

EVM User's Guide: TPS3842EVM

TPS3842 Evaluation Module

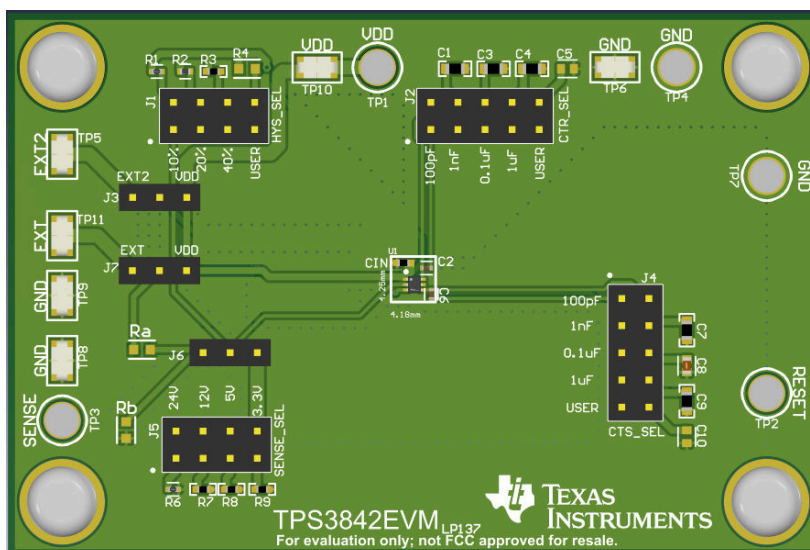


Description

The TPS3842EVM is an evaluation module (EVM) for the TPS3842-Q1 and TPS3842 family of voltage supervisors. The purpose of this EVM is to provide a sample design and test point for all input and output pins of the TPS3842 and TPS3842-Q1 device to capture measurements and gain familiarity with the device.

Features

- Wide supply voltage range: 1.9V to 42V
- VDD, SENSE, and $\overline{\text{RESET}}$ are rated to 42V
- Low quiescent current: 850nA (typical)
- High threshold accuracy: 0.5% (typical)
- Capacitor programmable adjustable delay time with CTR pin
- Capacitor programmable deglitch delay time with CTS pin



TPS3842EVM Board - Top

1 Evaluation Module Overview

1.1 Introduction

The TPS3842EVM helps design engineers evaluate the operation and performance of the TPS3842 family undervoltage monitors for possible use in the own circuit applications. This particular EVM configuration contains the TPS3842A011DRLR, an undervoltage supervisor designed to monitor an adjustable rail with the DRL package. The TPS3842 family includes adjustable capacitor pins for tying capacitors to adjust delays on both the rising and falling edges of the $\overline{\text{RESET}}$ outputs. Separately available SENSE input pins allow the redundancy sought by safety-critical and high-reliability systems. [Section 3](#) provides schematics, a BOM, and layout information on the board. [Section 2.1](#) describes the connectors, jumpers, and test points for the device. [Section 2.2](#) describes the setup and operation of the EVM.

This user's guide describes the operational use of the TPS3842EVM evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS3842, a low-power, high input voltage, undervoltage monitor. Included in this user's guide are setup instructions, a schematic diagram, printed-circuit board (PCB) layout drawings, and a bill of materials for the EVM.

1.2 Kit Contents

The TPS3842EVM circuit board comes preinstalled with the TPS3842A011DRLR device for full functionality testing of the TPS3842 family of devices. The TPS3842EVM circuit board comes packaged in a moisture barrier bag inside of antistatic foam layered cardboard box. Also contained in the box is the EVM literature disclaimer.

Table 1-1. Kit Contents

Item	Quantity
TPS3842EVM	1

1.3 Specification

		MIN	MAX	UNIT
Voltage	V_{DD}	1.9	42	V
Voltage	$V_{\text{SENSE}}, V_{\text{RESET}}$	0	42	V
Voltage	$V_{\text{CTS}}, V_{\text{CTR}}$	0	5	V
Current	$I_{\text{RESET}}, I_{\text{BIST}}$	0	± 10	mA
Temperature	Operating junction temperature, T_J	-40	125	$^{\circ}\text{C}$

1.4 Device Information

The TPS3842EVM is shipped preinstalled with the TPS3842A011DRLR device, but can be used with any TPS3842-Q1 and TPS3842 variant. The TPS3842 family has built-in self-test functionality for voltages up to 42V.

2 Hardware

2.1 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. Each device has an independent supply connection, but all grounds are connected on the board.

2.1.1 EVM Test Points

Table 2-1 lists the test points and functional descriptions. All pins of the device are broken out to test points on the EVM.

