

TPS7A45xxEVM-385

This user's guide describes the characteristics, operation, and use of the TPS7A45xxEVM-385 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS7A45xx low-noise fast-transient-response 1.5-A low-dropout (LDO) voltage regulator. This user's guide includes setup instructions, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the EVM.

Topic	Page
1 Introduction	2
2 Setup	2
3 Operation.....	3
4 Test Results.....	3
5 Board Layout	6
6 Schematic and Bill of Materials (BOM).....	10

1 Introduction

The TPS7A45xxEVM-385 helps designers evaluate the operation and performance of the TPS7A45xx dc/dc converter. This converter is a 1.5-A low-noise fast-transient-response regulator.

1.1 Related Documentation From Texas Instruments

TPS7A45xx 1.5-A Low-Noise Fast-Transient-Response Low-Dropout Regulator in 5DDPAK/TO-263 package data sheet ([SLVS720](#))

2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up, and use the TPS7A45xxEVM-385.

2.1 Input/Output Connector Descriptions

2.1.1 J1 – INPUT (4-Wire Power/Sense Option)

This is the positive input supply voltage. Twist the leads to the input supply and keep them as short as possible to minimize EMI transmission.

2.1.2 J3 – IN_GND (4-Wire Power/Sense Option)

This is the return connection for the input power supply of the converter.

2.1.3 J2 – OUTPUT (4-Wire Power/Sense Option)

This is the positive connection from the output. Connect this pin to the positive input of the load.

2.1.4 J4 – OUT_GND (4-Wire Power/Sense Option)

This is the return connection for the output.

2.1.5 JP1 –ENABLE

This jumper enables or disables the regulator. Connecting the shorting jumper between pins 1 and 2 (VIN and EN) enables the converter. Connecting the shorting jumper between pins 2 and 3 (EN and GND) disables the converter. Do not leave this pin floating.

2.1.6 JP2 – MODE

This jumper sets the mode of the TPS7A45xx. Connecting the shorting jumper between pins 1 and 2 forces the TPS7A45xx into fixed-output mode. Use this setting with fixed-output devices only. Remove J8 shorting jumper for adjustable-output devices.

For adjustable-output devices, the output voltage may be selected using these equations:

$$V_{OUT} = 1.21 (1 + R2 / R1) + I_{ADJ} \times R2$$

$$I_{ADJ} = 1.21 / R1$$

$$R1 < 4.17 \text{ k}\Omega$$

3 Operation

Connect the positive input power supply to J1. Connect the input power return (ground) to J3. The TPS7A45xx device has an absolute maximum input voltage of 20 V. The recommended maximum operating voltage is 20 V.

Connect the desired load between J2 and J4. The TPS7A45xx device can supply up to 1.5 A of output current.

Configure jumpers JP1 and JP2 as required. The functions of JP1 and JP2 are described in [Section 2.1.5](#) and [Section 2.1.6](#), respectively.

4 Test Results

The following figures show typical responses of the TPS7A45xx to line and load transients.

