Single-Channel, Power-Distribution Switch Evaluation Module

This user's guide describes the TPS20xxCDBVEVM-636 and TPS20xxCDGNEVM-635 evaluation modules (EVM). This guide contains the EVM schematics, bill of materials, assembly drawings, and top and bottom board layouts.

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1 Introduction

The TPS20xxCDBVEVM-636 and TPS20xxCDGNEVM-635 are evaluation modules (EVM) for the Texas Instruments family of single-channel, current-limited, power distribution switches. These EVMs operate over a 4.5-V to 5.5-V range and provide a continuous output current of up to 2 A (see Table 1). Test points provide convenient access to all critical node voltages.

The TPS20xxCDBVEVM-636 accepts an SOT23-5 packaged, power-distribution switch whereas the TPS20xxCDGNEVM-635 accepts MSOP-8 packaged switch with a thermal pad. These switches have an enable input, fault status output, and overtemperature shutdown. The shaded EVM options shown in Table 1 and Table 2 are not currently available.

Table 1 and Table 2 summarize the configurable EVM options.

2 Schematics and Bill of Materials

2.1 EVM Options

Table 1. TPS20xxCDBVEVM-636 Options

EVM	Device	Continuous Output Current (A)	ENABLE
TPS2051CDBVEVM-636	TPS2051DBV	0.5	Active High
TPS2065CDBVEVM-636	TPS2065DBV	1	Active High
TPS2530EVM-636	TPS2530DBV	0.5	Active High
TPS2531EVM-636	TPS2531DBV	0.25	Active High

Table 2. TPS20xxCDGNEVM-635 Options

EVM	Device	Continuous Output Current (A)	ENABLE
TPS2065CDGNEVM-635	TPS2065CDGN	1	Active High
TPS2069CDGNEVM-635	TPS2069CDGN	1.5	Active High
TPS2000CDGNEVM-635	TPS2000CDGN	2	Active Low
TPS2001CDGNEVM-635(1)	TPS2001CDGN	2	Active High

(1) TPS2001CDGK (2A switch with active-high enable) can be installed and evaluated on TPS20xxCDGNEVMN-635.