Table 2-1. Test Points

Test Point Number	Test Point Silkscreen Label	Function	Description
TP1	VDD	Connects to the VDD pin.	Allows user to measure voltage into VDD.
TP2	RESET	Connects to the RESET pin.	Allows user to measure the RESET output voltage.
TP3	SENSE	Connects to the SENSE pin.	Allows user to measure voltage into SENSE.
TP4	GND	Connects to ground.	Allows user to use ground connections from multiple points.
TP5	EXT2	Connects to the RP resistor.	Allows user to optionally pull up RP to an external voltage.
TP6	GND	Connects to ground.	Allows user to use ground connections from multiple points.
TP7	GND	Connects to ground.	Allows user to use ground connections from multiple points.
TP8	GND	Connects to ground.	Allows user to use ground connections from multiple points.
TP9	GND	Connects to ground.	Allows user to use ground connections from multiple points.
TP10	VDD	Connects to the VDD pin.	Allows user to apply desired voltage to VDD pin.
TP11	EXT_S	Connects to Ra resistor.	Allows user to apply a desired external voltage to sense pin decoupled from VDD.

2.1.2 EVM Jumpers

Table 2-2 lists the jumpers on the TPS3842EVM. As ordered, the EVM has twelve jumpers installed.

Table 2-2. Jumpers

Jumper	Default Connection	Description
J1	Pin7 and 8	Selectable jumper to pick hysteresis level. The resistors are configured to work with the 12V jumper selection on J5. Put the jumper on USER to use an external resistor to modulate hysteresis.
J2	Pin1 and 2 C2 (100pF)	Selectable jumper to pick capacitor time reset delay. These capacitors range from 100pF to 1uF. Put the jumper on USER to use an external capacitor to modulate the capacitor time reset delay.
J3	Pin1 and 2	Selectable jumper to pick between having RP pulled up to VDD or an external supply (EXT2). Connecting the jumper between the middle pin and VDD pulls RP up to VDD. Connecting the jumper between the middle pin and EXT2 pulls RP up to EXT2.
J4	Pin1 and 2 C6 (100pF)	Selectable jumper to pick capacitor time sense delay. These capacitors range from 100pF to 1uF. Put the jumper on USER to use an external capacitor to modulate the capacitor time sense delay.
J5	Closed on R9 (3.3V)	Selectable jumper to pick sense voltage. These resistors, in conjunction with the R5 resistors, allow sense to detect invalid voltage conditions at 3.3V, 5V, 12V, and 24V.
J6	Pin1 and 2	Selectable jumper to pick between using the included resistors of R5 to R9 to set sense voltage to using a user defined resistor divider (Ra and Rb) to set sense voltage. Connecting the jumper between the left and middle pin also allows sense to be decoupled from VDD, provided that the jumper on J7 is also between the left and middle pin.
J7	Open	Selectable jumper to pick between using the IC to sense an invalid condition on VDD or an external power supply. Connecting the jumper between the middle pin and VDD allows the user defined resistor divider (Ra and Rb) to set the invalid sense condition based on VDD. Connecting the jumper between the middle pin and EXT allows the user defined resistor divider to set the invalid sense condition based on EXT. When connecting the jumper between the middle pin and VDD, J6 must be left unconnected. J7 can be left disconnected if only the predefined resistors on J6 are to be used to detect invalid voltage on sense.

2.2 EVM Setup and Operation

This section describes the functionality and operation of the TPS3842EVM. The user needs to read the TPS3842 data sheet ([SNVSCK5](#)) for electrical characteristics of the device.

2.2.1 Capacitor Sense Time Delay

The TPS3842 family of devices contain an adjustable reset time delay pin that control the time with which the reset pins assert after the pins reach the invalid condition. The user can adjust the configuration of this pin via the jumpers located at J4. Position USER of the header connects the pin to a unstuffed 0603 capacitor pad for the user to solder on a capacitor of choice. The capacitor values for these jumpers are labeled on the board and are also listed in [Section 2.1.2](#) and have values of 100pF, 1nF, 0.1uF, 1uF and one with only a pad for user use. Please see the adjustable *Sense Time Delay Configuration* on the TPS3842 data sheet for more detailed information on user programming.

2.2.2 Capacitor Reset Time Delay

The TPS3842 family of devices contain an adjustable reset time delay pin that control the time with which the reset pins de-assert after the pins reach the valid condition. The user can adjust the configuration of these pins via the jumpers located at J2. Position USER of the header connects the pin to a unstuffed 0603 capacitor pad for the user to solder on a capacitor of choice. The capacitor values for these jumpers are labeled on the board and are also listed in [Section 2.1.2](#) and have values of 100pF, 1nF, 0.1uF, 1uF and one with only a pad for user use. Please see the adjustable *Reset Time Delay Configuration* on the TPS3842 data sheet for more detailed information on user programming.