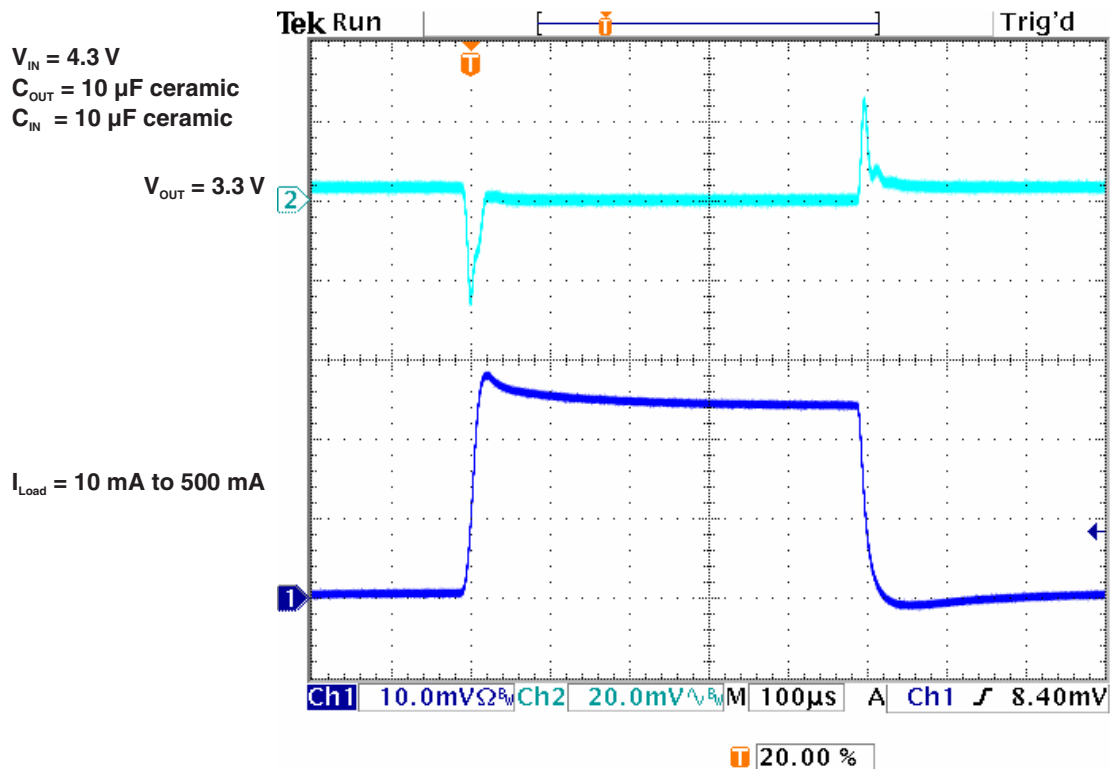


Figure 1. Load Transient Response ($I_{Load} = 10\text{ mA to } 500\text{ mA}$)

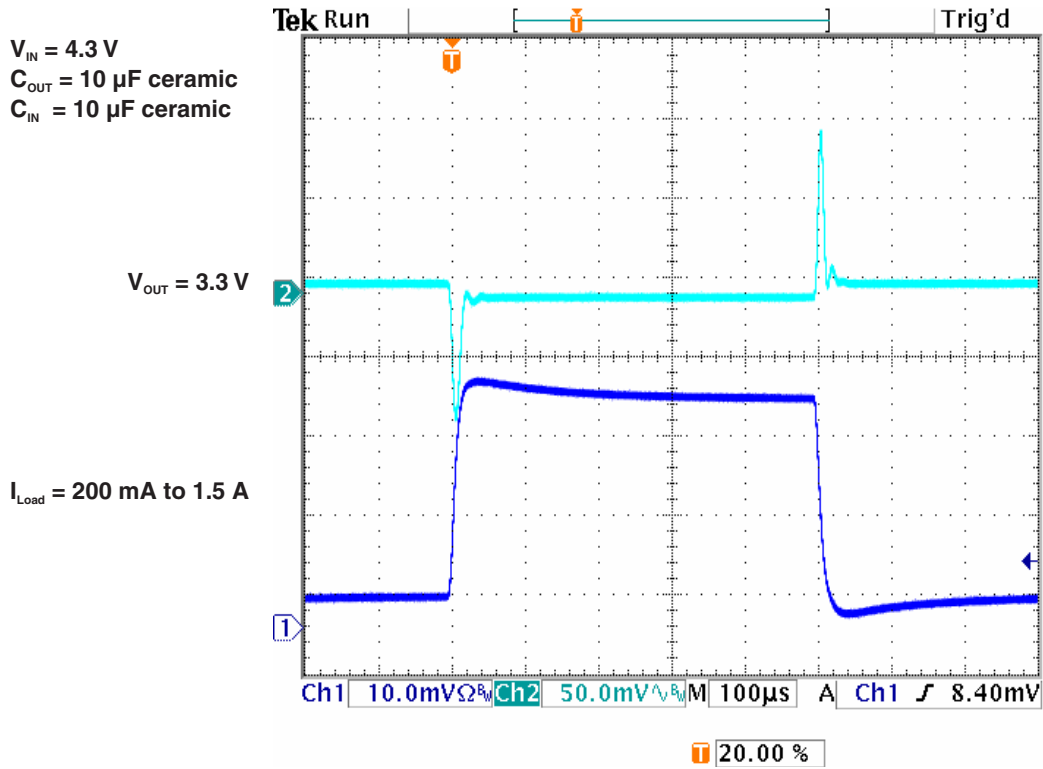


Figure 2. Load Transient Response ($I_{Load} = 200\text{ mA to }1.5\text{ A}$)

