

## **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  $-40^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$  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  $\leq 125^{\circ}\text{C}$  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.

### 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.

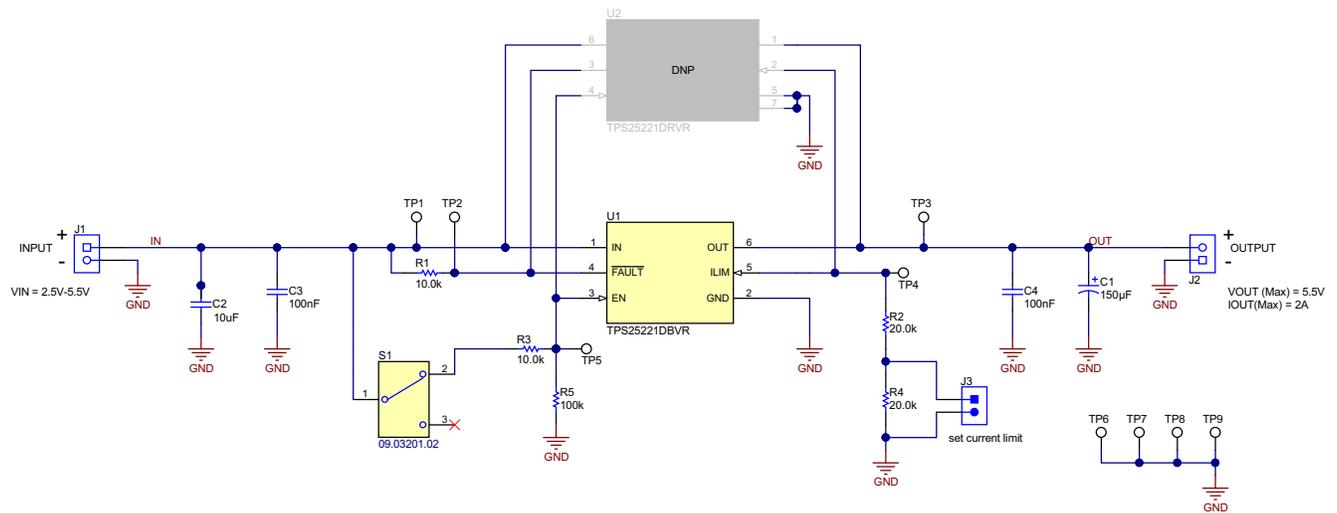


Figure 1. EVM Schematic

## 4 EVM Setup

### 4.1 Recommended Test Equipment

The following test equipment is recommended:

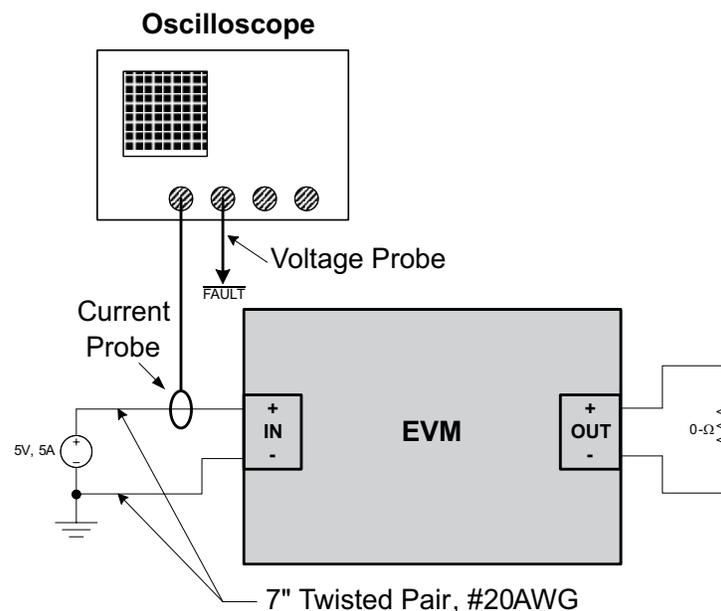
- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- An adjustable power supply with a 2.5-V to 5.5-V output and a 10-A output current-limit
- Volt-ohm meter
- A passive or active load capable of handling 3 A

