bq34110EVM-796 Evaluation Module

This evaluation module (EVM) is a complete evaluation system for the bq34110. This EVM includes one bq34110 circuit module, an external current sense resistor. A separate orderable 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 bq34110 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 EV2400 users can:

- Read the bq34110 data registers
- Program the chipset for different configurations
- Log cycling data for further evaluation
- Evaluate the overall functionality under different charge and discharge conditions

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[(1)][(2)]1 Features

This EVM has the following features:

- Complete evaluation system for the bq34110 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

The following items are included in the EVM kit:

- bq34110 circuit module
- Cable to connect the EVM to an EV2400 communications interface adapter

This EVM is used for the evaluation of the bq34110. Visit the product web folder (bq34110) to properly configure the bq34110.

1.2 Ordering Information

Table 1 lists the EVM ordering information.

Table 1. Ordering Information

Part Number	EVM Part Number	Configuration	Chemistry
bq34110	bq34110EVM-796	3 V–48 V	Li-Ion, Li-Polymer, LiFePO4, PbA, NiMH, NiCd

1.3 bq34110 Circuits Module Performance Specification Summary

Table 2 summarizes the performance specifications of the bq34110 circuit module.

Table 2. Performance Specification Summary

Specification	Min	Typ	Max	Units
Input voltage BAT+ to BAT– in 1S mode	3	4	5	V
Input voltage BAT+ to BAT– in multicell	6	28	48	V
Charge and discharge current	0	2	7	A

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2 bq34110EVM 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 Required for EVM Setup and Evaluation

The following items are required to set up and evaluate the EVM:

- bq34110 EVM
- EV2400 communications interface adapter
- USB cable to the communications interface adapter to the computer
- Windows 7 capable PC (or higher)
- DC power supply. (Constant current and constant voltage capability is desirable.)

If using the EV2300 (older version of interface adapter), USB drivers need to be installed. See the EV2300 product page for details: http://www.ti.com/tool/EV2300

2.2 Battery Management Studio (bqStudio) Software

bqStudio is a graphical user interface that allows the user to interact with the bq34110 device.

1. Download the latest version of bqStudio. The latest version listed as BQSTUDIOTEST is recommended since it will contain the latest improvements (bq34110 needs v1.3.80 or later).
2. Run the installer. Make sure to 'Run as Administrator'
3. Follow the on-screen instructions until completing the software installation.
4. Before starting the evaluation software, connect the EV2400 to the PC using the USB cable. The EV2400 driver will install automatically.

2.3 EV2400 Firmware Updater

The EV2400 firmware is updated periodically. The bqStudio software will indicate which firmware version is detected in the Dashboard. It is recommended to use v0.18 or later. If needed, the EV2400 Firmware Updater is available at http://www.ti.com/tool/ev2400. The EV2400 User's guide contains detailed instructions for using the Firmware Updater.

2.4 Update bq34110 Device Firmware

The bq34110 may need updated firmware. Updating to the latest firmware version is recommended if it is not already using the latest version.

1. 1. Download the latest bq34110 Firmware bundle from: http://www.ti.com/product/BQ34110/toolssoftware
2. The installation will place the extracted files in a folder in 'C:\ProgramData\Texas Instruments\'. Copy the .bqz file to the directory: 'C:\ti\BatteryManagementStudio\config'. This will ensure bqStudio has the latest updates and tools for bq34110 evaluation.
3. Find the .srec file in the same folder from Step 2. Follow the directions in Section 3.5 to use bqStudio to program the latest firmware .srec to the device.
4. Once programming is finished, the EVM is ready to use with the latest firmware.

2.5 EVM Connections

The bq34110 evaluation system comprises three hardware components: the bq34110 circuit module, the EV2400 PC interface board, and the PC.

2.5.1 Connecting the bq34110 Circuit Module to a Battery Pack

Figure 1 illustrates the board connections to a battery pack.

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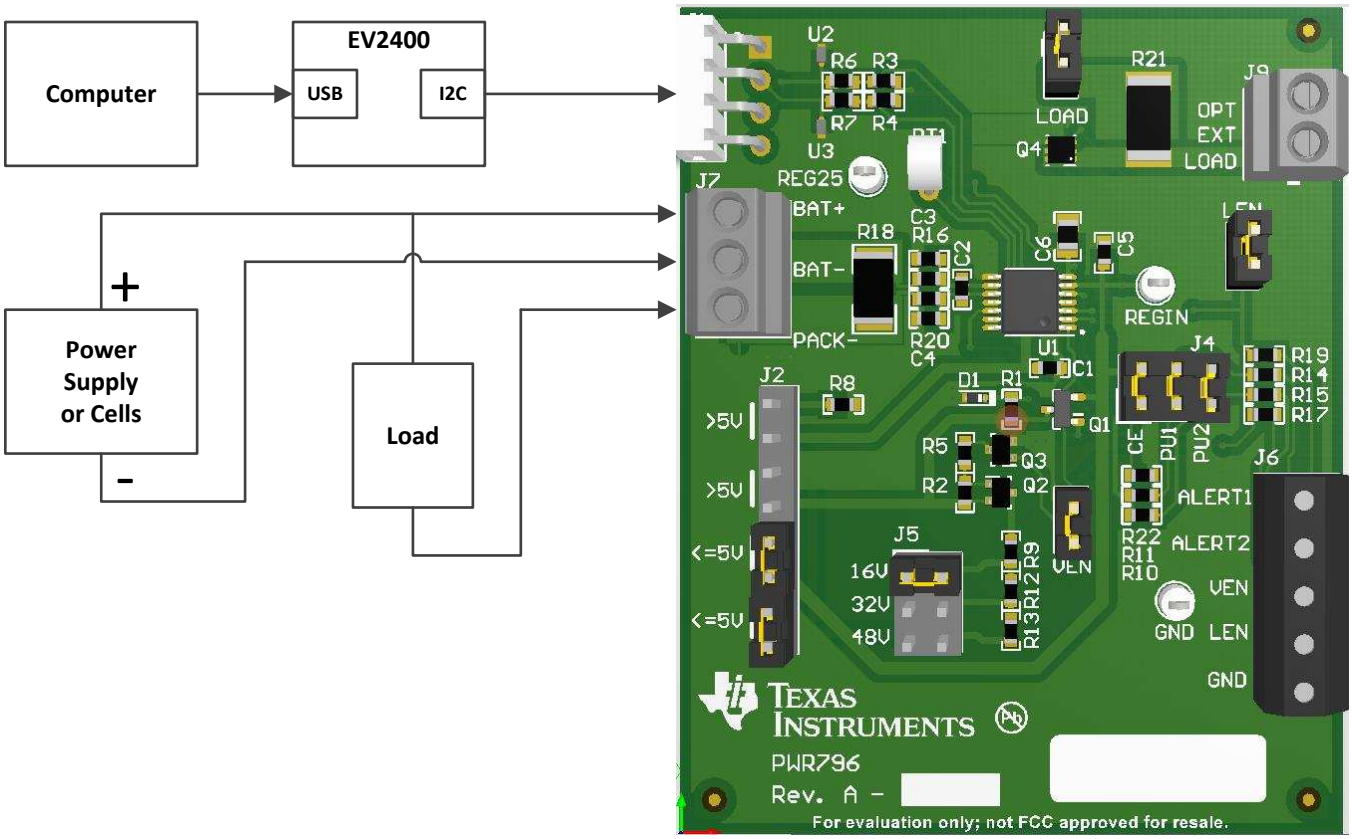

Figure 1. bq34110 Circuit Module Connection to Pack and System Load

2.5.2 Circuit Module Connections

Contacts on the circuit module provide the following connections:

- Direct connection to the battery pack (J7): BAT+ and BAT–

  See Table 3 to configure J2 and J5 to support the voltage range for your pack.

