User's Guide

TPS3899EVM Voltage Supervisor User Guide

ABSTRACT

This user's guide describes the TPS3899EVM evaluation module (EVM). This guide also contains the EVM schematic, bill of materials (BOM), assembly drawing, and top and bottom board layouts.

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Trademarks

1 Introduction

The TPS3899EVM is an evaluation module (EVM) for the TPS3899 voltage supervisor. The TPS3899EVM can be used with any TPS3899 device variant but please note that if using the push-pull variants (TPS3899PLXX or TPS3899PHXX), the shunt on J4 must be removed as push-pull devices do not use a pull-up resistor and R1 must be disconnected. Please also note if using TPS3899EVM with the active-high variant (TPS3899PHXX), the active-low $\overline{\text{RESET}}$ label on the EVM board and throughout this User Guide becomes active-high RESET. The TPS3899EVM offers connections for all of the input and output pins on the TPS3899.

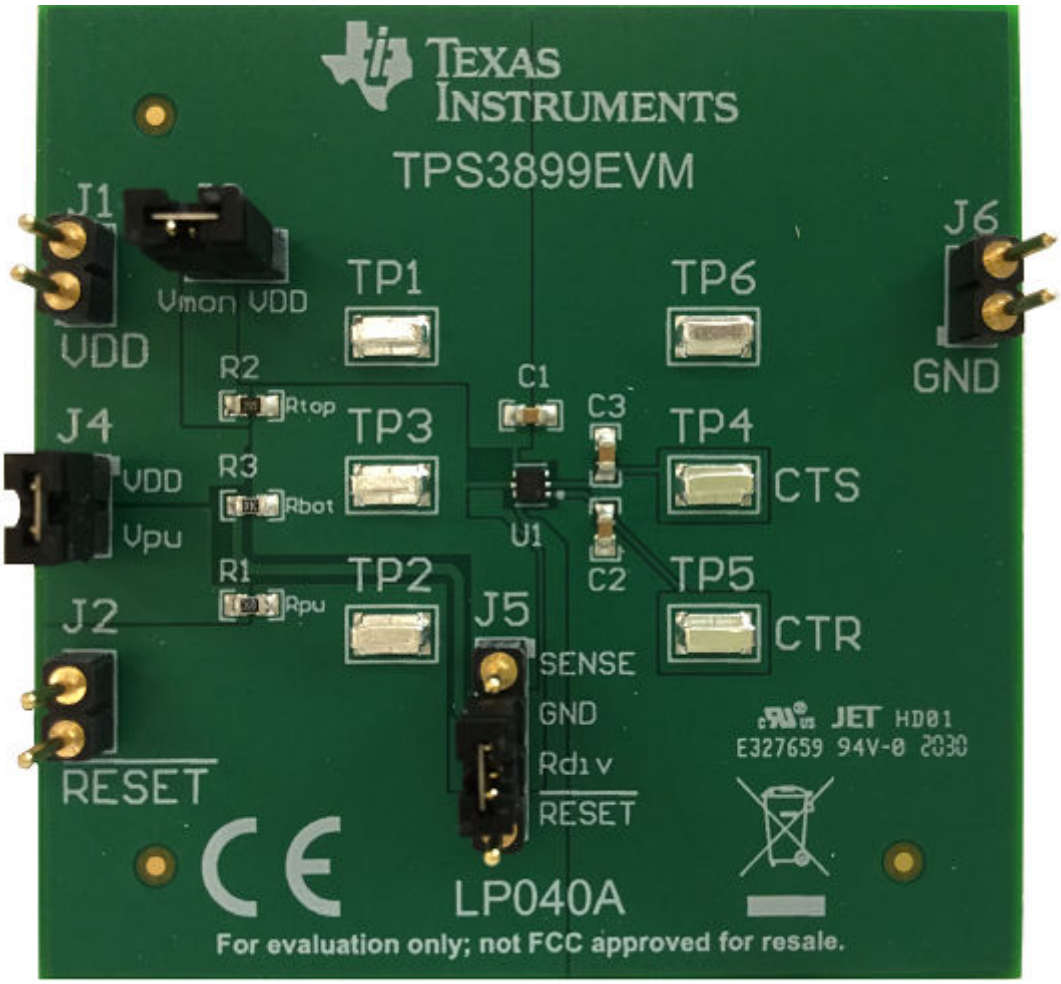

Figure 1-1. Board Top

Figure 1-2. Board Bottom

1.1 Related Documentation

TPS3899 Nano 125 nA I_Q, 1% Accurate Voltage Supervisor, Push-Button Monitor with Programmable Sense and Reset Delay, SLVSFM0.

1.2 TPS3899 Applications

- Grid Infrastructure (Circuit Breakers, Smart Meters, monitor and protection equipment)
- Factory Automation (Field Transmitters, PLC)
- Fire Safety Systems
- Electronic Point of Sale
- Portable, Battery-Powered Systems

2 Schematic, Bill of Materials, and Layout

This section provides a detailed description of the TPS3899EVM schematic, bill of materials (BOM), and layout.

