User's Guide
SLVUA56–June 2014

TPS25942xEVM-635: Evaluation Module for TPS25942x

This user's guide describes the evaluation module (EVM) for the Texas instruments TPS25942x devices. The TPS25942x devices are eFuse with True Reverse Blocking for a Power Mux that operates from 2.7V to 18V, and the devices have integrated back-to-back FETs with programmable under-voltage, over-voltage, reverse-voltage, over-current and in-rush current protection features.

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1 Introduction

The TPS25942x-EVM allows reference circuit evaluation of TI's TPS25942x devices. The TPS25942x devices are available with both latched and auto-retry operation.

1.1 EVM Features

- General TPS25942xEVM features include:
  - 2.7-V to 18.0-V (typ) operation
    - CH1 Rising Input voltage turn-on threshold – 10.5 V (TYP)
    - CH1 Falling Input voltage turn-off threshold – 9.7 V (TYP)
    - CH2 Rising Input voltage turn-on threshold – 2.3 V (TYP)
    - CH2 Falling Input voltage turn-off threshold – 2.1 V (TYP)
  - 0.6A to 5.0 A programmable current limit
  - Programmable under voltage lockout/overvoltage
  - Programmable VOUT slew rate
  - Latched-off TPS25942**L**RUV (CH2)
  - Auto-retry TPS25942**A**RUV (CH1)
- Push button RESET signal
- On-board transorb is for overvoltage input protection
- Common diode at output prevents negative spike when load is removed

1.2 EVM Applications

- Solid state drives and hard disk drives
- PCIe, RAID and NIC cards
- USB power switch
- Industrial
  - PLCs
  - Solid state relays and FAN control
- Power path management
  - Active ORing
  - Priority power multiplexing

2 Description

The TPS25942xEVM-635 enables full evaluation of the TPS25942x devices. The EVM supports two versions (Auto- Retry and Latched) of the devices on two channels (CH1 and CH2 respectively). Input power is applied at J3 (CH1), J8 (CH2) while J2 (CH1)/J7 (CH2) provide the output connection to the load; refer to the schematic in Figure 1 and test setup in Figure 2.

D5/C1 (CH1), D9/C7 (CH2) provide input protection for the TPS25942x (U1 and U2 respectively) while D4/C2/C3/C4 (CH1), D8/C8/C9/C10 (CH2) provide output protection.

S1 allows U1 and S2 allows U2 to be RESET or disabled. A power good (PG) indicator is provided by D6 for CH2 and circuit faults can be observed with D2, D6. Scaled channel current can be monitored at TP11 and TP22 with a scale factor of 0.842V/A.

Table 1. TPS25942x EVM Options and Default Settings

Part Number	EVM Function	Vin Range	UVLO		OVP	Current Limit			Fault Response	
			CH1	CH2		LO setting	No Jumper	HI Setting	CH1	CH2
TPS25942xEVM-635	Current Limiter with ENBLKb	2.7V–18V	10.5V	Internal (2.3V)	16.5V	3.6A	2.1A	5.3A	Auto-retry	Latched

