bq27220EVM-744 Evaluation Module

This evaluation module (EVM) is a complete evaluation system for the bq27220. This EVM includes one bq27220 circuit module, an external current sense resistor. A separate orderable EV2300 or EV2400 PC interface board for gas gauge along with a PC USB cable, and Microsoft® Windows® based PC software is needed when using this EVM. The circuit module includes one bq27220 integrated circuit and all other onboard components necessary to monitor and predict capacity for a system-side or removable battery pack fuel-gauge solution. With the EV2300 or EV2400, users can:

- Read the bq27220 data registers
- Program the chipset for different configurations
- Log cycling data for further evaluation
- Evaluate the overall functionality under different charge and discharge conditions

Contents

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List of Tables

1   Features

This EVM has the following features:

- Complete evaluation system for the bq27220 CEDV gas gauge
- Populated circuit module for quick setup
- Personal computer (PC) software and interface board for easy evaluation
- Software allows data logging for system analysis

1.1   Kit Contents

This EVM kit contains the following:

- bq27220 circuit module (PWR744)

This EVM is used for the evaluation of the bq27220 device. Visit the product web folder at www.ti.com to properly configure the bq27220.

1.2   Ordering Information

Table 1 lists the EVM ordering information.

Table 1. Ordering Information

Part Number	EVM Part Number	Configuration	Chemistry
bq27220	bq27220EVM-744	1-series cell	Li-ion

1.3   bq27220 Circuits Module Performance Specification Summary

Table 2 summarizes the performance specifications of the bq27220 circuit module.

Table 2. Performance Specification Summary

Specification	Min	Typ	Max	Units
Input Voltage Pack+ to Pack–	2.8	3.6	4.5	V

2 bq27220EVM Quick Start Guide

This section provides the step-by-step procedures required to take a new EVM and configure it for operation in a laboratory environment.

2.1 Items Needed for EVM Setup and Evaluation

The following items are required for setup and evaluation of the EVM:

- bq27220 circuit module
- EV2300 or EV2400 communications interface adapter
- USB cable to the communications interface adapter to the computer
- Computer setup with Windows XP or higher operating system
- Access to the internet to download bqStudio software setup program
- DC power supply capable of supplying 4.5 V and 2 A. (Constant current and constant voltage capability is desirable.)

2.2 System Requirements

The bqStudio software requires Windows XP or later. Using later versions of the Windows operating system can cause issues with the 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.

2.3 Software Installation

Find the latest software version of bqStudio on http://www.ti.com/tool/bqstudio. Search by part number for bq27220 to access the tool folder for the device. Use the following steps to install the bq27220 bqStudio 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 bqStudio installer file that was downloaded from the TI Web site.
4. Follow the on-screen instructions 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 the system prompt *New Hardware Found* appears. Choose *Select Location Manually*, and use the **Browse** button to point to the TIUSBWin2K-XP-1 subdirectory.
7. Answer **Continue** to the warning that drivers are not certified with Microsoft.
8. If the EV2300 is connected, after the 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 the EV2400, the driver should be installed along with software installation.

2.4 Troubleshooting Unexpected Dialog Boxes

Log in as administrator before downloading the files. The driver is not signed, so the administrator must allow installation of unsigned drivers in the operating system. If using Windows 7, install the software with administrator privileges.

2.5 EVM Connections

The bq27220 evaluation system comprises three hardware components: the bq27220 circuit module, the EV2300 or EV2400 PC interface board, and the PC.