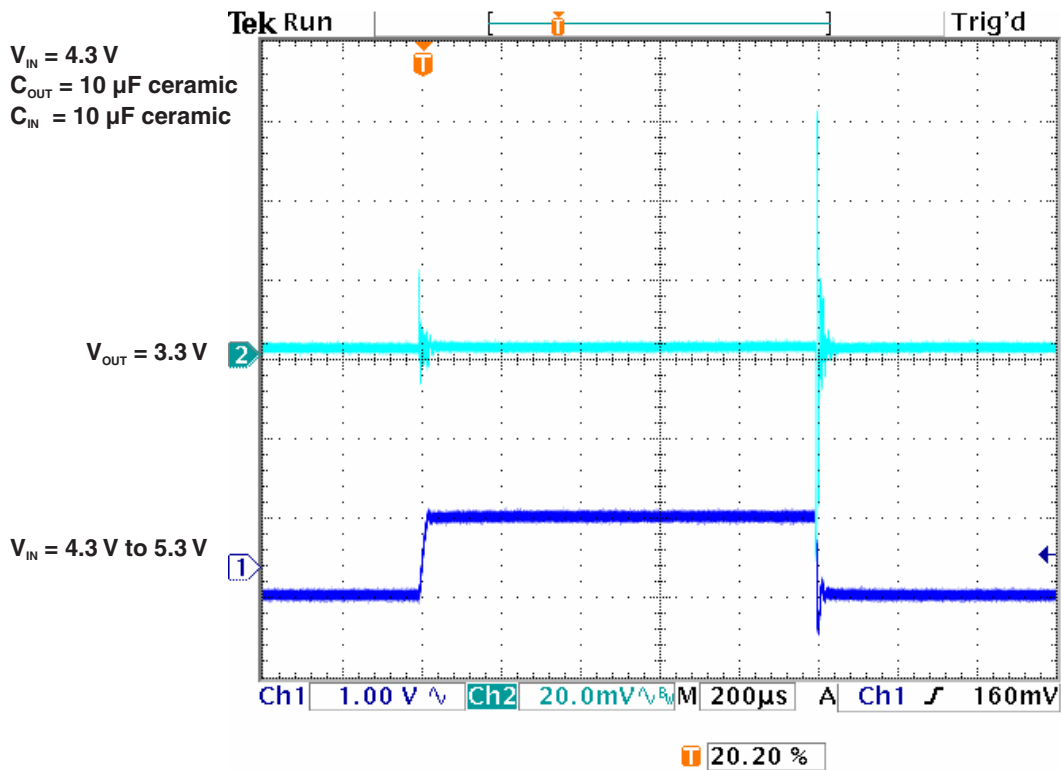


Figure 3. Line Transient Response ($V_{IN} = 4.3\text{ V to }5.3\text{ V}$)

