TPS2592XXEVM-531 EVM: TPS2592XX Evaluation Module User's Guide

User's Guide

Literature Number: SLVU923A
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Contents

List of Figures

List of Tables

Introduction

This User's Guide describes the evaluation module (EVM) for the TPS2592XX (TPS2592XXEVM-531). The TPS2592XXEVM is a 4.5-V to 18-V eFuse allowing for reference-circuit evaluation of Texas Instrument's TPS2592XX with an Integrated-Blocking FET Driver and Adjustable Current Limit. TPS2592XX is available for 4.5-V to 18-V operation with both latching and auto-retry operation.

1.1 Features

- TPS2592XX Features
  - 4.5-V to 13-V (typical) bus operation (TPS2592Ax)
  - 4.5-V to 5-V (typical) bus operation (TPS2592Bx)
  - 4.5-V to 18-V (typical) bus operation (TPS2592Zx)
  - Programmable current limit
  - Fixed overvoltage setting (TPS2592Ax and TPS2592Bx)
  - Programmable V_{out} slew rate
  - Programmable UVLO
  - Built-in thermal shutdown
  - Latched-off TPS2592AL, TPS2592BL, TPS2592ZL
  - Auto-retry TPS2592AA, TPS2592BA , TPS2592ZA
- Onboard output-overload circuit
- External blocking FET
- Push button RESET signal
- Copper pour with vias to the internal ground takes advantage of the PowerPAD™ Package
- Onboard transorb is for overvoltage input protection
- Common diode at output prevents negative spike when load is removed while powered on

1.2 Applications

- Server
  - Plug-in circuit boards
  - Redundant array of independent disks (RAID), disk drive
- Telecom
  - Advanced Telecom Computing Architecture (ATCA)
  - Micro-ATCA
- General hot plug
- Thunderbolt power bus protection

PowerPAD is a trademark of Texas Instruments.

Description

TPS2592XXEVM-531 enables full evaluation of the TPS2592XX devices. Refer to the schematic shown in Figure 2-1. Input power is applied at J5 and J7, while J3 and J7 provides the output connection to the load. D3 and C4 provide input protection for the TPS2592XX (U1) while the D4-C1-C2-C6 circuit provides output protection. S1 allows U1 to be RESET or disabled. Circuit faults are observed with D2 and at TP4.

Turnon or inrush slew-rate control is enabled by installing C3 (default) and observed at TP8. The ON and FAULT LEDs (D1 and D2 respectively) are enabled by installing a shunt on J1. TPS2592XXEVM-531 contains an output-overload circuit that enables by applying approximately 5 V between TP1 and TP3.

Table 2-1. TPS2592 Device Options

Part Number	Vin Range	UVLO / OVP	Current Limit (TYP)	Thermal Fault
TPS2592AADRC	9 V to 18 V	10.5 V / 15 V	2 A	Auto-Retry
TPS2592ALDRC	9 V to 18 V	10.5 V / 15 V	2 A	Latched
TPS2592BADRC	4 V to 6 V	4.5 V / 5.8 V	3 A	Auto-Retry
TPS2592BLDRC	4 V to 6 V	4.5 V / 5.8 V	3 A	Latched
TPS2592ZADRC	4.5 V to 18 V(1)	4.5 V / –	2 A	Auto-Retry
TPS2592ZLDRC	4.5 V to 18 V(1)	4.5 V / –	2 A	Latched

(1) The input supply voltage (including input transients) at the VIN pin should not exceed device maximum ratings as specified in the **ABSOLUTE MAXIMUM RATINGS** of the TPS2592XX data sheet (SLVSC11).

NOTE: The default devices on the EVM boards are TPS2592AA and TPS2592BL, to test other versions of the device, customers are suggested to replace with respective variants.

2.1 Schematic

The TPS2592XXEVM schematic is illustrated in Figure 2-1.

