TPS25221 Evaluation Module

This user's guide describes the TPS25221 evaluation module (EVM). This guide contains the EVM schematic, bill of materials (BOM), assembly drawing, and top and bottom board layouts.

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1 Introduction

The TPS25221 is an evaluation module (EVM) for Texas Instruments' family of power-distribution switches with adjustable current-limit. The EVM operates over a 2.5-V to 5.5-V range. An onboard jumper sets the output current-limit to either 1.3 A or 2.7 A. Test points provide convenient access to all critical node voltages.

The silkscreen outline on the PCB top-side encloses components found in a typical USB application.

The PCB top-side accepts a power-distribution switch in a SOT23-6 package; the PCB bottom side accepts a power-distribution switch in the smaller SON package with a thermal pad. These switches have an enable input, an overcurrent status output, and overtemperature shutdown.

1.1 Related Documentation from Texas Instruments

- *TPS25221 Precision Adjustable Current-Limited Power-Distribution Switches* datasheet

2 Electrical Specifications

The EVM meets the electrical specifications in Table 1 over the recommended operating junction-temperature range of –40°C ≤ T_J ≤ 125°C for the DBV (SOT23-6) and DRV (SON) package.

If the EVM current limit set to 2.7 A, the recommended max continuous current is 2 A according to TPS25221 specification. The user may also run 2.5-A continuous current on the EVM, but need make sure junction-temperature range ≤ 125°C for long term reliability.

Table 1. EVM Electrical Specifications

Parameter	Condition	MIN	TYP	MAX	Unit
Input voltage, V_{IN}	J1	2.5	–	5.5	V
Short-circuit output current-limit, I_{LIMIT}	J3 shorting-jumper is absent, J2 is short circuited, TPS25221 is enabled		1.36		A
	J3 shorting-jumper is present, J2 is short circuited, TPS25221 is enabled		2.72		

2.1 Electrostatic Discharge

The EVM has been tested to IEC 61000-4-2. The level used was 8-kV contact discharge and 15-kV air discharge. Surges were applied to the EVM input and output. No damage to the TPS25221 was observed.

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3 Schematic

3.1 EVM Options

Table 2. EVM Options

PSIL018	Device	Device Package	Enable
001	TPS25221DBV	SOT-23-6	Active High
002	TPS25221DRV	SON	Active High

3.2 Schematic

Figure 1 illustrates the EVM schematic.

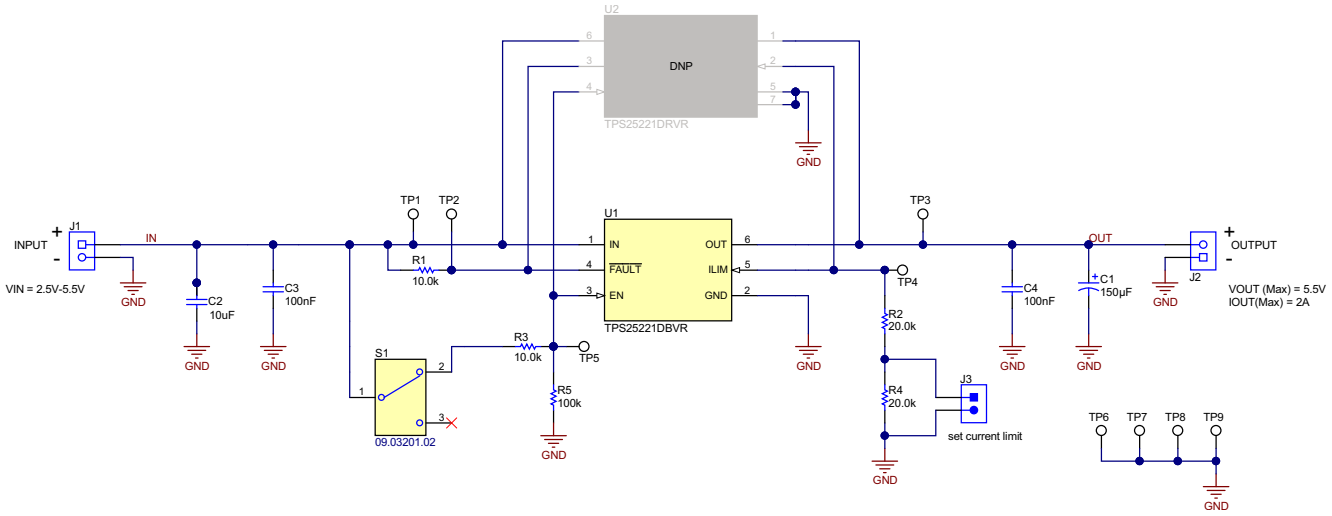


Figure 1. EVM Schematic

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4 EVM Setup

4.1 Recommended Test Equipment

The following test equipment is recommended:

- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- An adjustable power supply with a 2.5-V to 5.5-V output and a 10-A output current-limit
- Volt-ohm meter
- A passive or active load capable of handling 3 A

4.2 Measuring the Short-Circuit Output Current-Limit

TI recommends reading *TPS25221 Precision Adjustable Current-Limited Power-Distribution Switches* before using the EVM.

Figure 2 shows the EVM test setup for measuring current-limit. Switch S1 enables the power-distribution switch into a short circuit for this measurement. For retry controllers, Figure 3 shows the current waveform for the TPS25221DBVEVM with a shorting jumper populating header J3; Figure 4 shows the current waveform with header J3 unpopulated.

Figure 5 shows the current waveform for the TPS25221DRVEVM with a shorting jumper populating header J3; Figure 6 shows the current waveform with header J3 unpopulated.

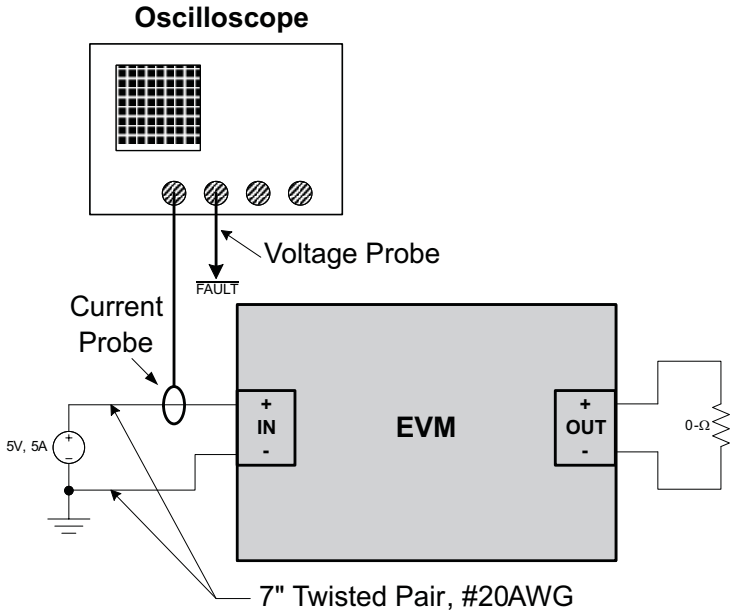


Figure 2. EVM Setup For Measuring Current-Limit

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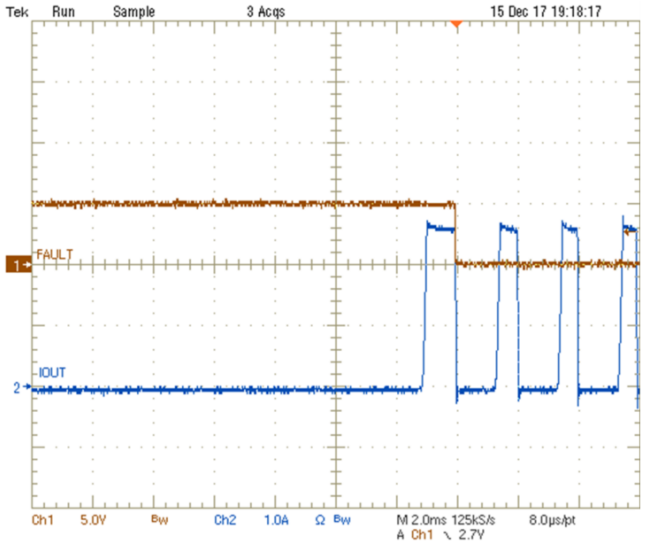


Figure 3. TPS25221DBVEVM Short-Circuit Output Current and $\overline{\text{FAULT}}$ Status With J3 Shorting Jumper Present

