TPS99110EVM and GUI User's Guide

1 Introduction

The TPS99110EVM is a module for evaluating the TPS99110-Q1 system-basis chip. This user's guide describes and explains both the hardware platform containing a sample TPS99110-Q1 device, along with the graphical user-interface (GUI) software to control the device. To interface with the GUI and board hardware, the user needs a TIGER interface board from Texas Instruments. For information on the TIGER board, go to the TI E2E™ Online Community.

In the event of any inconsistency between the official specification and any user's guide, application report, or other referenced material, the data sheet specification will be the definitive source.

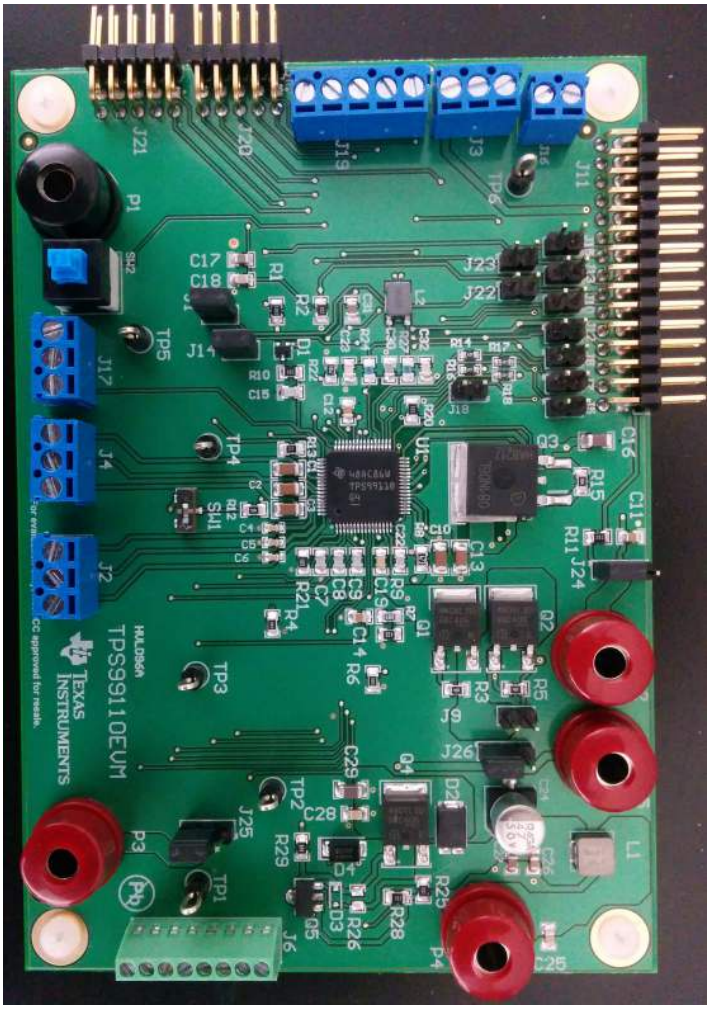


Figure 1. TPS99110EVM Board

1.1 Contents of EVM kit

The TPS9110EVM kit includes the following contents:

- Evaluation module board with a sample TPS99110-Q1 device
- USB connector

1.2 Related Documents from Texas Instruments

The following lists related documentation regarding TI's integrated circuits used in the assembly of the TPS99110EVM. These documents are available on www.TI.com.

- *TPS99110-Q1 System-Basis Chip for Automotive Applications*, SLIS155

1.3 Equipment Needed for Evaluation

The following equipment is required for evaluation of the TPS99110-Q1 device:

- Power supply capable of 14-V, 2-A operation
- Personal computer (PC) with Windows® operating system (XP or later)
- Digital multimeter
- Oscilloscope

2 EVM Hardware

The TPS99110EVM is used to evaluate the TPS99110-Q1 device. The EVM board already includes a TPS99110-Q1 device which eliminates the need for immediate soldering. Refer to the TPS9110-Q1 datasheet and Section 4 for more detail on the application configuration. The following function blocks are accessible on the EVM hardware and are highlighted in Figure 1.

- Two adjustable sensor supplies
- CAN and LIN communication interfaces
- Two integrated operational amplifiers
- Three current-loop interfaces
- LDO regulator outputs
- All digital input and output signals

2.1 Initial Setup

To operate and evaluate the EVM properly, the following steps must be followed:

Step 1. Supplied the TPS99110EVM with power for basic operation. Connect the power supply ground to the P1 banana jack, and connect the positive terminal of the power supply to the P4 banana jack. For a description of the uses for the rest of the banana jacks, see Table 1.

Step 2. Populate the necessary jumpers (J26, J24, J25, J1, and J14) if these jumpers are not already populated on the board for the proper power up.