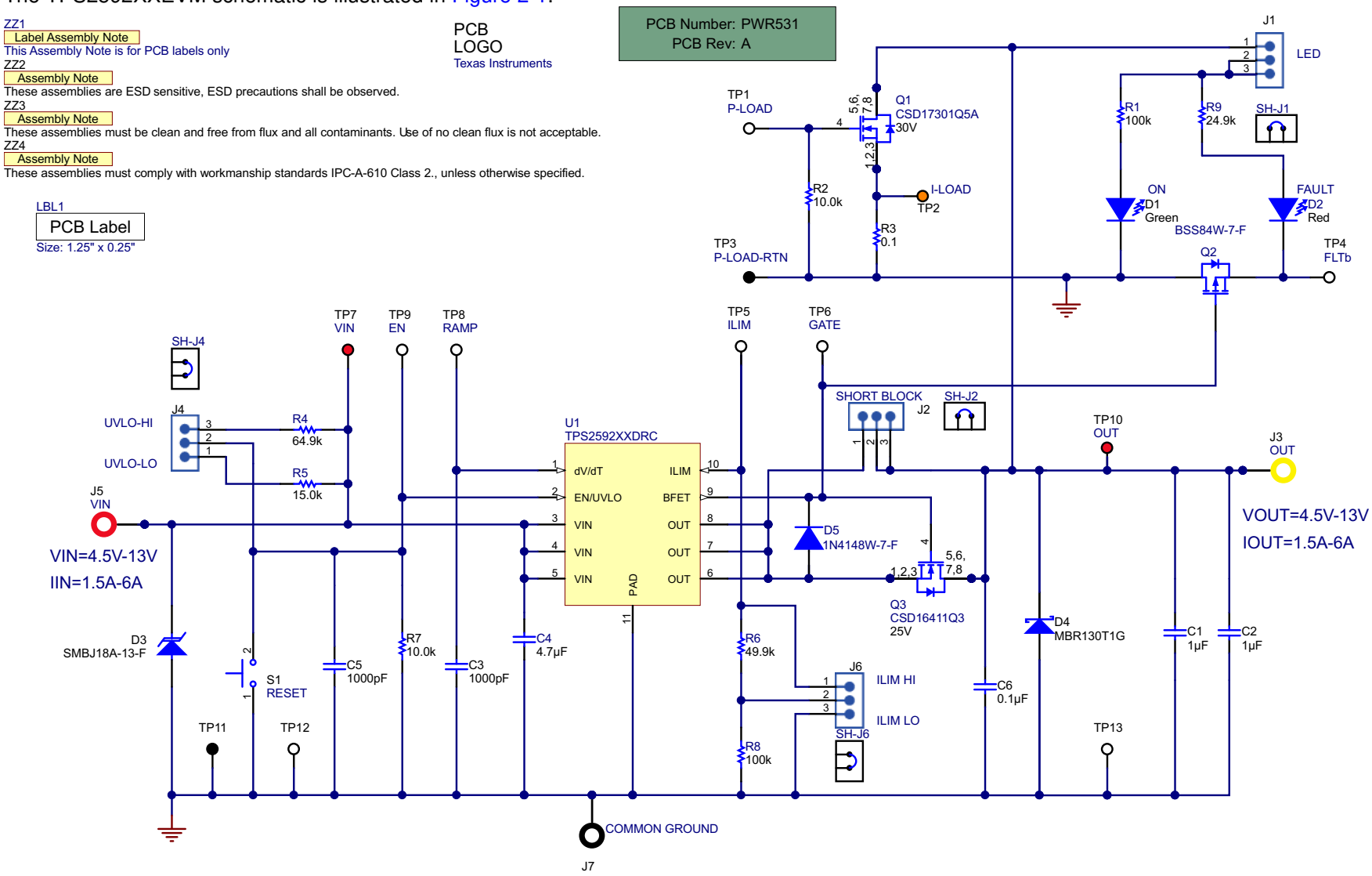

Figure 2-1. TPS2592XXEVM Schematic

General Configuration and Description

3.1 Physical Access

Table 3-1 lists the TPS2592XXEVM connector functionality. Table 3-2 describes the test point availability and Table 3-3 describes the jumper functionality.

Table 3-1. Connector Functionality

Connector	Label	Description
J5 / J7	INPUT / GND	4.5-V to 13-V[(1)] input to the EVM.
J3 / J7	OUTPUT / GND	4.5-V to 13-V[(1)] output from the EVM.

(1) 4.5 V to 18 V for TPS2592Zx versions.