3 Schematic

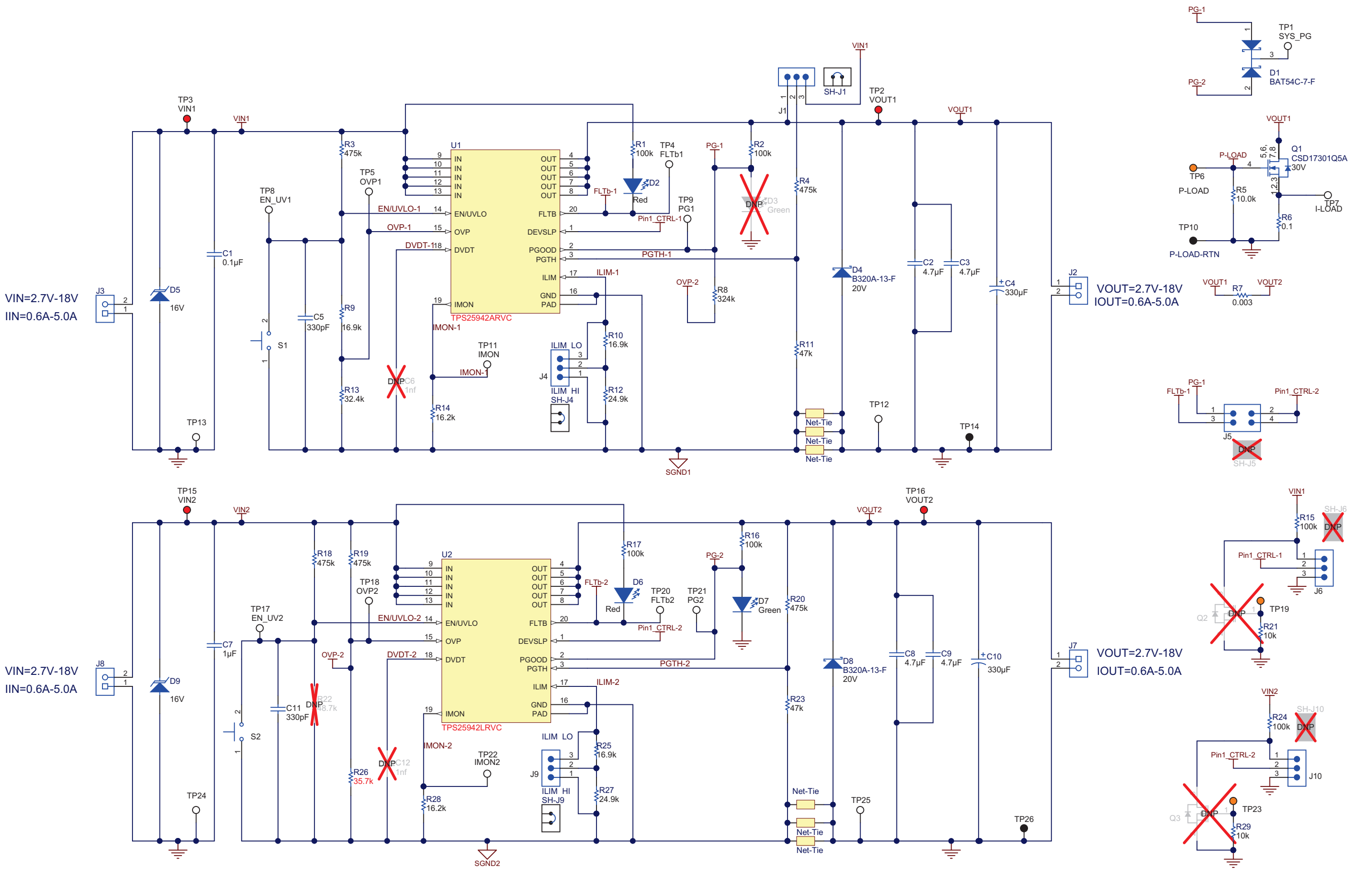

Figure 1. TPS25942xEVM Schematic

4 General configurations

4.1 Physical Access

Table 2 lists the TPS25942xEVM-635 input and output connector functionality, Table 3 describes the test point availability, and Table 4 describes the jumper functionality

Table 2. Input and Output Connector Functionality

Connector		Label	Description
J3	CH1	VIN1(+), GND(–)	CH1 Input power supply to the EVM
J2	CH1	VOUT1(+), GND(–)	CH1 Output power from the EVM
J8	CH2	VIN2(+), GND(–)	CH2 Input power supply to the EVM
J7	CH2	VOUT2(+), GND(–)	CH2 Output power from the EVM

Table 3. Test Points Description

Channel	Test Points	Label	Description
CH1	TP3	VIN1	CH1 Input power supply to the EVM
	TP8	EN_UV1	CH1 Active high enable and under voltage input
	TP5	OVP1	CH1, Active high overvoltage input (>16.5V)
	TP11	IMON1	CH1 Current monitor. Load current = 1.187 × voltage on TP11
	TP2	VOUT1	CH1 Output from the EVM
	TP9	PG1	CH1 Power good test point
	TP4	FLTb1	CH1, Fault test point
	TP12	GND	GND
	TP13	GND	GND
	TP14	GND	GND
CH2	TP15	VIN2	CH2 Input power supply to the EVM
	TP17	EN_UV2	CH2 Active high enable and under voltage input
	TP18	OVP2	CH2, Active high overvoltage input
	TP22	IMON2	CH2 Current monitor. Load current = 1.187 × voltage on TP22
	TP16	VOUT2	CH2 Output from the EVM
	TP21	PG2	CH2 Power good test point
	TP20	FLTb2	CH2, Fault test point
	TP24	GND	GND
	TP25	GND	GND
	TP26	GND	GND

Table 4. Jumper and LEDs Descriptions

Jumper	Label	Description
J1	J1	Priority Mux setting
J4	LO – HI	CH2 current setting
J5	J5	PG1 and FLTb1 setting
J6	J6	DEVSLP1 setting
J9	LO – HI	CH2 current setting
J10	J10	DEVSLP2 setting
D2 (Red)	D2	CH1 circuit fault indicator. LED turns on when the internal MOSFET is disabled due to a fault condition such as over load , short circuit, under voltage etc.
D6 (Red)	D6	CH2 circuit fault indicator. LED turns on when the internal MOSFET is disabled due to a fault condition such as over load , short circuit, under voltage etc.

Table 4. Jumper and LEDs Descriptions (continued)

Jumper	Label	Description
D7 (Green)	D9	CH2 Power good indicator. LED turns on when the voltage at TP2(VOUT1) is more than 11 V

Table 5 can be used to set the EVM in different configurations in order to achieve the desired functionality from the TPS25942xEVM-635.

Table 5. EVM Configuration Settings

Jumper Location		Auto Power Mux: 12V:12V	Priority Power Muxing
J4	1-2	Install Jumper at this location for 5.3A current Limit for VIN1	
	2-3	Install Jumper at this location for 3.6A current Limit for VIN1	
	OPEN	If No Jumper is installed default current limit is 2.1A for VIN1	
J9	1-2	Install jumper at this location for 5.3A current Limit for VIN2	
	2-3	Install jumper at this location for 3.6A current Limit for VIN2	
	OPEN	If No Jumper is installed default current limit is 2.1A for VIN2	
J5	1-2	OPEN	OPEN
	3-4		
J1	1-2	Install Jumper to get PG1 from VOUT1	OPEN
	2-3	OPEN	Install Jumper to set VIN1 (Main) Priority over VIN2.
J6	1-2	OPEN	OPEN
	2-3	OPEN	OPEN
J10	1-2	OPEN	OPEN
	2-3	OPEN	OPEN

4.2 Test Equipment

4.2.1 Power Supplies

One adjustable power supply: 0V to 20V output, 0A – 6A output current limit.

4.2.2 Meters

One DMM minimum needed and may require more if simultaneous measurements are needed.

4.2.3 Oscilloscope

A DPO2024 or Lecroy 424 oscilloscope or equivalent, three 10X voltage probes, and a DC current probe.

4.2.4 Loads

One resistive load or equivalent which takes up to a 6A DC load at 12V and capable of the output short.

4.3 Test Setup

Figure 2 shows a typical test setup for the TPS25942xEVM. Connect J3/J8 to the power supply and J2/J7 to the load.