2.2.3 Input Power (VDD)

The VDD supply is connected through the TP1 and TP10 test points on board. TP1 and TP10 are connected to the VDD pin of the TPS3842 device and TP4, TPS6, TP7, TP8, and TP9 are connected to the GND pin of the device. The supply voltage range is 2.7V to 42V and a 0.1μF decoupling capacitor is recommended at the input for reducing noise that can propagate through the device (included on the EVM board at C2). [Table 2-3](#) details the nominal supply voltage and typical input decoupling capacitor.

Table 2-3. Nominal Supply Parameters

Device	Nominal Supply Voltage (V)	Typical Decoupling Capacitor at Input
TPS3842	2.7V to 42V	0.1μF

3 Hardware Design Files

3.1 TPS3842EVM Schematic

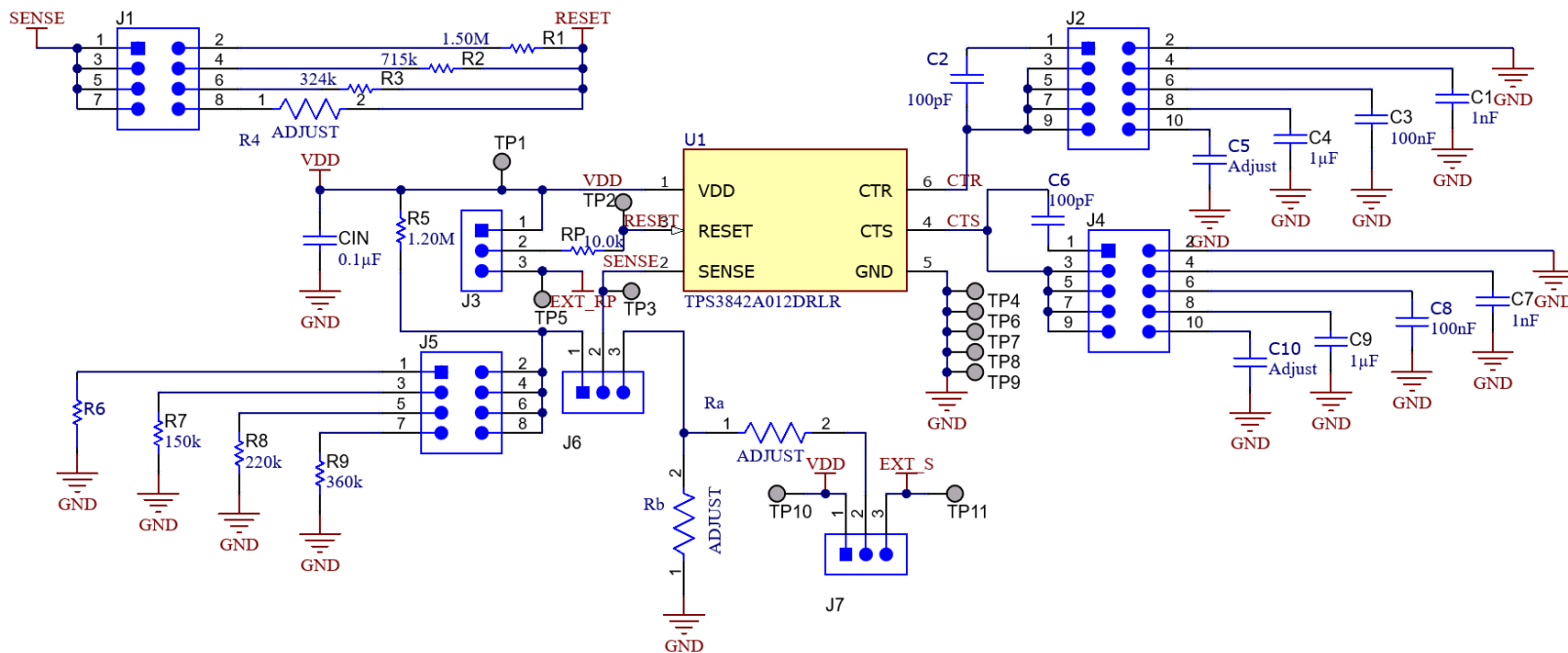


Figure 3-1. TPS3842EVM Schematic

3.2 PCB Layouts

Figure 3-2 and Figure 3-3 are the top overlay and bottom overlay of the printed circuit board (PCB) and shows the component placement on the EVM. Figure 3-4 shows the top layout, Figure 3-5 and Figure 3-6 show the top and bottom layers, and Figure 3-7 and Figure 3-8 show the top and bottom solder masks of the EVM.