Table 3-2. Test Points

Test Point	Color	Label	Description
TP7 / TP11 / TP12	RED / BLACK / SM[(1)]	INPUT / GND	4.5-V to 13-V[(2)] input to the EVM.
TP10 / TP13	RED / SM[(1)]	OUTPUT / GND	4.5-V to 13-V[(2)] output from the EVM.
TP9	WHITE	EN	Active-high enables input and active-low fault output
TP8	WHITE	RAMP	Slew rate control
TP6	WHITE	GATE	Blocking FET GATE control
TP5	WHITE	ILIM	Current limit resistor test point
TP1	WHITE	LDEN	Output load enable. Apply 3 to 8 V between TP1 and TP3 to enable U1 overload.
TP3	BLACK	GND	Ground for load circuit
TP2	ORANGE	ILD	Output current monitor. Load current = 10 × voltage on TP2 when the overload circuit is enabled at TP1.

(1) SM = Surface mount.
(2) 4.5 V to 18 V for TPS2592Zx versions.

Table 3-3. Jumpers

Jumper	Label	Description
J1	J1	Install between pins 1 and 2 to enable D1 and D2.
J2	J2	Install between pins 1 and 2 to bypass blocking FET, Q3.
J4	J4	Install between pins 1 and 2 for UVLO = 3.5 V and install between pins 2 and 3 for UVLO = 10.5 V.
J6	J6	Install between pins 1 and 2 for ILIM = 4 A and install between pins 2 and 3 for ILIM = 2.3 A.

3.2 Test Setup

Figure 3-1 shows a typical test setup for TPS2592XXEVM. Connect J5 and J7 to the power supply, and J3 and J7 to the load.

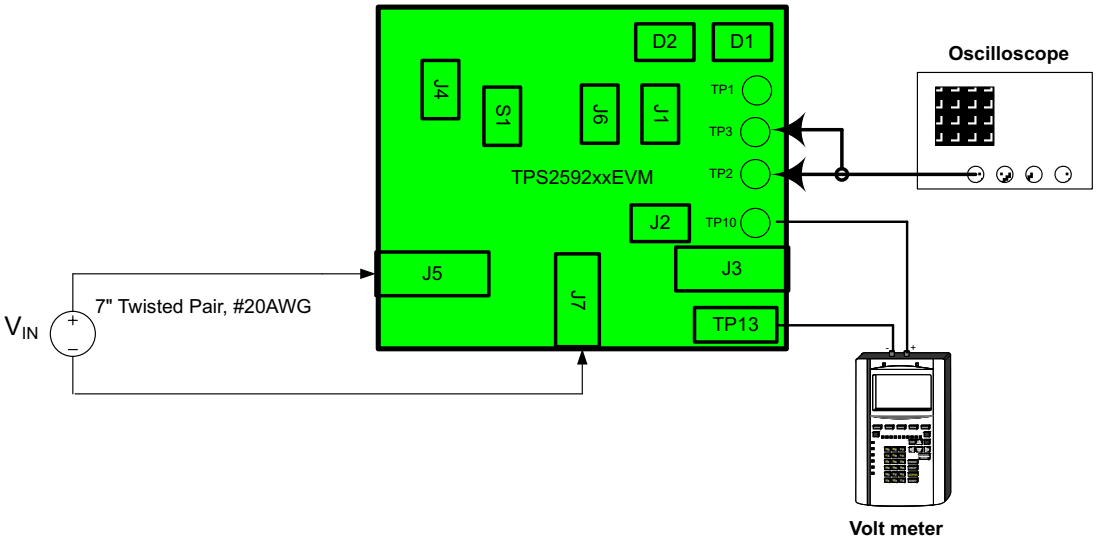

Figure 3-1. Typical TPS2592XXEVM Test Setup

EVM Assembly Drawings and Layout Guidelines

4.1 PCB Drawings

Figure 4-1, Figure 4-2, and Figure 4-3 show component placement and layout of the EVM.