2.1 TPS3899EVM Schematic

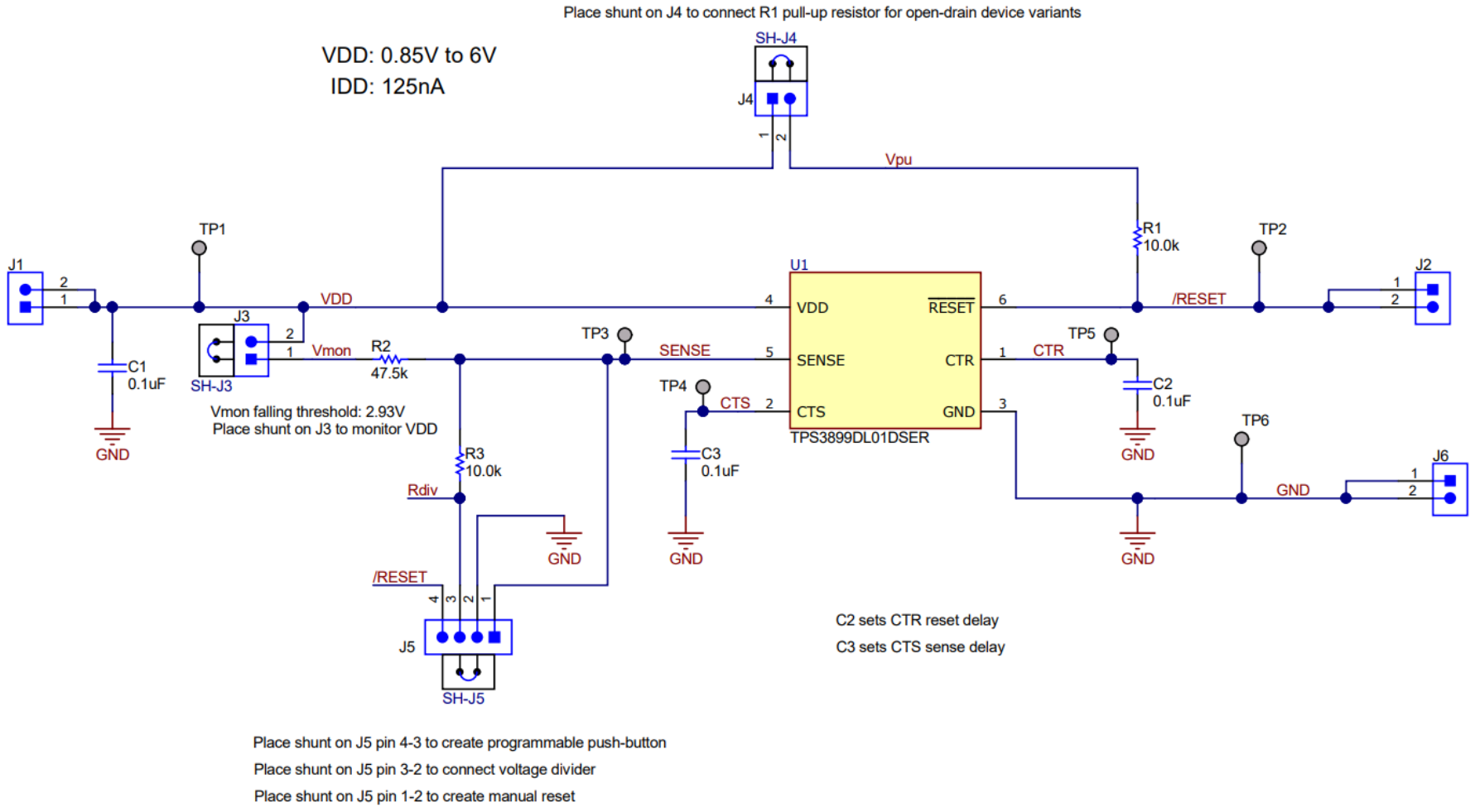

Figure 2-1. TPS3899EVM Schematic

2.2 TPS3899EVM Bill of Materials

Table 2-1. TPS3899EVM Bill of Materials

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer
!PCB1	1		Printed Circuit Board		LP040	Any
C1, C2, C3	3	0.1uF	CAP, CERM, 0.1 uF, 10 V, +/- 10%, X7R, 0603	0603	C0603C104K8RACTU	Kemet
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J3, J4, J6	5		Header, 100mil, 2x1, TH	Header, 2x1, 100mil, TH	800-10-002-10-001000	Mill-Max
J5	1		Header, 100mil, 4x1, TH	Header, 4x1, 100mil, TH	800-10-004-10-001000	Mill-Max
R1, R3	2	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0710KL	Yageo
R2	1	47.5k	RES, 47.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-0747K5L	Yageo
SH-J3, SH-J4, SH-J5	3		Shunt, 100mil, Tin plated, Black	Shunt Connector Black Open Top, 2x1	SNT-100-BK-T-H	Samtec
TP1, TP2, TP3, TP4, TP5, TP6	6		Test Point, Miniature, SMT	Test Point, Miniature, SMT	5019	Keystone
U1	1		Nano 125 nA IQ, 1% Accurate Voltage Supervisor, Push-Button Monitor with Programmable Sense and Reset Delay	WSON6	TPS3899DL01DSER	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A

