Two-Channel, Power-Distribution Switch EVM

This user's guide describes the TPS20xxEVM-293 and TPS20xxEVM-296 evaluation modules (EVM). This guide contains the EVM schematics, bill of materials, assembly drawings, and top and bottom board layouts.

Contents

List of Figures

List of Tables

1 Introduction

The TPS20xxEVM-293 and TPS20xxEVM-296 are evaluation modules (EVM) for the Texas Instruments family of two-channel, current-limited, power-distribution switches. These EVMs operate over a 2.7-V to 5.5-V range and provide a continuous output current of up to 1.5 A (see Table 1 and Table 2). 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 TPS20xxEVM-293 accepts an S0-8 packaged power-distribution switch whereas the TPS20xxEVM-296 accepts MSOP-8 packaged switch with a thermal pad. These switches have an enable input, an overcurrent status output, and overtemperature shutdown; the switch pinouts are identical.

Table 1 and Table 2 summarize the available EVM options.

2 Schematics and Bill of Materials

2.1 EVM Options

Table 1. TPS20xxEVM-293 Options

EVM	Device	Continuous Output Current (A)	ENABLE
TPS2042BEVM-293	TPS2042BD	0.5	Active Low
TPS2046BEVM-293	TPS2046BD	0.25	Active Low
TPS2052BEVM-293	TPS2052BD	0.5	Active High
TPS2056AEVM-293	TPS2056AD	0.25	Active High
TPS2062EVM-293	TPS2062D	1	Active Low
TPS2062-1EVM-293	TPS2062D-1	1	Active Low
TPS2066EVM-293	TPS2066D	1	Active High

Table 2. TPS20xxEVM-296 Options

EVM	Device	Continuous Output Current (A)	ENABLE
TPS2042BEVM-296	TPS2042BDGN	0.5	Active Low
TPS2052BEVM-296	TPS2052BDGN	0.5	Active High
TPS2060EVM-296	TPS2060DGN	1.5	Active Low
TPS2062EVM-296	TPS2062DGN	1	Active Low
TPS2064EVM-296	TPS2064DGN	1.5	Active High
TPS2066EVM-296	TPS2066DGN	1	Active High
TPS2066-1EVM-296	TPS2066DGN-1	1	Active High

