

TPS785EVM-033 Evaluation Module



ABSTRACT

This user's guide describes the operational use of the TPS785EVM-033 evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS785QDRBRQ1 low-dropout linear regulator (LDO). Included in this user's guide are setup and operating instructions, thermal and layout guidelines, a printed circuit board (PCB) layout, a schematic diagram, and a bill of materials (BOM).

Throughout this document, the terms *demonstration kit*, *evaluation board*, and *evaluation module* are synonymous with the TPS785EVM-033.

Table 1-1 lists the related documentation available through the Texas Instruments web site at www.ti.com.

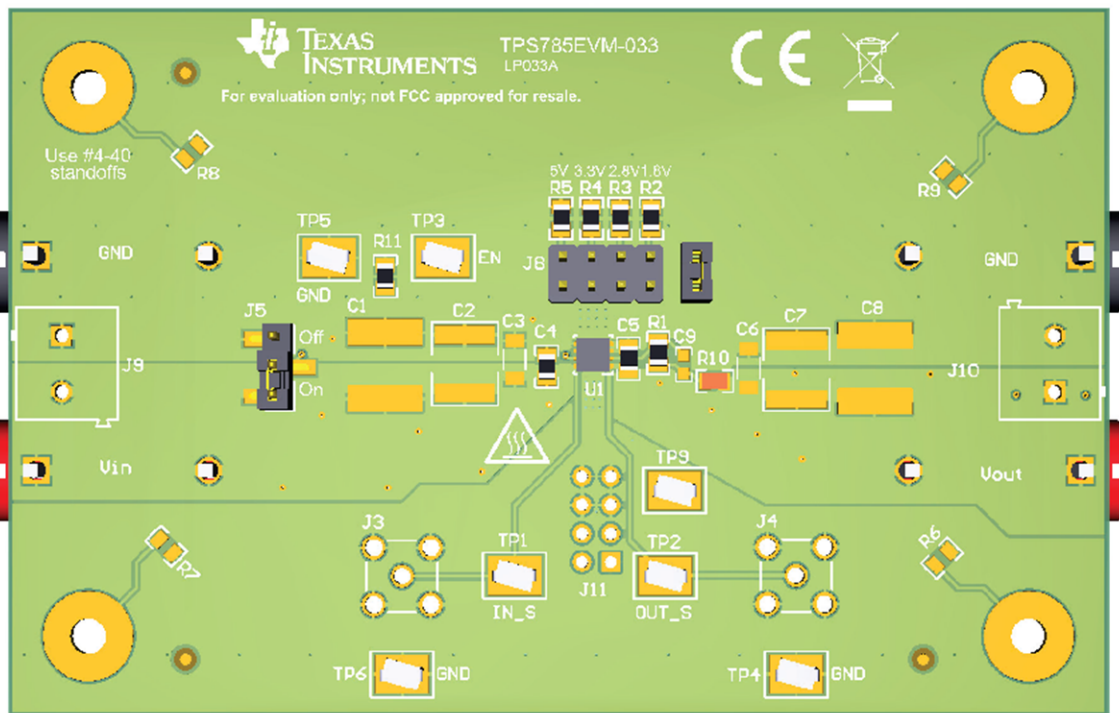


Table 1-1. Related Documentation

Device	Literature Number
TPS785-Q1	SBVS388

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1 Introduction

Texas Instruments TPS785EVM-033 EVM assists design engineers to evaluate the operation and performance of the TPS785-Q1 family of linear regulators for possible use in their own circuit application. This particular EVM configuration contains a single 1 A low-IQ, low-dropout regulator for automotive systems. The regulator is capable of delivering up to 1 A to the load with a V_{IN} range of 1.65 V to 6 V.

1.1 Before You Begin

The following warnings and cautions are noted for the safety of anyone using or working close to the TPS785EVM-033. Observe all safety precautions.

WARNING



Warning Hot surface. Contact may cause burns. Do not touch.

CAUTION

The circuit module may be damaged by overtemperature. To avoid damage, monitor the temperature during evaluation and provide cooling, as needed, for your system environment.

CAUTION

Some power supplies can be damaged by application of external voltages. If using more than one power supply, check your equipment requirements and use blocking diodes or other isolation techniques, as needed, to prevent damage to your equipment.

