bq27425 EVM: Single-Cell Impedance Track Technology

This evaluation module (EVM) is a complete evaluation system for the bq27425. The EVM includes one bq27425 circuit module with an integrated current-sense resistor. A separated orderable EV2300 or EV2400 PC interface board for gas gauge interface along with a PC USB cable, and Windows™-based PC software is needed when using this EVM. The circuit module includes one bq27425 integrated circuit and all other onboard components necessary to monitor and predict capacity for a system-side fuel gauge solution. The circuit module connects directly across the battery pack. With the EV2300 or EV2400 interface board and software, the user can:

- Read the bq27425 data registers
- Program the chipset for different configurations
- Log cycling data for further evaluation
- Evaluate the overall functionality of the bq27425 solution under different charge and discharge conditions

The latest Windows™ – based PC software can be downloaded from the product folder on the Texas Instruments Web site.

Contents

1 Features 2
1.1 Kit Contents 2
1.2 Ordering Information 2
2 bq27425-Based Circuit Module 3
2.1 Circuit Module Connections 3
2.2 Pin Description 3
3 bq27425 Circuit Module Schematic 3
3.1 Schematic 3
4 Circuits Module Physical Layout and Bill of Material 3
4.1 Board Layout 3
4.2 Bill of Material 6
4.3 Schematic 6
4.4 bq27425 Circuits Module Performance Specification Summary 6
5 EVM Hardware and Software Setup 7
5.1 System Requirements 7
5.2 Software Installation 7
6 Troubleshooting Unexpected Dialog Boxes 7
7 Hardware Connection 7
7.1 Connecting the bq27425 Circuit Module to a Battery Pack 7
7.2 PC Interface Connection 8
8 Operation 8
8.1 Starting the Program 8
8.2 Setting Programmable bq27425 Options 9
9 Calibrate Screen 11
9.1 To Calibrate the bq27425 11
9.2 Coulomb Counter Offset Calibration 11
9.3 Board Offset Calibration 11
9.4 Voltage Calibration 11
9.5 Temperature Calibration 11

Copyright © 2011–2013, Texas Instruments Incorporated

9.6 Pack Current Calibration 11
10 Related Documentation from Texas Instruments 12

List of Figures

1 bq27425EVM Layout – Top Silk 4
2 bq27425EVM Layout – Top Assembly 4
3 bq27425EVM Layout – Top Layer 5
4 bq27425EVM Layout – Bottom Layer 5
5 bq27425EVM Schematic 6
6 bq27425 Circuit Module Connection to Pack and System Load/Charger 8
7 DataRAM Screen 9
8 Data Flash Screen 10
9 Calibration Screen 12

List of Tables

1 Ordering Information 2
2 Bill of Materials 6
3 Performance Specification Summary 7
4 Circuit Module to EV2300/EV2400 Connections 8

1 Features

- Complete evaluation system for the bq27425 gas gauge with Impedance Track™ technology
- Populated circuit module for quick setup
- Personal computer (PC) software and interface board for easy evaluation
- Software that allows data logging for system analysis
- Ability to upgrade to the latest firmware version by flash reprogramming

1.1 Kit Contents

- bq27425 circuit module (PWR040)

This EVM is used for the evaluation of bq27425. Ensure that you visit the product Web folder at www.ti.com to properly configure the bq27425 to be evaluated.

1.2 Ordering Information

Table 1. Ordering Information

Part Number	EVM Part Number	Firmware Version (1)	Chemistry	Chemistry ID (2)	Configuration
BQ27425-G1	BQ27425EVM	v2.02 (0x0202)	4.2 V Li-ion	128	1 cell
BQ27425-G2A	BQ27425EVM-G2A	v2.05 (0x0205)	4.2 V Li-ion	128	1 cell
BQ27425-G2B	BQ27425EVM-G2B	v2.05 (0x0205)	4.3/4.35 V Li-ion	312	1 cell

(1) Using the FW_VERSION (0x0002) Control() Subcommand will help to differentiate between the BQ27425-G1 (will return 0x0202 for firmware version v2.02) and the BQ27425-G2x (will return 0x0205 for firmware version v2.05). See the BQ27425-Gx data sheet for information on Control() Subcommands.

(2) Using the CHEM_ID (0x0008) Control() Subcommand will help to differentiate between the BQ27425-G2A (will return 0x0128) and the BQ27425-G2B (will return 0x0312). Please refer to the BQ27425-G2 data sheet for information on Control() Subcommands.

Copyright © 2011–2013, Texas Instruments Incorporated

2 bq27425-Based Circuit Module

The bq27425-based circuit module is a complete and compact example solution of a bq27425 circuit for battery management. The circuit module incorporates a bq27425 battery gas gauge integrated circuit (IC) with integrated sense resistor and all other components necessary to accurately predict the capacity of 1-series Li-ion cell.

