

Using the TPS2560EVM-424 and TPS2561EVM-424

User's Guide



Literature Number: SLUU394

November 2009

Using the TPS2560EVM-424 and TPS2561EVM-424

This user's guide describes the TPS2560EVM-424 and TPS2561EVM-424 evaluation modules (EVM). This guide contains the EVM schematic, list of materials, assembly drawing, and top and bottom board layouts.

1 Introduction

The TPS2560EVM-424 and TPS2561EVM-424 are evaluation modules (EVM) for Texas Instruments' power-distribution switches with adjustable current-limit. These EVMs operate over a 2.5-V to 6.5-V range. An on-board jumper sets the output current-limit to either 0.5 A or 1 A. The board is designed for the 5-A capability of the TPS2560 or TPS2561. Test points provide convenient access to all critical node voltages.

2 Description

The PCB top-side accepts a power-distribution switch in a SON-10 (DRC) package with a thermal pad. These switches have dual enable, outputs and over-current status outputs. They have a single over-temperature shutdown and operate in current limit mode only. Outputs may be connected in parallel for twice the current output.

TPS2560 is enabled active LO while TPS2561 is enabled active HI.

2.1 Switches

Table 1. Switches

ENABLE	S2 POSITION – OUT1	S1 POSITION –OUT2
TPS2560	LO	LO
TPS2561	HI	HI

2.2 Jumpers

Table 2. Jumpers

CURRENT	J2
0.1 A	ON
1.0 A	OFF

2.3 Test Points

Table 3. Test Points

TEST POINT	PIN
TP1	VIN
TP2	EN2
TP3	FLT2
TP4	ILIM
TP5	VOUT2
TP6	GND
TP	GND
TP8	GND
TP9	GND
TP10	EN1
TP11	FLT1
TP12	VOUT1

4 Getting Started

Preset the power supply to 5 V and turn off. Connect the power supply output to the input terminals of the HPA424. Remove jumper J2.

Slide S1 and S2 to disable the TPS2556 or TPS2557. Turn on the power supply to apply 5.0 V to the EVM input-power terminals. VOUT1 should be 0 V.

Slide S2 to enable the device. For TPS2556, set S1 to LO; for TPS2557, set S1 to HI. VOUT1 should be $V_{IN} + / - 0.3 \text{ V}$.

Set the oscilloscope to auto trigger mode and the horizontal-sweep to 4 ms/div. Set all vertical channels for 2 V/div except the current probe set for 500 mA/div.

4.1 Monitor

1. Input voltage at TP1
2. Output voltage at TP12
3. EVM input current
4. FAULT# status voltage at test point TP11

4.2 Verify EVM Output

1. Set the scope for normal trigger, single sweep. Trigger on VOUT1, negative slope at about a 3.5-V level.
2. Momentarily short the output connector. A sample scope trace is shown in [Figure 2](#). Observe VOUT1 drops to 0 V.
3. Input current rises to an amplitude of 1.25 A $\pm$ 0.25 A, within 0 to 4 ms after VOUT low.
4. FAULT1 signal is low 2 ms to 20 ms after VOUT low.

5 Performance Data and Typical Characteristics Curves

VOUT2 can be verified the same way as VOUT1.