Table 3. Cell Configuration Jumper Placement

Cell Configuration	Jumper Placement
J2:	
Single cell or stack voltage less than 5 V	Place jumpers in the ≤ 5-V positions
Multicell:	Place jumpers in the > 5 V positions
J5:	
Single cell:	Does not matter
Multicell:	Place the jumper to the appropriate setting for your series cell configuration

  Attach BAT– to the bottom of the battery stack and attach BAT+ to the top of the battery stack.

- Charger or load connection (J7): BAT+ and PACK–

  Attach the load or power supply to the J7 terminal block. Connect the positive load or power supply wire to the terminal block position labeled BAT+. Connect the ground wire for the load or power supply to the terminal block position labeled PACK–.

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- I2C communication port (J1): I2C bus

  Attach the communications interface adapter cable to J1 and to the I2C port on the EV2400.
- *Chip Enable* (J4): CE

  Place a jumper on CE enabling the REG25 regulator to power the bq34110.
- *External Learning Load*: LOAD jumper and J8.

  The external learning load can be configured using the on-board 20-Ω load resistor or an external resistor attached to J8. The 20-Ω resistor can support a 2000-mAh single-cell configuration. Other configurations require that a resistor be attached to J8. The LOAD jumper must be removed when using the external load resistor.
- ALERT1, ALERT2 (J6)

  Place jumpers on J4 PU1 and PU2 to apply pull-up resistors to open drain outputs ALERT1 and ALERT2. Monitor the outputs monitored on J6.

2.5.3 Pin Description

Table 4 lists the EVM pin descriptions.

Table 4. EVM Pin Descriptions

Pin Name	Description
ALERT1	Open drain alert output
ALERT2	Open drain alert output
BAT+	Battery stack positive terminal
BAT–	Battery stack negative terminal
CE	Chip Enable
GND	Ground return
LEN	Optional LEN GPIO
PACK–	Pack negative terminal
OPT EXT LOAD	Connection to apply an external learning load
SCL	I^2C clock signal
SDA	I^2C data signal
VEN	Optional VEN GPIO. When set, this pin is used to control the external voltage divider for the BAT pin and disables the internal voltage divider.

2.6 PC Interface Connection

The following steps configure the hardware for interfacing with the PC:

1. Connect the bq34110 EVM to the EV2400 using wire leads as shown in Table 3.
2. Connect the PC USB cable to the EV2400 and the PC USB port.

Table 5. Circuit Module to EV2400 Connections

bq34110EVM	EV2300	EV2400
SDA	SDA	PORT2 - SDA
SCL	SCL	PORT2 - SCL
VSS	GND	PORT2 - VSS

The bq34110EVM-796 is now set up for operation.

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3 Operation

This section provides instructions for operating the software.

3.1 Starting the Program

With the EV2400 and the bq34110EVM connected to the computer, run bqStudio from the Desktop or installation directory. The initial 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. Additional windows can be added by clicking the corresponding icons in the tools panel at the top of the main window.

The **Scan** (continuous scan) or **Refresh** (single time scan) buttons can be clicked in order to update the data in the *Registers* and *Data Memory* windows.

bqStudio provides a logging function which logs selected Data Registers last received from the bq34110. To enable this function, click the **Start Log** button. The default elapsed interval is 4000 milliseconds, to change this interval, go to *Windows*, select *Preferences*, choose *Registers*, and change *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.

The *Registers* section contains parameters used to monitor gauging (see Figure 2). The *Bit Registers* section provides a bit-level picture of status and fault registers. A green flag indicates that the bit is 0 (low state) and a red flag indicates that the bit is 1 (high state). Data begins to appear once the **Refresh** (single-time scan) button is selected, or it scans continuously if the **Scan** button is selected.

