

## **TPS65217 EVM**

This user's guide describes the characteristics, operation, and use of the TPS65217 evaluation module (EVM). The TPS65217EVM is a fully assembled platform for evaluating the performance of the TPS65217 power management device. This document includes schematic diagrams, a printed circuit board (PCB) layout, and bill of materials.

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## 1 Introduction

The TPS65217 is a highly integrated power management solution for portable electronics. Features of the TPS65217 include:

- Power path management for Lithium-ion battery, USB, and AC inputs
- Linear Battery Charger
- 3 DC/DC Step-Down Converters
- 2 LDOs
- 2 Load Switches (that can be configured as LDOs)
- White LED driver capable of driving up to 20 LEDs

## 2 Requirements

### 2.1 Software

The EVM will power-up and operate without use of software. However, in order to make I2C commands, check the product folder on the TI website for the necessary software.

### 2.2 Host Computer

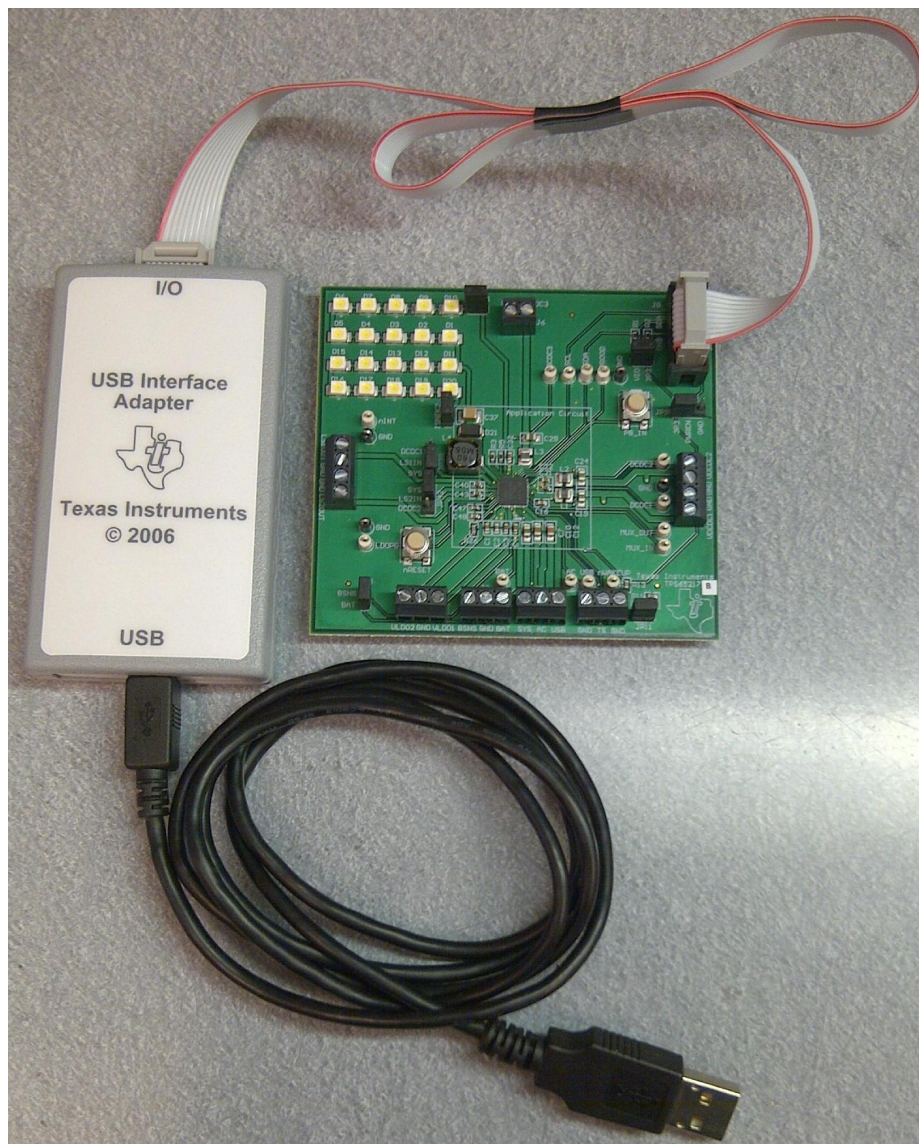
A computer with an available USB port is required to make use of the EVM software. The EVM software runs on the computer and communicates with the EVM via the USB-to-GPIO interface.

