

TPS2080EVM for Compact Flash Plus Card

User's Guide

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

EVM IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation kit being sold by TI is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not considered by TI to be fit for commercial use. As such, the goods being provided may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product incorporating the goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this evaluation kit not meet the specifications indicated in the EVM User's Guide, the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Please be aware that the products received may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein**.

Please read the EVM User's Guide and, specifically, the EVM Warnings and Restrictions notice in the EVM User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact the TI application engineer.

Persons handling the product must have electronics training and observe good laboratory practice standards.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Contents

1	Introduction	1-1
1.1	Operating Specifications	1-2
2	Description and Testing	2-1
2.1	EVM Schematic	2-2
2.2	EVM Layout	2-3
2.3	EVM Setup	2-5
2.4	Test Results	2-7

Figures

2-1	Schematic of the CompactFlash Plus Card Evaluation Module (TPS2080EVM)	2-2
2-2	TPS2080EVM (SLVP196)—Top Layer	2-3
2-3	TPS2080EVM (SLVP196)—Bottom Layer	2-4
2-4	TPS2080EVM (SLVP196)—Top Assembly	2-4
2-5	TPS2080EVM Evaluation Setup	2-6
2-6	TPS2080EVM Test at $V_I = 3.3\text{ V}$, $I_O = 75\text{ mA}$	2-7
2-7	TPS2080EVM Test at $V_I = 5\text{ V}$, $I_O = 100\text{ mA}$	2-7
2-8	TPS2080EVM Test at $V_I = 2.7\text{ V}$, $I_O = 75\text{ mA}$	2-8
2-9	TPS2080EVM Test at $V_I = 5.5\text{ V}$, $I_O = 100\text{ mA}$	2-8
2-10	Thermal Shutdown at $V_I = 3.3\text{ V}$, $V_O = \text{Short}$	2-8

Tables

1-1	Operating Specifications for the TPS2080EVM (SLVP196)	1-2
1-2	Power-Up/Power-Down Timing of the TPS2080EVM (SLVP196)	1-2
2-1	TPS2080EVM Bill of Materials	2-3



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.

Topic	Page
1.1 Operating Specifications	1-2

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, $C_O = 150$ μ F

[‡] $V_O = 2.7$ V at 75 mA, $C_O = 150$ μ F

[§] $V_O = 5.5$ V at 100 mA, $C_O = 150$ μ F

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	2-2
2.2 EVM Layout	2-3
2.3 EVM Setup	2-5
2.4 Test Results	2-7