CAUTION

The circuit module is not a finished product or electrical appliance. The module does not contain current or voltage thresholds for circuit protection. It must be used by qualified personnel with additional equipment for evaluation only.

2 EVM Setup

This section describes how to properly connect and set up the TPS785EVM-033, including the jumpers and connectors on the EVM board.

2.1 Input/Output Connector and Jumper Descriptions

2.1.1 J1 – VIN (Banana Jack)

Input power-supply voltage connector. Twist together the positive input lead and ground return lead from the input power supply, and keep them as short as possible to minimize input inductance. Add additional bulk capacitance between the input supply and ground (use the C1, C2 footprints) if the supply leads are greater than six inches. For example, an additional 47- μ F electrolytic capacitor connected from the input supply (J1) to ground can improve the transient response of the TPS785-Q1, and eliminates unwanted ringing on the input because of long wire connections.

2.1.2 J2 – VOUT (Banana Jack)

Regulated output voltage connector.

2.1.3 J3 – VIN_S

Input sense test point.

2.1.4 J4 – VOUT_S

Output sense test point.

2.1.5 J5 – VEN

Output enable. To enable the output, connect a jumper to short VIN to EN.

2.1.6 J6 – GND (Banana Jack)

Input ground return connector.

2.1.7 J7 – GND (Banana Jack)

Output ground return connector.

2.1.8 J8 – OUTPUT VOLTAGE SET

For convenience, the EVM is prepopulated with four resistor divider options. Place a shunt on J8 next to the silkscreen label of your desired output voltage.

2.1.9 J9 – VIN (TERMINAL BLOCK)

Input power-supply voltage connector. Twist together the positive input lead and ground return lead from the input power supply, and keep them as short as possible to minimize input inductance. Add additional bulk capacitance between the input supply and ground (use the C1, C2 footprints) if the supply leads are greater than six inches. For example, an additional 47- μ F electrolytic capacitor connected from the input supply (J1) to ground can improve the transient response of the TPS785-Q1, and eliminates unwanted ringing on the input because of long wire connections.

2.1.10 J10 – VOUT (TERMINAL BLOCK)

Regulated output voltage connector.

2.1.11 J11 – DEBUG TERMINAL

Debug connector, for internal use only.

2.1.12 TP1 – VIN_S

Input sense test point.

2.1.13 TP2 – VOUT_S

Output sense test point.

2.1.14 TP3 – VEN

Enable test point.

2.1.15 TP4 – TP6 – GND

Ground test points.

3 Soldering Guidelines

To avoid damaging the integrated circuit (IC), use a hot-air system for any solder rework to modify the EVM for the purpose of repair or other application reasons.

4 Equipment Connection

Use the following steps when connecting the equipment:

1. Set the input power supplies to 6 V (max), and turn the power supplies off.
2. Connect the positive voltage lead from the input power supply to VIN at the J1 connector of the EVM.
3. Connect the ground lead from the input power supply to GND at the J6 connector of the EVM.
4. Connect a 0-A to 1-A load between VOUT J2 connector and GND J7 connector.
5. Disable the output by shorting VEN to GND through J5.

5 Operation

Use the following steps to operate the equipment:

1. Turn on the power supply.
2. Enable the output by jumping J5 (the EN pin) to VIN.
3. Vary the respective load and input voltage, as necessary, for test purposes.

6 PCB Layout

Figure 6-1 to Figure 6-5 illustrate the PCB layout for this EVM.