### 2.3 Power Supply

A DC power supply capable of delivering up to 5V and 3A is required to operate this EVM.

## 2.4 EVM Kit

Figure 1 shows the EVM kit.



**Figure 1. TPS65217 EVM KIT**

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**NOTE:** If the ribbon cable is not connected to EVM connector J8, the user must still supply 3.3V to the 3P3 node.

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### 3 Schematic

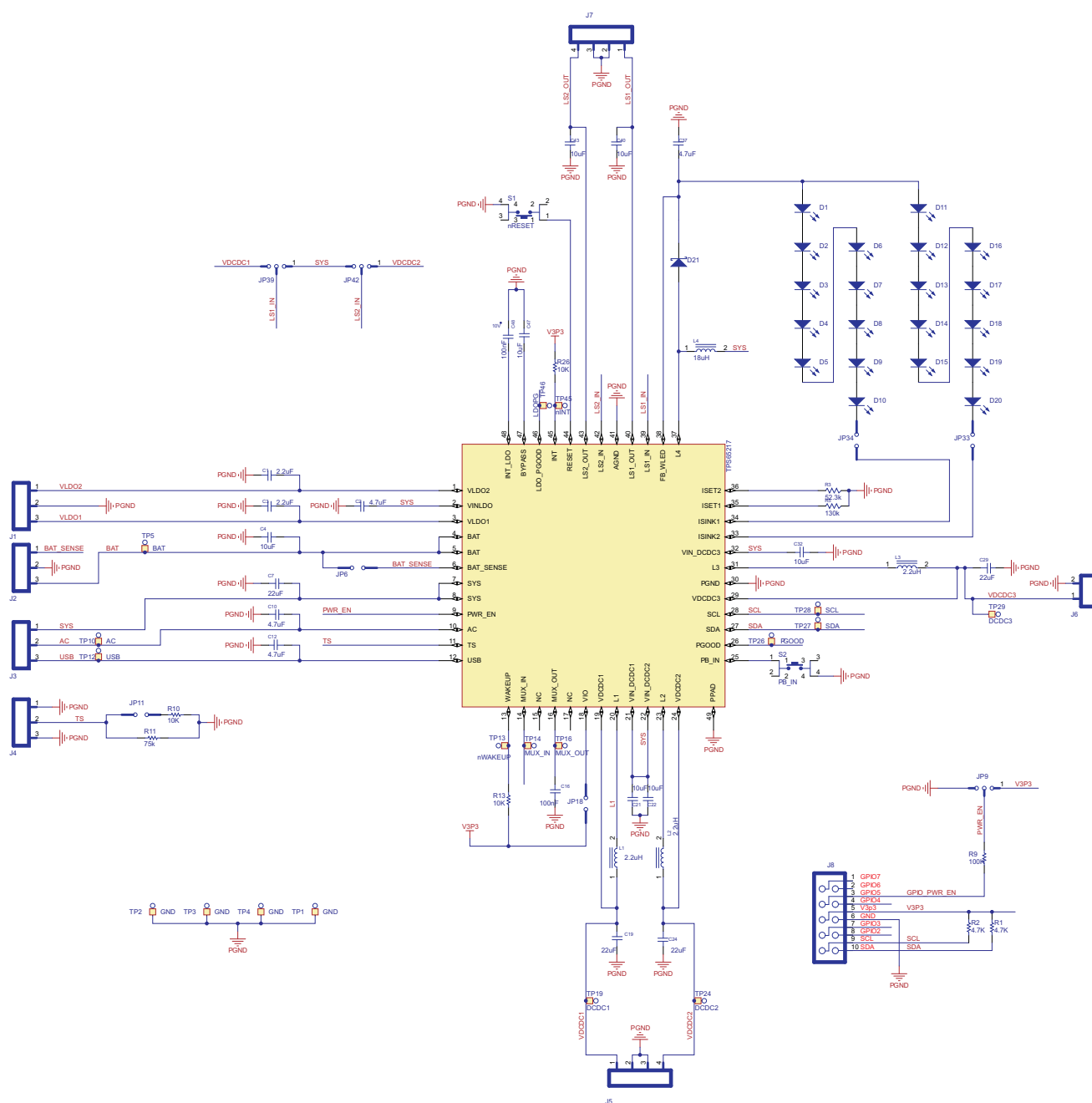


Figure 2. TPS65217 EVM Schematic



## 4 Terminal Block Descriptions

**Table 1. Terminal Blocks**

	Connector	Description
J1	VLDO2	Output voltage of LDO2
	GND	Ground
	VLDO1	Output voltage of LDO1
J2	BSNS	Battery Voltage Sense Input
	GND	Ground
	BAT	Battery
J3	SYS	System Voltage
	AC	AC adapter input
	USB	USB voltage input
J4	GND	Ground
	TS	Temperature sense input
	GND	Ground
J5	VDCDC1	DCDC1 output
	GND	Ground
	GND	Ground
	VDCDC2	DCDC2 output
J6	VDCDC3	DCDC3 output
	GND	Ground
J7	LS1OUT	LS1 / LDO3 Output
	GND	Ground
	GND	Ground
	LS2OUT	LS2 / LDO4 Output
J8	SDA	I2C Data
	SCL	I2C Clock
	GND	Ground
	3P3	3.3V
	GPIO_PWR_EN	Software PWR_EN signal

## 5 Test Point Descriptions

**Table 2. Test Points<sup>(1)(2)</sup>**

Test Point	Description
BAT	Battery
AC	AC adapter input
USB	USB voltage input
nWAKEUP	Wakeup output signal
MUXI	Input to analog multiplexer