2.5.1 Connecting the bq27220 Circuit Module to a Battery Pack

Figure 1 illustrates the device connection to a battery and system load and charger.
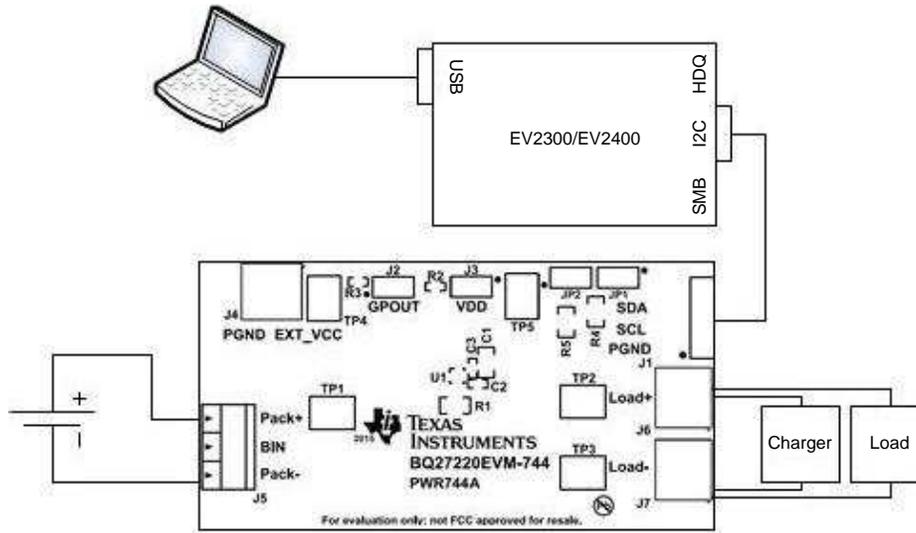
Figure 1. bq27220 Circuit Module Connection to Pack and System Load/Charger

2.5.2 Circuit Module Connections

Contacts on the circuit module provide the following connections:
- Direct connection to the battery pack (J6): PACK+/PACK–
- Charger and load connection (J7 and J8): LOAD+ and LOAD–
- I2C communication port (J5): SDA, SCL, and VSS
- Signal outputs (J3): SOC_INT, SDQ and BAT_GD
- External power connection (J1): EXT

2.5.3 Pin Description

Table 3 lists the EVM pins and their descriptions.

Table 3. EVM Pins Descriptions

Pin Name	Description
PACK+	Pack positive terminal
PACK–	Pack negative terminal
TS	Pack thermistor connection
SDA	I2C communication data line
SCL	I2C communication clock line
BAT_GD	Battery Good push-pull indicator output
SOC_INT	SOC state interrupts output
SDQ	Communication interface to authentication ID IC using SDQ protocol
CE	Chip enable
EXT	External supply connection
LOAD+	High potential of load or charger connection
LOAD–	Low potential of load or charger connection

2.6 PC Interface Connection

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

1. Connect the bq27220-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 or EV2400 Connections

bq27220EVM	EV2300	EV2400
SDA	SDA	SDA
SCL	SCL	SCL
VSS	VSS	VSS
J9	Short	Open
J10	Short	Open

The bq27220EVM-744 is now set up for operation.

3 Operation

This section details the operation of the bq27220 bqStudio software.

3.1 *Starting the Program*

With the EV2300 or EV2400 and the bq27220EVM connected to the computer, run bqStudio from the Desktop or installation directory. The window consists of a tools panel at the top and other child windows that can be hidden, docked in various positions, or allowed to float as separate windows. When bqStudio first starts up, the *DashBoard*, the *Registers*, and *Commands* windows should be open (Figure 2). Additional windows can be added by clicking the corresponding icons in the tools panel at the top of the main window.

Clicking the **Scan** (continuous scan) or **Refresh** (single time scan) buttons updates the data in the *Registers* and *Data Memory* windows.