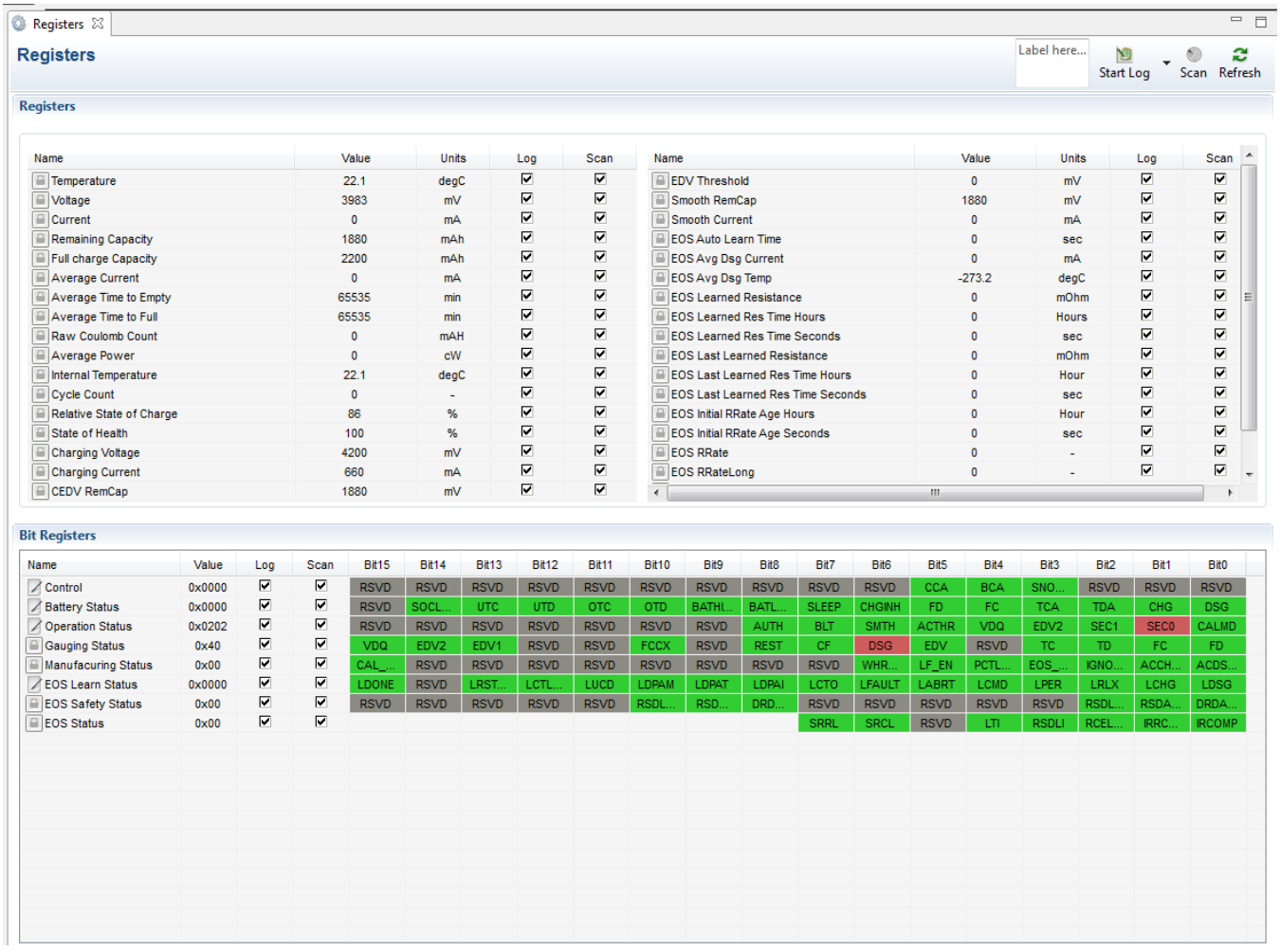

Figure 2. Registers Screen

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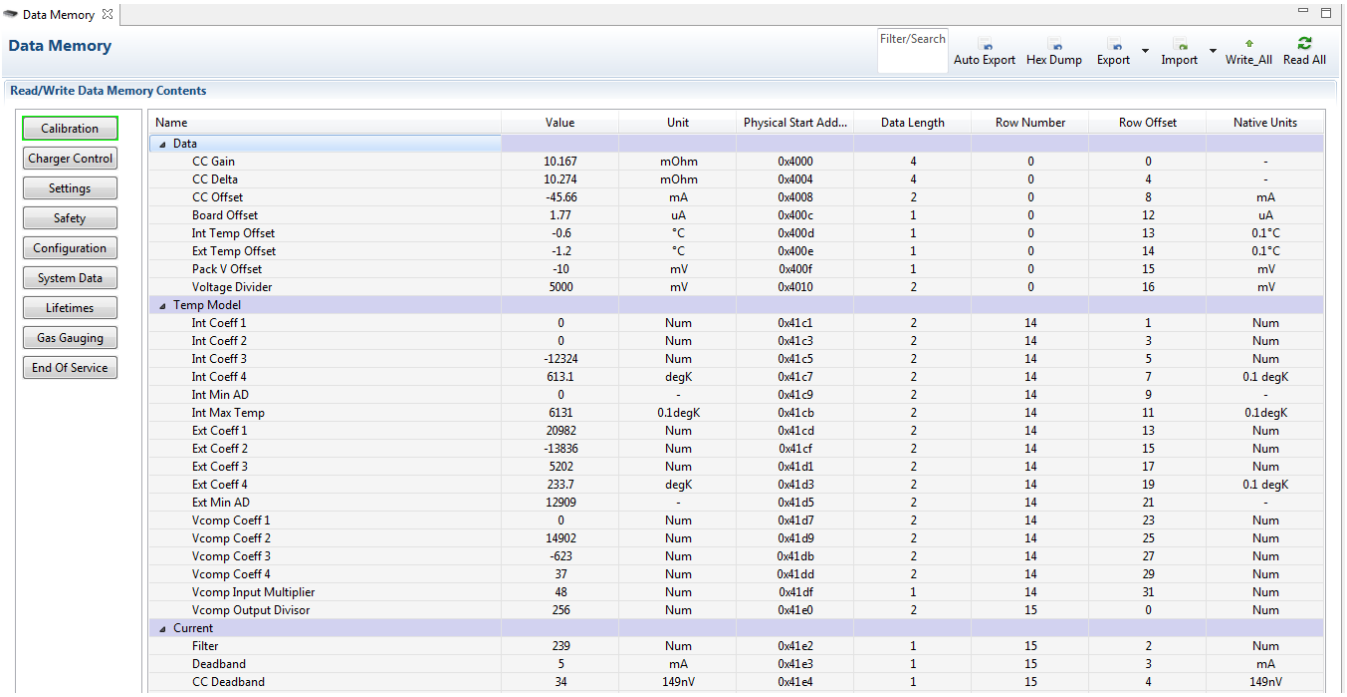
3.2 Setting Programmable bq34110 Options

The bq34110 comes configured per the default settings detailed in the *bq34110 Technical Reference Manual* (SLUUBF7). Ensure that the settings are correctly changed to match pack and applications for the bq34110 solution being evaluated.

NOTE: The bq34110 comes up **UNSEALED** but not in **FULL ACCESS**. Execute the **UNSEAL** and then the **UNSEAL FULL ACCESS** commands from the command window to enable access to the data memory.

NOTE: The correct setting of these options is essential to get the best performance. The settings can be configured using the *Data Memory* window (Figure 3).



Name	Value	Unit	Physical Start Add...	Data Length	Row Number	Row Offset	Native Units
Data							
CC Gain	10.167	mOhm	0x4000	4	0	0	-
CC Delta	10.274	mOhm	0x4004	4	0	4	-
CC Offset	-45.66	mA	0x4008	2	0	8	mA
Board Offset	1.77	uA	0x400c	1	0	12	uA
Int Temp Offset	-0.6	°C	0x400d	1	0	13	0.1°C
Ext Temp Offset	-1.2	°C	0x400e	1	0	14	0.1°C
Pack V Offset	-10	mV	0x400f	1	0	15	mV
Voltage Divider	5000	mV	0x4010	2	0	16	mV
Temp Model							
Int Coeff 1	0	Num	0x41c1	2	14	1	Num
Int Coeff 2	0	Num	0x41c3	2	14	3	Num
Int Coeff 3	-12324	Num	0x41c5	2	14	5	Num
Int Coeff 4	613.1	degK	0x41c7	2	14	7	0.1 degK
Int Min AD	0	-	0x41c9	2	14	9	-
Int Max Temp	6131	0.1degK	0x41cb	2	14	11	0.1degK
Ext Coeff 1	20982	Num	0x41cd	2	14	13	Num
Ext Coeff 2	-13836	Num	0x41cf	2	14	15	Num
Ext Coeff 3	5202	Num	0x41d1	2	14	17	Num
Ext Coeff 4	233.7	degK	0x41d3	2	14	19	0.1 degK
Ext Min AD	12909	-	0x41d5	2	14	21	-
Vcomp Coeff 1	0	Num	0x41d7	2	14	23	Num
Vcomp Coeff 2	14902	Num	0x41d9	2	14	25	Num
Vcomp Coeff 3	-623	Num	0x41db	2	14	27	Num
Vcomp Coeff 4	37	Num	0x41dd	2	14	29	Num
Vcomp Input Multiplier	48	Num	0x41df	1	14	31	Num
Vcomp Output Divisor	256	Num	0x41e0	2	15	0	Num
Current							
Filter	239	Num	0x41e2	1	15	2	Num
Deadband	5	mA	0x41e3	1	15	3	mA
CC Deadband	34	149nV	0x41e4	1	15	4	149nV

Figure 3. Data Memory Screen

To read all the data from the bq34110 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 or write to the data memory. To update a parameter, click on the desired parameter and a window will pop-up that provides details on the selected parameter. Next, enter the value in the value textbox and press **Enter**. After **Enter** has been pressed, bqStudio will update the selected parameter. The **Import** button in the *Data Memory* window can be clicked in order to import an entire configuration from a specified *.gg.csv file.

The configuration can be saved to a file by clicking the **Export** button in the *Data Memory* window and entering a file name. The configuration will be saved to a *.gg.csv file. The module calibration data is also held in the bq34110 data memory. If the *Gauge Dashboard* is not displaying any information, then the bq34110 may not be supported by the bqStudio version that is being used, a bqStudio upgrade may be required.