Step 3. Position SW1 in the correct location if it is not already in the correct position. To ensure that SW1 is positioned correctly, verify that it is switched to the 1-2 position (as shown in Figure 1).

Step 4. Connect the TIGER interface board to the J11 header as shown in Figure 2. For the GUI to communicate with the TPS99110-Q1 device, this interface board must be connected and jumpers J5, J7, J8, and J12 must be populated.

Step 5. Connect the TIGER interface board to the controlling PC using USB connector after the TIGER interface board is connected and jumpers are populated.

Step 6. Set the voltage on the power supply. The VBAT (P4) port should be set for 12 V which is the nominal voltage of the TPS99110-Q1 device.

CAUTION

The voltage can go up to a maximum of 38.5 V. Operating the device at a voltage higher than the maximum for an extended amount of time will damage the device.

Step 7. Switch on the power supply to power up the EVM.

Step 8. Open the TPS99110EVM GUI. To verify that the GUI initialized correctly, check the TIGER status box which should display *Firmware 1.3.6*.

Step 9. Begin evaluating the device.

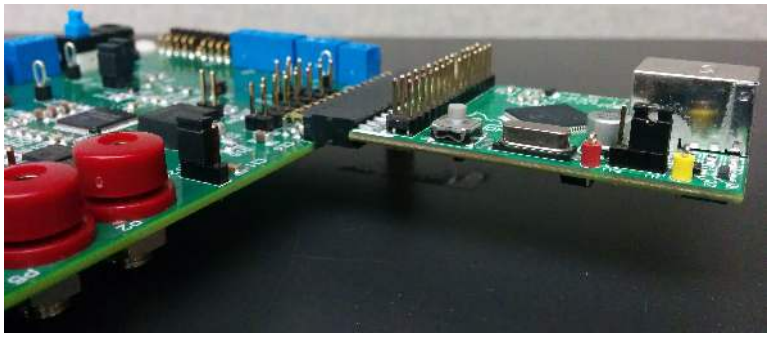


Figure 2. TIGER Board Configuration

2.2 Banana Jacks

The TPS99110EVM has 5 banana jacks. These ports provide a convenient means to connect the EVM board to external circuits or power supplies that may require high current. Table 1 lists all banana jacks and corresponding functions.

Table 1. Banana Jack Descriptions

BANANA JACK DESIGNATOR	FUNCTION
P1	GND connection, best used for power supply
P2	If the user chooses, can be used to externally supply VIO
P3	If the user chooses, can be used to externally supply SENSOR_IN
P4	Positive terminal of the board power supply
P5	If the user chooses, can be used to externally supply VOP

2.3 Jumpers

The TPS99110EVM has 16 jumpers that provide a simple way to configure signals to and from the TPS99110-Q1 device on the board. Table 2 lists all jumpers and corresponding functions.

Table 2. Jumper Descriptions

JUMPER	JUMPER NAME	FUNCTION
J1	NWDDIS	Shorts the NWDDIS pin to GND, disabling the Watchdog for evaluation.
J5	SDO	Connects the SDO pin to the TIGER interface board
J7	CLK	Connects the CLK pin to the TIGER interface board
J8	NCS	Connects the NCS pin to the TIGER interface board
J9	PRE2/PRE1 SNS	Shorts PRE1SNS and PRE2SNS together
J10	PWL_WD	Connects the PWL_WD pin to the TIGER interface board
J12	SDI	Connects the SDI pin to the TIGER interface board
J13	NRST3	Connects the NRST3 pin to the TIGER interface board
J14	VDD5_CAN	Supplies VDD5_CAN from the VDD5 regulator on the TPS99110-Q1 device
J15	NRST5	Connects the NRST5 pin to the TIGER interface board
J18	PWL_WD GND	Connects the PWL_WD pin to GND
J22	NWDDIS TIGER	Connects the NWDDIS pin to the TIGER interface board
J23	NResistorTART	Connects the NResistorTART pin to the TIGER interface board
J24	VIO supply	Position 1-2: Supplies VIO from the VDD5 regulator Position 2-3: Supplies VIO from the VDD3 regulator Leave unpopulated to use the P2 banana jack for VIO supply
J25	SENSOR_IN supply	Position 1-2: Supplies SENSOR_IN from the PRE1SNS pin Position 2-3: Supplies SENSOR_IN from the PRE2SNS pin Leave unpopulated to use the P3 banana jack for SENSOR_IN supply
J26	VOP supply	Position 1-2: Supplies VOP from the PRE1SNS pin Position 2-3: Supplies VOP from the PRE2SNS pin Leave unpopulated to use the P5 banana jack for VOP supply

2.4 Test Points

There are 5 test points scattered across the board, all connected to the board GND. These are just for the convenience of the user when probing any point on the EVM.