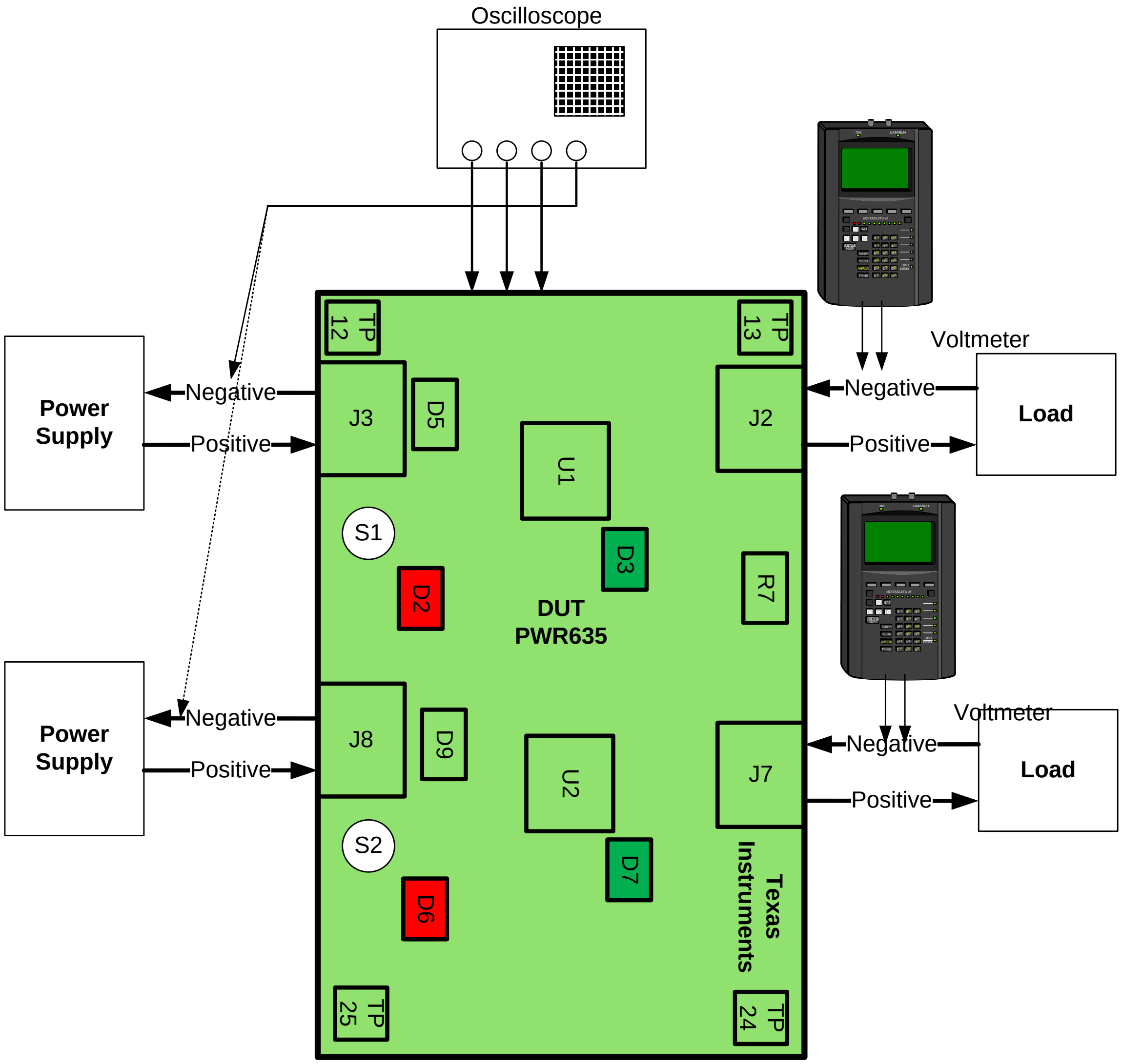

Figure 2. EVM Test Setup

4.4 Test Procedures

- The operational voltage range of the two rails VIN1 and VIN2 can be adjusted by changing a few resistor settings, as listed in Table 6.

Table 6. Operational Range Settings for VIN1, VIN2 = 12V, 5V, and 3.3V

VIN Operational Range	Rail: VIN1 or VIN2	R9	R13	R11	R22	R19
12V: 10.5V to 16V (default)	VIN1	16.9k	32.4k	47k		
5V: 4.6V to 5.7V	VIN1	23.2k	105k	137k		
3.3V: 3V to 3.8V	VIN1	48.7k	187k	237k		
2.3V to 15.5V (default)	VIN2				No PoP	475k
5V: 4.6V to 5.7V	VIN2				130k	169k
3.3V: 3V to 3.8V	VIN2				237k	97.6k

- Turn on the power supply and set the power supply voltage to 12V on CH1 and CH2.
- Turn off the power supply. Hook up CH1 and CH2 of the PWR635 assembly as shown in Figure 3.
- Ensure that the output load is disabled and the power supply is set properly for the DUT. Connect the negative probe of the DMM to TP12 or TP25 (GND) to the test points in Table 7.
- Turn on the power supply. Verify that the voltages shown in Table 7 are obtained. **Only one power supply at a time for this verification**.

Table 7. PWR635 DMM Readings at Different Test Points

Voltage Test on (CH1)	Measured Voltage Reading	Voltage Tested on (CH2)	Measured Voltage Reading
VIN1 (TP3)	12 ± 0.3 VDC	VIN2 (TP15)	12 ± 0.3 VDC
EN_UV1 (TP8)	1.13 ± 0.1 VDC	EN_UV2 (TP17)	12 ± 1 VDC
OVP1 (TP5)	0.742 ± 0.1 VDC	OVP2 (TP18)	Conditional[1]
IMON1 (TP11)	33.8 mV ± 5 mVDC	IMON2 (TP22)	33.8 mV ± 5 mVDC
VOUT1 (TP2)	12 ± 0.3 VDC	VOUT2 (TP16)	12 ± 0.3 VDC
PG1 (TP9)	9.30 ± 2.0 VDC	PG2 (TP21)	2.4 ± 0.2 VDC
FLTb1 (TP4)	10.51 ± 0.5 VDC	FLTb2 (TP20)	10.5 ± 0.5VDC

(1) OVP2 is > 1V if VIN1 is within the defined input voltage range otherwise < 0.97V, this sets the VIN1 priority over VIN2.