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3.2.1 Cell Configuration

The bq34110 operates in one of two modes for measuring battery voltage. Place jumpers on the J2 and J5 headers to select the mode of operation. See the EVM Connections section.

For packs where the stack voltage is less than 5 V:

- Enable Calibration Mode on the device by pressing the **CAL_TOGGLE** button on the Commands panel. Verify that the *CAL_EN* flag is set in the *Manufacturing Status* register.
- Update the ***Flash Update OK Voltage*** parameter on the Data Memory ***Configuration*** screen to 100mV (default is 2.8V). This parameter prevents flash updates when the measured voltage is below this setting. This can later be updated to an appropriate voltage once the dividers are configured.
- Set the ***Number of Series Cells*** parameter to the appropriate value on the Data Memory ***Configuration*** screen.
- Reset the gauge using the **RESET** button on the *Commands* panel.
- Calibrate the stack voltage. See the Calibration section.

NOTE: The EVM can support single cell applications, where the cell voltage can drop below 2.5 V, by providing an external 3.3-V supply to power REGIN. For voltages below 2.5V, remove the jumper from J2 – pins 3 and 4 (upper ≤ 5-V jumper location) and apply a 3.3-V supply to the REGIN test point.

For packs where the stack voltage is greater than 5 V:

- Enable Calibration Mode on the device by pressing the **CAL_TOGGLE** button on the *Commands* panel. Verify that the *CAL_EN* flag is set in the *Manufacturing Status* register.
- Update the ***Flash Update OK Voltage*** parameter on the Data Memory ***Configuration*** screen to 100mV (default is 2.8V). This parameter prevents flash updates when the measured voltage is below this setting.
- Set the ***VEN_EN*** bit to “1” in the ***Pin Control Config*** in Data Memory on the ***Settings*** screen. This enables the external voltage divider on the EVM and disables the internal voltage divider. The VEN pin will pulse to enable the external resistor divider only during a voltage measurement to save power.
- Set the ***Number of Series Cells*** parameter to the appropriate value on the Data Memory ***Configuration*** screen.
- Set the ***Voltage Divider*** parameter in Data Memory on the ***Calibration*** screen. This value should be set based on the external resistor divider setting. (For example, use ~19,200 when the J5 header is set to the 16V setting which divides the BAT+ voltage by 19.2).
- Reset the gauge using the **RESET** button on the *Commands* panel.
- Calibrate the stack voltage. See the Calibration section.

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3.3 Calibration

The bq34110EVM must be calibrated to ensure accurate value reporting. This is done in the *Calibration* window (Figure 4) in bqStudio.

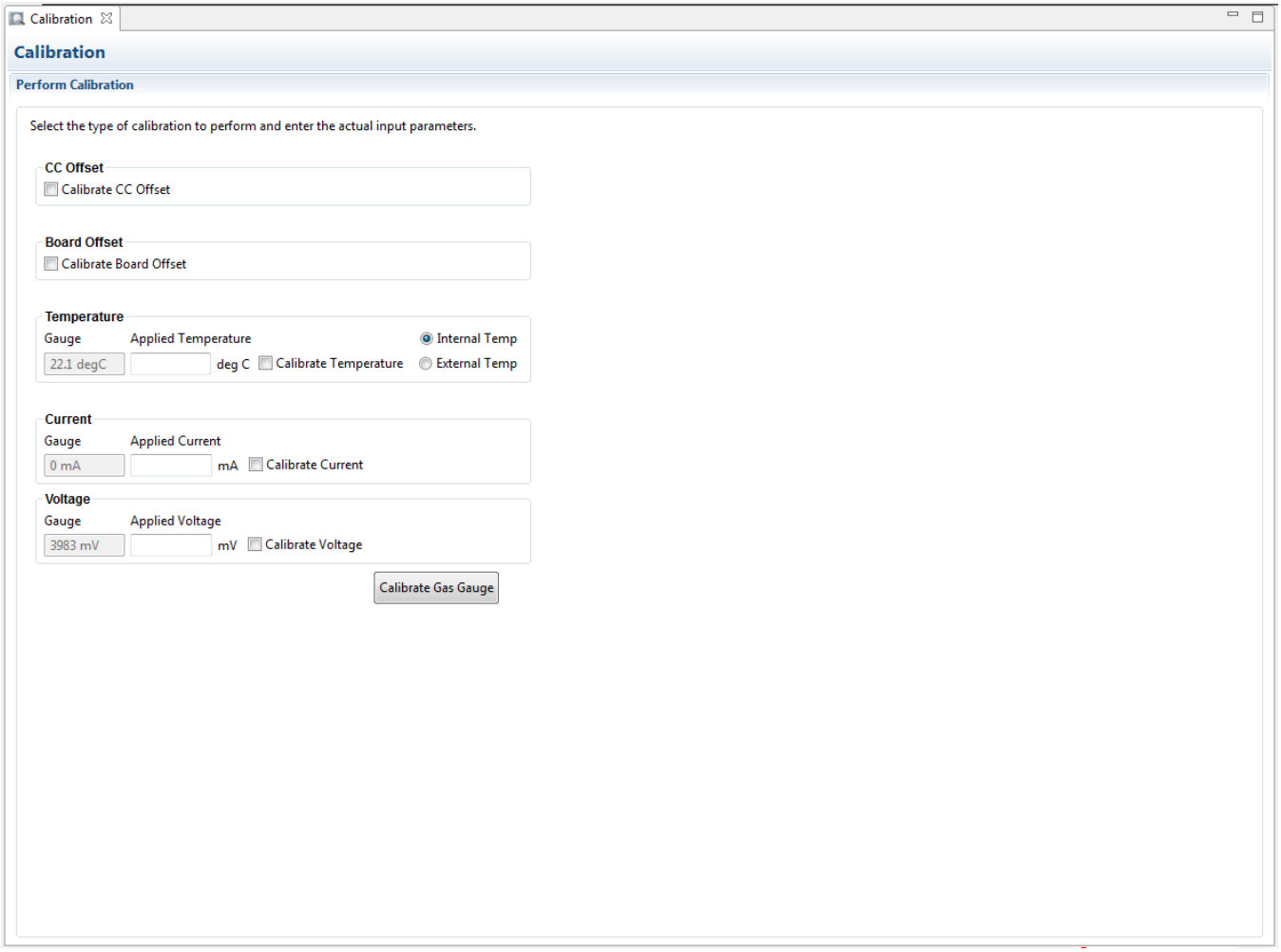

Figure 4. Calibration Screen

3.3.1 Voltage Calibration

Voltage calibration instructions follow:

- Measure the voltage from BAT+ to BAT–, enter this value in the *Applied Voltage* field, and select the *Calibrate Voltage* box.
- Press the **Calibrate Gas Gauge** button to calibrate the voltage measurement system.
- Deselect the *Calibrate Voltage* boxes after voltage calibration has completed.

3.3.2 Temperature Calibration

Temperature calibration instructions follow::

- Enter the room temperature in each of the *Applied Temperature* fields and select the *Calibrate Temperature* box for the thermistor to be calibrated. The temperature values must be entered in degrees Celsius.
- Press the **Calibrate Gas Gauge** button to calibrate the temperature measurement system.
- Deselect the *Calibrate* boxes after temperature calibration has completed.