2.2 Schematics

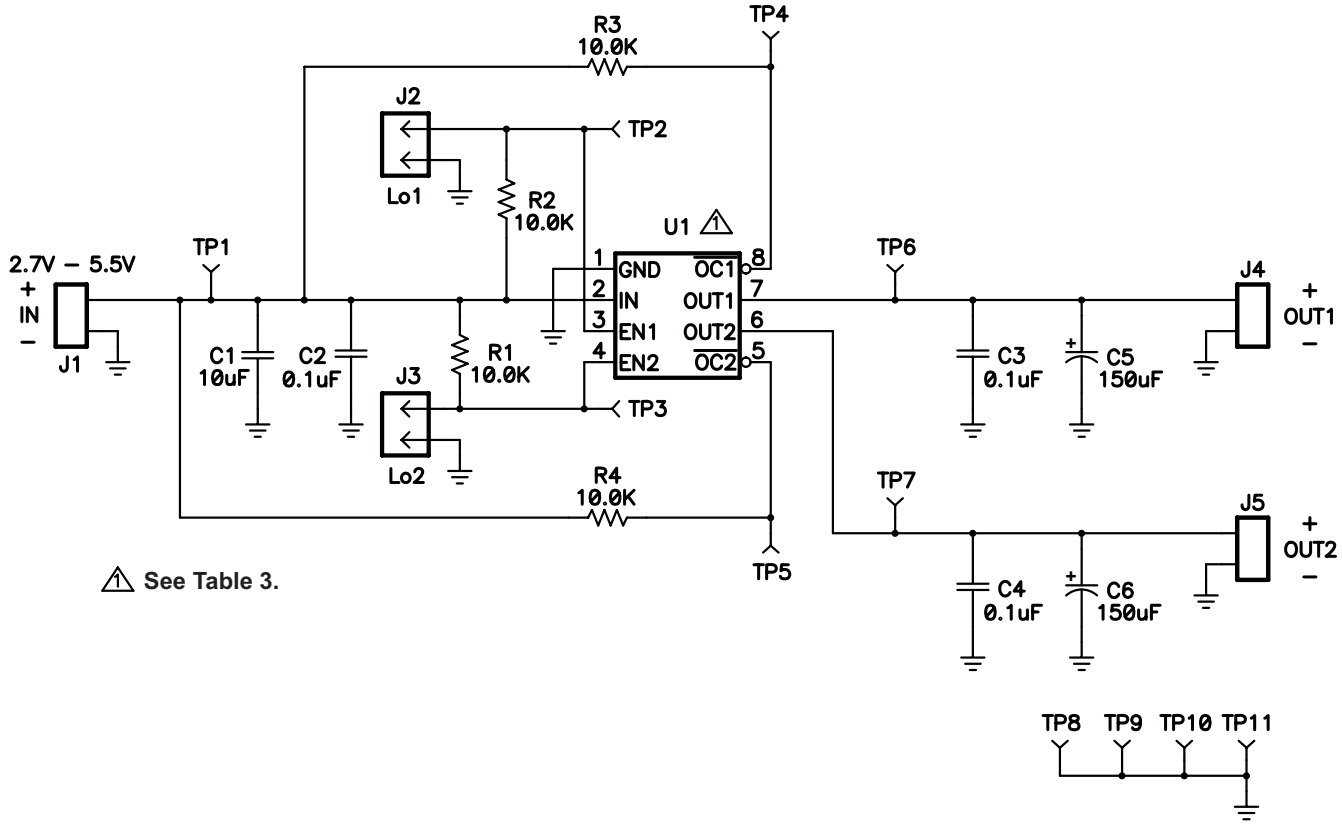

Figure 1. TPS20xxEVM-293 Schematic

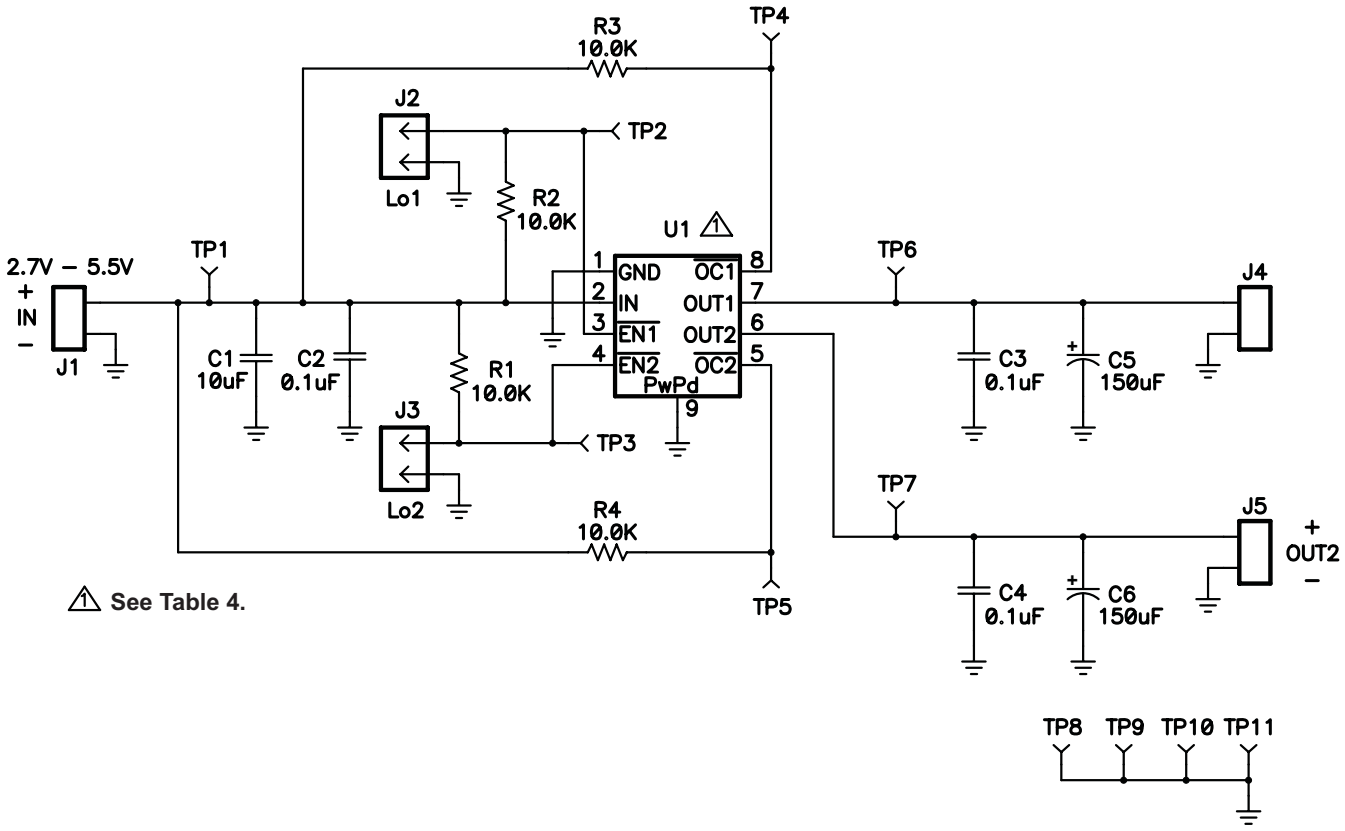

Figure 2. TPS20xxEVM-296 Schematic

2.3 Bill of Material

Table 3. TPS20xxEVM-293 Bill of Materials

QTY							RefDes	Value	Description	Size	Part Number	MFR
-001	-002	-003	-004	-005	-006	-007						
1	1	1	1	1	1	1	C1	10 µF	Capacitor, Ceramic, 10-uF, X7R, 10V, 10%	1206	STD	STD
3	3	3	3	3	3	3	C2–C4	0.1 µF	Capacitor, Ceramic, 16V, X7R, 10%	0805	STD	STD
2	2	2	2	2	2	2	C5, C6	150 µF	Capacitor, Tantalum, 150 µF, 10V, 100 mΩ, 10%	7343 (D)	B45197A2157K409	Kemet
1	0	0	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 500-mA	SO8	TPS2042BD	TI
0	1	0	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 250-mA	SO8	TPS2046BD	TI
0	0	1	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 500-mA	SO8	TPS2052BD	TI
0	0	0	1	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 250-mA	SO8	TPS2056AD	TI
0	0	0	0	1	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	SO8	TPS2062D	TI
0	0	0	0	0	1	0	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	SO8	TPS2062D-1	TI
0	0	0	0	0	0	1	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	SO8	TPS2066D	TI
1	1	1	1	1	1	1	--		PCB, 2.25 In x 2.225 In × 0.062 In		HPA293	Any
4	4	4	4	4	4	4	R1–R4	10.0K	Resistor, Chip, 1/10W, 1%	0805	CRCW0805-1002F	Vishay