4.5 Preliminary Tests

4.5.1 For CH1 (J3-J2)

- With the power supply set to 12V on CH1, verify that the red LED (D2) is off. Press the EVM RST switch (S1) and verify that the voltage at VOUT1 (TP2) starts falling slowly below 12V and that the FLTb1 red LED (D2) turns ON. Release S1.
- Reduce the input voltage on VIN1 and monitor VOUT1. Verify that VOUT1 (TP2) starts falling and is fully turned off when VIN1 (TP3) reaches 9.5V (±0.5V). Verify that the FLTb1 red LED (D2) turns ON.
- Increase the input voltage on VIN1 and monitor VOUT1. Verify that VOUT1(TP2) starts increasing and is fully turned off when VIN1(TP3) reaches 16.5V(±1V). Verify that the FLTb1 red LED (D2) turns ON.

4.5.2 For CH2 (J8-J7)

- With the power supply set to 12V on VIN1 and VIN2, verify that the green PG LED (D7) and the red LED (D6) are on (CH1 has priority over CH2).
- Set VIN1 = 0. Verify that the green PG LED (D7) is on.
- With the power supply set to 12V on VIN2, press the EVM RST switch (S2) and verify that the voltage at VOUT2 (TP16) starts falling slowly below 12V and that the green PG LED (D7) turns off and the RED FLTb2 LED (D6) turns on. Release S2.
- Reduce the input voltage on VIN2 and monitor VOUT2. Verify that VOUT2 (TP16) starts falling and is fully turned off when VIN2 (TP15) reaches 2.1V (+0.3V). Verify that the PG2 green LED (D7) turns off and the FLTb2 red LED (D6) turns ON.
- Increase the input voltage on VIN2 and monitor VOUT2. Verify that VOUT2 (TP16) starts increasing and is fully turned off when VIN2 (TP15) reaches 15.5V (±1V). Verify that the PG2 green LED (D7) turns off and the FLTb2 red LED (D6) turns ON.
- Turn off both power supplies.

4.5.3 Ramp up Time Test (CH1 and CH2)

- Verify ramp up time (CH1 and CH2, with only 1 channel powered at a time). Set up the oscilloscope as listed in Table 8.

Table 8. PWR635 Oscilloscope Settings for Ramp Up Voltage Test

Oscilloscope Setting	CH1 Probe Points	CH2 Probe Points
Channel 1 = 5V/div	TP2 = VOUT1	TP16 = VOUT2
Channel 2 = 5V/div	TP3 = VIN1	TP15 = VIN2
Channel 3 = 2V/div	TP8 = EN/UVLO1	TP17 = EN/UVLO2
Trigger source = Channel 1		
Trigger level = 6.0 ± 0.5 V		
Trigger polarity = Positive		
Trigger mode = Single sequence		
Time base = 1ms/div		

- Set the output load at 100Ω on CH1 and then enable the load. Turn on the power supply, press the EVM RST switch (S1) and release, and verify that VOUT1 (TP2) ramps up as shown in Figure 3.

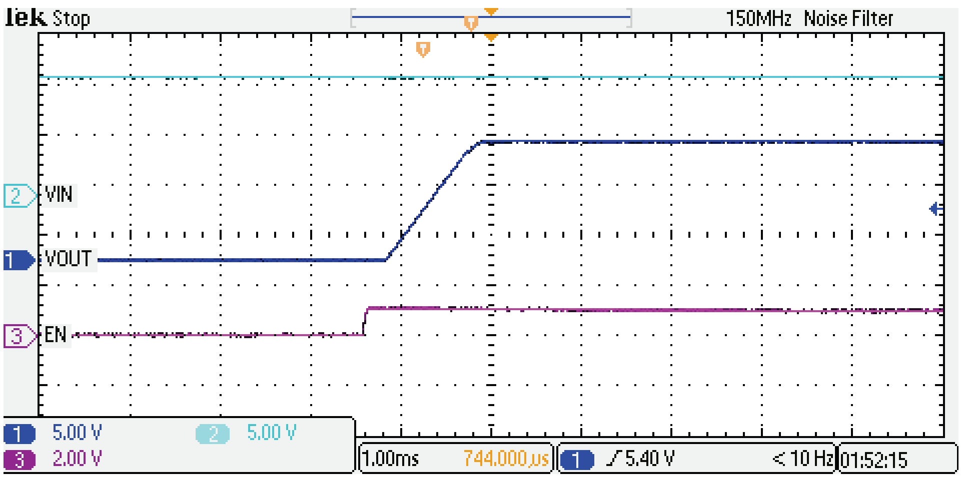

Figure 3. Vout Ramp up Time for CH1

- Set the output load at 100Ω on CH2 and then enable the load. Turn on the power supply, press the EVM RST switch (S2) and release, and verify that VOUT2 (TP16) ramps up as shown in Figure 4.