2.3 Layout and Component Placement

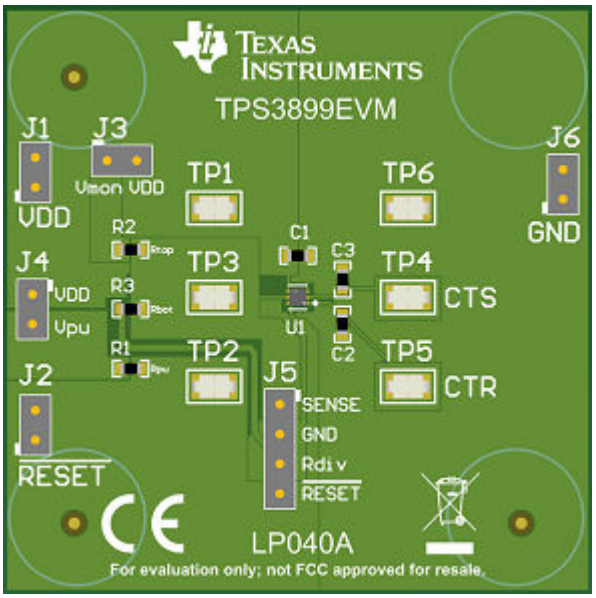

Figure 2-2. Component Placement—Top Assembly

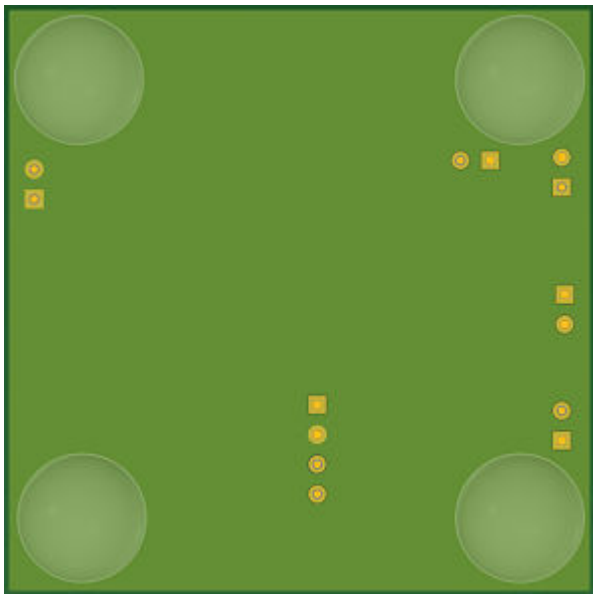

Figure 2-3. Component Placement—Bottom Assembly

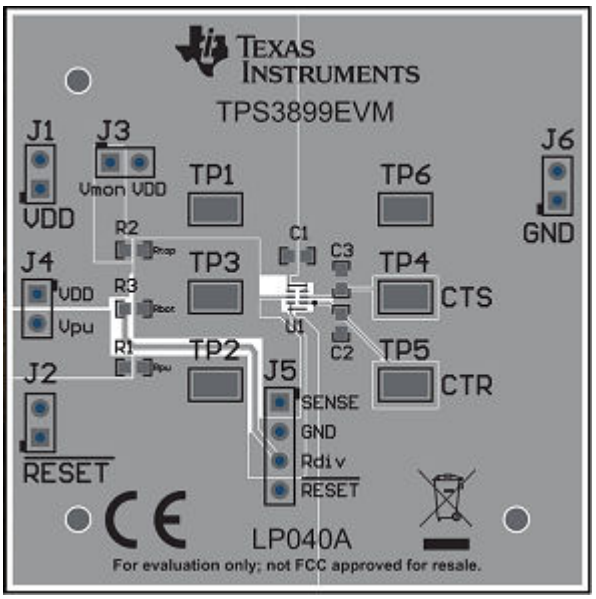

Figure 2-4. Layout—Top

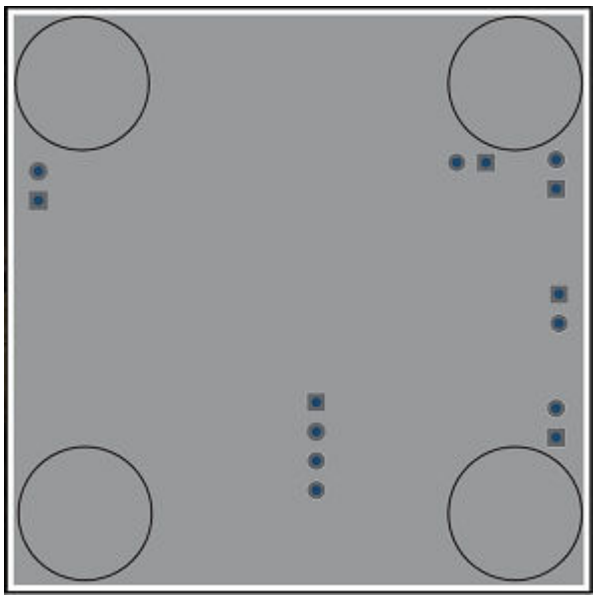

Figure 2-5. Layout—Bottom

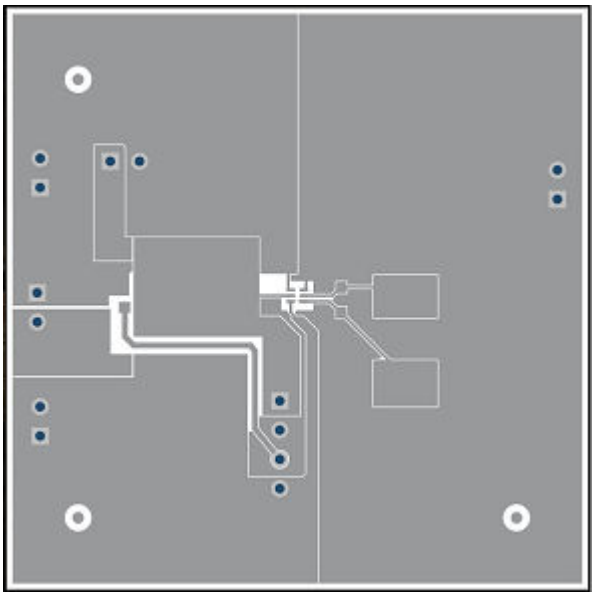

Figure 2-6. Top Layer

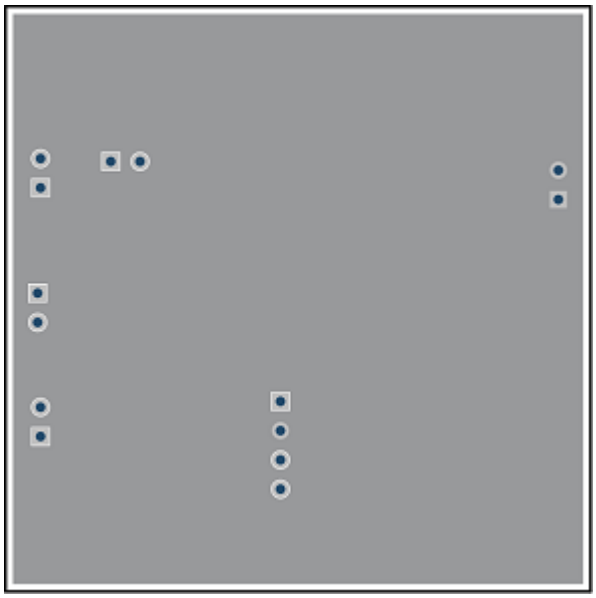