### 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**

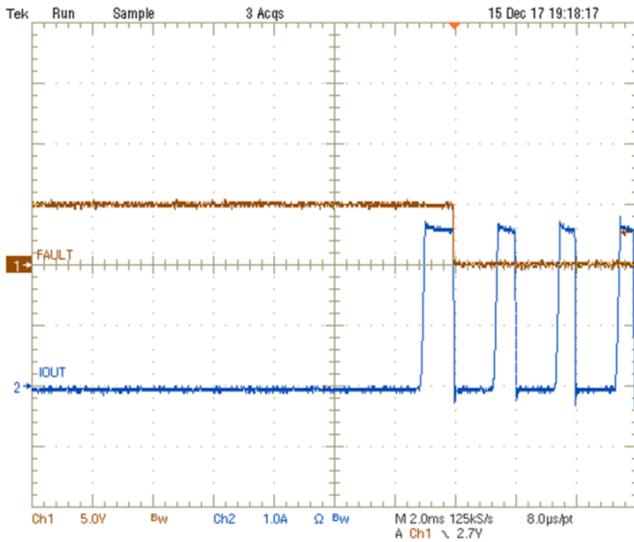


Figure 3. TPS25221DBVEVM Short-Circuit Output Current and FAULT Status With J3 Shorting Jumper Present

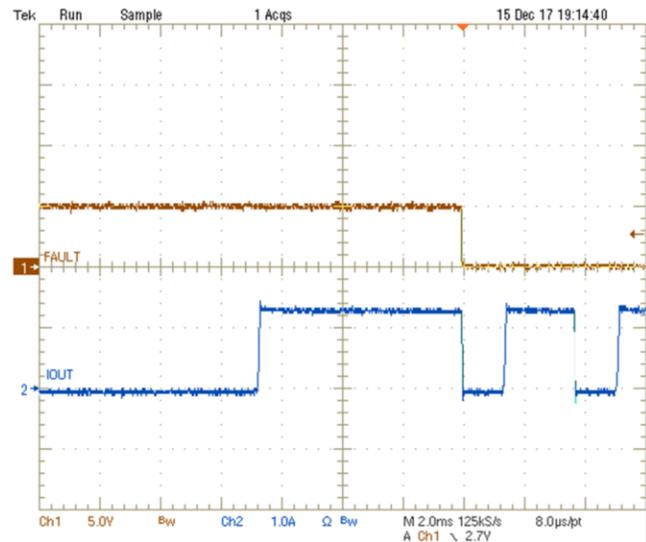


Figure 4. TPS25221DBVEVM Short-Circuit Output Current and FAULT Status With J3 Shorting Jumper Absent

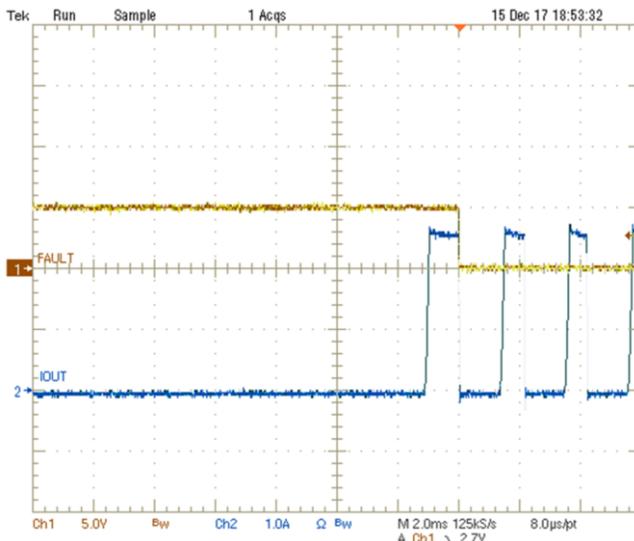


Figure 5. TPS25221DRVEVM Short-Circuit Output Current and FAULT Status With J3 Shorting Jumper Present