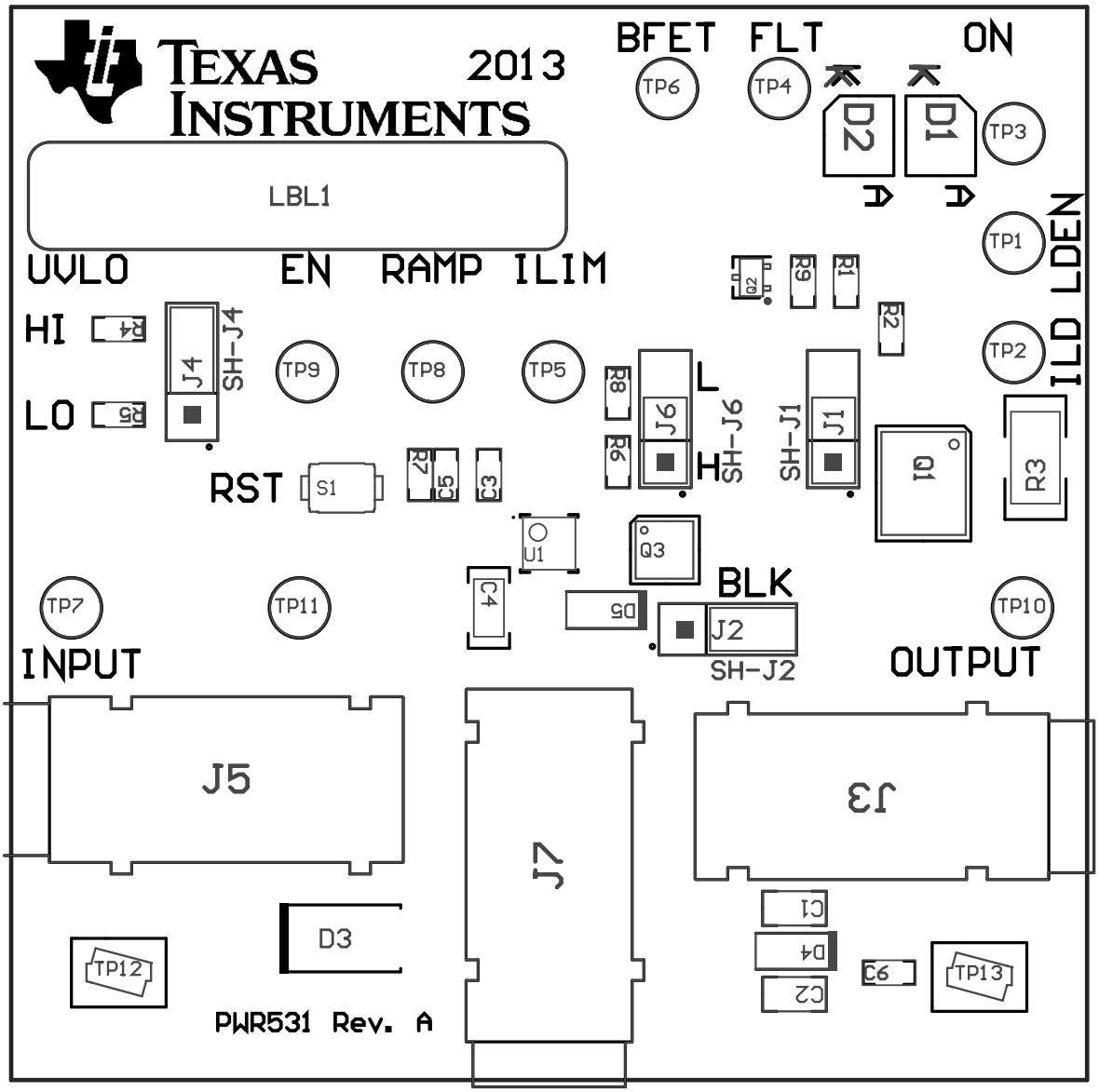

Figure 4-1. Top-Side Placement

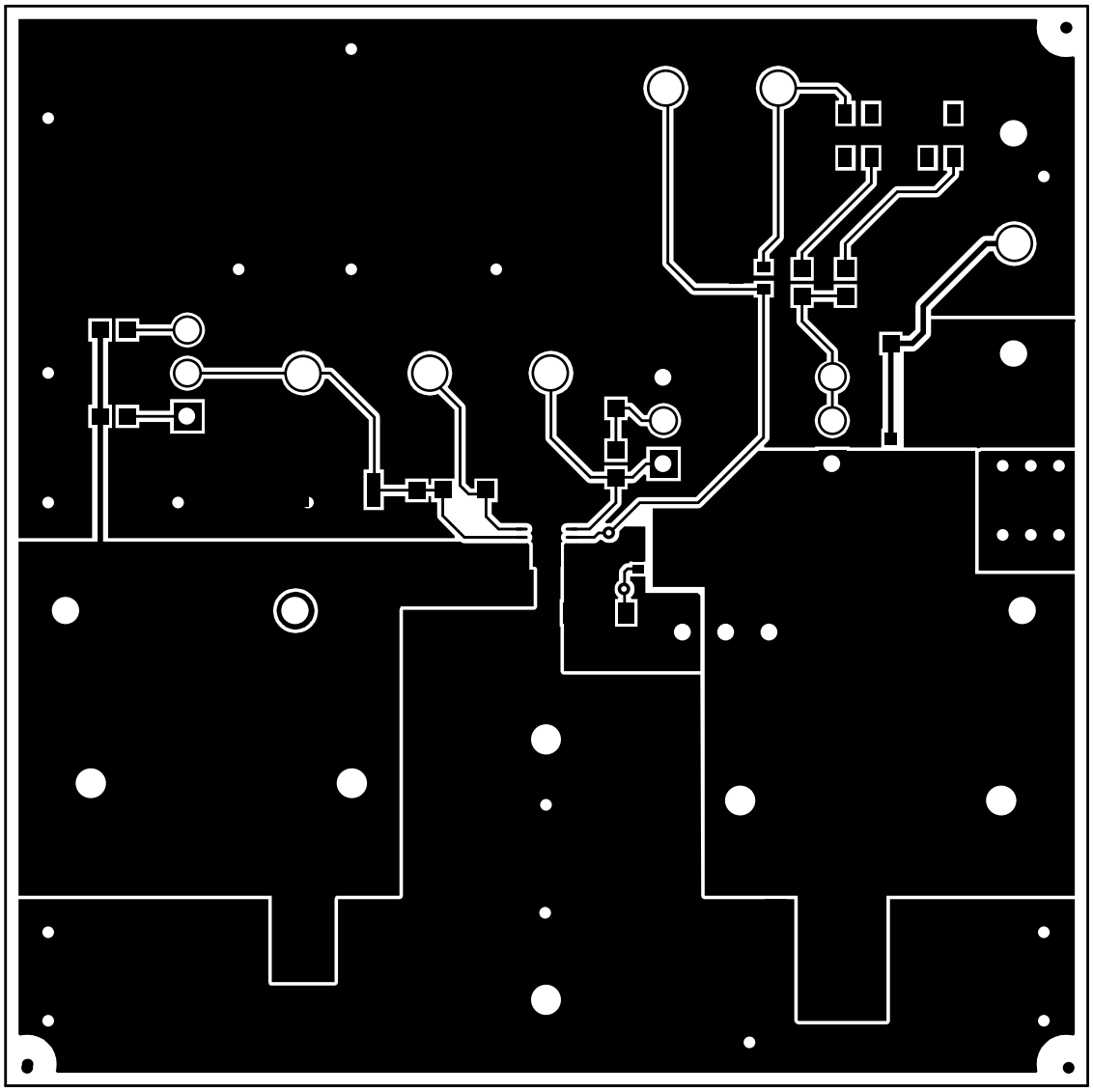