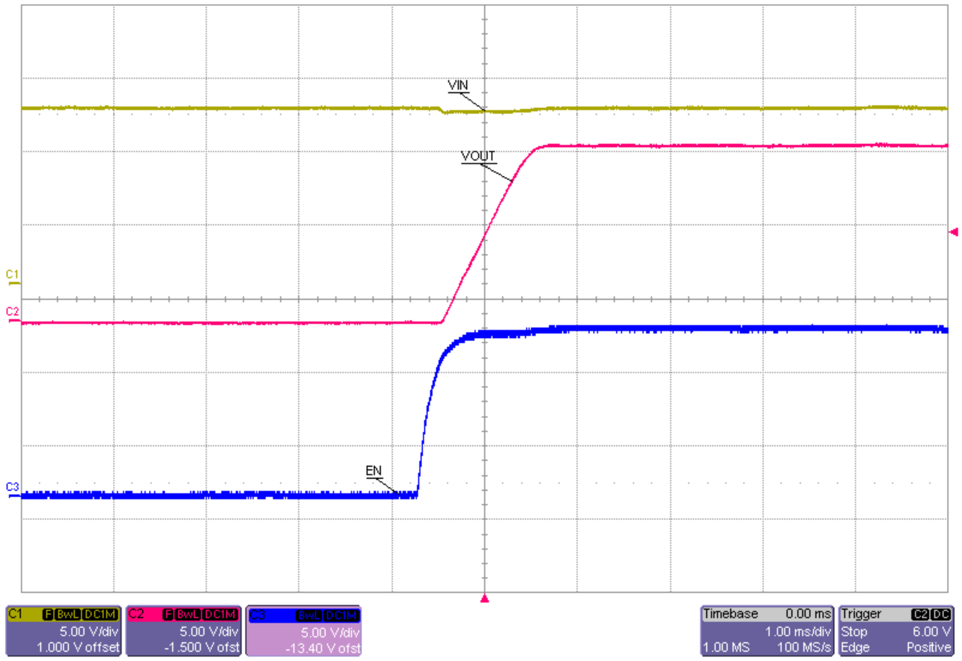

Figure 4. Vout Ramp up Time for CH2

4.5.4 Current Limit Tests

- Verify all three current limits (CH1 and CH2, **with only 1 channel powered at a time**) and verify the latch and auto-retry feature. Set up the oscilloscope as listed in Table 9.

Table 9. PWR635 Oscilloscope Settings for Current Limit Test

Oscilloscope Setting	CH1 Probe Points	CH2 Probe Points
Channel 1 = 5V/div	TP2 = VOUT1	TP16 = VOUT2
Channel 2 = 5V/div	TP3 = VIN1	TP15 = VIN2
Channel 4 = 2A/div	Input current into J3 +ve wire	Input current into J8 +ve wire
Trigger source = Channel 4		
Trigger level = 1.0 ± 0.2 A		
Trigger polarity = +ve		
Trigger mode = Single sequence		
Time base	40ms/div	100ms/div

- Note: If an electronic load is used, ensure that the output load is set to constant resistance mode and not constant current mode.
- Note: Measuring Current Limit values on the oscilloscope can easily cause 10% error from anticipated values listed in Table 10.
- Note: Since the pulse width of current can vary significantly with the VIN ramp rate, which varies from one power supply to another, do NOT worry about matching the pulse widths of Figure 5 and Figure 6.
- The jumper settings for the different current limits are listed in Table 10.

Table 10. PWR635 Jumper Settings for Current Limits

Jumper Position		Load Current Limit
J4 (CH1)	J9 (CH2)	
HI	HI	5.3A
LO	LO	3.6A

Table 10. PWR635 Jumper Settings for Current Limits (continued)

Jumper Position		Load Current Limit
J4 (CH1)	J9 (CH2)	
No Jumper	No Jumper	2.1A

- Set the output load at 1.0± 0.1Ω on CH1 and then enable the load. Turn on the power supply and verify that input current is limited as per the settings in Table 10 and the device is latched and FLTb1, RED LED (D3) turns on.

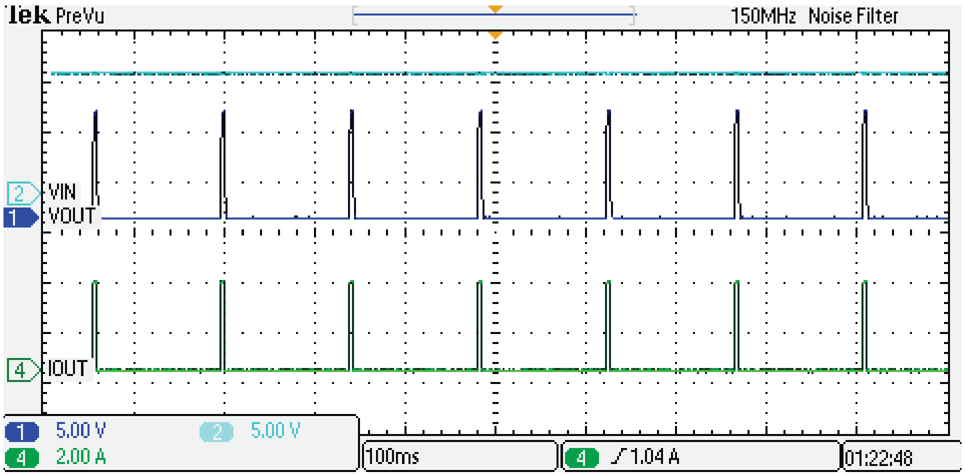

Figure 5. J4 = LO Current Limit Test Auto Retry (CH1)

- Set the output load at 1.0± 0.1Ω on CH2 and then enable the load. Turn on the VIN2 power supply and verify that the input current is limited as per the settings in Table 10 and the device is in latched-off mode and FLTb1 RED LED (D2) turns ON as shown in Figure 6.