3 GUI Software

The GUI software to go along with the TPS99110EVM is a simple, and coherent interface to control the TPS99110-Q1 device. The GUI is divided into 2 different tabs: one for custom SPI commands the user can input themselves, and one for the SPI register map.

3.1 SPI Command Tab

The SPI Command tab provides the user the option to write their own SPI commands or to read the register of their choice. Figure 3 shows the SPI Command which includes dialog boxes for the register address, the write data, the output data in hexadecimal, and the output data in binary. This tab also includes two drop down menus; one for the read or write selection and one for the register space. The register space will always be set to *CAS*. To send a command, the corresponding *ENABLE* button must be clicked followed by the clicking *SEND ALL* button. The user can also enable multiple commands at one time and then click the SEND ALL button to send multiple commands at once.

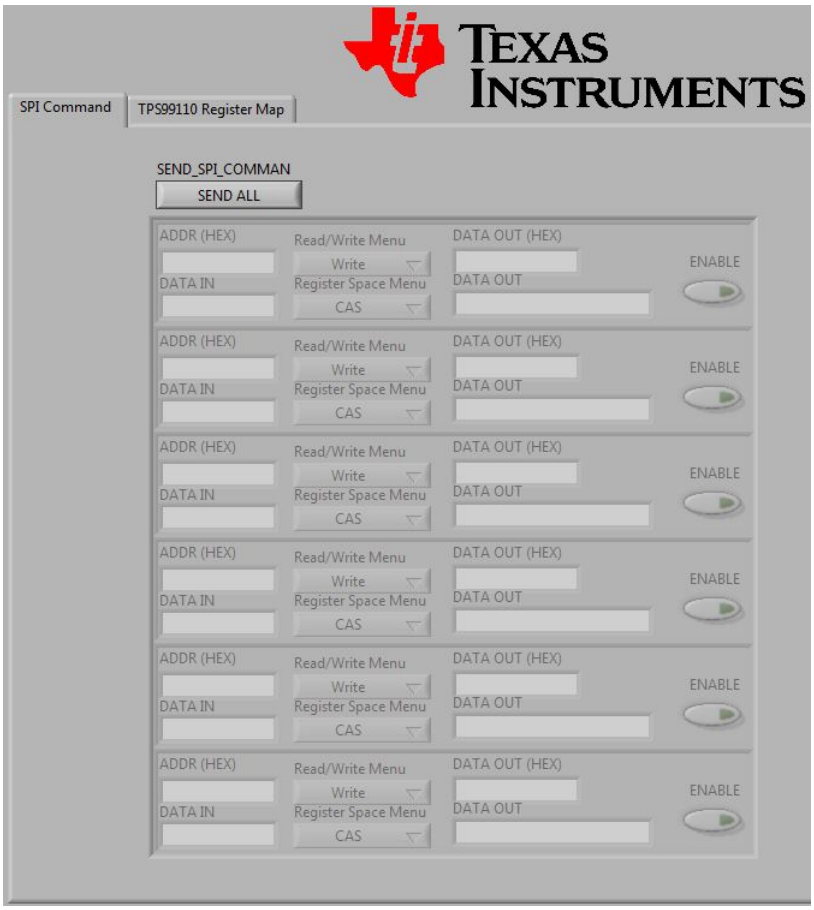


Figure 3. SPI Command Tab

3.1.1 Write Command

To use the write command, the user must first select *Write* from the *Read/Write Menu* drop-down. Then the address (in hexadecimal) should be entered into the *ADDR (HEX)* dialog box. The data that is to be written (in hexadecimal) to the selected register is then entered into the *DATA IN* dialog box. The *ENABLE* button must then be clicked for the write to occur. When the write is complete, the *DATA OUT (HEX)* dialog box and the *DATA OUT* dialog box should display the resulting write. If the *DATA OUT* dialog box does not match what the was written, an issue with the TIGER interface board may have occurred. Click the *RECONNECT TIGER* button next to the title of the GUI (see Figure 4). After clicking this button, try to click the ENABLE button again and ensure that the data-out dialog boxes match what was written.

3.1.2 Read Command

To use the read command, the user must first select *Read* from the *Read/Write Menu* drop-down. Then the address (in hexadecimal) should be entered into the *ADDR (HEX)* dialog box. The *DATA IN* box is left blank. Click the *ENABLE* button for the read to occur. When the read is complete, the register data that was read should be displayed in the *DATA OUT (HEX)* and *DATA OUT* dialog boxes.

3.2 SPI Register Map Tab

The SPI Register Map tab provides the user an easy-to-use interface to control every accessible register and bit. Each bit has a title associated to provide some description of the bit. For the detailed bit descriptions, refer to the TPS99110-Q1 data sheet. Each bit also has a box that shows the bit setting (either a 0 or a 1) at any given read. The 0 setting appears with a red background and the 1 appears with a green background.

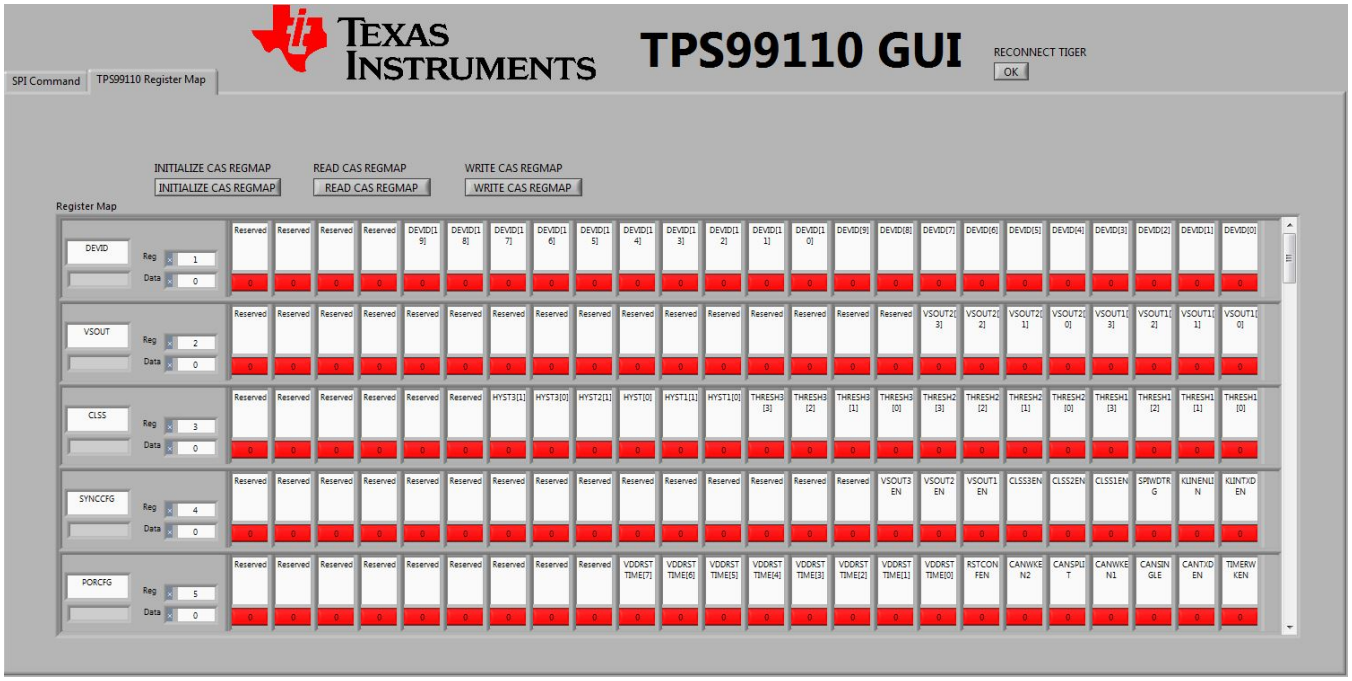


Figure 4. SPI Register Map

3.2.1 Read Register Map

To read all the registers, click the *READ CAS REGMAP* button. Clicking this button also updates the register map. If the map displays something that is not expected, try reconnecting the TIGER interface board by clicking the *RECONNECT TIGER* button at the top of the GUI.

3.2.2 Write to Register Map

To write to register bits using the register, click the bit to flip the current setting. After the setting is changed, click the *WRITE CAS REGMAP* button to write every change that has been implemented since the last read or write.

3.2.3 Initialize Register Map

To populate the register map with default values, click the *INITIALIZE CAS REGMAP*. This feature is helpful if the user has made numerous changes but wants to go back to the normal settings without power cycling the EVM.

4 Schematic, Layout, and Bill of Materials

The following sections include the schematic, layout, and bill of materials (BOM) for the TPS99110EVM.

4.1 Schematic

Figure 5 shows the schematic for the TPS99110EVM.