Figure 2-7. Bottom Layer

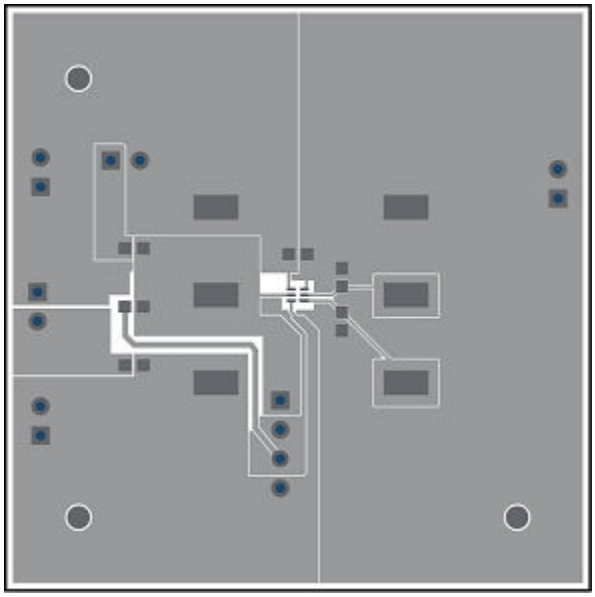

Figure 2-8. Top Solder Mask

3 EVM Connectors

This section describes the connectors, jumpers, and test points on the EVM as well as how to connect, set up, and properly use the EVM.

3.1 EVM Test Points

Table 3-1 lists the test points and functional descriptions. All TPS3899 pins have a corresponding test point on the EVM. These test points are located close to the pins for more accurate measurements.