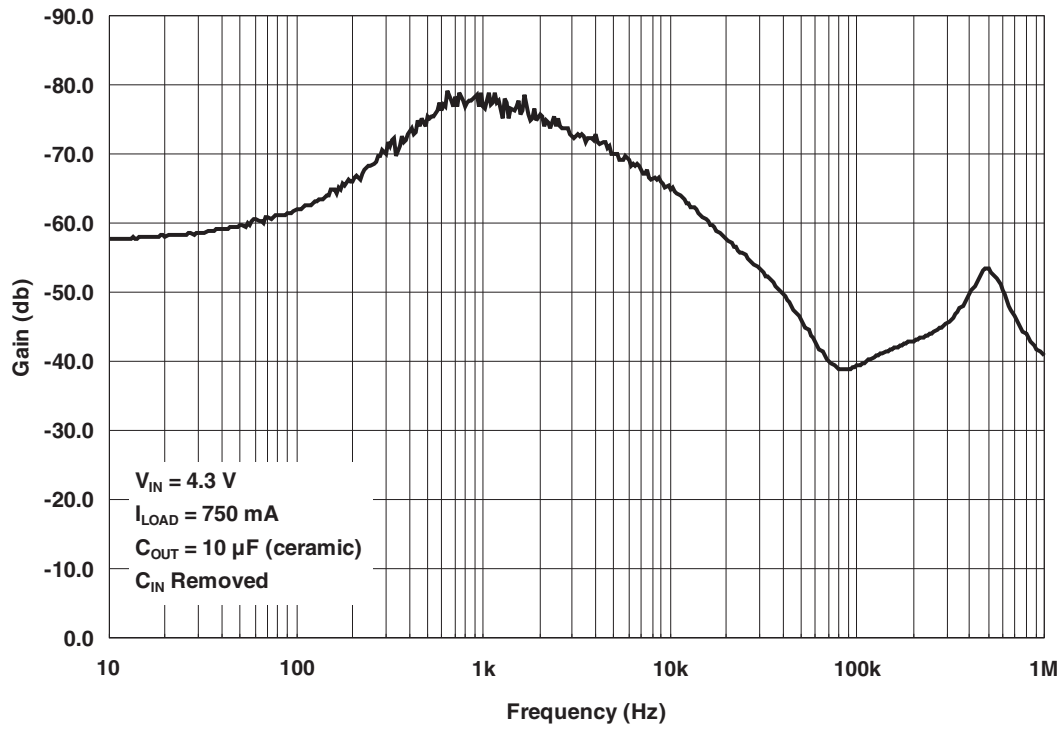


Figure 4. Power-Supply Ripple Rejection

5 Board Layout

The following figures show the board layout of the EVM.

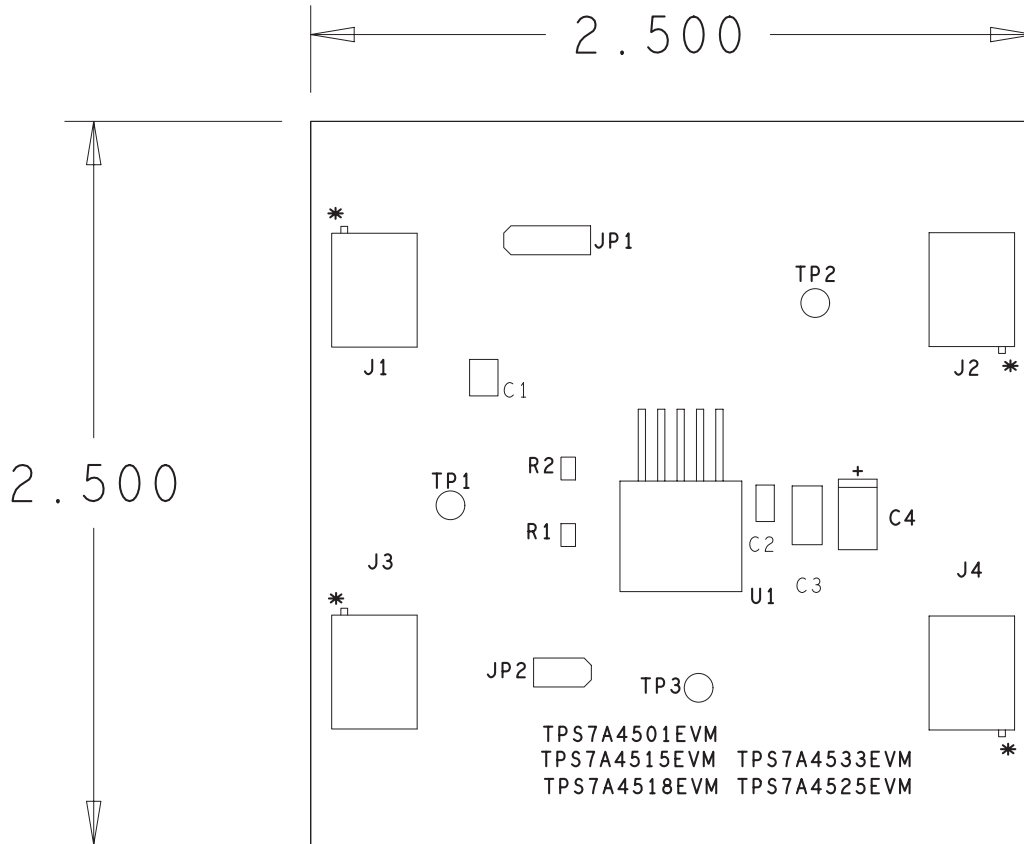


Figure 5. EVM Board Layout (1 of 4)