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3.3.3 Current Calibration

The gauge offers *CC Offset* and *Board Offset* calibration options to zero any residual current that may be reported by the gauge. These calibrations are only required if the gauge does not report 0-mA current when no current should be present.

- Select the *CC Offset* calibration option.
- Press the **Calibrate Gas Gauge** button to calibrate.
- Verify whether the current reports 0 mA. Proceed with the *Board Offset Current* calibration if current is reported.
- Select the *CC Offset* calibration option.
- Press the *Calibrate Gas Gauge* button to calibrate.
- Verify whether the current reports 0 mA.
- Connect a 2-A load from BAT+ to PACK–.
- Enter –2000 in the *Applied Current* field and select the *Calibrate Current* box.
- Press the **Calibrate Gas Gauge** button to calibrate.
- Deselect the *Calibrate Current* box after current calibration has completed.

3.4 Programming Screen

Press the **Programming** button to select the *Programming Update* window (Figure 5). This window allows the user to import the device firmware.

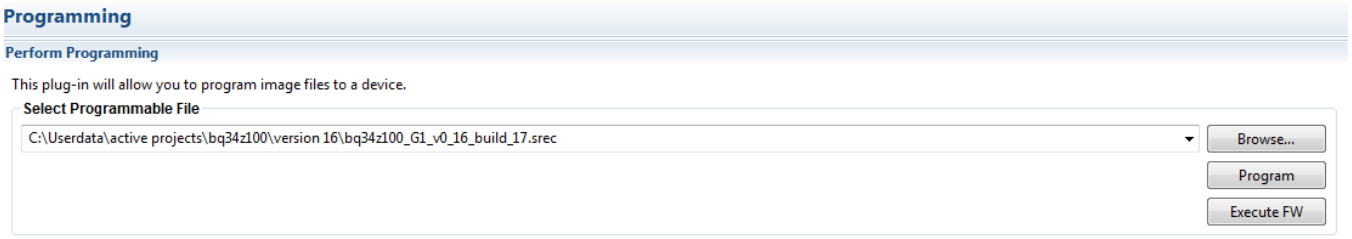

Figure 5. Programming Screen

3.4.1 Programming the Flash Memory

The *Programming* screen is used to initialize the device by loading the default .srec into the flash memory (see Figure 5).

- Search for the .srec file using the **Browse** button.
- Press the **Program** button and wait for the download to complete.
- Press the **Execute FW** button after the programming has been completed.
  - Press the **Read Srec** button to save the flash memory contents to the file. Wait for the download to complete.

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3.5 Advanced Comm I2C Screen

Press the **Advanced Comm** button to select the *Advanced Comm I2C* window. This tool provides access to parameters using I²C and *Manufacturing Access* commands (see Figure 6).

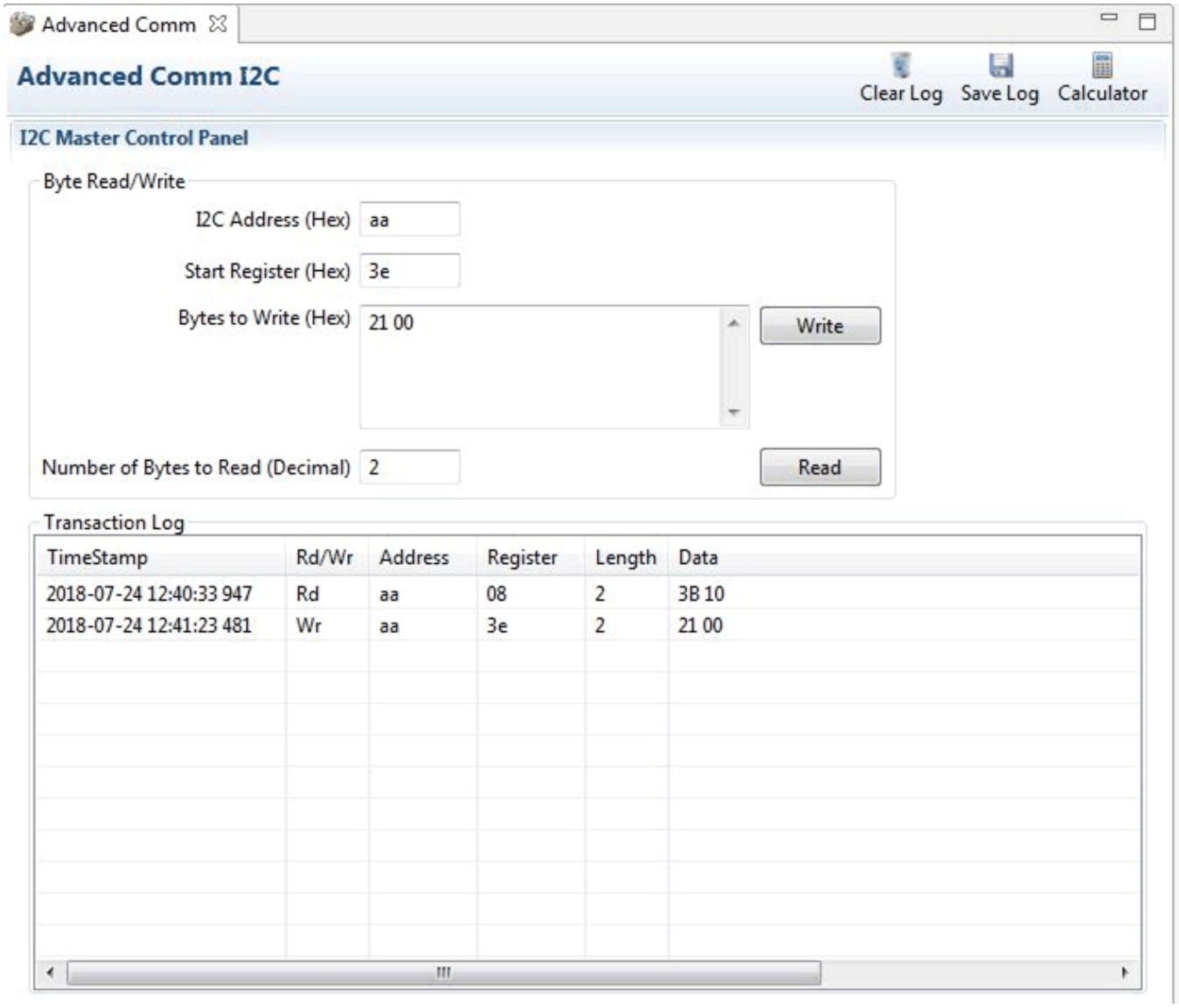

Figure 6. Advanced Comm I²C Screen

Examples:

Reading an I²C Command:

- Read SBData Voltage (0x08)
  - Start Register = 08, 2 bytes. Press the **Read** button.
  - Word = 0x103B, which is hexadecimal for 4155 mV

Sending an EOS_EN to start gauging via ManufacturerAccessControl():

- Send EOS_EN() (0x0021) to ManufacturerAccessControl().
  - Start Register = 0x3e. Data = 21 00. Press the **Write** button.

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3.6 Golden Image Screen

Press the **Golden Image** button to select the *Golden Image* window. This window allows the user to export the device firmware as an .srec, .bq.fs and .df.fs files.