The logging function in bqStudio logs selected Data Registers last received from the bq27220. Enable this function by clicking the **Start Log** button. The default elapsed interval is 4000 milliseconds, to change this interval, go to *Windows*, select *Preferences*, choose *Registers*, and change the Scan/Log Interval from 4000 to 1000 milliseconds. There is no need to log faster than 1 second as the gauge will not update the registers faster than 1 second.
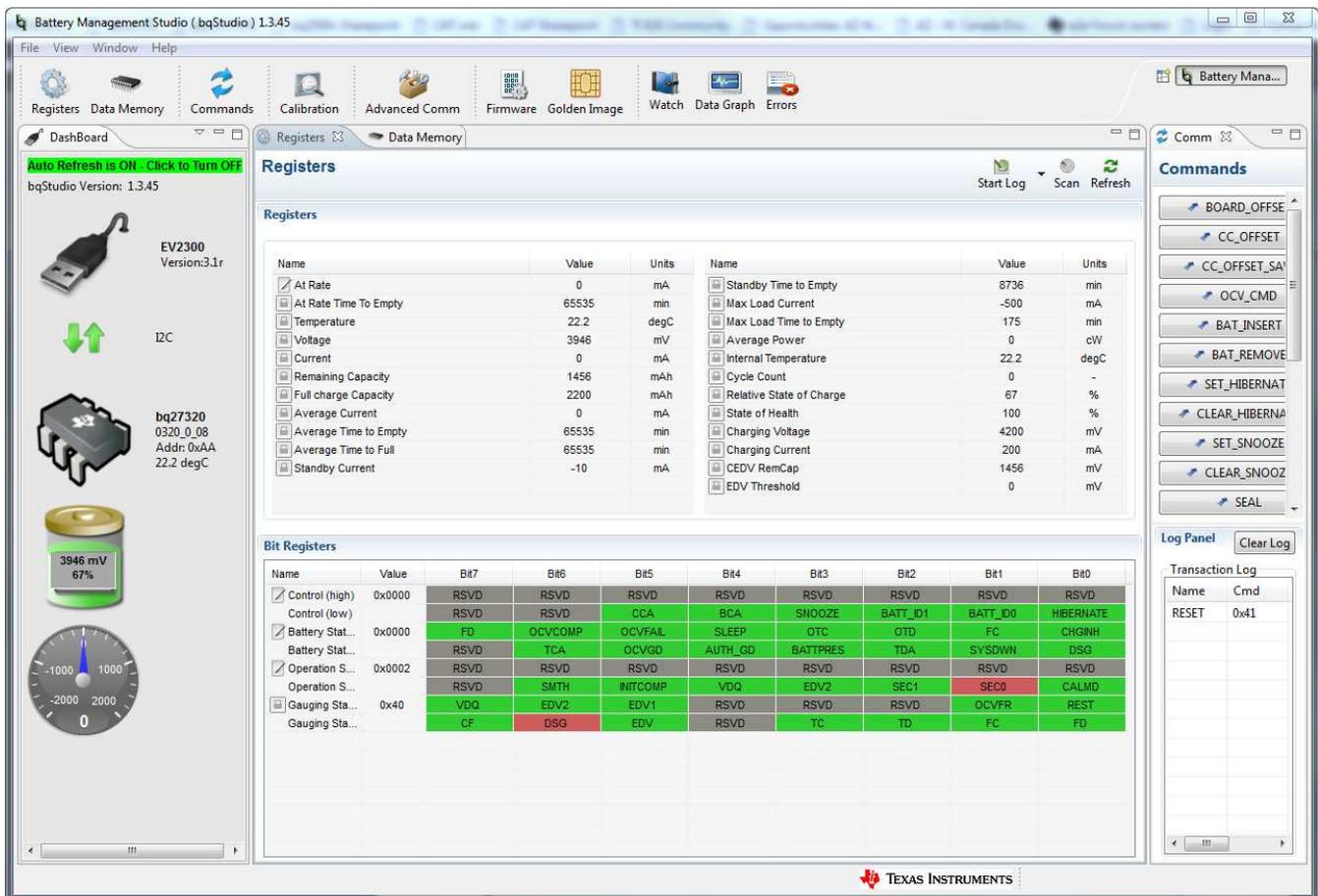
Figure 2. Registers Screen

3.2   *Setting Programmable bq27220 Options*

The bq27220 comes configured per the default settings detailed in the bq27220 technical reference manual (TRM) (SLUUBE6). Ensure that the settings are correctly changed to match pack and application for the bq27220 solution being evaluated.