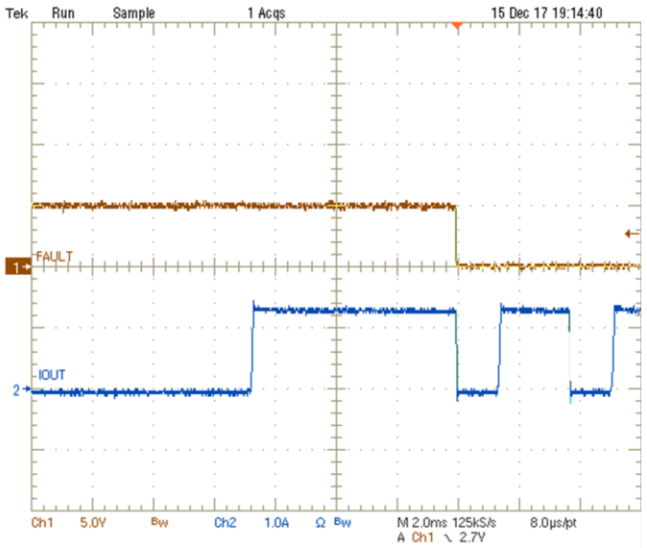


Figure 4. TPS25221DBVEVM Short-Circuit Output Current and $\overline{\text{FAULT}}$ Status With J3 Shorting Jumper Absent

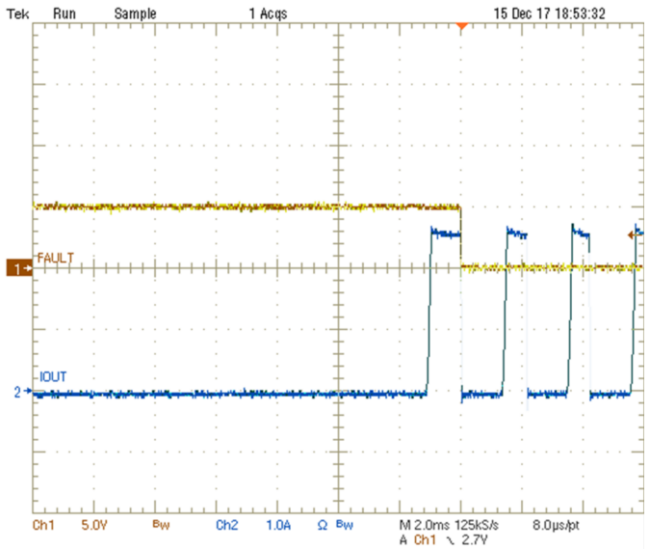


Figure 5. TPS25221DRVEVM Short-Circuit Output Current and $\overline{\text{FAULT}}$ Status With J3 Shorting Jumper Present

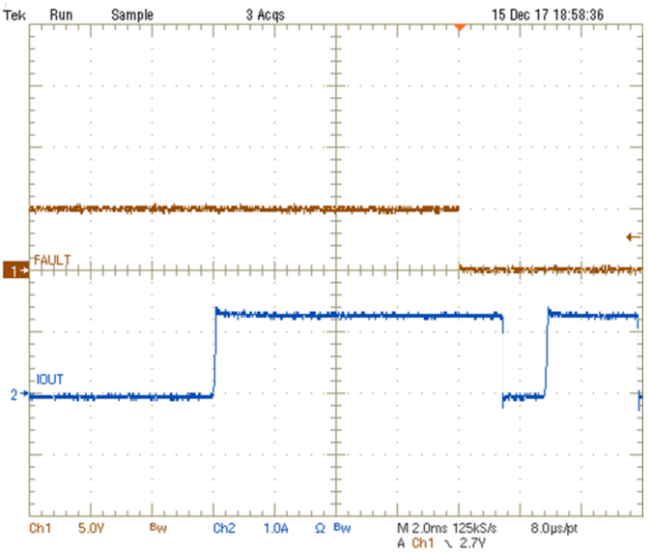


Figure 6. TPS25221DRVEVM Short-Circuit Output Current and $\overline{\text{FAULT}}$ Status With J3 Shorting Jumper Absent

4.3 Adjusting the Short-Circuit Output Current-Limit

The EVM provides two current-limit settings. If a different setting is required, populate header J3 with a shorting jumper and modify resistor R2 using the current limit resistor calculator, TPS25221.

See *TPS25221 Precision Adjustable Current-Limited Power-Distribution Switches* datasheet for the worst-case current-limit variation.