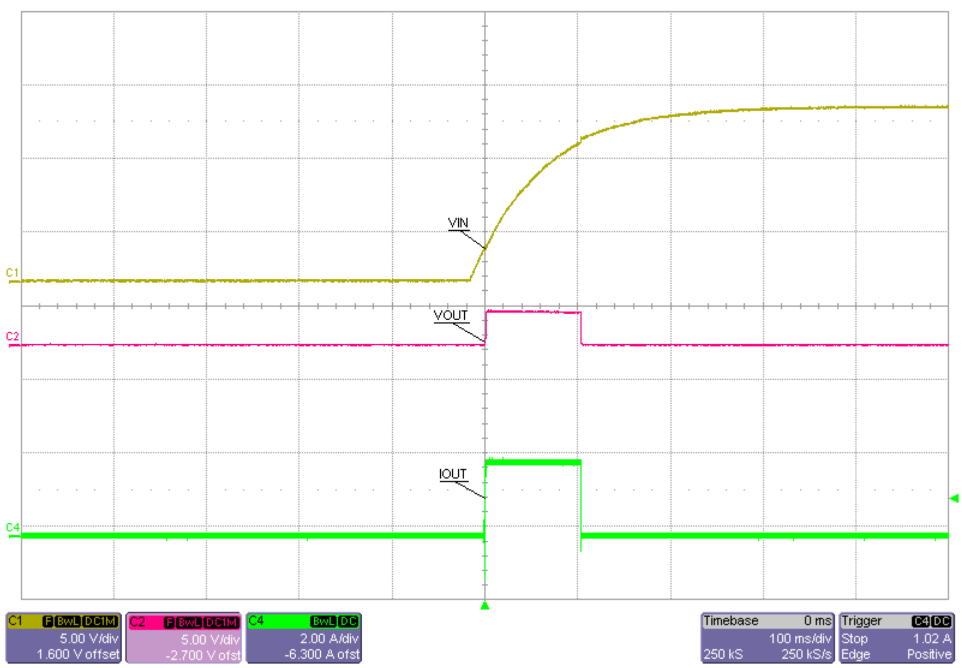

Figure 6. J9 = NO Jumper Current Limit Test with Latch (CH2)

- Set the input power supply to zero volts and disconnect all equipment from the DUT.

4.6 Auto Power Mux (Active ORing)

The TPS25942xEVM-635 can be configured in the “Auto Power Mux” configuration by depopulating R8. In the Auto Power Mux configuration, within the programmed operation range of VIN1 and VIN2, the higher rail supplies the load, while the lower rail gets cut-off from the load. If the two rails are equal, the load is shared between the two rails. If any rail drops out of the programmed operation range, that rail is cut-off from the load. For a detailed explanation, consult the System Examples section of the TPS25942 data sheet.

4.7 Priority Power Mux

The TPS25942xEVM-635 is configured by default in the “Priority Power Mux” configuration, with priority of VIN1 (MAIN) over VIN2 (AUX). This means VIN1 will provide power to the load within the specified range of input voltage at VIN1, irrespective of VIN2 voltage level. When VIN1 falls out of the desired voltage range, U2 starts powering the load. This is called VIN1 priority over VIN2. For a detailed explanation, consult the System Examples section of the TPS25942 data sheet.

4.8 Priority Power Mux with Almost Equal Rails (VIN1 ~ VIN2)

When the two rails being muxed are close to each other, VIN1 (MAIN) is within 1 diode drop of VIN2 (AUX), U2 can be operated in “Diode Mode” for a faster switch-over. The faster switch-over reduces the required hold-up capacitor on the output rail for a given droop specification. The TPS25942xEVM-635 allows this by populating the J5 shunt. For a detailed explanation, consult the System Examples section of the TPS25942 data sheet.

5 EVM Assembly Drawings and Layout Guidelines

5.1 PCB Drawings

Figure 7 through Figure 9, show component placement and layout of the EVM.