IMPORTANT: The correct setting of these options is essential for the best performance. Configure the settings using the *Data Memory* window (Figure 3).
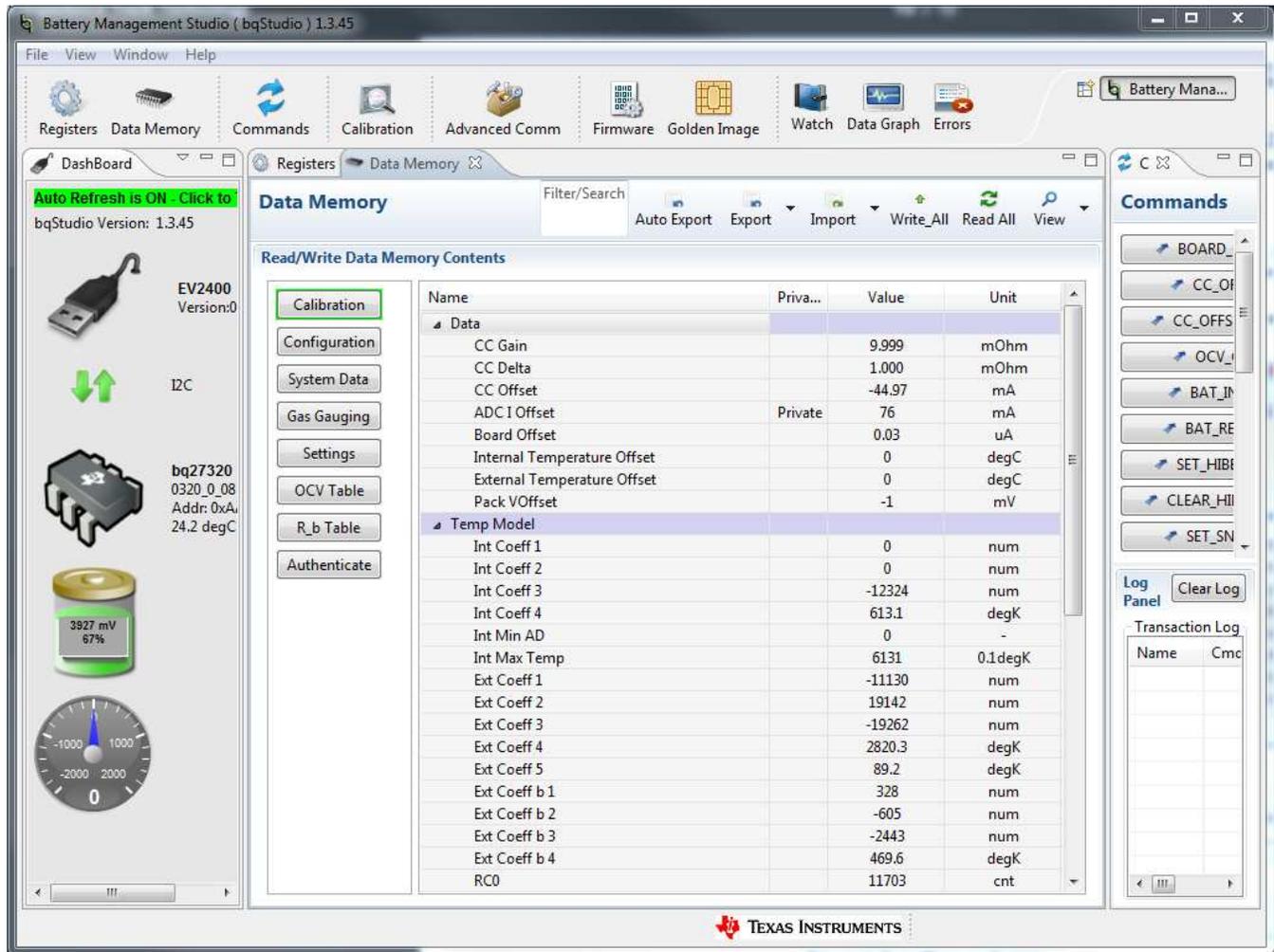
Figure 3. Data Memory Screen

To read all the data from the bq27220 non-volatile flash memory, click on the *Read All* button on the *Data Memory* window. Make sure the device is not sealed and in full access to read and write to the data memory. Clicking on a parameter is the first step for parameter updates and a window pops up providing details on the selected parameter. Next, enter the value in the value textbox and press **Enter**. After pressing **Enter**, bqStudio updates the selected parameter. Click the *Import* button in the *Data Memory* window to import an entire configuration from a specified *.gg.csv file.