MUXO	Output of analog multiplexer
DCDC1	DCDC1 output voltage
GND	Ground
DCDC2	DCDC2 output voltage
GND	Ground
PGOOD	Power Good
SDA	I2C Data
SCL	I2C Clock
DCDC3	DCDC3 output voltage
nINT	Interrupt Output
GND	Ground
GND	Ground
LDOPG	LDO Power Good

<sup>(1)</sup> Test points are not designed to carry current. They are intended for measuring voltage.

<sup>(2)</sup> The test points for high current nodes (BAT, AC, USB, DCDC1, DCDC2, and DCDC3) are designed to measure voltage at their respective input/output capacitor.

## 6 Jumper Descriptions

**Table 3. Jumpers**

Jumper	Description
JP6	Connects battery to battery voltage sense input. User should only install this jumper if use of the battery charger is desired and the supply connected to BAT is capable of sinking current.
JP9	Used to pull PWREN either high or low. If not installed, the software can control PWR_EN via the GPIO_PWR_EN signal.
JP11	Connects TS input to a 10k resistor to simulate a thermistor. If using a battery pack, do not install this jumper. Instead, use J4 to connect thermistor to TS.
JP18	Connects VIO to 3P3. Do not install if other VIO supply is desired.
JP39	Allows user to select input to LS1
JP42	Allows user to select input to LS2
ISINK1	Connects LED string to ISINK1. Must connect to use LEDs.
ISINK2	Connects LED string to ISINK2. Must connect to use LEDs.