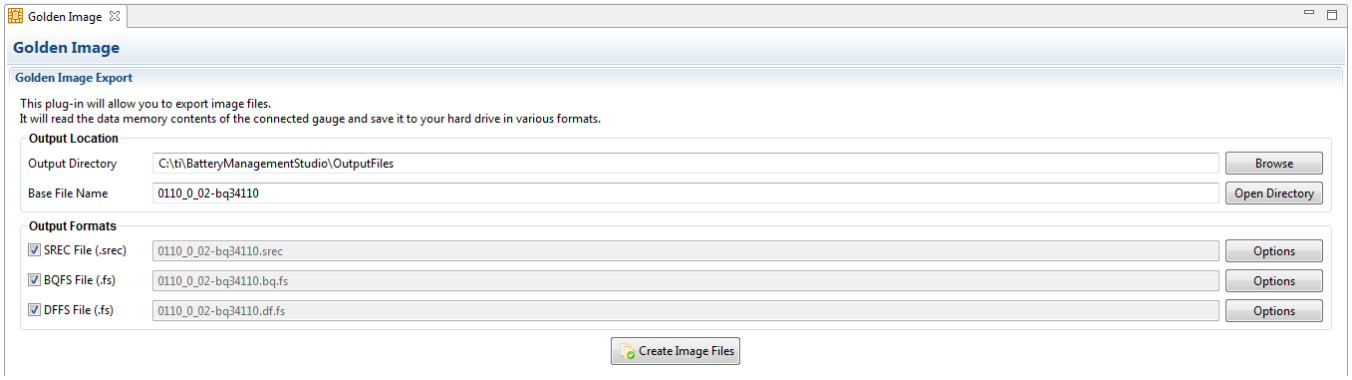

Figure 7. Golden Image Window

3.6.1 Exporting the Flash Memory

The .srec file contains the full flash memory. The .bq.fs contains the program memory portion for the flash memory and the .df.fs contains the data flash portion of the flash memory (seeFigure 7).

- Select the directory location to export the files.
- Enter the file name for the files.
- Select the files types to export.
- Press the **Create Image File** button to export the memory and create the files.

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3.7 Setting the CEDV Parameters

To ease evaluation of the bq34110, users can obtain the CEDV parameters from our online gauging parameter calculator (GPC) for the CEDV gauges tool (www.ti.com/tool/GPCCEDV). After programming the design parameters to the gauge, the EVM can be used to obtain the experimental data needed to calculate the CEDV coefficients.

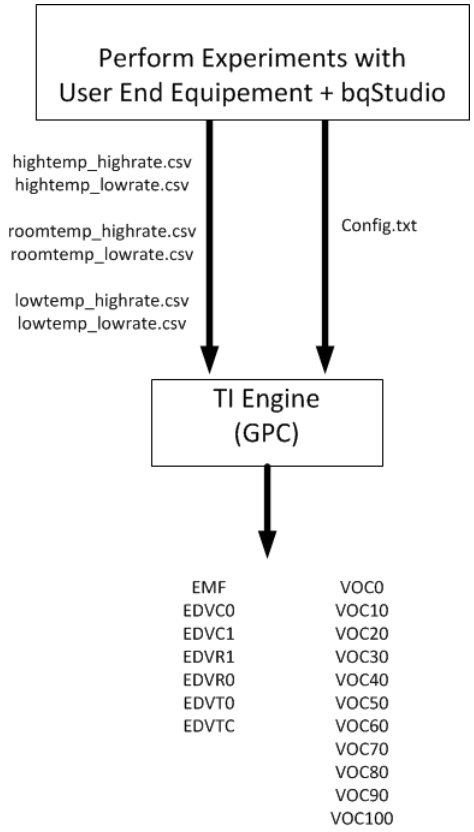

Figure 8. CEDV Coefficients Calculation Flow

The equipment necessary is as follows:

- bqStudio software
- bq34110EVM-796
- Power supply able to source/sink current. A DC power supply and electronic load.

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

Use the *GPC Cycle* plug-in to control the collection of the log files and the *GPCPackager* plug-in to package the files into a zip file to import to the online GPCCHEM tool.

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4 Circuit Module Physical Layout, Bill of Materials and Schematic

This section contains the board layout, bill of materials, and schematic for the bq34110 circuit module.

4.1 Board Layout

This section shows the printed circuit board (PCB) layers (Figure 9 through Figure 12) and assembly drawing for the bq34110 module.

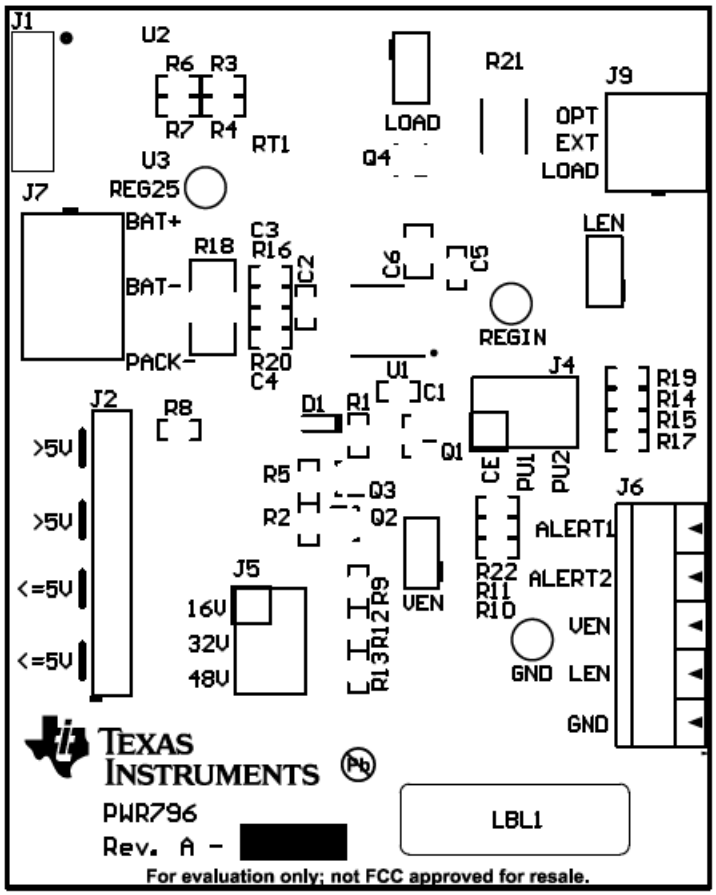

Figure 9. Top Silk Screen

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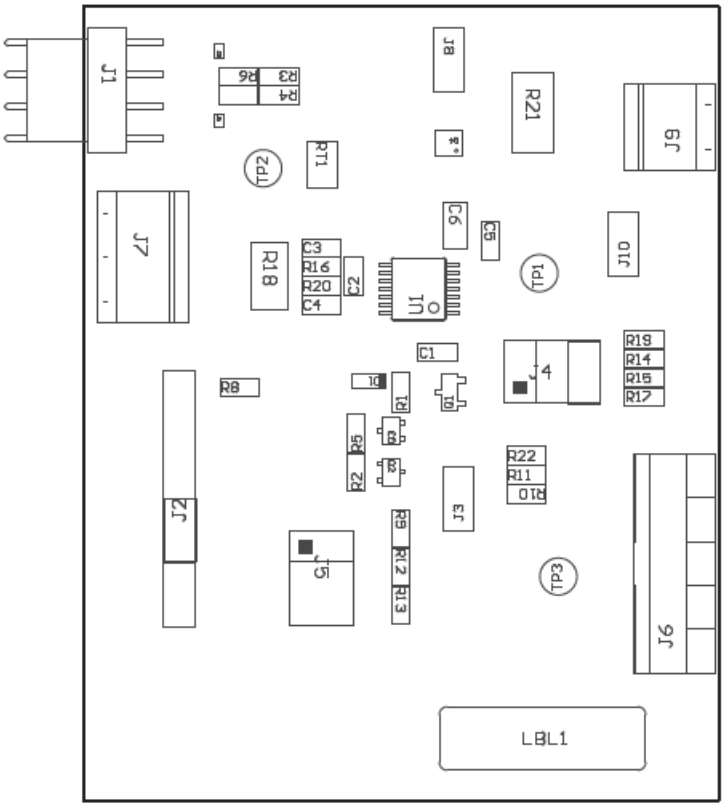