Save the configuration to a file by clicking the **Export** button in the *Data Memory* window and entering a file name. The configuration is saved to a *.gg.csv file. The module calibration data is also held in the bq27220 data memory. If the *Gauge Dashboard* is not displaying any information, then the bq27220 may not be supported by the bqStudio version being used: a bqStudio upgrade may be required.

3.3 *Calibration*

The bq27220EVM must be calibrated to ensure accurate value reporting. Calibrate the EVM in the *Calibration* window in bqStudio (Figure 4).
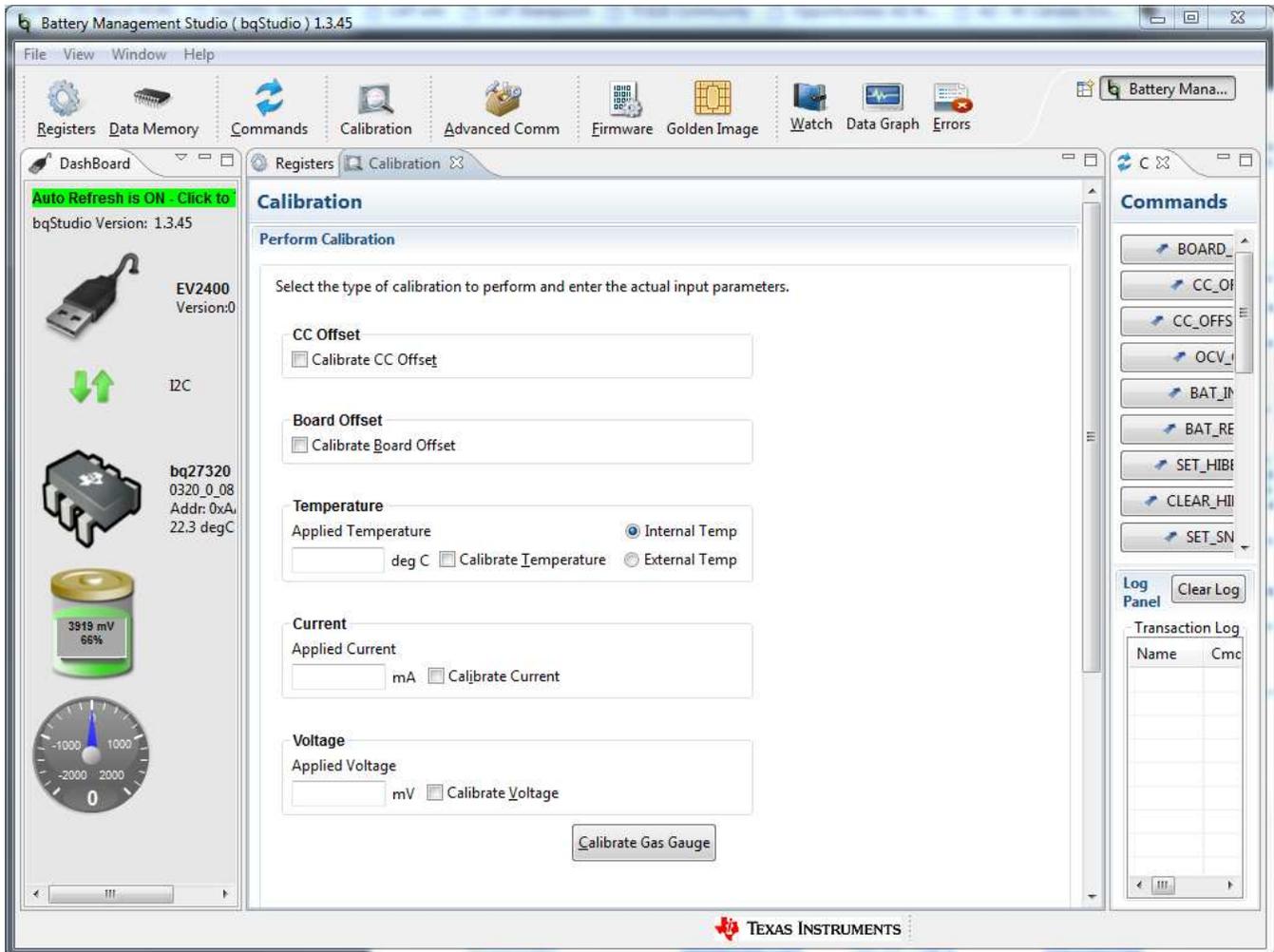
Figure 4. Calibration Screen

Calibration consists of the following:

- CC Offset/Board Offset: Check **Calibrate CC Offset** and **Calibrate Board Offset**, then click the **Calibrate Gas Gauge** button to calibrate the Coulomb counter and board offsets. Ensure no current is flowing through the sense resistor during these steps. After a successful calibration, a green check mark shows next to the **Calibrate Gas Gauge** button.
- Current: Connect a 2-A load to LOAD+/LOAD– or a current source to LOAD–/PACK–. Ensure the measured current reported is negative, or else reverse the connections. Check **Calibrate Current** and enter the current into the textbox then click the **Calibrate Gas Gauge** button.
- Voltage: Apply a known DC voltage to PACK+/PACK– with no current flowing through the sense resistor. Check **Calibrate Voltage** and enter the voltage into the textbox then click the **Calibrate Gas Gauge** button.

3.4   Setting the CEDV Parameters

TI provides an online gauging parameter calculator (GPC) for CEDV gauges tool (www.ti.com/tool/GPCCEDV) to evaluate the bq27220. After programming the design parameters to the gauge, use the EVM to obtain the experimental data needed to calculate the CEDV coefficients.
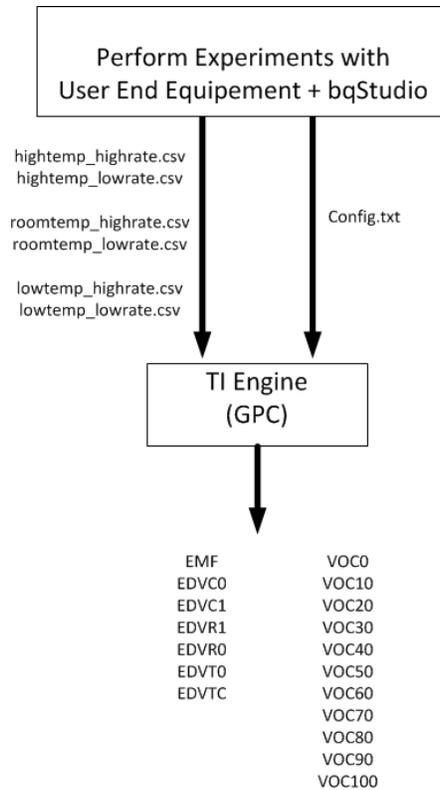
Figure 5. CEDV Coefficients Calculation Flow

The folllowing items are required:

- bqStudio software
- bq27220EVM-744
- Power supply able to source/sink current. For example, a gauge development kit (GDK) or a Keithley sourcemeter. Alternatively, use a regular DC power supply and electronic load.

Refer to *Simple Guide to CEDV Data Collection for Gauging Parameter Calculator (GPC)* (SLUUB45) for a detailed explanation of the CEDV coefficients data collection process and GPC tool configuration.

4   Circuit Module Physical Layout, Bill of Materials and Schematic

This section contains the board layout, bill of materials, and schematic for the bq27220 circuit module.