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5 Board Layout

Figure 7 through Figure 10 illustrate the PCB layout images.

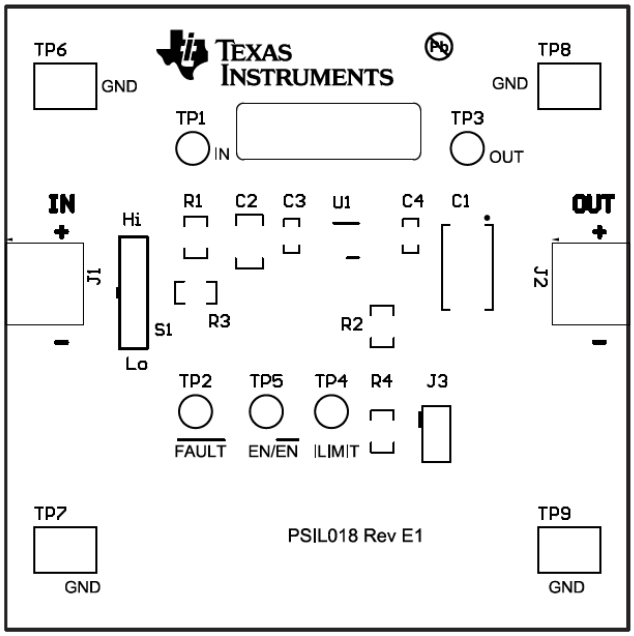


Figure 7. EVM Top Assembly

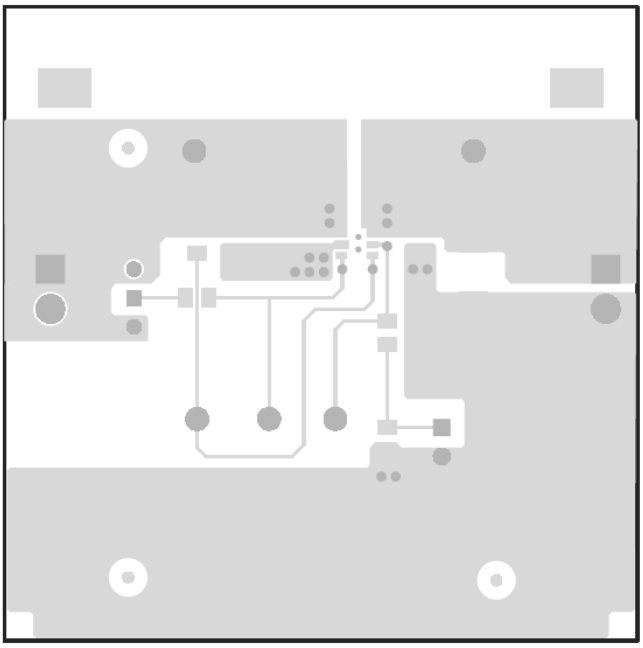


Figure 8. EVM Top-Side Layout

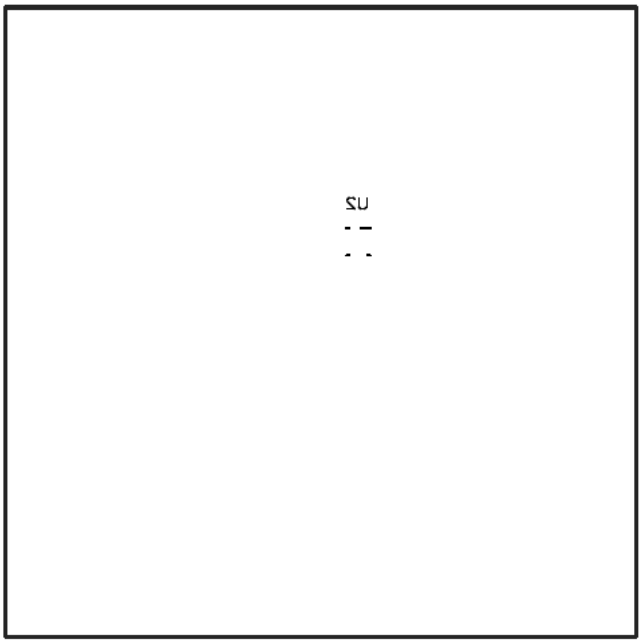


Figure 9. EVM Bottom Assembly

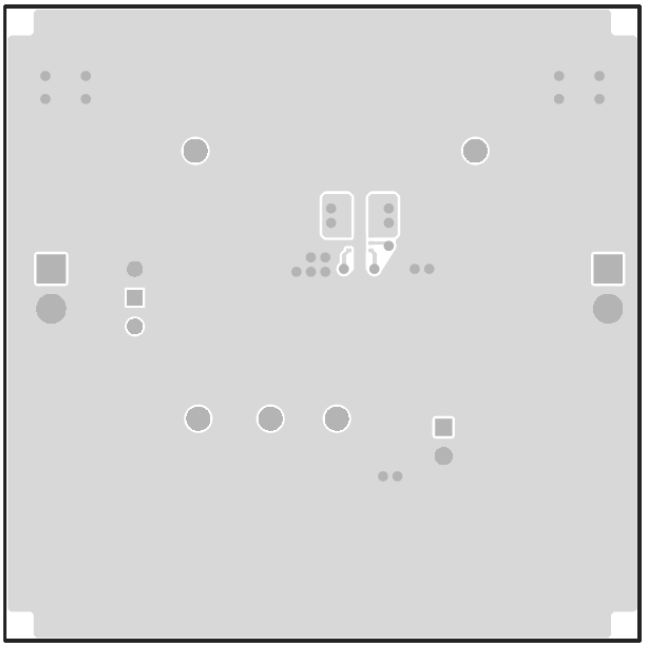


Figure 10. EVM Bottom-Side Layout

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6 Bill of Materials

Table 3 lists the EVM BOM.

Table 3. EVM Bill of Materials (1) (2) (3) (4) (5) (6)

Quantity		Designator	Value	Description	Part Number	Manufacturer
001	002					
1	1	C1	150 uF	CAP, TA, 150 µF, 10 V, ±10%, 0.1 ohm, SMD	T495D157K010ATE100	Kemet
1	1	C2	10 uF	CAP, CERM, 10 µF, 16 V, ±10%, X7R, 1206	GRM31CR71C106KAC7L	MuRata
2	2	C3, C4	0.1 uF	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	GRM188R71C104KA01D	MuRata
3	3	FID1, FID2, FID3		Fiducial mark. There is nothing to buy or mount.	N/A	N/A
2	2	J1, J2		Terminal Block, 3.5mm Pitch, 2x1, TH	ED555/2DS	On-Shore Technology
1	1	J3		Header, 100mil, 2x1, Tin, TH	PEC02SAAN	Sullins Connector Solutions
1	1	LBL1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	THT-14-423-10	Brady
2	2	R1, R3	10.0 k	RES, 10.0 k, 1%, 0.125 W, 0805	CRCW080510K0FKEA	Vishay-Dale