## 7 Setup

Example setup for using TPS65217 EVM

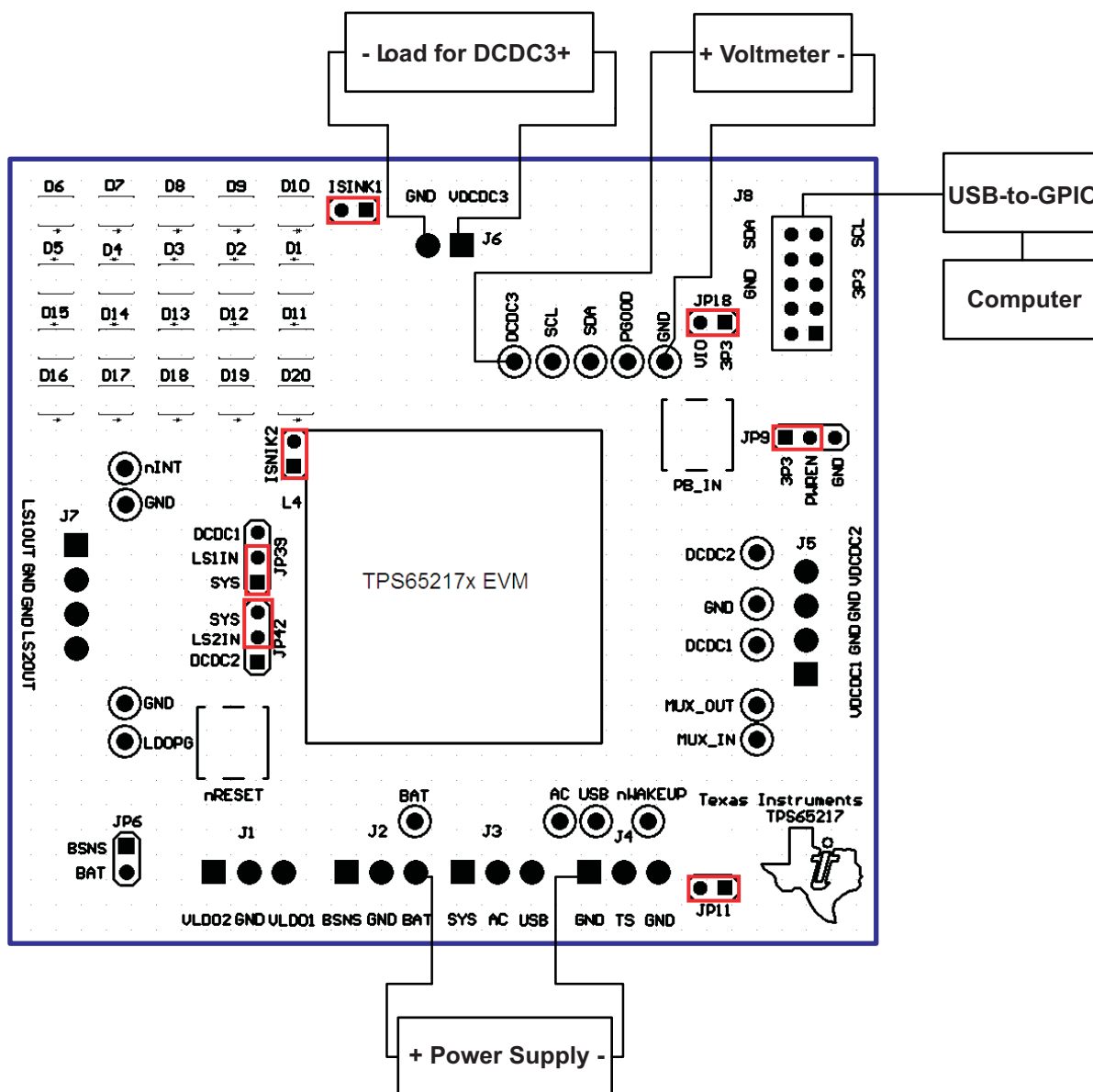


Figure 3. TPS65217 EVM Setup

## 8 Software

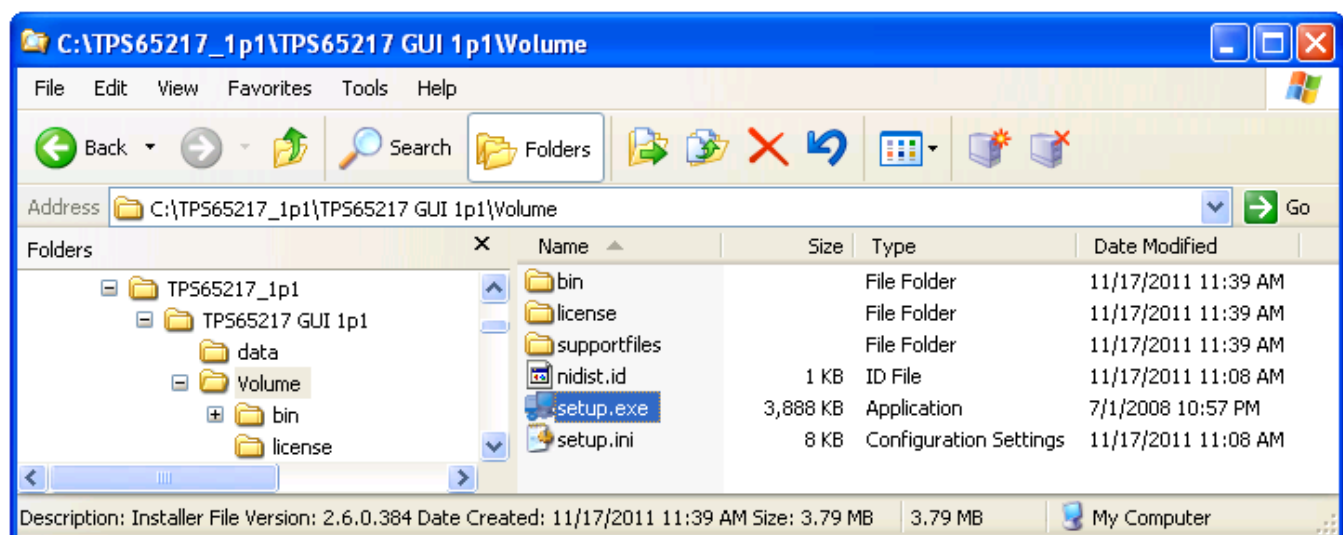
### 8.1 Software Installation Instruction

The following section explains the procedure for installing the Graphical User Interface (GUI) onto a Windows based PC. A USB interface adapter is required to connect the EVM to a PC and should have been provided with the EVM.