Figure 10. Top Assembly

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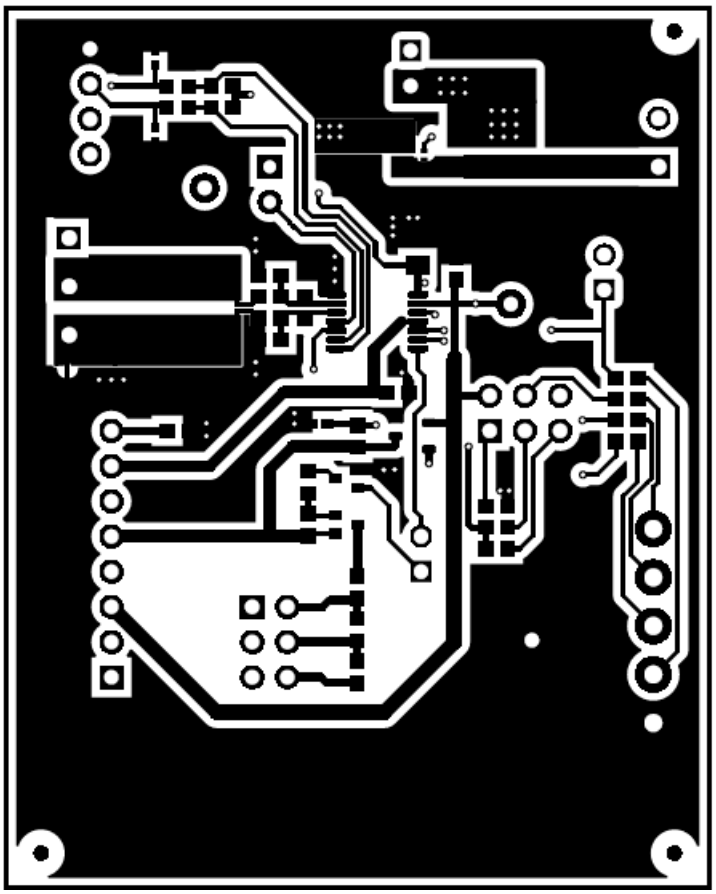

Figure 11. Top Layer

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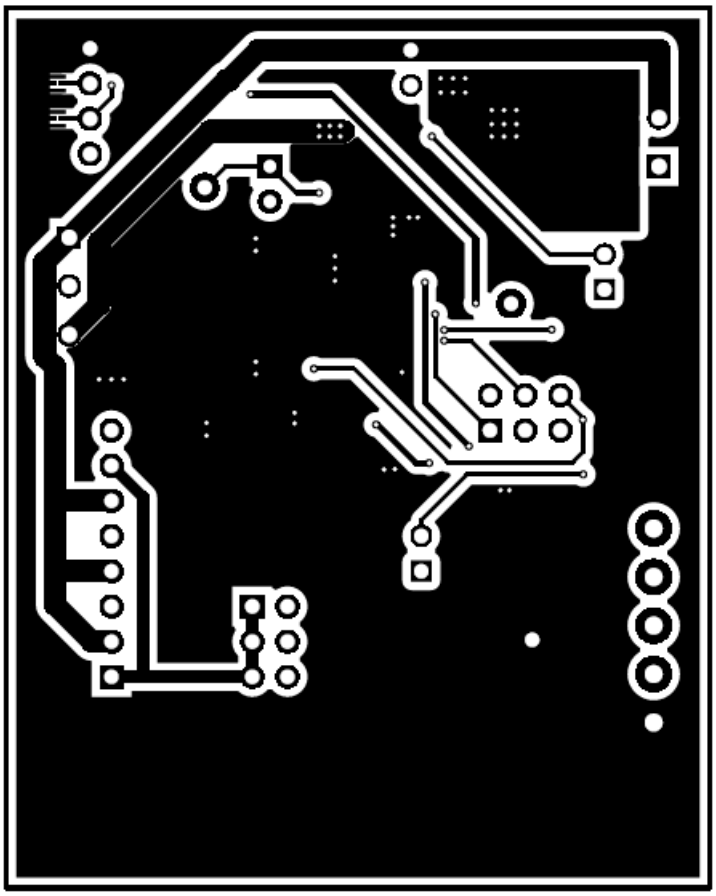

Figure 12. Bottom Layer

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4.2 Bill of Materials

Table 6 lists the BOM for this EVM.

Table 6. Bill of Materials

Qty	Reference Designator	Value	Description	Size	Part Number	Manufacturer
1	C1	3300pF	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 0603	0603	GRM188R71H332KA01D	Murata
4	C2, C3, C4, C5	0.1uF	CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 0603	0603	GRM188R71H104KA93D	Murata
1	C6	1uF	CAP, CERM, 1 µF, 50 V, +/- 10%, X7R, 0805	0805	GRM21BR71H105KA12L	Murata
1	D1	5.6V	Diode, Zener, 5.6 V, 300 mW, SOD-523	SOD-523	BZT52C5V6T-7	Diodes Inc.
1	H1		Cable	Used in PnP output	CBL002	Any
1	J1		Header (friction lock), 100mil, 4x1, R/A, TH	4x1 R/A Header	22-05-3041	Molex
1	J2		Header, 100mil, 8x1, Tin, TH	Header, 8x1, 100mil, TH	PEC08SAAN	Sullins Connector Solutions
3	J3, J8, J10		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
2	J4, J5		Header, 100mil, 3x2, Tin, TH	3x2 Header	PEC03DAAN	Sullins Connector Solutions
1	J6		Terminal Block, 3.5mm Pitch, 5x1, TH	17.5x8.2x6.5mm	ED555/5DS	On-Shore Technology
1	J7		Terminal Block, 3.5 mm, 3x1, Tin, TH	Terminal Block, 3.5 mm, 3x1, TH	39357-0003	Molex
1	J9		Terminal Block, 3.5 mm, 2x1, Tin, TH	Terminal Block, 3.5 mm, 2x1, TH	39357-0002	Molex
1	Q1	60V	MOSFET, N-CH, 60 V, 0.17 A, SOT-23	SOT-23	2N7002-7-F	Diodes Inc.
1	Q2	-50V	MOSFET, P-CH, -50 V, -0.13 A, SOT-323	SOT-323	BSS84W-7-F	Diodes Inc.
1	Q3	50V	MOSFET, N-CH, 50 V, 0.2 A, SOT-323	SOT-323	BSS138W-7-F	Diodes Inc.
1	Q4	30V	MOSFET, N-CH, 30 V, 5 A, SON 2x2mm	SON 2x2mm	CSD17313Q2	Texas Instruments
1	R1	10k	RES, 10k ohm, 5%, 0.1W, 0603	0603	CRCW060310K0JNEA	Vishay-Dale
3	R2, R10, R11	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	CRCW0603100KFKEA	Vishay-Dale
2	R3, R4	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
1	R5	165k	RES, 165 k, 1%, 0.1 W, 0603	0603	CRCW0603165KFKEA	Vishay-Dale
4	R6, R7, R16, R20	100	RES, 100, 1%, 0.1 W, 0603	0603	CRCW0603100RFKEA	Vishay-Dale
1	R8	16.5k	RES, 16.5 k, 0.1%, 0.1 W, 0603	0603	RG1608P-1652-B-T5	Susumu Co Ltd
3	R9, R12, R13	300k	RES, 300 k, 0.1%, 0.1 W, 0603	0603	RG1608P-304-B-T5	Susumu Co Ltd
4	R14, R15, R17, R19	1.0k	RES, 1.0k ohm, 5%, 0.1W, 0603	0603	CRCW06031K00JNEA	Vishay-Dale
1	R18	0.01	RES, 0.01, 1%, 1 W, 2010	2010	WSL2010R0100FEA18	Vishay-Dale
1	R21	20	RES, 20, 5%, 1 W, AEC-Q200 Grade 0, 2512	2512	CRCW251220R0JNEG	Vishay-Dale
1	R22	1.0Meg	RES, 1.0 M, 5%, 0.1 W, 0603	0603	CRCW06031M00JNEA	Vishay-Dale
1	RT1	10.0k ohm	Thermistor NTC, 10.0k ohm, 1%, Disc, 5x8.4 mm	Disc, 5x8.4 mm	103AT-2	SEMITEC Corporation
3	TP1, TP2, TP3	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
1	U1		Multi-Chemistry CEDV Gas Gauge for Rarely Discharged Applications, PW0014A	PW0014A	BQ34110PWR	Texas Instruments