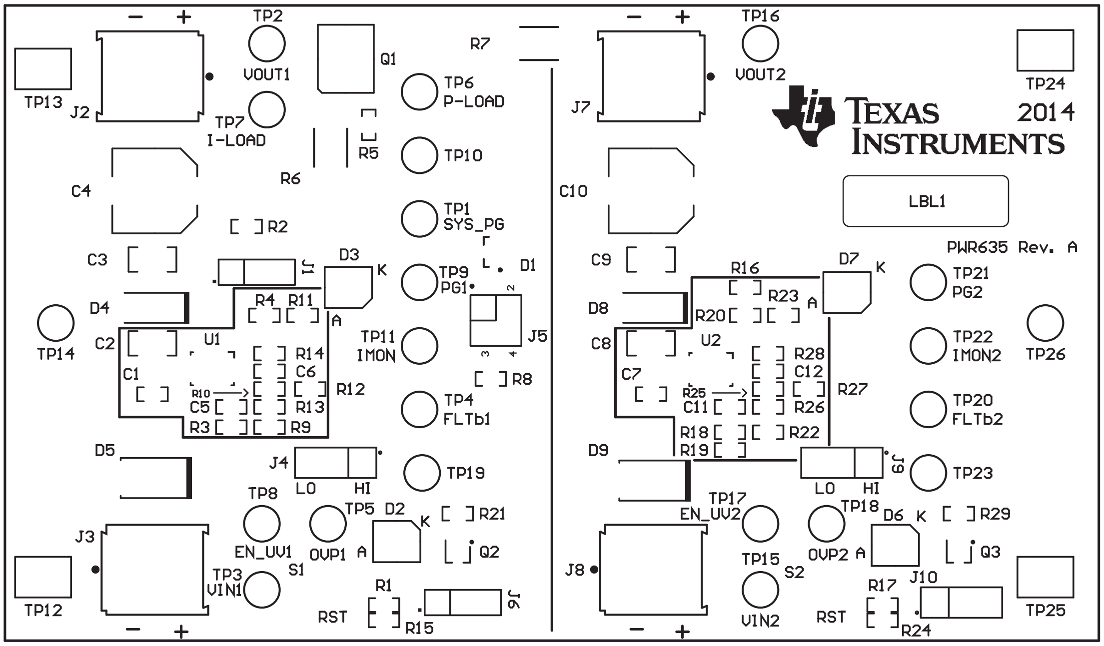

Figure 7. Top Side Placement

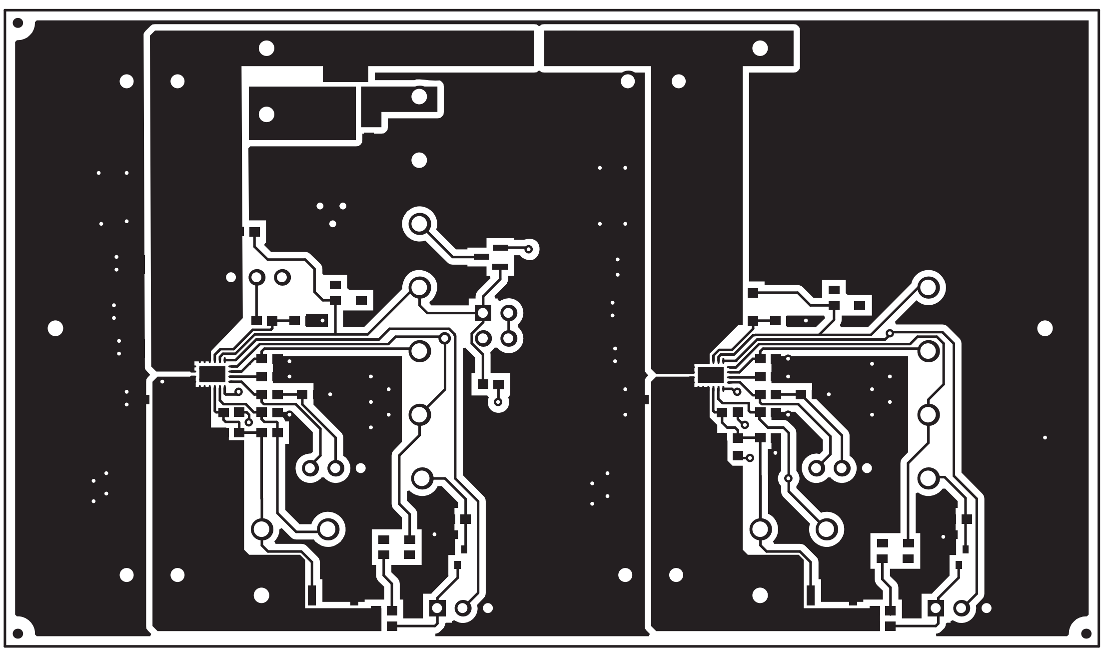

Figure 8. Top Side Routing Layer

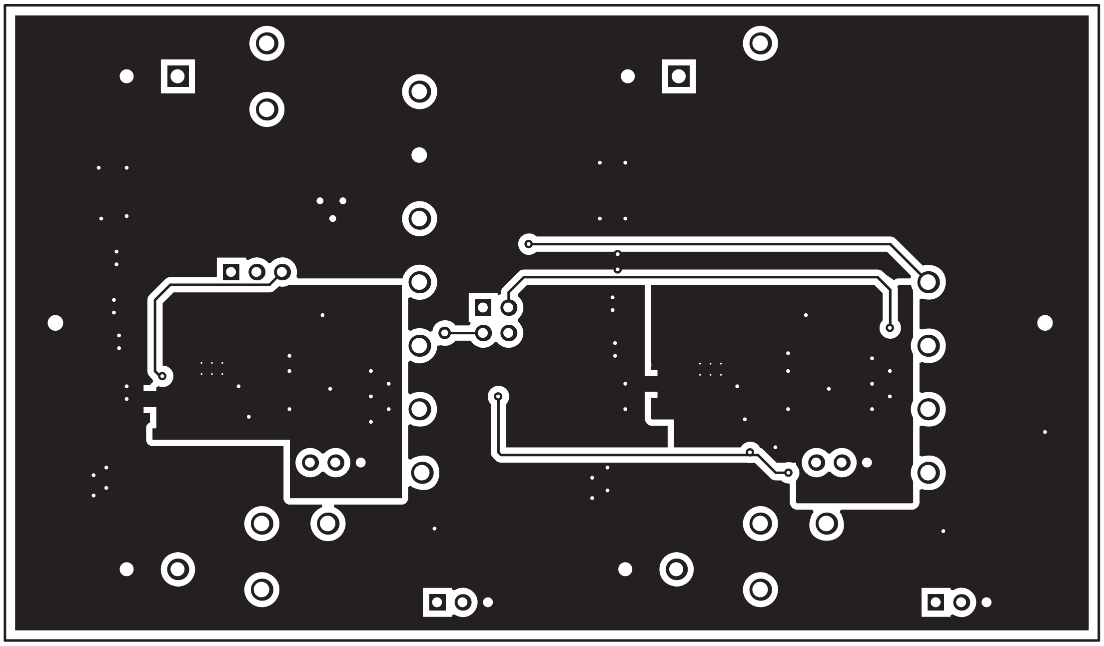

Figure 9. Bottom Side Routing Layer

6 Bill of Materials (BOM)

Table 11. TPS25942xEVM-635 Bill of Materials

Designator	QTY	Value	Description	Package Reference	Part No.	MFG.	Alternate	
							Part No.	MFG
PCB	1		Printed Circuit Board		PWR635	Any	—	—
C1	1	0.1µF	CAP, CERM, 0.1µF, 25V, ±10%, X7R, 0603	0603	06033C104KAT2A	AVX		
C2, C3, C8, C9	4	4.7µF	CAP, CERM, 4.7µF, 25V, ±10%, X7R, 1206	1206	C3216X7R1E475K	TDK		
C4, C10	2	330µF	CAP, AL, 330µF, 25V, ±20%, 0.16 ohm, SMD	HA0	EMZA250ADA331MHA0G	Nippon Chemi-Con		
C5, C11	2	330pF	CAP, CERM, 330pF, 100V, ±5%, X7R, 0603	0603	06031C331JAT2A	AVX		
C7	1	1µF	CAP, CERM, 1µF, 25V, ±10%, X5R, 0603	0603	C1608X5R1E105K080AC	TDK		
D1	1	30V	Diode, Schottky, 30V, 0.2A, SOT-23	SOT-23	BAT54C-7-F	Diodes Inc.		
D2, D6	2	Red	LED, Red, SMD	Power TOPLED w/lens	LS E63F-DBFA-1-Z	OSRAM	—	—
D4, D8	2	20V	Diode, Schottky, 20V, 3A, SMA	SMA	B320A-13-F	Diodes Inc.		
D5, D9	2	16V	Diode, TVS, Uni, 16V, 600W, SMB	SMB	SMBJ16A-13-F	Diodes Inc.		
D7	1	Green	LED, Green, SMD	Power TOPLED w/lens	LT E63C-CADB-35-L-Z	OSRAM	—	—
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A		
H1, H2, H3, H4	4		Bumpon, Cylindrical, 0.312 × 0.200, Black	Black Bumpon	SJ61A1	3M		
J1, J4, J6, J9, J10	5	1x3	Header, TH, 100mil, 1×3, Gold plated, 230 mil above insulator	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions	Equivalent	Any
J2, J3, J7, J8	4		Terminal Block, 2x1, 5.08mm, TH	10.16 x 15.2 x 9 mm	282841-2	TE Connectivity		
J5	1		Header, TH, 100mil, 2x2, Gold plated, 230 mil above insulator	TSW-102-07-G-D	TSW-102-07-G-D	Samtec, Inc.	Equivalent	Any
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200"H - 10,000 per roll	PCB Label 0.650" H x 0.200" W	THT-14-423-10	Brady	—	—
Q1	1	30V	MOSFET, N-CH, 30V, 100A, SON 5x6mm	SON 5x6mm	CSD17301Q5A	Texas Instruments	None	None
R1, R2, R16, R17	4	100k	RES, 100kΩ, 5%, 0.1W, 0603	0603	CRCW0603100KJNEA	Vishay-Dale		
R3, R4, R18, R19, R20	5	475k	RES, 475kΩ, 1%, 0.1W, 0603	0603	CRCW0603475KFKEA	Vishay-Dale	Equivalent	Any
R5	1	10.0k	RES, 10.0kΩ, 1%, 0.1W, 0603	0603	CRCW060310K0FKEA	Vishay-Dale	Equivalent	Any
R6	1	0.1	RES, 0.1 Ω, 1%, 3W, 2512	2512	CRA2512-FZ-R100ELF	Bourns		
R7	1	0.003	RES, 0.003 Ω, 1%, 1W, 2512	2512	73M1R003F	CTS Resistor		