Additional interfaces can be ordered through <http://focus.ti.com/docs/toolsw/folders/print/usb-to-gpio.html>

To install the EVM software follow the steps outlined:

- Copy the TPS65217\_1p1.zip to your computer and extract all files.
- Double-click on the setup.exe file in the TPS65217 GUI 1p1\Volume directory
- Follow the prompts to finish the installation.
- At the end of the installation, a reboot of your computer may be required.



**Figure 4. The setup.exe. File is Located in the Volume Directory**

I<sup>2</sup>C read/write commands may be made using the provided software. Registers 0x00 through 0x0F are available in the “Basic 1” tab. Registers 0x10 through 0x1E are available in the “Basic 2” tab. A dark grey block means the bit is ‘high’. A light grey block means the bit is ‘low’. A write may be performed simply by clicking on an individual bit; or, an entire register may be written by using the write command on the left side of the GUI.

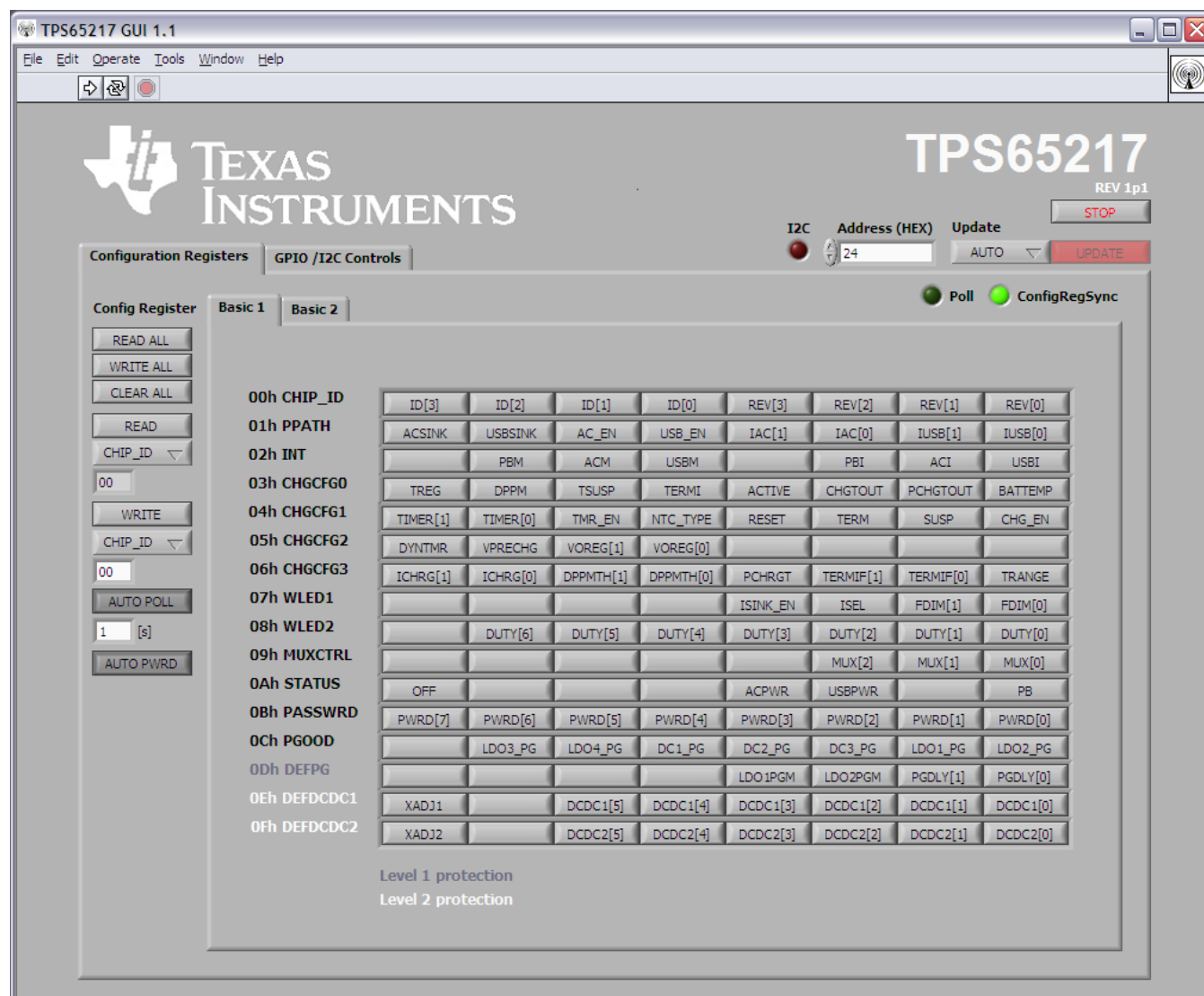


Figure 5. TPS65217 GUI Basic

The software includes an auto-password function so that the protected registers may be used more easily (without entering any password).

If JP9 is not installed, the GPIO tab may be used to control the PWR\_EN signal.