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Table 6. Bill of Materials (continued)

Qty	Reference Designator	Value	Description	Size	Part Number	Manufacturer
2	U2, U3		ESD in 0402 Package with 10 pF Capacitance and 6 V Breakdown, 1 Channel, -40 to +125 degC, 2-pin X2SON (DPY), Green (RoHS & no Sb/Br)	DPY0002A	TPD1E10B06DPYR	Texas Instruments

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4.3 Schematic

Figure 13 illustrates the schematic for the EVM.

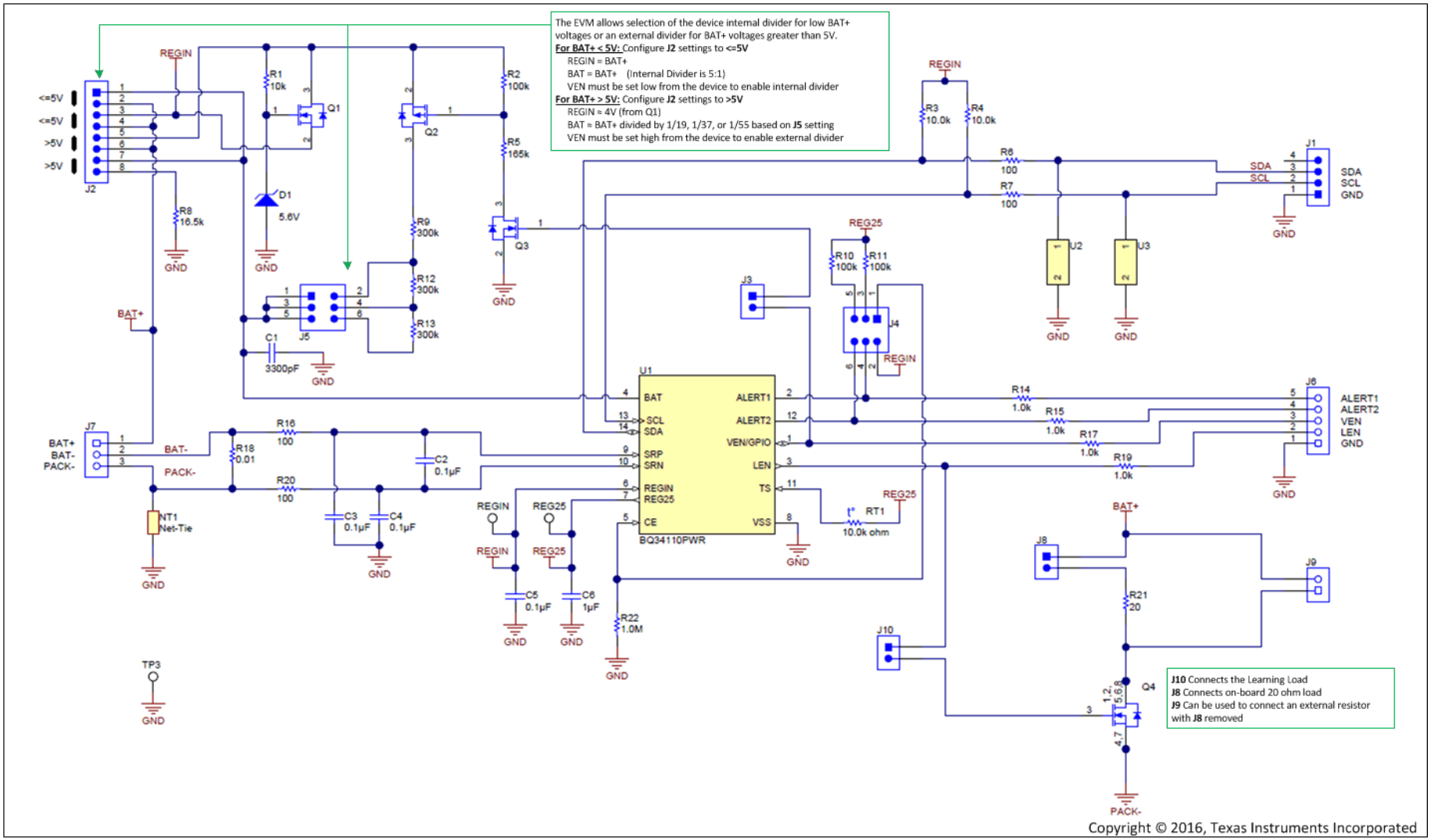

Figure 13. bq34110EVM Schematic

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5 Related Documentation from Texas Instruments

bq34110 data sheet, bq34110 Multi-Chemistry CEDV Battery Gas Gauge for Rarely Discharged Applications datasheet, SLUSCI1B

bq34110 Technical Reference Manual, SLUUBF7

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Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from October 25, 2016 to July 25, 2018 **Page**

- Removed references throughout the document for EV2300 which is being discontinued for new designs. 1
- Updated image and example to show the transaction log. 1
- Added additional jumper settings descriptions within the schematic image. 2
- Changed Quick Start Guide to include steps to set up EV2400 firmware and bq34110 firmware. 3
- Added Additional description for VEN pin functionality. 5
- Clarified the instructions for putting the device in UNSEAL FULL ACCESS mode. 7
- Updated Cell Configuration section to include additional important steps. 8
- Updated image and example to show the transaction log. 11
- Corrected device name. 13
- Added additional jumper settings descriptions within the schematic image. 20
- Updated with links to relevant documents for the bq34110. 21

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