2.1 Circuit Module Connections

Contacts on the circuit module provide the following connections:

- Direct connection to the battery pack (TB2): PACK+, PACK–
- To the serial communications port (J6): SDA, SCL, and VSS
- The system load and charger connect across charger and load (TB1): CHARGER–/LOAD– and CHARGER+/LOAD+.
- Access to signal outputs (TB3): BIN, and GPOUT

2.2 Pin Description

Pin Name	Description
PACK+	Pack positive terminal
PACK–	Pack negative terminal
SDA	I2C™ communication data line
SCL	I2C communication clock line
VSS	Signal return for communication line, shared with charger and ground
CHG+/LOAD+	High potential of load or charger connection
CHG–/LOAD–	Low potential of load or charger connection (system VSS)
BIN	Battery insertion detection input
GPOUT	General purpose output

3 bq27425 Circuit Module Schematic

3.1 Schematic

The schematic follows the bill of materials in this user's guide.

4 Circuits Module Physical Layout and Bill of Material

This section contains the board layout, bill of materials, and assembly drawings for the bq27425 circuit module.

4.1 Board Layout

This section shows the printed-circuit board (PCB) layers (Figure 1 through Figure 4), and assembly drawing for the bq27425 module.

Copyright © 2011–2013, Texas Instruments Incorporated

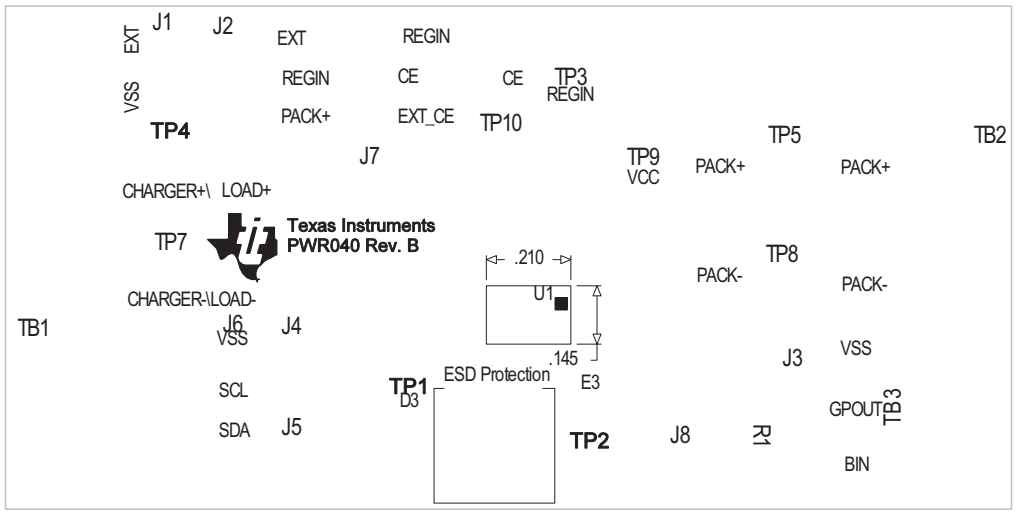