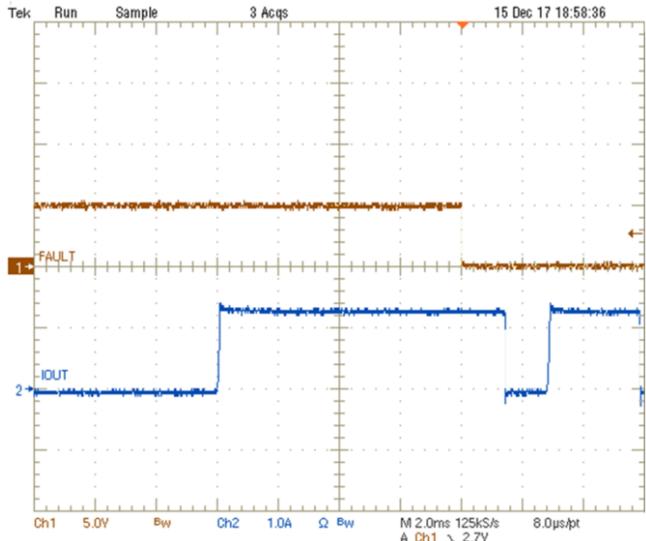


Figure 6. TPS25221DRVEVM Short-Circuit Output Current and FAULT Status With J3 Shorting Jumper Absent

### 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.

## 5 Board Layout

Figure 7 through Figure 10 illustrate the PCB layout images.

