high-to-low delay of the TPS3803-01-Q1 device with jumper J2 enabled. Figure 13 shows the high-to-low delay of the TPS3805H33-Q1 device.

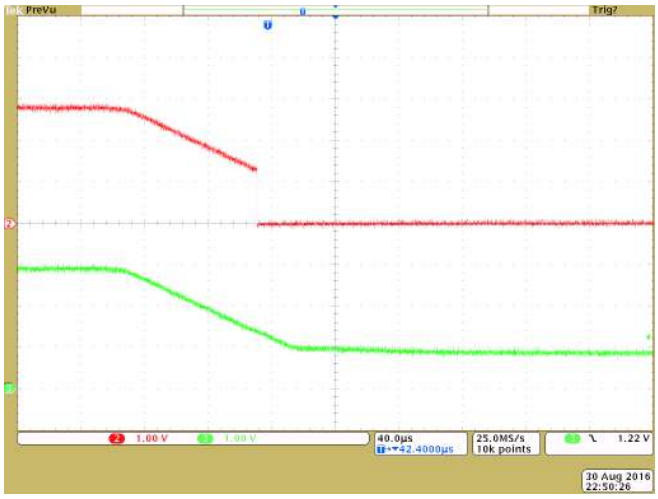

Figure 11. TPS3803G15-Q1 High-to-Low-Level Output

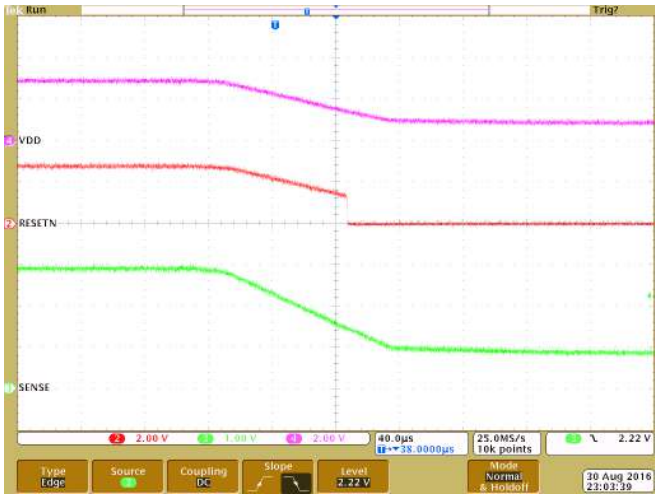

Figure 12. TPS3803-01-Q1 High-to-Low-Level Output

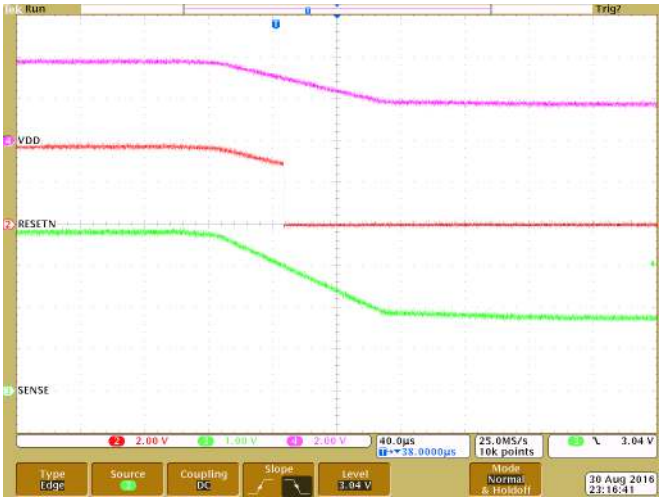

Figure 13. TPS3805H33-Q1 High-to-Low-Level Output

Figure 14 shows the low-to-high delay of the TPS3803G15-Q1 device with jumper J1 enabled. Figure 15 shows the low-to-high delay of the TPS3803-01-Q1 device with jumper J2 enabled. Figure 16 shows the low-to-high delay of the TPS3805H33-Q1 device.