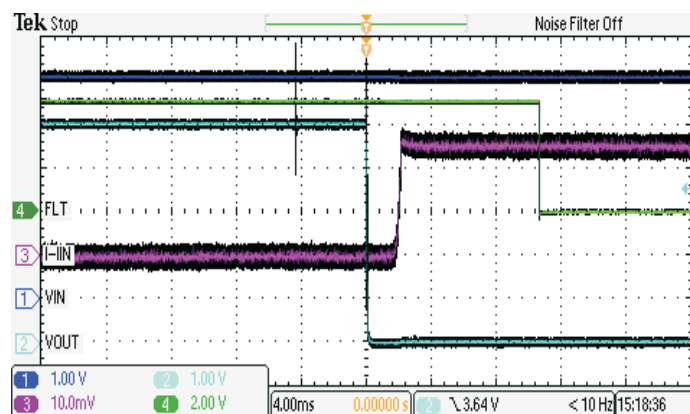


Figure 2. 100-k Ω R_{ILIM} Enabled into a Short Circuit

6 EVM Assembly Drawing and PCB Layout

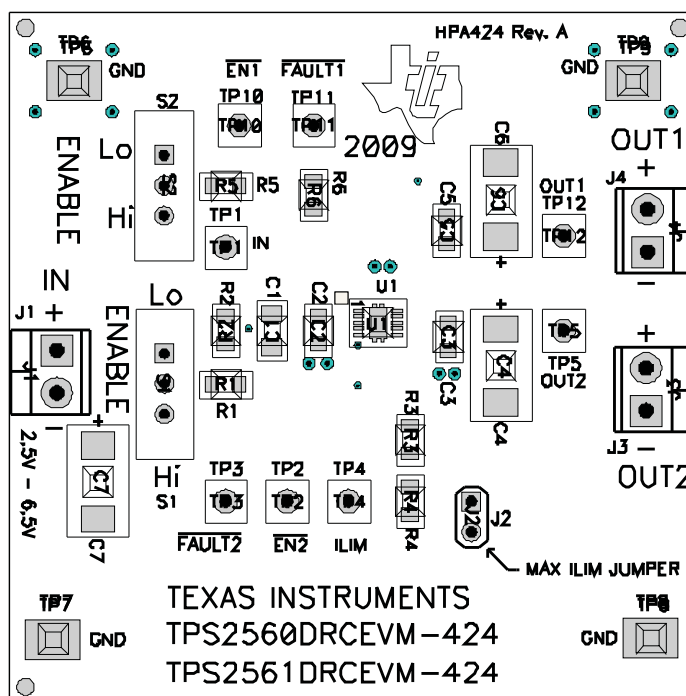


Figure 3. Top Layer Assembly (top view)

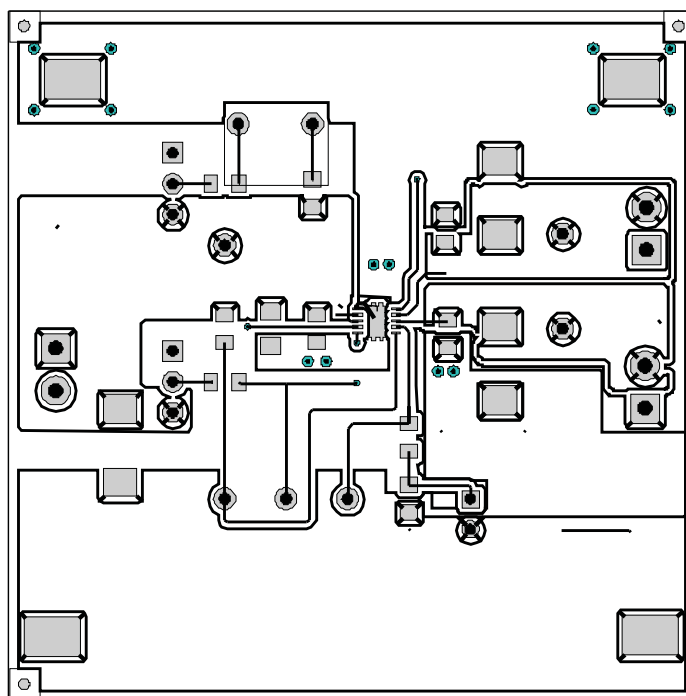


Figure 4. Top Copper (top view)