Table 4. TPS20xxEVM-296 Bill of Materials

QTY							RefDes	Value	Description	Size	Part Number	MFR
-001	-002	-003	-004	-005	-006	-007						
1	1	1	1	1	1	1	C1	10 µF	Capacitor, Ceramic, 10-µF, X7R, 10V, 10%	1206	STD	STD
3	3	3	3	3	3	3	C2–C4	0.1 µF	Capacitor, Ceramic, 16V, X7R, 10%	0805	STD	STD
2	2	2	2	2	2	2	C5, C6	150 µF	Capacitor, Tantalum, 150 µF, 10V, 100 mΩ, 10%	7343 (D)	B45197A2157K409	Kemet
1	0	0	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 500-mA	MSOP-8	TPS2042BDGN	TI
0	1	0	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 500-mA	MSOP-8	TPS2052BDGN	TI
0	0	1	0	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 1500-mA	MSOP-8	TPS2060DGN	TI
0	0	0	1	0	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	MSOP-8	TPS2062DGN	TI
0	0	0	0	1	0	0	U1		IC, Dual Power-distribution switch, 5.5V, 1500-mA	MSOP-8	TPS2064DGN	TI
0	0	0	0	0	1	0	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	MSOP-8	TPS2066DGN	TI
0	0	0	0	0	0	1	U1		IC, Dual Power-distribution switch, 5.5V, 1000-mA	MSOP-8	TPS2066DGN-1	TI
1	1	1	1	1	1	1	--		PCB, 2.25 In × 2.225 In × 0.062 In	2.25 in × 2.25 in	HPA296	Any
4	4	4	4	4	4	4	R1–R4	10.0K	Resistor, Chip, 1/10W, 1%	0805	CRCW0805-1002F	Vishay

3 Board Layout

This section contains three views of the TPS20xxEVM-293 and the TPS20xxEVM-296 evaluation boards.