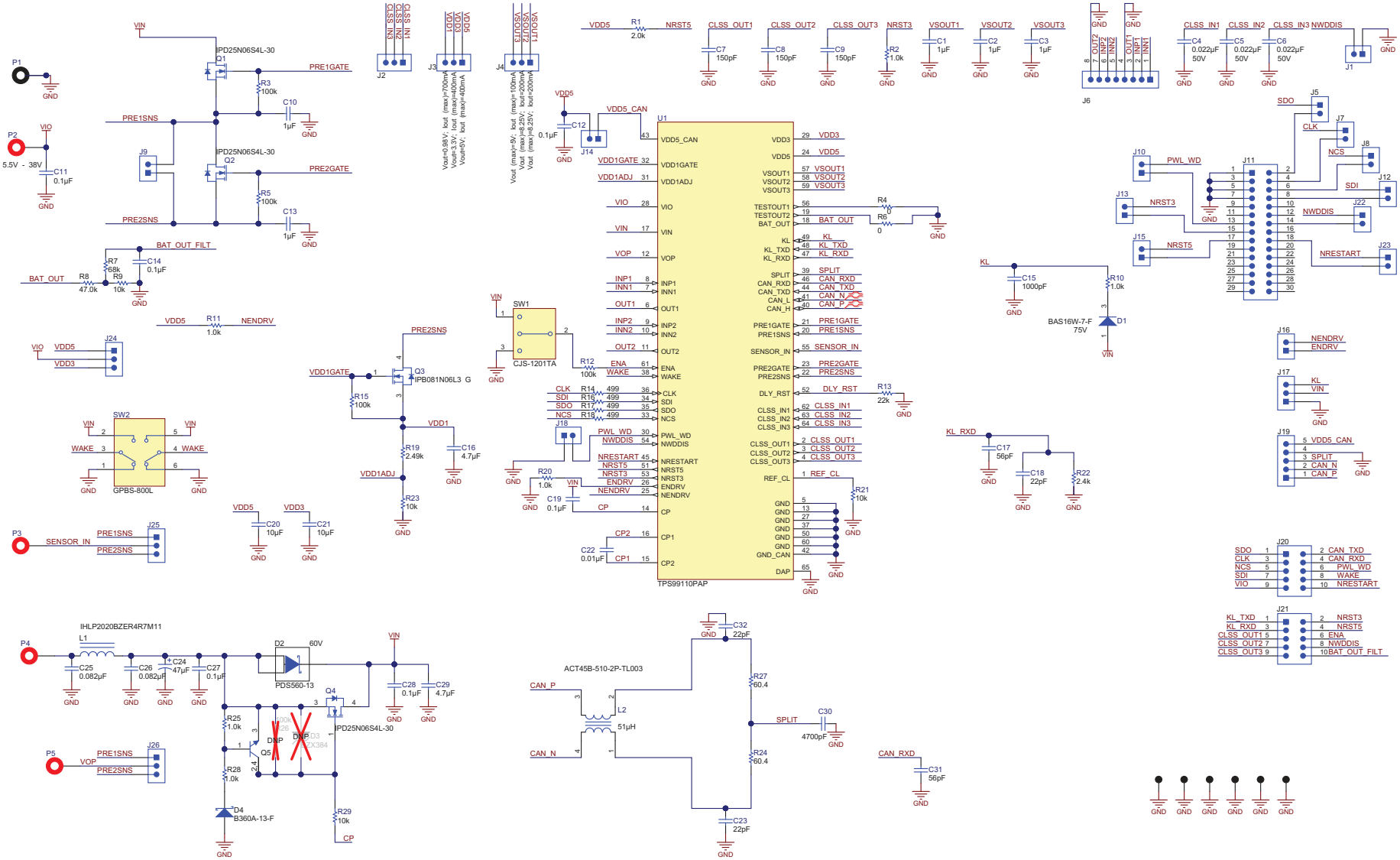
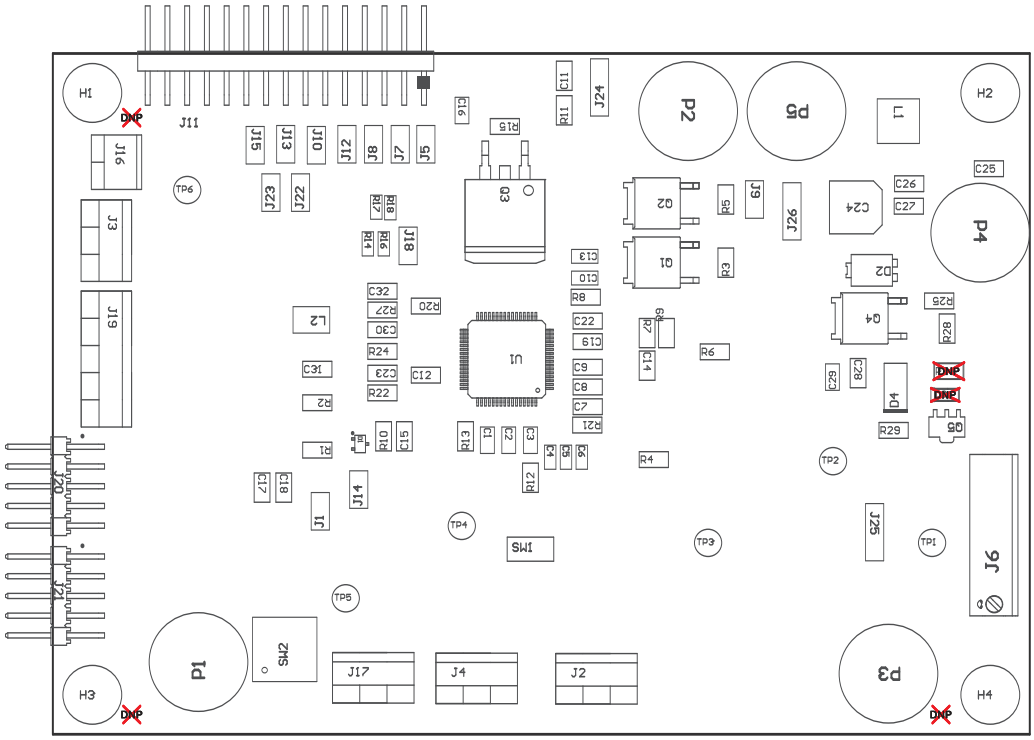


Figure 5. TPS99110EVM Schematic

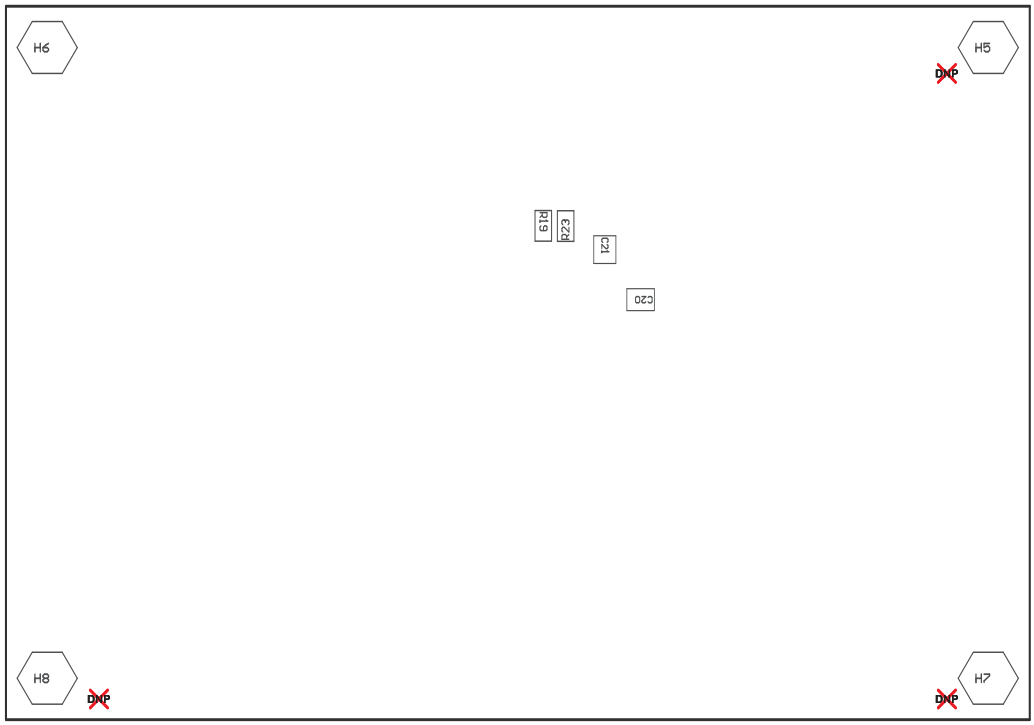
4.2 Component Layout

Figure 6 and Figure 7 show the component layout for the PCB.



Components marked DNP should not be populated.

Figure 6. Top-Side Layer



Components marked DNP should not be populated.

Figure 7. Bottom-Side Layer

4.3 Bill of Materials

Table 3 lists the BOM for the TPS99110EVM.

Table 3. BOM

DESIGNATOR	QUANTITY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
!PCB1	1		Printed circuit board		HVL096	Any
C1, C2, C3	3	1 µF	Capacitor, ceramic, 1 µF, 50 V, ±10%, X7R, 1206	1206	C3216X7R1H105K	TDK
C4, C5, C6	3	0.022 µF	Capacitor, ceramic, 0.022 µF, 50 V, ±10%, X8R, 0603	0603	C1608X8R1H223K	TDK
C7, C8, C9	3	150 pF	Capacitor, ceramic, 150 pF, 50 V, ±5%, C0G/NP0, 0805	0805	C0805C151J5GACTU	Kemet
C10, C13	2	1 µF	Capacitor, ceramic, 1 µF, 50 V, ±10%, X7R, 1206	1206	GRM31MR71H105KA88L	MuRata
C11	1	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, ±10%, X7R, 0805	0805	C2012X7R1H104K	TDK
C12	1	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, ±10%, X7R, 0805	0805	C0805C104K5RACTU	Kemet
C14	1	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, ± 10%, X7R, 0805	0805	GRM21BR71H104KA01L	MuRata
C15	1	1000 pF	Capacitor, ceramic, 1000 pF, 50 V, ±5%, C0G/NP0, 0805	0805	GRM2165C1H102JA01D	MuRata
C16, C29	2	4.7 µF	Capacitor, ceramic, 4.7 µF, 50 V, ±10%, X5R, 1206	1206	GRM319R61H475KA12	MuRata
C17, C31	2	56 pF	Capacitor, ceramic, 56 pF, 50 V, ±5%, C0G/NP0, 0805	0805	C0805C560J5GACTU	Kemet
C18, C23, C32	3	22 pF	Capacitor, ceramic, 22 pF, 50 V, ±5%, C0G/NP0, 0805	0805	08055A220JAT2A	AVX
C19, C28	2	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, ±5%, X7R, 0805	0805	08055C104JAT2A	AVX
C20, C21	2	10 µF	Capacitor, ceramic, 10 µF, 50 V, ±10%, X7R, 1210	1210	GRM32ER71H106KA12L	MuRata
C22	1	0.01 µF	Capacitor, ceramic, 0.01 µF, 50 V, ±5%, C0G/NP0, 0805	0805	GRM2195C1H103JA01D	MuRata
C24	1	47 µF	Capacitor, aluminum, 47 µF, 50 V, ± 20%, Ω, SMD	F80	EMVA500ADA470MF80G	Nippon Chemi-Con
C25, C26	2	0.082 µF	Capacitor, ceramic, 0.082 µF, 50 V, ± 10%, X7R, 0805	0805	08055C823KAT2A	AVX
C27	1	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, ± 20%, X7R, 0805	0805	C0805C104M5RACTU	Kemet
C30	1	4700 pF	Capacitor, ceramic, 4700 pF, 50 V, ±5%, X7R, 0805	0805	08055C472JAT2A	AVX
D1	1	75 V	Diode, switching, 75 V, 0.15 A, SOT-323	SOT-323	BAS16W-7-F	Diodes Inc.
D2	1	60 V	Diode, Schottky, 60 V, 5A, PowerDI5	PowerDI5	PDS560-13	Diodes Inc.
D4	1	60 V	Diode, Schottky, 60 V, 3 A, SMA	SMA	B360A-13-F	Diodes Inc.
H1, H2, H3, H4	4		Machine screw, round, #4-40 × 1/4, nylon, Philips panhead	Screw	NY PMS 440 0025 PH	BXYZF Fastener Supply
H5, H6, H7, H8	4		Standoff, hex, 0.5"L #4-40 nylon	Standoff	1902C	Keystone
J1, J5, J7, J8, J9, J10, J12, J13, J14, J15, J18, J22, J23	13		Header, 100 mil, 2 × 1, tin, TH	Header, 2 × 1, 100 mil, TH	5-146278-2	TE Connectivity
J2, J3, J4, J17	4		Terminal block, 6 A, 3.5 mm pitch, 3-Pos, TH	10.5 × 8.2 × 6.5 mm	ED555/3DS	On-Shore Technology
J6	1		Terminal block, 8 × 1, 2.54 mm, TH	8POS Terminal Block	1725711	Phoenix Contact
J11	1		R/A header, 100 mil, 15 × 2, gold, TH	15 × 2 R/A Header	PBC15DBAN	Sullins Connector Solutions
J16	1		Terminal block, 6 A, 3.5 mm pitch, 2-Pos, TH	7 × 8.2 × 6.5 mm	ED555/2DS	On-Shore Technology
J19	1		Terminal block, 6 A, 3.5 mm pitch, 5-Pos, TH	17.5 × 8.2 × 6.5mm	ED555/5DS	On-Shore Technology
J20, J21	2		Header, 100 mil, 5 × 2, gold, R/A, TH	Header, 5 × 2, 100 mil, R/A	TSW-105-08-G-D-RA	Samtec

Table 3. BOM (continued)

DESIGNATOR	QUANTITY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
J24, J25, J26	3		Header, 100 mil, 3 × 1, Tin, TH	Header, 3 × 1, 100 mil, TH	5-146278-3	TE Connectivity
L1	1	4.7 µH	Inductor, shielded drum core, powdered iron, 4.7 µH, 3 A, 0.0813 Ω, SMD	5.49 × 2 × 5.18 mm	IHLP2020BZER4R7M11	Vishay-Dale
L2	1	51 µH	Coupled inductor, 51 µH, 0.2 A, 1 Ω, SMD	4.5 × 2.8 × 3.2 mm	ACT45B-510-2P-TL003	TDK
P1	1		Banana jack, solder lug, black, TH	Black insulated banana jack	SPC15354	Tenma
P2, P3, P4, P5	4		Banana jack, solder lug, red, TH	Red insulated banana jack	SPC15363	Tenma
Q1, Q2, Q4	3	60 V	MOSFET, N-CH, 60 V, 25 A, DPAK	DPAK	IPD25N06S4L-30	Infineon Technologies
Q3	1	60 V	MOSFET, N-CH, 60 V, 50 A, DDPAK	DDPAK	IPB081N06L3 G	Infineon Technologies
Q5	1	40 V	Transistor, NPN, 40 V, 0.6 A, SOT-89	SOT-89	DXT2222A-13	Diodes Inc.
R1	1	2 kΩ	Resistor, 2 kΩ, 5%, 0.125 W, 0805	0805	CRCW08052K00JNEA	Vishay-Dale
R2, R10, R11, R20	4	1 kΩ	Resistor, 1 kΩ, 5%, 0.125 W, 0805	0805	CRCW08051K00JNEA	Vishay-Dale
R3, R5, R15	3	100 kΩ	Resistor, 100 kΩ, 5%, 0.125 W, 0805	0805	CRCW0805100KJNEA	Vishay-Dale
R4, R6	2	0 Ω	Resistor, 0 Ω, 5%, 0.125 W, 0805	0805	CRCW08050000Z0EA	Vishay-Dale
R7	1	68 kΩ	Resistor, 68 k, 5%, 0.125 W, 0805	0805	CRCW080568K0JNEA	Vishay-Dale
R8	1	47 kΩ	Resistor, 47 kΩ, 0.1%, 0.125 W, 0805	0805	RT0805BRD0747KL	Yageo America
R9	1	10 kΩ	Resistor, 10 kΩ, 5%, 0.125 W, 0805	0805	CRCW080510K0JNEA	Vishay-Dale
R12	1	100 kΩ	Resistor, 100 kΩ, 5%, 0.125 W, 0805	0805	ERJ-6GEYJ104V	Panasonic
R13	1	22 kΩ	Resistor, 22 kΩ, 5%, 0.125 W, 0805	0805	CRCW080522K0JNEA	Vishay-Dale
R14, R16, R17, R18	4	499 Ω	Resistor, 499 Ω, 1%, 0.1 W, 0603	0603	CRCW0603499RFKEA	Vishay-Dale
R19	1	2.49 kΩ	Resistor, 2.49 kΩ, 1%, 0.125 W, 0805	0805	CRCW08052K49FKEA	Vishay-Dale
R21, R23, R29	3	10 kΩ	Resistor, 10 kΩ, 5%, 0.125 W, 0805	0805	CRCW080510K0JNEA	Vishay-Dale
R22	1	2.4 kΩ	Resistor, 2.4 kΩ, 5%, 0.125 W, 0805	0805	CRCW08052K40JNEA	Vishay-Dale
R24, R27	2	60.4 Ω	Resistor, 60.4 Ω, 1%, 0.125 W, 0805	0805	CRCW080560R4FKEA	Vishay-Dale
R25, R28	2	1.0 kΩ	Resistor, 1 kΩ, 5%, 0.125 W, 0805	0805	CRCW08051K00JNEA	Vishay-Dale
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5	5		Shunt, 100 mil, Gold plated, Black	Shunt 2 pos. 100 mil	881545-2	TE Connectivity
SW1	1		Slide SW, SPDT 0.1 A 50 VDC	SW, 3.1 × 2.5 × 6 mm	CJS-1201TA	Copal Electronics
SW2	1		Switch, pushbutton, DPDT, TH	Switch, 8 × 13.5 × 8mm	GPBS-800L	CW Industries
TP1, TP2, TP3, TP4, TP5, TP6	6	Black	Test point, multipurpose, black, TH	Black multipurpose testpoint	5011	Keystone
U1	1		System basis chip for automotive applications, PAP0064F	PAP0064F	TPS99110PAP	Texas Instruments
D3	0		Diode, Zener, 15 V, 300 mW, SOD-323	SOD-323	BZX384-C15,115	NXP Semiconductor
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	—	—
FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	—	—	—
R26	0	100 kΩ	Resistor, 100 kΩ, 5%, 0.125 W, 0805	0805	CRCW0805100KJNEA	Vishay-Dale

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *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

      NOTE: 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

NOTE: 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.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-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.

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.

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.

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

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs 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 EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

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西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should 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 also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure 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. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

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8. *Limitations on Damages and Liability:*

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