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2.2 Schematics

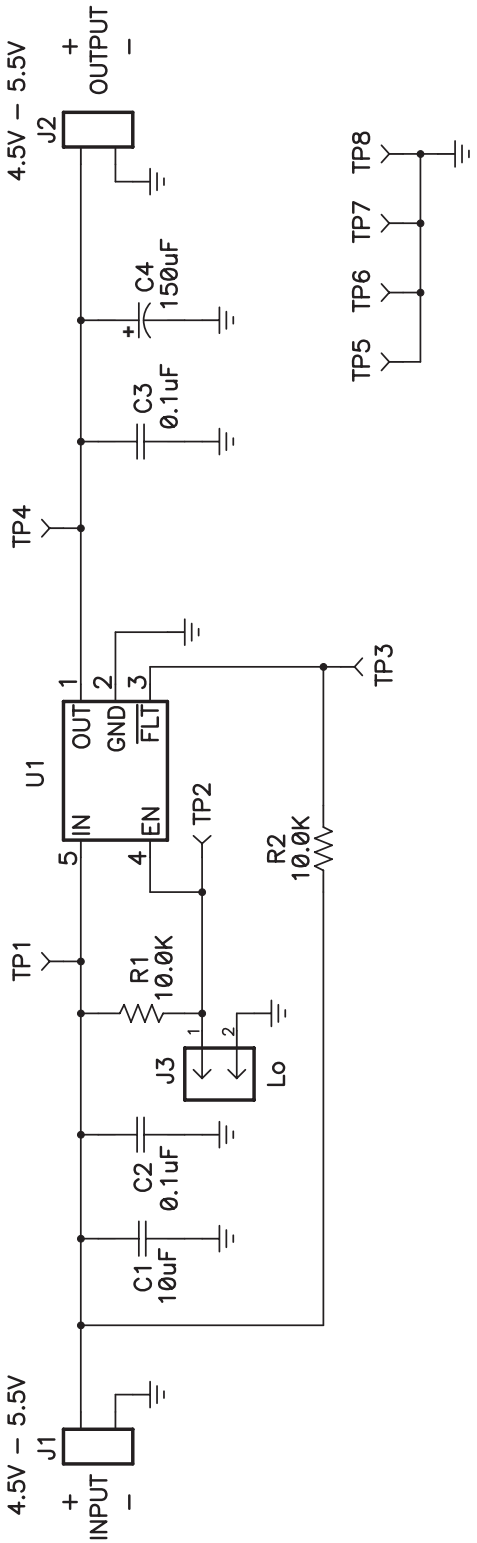


Figure 1. TPS20xxCDBVEVM-636 Schematic

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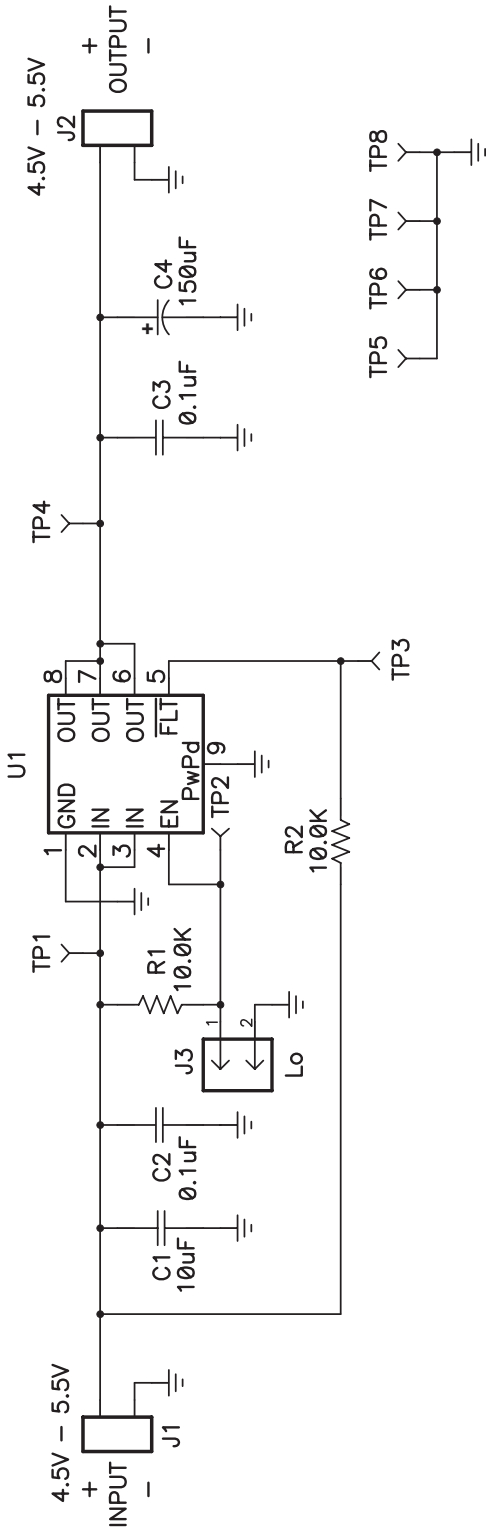


Figure 2. TPS20xxCDGNEVM-635 Schematic

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2.3 Bill of Material

Table 3. TPS20xxCDBVEVM-636 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	10 µF	Capacitor, Ceramic, X7R, 10V, 10%	1206	STD	STD
2	C2, C3	0.1 µF	Capacitor, Ceramic, 16V, X7R, 10%	0805	STD	STD
1	C4	150 µF	Capacitor, Tantalum, 10V, 100milliohm, 10%	7343 (D)	B45197A2157K409	Kemet
2	J1, J2	ED555/2DS	Terminal Block, 2-pin, 6-A, 3.5mm	0.27 x 0.25 inch	ED555/2DS	OST
1	J3	PEC02SAAN	Header, Male 2-pin, 100mil spacing,	0.100 inch x 2	PEC02SAAN	Sullins
2	R1, R2	10.0K	Resistor, Chip, 1/10W, 1%	0805	STD	STD
4	TP1, TP2, TP3, TP4	5002	Test Point, White, Thru Hole Color Keyed	0.100 x 0.100 inch	5002	Keystone
4	TP5, TP6, TP7, TP8	5016	Test Point, SM, 0.150 x 0.090	0.185 x 0.135 inch	5016	Keystone
1	U1	See Table 1	IC, Current-Limited, Power-Distribution Switch	SOT-23-5	See Table 1	TI
1	–	HPA636	PCB, 2.25 In x 2.225 In x 0.062 In	2.25 inch x 2.225 inch	HPA636	Any
1	–	929955-06	Shorting Jumper, 10u-inch gold		929955-06	3M
4		2566	Bumper, rubber		2566	SPC Tech
1	–		Label (See note 7)	1.25 x 0.25 inch	THT-13-457-10	Brady