3.1 TPS20xxEVM-293 Board

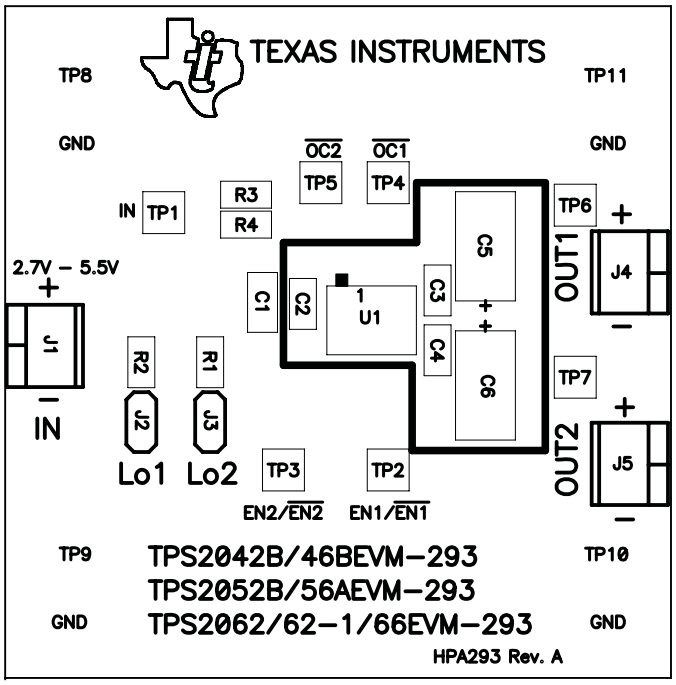

Figure 3. TPS20xxEVM-293 Component Placement

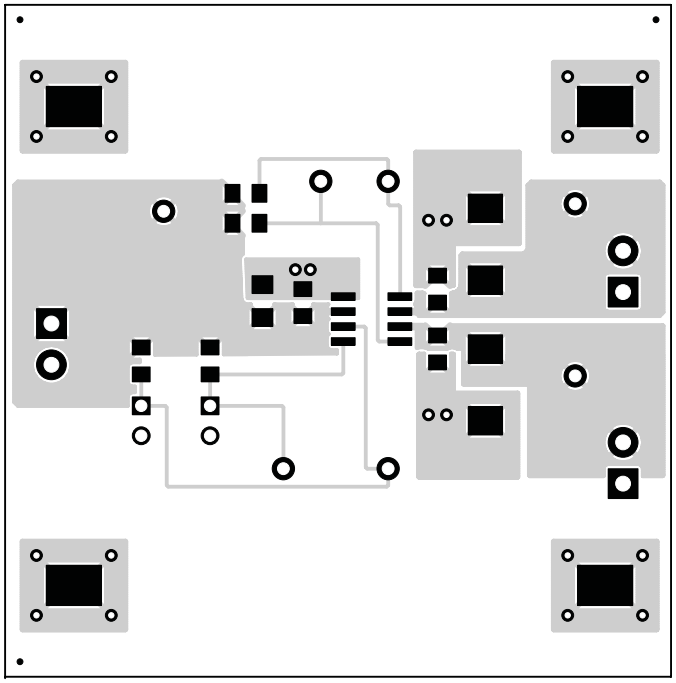

Figure 4. TPS20xxEVM-293 Top-Side Layout

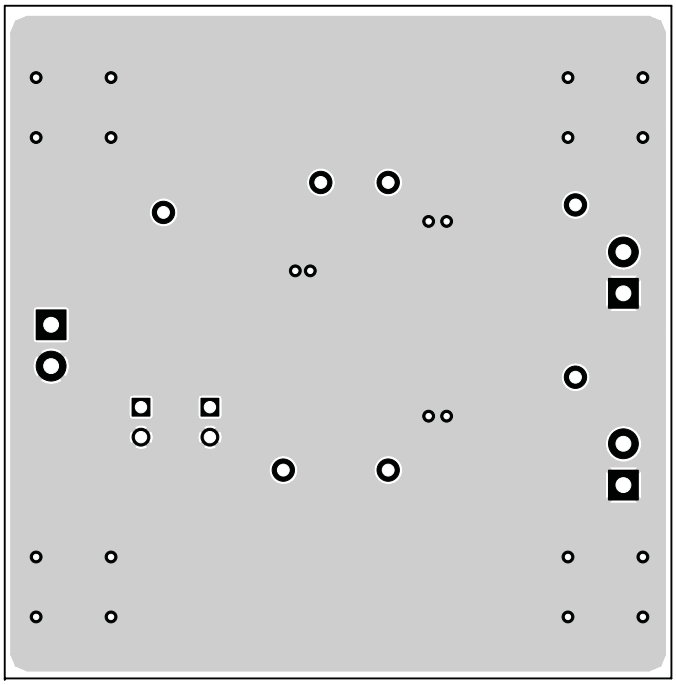

Figure 5. TPS20xxEVM-293 Bottom-Side Layout

3.2 TPS20xxEVM-296 Board

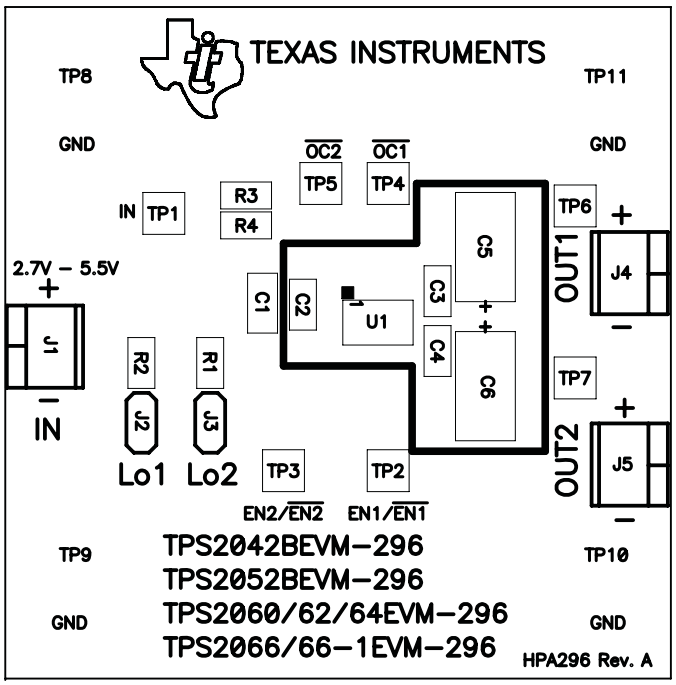

Figure 6. TPS20xxEVM-296 Component Placement

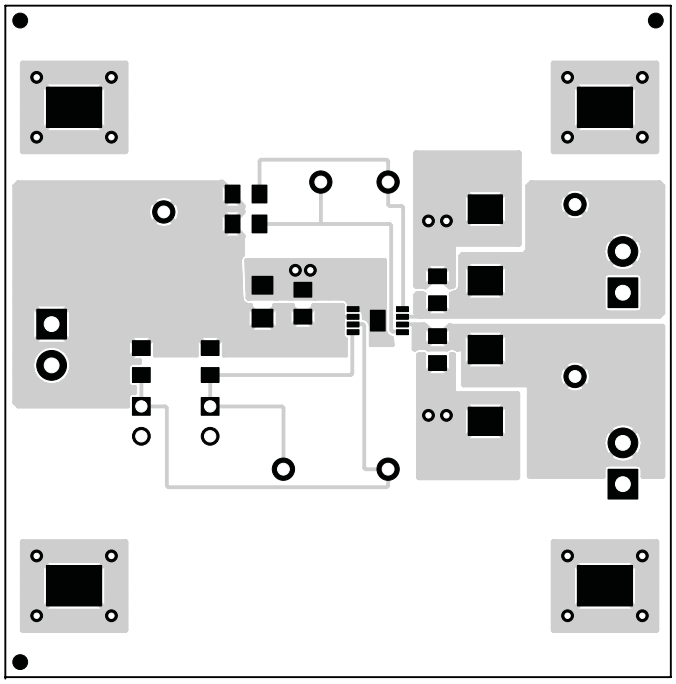

Figure 7. TPS20xxEVM-296 Top-Side Layout

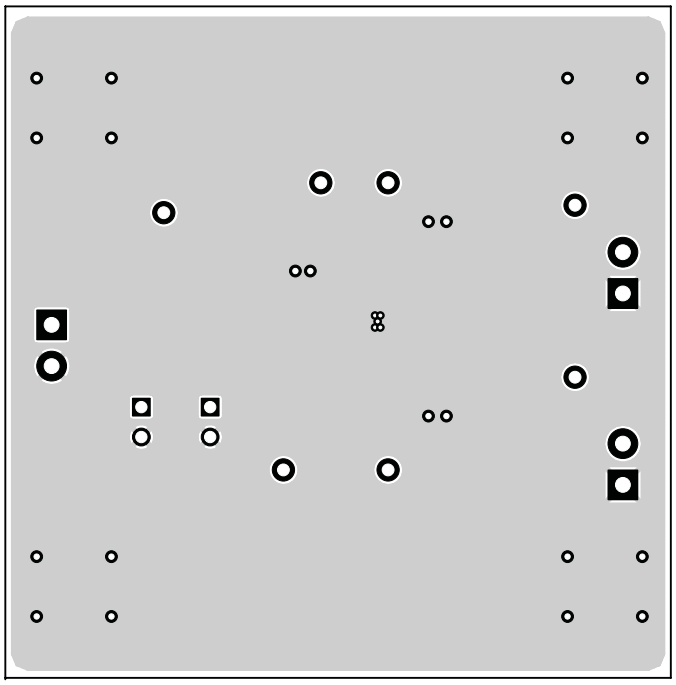

Figure 8. TPS20xxEVM-296 Bottom-Side Layout

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 2.7-V to 5.5-V output and a 5-A output current-limit
- Volt-ohm meter
- A passive or active load capable of handling 5-A

4.2 Measuring Current Limit

The user should read the applicable data sheet before using the EVM.

Figure 9 shows the EVM test set up for measuring current limit. A single switch is enabled into a short circuit for this measurement. Figure 10 shows the current waveform for the TPS2052BEVM-293.

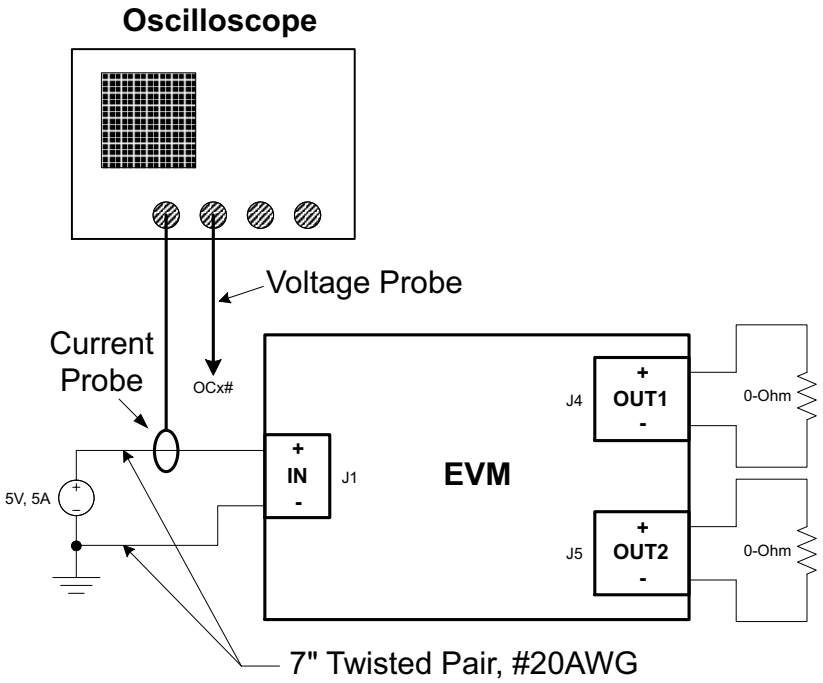

Figure 9. EVM Setup For Measuring Current Limit

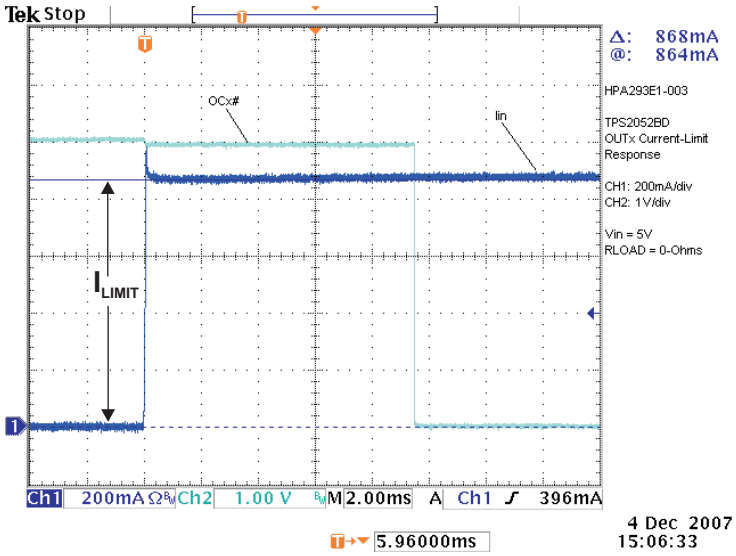

Figure 10. TPS2052BEVM-293 Short-Circuit Output Current and $\overline{\text{OCx}}$ Status

5 Related Documentation from Texas Instruments

- *TPS2041B, TPS2042B, TPS2043B, TPS2044B, TPS2051B, TPS2052B, TPS2053B, TPS2054B, Current-Limited, Power-Distribution Switches* data sheet (SLVS514)
- *TPS2045B, TPS2055B, TPS2046B, TPS2047B, Current-Limited, Power-Distribution Switches* data sheet (SLVS532)
- *TPS2045A, TPS2046A, TPS2047A, TPS2048A, TPS2055A, TPS2056A, TPS2057A. TPS2058A, Current-Limited, Power-Distribution Switches* data sheet (SLVS251)
- *TPS2061, TPS2062, TPS2063, TPS2065, TPS2066, TPS2067,Current-Limited, Power-Distribution Switches* data sheet (SLVS490)
- *TPS2062-1, TPS2065-1, TPS2066-1, Current-Limited, Power-Distribution Switches* data sheet (SLVS714)
- *TPS2060, TPS2064, TPS2068, TPS2069, Current-Limited, Power-Distribution Switches* data sheet (SLVS553)

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2.7 V to 5.5 V and the output voltage range of 2.7 V to 5.5 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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