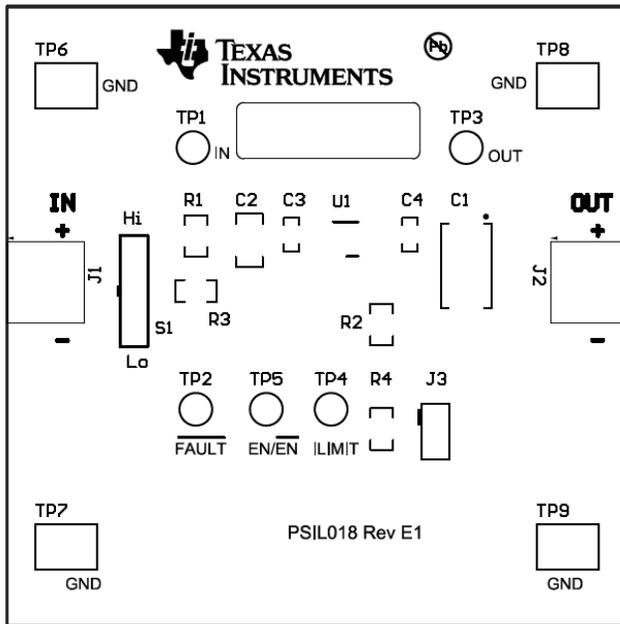


Figure 7. EVM Top Assembly

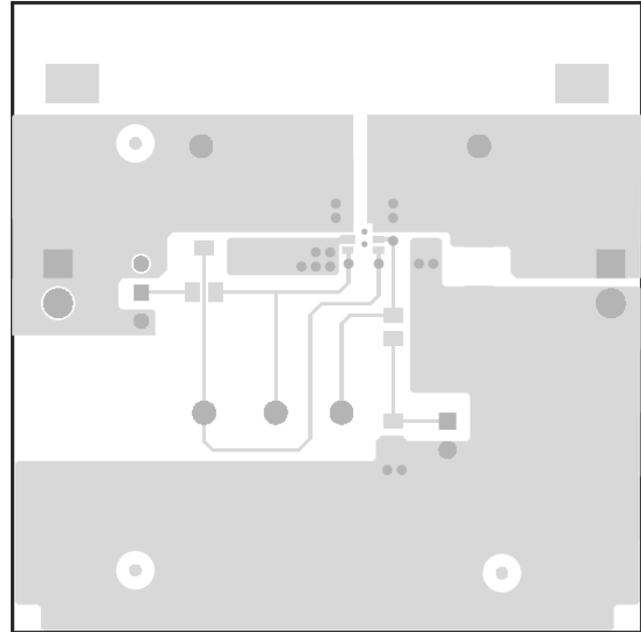


Figure 8. EVM Top-Side Layout

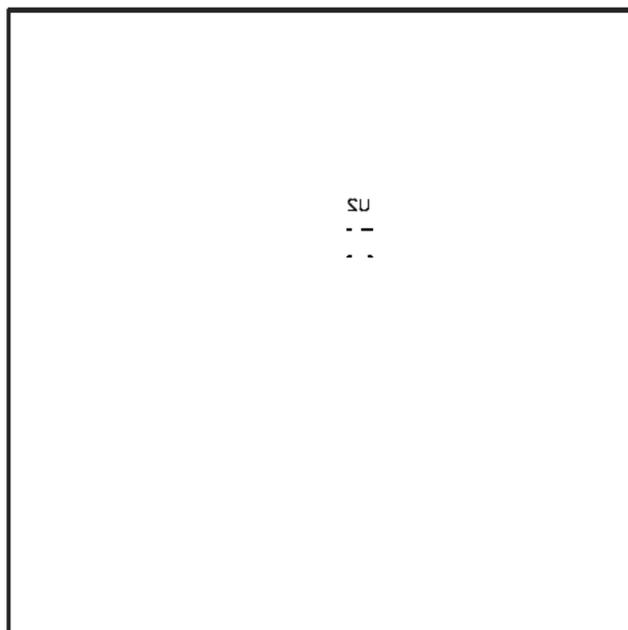


Figure 9. EVM Bottom Assembly

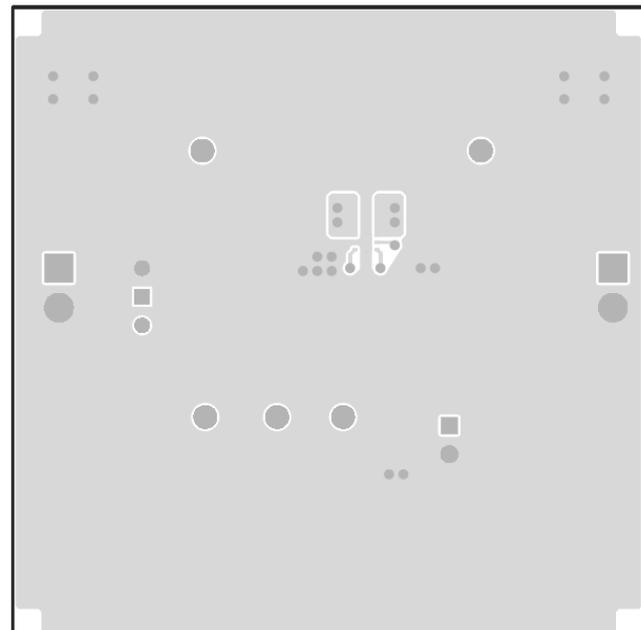


Figure 10. EVM Bottom-Side Layout

## 6 Bill of Materials

Table 3 lists the EVM BOM.

**Table 3. EVM Bill of Materials** <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(6)</sup>

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

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

## Revision History

<b>Changes from Original (January 2018) to A Revision</b>	<b>Page</b>
• Updated <i>Electrical Specifications</i> section .....	2
• Updated <a href="#">Figure 1</a> .....	3
• Updated <i>Bill of Materials</i> table .....	7

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