Figure 4-2. Top-Side Routing

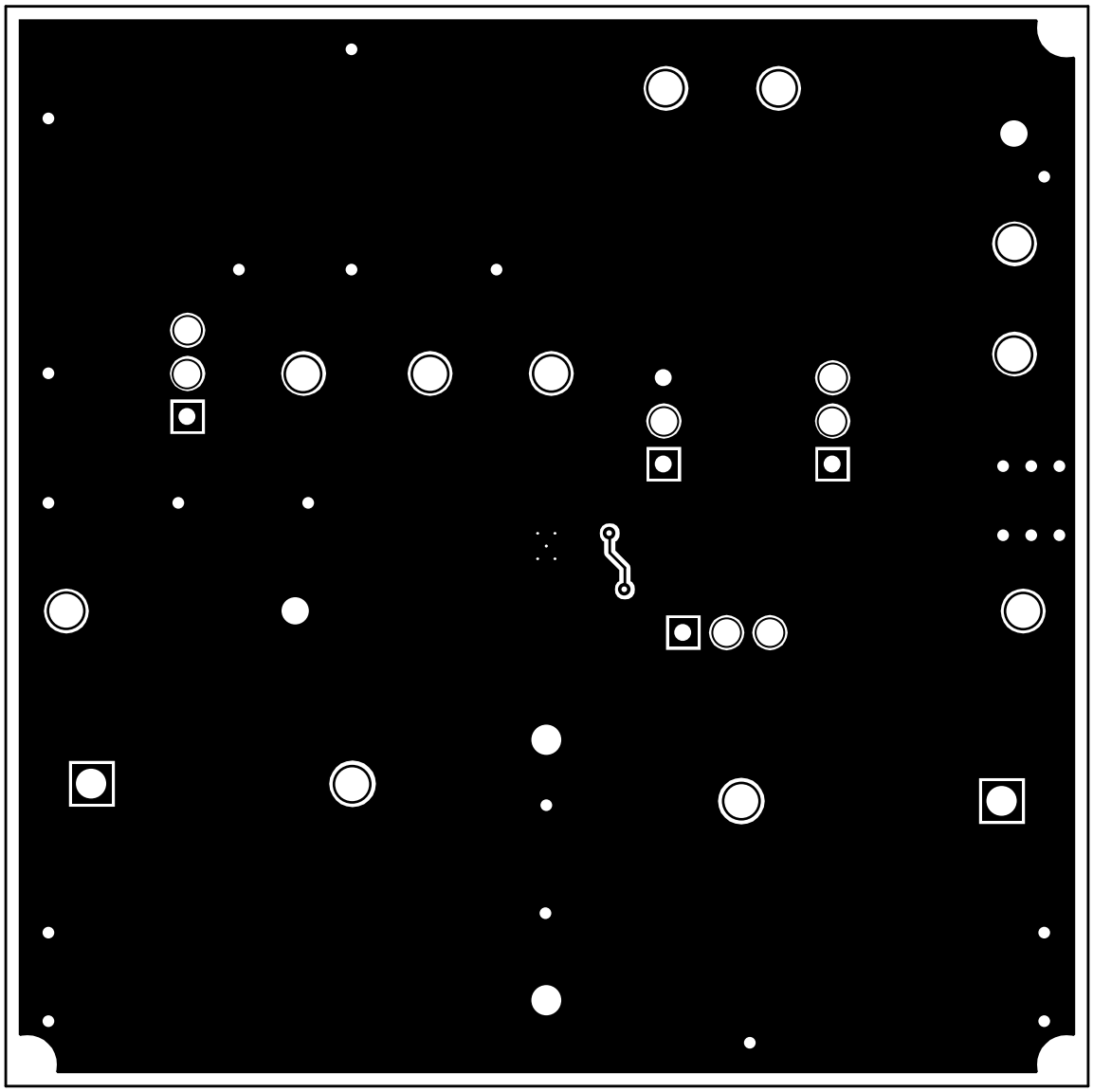

Figure 4-3. Bottom-Side Routing

Bill of Materials

The TPS2592XXEVM bill of materials is shown in Table 5-1.

