TPS7A69xx Evaluation Module (EVM)

The Texas Instruments TPS7A69xxEVM(1) evaluation module (EVM) helps designers evaluate the operation and performance of the TPS7A69xx Linear Regulator.

The EVM contains one linear regulator (See Table 1).

Table 1. Device and Package Configurations

EVM (1)	REGULATOR	IC	PACKAGE
TPS7A69xxEVM	U1	TPS7A6933QDRQ1	SOIC-8
TPS7A69xxEVM	U1	TPS7A6950QDRQ1	SOIC-8

(1) Where xx is 33 for 3.3-V output and 50 for 5-V output

1 Setup

This section describes the jumpers and connectors on the EVM, as well as how properly to connect, set up, and use the TPS7A69xx EVM.

1.1 Input and Output Connector Descriptions

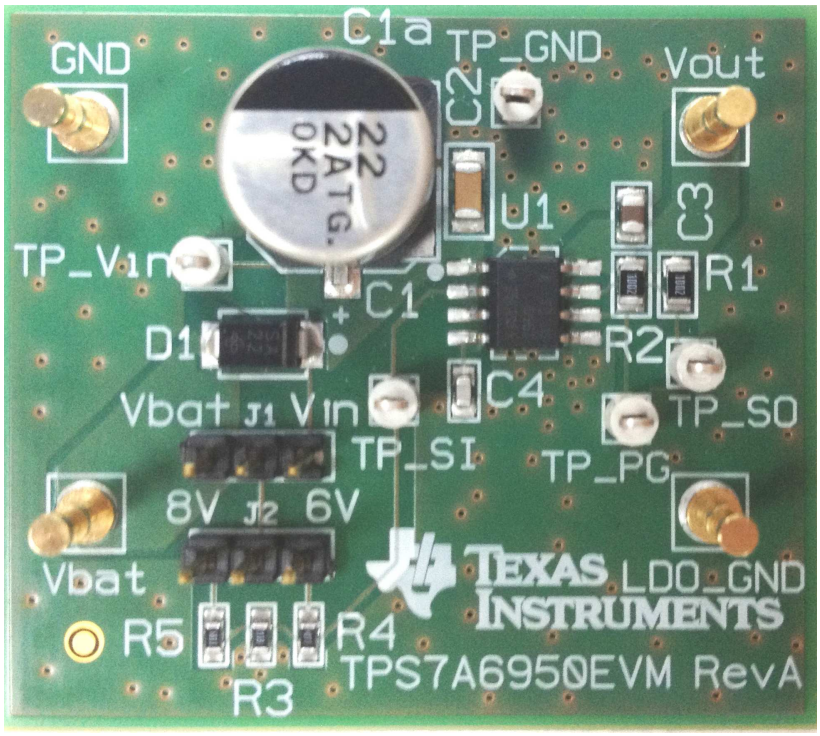

Figure 1. TPS7A69xxEVM Board

VBAT is the protected power input for the regulator. The test point provides a power (V_{BAT}) connection and a reverse-battery protection diode to allow the user to power the EVM.

GND is the ground return for the regulator. The EVM provides three GND test points to allow the user to power the EVM, connect the load, and attach an oscilloscope ground lead.

TP_Vin is a power test point. The test point allows the user to measure the input voltage after the reverse-battery protection diode. The user can also apply power to the regulator through this test point.

J1 is a jumper used for choosing the input-voltage sense point, before or after the reverse-battery protection diode. When 1 and 2 are connected, chip damage occurs under a reverse-battery condition.

J2 is a jumper used for selecting different resistance dividers.

TP_SI is a power test point. The test point allows the user to measure the input voltage of SI pin. The user can also apply power to this test point directly.

NC is a redundant pin; leave this pin open.

TP_SO is a power test point that allows the user to attach an oscilloscope to track input voltage.

TP_PG is a power test point that allows the user to monitor the status of the PG pin.

VOUT is a power output for the regulator. The test point provides a connection to attach a load to the EVM.

1.2 Setup

The input voltage range for the converter is 5.5 V to 40 V. The EVM can support up to 150 mA of load current. Setup steps follow:

1. Short pin 2 and pin 3 of J1.
2. Connect pin 1 and pin 2 of J2.
3. Set the input supply voltage to 12 V and set current limit to 0.8 A.
4. Connect the input power supply positive lead to Vbat and the return lead to GND.
5. Apply the load between Vout and LDO_GND.

1.3 Operation

The TPS7A69xx powers up after the VBAT voltage has exceeded the power-on-reset threshold.

The PCB offers footprints for the TPS7A69xxQDRQ1 device.

2 Board Layout

Figure 2, Figure 3, and Figure 4 show the board layout for the TPS7A69xx EVM PWB.

The large numbers of vias on the board enhance thermal performance. Solder the device pins to the copper landing on the PCB for optimal performance. The PCB provides 2-oz (0.071-mm thick) copper planes on the top and bottom to dissipate heat.