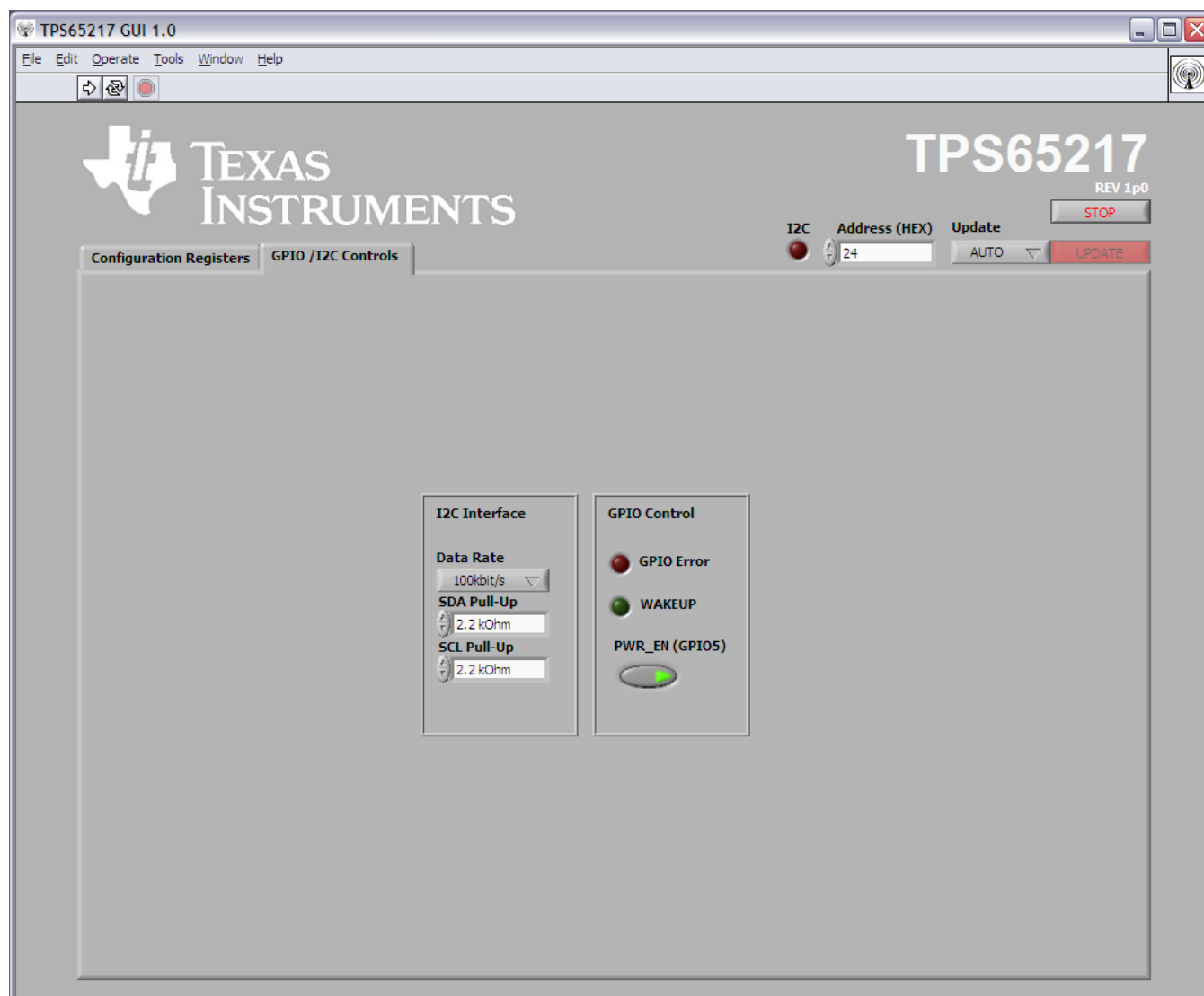


Figure 6. TPS65217 GUI GPIO





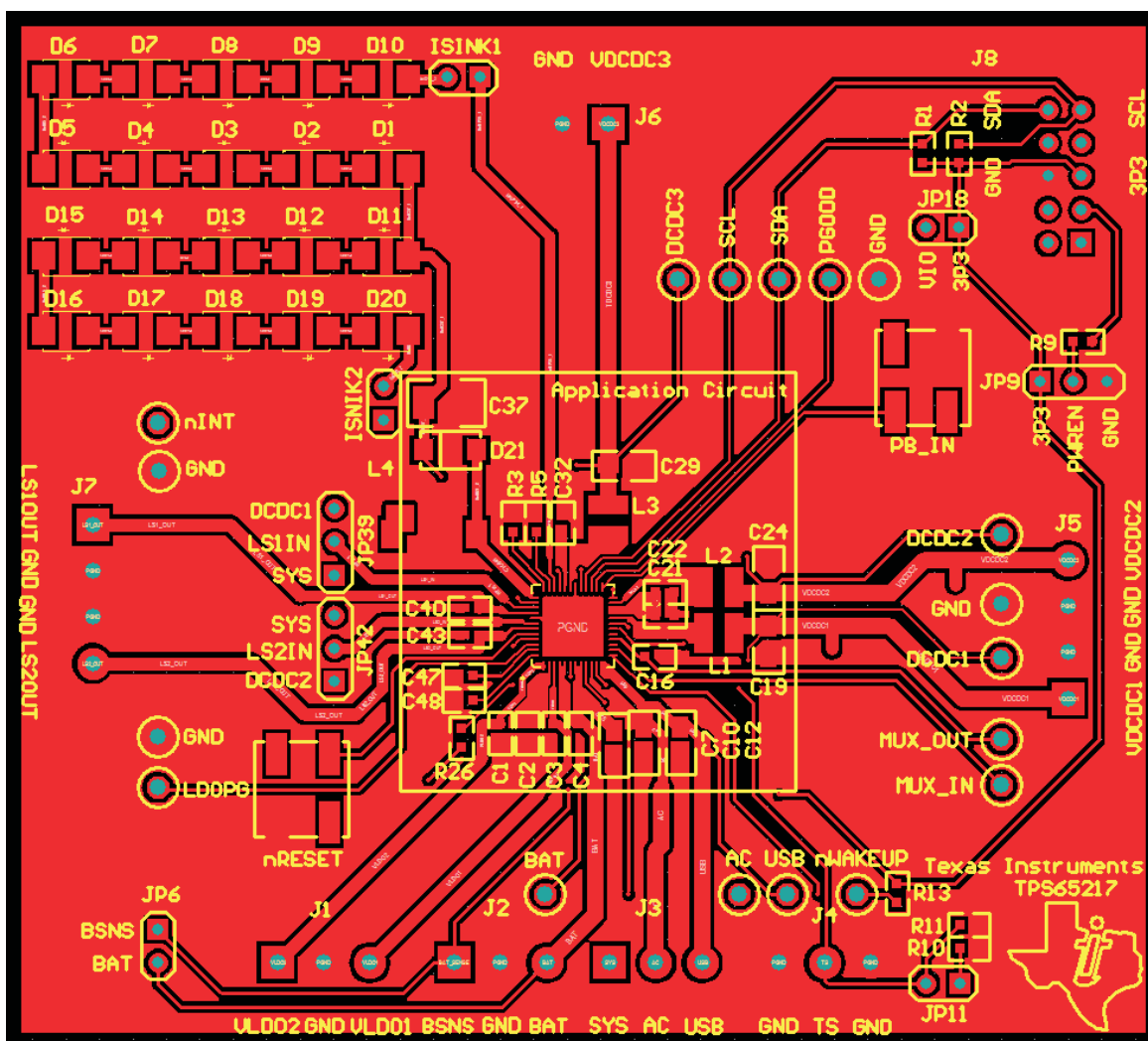


Figure 8. Layout - Top Layer Silkscreen

## 10 Bill of Materials

QTY	Value	Designator	MFR	MFR Part Number	Description
1	–	–	Texas Instruments	TPS65217C	Power Management IC
2	2.2uF	C1, C3	TDK Corporation	C1608X5R1C225K	CAP CER 2.2UF 16V X5R 0603
2	4.7uF	C10, C12	TDK Corporation	C2012X5R1E475K	CAP CER 4.7UF 25V X5R 0805
1	100nF	C16, C48	TDK Corporation	C1608X7R1C104K	CAP CER 0.10UF 16V X7R 10% 0603
1	4.7uF	C2	TDK Corporation	C1608X5R1A475K	CAP CER 4.7UF 10V X5R 0603
1	4.7uF	C37	AVX Corporation	12105C475KAT2A	CAP CER 4.7UF 50V X7R 10% 1210
7	10uF	C4, C21, C22, C32, C40, C43, C47	TDK Corporation	C1608X5R1A106M	CAP CERAMIC 10UF 10V 0603 X5R
4	22uF	C7, C19, C24, C29	Taiyo Yuden	LMK212BJ226MG-T	CAP CERAMIC 22UF 10V 0805 X5R
20	–	D1 - D20	Lumex Opto/Components Inc	SML-LX2832UWC-TR	LED WHITE 2.8X3.2MM 150 MCD SMD