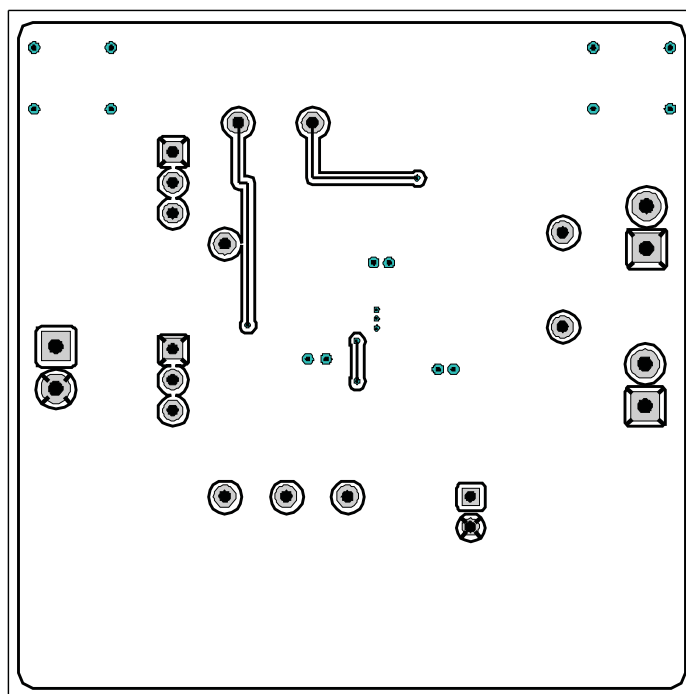


Figure 5. Bottom Copper (top view)

7 List of Materials

Table 4. List of Materials

-002	-001	REF DES	DESCRIPTION	PART NUMBER	MFR
1	1	C1	Capacitor, ceramic, X7R, 10 V, 10%, 10 μ F, 1206	STD	STD
3	3	C2, C3, C5	Capacitor, ceramic, 16 V, X7R, 10%, 0.1 μ F, 0805	STD	STD
2	2	C4, C6,	Capacitor, tantalum, 10 V, 100 m Ω , 10%, 150 μ F, 7343 (D)	B45197A2157K409	KEMET
0	0	C7	Capacitor, tantalum, 10 V, 100 m Ω , 10%, 150 μ F, 7343 (D)	B45197A2157K409	KEMET
3	3	J1, J3, J4	Terminal block, 2 pin, 6 A, 3.5 mm, 0.27 x 0.25 inch	ED555/2DS	OST
1	1	J2	Header, male 2 pin, 100-mil spacing, 0.100 inch x 2	PEC02SAAN	Sullins
4	4	R1, R2, R5, R6	Resistor, chip, 1/10 W, 1%, 10 k Ω , 0805	STD	STD
1	1	R3	Resistor, chip, 1/10 W, 1%, 20 k Ω , 0805	STD	STD
1	1	R4	Resistor, chip, 1/10 W, 1%, 80.6 k Ω , 0805	STD	STD
2	2	S1, S2	Switch, SPDT, slide, PC mount, 500 mA, 0.457 x 0.157 inch	EG1218	E-SWITCH
8	8	TP1, TP2, TP3, TP4, TP5, TP10, TP11, TP12	Test point, white, thru hole color keyed, 0.100 x 0.100 inch	5002	Keystone
4	4	TP6, TP7, TP8, TP9	Test point, SM, 0.150 x 0.090, 0.185 x 0.135 inch	5016	Keystone
0	1	U1	Current-Limited, Power-Distribution Switches	TPS2560DRC	TI
1	0	U1	Current-Limited, Power-Distribution Switches	TPS2561DRC	TI
1	1	--	PCB, 2.25 In x 2.22 In x 0.062 In	HPA424	Any
1	1	--	Shunt, 100-mil, black	929950-00	3M

EVALUATION BOARD/KIT IMPORTANT NOTICE

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

This evaluation board/kits 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/kits 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/kits not meet the specifications indicated in the User's Guide, the board/kits 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/kits 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 2.5 V_{DC} to 6.25 V_{DC} and the output current of 5 A .

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 100 °C. The EVM is designed to operate properly with certain components above 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 © 2009, 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
DLP® Products	www.dlp.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 © 2009, Texas Instruments Incorporated