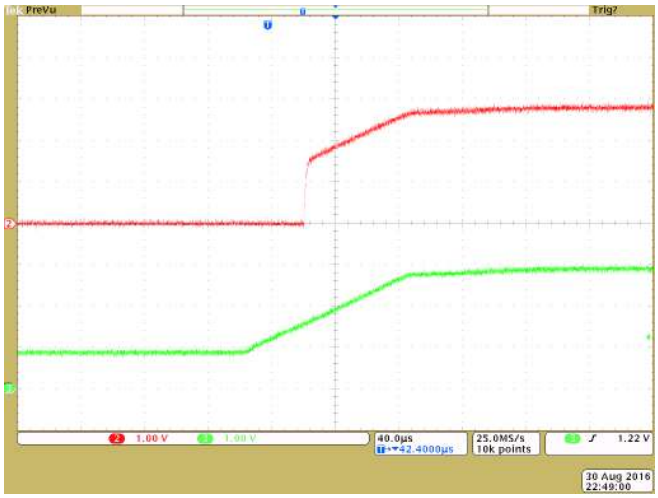

Figure 14. TPS3803G15-Q1 Low-to-High-Level Output

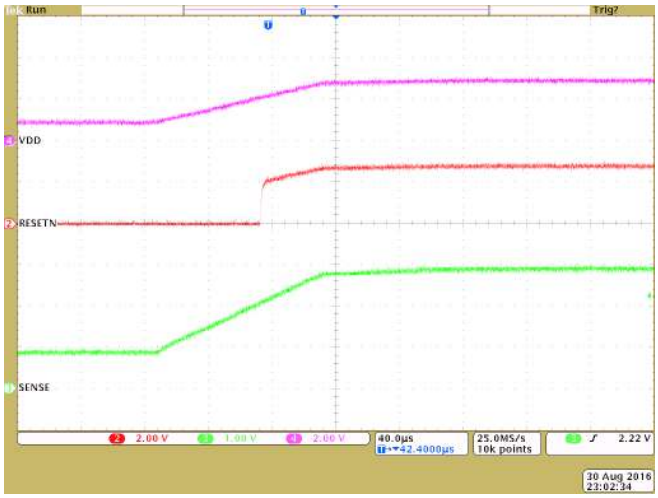

Figure 15. TPS3803-01-Q1 Low-to-High-Level Output

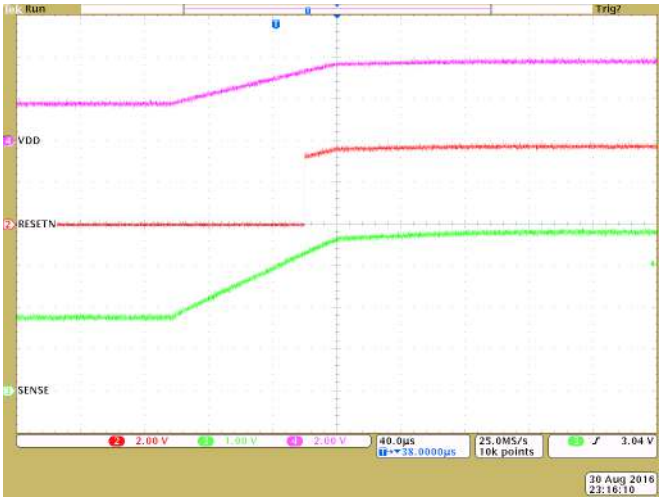

Figure 16. TPS3805H33-Q1 Low-to-High-Level Output

3.3.2 Measuring the Rising and Falling Voltage Thresholds

To test the voltage thresholds, monitor the RESET pin using a multimeter or voltmeter. Additionally, the user can monitor SENSE and input voltages using a multimeter, if desired. A power supply is necessary to supply the EVM board with the desired supply voltage.

Table 4 shows the rising voltage thresholds on the RESET pin for the TPS3803G15-Q1, the TPS3803-01-Q1, and the TPS3805H33-Q1 device. Note that both jumpers are enabled for this example and that the rising voltage threshold maximum value takes account of power on hysteresis.

Table 4. Rising Voltage Thresholds

Device	Minimum Value (V)	Maximum Value (V)	Measured Value (V)
TPS3803G15-Q1	1.38	1.45	1.43
TPS3803-01-Q1	1.7	1.98	1.73
TPS3805H33-Q1	3	3.13	3.13

Table 5 shows the falling voltage thresholds on the RESET pin for the TPS3803G15-Q1, the TPS3803-01-Q1, and the TPS3805H33-Q1 device. Note that both jumpers are enabled for this example.

Table 5. Falling Voltage Thresholds

Device	Minimum Value (V)	Maximum Value (V)	Measured Value (V)
TPS3803G15-Q1	1.38	1.42	1.4
TPS3803-01-Q1	1.7	1.73	1.7
TPS3805H33-Q1	3	3.1	3.09

Revision History

DATE	REVISION	NOTES
November 2016	*	Initial Release

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

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   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

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   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      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.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *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*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). 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

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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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4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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