1	–	D21	On Semiconductor	MBRA140T3G	DIODE SCHOTTKY 40V 1A SMA
4	–	J1, J2, J3, J4	On Shore Technology Inc	ED555/3DS	TBLK_6A_3X3.5MM
2	–	J5, J7	On Shore Technology Inc	ED555/4DS	TBLK_6A_4X3.5MM
1	–	J6	On Shore Technology Inc	ED555/2DS	TBLK_6A_2X3.5MM
1	N2510-6002-RB	J8	3M	N2510-6002-RB	CONN HEADER 10 POS STRGHT GOLD
5	PEC02SAAN	JP34, JP33, JP18, JP11, JP6	Sullins Connector Solutions	PEC02SAAN	CONN HEADER 0.100 SINGL STR 2POS
3	PEC03SAAN	JP9, JP39, JP42	Sullins Connector Solutions	PEC03SAAN	CONN HEADER 0.100 SINGL STR 3POS
3	2.2uH	L1, L2, L3	Murata Electronics North America	LQM2HPN2R2MG0L	INDUCTOR 2.2UH 20% 1300MA 1008
1	18uH	L4	Sumida America Components Inc	CDRH74NP-180MC	POWER INDUCTOR 18UH 1.31A SMD
2	4.7K	R1, R2	Panasonic -ECG	ERJ-3EKF4701V	RES 4.70K OHM 1/10W 1% 0603 SMD
1	75k	R11	Panasonic-ECG	ERJ-3GEYJ753V	RES 75K OHM 1/10W 5% 0603 SMD
3	10K	R26, R13, R10	Panasonic-ECG	ERJ-3GEYJ103V	RES 10K OHM 1/10W 5% 0603 SMD
1	52.3k	R3	Panasonic-ECG	ERJ-3EKF5232V	RES 52.3K OHM 1/10W 1% 0603 SMD
1	130k	R5	Panasonic-ECG	ERJ-3EKF1303V	RES 130K OHM 1/10W 1% 0603 SMD
1	100k	R9	Panasonic-ECG	ERJ-3GEYJ104V	RES 100K OHM 1/10W 5% 0603 SMD
2	–	S1, S2	C&K Components	KT11P2JM34LFS	SWITCH TACT 2.36MM SILV J-LEAD
4	Black	TP1, TP2, TP3, TP4	Keystone Electronics	5001	TEST POINT PC MINI .040"D BLACK
14	White	TP5, TP10, TP12, TP13, TP14, TP16, TP19, TP24, TP26, TP27, TP28, TP29, TP45, TP46	Keystone Electronics	5002	TEST POINT PC MINI 0.040"D WHITE

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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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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.

**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.

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### Products

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Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
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