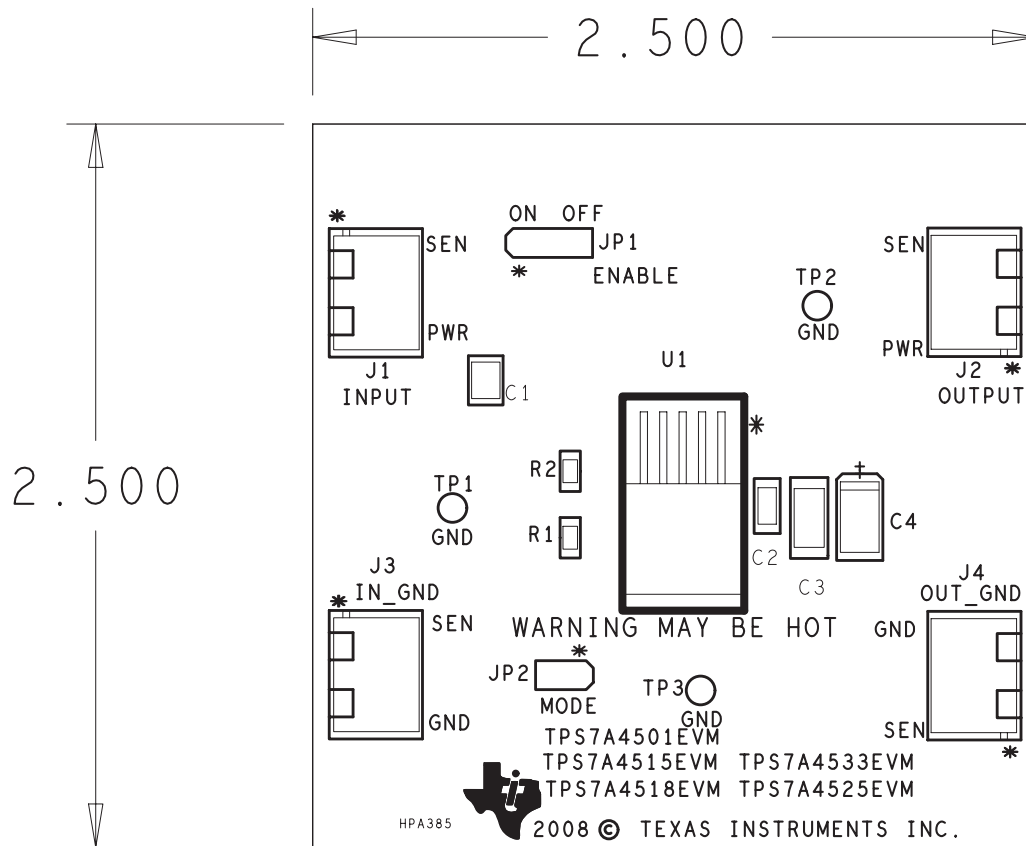


Figure 6. EVM Board Layout (2 of 4)