Figure 1. bq27425EVM Layout – Top Silk

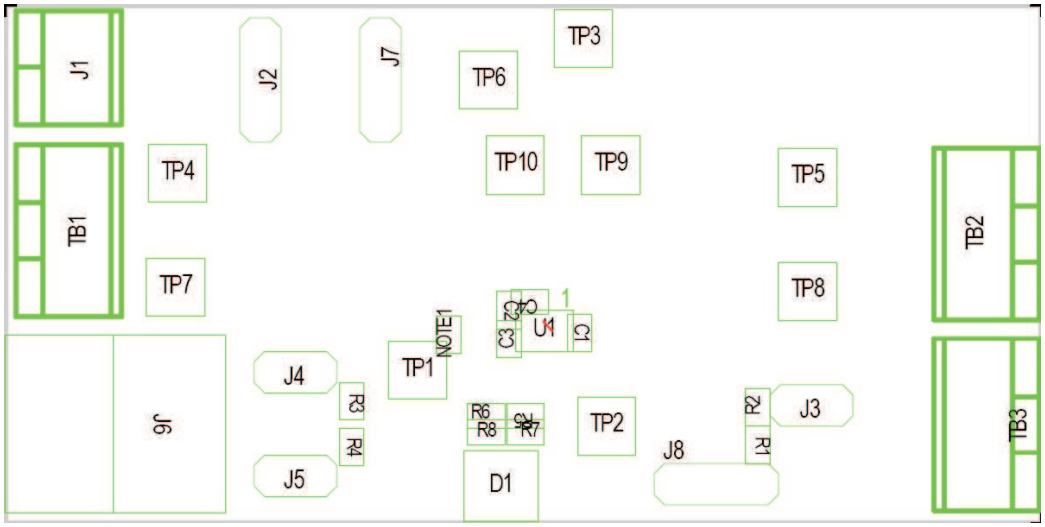


Figure 2. bq27425EVM Layout – Top Assembly

Copyright © 2011–2013, Texas Instruments Incorporated

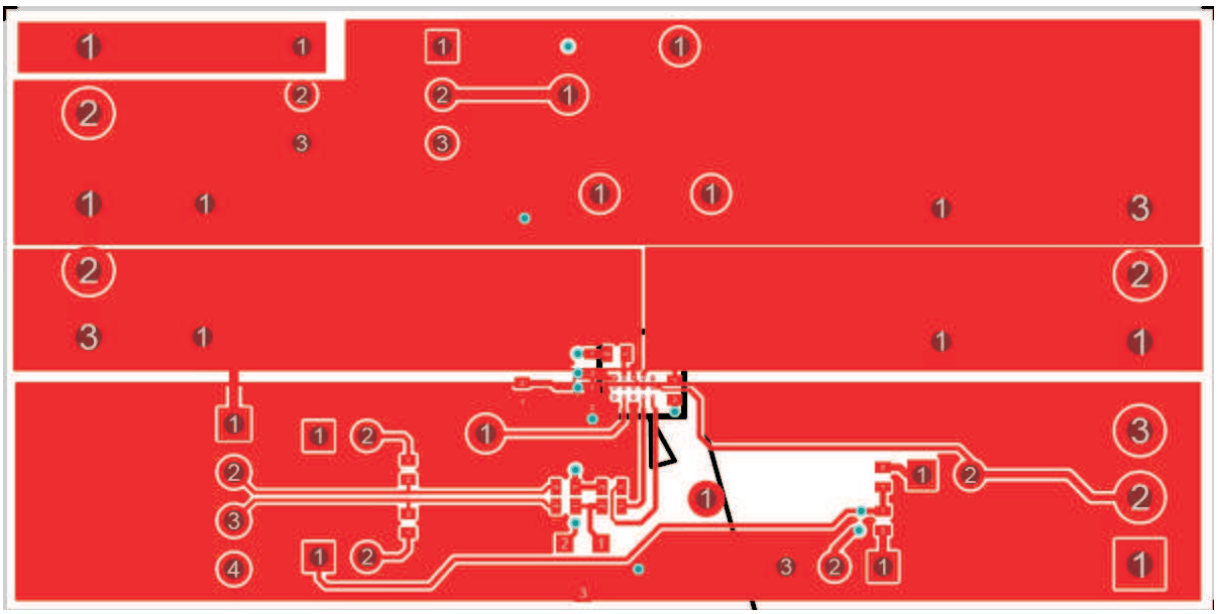


Figure 3. bq27425EVM Layout – Top Layer

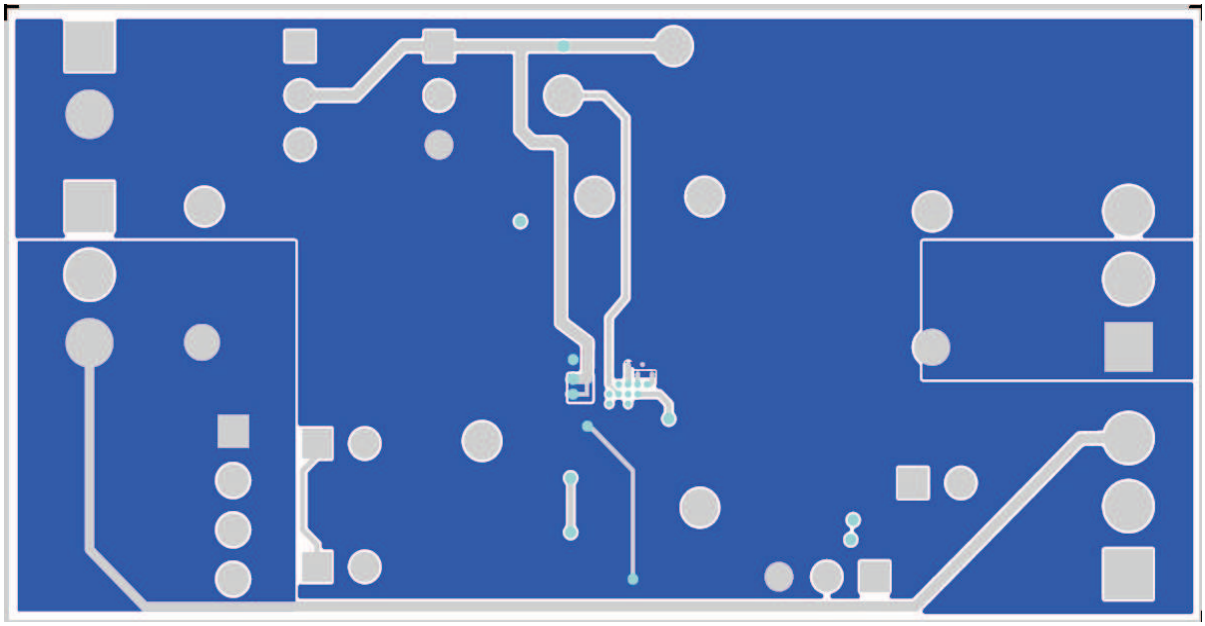


Figure 4. bq27425EVM Layout – Bottom Layer

Copyright © 2011–2013, Texas Instruments Incorporated

4.2 Bill of Material

Table 2. Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	Mfr
3	C1, C2, C3	0.1uF	Capacitor, Ceramic, 10V, X5R, 10%	0402	GRM155R61A104KA01D	Murata
1	C4	1uF	Capacitor, Ceramic, 6.3V, X5R, 10%	0402	GRM155R60J105KE19D	Murata
1	D1	AZ23C5V6-7-F	Diode, Dual, Zener, 5.6 V, 300mW	SOT23	AZ23C5V6-7-F	Diodes
1	J1	ED555/2DS	Terminal Block, 2-pin, 6-A, 3.5mm	0.27 x 0.25 inch	ED555/2DS	OST
3	J2, J7, J8	PEC36SAAN	Header, Male 3-pin, 100mil spacing	0.100 inch x 3	PEC36SAAN	Sullins
3	J3, J4, J5	PEC02SAAN	Header, Male 2-pin, 100mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
1	J6	22-05-3041	Header, Friction Lock Ass'y, 4-pin Right Angle	0.400 x 0.500	22-05-3041	Molex
1	R1	1.8M	Resistor, Chip, 1/16-W, 5%	0402	Std	Std
1	R2	100k	Resistor, Chip, 1/16-W, 5%	0402	Std	Std
2	R3, R4	10k	Resistor, Chip, 1/16-W, 5%	0402	Std	Std
4	R5, R6, R7, R8	100	Resistor, Chip, 1/16-W, 5%	0402	Std	Std