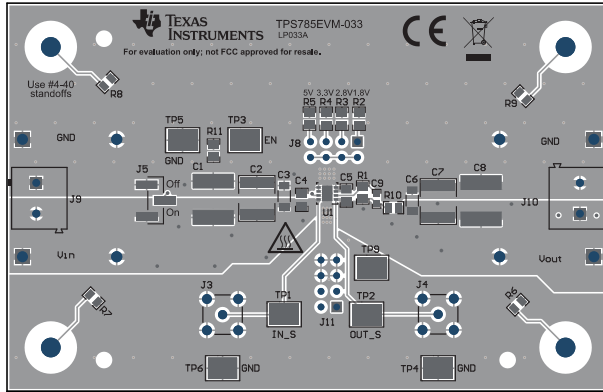


Figure 6-1. Top Composite View

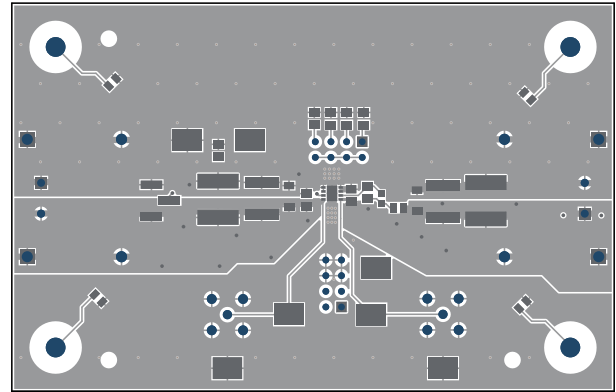


Figure 6-2. Top Layer Routing

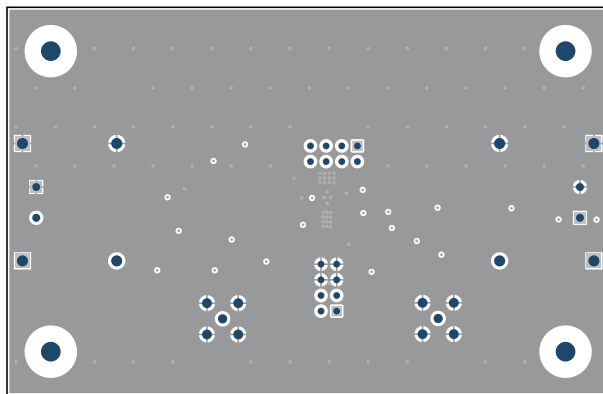


Figure 6-3. Signal Layer 1 Routing

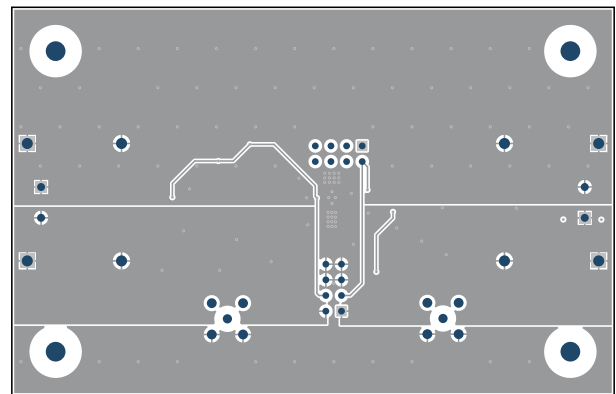


Figure 6-4. Signal Layer 2 Routing

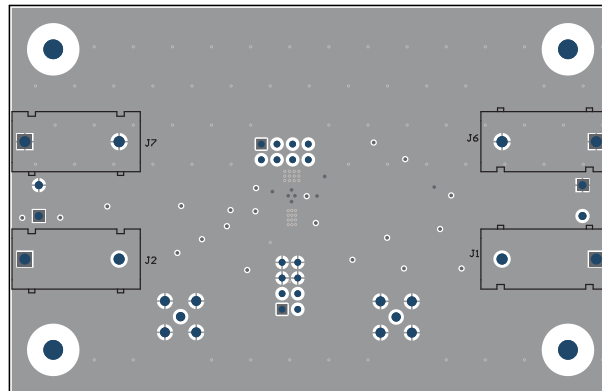


Figure 6-5. Bottom Layer Routing

7 Schematic

Figure 7-1 is the schematic for this EVM.

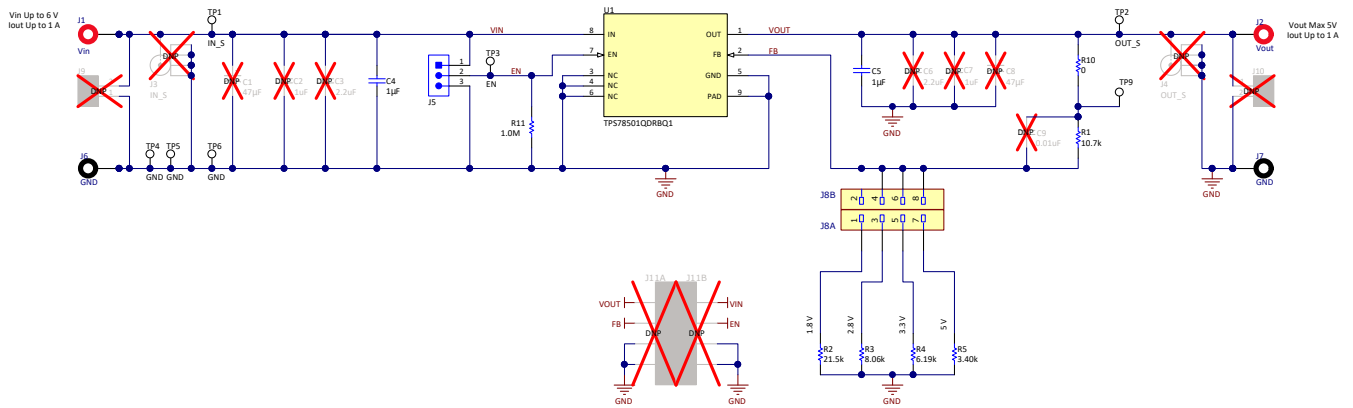


Figure 7-1. TPS785EVM-033 Schematic

8 Bill of Materials

The BOM for this EVM is shown in [TPS785EVM-033 \(1\) \(2\) \(3\) \(4\)](#)

Table 8-1. TPS785EVM-033 (1) (2) (3) (4)

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
!PCB	1		Printed Circuit Board		LP033	Any		
C4, C5	2	1uF	CAP, CERM, 1 μ F, 35 V,+/- 10%, X7R, 0805	0805	GRM219R7YA105KA12D	MuRata		
J1, J2	2		Standard Banana Jack, insulated, 10A, red	571-0500	571-0500	DEM Manufacturing		
J5	1		Header, 100mil, 3x1, Gold, SMT	Samtec_TSM-103-01-X-SV	TSM-103-01-L-SV	Samtec		
J6, J7	2		Standard Banana Jack, insulated, 10A, black	571-0100	571-0100	DEM Manufacturing		
J8	1		CONN HEADER VERT 8POS 2.54MM	HDR8	61300821121	Würth Electronics		
R1	1	10.7k	RES, 10.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF1072V	Panasonic		
R2	1	21.5k	RES, 21.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF2152V	Panasonic		
R3	1	8.06k	RES, 8.06 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF8061V	Panasonic		
R4	1	6.19k	RES, 6.19 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08056K19FKEA	Vishay-Dale		
R5	1	3.40k	RES, 3.40 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08053K40FKEA	Vishay-Dale		
R10	1	0	RES, 0, 1%, 0.5 W, 0805	0805	5106	Keystone		
R11	1	1.0Meg	RES, 1.0 M, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6GEYJ105V	Panasonic		
SH-J1, SH-J2	2	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6, TP9	7		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone		
U1	1		1-A, Low-IQ Low-Dropout Regulator, DRB0008F (VSON-8)	DRB0008F	TPS78501QDRBQ1	Texas Instruments		Texas Instruments

Table 8-1. TPS785EVM-033 (1) (2) (3) (4) (continued)

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
C1, C8	0	47uF	CAP, TA, 47 μ F, 50 V, +/- 10%, 0.24 ohm, SMD	6.2x6mm	597D476X9050Z2T	Vishay-Sprague		
C2, C7	0	1uF	CAP, CERM, 1 uF, 250 V, +/- 10%, X7R, 2220	2220	GRM55DR72E105K W01L	MuRata		
C3, C6	0	2.2uF	CAP, CERM, 2.2 uF, 50 V, +/- 10%, X7R, 1206	1206	C3216X7R1H225K16 0AB	TDK		
C9	0	0.01uF	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H103K08 0AA	TDK		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
H5, H7, H9, H11	0		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply		
H6, H8, H10, H12	0		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone		
J3, J4	0		SMA Straight PCB Socket Die Cast, 50 Ohm, TH	SMA Straight PCB Socket Die Cast, TH	5-1814832-1	TE Connectivity		
J9, J10	0		Terminal Block, 5 mm, 2x1, Tin, TH	Terminal Block, 5 mm, 2x1, TH	691 101 710 002	Wurth Elektronik		
J11	0		CONN HEADER VERT 8POS 2.54MM	HDR8	61300821121	Wurth Electronics		
R6, R7, R8, R9	0	0	RES, 0, 1%, 0.5 W, 0805	0805	5106	Keystone		

- (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) Unless otherwise noted in the Alternate Part Number or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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