Table 5-1. TPS2592XXEVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
PCB	1		Printed Circuit Board		PWR531	Any
C1, C2	2	1 µF	CAP, CERM, 1 µF, 25 V, ±10%, X5R, 0805	0805	08053D105KAT2A	AVX
C3, C5	2	1000 pF	CAP, CERM, 1000 pF, 100 V, ±20%, X7R, 0603	0603	06031C102MAT2A	AVX
C4	1	4.7 µF	CAP, CERM, 4.7 µF, 25 V, ±10%, X7R, 1206	1206	C3216X7R1E475K	TDK
C6	1	0.1 µF	CAP, CERM, 0.1 µF, 25 V, ±10%, X7R, 0603	0603	06033C104KAT2A	AVX
D1	1	Green	LED, Green, SMD	Power TOPLED w/lens	LT E63C-CADB-35-L-Z	OSRAM
D2	1	Red	LED, Red, SMD	Power TOPLED w/lens	LS E63F-DBFA-1-Z	OSRAM
D3	1	18 V	Diode, TVS, Uni, 18 V, 600 W, SMB	SMB	SMBJ18A-13-F	Diodes Inc.
D4	1	0.47 V	Diode, Schottky, 30 V, 1 A, SOD-123	SOD-123	MBR130T1G	ON Semiconductor
D5	1	1.25 V	Diode, Ultrafast, 100 V, 0.15 A, SOD-123	SOD-123	1N4148W-7-F	Diodes Inc.
J1, J2, J4, J6	4	1 × 3	Header, TH, 100 mm, 1 × 3, Gold plated, 230 mm above insulator	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions
J3	1	10 A	Standard Banana Jack, insulated, 10 A, yellow	571-0700	571-0700	DEM Manufacturing
J5	1	10 A	Standard Banana Jack, insulated, 10 A, red	571-0500	571-0500	DEM Manufacturing
J7	1	10 A	Standard Banana Jack, insulated, 10 A, black	571-0100	571-0100	DEM Manufacturing
LBL1	1		Thermal Transfer Printable Labels, 1.25 in (W) x 0.250 in (H) — 10,000 per roll	PCB Label 1.25 in (H) x 0.250 in (W)	THT-13-457-10	Brady
Q1	1	30 V	MOSFET, N-CH, 30 V, 100 A, SON 5 mm × 6mm	SON 5 mm × 6 mm	CSD17301Q5A	Texas Instruments
Q2	1	–50 V	MOSFET, P-CH, –50 V, –0.13 A, SOT-323	SOT-323	BSS84W-7-F	Diodes Inc.
Q3	1	25 V	MOSFET, N-CH, 25 V, 56 A, SON 3.3 mm × 3.3 mm	SON 3.3 mm × 3.3mm	CSD16411Q3	Texas Instruments
R1, R8	2	100 k	RES, 100 kΩ, 1%, 0.1 W, 0603	0603	CRCW0603100KFKEA	Vishay-Dale
R2, R7	2	10 k	RES, 10 kΩ, 1%, 0.1 W, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
R3	1	0.1	RES, 0.1 Ω, 1%, 0.5 W, 2010	2010	WSL2010R1000FEA	Vishay-Dale
R4	1	64.9 k	RES, 64.9 k ohm, 1%, 0.1 W, 0603	0603	CRCW060364K9FKEA	Vishay-Dale
R5	1	15 k	RES, 15 kΩ, 1%, 0.1 W, 0603	0603	CRCW060315K0FKEA	Vishay-Dale
R6	1	49.9 k	RES, 49.9 kΩ, 1%, 0.1 W, 0603	0603	CRCW060349K9FKEA	Vishay-Dale
R9	1	24.9 k	RES, 24.9 kΩ, 1%, 0.1 W, 0603	0603	CRCW060324K9FKEA	Vishay-Dale
S1	1		Switch, Push Button, SMD	2.9 mm × 2 mm × 3.9mm SMD	SKRKAEE010	Alps
SH-J1, SH-J2, SH-J4, SH-J6	4	1 × 2	Shunt, 100 mm, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP4, TP5, TP6, TP8, TP9	6	White	Test Point, TH, Multipurpose, White	Keystone5012	5012	Keystone
TP2	1	Orange	Test Point, TH, Multipurpose, Orange	Keystone5013	5013	Keystone
TP3, TP11	2	Black	Test Point, TH, Multipurpose, Black	Keystone5011	5011	Keystone
TP7, TP10	2	Red	Test Point, TH, Multipurpose, Red	Keystone5010	5010	Keystone
TP12, TP13	2	SMT	Test Point, SMT, Compact	Testpoint_Keystone_Compact	5016	Keystone
U1	1		12-V eFuse with Integrated Blocking FET Driver, Auto Retry, DRC0010A	DRC0010A	TPS2592AADRC	Texas Instruments

Revision History

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

- Changed '12-V' and '12-V and 5-V' operation to '4.5-V to 18-V' in Introduction section. 4
- Added '4.5-V to 18-V (typical) bus operation (TPS2592Zx)' in the Features section. 4
- Added 'TPS2592Ax and TPS2592Bx' to Fixed overvoltage setting bullet in the Features section. 4
- Added 'TPS2592ZL' to Latched-off bullet in the Features section. 4
- Added 'TPS2592ZA' to Auto-retry bullet in the Features section. 4
- Added 'Thunderbolt power bus protection' to Applications section. 4
- Added two rows and a table note to the bottom of TPS2592 Device Options table. 5
- Added table note to Connector Functionality table 7
- Added table note to Test Points table 7

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

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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.

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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

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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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-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.

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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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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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.

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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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2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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