TPS658310EVM Evaluation Board

This EVM user's guide describes the characteristics, operation, and use of the TPS658310 Evaluation Module TIPMM-19108-03. The EVM is designed for evaluating the power management unit TPS658310 and derivatives.

Contents

List of Tables

1 TPS658310 Device Information

The TPS658310 Power Management Unit is a broad use, multichannel device for portable applications. The device consists of an integrated Power Path management and switch mode Li-ion battery charger that provides system power from a regulated wall adapter or a USB port. It also handles lighting management with integrated backlight boosts, LED matrix controller for keypad, camera flash LED controller, current source, and RGB channels. For additional information about the TPS658310, see its product folder on the TI Web site (www.ti.com/product/tps658310).

2 Required Tools

To use this EVM, the following is required:

- Power supply. At least one supply at BAT, AC, or USB is required.
- USB-to-I2C interface controlled by PC-Software REV 48 for Windows™ operating system™
- Oscilloscope, multimeter

3 TPS658310EVM Hardware

The TPS658310EVM contains the TPS658310 device and its required external components. This board contains several jumpers and connectors that allow customizing the board for specific operating conditions. The board is made for laboratory use.

4 Motherboard Connectors

This section describes the power supply connections needed for operation. At least one of the following supply voltages – BAT, AC, or USB – is required to power the device. More than one voltage can be connected at the same time. The priorities of power source for the PWR pin is AC, USB, and then BAT.

- Power source connected between BAT (J2) and PGNDCHG (J16).
  Voltage range: 3.2 V – 4.4 V.
- Power source connected between USB (J4) and PGNDCHG (J23).
  Voltage range: 4.2 V – 5.5 V.
- Power source connected between AC (J3) and PGNDCHG (J5 or J23).
  Voltage range: 4.2 V – 5.5 V.

Test points are available for measurements at ALGDIMC (TP1), MINIPWR (TP2), TS (TP4), MBST_L (TP7), ABST_L (TP8), CHG_L (TP9), and SYS (TP10). Several connectors allow access to additional signals for measurement and device control.

For battery charge functionality, a temperature sensor (TS) must be connected at J42. Alternatively, the control voltage can be emulated by a power supply.

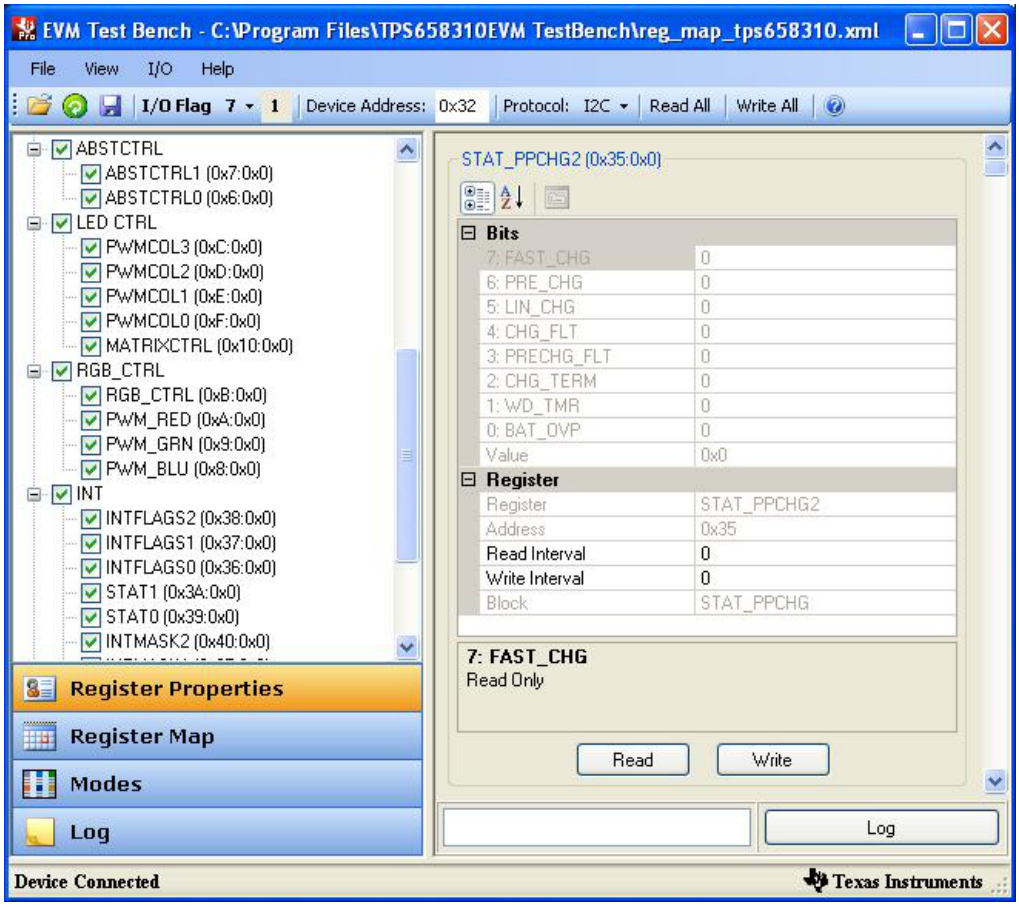
The communication interface (J20) contains the I2C interface, reset, and interrupt line access, which can be controlled with PC-Software via a Texas Instruments USB Interface Adapter.