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Table 4. TPS20xxCDGNEVM-635 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	10 µF	Capacitor, Ceramic, X7R, 10V, 10%	1206	STD	STD
2	C2, C3	0.1 µF	Capacitor, Ceramic, 16V, X7R, 10%	0805	STD	STD
1	C4	150 µF	Capacitor, Tantalum, 10V, 100milliohm, 10%	7343 (D)	B45197A2157K409	Kemet
2	J1, J2	ED555/2DS	Terminal Block, 2-pin, 6-A, 3.5mm	0.27 x 0.25 inch	ED555/2DS	OST
1	J3	PEC02SAAN	Header, Male 2-pin, 100mil spacing,	0.100 inch x 2	PEC02SAAN	Sullins
2	R1, R2	10.0K	Resistor, Chip, 1/10W, 1%	0805	STD	STD
4	TP1, TP2, TP3, TP4	5002	Test Point, White, Thru Hole Color Keyed	0.100 x 0.100 inch	5002	Keystone
4	TP5, TP6, TP7, TP8	5016	Test Point, SM, 0.150 x 0.090	0.185 x 0.135 inch	5016	Keystone
1	U1	See Table 2	IC, Current-Limited, Power-Distribution Switch	DGN-8	See Table 2	TI
1	--	929955-06	Shorting Jumper, 10u-inch gold		929955-06	3M
4	--	2566	Bumper, rubber		2566	SPC Tech
1	--	HPA635	PCB, 2.25 In x 2.225 In x 0.062 In	2.25 inch x 2.225 inch	HPA635	Any
1	--		Label (See note 7)	1.25 x 0.25 inch	THT-13-457-10	Brady

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3 Board Layout

This section contains three views of the TPS20xxCDBVEVM-636 and the TPS20xxCDGNEVM-635 evaluation boards as well as some layout considerations.