Table 3-1. Test Points

Test Point Number	Test Point Silkscreen Label	Function	Description
TP1	VDD	Connect to VDD pin	Allows user to connect to VDD pin. The VDD pin connects to the input power supply.
TP2	$\overline{\text{RESET}}$	Connect to $\overline{\text{RESET}}$ pin	Allows user to monitor the $\overline{\text{RESET}}$ output pin.
TP3	SENSE	Connect to SENSE pin	Allows user to connect to SENSE pin. The SENSE pin is the voltage that will be monitored by TPS3899.
TP4	CTS	Connect to CTS pin	Allows user to monitor the CTS pin. The CTS capacitor sets the sense delay. Leave CTS pin floating (no capacitor) for minimum sense delay.
TP5	CTR	Connect to CTR pin	Allows user to monitor the CTR pin. The CTR capacitor sets the reset delay. Leave CTR pin floating (no capacitor) for minimum reset delay.
TP6	GND	Connect to GND pin	Allows user to connect to GND.

3.2 EVM Jumpers

Table 3-2 lists the jumpers on the TPS3899EVM. As ordered, the EVM will have five jumpers and three shunts.

Table 3-2. EVM Jumpers

Jumper	Default Connection	Description
J1	Shorted	Both pins on J1 are shorted together. Connect either pin on jumper J1 to the input power supply.
J2	Shorted	Both pins on J2 are connected together. Use either pin on jumper J2 monitor the output $\overline{\text{RESET}}$.
J3	Closed (Shunt)	Connect a shunt to jumper J3 to short V_{MON} to VDD.
J4	Closed (Shunt)	Connect a shunt to jumper J4 to use R1 as the pull-up resistor on the $\overline{\text{RESET}}$ output pin.
J5	Closed (Shunt on R_{DIV} [pin 3] to GND [pin 2])	Connect a shunt to this jumper J5 for different configurations. Connect shunt to R_{DIV} and GND for voltage divider configuration. Connect shunt to GND and SENSE to manually reset. Connect shunt to $\overline{\text{RESET}}$ and R_{DIV} for programmable push-button functionality.
J6	Shorted	Both pins on J6 are connected together. Connect either pin on jumper J6 to connect to ground.

4 EVM Setup and Operation

This section describes the functionality and operation of the TPS3899EVM. The user should read the TPS3899 data sheet for electrical characteristics of the device.

4.1 Input Power (VDD)

The VDD supply is connected through the J1 header on board. Both pins of jumper J1 are connected together so power can be applied to either pin. The voltage range is 0.85V to 6V for the open-drain low (DL) and push-pull low (PL) variations and 1V to 6V for the push-pull high (PH) variations.

4.2 Monitoring Voltage on SENSE Pin

The TPS3899 device monitors voltage via the SENSE pin. The user can connect to the sense pin using TP3.

The EVM provides options for voltage monitoring.

1. Monitor VDD: VDD can be monitored by connecting the shunt to jumper J3 which creates a short and makes V_{MON} = VDD.
2. Voltage divider for V_{MON}: V_{MON} can connect to SENSE through a voltage divider. To use this voltage divider connect the shunt to jumper J5 (Rdiv [pin 3] to GND [pin 2]). This voltage divider can be adjusted to monitor any voltage above the device's V_{IT-} (See Table 4-1 for information on the default EVM threshold voltage values).

Table 4-1. Default EVM Nominal Input Threshold Voltage

	V_{IT-}	V_{IT+}	V_{MON} Negative-Going Threshold Voltage	V_{MON} Positive-Going Threshold Voltage
TPS3899XX01, R1 = 47.5k, R2 = 10k (x0.174 Voltage Divider)	0.51 V	0.536 V	2.93 V	3.08 V

4.3 Reset Output ($\overline{\text{RESET}}$)

The TPS3899EVM includes the default TPS3899DL01 device variant that includes open-drain, active-low output topology for the $\overline{\text{RESET}}$ pin. The other device variations provide different output topologies and can be used on this EVM. If using a TPS3899 device variation with push-pull output topology (PH or PL), the pull-up resistor must be disconnected by leaving jumper J4 open. It is also possible to apply a separate pull-up voltage by leaving the jumper J4 open and connecting the pull-up voltage to Vpu [pin 2] of jumper J4. The EVM provides a jumper J2 and a test point TP2 connected directly to the $\overline{\text{RESET}}$ pin for monitoring and or interfacing to other devices.