R8	1	324k	RES, 324kΩ, 1%, 0.1W, 0603	0603	RC0603FR-07324KL	Yageo America		
R9, R10, R25	3	16.9k	RES, 16.9kΩ, 1%, 0.1W, 0603	0603	CRCW060316K9FKEA	Vishay-Dale	No Value	No Value
R11, R23	2	47k	RES, 47kΩ, 5%, 0.1W, 0603	0603	CRCW060347K0JNEA	Vishay-Dale		
R12, R27	2	24.9k	RES, 24.9kΩ, 1%, 0.1W, 0603	0603	CRCW060324K9FKEA	Vishay-Dale		
R13	1	32.4k	RES, 32.4k ohm, 1%, 0.1W, 0603	0603	CRCW060332K4FKEA	Vishay-Dale		
R14, R28	2	16.2k	RES, 16.2kΩ, 1%, 0.1W, 0603	0603	CRCW060316K2FKEA	Vishay-Dale		
R15, R24	2	100k	RES, 100kΩ, 1%, 0.1W, 0603	0603	CRCW0603100KFKEA	Vishay-Dale		
R21, R29	2	10k	RES, 10kΩ, 5%, 0.1W, 0603	0603	CRCW060310K0JNEA	Vishay-Dale		

Table 11. TPS25942xEVM-635 Bill of Materials (continued)

Designator	QTY	Value	Description	Package Reference	Part No.	MFG.	Alternate	
							Part No.	MFG
R26	1	35.7k	RES, 35.7k ohm, 1%, 0.1W, 0603	0603	RC0603FR-0735K7L	Yageo America		
S1, S2	2		Switch, Push Button, SMD	2.9x2x3.9mm SMD	SKRKAEE010	Alps	Equivalent	Any
SH-J1, SH-J4, SH-J9,	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1, TP4, TP5, TP8, TP9, TP11, TP17, TP18, TP20, TP21, TP22	11	White	Test Point, TH, Multipurpose, White	Keystone5012	5012	Keystone	Equivalent	Any
TP2, TP3, TP15, TP16	4	Red	Test Point, TH, Multipurpose, Red	Keystone5010	5010	Keystone	Equivalent	Any
TP6, TP19, TP23	3	Orange	Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone		
TP7	1	White	Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone		
TP10, TP14, TP26	3	Black	Test Point, TH, Multipurpose, Black	Keystone5011	5011	Keystone	Equivalent	Any
TP12, TP13, TP24, TP25	4	SMT	Test Point, SMT, Compact	Testpoint Keystone Compact	5016	Keystone	Equivalent	Any
U1	1		2.7V-18V eFuse with True Reverse Blocking for Power Mux, RVC0020A	RVC0020A	TPS25942ARVC	Texas Instruments		None
U2	1		2.7V-18V eFuse with True Reverse Blocking for Power Mux, RVC0020A	RVC0020A	TPS25942LRVC	Texas Instruments		None
C6, C12	0	1000pF	CAP, CERM, 1000pF, 100V, ±20%, X7R, 0603	0603	06031C102MAT2A	AVX	—	—
D3	0	Green	LED, Green, SMD	Power TOPLED w/lens	LT E63C-CADB-35-L-Z	OSRAM	—	—
Q2, Q3	0	60V	MOSFET, N-CH, 60V, 0.31A, SOT-323	SOT-323	2N7002KW	Fairchild Semiconductor		None
R22	0	48.7k	RES, 48.7kΩ, 1%, 0.1W, 0603	0603	CRCW060348K7FKEA	Vishay-Dale		
SH-J5, SH-J6, SH-J10	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec

Note: Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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