3.1 TPS20xxCDBVEVM-636 Board

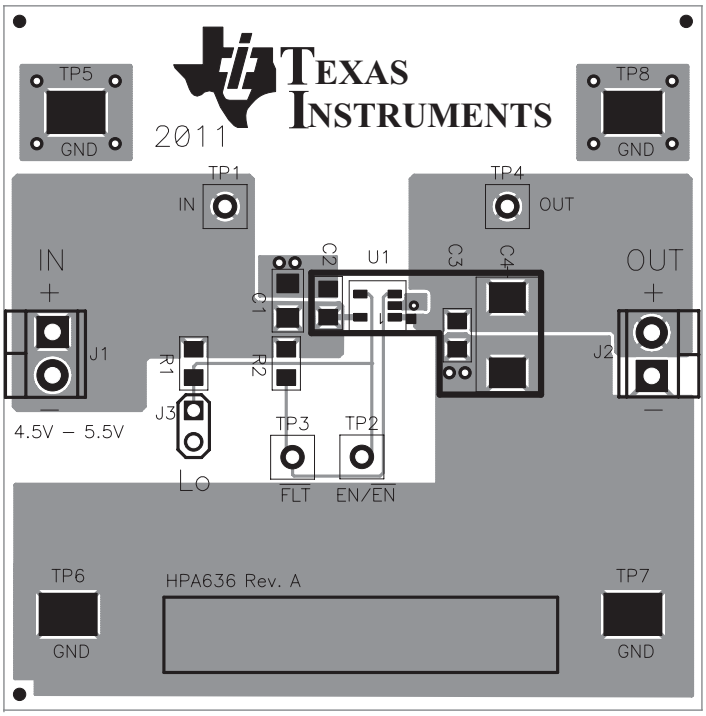


Figure 3. TPS20xxCDBVEVM-636 Component Placement

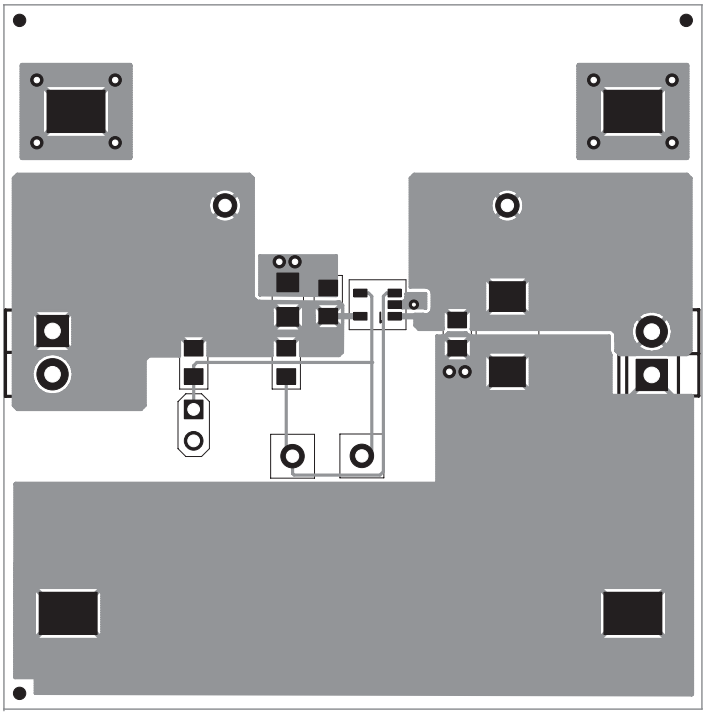


Figure 4. TPS20xxCDBVEVM-636 Top-Side Layout

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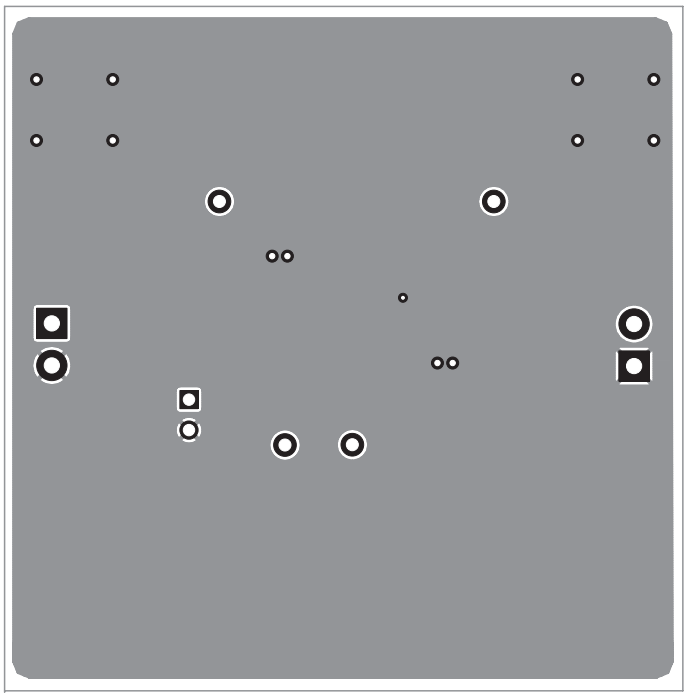