The reset signal is asserted when the voltage on the SENSE pin falls below V_{IT-} for the duration of sense delay time. When the voltage on SENSE rises higher than $V_{IT+} = V_{IT-} + V_{HYS}$ for the duration of reset delay time, the reset signal will deassert.

The reset signal will also be asserted when a shunt is connected to jumper J5 (GND [pin 2] to SENSE [pin 1]) which acts as a manual reset.

Please refer to the data sheet for more information on the $\overline{\text{RESET}}$ output and how it reacts to startup conditions and minimum values of VDD.

4.4 Sense and Reset Time Delay Programming (Program $t_{D\text{-}SENSE}$ and t_D)

The TPS3899 device has two time delay programming pins. Placing a capacitor on CTS and CTR changes the sense delay and reset delay respectively. Leaving CTS and CTR pins floating (no capacitor connected) will cause the TPS3899 to use the default delay times of 50µs [max] for sense delay and 80µs [max] for reset delay.

Table 4-2. Sense and Reset Delay Programming with CTS and CTR Pins

	$t_{D\text{-}SENSE}$ (Sense Delay, Programmed with CTS)	t_D (Reset Delay, Programmed with CTR)
Capacitors NC	50µs [max]	80µs [max]
CTS = 0.1 µF, CTR = 0.1µF (EVM Default)	61.94ms	61.97ms
CTS = 1 µF, CTR = 1 uF	619ms	619ms
CTS = 10 µF, CTR = 10 µF	6.19s	6.19s

The sense and reset time delay can be programmed to any value within the range by connecting a capacitor no larger than 10µF between the corresponding CTS or CTR pin and GND. The relationship between the external capacitors and sense and reset time delays is given by Equation 1 and Equation 2 respectively. The recommended maximum delay capacitor for the TPS3899 is limited to 10µF as this ensures there is enough time for the capacitor to fully discharge when the reset condition occurs.

$$t_{D\text{-}SENSE} = 618937 \times C_{CTS} + t_{D\text{-}SENSE} \text{ (no cap)} \quad (1) \tag{1}$$

$$t_D = 618937 \times C_{CTR} + t_D \text{ (no cap)} \quad (2) \tag{2}$$

See User-Programmable Sense and Reset Time Delay section of the TPS3899 Data Sheet for more information.

Figure 4-1 and Figure 4-2 show oscilloscope captures of sense delay and reset delay on the EVM. These captures were taken with a shunt on J3, J4, and J5 (Rdiv [pin 3] to GND [pin 2]).