The board can be configured with jumpers shown in the schematic for user-specific conditions.

5 USB-to-I2C Interface and GUI Software

A personal computer (PC) with a USB port is required to operate this EVM. The graphical user interface (GUI) requires a USB-to-I2C Interface adapter (HPA172) at the PC USB port. The connection to the TPS658310 evaluation board is made through J20. For additional information, see the USB Interface Adapter EVM product folder on the TI Web site.

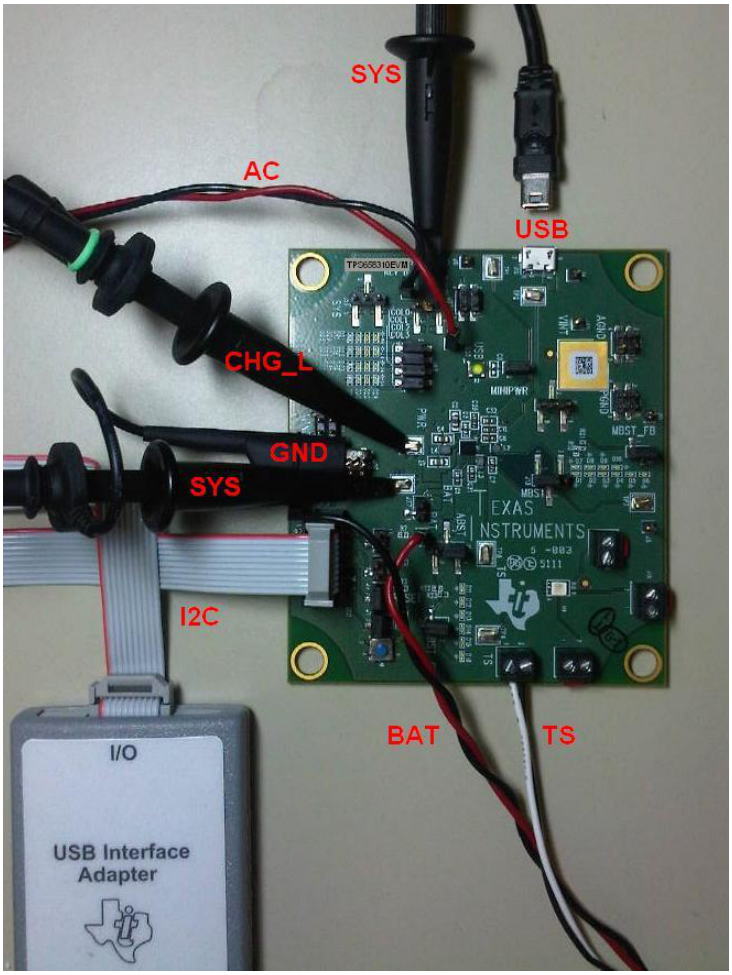
The GUI runs on any Windows XP or higher compatible PC. The input file *reg_map_tps658310.xml* contains all registers which can be accessed. The I2C device address is 0x32.



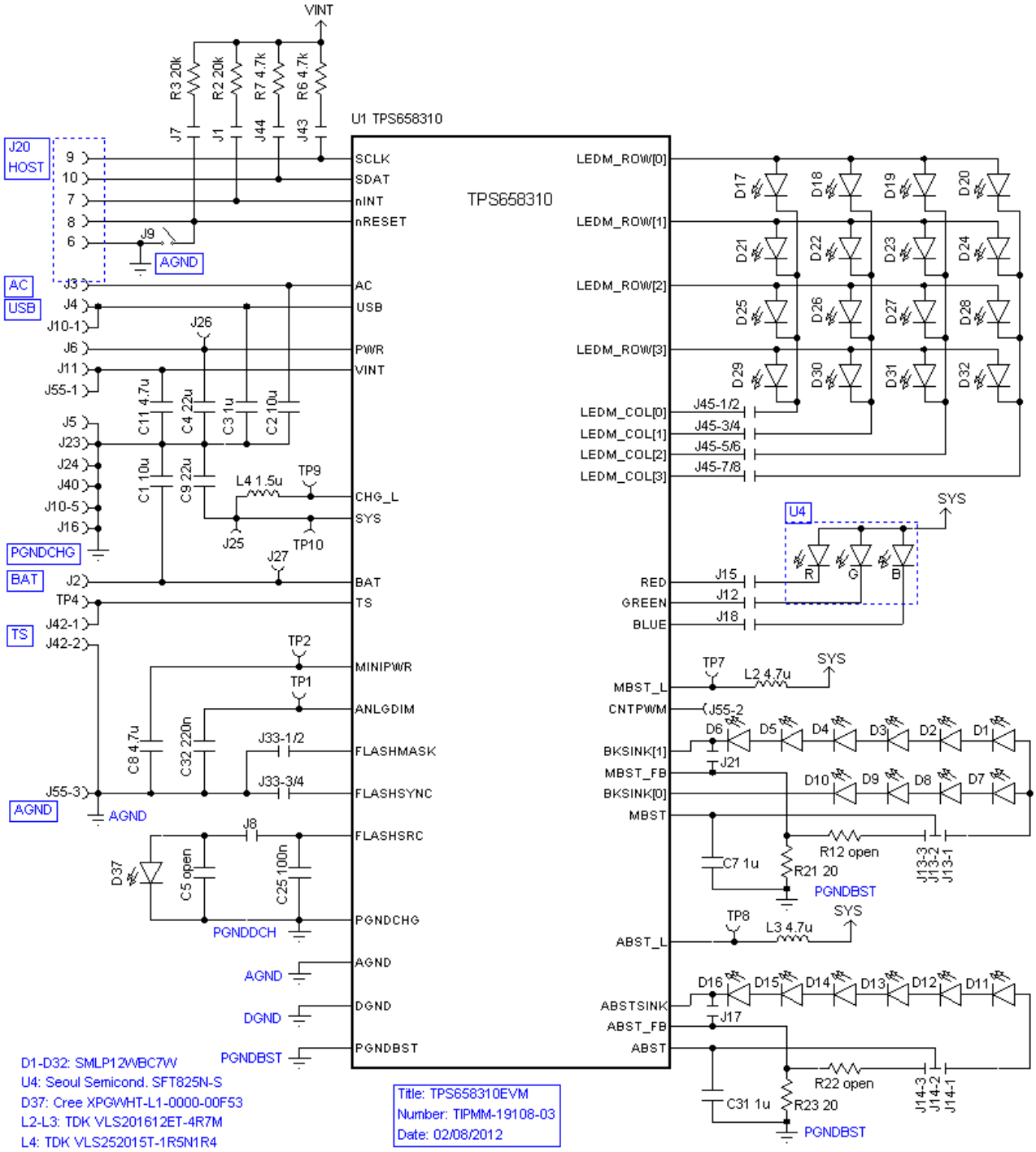
6 TPS658310EVM Layout, Schematic, and Bill of Materials

This section provides the TPS658310EVM board layout, schematic, and bill of materials.

6.1 TPS658310EVM Layout



6.2 TPS658310EVM Schematic



6.3 Bill of Materials

Table 1. Bill of Materials

Qty	Reference	Part Name	Manufacturer	Part Number	Description
1	C25	CAP0603,100nF	Taiyo Yuden	EMK107B7104KA-T	CAP CER .10UF 16V X7R 0603
1	C1	CAP0603,10uF	Taiyo Yuden	JMK107BJ106MA-T	CAP CER 10UF 6.3V X5R 0603
1	C3	CAP0603,1uF	Taiyo Yuden	EMK107BJ105KA-T	CAP CER 1.0UF 16V X5R 0603
2	C7 C31	CAP0603,1uF	Taiyo Yuden	GMK107BJ105KA-T	CAP CER 1.0UF 35V X5R 0603
1	C32	CAP0603,220nF	Taiyo Yuden	EMK107B7224KA-T	CAP CER 0.22UF 16V 10% X7R 0603
2	C8 C11	CAP0603,4.7uF	Taiyo Yuden	LMK107BJ475KA-T	CAP CER 4.7UF 10V 10% X5R 0603
1	C5	CAP0603,open	Taiyo Yuden		CAP CER e.g. EMK107B7 series
1	C2	CAP0805,10uF	Taiyo Yuden	EMK212BJ106KG-T	CAP CER 10UF 16V X5R 0805
2	C4 C9	CAP0805,22uF	Taiyo Yuden	JMK212BJ226KG-T	CAP CER 22UF 6.3V X5R 0805
10	J2-6 J11 J16 J23-24 J40	CON-SIP-1P	TE Connectivity	87224-1	CONN HEADER VERT .100 1POS 15AU
7	TP1-2 TP4 TP7-10	CON-SIP-1P	Keystone Electronics	5016KCT-ND	PC TEST POINT COMPACT SMT
8	J1 J7-8 J17 J21 J27 J43-44	CON-SIP-2P	Molex	68301-1055	SMT CONN HEADER 2POS .100" VERT 15AU
4	J12 J42 J18 J15	CON-SIP-2P	On Shore Technology Inc	ED555/2DS	TERMINAL BLOCK 3.5MM 2POS PCB
5	J13-14 J25-26 J55	CON-SIP-3P	Sullins	GBC36SABN-M30	CONN HEADER 3PS .100 SINGLE SMD
5	J19 J22 J32-33 J35	CON-SIP-4P	Molex	15910040	2.54mm (.100") Pitch C-Grid® Header, Surface Mount, Dual Row, Vertical, 4 Circuits, 0.38µm (15µ") Gold (Au) Selective Plating
1	J10	CON-SIP-8P	Molex	473460001	0.65mm (.026") Pitch Micro-USB B Receptacle, Bottom Mount, SMT, Lead Free
1	J45	CON-SIP-8P	Molex	15910080	2.54mm (.100") Pitch C-Grid® Header, Surface Mount, Dual Row, Vertical, 8 Circuits, 0.38µm (15µ") Gold (Au) Selective Plating
1	U4	D_LED_SFT825N-S,SFT825N-S	Seoul	SFT825N-S	LED, Tri-Color, 20 mA 5V 1600 mcd Max.
1	D37	D_LED_XPGWHT_SERIES, XPGWHT-L1-0000-00F53	Cree Inc	XPGWHT-L1-0000-00F53	LED, SMD 3.75V 1.5A
1	J20	HEADER-5X2POL	Sullins	SBH11-NBPC-D05-SM-BK	CONN HEADR 2.54MM 10POS GOLD SMD
1	L4	IND_LPS3010_SERIES,1.5uH	TDK	VLS252015T-1R5N1R4	INDUCTOR POWER 1.5UH 1.4A SMD
2	L2-3	IND_LPS3010_SERIES,4.7uH	TDK	VLS201612ET-4R7M	INDUCTOR POWER 4.7UH .78A SMD
32	D1-32	LED-1	Rohm	SMLP12WBC7W	LED 0402 WHITE INGAN ON SIC
2	R21 R23	RES0402,20	Yageo	RC0402JR-0720RL	RES 20 OHM 1/16W 5% 0402 SMD
2	R2-3	RES0402,20k	Yageo	RC0402FR-0720KL	RES 20.0K OHM 1/16W 1% 0402 SMD
2	R6-7	RES0402,4.7k	Yageo	RC0402JR-074K7L	RES 4.7K OHM 1/16W 5% 0402 SMD
2	R12 R22	RES0402,open	Yageo		RES 0402 SMD e.g. RC0402 series
1	J9	SWITCH-ST	t.b.d.		SMD switch between Pin 1 and Pin 2
1	U1	TPS658310	Texas Instruments	TPS658310	Power Management Unit

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

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.

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.

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 visit www.ti.com/esh or contact TI.

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. 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.

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 is 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.

REGULATORY COMPLIANCE INFORMATION (continued)

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, Shinjukku-ku, Tokyo, Japan

http://www.tij.co.jp

【ご使用にあたっての注】

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。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿６丁目２４番１号
西新宿三井ビル
http://www.tij.co.jp

EVALUATION BOARD/KIT/MODULE (EVM)
WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265