Figure 5. TPS20xxCDBVEVM-636 Bottom-Side Layout

3.2 TPS20xxCDGNEVM-635 Board

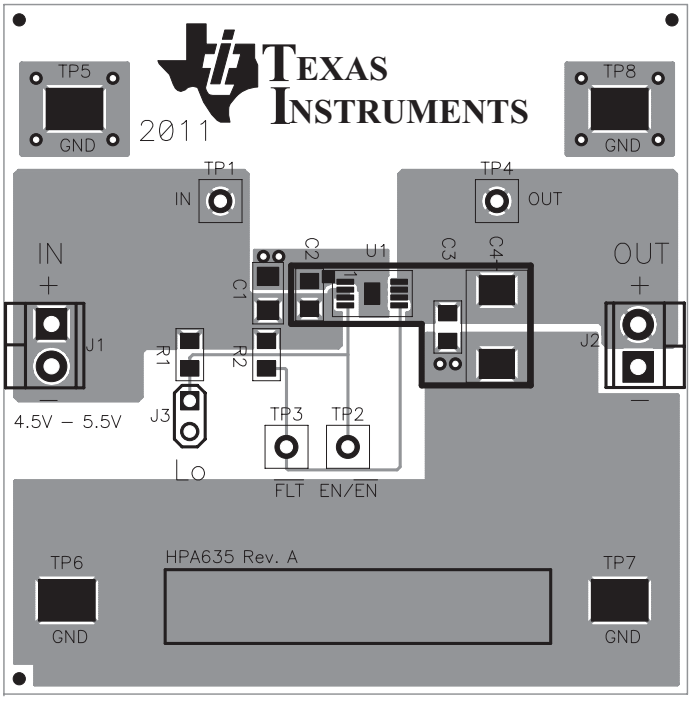


Figure 6. TPS20xxCDGNEVM-635 Component Placement

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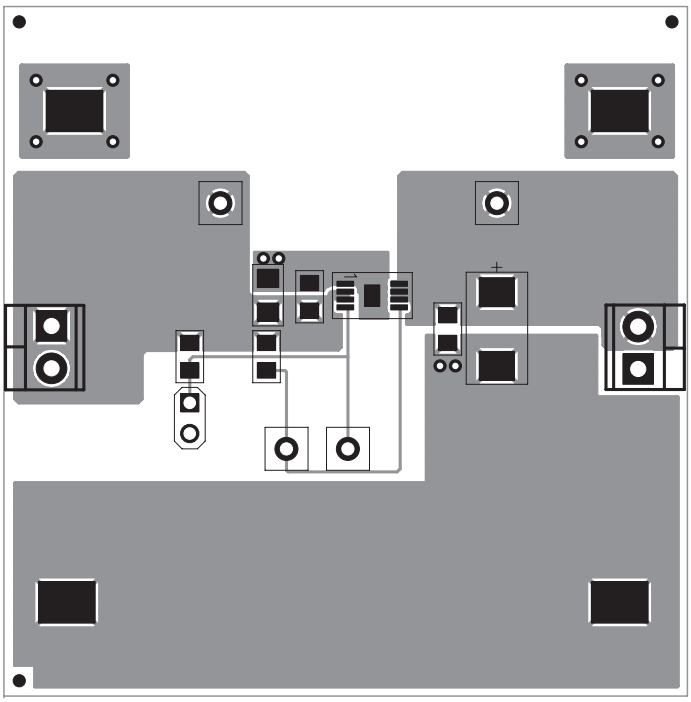


Figure 7. TPS20xxCDGNEVM-635 Top-Side Layout

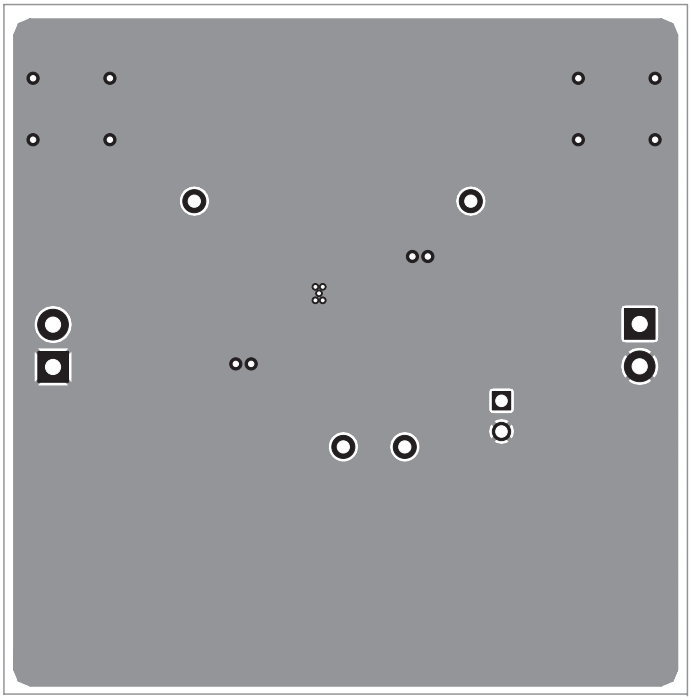


Figure 8. TPS20xxCDGNEVM-635 Bottom-Side Layout

3.3 Layout Considerations

The IN and OUT pins of U1 can carry significant current; so, traces to these pins must be of suitable length and width to minimize the voltage drop to the load. Locate the 0.1-µF bypass capacitors close to the IN and OUT pins of U1.

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4 EVM Setup

4.1 Recommended Test Equipment

The following test equipment is recommended:

- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- 5 V at 5-A power supply
- Volt-ohm meter
- A passive or active load

4.2 Measuring Current Limit

The user is advised to read the applicable data sheet before using the EVM.

Figure 9 shows the EVM test setup for measuring current limit. The power distribution switch is enabled into a short circuit for this measurement. Figure 10 shows the current waveform for TPS2069CDGNEVM-635.