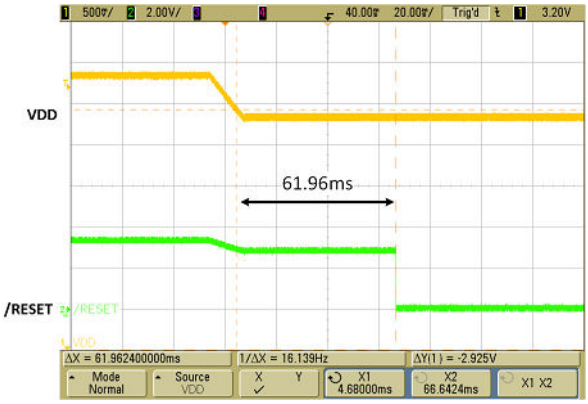

Figure 4-1. Sense Delay Oscilloscope Capture

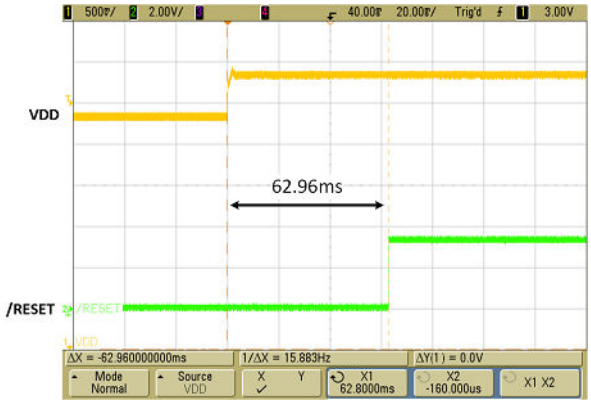

Figure 4-2. Reset Delay Oscilloscope Capture

4.5 Programmable Push-Button Functionality Using Jumper J5

Figure 4-3 shows a programmable push-button circuit that has a programmable holding condition and a programmable output width. The TPS3899EVM supports testing for programmable push-button functionality. This is accomplished using a shunt on jumper J5 ($\overline{\text{RESET}}$ [pin 4] to R_{DIV} [pin 3]). This shunt shorts $\overline{\text{RESET}}$ to R3 which then connects to SENSE and simulates the push-button. Please note this functionality is designed for the push-pull active high variant (TPS3899PHXX) which does not come default installed on the EVM.

This configuration allows the user to create a programmable push-button such that it has to be held for the sense time delay set by the CTS capacitor for the reset to become active. After the reset becomes asserted, the push-button no longer affects the reset output and reset will remain asserted for the reset time delay set by the CTR capacitor. This configuration is useful if needing to hold a device on/off for a certain duration of time after a specified push-button press has occurred. See Figure 4-4 for a detailed timing diagram.

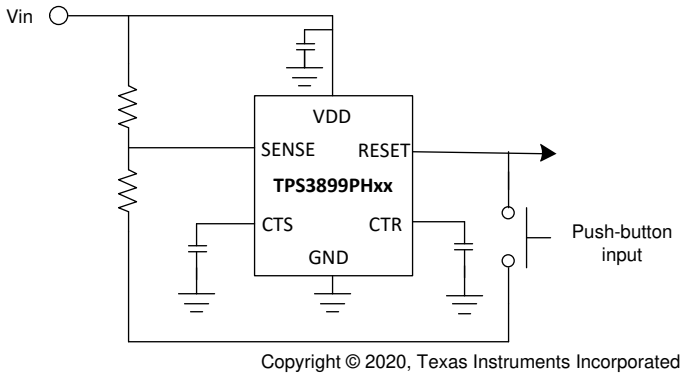

Figure 4-3. Programmable Push-Button Circuit

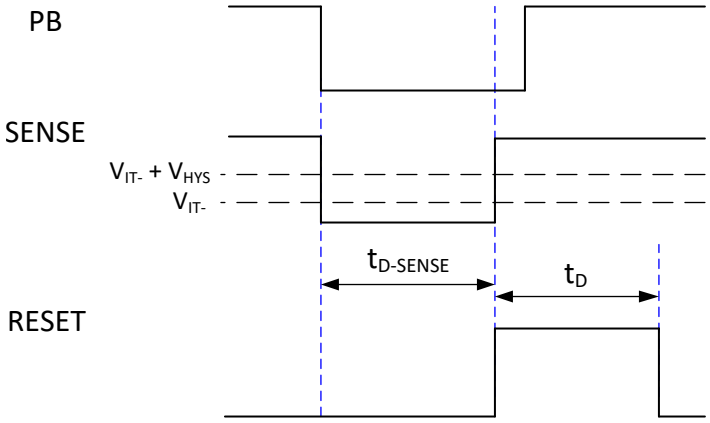

Figure 4-4. Programmable Push-Button Timing Diagram

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying 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 set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   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.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   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 a nonconforming EVM if (a) the nonconformity was 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, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, 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.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

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

FCC NOTICE: 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 or RSS-247*

Concerning EVMs Including Radio Transmitters:

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

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 to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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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2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page
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3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

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Last updated 10/2025