3	TB1, TB2, TB3	ED555/3DS	Terminal Block, 3-pin, 6-A, 3.5mm	0.41 x 0.25 inch	ED555/3DS	OST
7	TP1, TP2, TP4, TP5, TP6, TP9, TP10	5000	Test Point, Red, Thru Hole Color Keyed	0.100 x 0.100 inch	5000	Keystone
3	TP3, TP7, TP8	5001	Test Point, Black, Thru Hole Color Keyed	0.100 x 0.100 inch	5001	Keystone
1	U1	BQ27425YZF	IC, Battery Monitor and Data Logger	DSBGA	BQ27425YZF	TI

4.3 Schematic

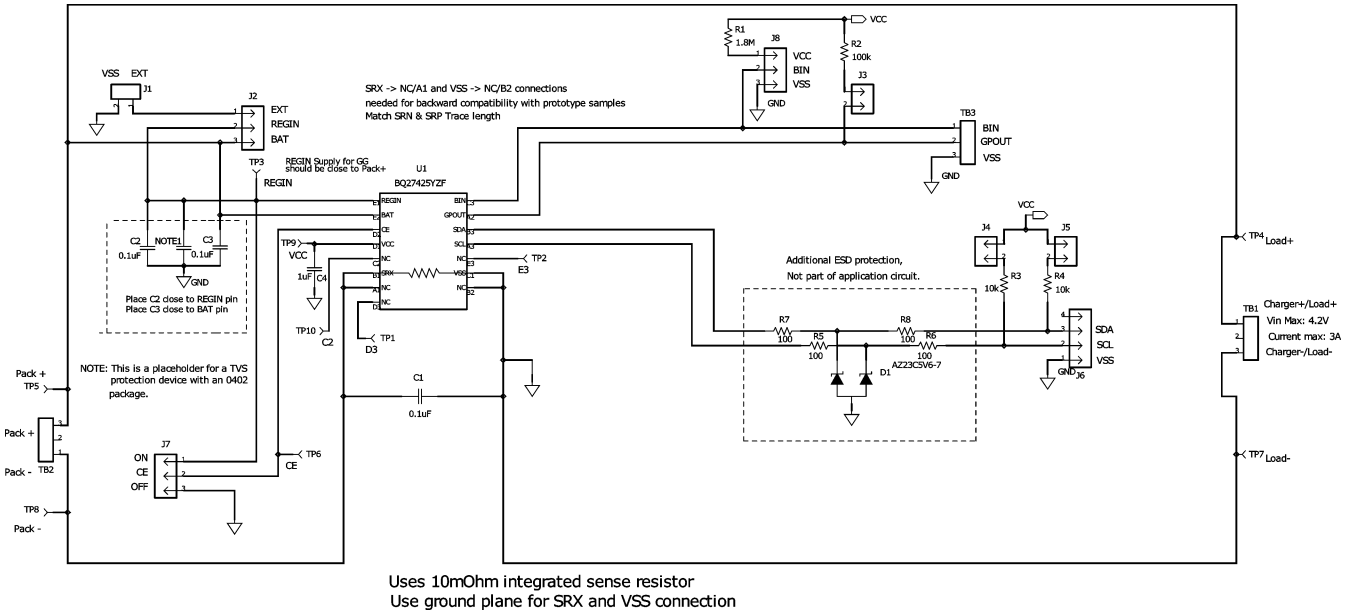


Figure 5. bq27425EVM Schematic

4.4 bq27425 Circuits Module Performance Specification Summary

This section summarizes the performance specifications of the bq27425 circuit module.

Copyright © 2011–2013, Texas Instruments Incorporated

Table 3. Performance Specification Summary

Specification	Min	Typ	Max	Units
Input voltage Pack+ to Pack–	2.7	3.6	4.3	V
Charge and discharge current	0	1	2.5	A

5 EVM Hardware and Software Setup

This section describes how to install the bq27425EVM PC software and how to connect the different components of the EVM.

5.1 System Requirements

The bq27425EVSW software requires Windows 2000 or Windows XP. Drivers for Windows 98SE are provided, but Microsoft™ no longer supports Windows 98; therefore, Windows 98 can have issues with USB driver support. The EV2300 USB drivers have been tested for Windows 98SE, but no assurance is made for problem-free operation with specific system configurations.

5.2 Software Installation

Find the latest software version in the bq27425 tool folder on power.ti.com. Make a search by Part Number for bq27425 to access the tool folder. Use the following steps to install the bq27425EVSW software:

1. Ensure that the EV2300 or EV2400 is not connected to the personal computer (PC) through the USB cable before starting this procedure.
2. Open the archive containing the installation package, and copy its contents into a temporary directory.
3. Open the software file that was downloaded from the TI Web site.
4. Follow the instructions on screen until completing the software installation.
5. Before starting the evaluation software, connect the EV2300 or EV2400 to the computer using the USB cable.
6. If EV2300 is connected, wait until system prompt “new hardware found” appears. Choose “select location manually”, and use the “browse” button to point to subdirectory TIUSBWin2K-XP-1.
7. Answer “continue” to the warning that drivers are not certified with Microsoft™.
8. If EV2300 is connected, after previous installation finishes, another system prompt "new hardware found" appears. Repeat steps 1 through 5, but specify the directory as TIUSBWin2K-XP-2.
9. Answer "continue" to the warning that drivers are not certified with Microsoft. Driver installation is now finished.
10. For EV2400, the driver should be installed along with software installation.

6 Troubleshooting Unexpected Dialog Boxes

The user that is downloading the files must be logged in as the administrator. The driver is not signed, so the administrator must allow installation of unsigned drivers in the operating system policy.

7 Hardware Connection

The bq27425 evaluation system comprises three hardware components: the bq27425 circuit module, the EV2300 or EV2400 PC interface board, and the PC.

7.1 Connecting the bq27425 Circuit Module to a Battery Pack

Figure 6 shows how to connect the bq27425 circuit module to the cells and system load/charger.

Copyright © 2011–2013, Texas Instruments Incorporated

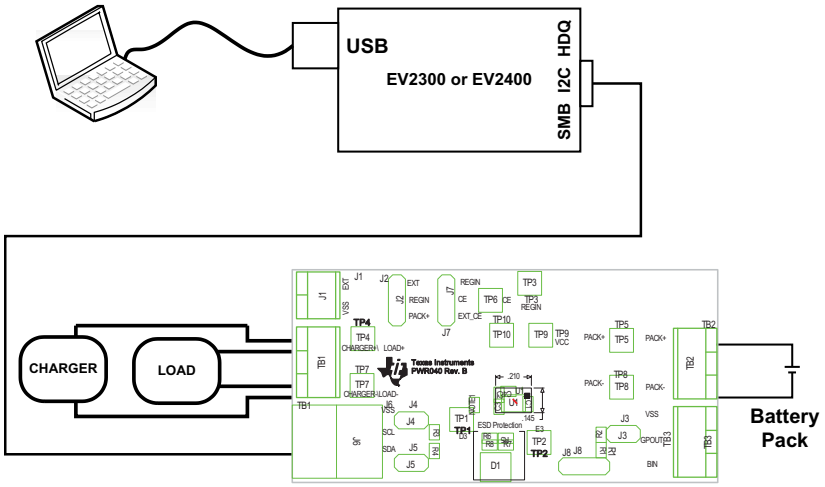


Figure 6. bq27425 Circuit Module Connection to Pack and System Load/Charger

7.2 PC Interface Connection

The following steps configure the hardware for interface to the PC.

1. Connect the bq27425-based EVM to the EV2300 or EV2400 using wire leads as shown in Table 4.
2. Connect the PC USB cable to the EV2300 or EV2400 and the PC USB port.

Table 4. Circuit Module to EV2300/EV2400 Connections

bq27425EVM	EV2300/EV2400
SDA	SDA
SCL	SCL
VSS	GND/VSS

The bq27425EVM is now set up for operation.

8 Operation

This section details the operation of the bq27425 EVSW software.

8.1 Starting the Program

Run bq27425 EVSW from the Start | Programs | Texas Instruments | bq Evaluation Software menu sequence. The DataRAM screen (Figure 7) appears. Data begins to appear once the <Refresh> (single time scan) button is clicked, or when the <Keep Scanning> check box is checked. To disable the scan feature, deselect <Keep Scanning>.

The continuous scanning period can be set with the | Options | and | Set Scan Interval | menu selections. The range for this interval is 0 ms to 65,535 ms. Only items that are selected for scanning are scanned within this period.

The bq27425 EVSW provides a logging function which logs the values that were last scanned by EVSW. To enable this function, select the *Start Logging* button; this causes the *Keep Scanning* button to be selected. When logging is stopped, the Keep Scanning button is still selected and has to be manually unchecked.

The logging intervals are specified under the | Options | menu with the maximum value of 65,535 ms. The *Log* interval cannot be smaller than the scan interval because this results in the same value being logged at least twice.