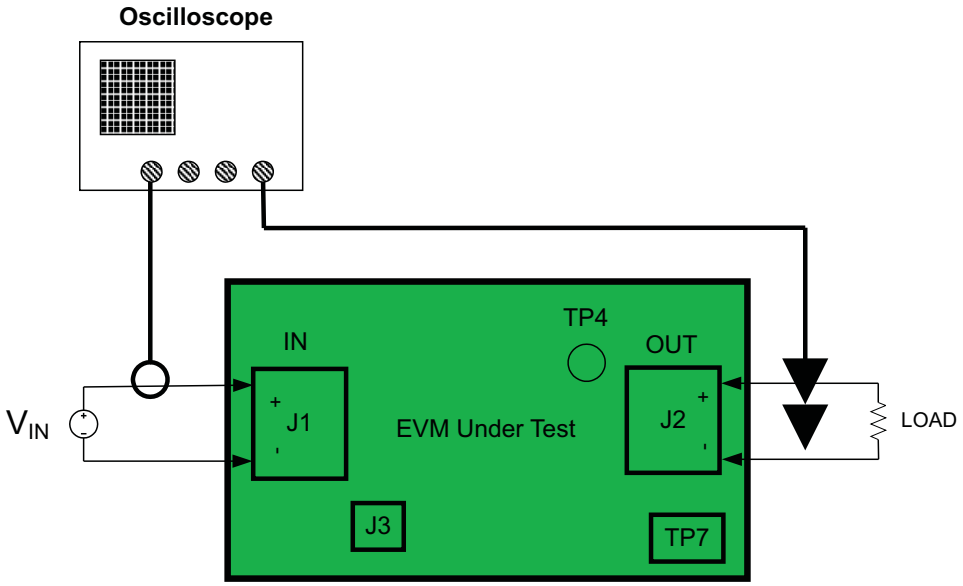


Figure 9. EVM Setup For Measuring Current Limit

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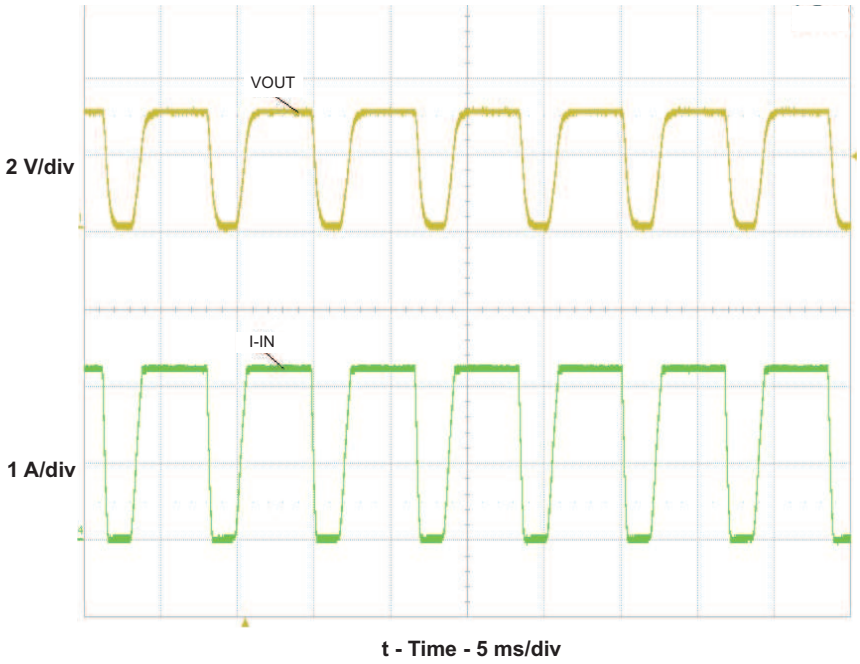


Figure 10. TPS2069CDGNEVM-635 Short-Circuit Input Current and Output Voltage

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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 LIMITED 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. 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.

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REGULATORY COMPLIANCE INFORMATION

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.

【Important Notice for Users of this Product in Japan】

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.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

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1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
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.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible 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, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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ООО «НИОКР СИТЕМС»
Москва, 125362, Россия, ул. Вишневая, д. 9, к. 1, Блок 104 а и 104 в

Телефон: 8 (495) 268-14-82
Email: n@nsistems.ru

ИНН: 7735154786
ОГРН: 1167746717709