4.1   Board Layout

This section shows the assembly drawing and printed circuit board (PCB) layers for the bq27220 module.
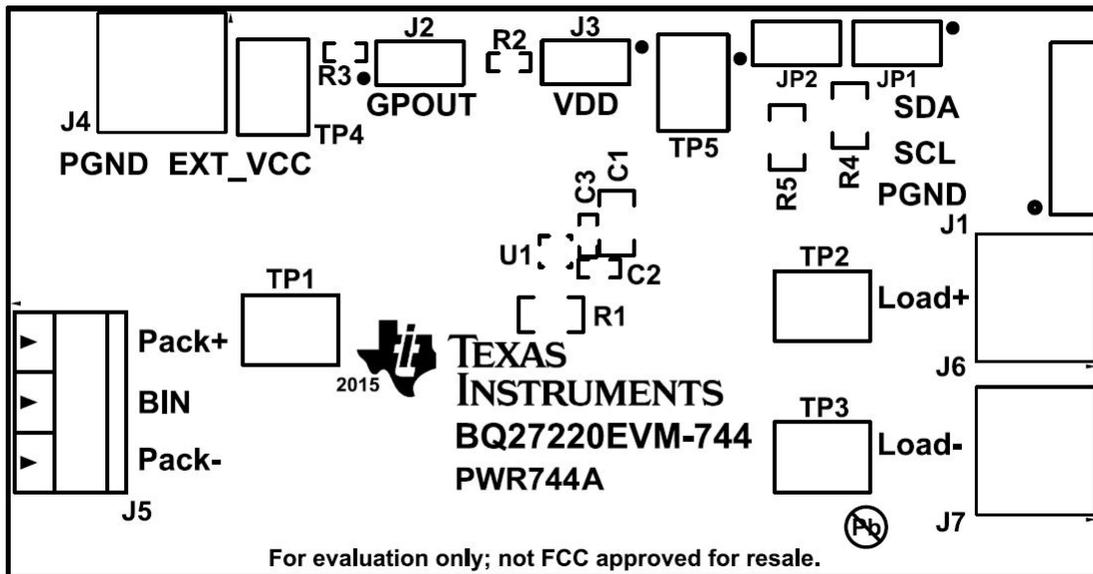
Figure 6. Top Silk Screen
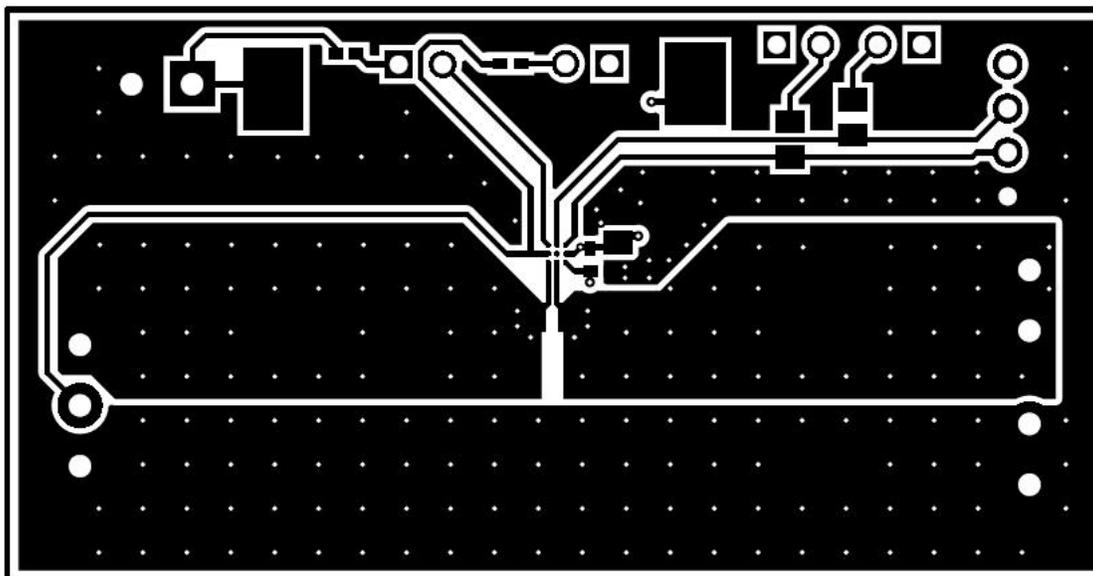
Figure 7. Top Layer
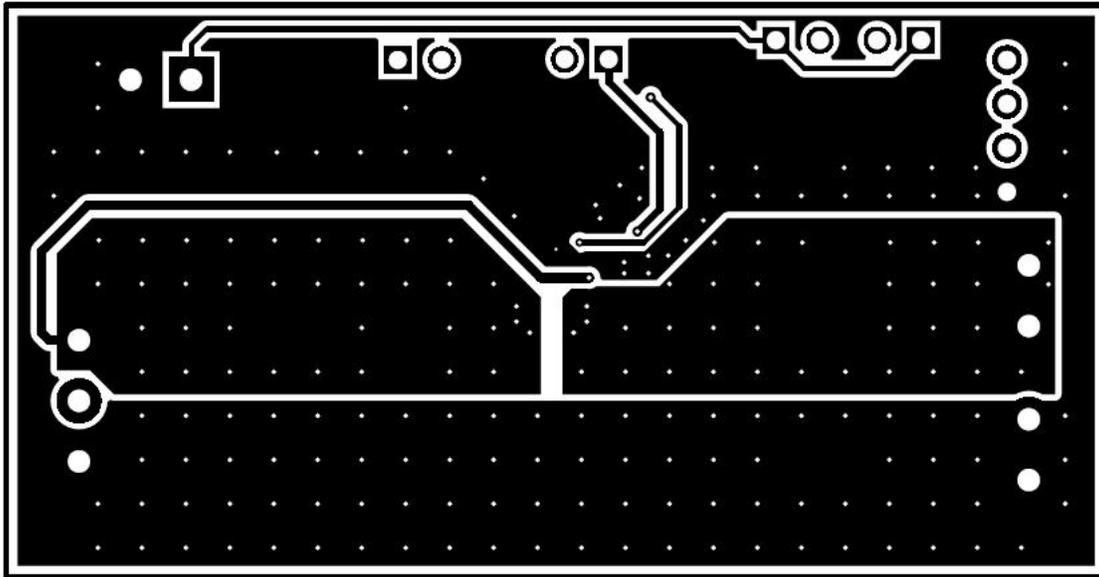
Figure 8. Bottom Layer