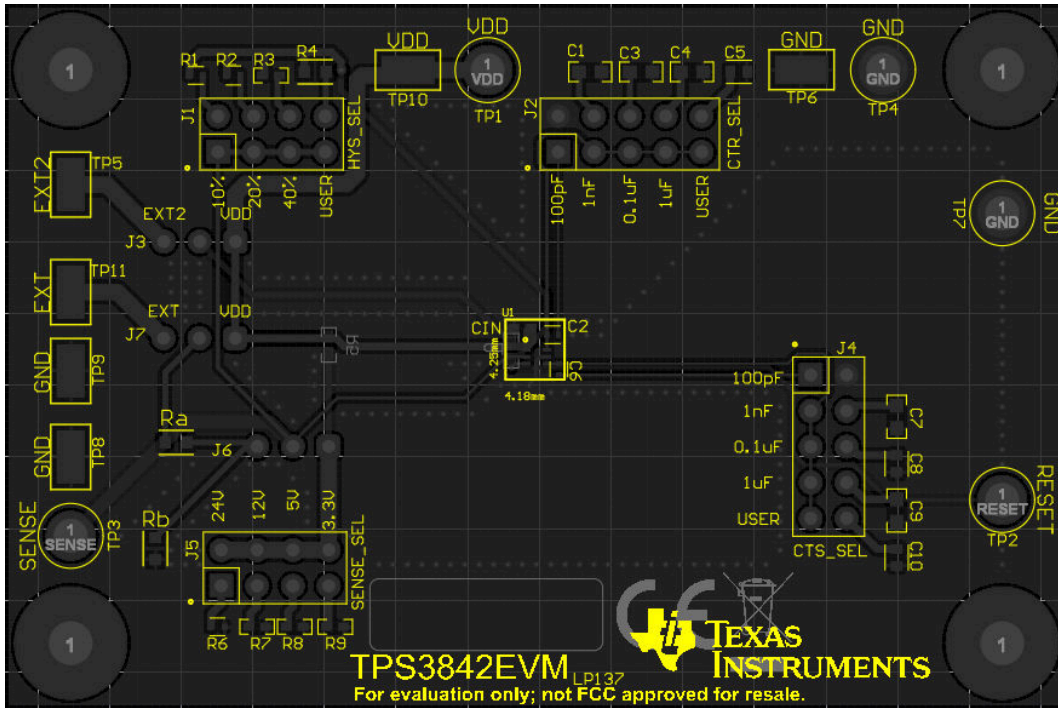


Figure 3-2. Top Overlay

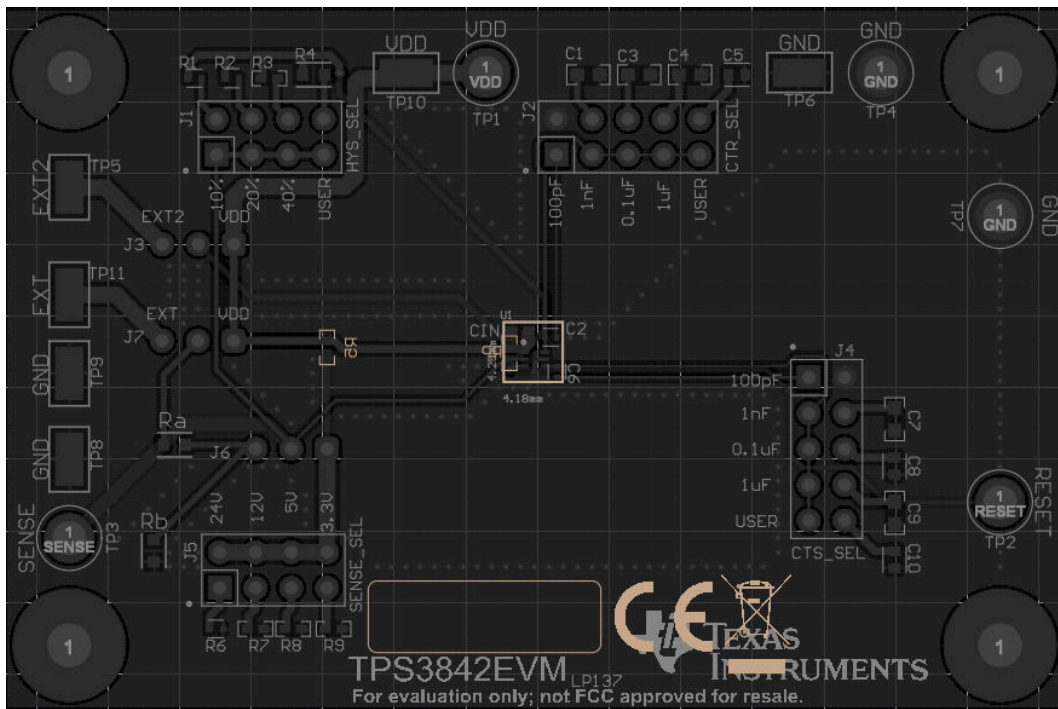


Figure 3-3. Bottom Overlay

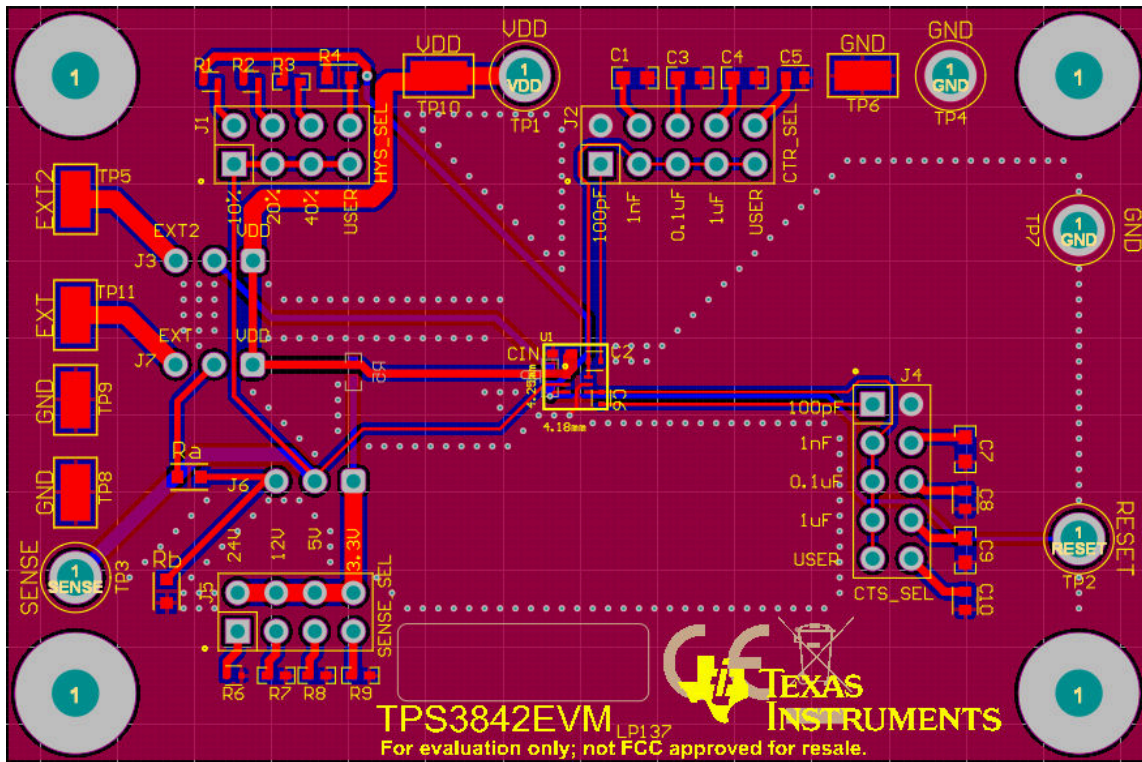


Figure 3-4. Top Layout

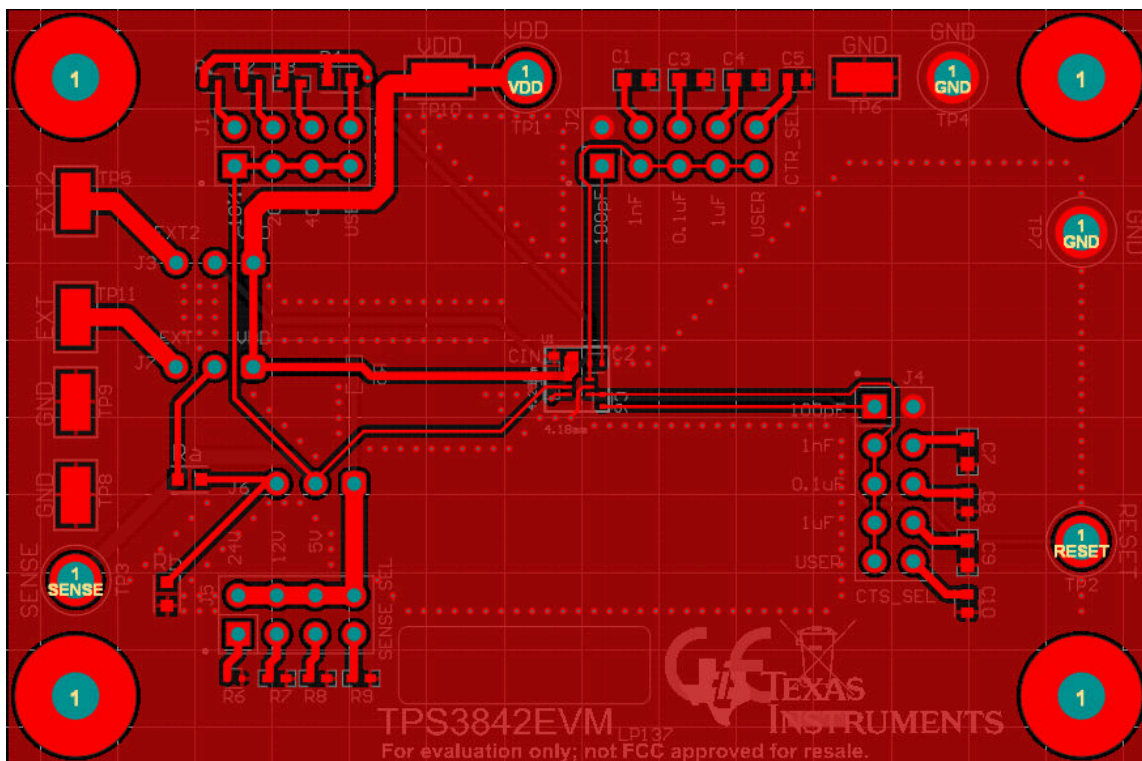


Figure 3-5. Top Layer

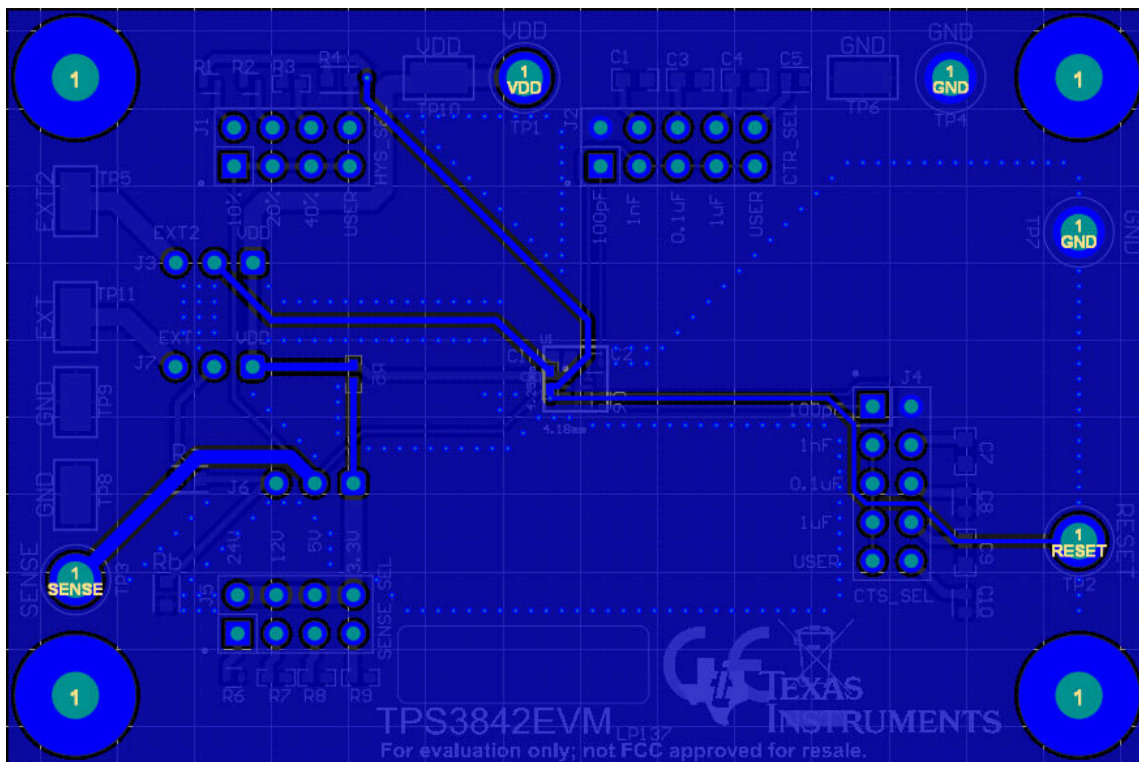


Figure 3-6. Bottom Layer

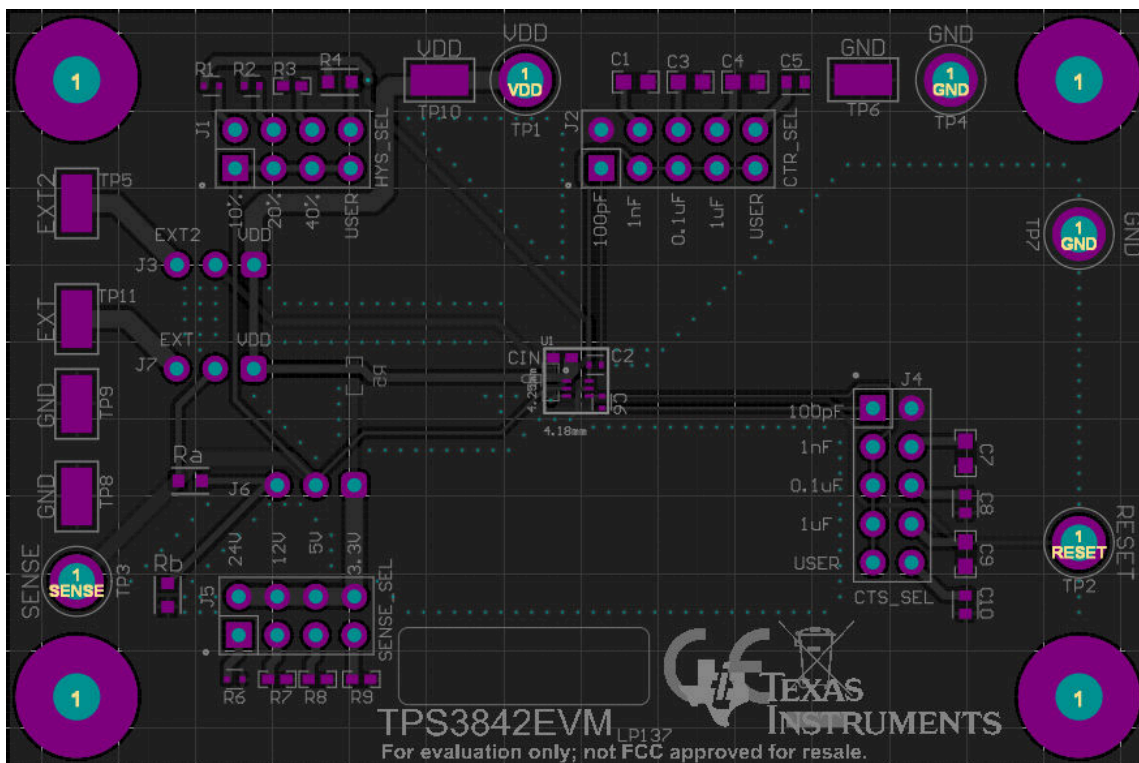


Figure 3-7. Top Solder Mask

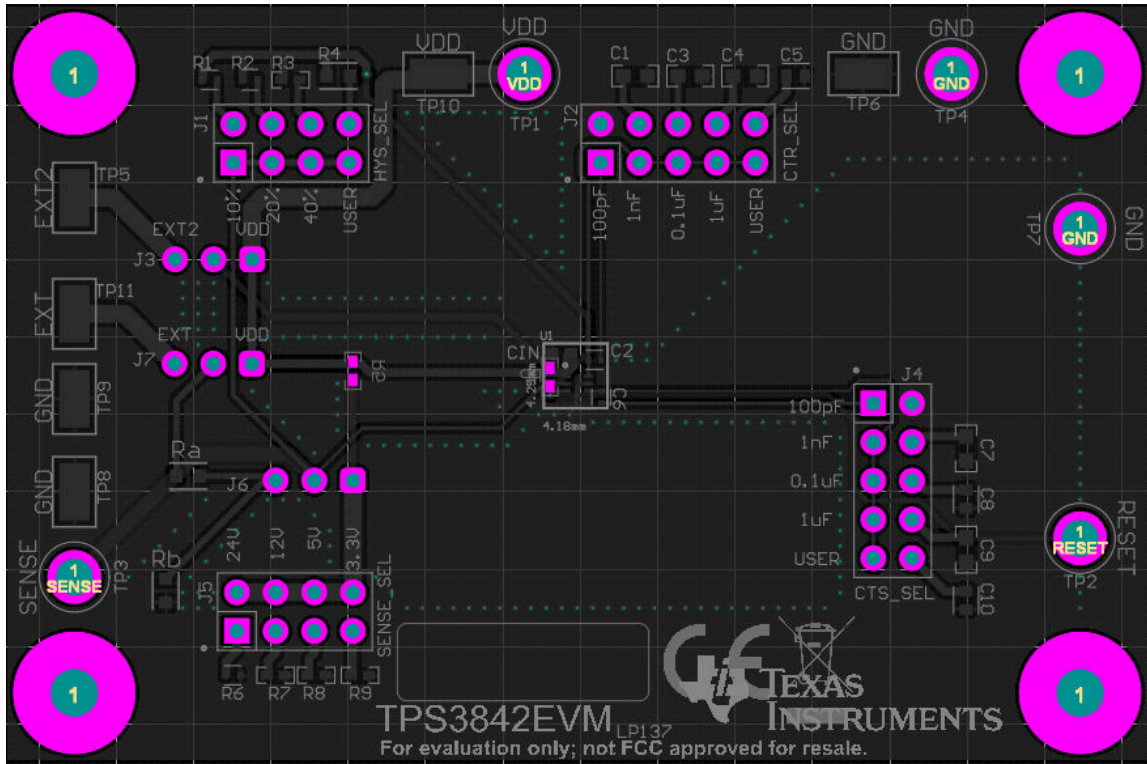


Figure 3-8. Bottom Solder Mask

3.3 Bill of Materials

Table 3-1. Bill of Materials (BOM)

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
!PCB	1		Printed Circuit Board			
C1, C7	2	1nF	Cap Ceramic 1nF 100V X7R 10% Pad SMD 0805 +125°C Automotive T/R	0402	GRM188R72D102KW07D	TDK