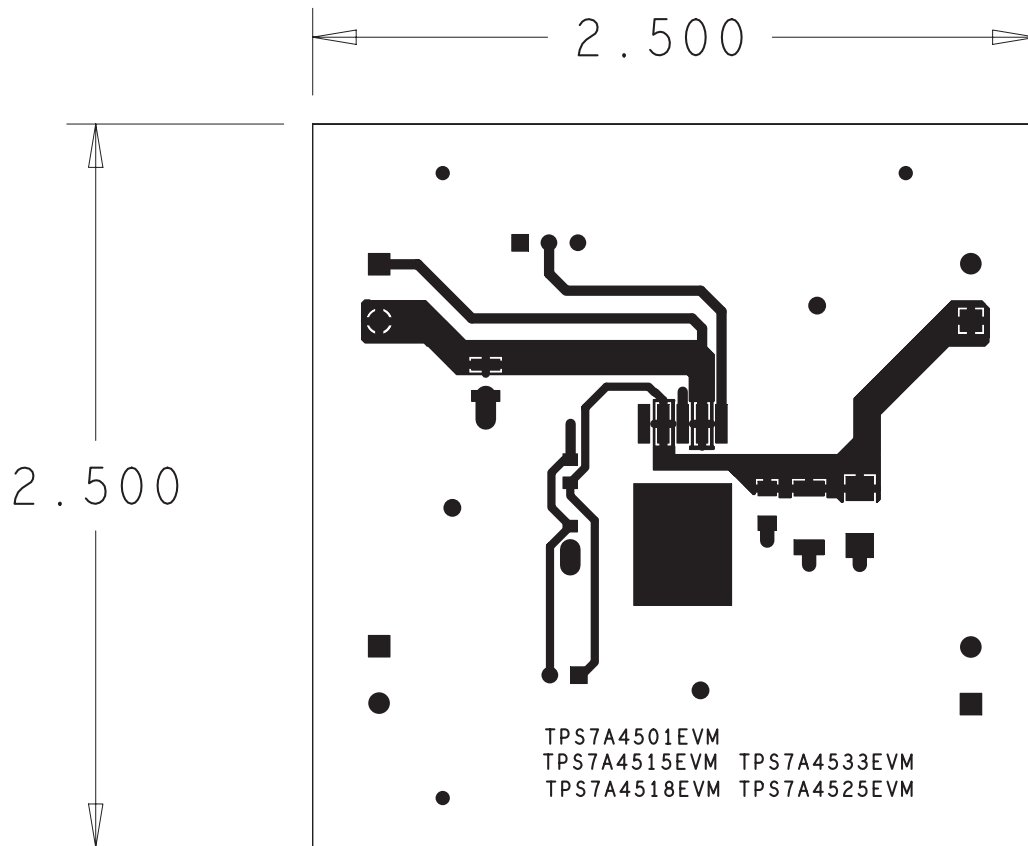


Figure 7. EVM Board Layout (3 of 4)

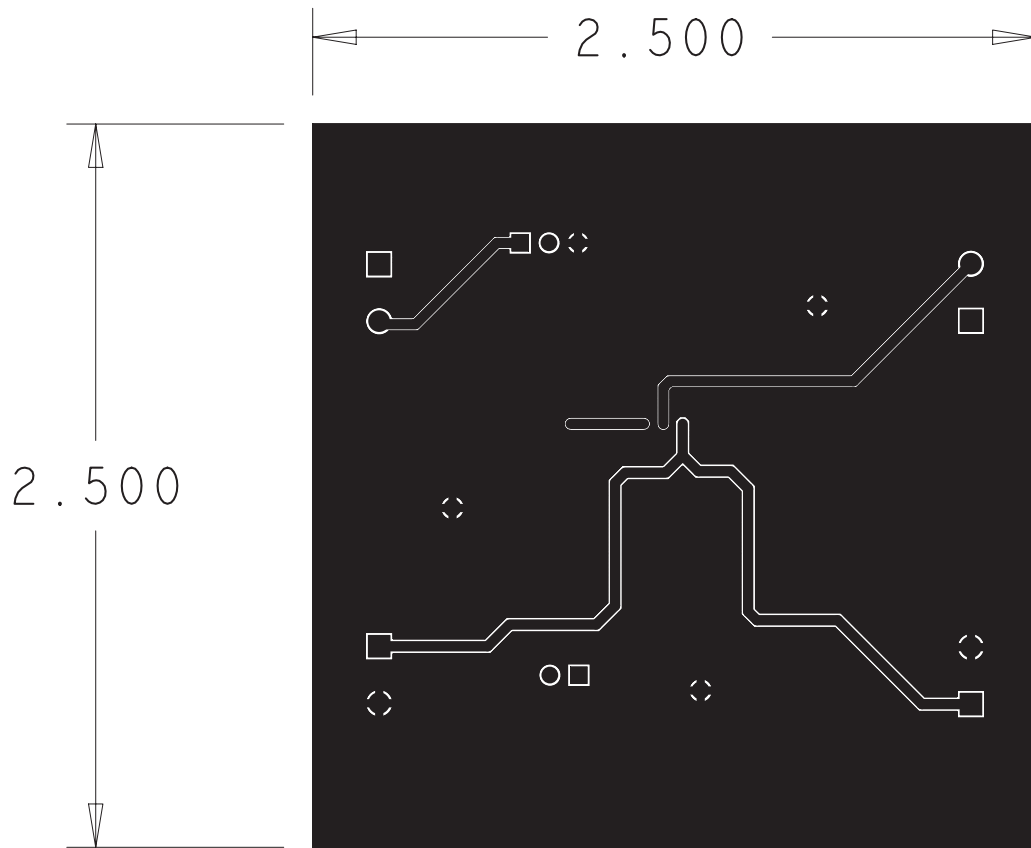


Figure 8. EVM Board Layout (4 of 4)

6 Schematic and Bill of Materials (BOM)

Figure 9 shows the EVM schematic. Table 1 shows the EVM BOM.

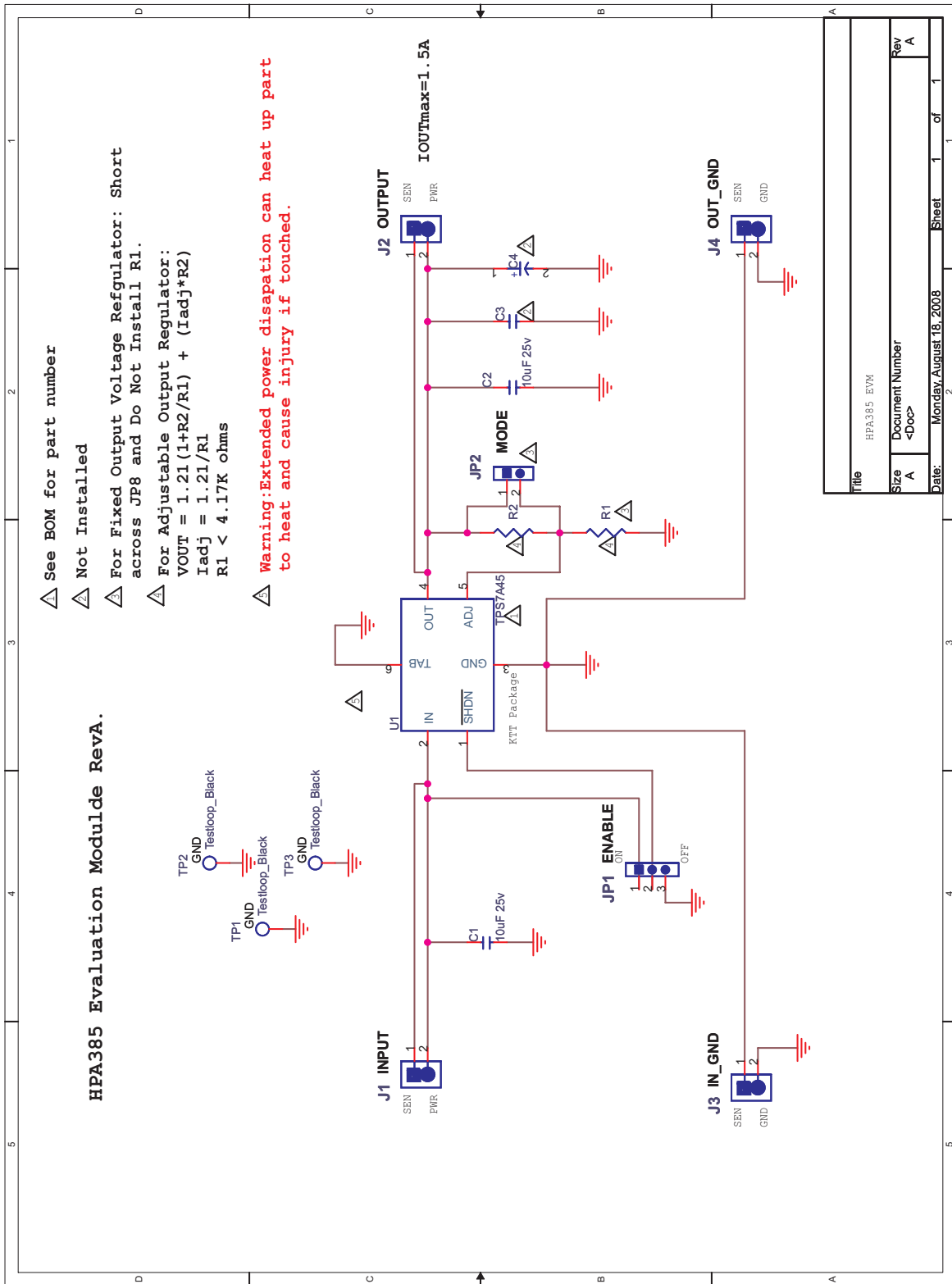


Figure 9. EVM Schematic

Table 1. HPA285 EVM Bill of Materials ⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

Count					Reference Designator	Value	Description	Size	Part Number	Manufacturer
01	02	03	04	05						
1	1	1	1	1	--	HPA385	PCB, HPA385	2.5 in x 2.5 in x 0.062 in	HPA385	Any
1	1	1	1	1	C1	10 μ F	Capacitor, ceramic, 10 μ F, 25 V, X5R	1210	GCM32ER71E 106KA57L	MuRata
1	1	1	1	1	C2	10 μ F	Capacitor, ceramic, 10 μ F, 25 V, X5R	1206	GRM31CR61E 106KA12L	MuRata
0	0	0	0	0	C3	Selected by user	Capacitor, ceramic	2010	Std	Std
0	0	0	0	0	C4	Selected by user	Capacitor, tantalum	C	Std	Std
4	4	4	4	4	J1, J2, J3, J4	MKDS 1/2-3,5BK	Connector terminal block, 1x2 pos	2POS 5MM	1711026	Phoenix
1	1	1	1	1	JP2	HMTSW-102-07-G-S-.230	Header, 2 pin, 100-mil spacing	0.100 in x 2	HMTSW-102-07-G-S-.230	Samtec
1	1	1	1	1	JP1	HMTSW-103-07-G-S-.230	Header, 3 pin, 100-mil spacing	0.100 in x 3	HMTSW-103-07-G-S-.231	Samtec
0	0	0	0	0	R1	Selected by user	Resistor, chip,value, 1/8 W, 5%	805	Std	Std
0	0	0	0	0	R2	Selected by user	Resistor, chip,value, 1/8 W, 5%	805	Std	Std
4	4	4	4	4	--	--	Hardware 1/4-in screw 4/40 handle mtg	4/40 x 0.250 in	9900	Keystone Electronics
4	4	4	4	4	SO1, SO2, SO3, SO4	--	Standoff, round, 4/40 x 0.250 in, aluminum	4/40 x 0.250 in	2025	Keystone Electronics
3	3	3	3	3	TP1, TP2, TP3	Black	Testpoint	.050 in dia	TP-105-01-00	Bisco
1	0	0	0	0	U1	TPS7A4501	IC, single chip, low noise 1.5 A, low dropout regulator, adjustable output 1.21 V to 20 V	5DDPAK/ TO263	TPS7A4501	TI
0	1	0	0	0	U1	TPS7A4515	IC, single chip, low noise 1.5 A, low dropout regulator, fixed output 1.5 V	5DDPAK/ TO263	TPS7A4515	TI
0	0	1	0	0	U1	TPS7A4518	IC, single chip, low noise 1.5A, low dropout regulator, fixed output 1.8 V	5DDPAK/ TO263	TPS7A4518	TI
0	0	0	1	0	U1	TPS7A4525	IC, single chip, low noise 1.5 A, low dropout regulator, fixed output 2.5 V	5DDPAK/ TO263	TPS7A4525	TI
0	0	0	0	1	U1	TPS7A4533	IC, single chip, low noise 1.5 A, low dropout regulator, fixed output 3.3 V	5DDPAK/ TO263	TPS7A4533	TI
4	4	4	4	4	1	NA	Shunt, 100 mil, black	0.100	929950-00	3M

- (1) These assemblies are ESD sensitive, ESD precautions must be observed.
(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) Reference designators marked with an asterisk (*) cannot be substituted. All other components can be substituted with equivalent manufacturers components.

EVALUATION BOARD/KIT IMPORTANT NOTICE

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

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/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. 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 User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

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.

FCC WARNING

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2 V to 20 V and the output voltage range of 0.6 V to 6 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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated

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 TI 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. Information of third parties may be subject to additional restrictions.

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.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated