TEXAS INSTRUMENTS

TPS2080EVM for Compact Flash Plus Card

User's Guide

September 2001

PMP PD & PS

SLVU055

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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 40°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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Chapter 1

Introduction

The TPS2080 is a Texas Instruments power distribution switch that eliminates high-frequency hot-plug or hot-removal transients, reduces inrush current, and provides overcurrent protection. The TPS2080 is a dual-channel N-channel power MOSFET designed for a CompactFlash Plus card but suitable for many other applications. The TPS2080 meets the required power management specified in CF+ and CompactFlash specification revision 1.4.

The TPS2080 (SLVP196) evaluation module (EVM) helps designers evaluate the device and simulate hot-insertion and hot-removal actions under varied conditions.

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1.1 Operating Specifications

Table 1–1. Operating Specifications for the TPS2080EVM (SLVP196)

Item	Min	Typ	Max	Units
Input voltage range (V_I)	2.7		5.5	V
Output voltage range (V_O)	2.7		5.5	V
Output current range (I_O)	0		0.5	A
Output current limit	0.7	1	1.3	A

Table 1–2. Power-Up/Power-Down Timing of the TPS2080EVM (SLVP196)

Item	Test Condition	Min	Typ	Max	Unit
t_r Output voltage rise time	10% – 90% of V_O	2†	3†	4‡	ms
t_f Output voltage fall time	90% – 10% of V_O	4†	5†	20§	ms

† V_O = 3.3 V at 75 mA or V_O = 5 V at 100 mA, C_O = 150 µF
‡ V_O = 2.7 V at 75 mA, C_O = 150 µF
§ V_O = 5.5 V at 100 mA, C_O = 150 µF

Chapter 2

Description and Testing

Figure 2–1 shows the schematic of the TPS2080EVM (SLVP196). The schematic shows two connectors (J1 and J2). J1 is used to connect input supply voltages and external enable signals (EN1 and EN2). EN1 is used to externally enable V_O1 and En2 is used to externally enable V_O2.

Note:

When external enable terminals are used, SW1 and SW2 must be on the Disable positions marked on the EVM. For normal operation, EN1 and EN2 should be floating.

When testing the EVM, set slide switch SW1 (and/or SW2) on the EVM to Enable V_O1 (and/or Enable V_O2) as marked on the board.

Several capacitors and connectors are only required for evaluation purposes and are not necessary for the hot-swap applications. Refer to the applicable data sheets to optimize your designs.

The bill of materials (BOM) for the TPS2080EVM is shown in Table 2–1.

Topic **Page**

2.1 EVM Schematic

Figure 2–1. Schematic of the CompactFlash Plus Card Evaluation Module (TPS2080EVM)

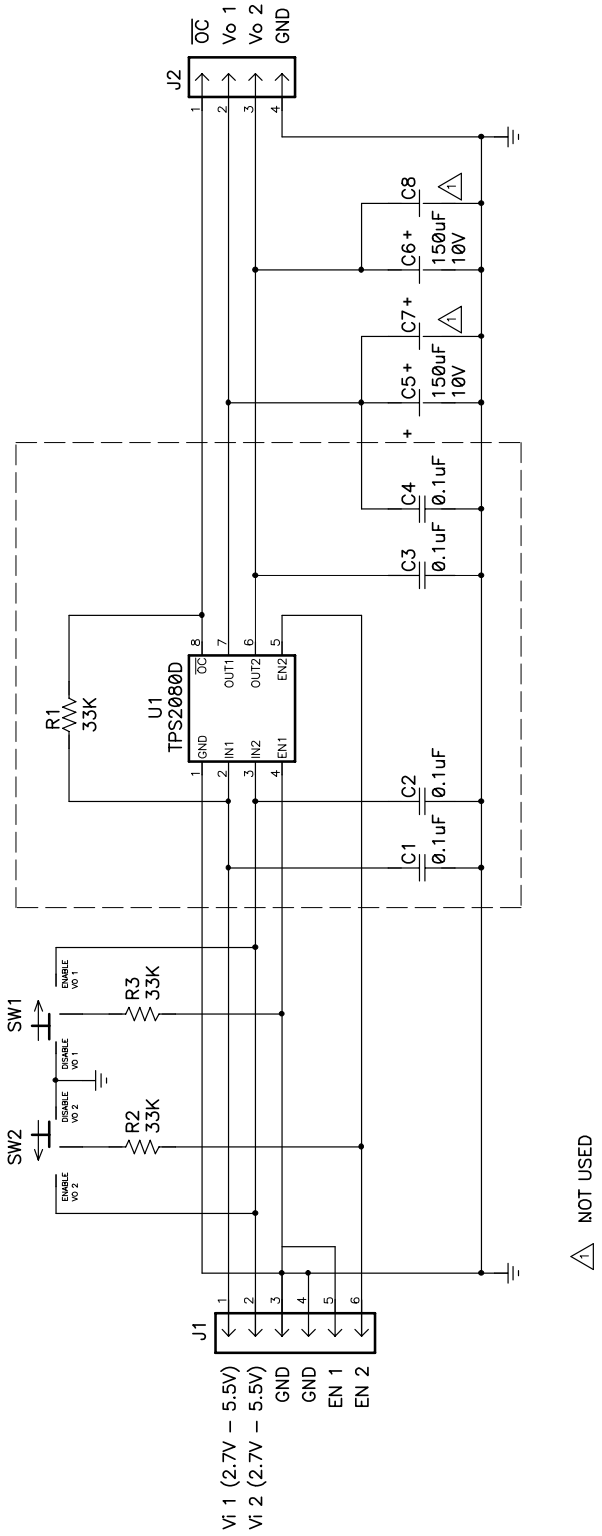


Table 2–1. TPS2080EVM Bill of Materials

Qty.	Designator	Description	Size	Manufacturer	Part Number
1	C1	Capacitor, ceramic, 0.1 µF, 16 V	603	Murata	GRM39X7R104K016A
1	C2	Capacitor, ceramic, 0.1 µF, 16 V	603	Murata	GRM39X7R104K016A
1	C3	Capacitor, ceramic, 0.1 µF, 16 V	603	Murata	GRM39X7R104K016A
1	C4	Capacitor, ceramic, 0.1 µF, 16 V	603	Murata	GRM39X7R104K016A
1	C5	Capacitor, aluminum, 150 µF, 10 V, 20%	0.335 x 0.374 (E)	Panasonic	EEV–FC1A151P
1	C6	Capacitor, aluminum, 150 µF, 10 V, 20%	0.335 x 0.374 (E)	Panasonic	EEV–FC1A151P
1	J1	Header, 6-pin, 100-mil spacing, 1X6	45100	Sullins	PTC36SAAN
1	J2	Header, 4-pin, 100-mil spacing, 1X4	45100	Sullins	PTC36SAAN
1	R1	Resistor, chip, 33 kΩ, 5%	603	Panasonic–ECG	ERJ–3GEYJ333V
1	R2	Resistor, chip, 33 kΩ, 5%	603	Panasonic–ECG	ERJ–3GEYJ333V
1	R3	Resistor, chip, 33 kΩ, 5%	603	Panasonic–ECG	ERJ–3GEYJ333V
1	SW1	Slide switch	500 mA	EAO	09–03201–02
1	SW2	Slide switch	500 mA	EAO	09–03201–02
1	U1	Power distribution controller	SO8	TI	TPS2080D
1	C7	Not used			
1	C8	Not used			

2.2 EVM Layout

Figures 2–2, 2–3, and 2–4 illustrate the placement of the components and the layouts for the TPS2080EVM. All the components are placed on the top layers. The bottom layers are for ground planes, except for a few short traces on the EVM.

Figure 2–2. TPS2080EVM (SLVP196)—Top Layer

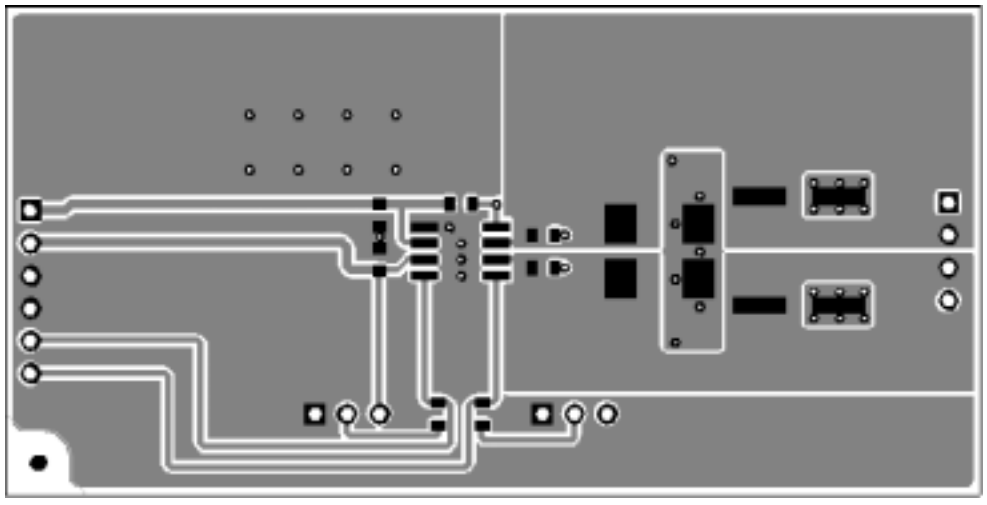


Figure 2–3. TPS2080EVM (SLVP196)—Bottom Layer

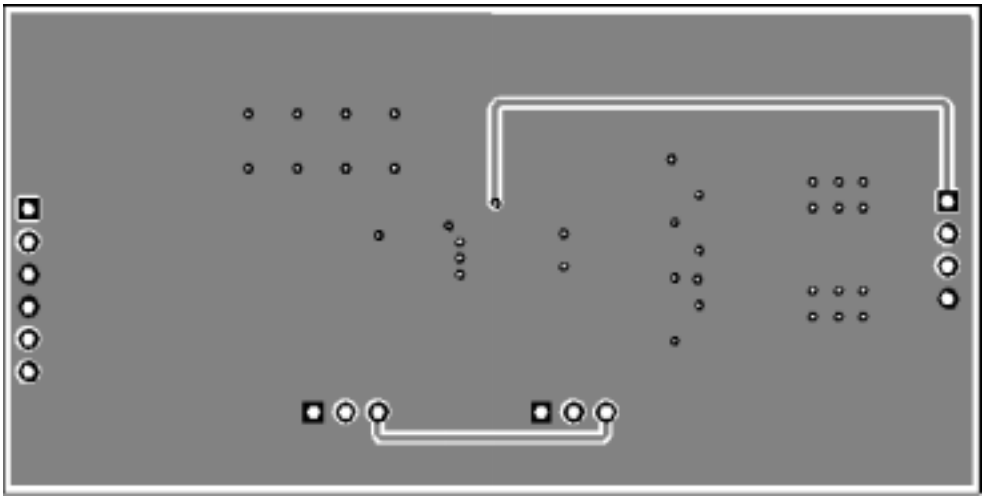
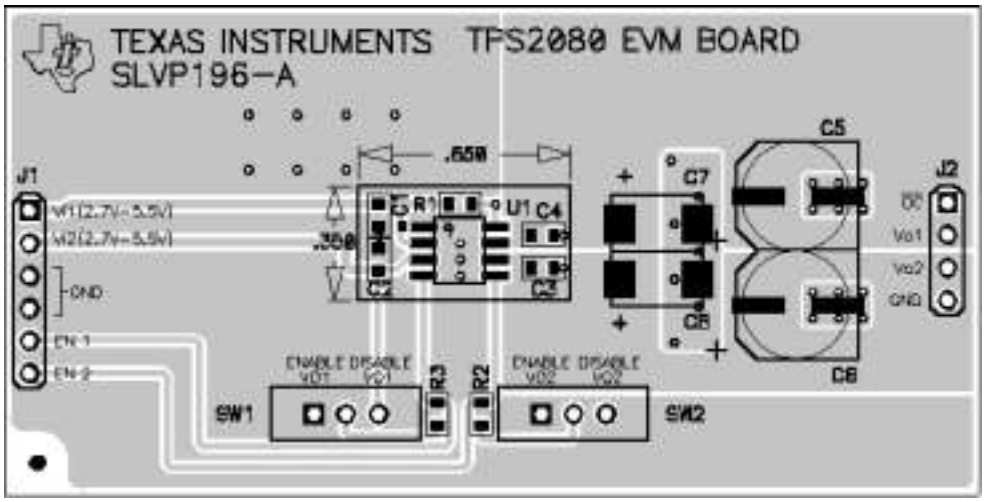


Figure 2–4. TPS2080EVM (SLVP196)—Top Assembly



2.3 EVM Setup

Proper operation of the EVM requires two 6-V/1-A power supplies, two resistive loads, two voltage meters, and an oscilloscope.

Refer to the setup diagram in Figure 2–5 and follow these steps for hot-plug testing:

1) With the input supplies disconnected from the unit under test, adjust the input voltages to 3.3 volts and turn off the power supplies. Slide switches SW1 and SW2 (on the SLVP196) to the Disable position.

2) Adjust the load currents to 0.075 A (or 44 Ω), and connect the loads to the two output pins—one load connected from V_O1 (pin 2 of J2) to ground (pin 4 of J2), and the other load from V_O2 (pin 3 of J2) to ground (pin 4 of J2).

3) Connect the power supplies to the two input pins of the SLVP196—connect one from V_I1 (pin 1 of J1) to ground (pin 3 or 4 of J1), and the other from V_I2 (pin 2 of J1) to ground (pin 3 or 4 of J1). Then turn the power supply on. Do not exceed an input voltage of 5.5 V or a load current of 1 A (or 3.3 Ω) at any time while the unit under test is connected to the input supply.

4) Slide switch SW1 and/or SW2 marked on the EVM (SLVP196) to the Enable V_O1 and Enable V_O2 positions (as marked on the EVM), respectively.

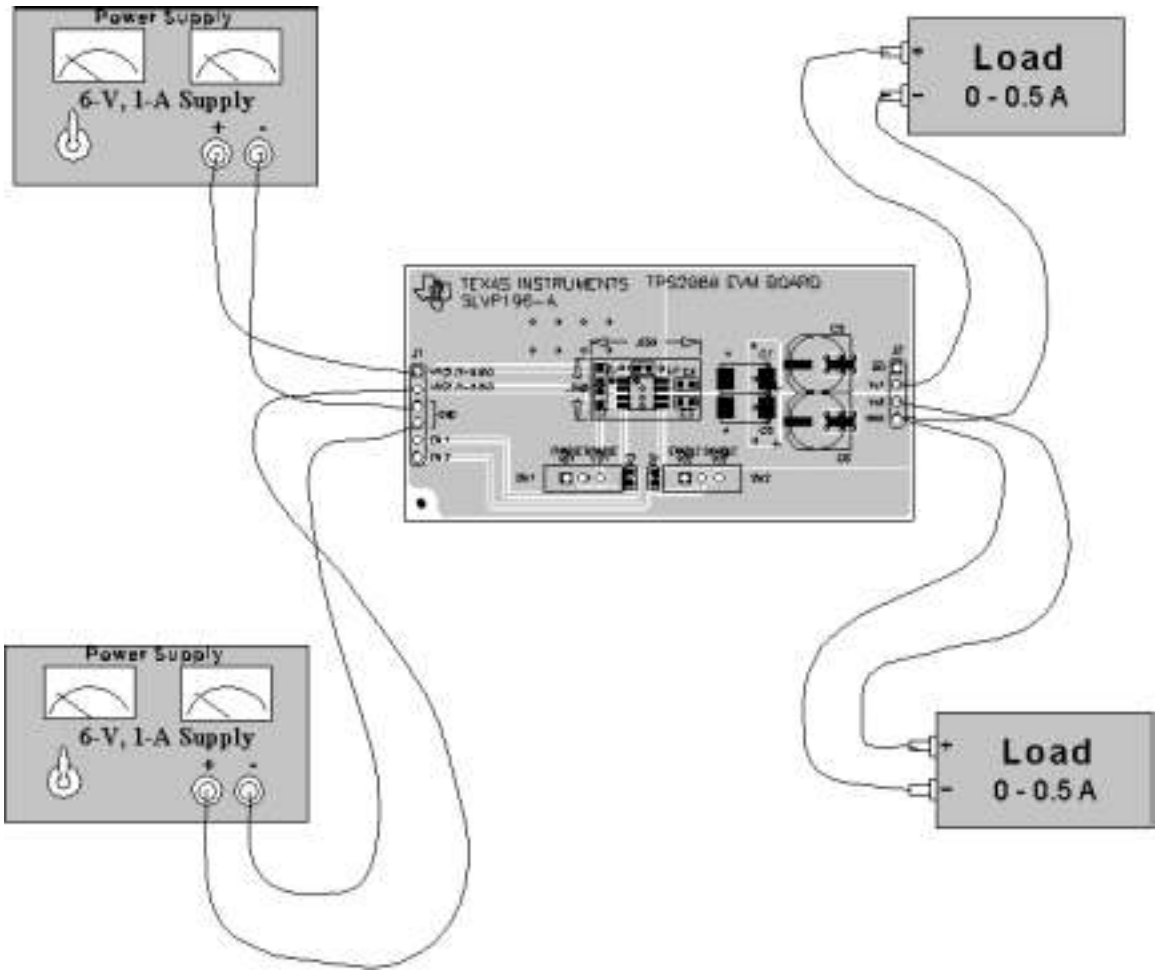
5) Read the voltage from V_O1 (pin 2 of J2) and V_O2 (pin 3 of J2) to GND. The values should be about 3.3 V. Otherwise, the board may have problems or the testing may not be correct.

6) The preceding test procedure (numerals 1 through 5) can be repeated with V_I1=V_I2 = 5 V. Note that the loads must be 0.075 A (67 Ω) at V_I1 = V_I2 = 5 V and the output voltages from V_O1 (pin 2 of J2) and V_O2 (pin 3 of J2) must be about 5 V. Otherwise, the board may have problems or the testing may not be correct.

7) The preceding test procedure (numerals 1 through 5) can be repeated with two input voltages (V_I1 = 3.3 V and V_I2 = 5 V, or vice versa). Note that the load currents must be less than 0.075 A for each channel and the output voltages must be about V_O1 = 3.3 V and V_O2 = 5 V, or vice versa.

The load current limits for V_O1 and V_O2 are set to 1 A.

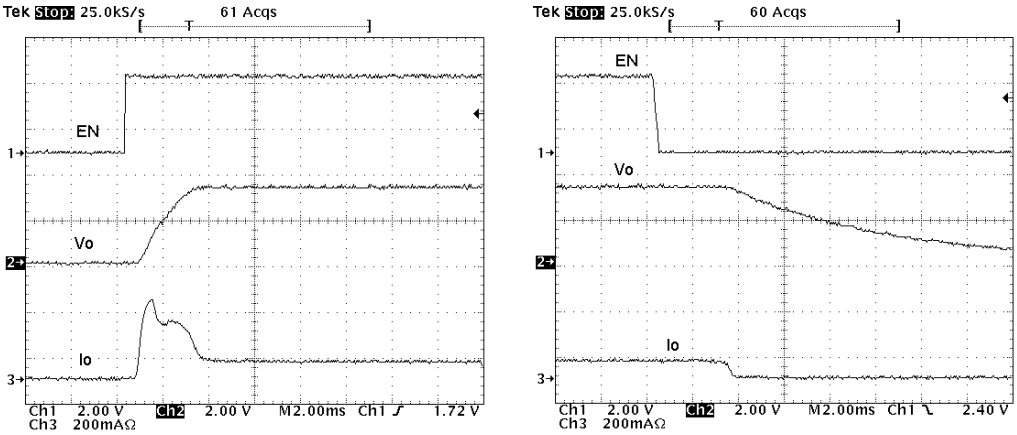
Figure 2–5. TPS2080EVM Evaluation Setup



2.4 Test Results

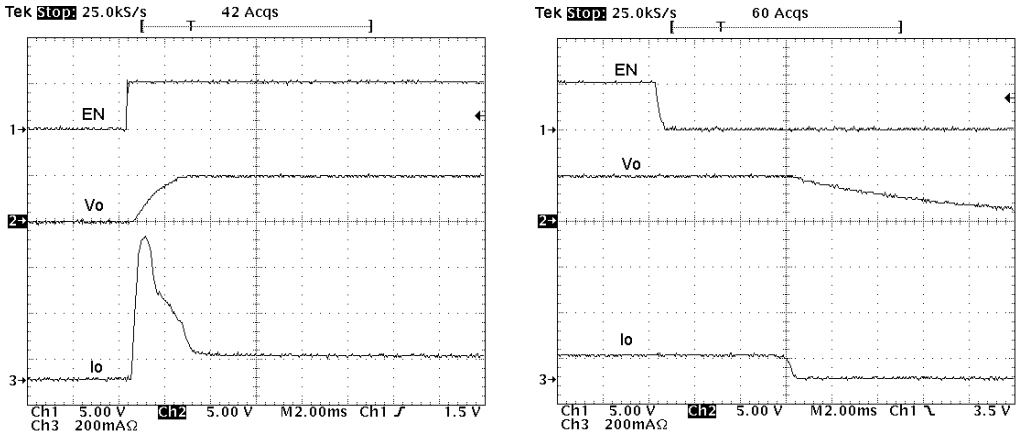
Figures 2–6 through 2–10 show the test results for the TPS2080EVM.

Figure 2–6. TPS2080EVM Test at V_I = 3.3 V, I_O = 75 mA



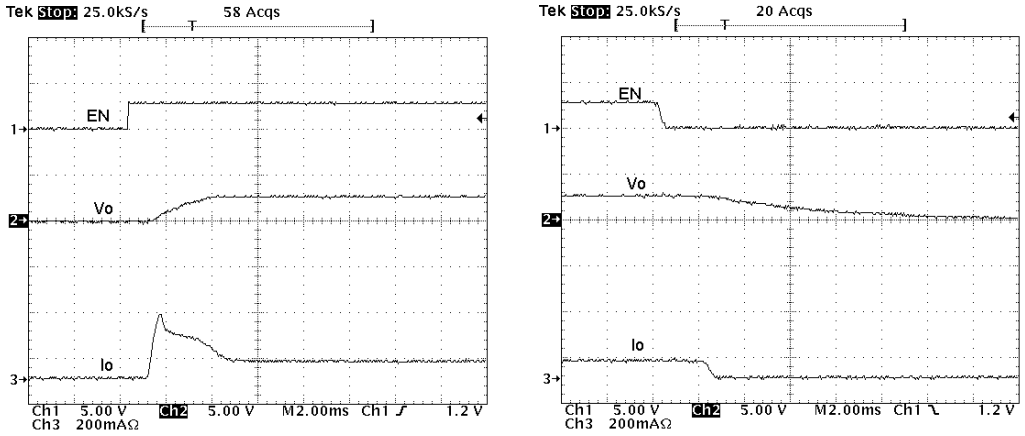
(a) Hot-Plug (b) Hot-Removal

Figure 2–7. TPS2080EVM Test at V_I = 5 V, I_O = 100 mA



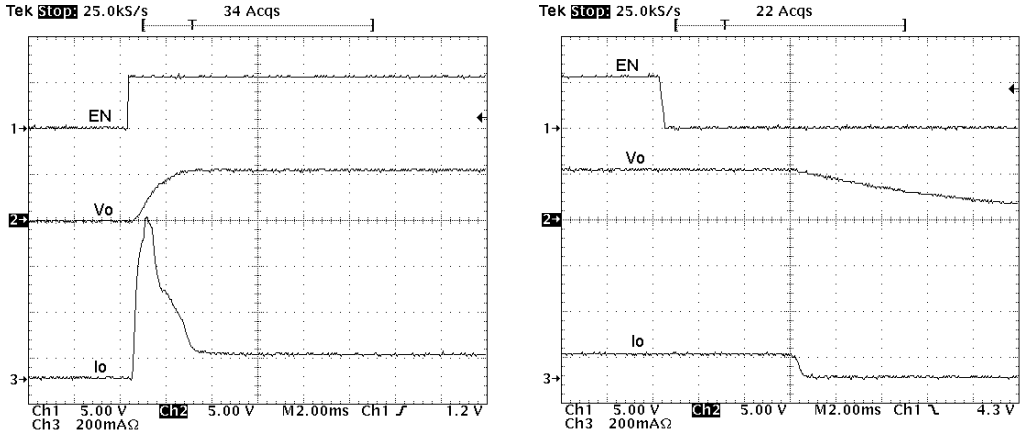
(a) Hot-Plug (b) Hot-Removal

Figure 2–8. TPS2080EVM Test at V_I = 2.7 V, I_O = 75 mA



(a) Hot-Plug (b) Hot-Removal

Figure 2–9. TPS2080EVM Test at V_I = 5.5 V, I_O = 100 mA



(a) Hot-Plug (b) Hot-Removal

Figure 2–10. Thermal Shutdown at V_I = 3.3 V, V_O = Short