4.2 Bill of Materials

Table 5 lists the BOM for this EVM.

Table 5. bq27220EVM-744 Bill of Materials

| Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB	1		Printed Circuit Board		PWR744	Any	-	-
C1	1	2.2uF	CAP, CERM, 2.2 µF, 16 V, +/- 10%, X5R, 0805	0805	0805YD225KAT2A	AVX		
C2	1	1uF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0402	0402	C1005X5R1C105K050BC	TDK		
C3	1	0.47uF	CAP, CERM, 0.47 µF, 6.3 V, +/- 10%, X5R, 0402	0402	GRM155R60J474KE19D	Murata		
J1	1		Header (friction lock), 100mil, 4x1, R/A, TH	4x1 R/A Header	22-05-3041	Molex		
J2, J3, JP1, JP2	4		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions		
J4, J6, J7	3		Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	7.0x8.2x6.5mm	ED555/2DS	On-Shore Technology		
J5	1		Terminal Block, 6A, 3.5mm Pitch, 3-Pos, TH	10.5x8.2x6.5mm	ED555/3DS	On-Shore Technology		
R1	1	0.01	RES, 0.01, 1%, 0.25 W, 0805	0805	WSL0805R0100FEA18	Vishay-Dale		
R2	1	1.8Meg	RES, 1.8Meg ohm, 5%, 0.063W, 0402	0402	CRCW04021M80JNED	Vishay-Dale		
R3	1	5.1k	RES, 5.1k ohm, 5%, 0.063W, 0402	0402	CRCW04025K10JNED	Vishay-Dale		
R4, R5	2	10.0k	RES, 10.0 k, 1%, 0.125 W, 0805	0805	CRCW080510K0FKEA	Vishay-Dale		
TP1, TP2, TP3, TP4, TP5	5	SMT	Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone		
U1	1		System-Side CEDV Fuel Gauge, YZF0009-C01	YZF0009-C01	BQ27220YZFR	Texas Instruments	BQ27220YZFT	Texas Instruments
		Notes:	Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.					

4.3 *Schematic*

Figure 9 illustrates the schematic for the EVM.

**Figure 9. bq27220EVM Schematic**

5   Related Documentation from Texas Instruments

Please contact the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580 for additional support. 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.

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 may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of 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】 開発キットの中には技術基準適合証明を受けて
いないものがあります。 技術適合証明を受けていないもの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
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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

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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.

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