2.1 EVM Schematic

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

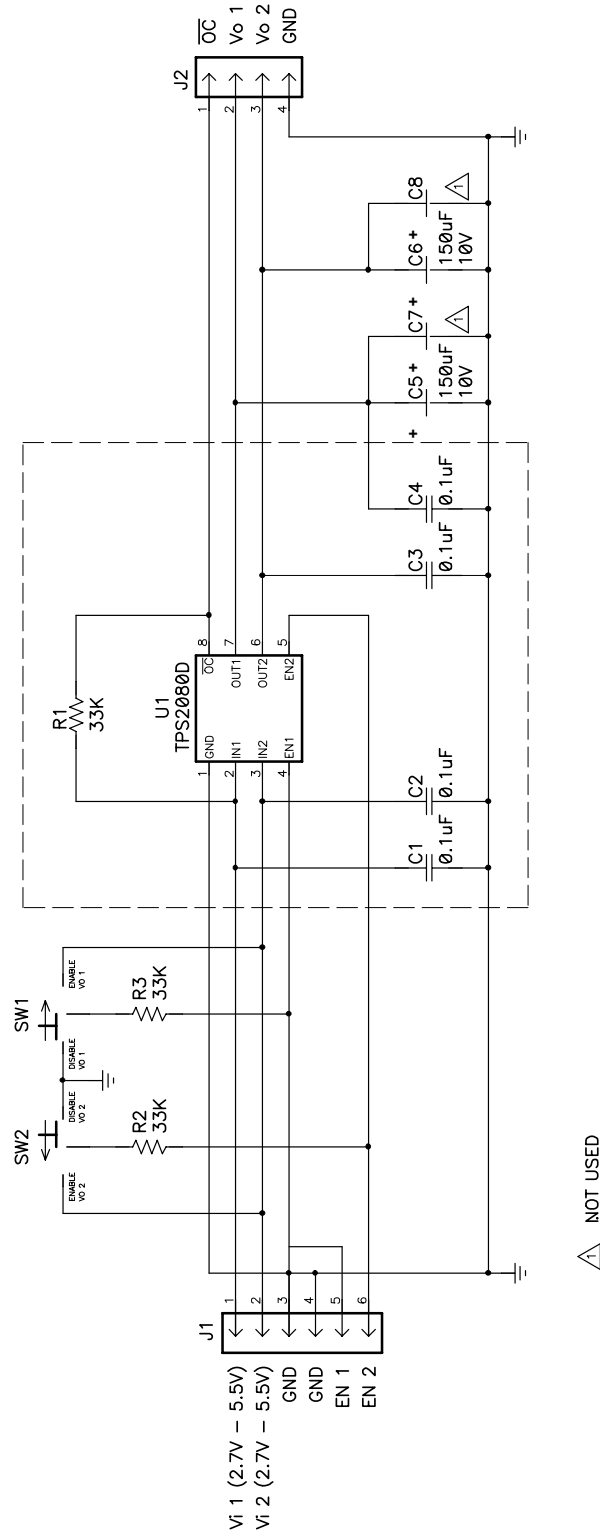


Table 2–1. TPS2080EVM Bill of Materials

Qty.	Designator	Description	Size	Manufacturer	Part Number
1	C1	Capacitor, ceramic, 0.1 μ F, 16 V	603	Murata	GRM39X7R104K016A
1	C2	Capacitor, ceramic, 0.1 μ F, 16 V	603	Murata	GRM39X7R104K016A
1	C3	Capacitor, ceramic, 0.1 μ F, 16 V	603	Murata	GRM39X7R104K016A
1	C4	Capacitor, ceramic, 0.1 μ F, 16 V	603	Murata	GRM39X7R104K016A
1	C5	Capacitor, aluminum, 150 μ F, 10 V, 20%	0.335 x 0.374 (E)	Panasonic	EEV-FC1A151P
1	C6	Capacitor, aluminum, 150 μ F, 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 k Ω , 5%	603	Panasonic-ECG	ERJ-3GEYJ333V
1	R2	Resistor, chip, 33 k Ω , 5%	603	Panasonic-ECG	ERJ-3GEYJ333V
1	R3	Resistor, chip, 33 k Ω , 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