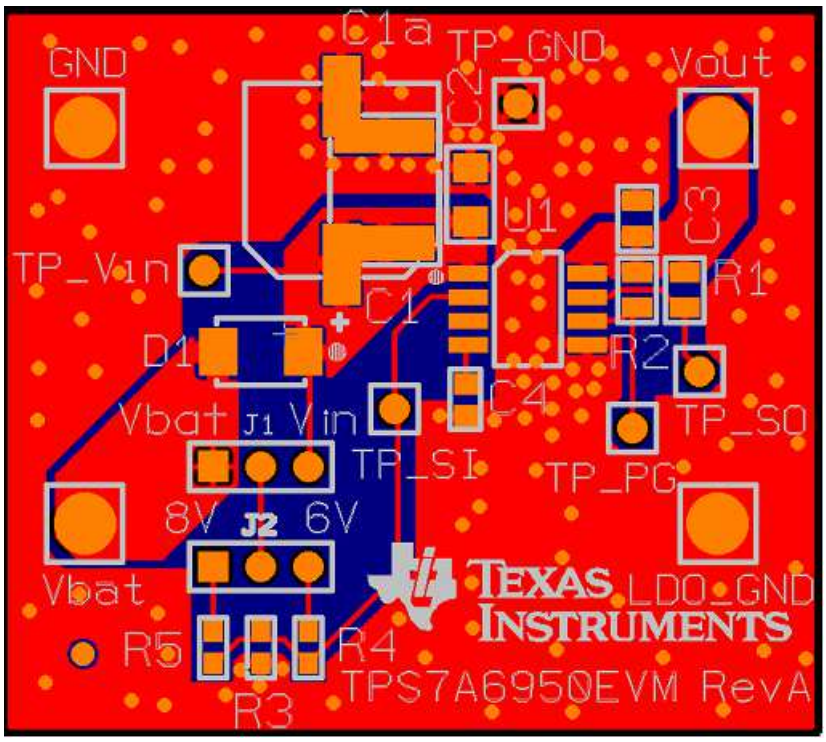

Figure 2. Top Assembly Layer

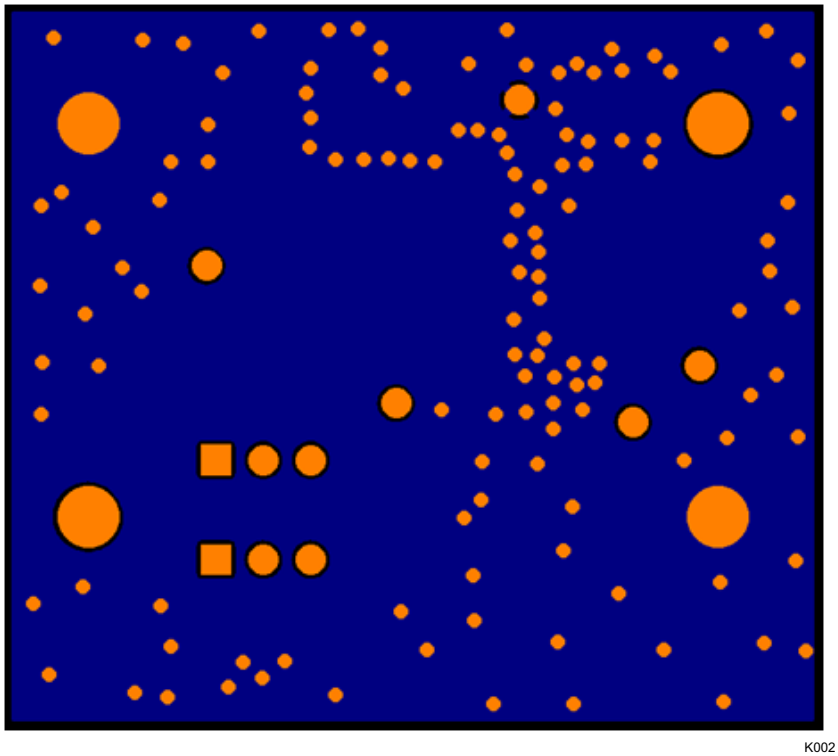

Figure 3. Bottom Layer

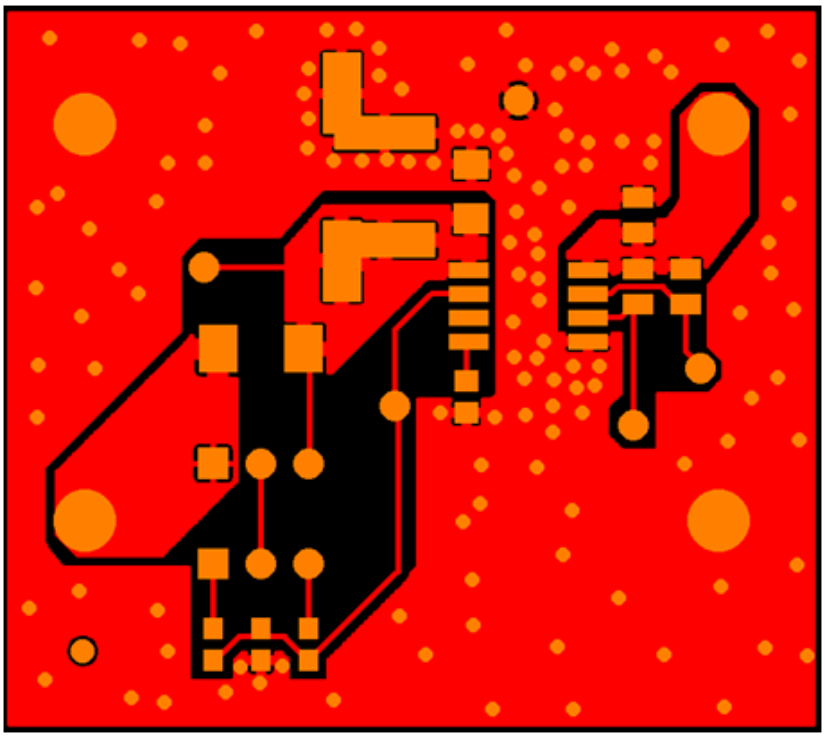

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Figure 4. Top Layer Routing

3 Schematic and Bill of Materials

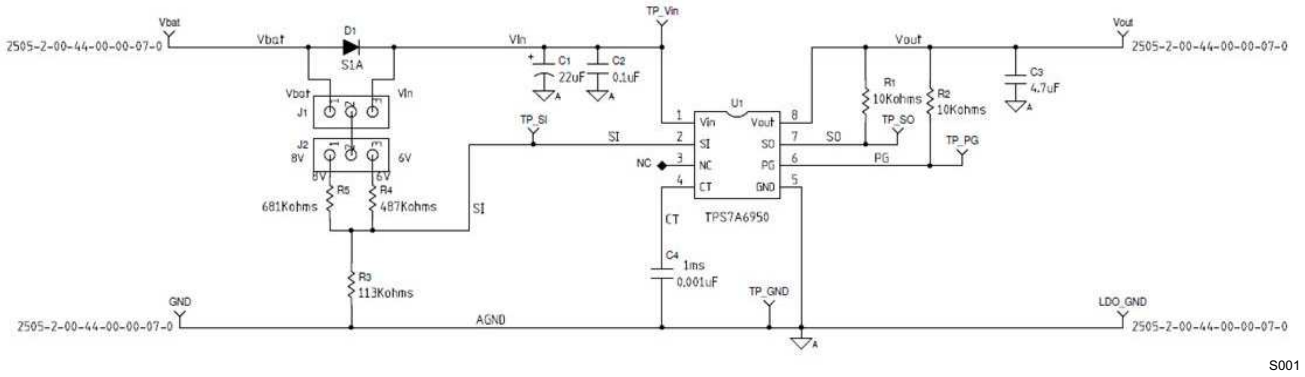

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Figure 5. TPS7A69xx EVM Schematic

Table 2. Bill of Materials

Count	MFR	Part Number	Ref Des	Description
	Fischer	SL LP 1 097 3 G	J1, J2	Header, THU, 1 × 3, 2.54-mm
1	Kemet	C0603C102J5GAC	C4	Capacitor, SMT, 0603, ceramic, COG(NPO), 50-V, 5%, 1000 pF
1	TDK	C2012X7R1A475M	C3	Capacitor, SMT, 0805, ceramic, 4.7-µF, 10-V, 20%, X7R
1	Kemet	C1206C104K5RAC	C2	Capacitor, SMT, 1206, ceramic, 0.1-µF, 50-V, 10%, X7R
1	Panasonic	EEETG2A220P	C1	Capacitor, SMT, 2P, electrolytic, 22-µF, 100-V, 20%, –40ºC to 125ºC
1	Fairchild	S1A	D1	Diode, SMT, SMA-2, rectifier, 50-V, 1-A, 1.4-W
1	TI	TPS7A69xx	U1	Supplied by TI
1	Vishay	CRCW0603113KF	R3	Resistor, SMT, 0603, 1%, 1/10-W, 113-kΩ
1	Vishay	CRCW0603487KF	R4	Resistor, SMT, 0603, 1%, 1/10-W, 487-kΩ
1	Vishay	CRCW0603681KF	R5	Resistor, SMT, 0603, 1%, 1/10-W, 681-kΩ
2	Vishay	CRCW080510K0F	R1, R2	Resistor, SMT, 0805, thick film, 1%, 1/8-W,10.0-kΩ
4	MILL-MAX	2505-2-00-44-00-00-07-0	GND, LDO_GND, Vbat, Vout	Test points, THU, any, gold
5	Keystone	5002	TP_GND, TP_PG, TP_SI, TP_SO, TP_Vin	Test point, THU, miniature, 0.1 LS, 120 TL, white
2	Wuerth	609 002 134 21	J1, J2	2.54-mm jumper with test point

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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module 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 or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment 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.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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