Copyright © 2011–2013, Texas Instruments Incorporated

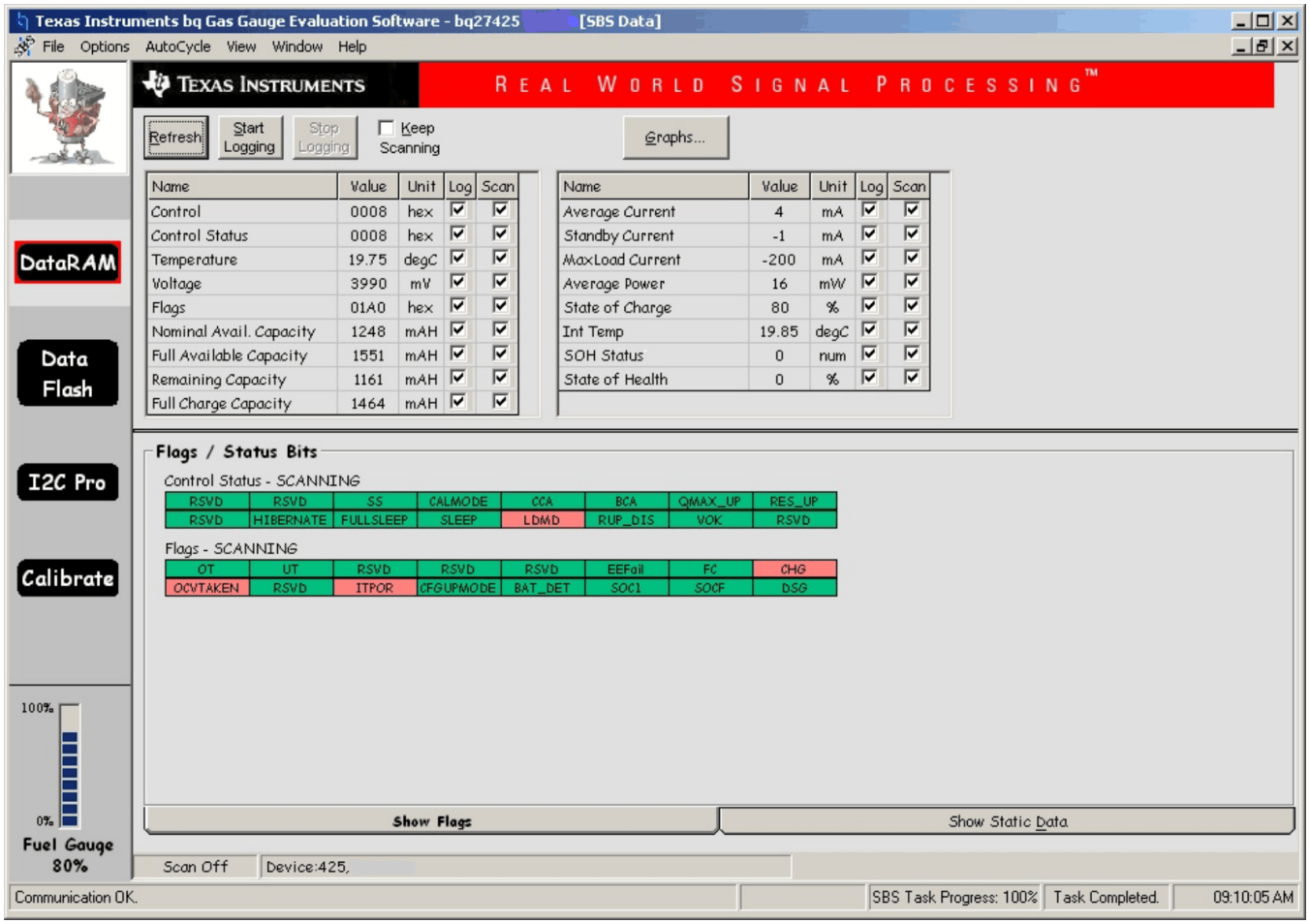


Figure 7. DataRAM Screen

This screen (Figure 7) shows the RAM data set. Additional Flag and Status data can be viewed at the bottom of the DataRAM screen.

Dragging the splitter bar (line that separates the Flags/Status data from Data Ram register values) changes the height of the Flags/Status Data display. Selecting | View |, then | Auto Arrange | returns the splitter bar to its original location.

8.2 Setting Programmable bq27425 Options

The bq27425 data flash comes configured per the default settings detailed in the bq27425 data sheet. Ensure that the settings are correctly changed to match the pack and application for the bq27425 solution being evaluated.

IMPORTANT: The correct setting of these options is essential to get the best performance. The settings can be configured using the Data Flash screen (Figure 8).