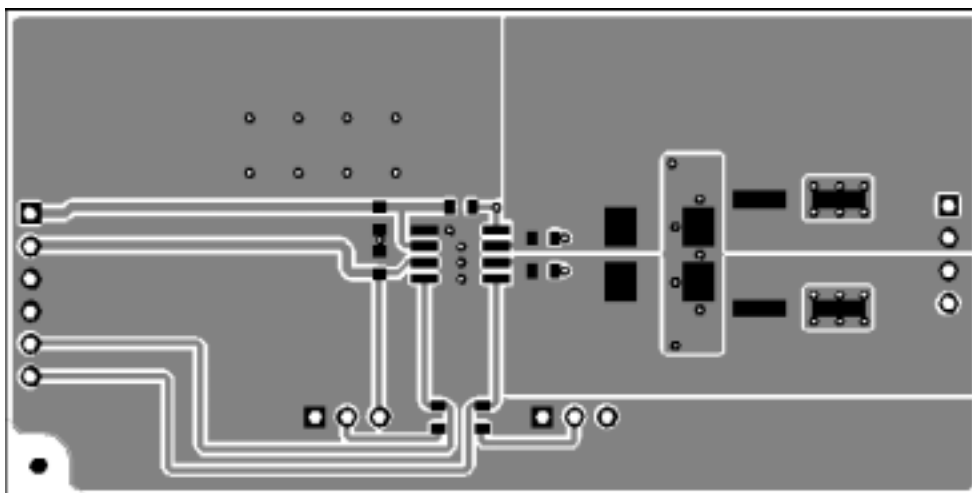


Figure 2–3. TPS2080EVM (SLVP196)—Bottom Layer

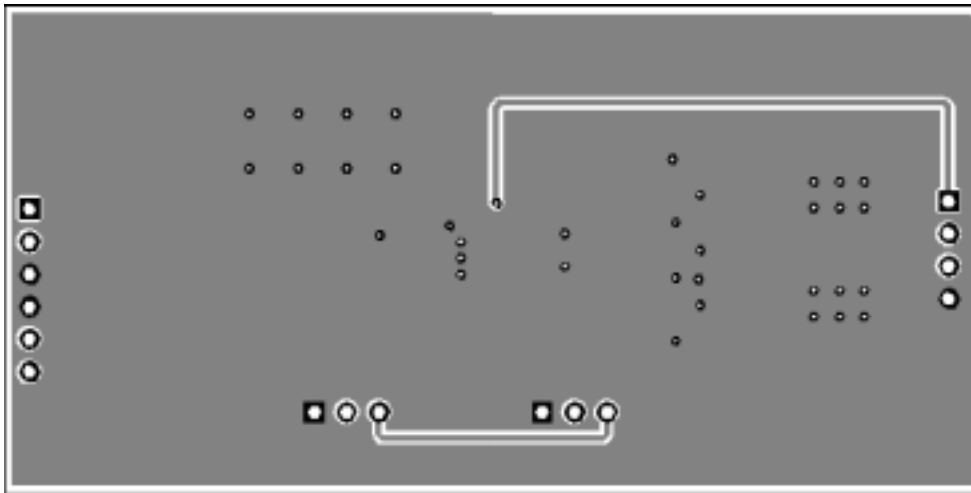
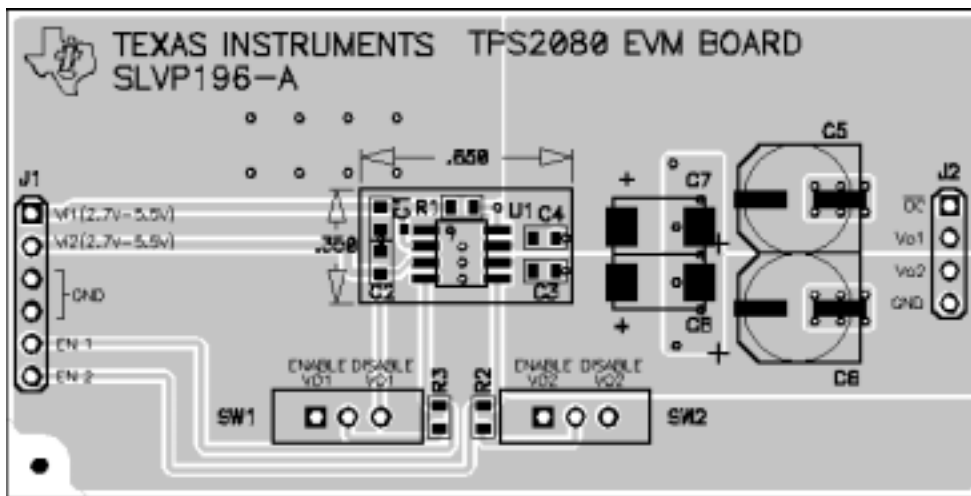


Figure 2–4. TPS2080EVM (SLVP196)—Top Assembly



2.3 EVM Setup

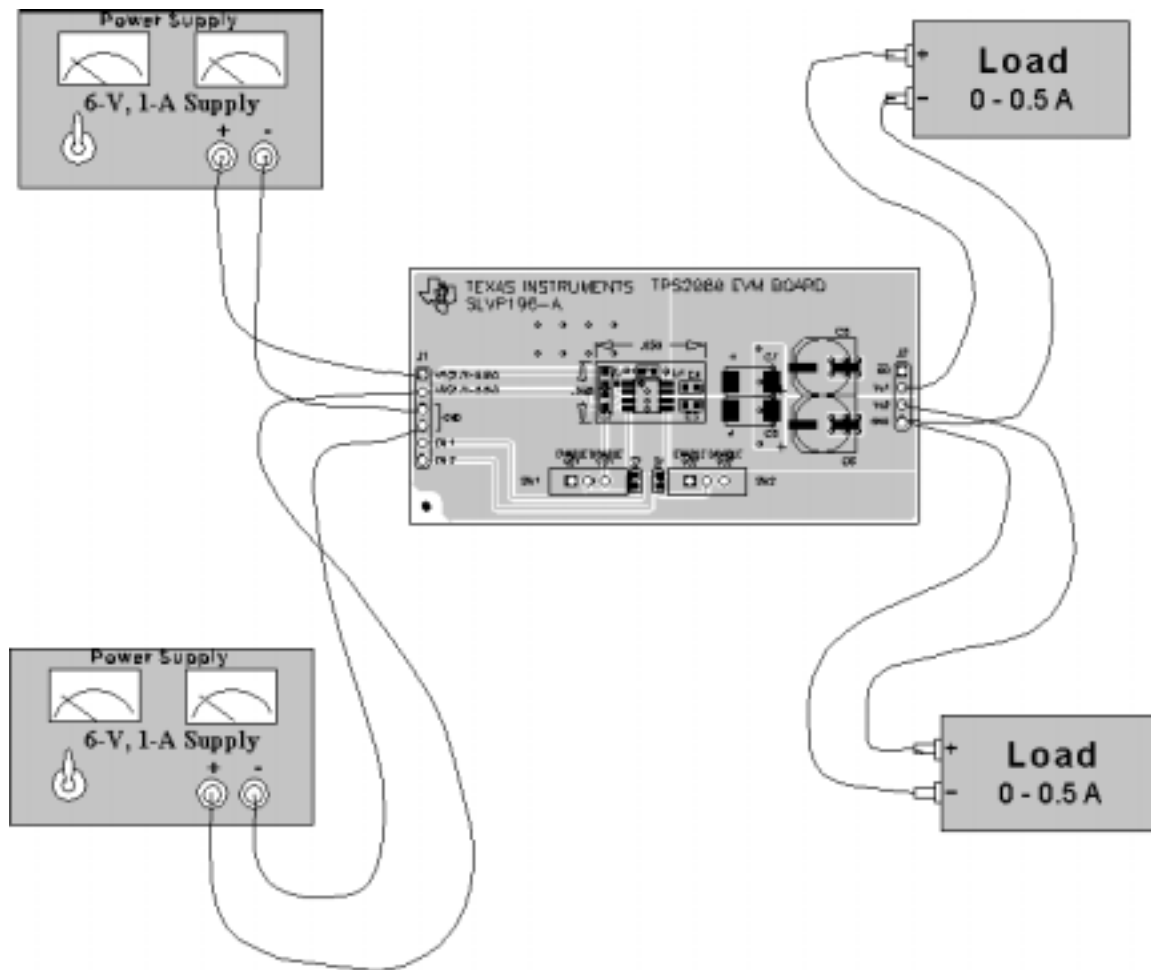
Proper operation of the EVM requires two 6-V/1-A power supplies, two resistive loads, two voltage meters, and an oscilloscope.

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 $V_I = 3.3\text{ V}$, $I_O = 75\text{ mA}$

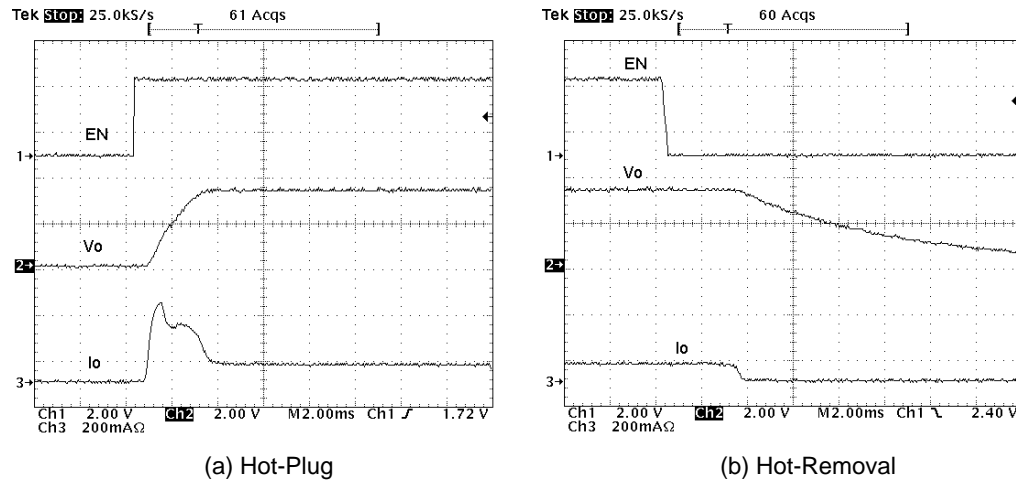


Figure 2–7. TPS2080EVM Test at $V_I = 5\text{ V}$, $I_O = 100\text{ mA}$

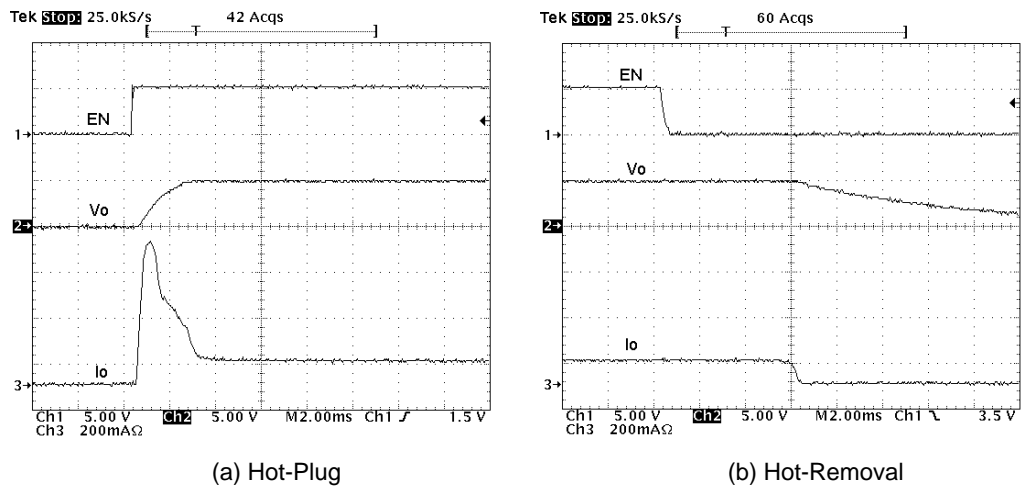


Figure 2–8. TPS2080EVM Test at $V_I = 2.7\text{ V}$, $I_O = 75\text{ mA}$

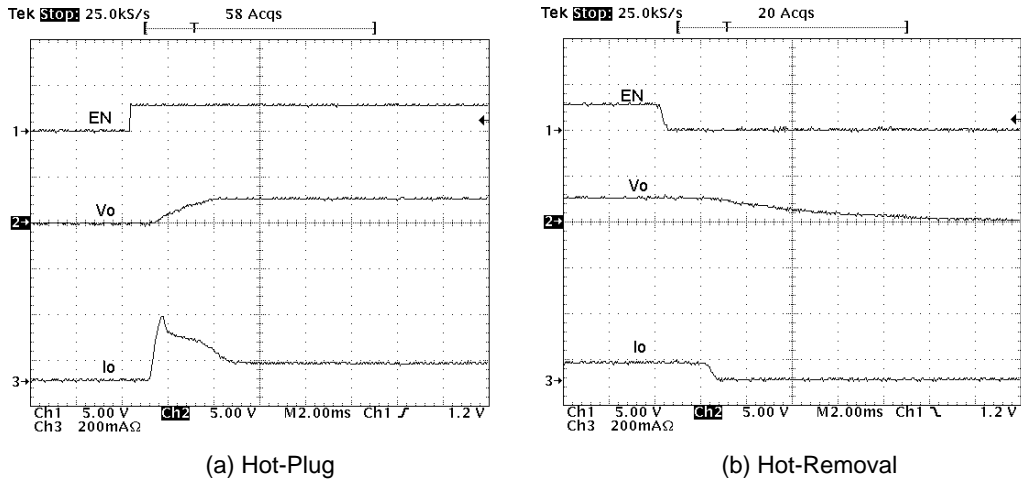


Figure 2–9. TPS2080EVM Test at $V_I = 5.5\text{ V}$, $I_O = 100\text{ mA}$

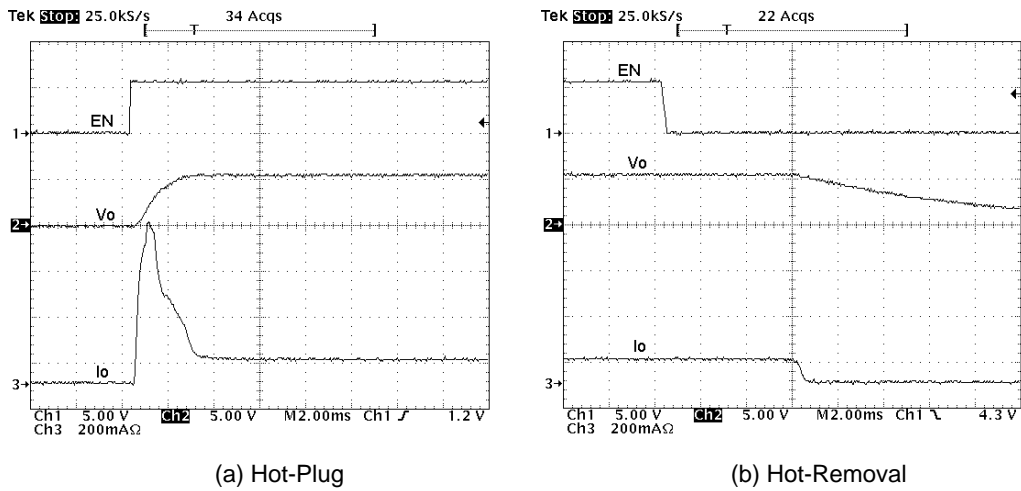


Figure 2–10. Thermal Shutdown at $V_I = 3.3\text{ V}$, $V_O = \text{Short}$