C2, C6	2	100pF	Multilayer Ceramic Capacitors 100pF ±5% 100V C0G SMD 0402	0402	CGA2B2NP02A101J050BA	TDK
C3, C8	2	100nF	Cap Ceramic 100nF 100V X7R 10% Pad SMD 0805 +125°C Automotive T/R	0603	06035C104KAZ2A	TDK
C4, C9	2	1 uF	Cap Ceramic 1uF 100V X7S 10% Pad SMD 0805 +125°C Automotive T/R	0603	CGA3E1X7R1V105K080AE	TDK
C5 (DNI), C10 (DNI)	0		Cap Ceramic 100nF 100V X7R 10% Pad SMD 0805 +125°C Automotive T/R	805		
C1N	1	100nF	Cap Ceramic 100nF 100V X7S 10% Pad SMD 0603 +125°C Automotive T/R	0402	CGA2B3X7R1H104K050BD	TDK
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead		NYPMS4400025PH	B&F Fastener
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon		1902C	Keystone Electronics
J1, J5	2		Male Header, Pitch 2.54mm, 2 x 4 Position, Height 8.38mm, Tail Length 5.08mm, -55°C to 125°C, RoHS, Bulk		TSW-104-08-L-D	Samtech
J2, J4	2		Post Terminal Strip Assembly, Pitch 2.54mm, 2 x 5 Position, Height 8.58mm, Tail Length 2.5mm, -55°C to 125°C, RoHS, Bulk		TSW-105-07-G-D	Samtech
J3, J6, J7	3		0.025in SQ Post Header, Through-hole, Vertical, -55°C to 125°C, 2.54mm Pitch, 3-Pin, Male, RoHS		TSW-103-07-G-S	Samtech
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll		THT-14-423-10	Brady
R1	1	1.5M		0402	RMCF0402FT1M50	Yageo
R2	1	715 K		0402	CRCW0402715KFKED	Yageo
R3	1	324 K		0402	CRCW0402324KFKED	Yageo
R4 (DNI), Ra (DNI), Rb (DNI)	0			0402		
R5	1	1.2M		0402	ERJ-2GEJ125X	Yageo
R6	1	43 K		0402	ERJ-2RKF4302X	Panasonic
R7	1	150 K		0402	ERJ-2RKF1503X	Yageo
R8	1	220 K		0402	RC0402FR-07220KL	Yageo

Table 3-1. Bill of Materials (BOM) (continued)

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
R9	1	360 K		0402	ERJ-2RKF3603X	Yageo
RP	1	10 K		0402	ERJPA2F1002X	Yageo
TP1, TP2, TP3, TP4, TP7	5		Terminal DBL Turret, Through Hole, RoHS		1502-2	Keystone Electronics
TP5, TP6, TP8, TP9, TP10, TP11	6		Test Point, 1 Position SMD, RoHS, Tape and Reel		5019	Keystone Electronics
U1	1		TPS3842A011DRLR		TPS3842A011DRLR	Texas Instruments

4 Additional Information

4.1 Trademarks

All trademarks are the property of their respective owners.

5 Related Documentation

- TPS3842 42V Small Size, 850nA Undervoltage Supervisor With Programmable Delay and De-Glitch data sheet, [SNVSCK5](#).

Please see the TPS3842 data sheet for more detailed specifications, pin descriptions, applications, and other information related to the device. This user's guide provides information related to using the EVM.

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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.
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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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 - 2.1 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 DEGRADATION 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/lstds/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。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 <https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html>

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.
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