2	2	R2, R4	20.0 k	RES, 20.0 k, 1%, 0.125 W, 0805	CRCW080520K0FKEA	Vishay-Dale
1	1	R5	100 k	RES, 100 k, 1%, 0.1 W, 0603	CRCW0603100KFKEA	Vishay-Dale
1	1	S1		Switch, SPDT, Slide, On-On, 2 Pos, TH	09.03201.02	EAO Switch
5	5	TP1, TP2, TP3, TP4, TP5	White	Test Point, Miniature, White, TH	5002	Keystone
4	4	TP6, TP7, TP8, TP9	SMT	Test Point, Compact, SMT	5016	Keystone
1	0	U1		Precision Adjustable Current-Limited Power-Distribution Switch, DBV0006A (SOT-23-6)	TPS25221DBVR	Texas Instruments
0	1	U2		Precision Adjustable Current-Limited Power-Distribution Switch, DRV0006A (WSON-6)	TPS25221DRVR	Texas Instruments

(1) These assemblies are ESD sensitive, observe ESD precautions.
(2) These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.
(3) These assemblies must comply with workmanship standards IPC-A-610 Class 2.
(4) Ref designators marked with an asterisk ('**') cannot be substituted. All other components can be substituted with equivalent MFG's components.
(5) Attach a rubber bumper to each corner of the PCB.
(6) Insert shorting jumper on header J2.

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Revision History

Changes from Original (January 2018) to A Revision	Page
• Updated *Electrical Specifications* section	2
• Updated Figure 1	3
• Updated *Bill of Materials* table	7

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