Copyright © 2011–2013, Texas Instruments Incorporated

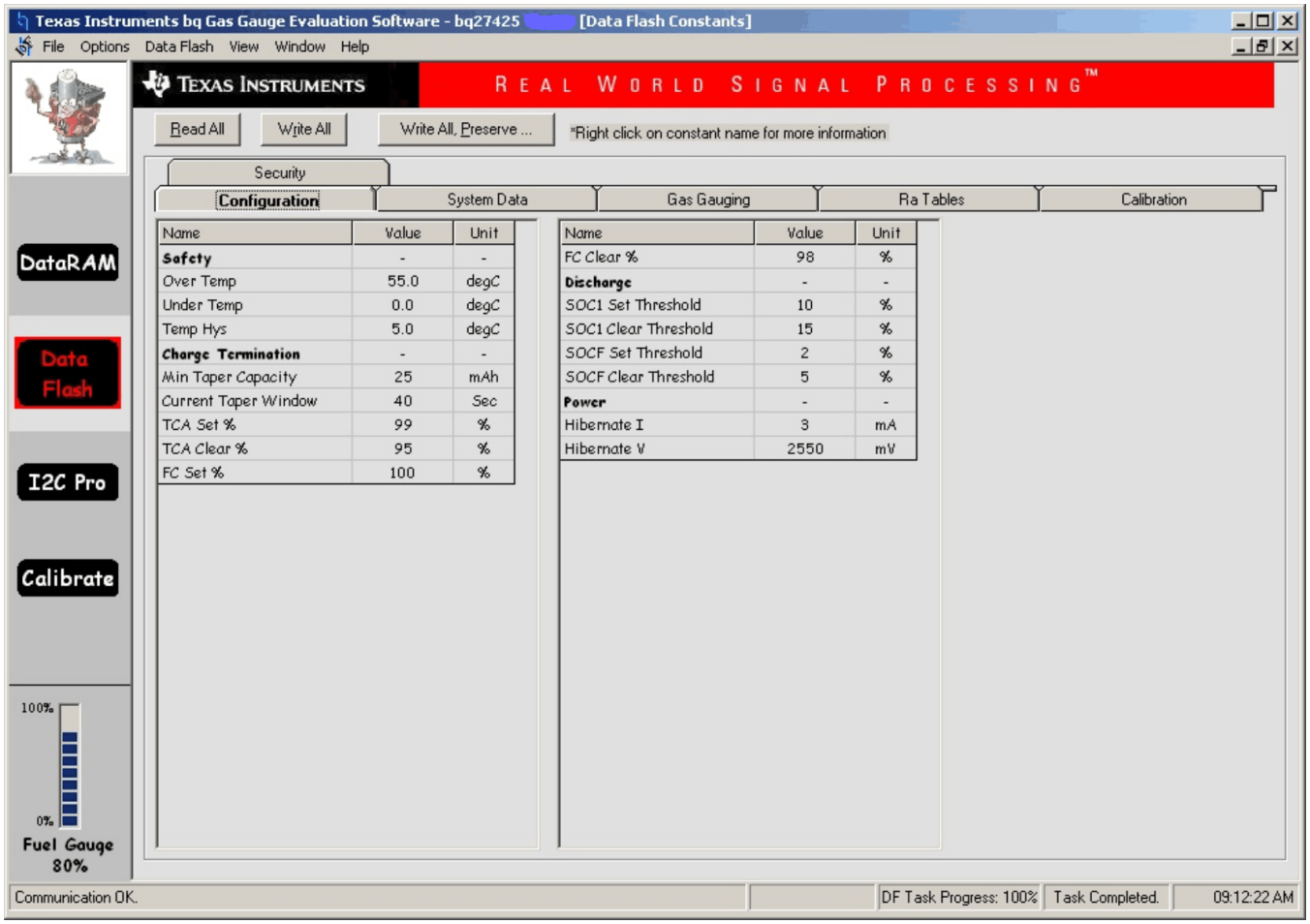


Figure 8. Data Flash Screen

To read all the data from the bq27425 data flash, click on menu option | Data Flash | Read All |.

To write to a data flash location, please make sure that the CFGUPMODE register in flash register is set by sending the subcommand 0x13. Click on the desired location, enter the data and press <Enter>, which writes the entire tab of flash data, or select menu option | Data Flash | Write All |. The data flash must be read before any writes are performed to avoid any incorrect data being written to the device. Some of these values are stored in RAM so a POR or power reset will change them back to the default value.

The | File | Special Export | menu options allows the data flash to be exported, but it configures the exported data flash to a learned state ready for mass production use.

The data-flash configuration can be saved to a file by selecting | File | Export | and entering a file name. A data-flash file also can be retrieved in this way, imported, and written to the bq27425 using the | Write All |button.

The module calibration data is also held in the bq27425 data flash.

The bq27425 allows for an automatic data-flash export function, similar to the DataRAM logging function. This feature, when selected via | Options | Auto Export |, exports Data Flash to a sequential series of files named as *FilenameNNNNN.gg* where N = a decimal number from 0 to 9.

The AutoExport interval is set under the | Options menu | with a minimum value of 15 s. The AutoExport filename also is set under the | Options menu |.

When a check is next to | AutoExport |, the AutoExport is in progress. The same menu selection is used to turn on/off AutoExport.

Copyright © 2011–2013, Texas Instruments Incorporated

If the Data Flash screen is blank, then the bq27425 that is being used may not be supported by the bqEVSW version that is being used. An bqEVSW upgrade may be required.

9 Calibrate Screen

To ensure proper calibration, perform the following steps. These steps may or may not be required, depending on the type of calibration being performed. Only one calibration item can be selected and calibrated at once.

9.1 To Calibrate the bq27425

1. Select the types of calibration to be performed (see Figure 9).
2. Enter the measured values for the types selected.
3. Press the button to calibrate.

9.2 Coulomb Counter Offset Calibration

This performs the internal calibration of the coulomb counter input offset.

9.3 Board Offset Calibration

This performs the offset calibration for the current offset of the board.

It is expected that no current is flowing through the sense resistor while performing this calibration step.

1. Remove load and short PACK– to LOAD–.
2. Press the Calibrate Board Offset button.

9.4 Voltage Calibration

Voltage calibration usually is not required. If needed, follow these steps:

1. Measure the voltage across Pack+ and Pack–.
2. Type the voltage value in mV into *Enter Actual Voltage*.
3. Press the *Calibrate Part as indicated below* button.

9.5 Temperature Calibration

Temperature calibration usually is not required. If needed, follow these steps:

1. Measure the temperature for PACK.
2. Type the temperature value into *Enter Actual Temperature*.
3. Select if the temperature sensor to calibrate is the internal or external.
4. Press the *Calibrate Voltage and Current as indicated below* button.

9.6 Pack Current Calibration

1. Connect a load to LOAD– and LOAD+ that draws approximately 1 A, or connect a current source to LOAD– and Pack–.
2. Measure the current and type value into *Enter Actual Current* using (–) for current in discharge direction.
3. Press the *Calibrate Pack Current as indicated below* button.

Copyright © 2011–2013, Texas Instruments Incorporated

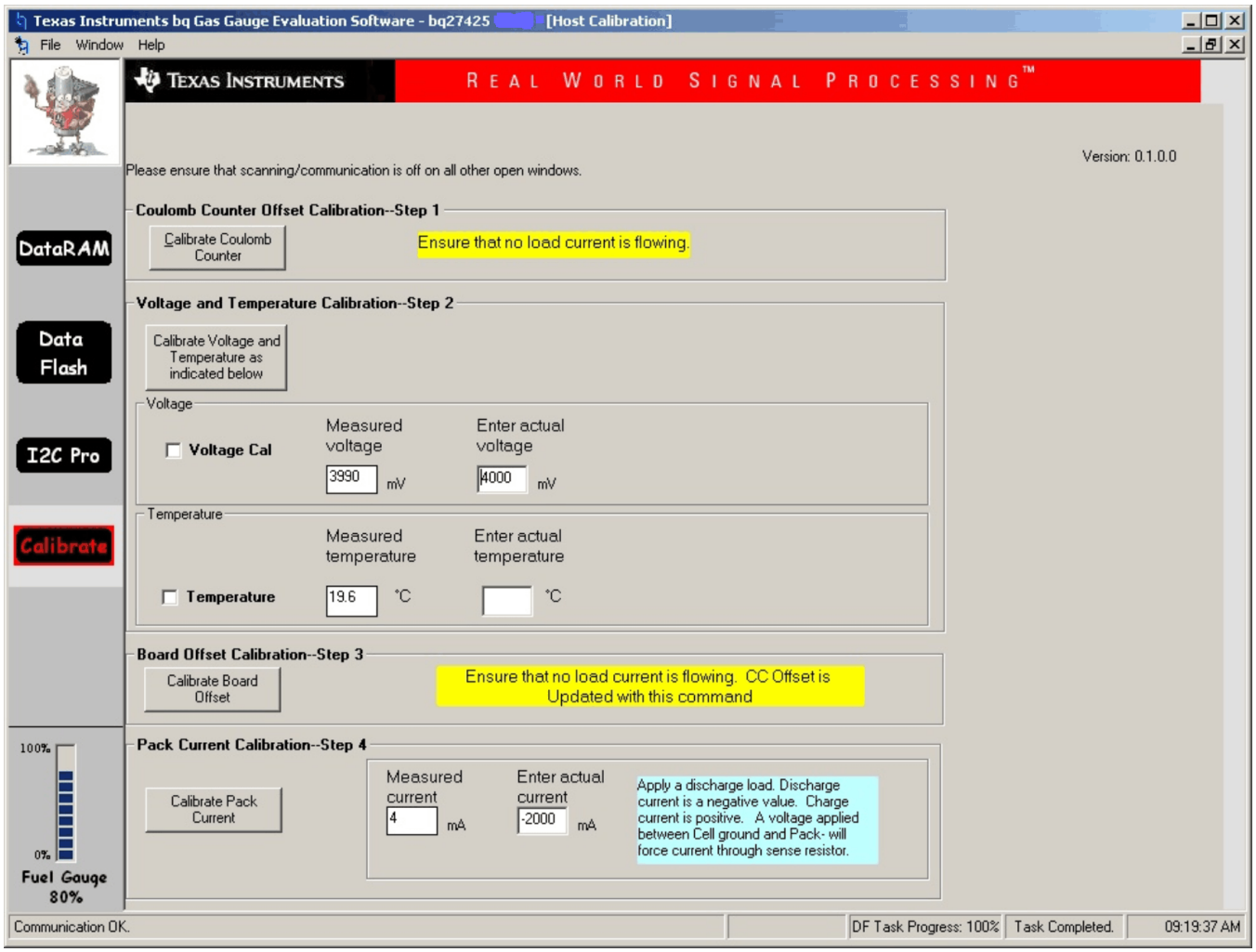


Figure 9. Calibration Screen

10 Related Documentation from Texas Instruments

To obtain a copy of any of the following TI documents, call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580. When ordering, identify this document by its title and literature number. Updated documents also can be obtained through the TI Web site at www.ti.com .

1. *bq27425, System-Side Impedance Track™ Fuel Gauge with Integrated Sense Resistor* data sheet (SLUSAI6)

Copyright © 2011–2013, Texas Instruments Incorporated

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 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

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
Copyright © 2012, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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 Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated