This evaluation module (EVM) is a complete evaluation system for the bq34z120 wide-range fuel gauge for nickel chemistries when combined with an EV2300 USB adapter and Windows®-based PC software, downloadable from the TI.com website.

The circuit module includes one bq34z120 integrated circuit (IC) and all other components necessary to monitor and predict capacity in 3 or more series cell NiMH or NiCd battery packs. The circuit module connects directly across the battery.

With the EV2300 interface adapter and software, it is possible to read the bq34z120 data registers, program the chip for different pack configurations, log cycling data for further evaluation, and evaluate the overall functionality of the bq34z120 solution under different charge and discharge conditions.

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Impedance Track is a trademark of Texas Instruments, Inc..

Windows is a registered trademark of Microsoft Corporation.
1 Features

- Complete evaluation system for the bq34z120 advanced gas gauge with Impedance Track™ technology.
- Populated circuit module for quick setup
- Link to software allowing data logging for system analysis

1.1 Kit Contents

- bq34z120 circuit module
- Support documentation

1.2 Ordering Information

<table>
<thead>
<tr>
<th>EVM Part Number</th>
<th>Chemistry</th>
<th>Configuration</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>bq34z120EVM</td>
<td>Lead Acid</td>
<td>3 V–65 V</td>
<td>Any</td>
</tr>
</tbody>
</table>
2 bq34z120 Device-Based Circuit Module

The bq34z120-based circuit module is a complete and compact example solution of a bq34z120 fuel gauge solution for Lead Acid packs. The circuit module incorporates a bq34z120 fuel gauge IC and various option components and jumpers necessary for evaluation under various battery voltage, LED, and ALERT signal configurations.

2.1 Circuit Module Connections

Contacts on the circuit module provide the following connections:
• Direct connection to BAT+ and BAT–
• The system load and charger connect across BAT+ and PACK–
• To the I2C and HDQ serial communication ports
• To the ALERT output

2.2 Pin Descriptions

<table>
<thead>
<tr>
<th>PIN NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT +</td>
<td>Positive battery stack and pack connection</td>
</tr>
<tr>
<td>BAT –</td>
<td>Negative battery stack connection</td>
</tr>
<tr>
<td>PACK –</td>
<td>Pack negative terminal</td>
</tr>
<tr>
<td>SDA</td>
<td>I2C data signal</td>
</tr>
<tr>
<td>SCL</td>
<td>I2C clock signal</td>
</tr>
<tr>
<td>GND</td>
<td>Communication and ALERT grounds</td>
</tr>
<tr>
<td>HDQ</td>
<td>HDQ serial communication signal</td>
</tr>
<tr>
<td>ALERT</td>
<td>ALERT output signal</td>
</tr>
</tbody>
</table>

3 bq34z120 Circuit Module

This section contains information on the schematic for the bq34z120 implementation.

3.1 Choosing ≤ 5-V or > 5-V Operation

The bq34z120 operates in one of two modes for measuring battery voltage. Place two jumpers on header J5 to select the mode of operation. Refer to the silk screen markings near J5 on the EVM.

```
WARNING
Applying a voltage higher than 5 V when jumpers are configured for ≤ 5-V operation is very likely to damage the IC.
```

The ≤ 5-V mode simplifies the circuit from that shown in the schematic. Most of the components shown to the left of the bq34z120 are not necessary.

3.2 Choosing Maximum MultiCell Battery Voltage

In the MultiCell > 5-V setup, three levels of maximum battery voltage: 16, 32, and 48 V are selectable on the header J2. Refer to the schematic and silk screen markings on the EVM for jumper placement. Ideally, the total divider ratio, including the 16.5-kΩ resistor, R28, converts the maximum expected voltage on the battery to something between 0.8 V and 1.0 V at the BAT pin of the gauge. For this reason, test points TP1 and TP2 are provided to customize the top leg of the divider for your application. While the bq34z120 firmware is able to handle battery voltage up to 65 V, voltages above 50 V should never be applied to the EVM.
3.3 Choosing the LED configuration

When configuring the data flash registers, choose one of five LED/Comm configuration codes (refer to Table 12 in the bq34z120 datasheet). After reviewing those possibilities, select the jumper pattern desired for the J6 header on the EVM. For single-LED mode, place a jumper on the pair marked A. For four-direct LED mode, place jumpers on A, B, C, and D. For external LEDs using the shift register option, place a single jumper on EXT. In all cases, where one or more LED’s are used, place a jumper across the J1 header to provide power to the LED.

3.4 Choosing the ALERT configuration

The pin used to provide the ALERT output depends on the LED mode selected in the LED/Comm data flash register. Refer to Table 13 in the bq34z120 datasheet for a guide to the proper ALERT pin, then place one and only one jumper on the J3 header accordingly.

4 Circuit Module Physical Layouts, Schematic, and Bill of Materials

This section contains the board layout, assembly drawings, schematic, and bill of materials for the bq34z120 circuit module.

4.1 Board Layout

Figure 1 through Figure 6 show the PCB layers, and assembly drawing for the bq34z120 module.

![Figure 1. bq34z120EVM Layout (Silkscreen)]
Figure 2. bq34z120EVM Top Assembly

Figure 3. bq34z120EVM Top Layer
Figure 4. bq34z120EVM Inner Layer 1

Figure 5. bq34z120EVM Inner Layer 2
Figure 6. bq34z120EVM Bottom Layer
4.2 Schematic

Figure 7. bq34z120EVM Schematic

Optional for additional power saving
Adjust for minimum current consumption in the application
I2C pullups normally implemented in the host. Duplicated here since EV2300 does not provide
Optimize for required LED power dissipation
### 4.2.1 Bill of Materials

Table 2 is the BOM for the bq34z120EVM.

<table>
<thead>
<tr>
<th>Count</th>
<th>RefDes</th>
<th>Value</th>
<th>Description</th>
<th>Size</th>
<th>Part Number</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C1, C8</td>
<td>1uF</td>
<td>Capacitor, Ceramic, 6.3V, X7R, 20%</td>
<td>0603</td>
<td>Std</td>
<td>Any</td>
</tr>
<tr>
<td>6</td>
<td>C2-C7</td>
<td>0.1uF</td>
<td>Capacitor, Ceramic, 50V, X7R, 20%</td>
<td>0603</td>
<td>Std</td>
<td>Any</td>
</tr>
<tr>
<td>1</td>
<td>C9</td>
<td>3300 pF</td>
<td>Capacitor, Ceramic, 50V, X7R, 20%</td>
<td>0603</td>
<td>Std</td>
<td>Any</td>
</tr>
<tr>
<td>2</td>
<td>D1, D2</td>
<td>AZ23CV56-7</td>
<td>Diode, Dual, Zener, 5.6 V, 300mW</td>
<td>SOT23</td>
<td>AZ23CV56-7</td>
<td>Diodes</td>
</tr>
<tr>
<td>3</td>
<td>D12, D13, D14</td>
<td>QTLP610C-3 YEL</td>
<td>Diode, LED yellow, 30-mA</td>
<td>0.126 x 0.087 inch</td>
<td>QTLP610C-3</td>
<td>Fairchild</td>
</tr>
<tr>
<td>8</td>
<td>D3-D6, D8, D15-D17</td>
<td>QTLP610C-4 GRN</td>
<td>Diode, LED green, 30-mA</td>
<td>0.126 x 0.087 inch</td>
<td>QTLP610C-4</td>
<td>Fairchild</td>
</tr>
<tr>
<td>1</td>
<td>D7</td>
<td>BZT52CV56S-7</td>
<td>Diode, Zener, 200mW, 5.6V</td>
<td>SOD-323</td>
<td>BZT52CV56S-7</td>
<td>Diodes Inc</td>
</tr>
<tr>
<td>3</td>
<td>D9, D10, D11</td>
<td>QTLP610C-7 RED</td>
<td>Diode, LED red, 30-mA</td>
<td>0.126 x 0.087 inch</td>
<td>QTLP610C-7</td>
<td>Fairchild</td>
</tr>
<tr>
<td>1</td>
<td>J1</td>
<td>PEC02SAAN</td>
<td>Header, Male 2-pin, 100mil spacing,</td>
<td>0.100 inch x 2</td>
<td>PEC02SAAN</td>
<td>Sullins</td>
</tr>
<tr>
<td>1</td>
<td>J2</td>
<td>PEC03DAAN</td>
<td>Header, Male 2x3-pin, 100mil spacing,</td>
<td>0.20 inch x 0.30</td>
<td>PEC03DAAN</td>
<td>Sullins</td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>PEC04DAAN</td>
<td>Header, Male 2x4-pin, 100mil spacing,</td>
<td>0.20 x 0.40 inch</td>
<td>PEC04DAAN</td>
<td>Sullins</td>
</tr>
<tr>
<td>2</td>
<td>J4, J7</td>
<td>22-05-3041</td>
<td>Header, Friction Lock Ass’y, 4-pin Right Angle</td>
<td>0.400 x 0.500</td>
<td>22-05-3041</td>
<td>Molex</td>
</tr>
<tr>
<td>1</td>
<td>J5</td>
<td>PEC08SAAN</td>
<td>Header, Male 8-pin, 100mil spacing,</td>
<td>0.100 inch x 8</td>
<td>PEC08SAAN</td>
<td>Sullins</td>
</tr>
<tr>
<td>1</td>
<td>J6</td>
<td>PEC09DAAN</td>
<td>Header, Male 2x5-pin, 100mil spacing,</td>
<td>0.100 inch x 5 X 2</td>
<td>PEC09DAAN</td>
<td>Sullins</td>
</tr>
<tr>
<td>4</td>
<td>Q1, Q2, Q6, Q7</td>
<td>2SK3019</td>
<td>MOSFET, Nch, 30V, 100mA, 8 Ohm</td>
<td>SC-75A</td>
<td>2SK3019</td>
<td>Rohm</td>
</tr>
<tr>
<td>2</td>
<td>Q3, Q8</td>
<td>2N7002</td>
<td>MOSFET, N-ch, 60-V, 115-mA, 1.2-Ohms</td>
<td>SOT23</td>
<td>2N7000-7-F</td>
<td>Diodes Inc</td>
</tr>
<tr>
<td>1</td>
<td>Q4</td>
<td>BS5138</td>
<td>MOSFET, Nch, 50V, 0.22A, 3.5 Ohm</td>
<td>SOT23</td>
<td>BS5138</td>
<td>Fairchild</td>
</tr>
<tr>
<td>1</td>
<td>Q5</td>
<td>BS584</td>
<td>MOSFET, P-ch, 50-V, 130-mA, 10-Ohms</td>
<td>SOT23</td>
<td>BS584</td>
<td>Fairchild</td>
</tr>
<tr>
<td>3</td>
<td>R1, R26, R27</td>
<td>300K 0.1%</td>
<td>Resistor, Chip, 0.1W, 0.1%, 25 ppm</td>
<td>0603</td>
<td>RG1608P-304-B-T5</td>
<td>SSM</td>
</tr>
<tr>
<td>1</td>
<td>R2</td>
<td>100K</td>
<td>Resistor, Chip, 1/16-W, 1%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>2</td>
<td>R3, R41</td>
<td>27K</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R4</td>
<td>165K</td>
<td>Resistor, Chip, 1/16-W, 1%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>8</td>
<td>R5, R6, R13, R14, R34-R37</td>
<td>100</td>
<td>Resistor, Chip, 1/16W, 5%</td>
<td>0603</td>
<td>Std</td>
<td>Any</td>
</tr>
<tr>
<td>1</td>
<td>R7</td>
<td>2M</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>14</td>
<td>R8-R12, R15-R20, R22-R24</td>
<td>1.5K</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R21</td>
<td>220K</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R25</td>
<td>200</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0603</td>
<td>Std</td>
<td>Any</td>
</tr>
<tr>
<td>1</td>
<td>R28</td>
<td>16.5K, 1%</td>
<td>Resistor, Chip, 0.1W, 0.1%, 25 ppm</td>
<td>0603</td>
<td>RG1608P-1652-B-T5</td>
<td>SSM</td>
</tr>
<tr>
<td>2</td>
<td>R29, R31</td>
<td>10K</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R30</td>
<td>0.10 75ppm</td>
<td>Resistor, Chip, 1/2W, 1%, 75ppm</td>
<td>2010</td>
<td>WSL2010R0100FEA</td>
<td>Dale</td>
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<tr>
<td>2</td>
<td>R32, R33</td>
<td>1M</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>0402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R38</td>
<td>1k</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>2</td>
<td>R39-40</td>
<td>47</td>
<td>Resistor, Chip, 1/16-W, 5%</td>
<td>402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>RT1</td>
<td>10K</td>
<td>Thermistor, NTC, 3-A</td>
<td>0.095 X 0.150 inch</td>
<td>103AT-2</td>
<td>Semitec</td>
</tr>
<tr>
<td>1</td>
<td>SW1</td>
<td>EVG-PLHA15</td>
<td>Switch, Push button, Momentary, N.O. Low Profile</td>
<td>0.200 x 0.200 inch</td>
<td>EVG-PLHA15</td>
<td>Panasonic</td>
</tr>
</tbody>
</table>
### Table 2. bq34z120EVM Bill of Materials (continued)

<table>
<thead>
<tr>
<th>Count</th>
<th>RefDes</th>
<th>Value</th>
<th>Description</th>
<th>Size</th>
<th>Part Number</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-001</td>
<td>-002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>TB1, TB3</td>
<td>ED555/3DS</td>
<td>Terminal Block, 3-pin, 6A, 3.5mm</td>
<td>0.41 x 0.25 inch</td>
<td>ED555/3DS</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>TP1</td>
<td>Vs scale Hi</td>
<td>Test Point, Black, Thru Hole Color Keyed</td>
<td>0.100 x 0.100 inch</td>
<td>5001</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>TP2</td>
<td>Vs scale Lo</td>
<td>Test Point, Black, Thru Hole Color Keyed</td>
<td>0.100 x 0.100 inch</td>
<td>5001</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>TP3–TP8</td>
<td>STD</td>
<td>Test Point, 0.020 Hole</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>U1, U3</td>
<td>SN74HC164PW</td>
<td>IC, 8-Bit Parallel-Out Serial Shift Registers</td>
<td>TSSOP-14</td>
<td>SN74HC164PW</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>U2</td>
<td>bq34z120PW</td>
<td>IC, Gas Gauge</td>
<td>TSSOP</td>
<td>bq34z120PW</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>—</td>
<td>PCB, 68 mm x 50 mm x 1 mm</td>
<td>PWR111</td>
<td>Any</td>
<td></td>
</tr>
</tbody>
</table>

**CONNECTOR**

<table>
<thead>
<tr>
<th>Count</th>
<th>RefDes</th>
<th>Value</th>
<th>Description</th>
<th>Part Number</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>J4 mate</td>
<td>Connector, Female, 0.100 Centers</td>
<td>Molex</td>
<td>22-01-3047</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>N/A</td>
<td>Terminal, Crimp, Tin</td>
<td>Molex</td>
<td>25-50-0114</td>
</tr>
<tr>
<td>N/A</td>
<td>Wire, Insulated 24 Awg, Red, 18 inches (+/-3 inches) (USB_5V)</td>
<td>Alpha</td>
<td>1854-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>Wire, Insulated 24 Awg, White, 18 inches (+/-3 inches) (SCL)</td>
<td>Alpha</td>
<td>1854-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>Wire, Insulated 24 Awg, Black, 18 inches (+/-3 inches) (GND)</td>
<td>Alpha</td>
<td>1854-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>Wire, Insulated 24 Awg, Brown, 18 inches (+/-3 inches) (SDA)</td>
<td>Alpha</td>
<td>1854-7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>N/A</td>
<td>Heatshrink 1”</td>
<td>Any</td>
<td>Any</td>
</tr>
</tbody>
</table>

**Notes:**
1. These assemblies are ESD sensitive, observe ESD precautions.
2. These assemblies must be clean and free from flux and all contaminants. Use of no-clean flux is not acceptable.
3. These assemblies must comply with workmanship standards IPC-A-610 Class 2.
4. Reference designators marked with an asterisk (‘*’) cannot be substituted. All other components can be substituted with equivalent MFG’s components.
5. Make one SMBus connector wire assembly for each assembly produced, from J4 mate, 4–24 Awg wires and crimp terminals. Wire colors for pin numbers are listed below. Place a J4 mate on each end of the wire assembly.
4.3 bq34z120 Circuit Module Performance Specification Summary

This section summarizes the performance specifications of the bq34z120 circuit module.

Table 3. Performance Specification Summary

<table>
<thead>
<tr>
<th>Specification</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage BAT+ to BAT- in ≤ 5-V mode</td>
<td>2.7</td>
<td>4</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Input voltage BAT+ to BAT- in MultiCell &gt; 5-V mode</td>
<td>5</td>
<td>28</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>Charge and discharge current</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>A</td>
</tr>
</tbody>
</table>

5 EVM Hardware and Software Setup

This section describes how to install the bq34z120EVM PC software and how to connect the different components of the EVM.

5.1 System Requirements

The bq34z120EVSW requires Windows 2000, Windows XP, Windows Vista, or Windows 7.

5.2 Software Installation

**NOTE:** For the latest software archive, contact the Texas Instruments field representative assigned to this device.

Install the bq34z120EVSW software with the following steps:

1. Save the archive to a temporary directory.
2. Double-click the executable filename and follow the installer instructions to complete the bq34z120 EVSW installation.
   - If the EV2300 or EV2400 was not previously installed: After bq34z120 EVSW installation, a TI USB DRIVER INSTALLER pops up. Click Yes for the agreement message and follow its instructions.
3. Plug the EV2300 or EV2400 into a USB port.

5.3 Troubleshooting Unexpected Dialog Boxes

Users downloading the files must be logged in as the administrator, or must have privileges to install new programs.

The driver is not signed, so the administrator must allow installation of unsigned drivers.

5.4 Hardware Connection

The bq34z120EVM comprises two hardware components: the bq34z120 circuit module and either the EV2300 or EV2400 PC-interface box.
5.4.1 Connecting the bq34z120 Circuit Module to a Battery Pack

Figure 8 shows how to connect the bq34z120 circuit module to the cells and system load and charger.

Figure 8. bq34z120 Circuit Module Connection to Cells and System Load and Charger

5.4.2 PC Interface Connection

Configure the hardware to interface with the PC by doing the following:

1. Connect the bq34z120 device-based smart battery to the EV2300 or EV2400 using the provided cable or the connections shown in Table 4.

   Table 4. Circuit Module to EV2300 or EV2400 Connections

<table>
<thead>
<tr>
<th>bq34z120 Device-Based Battery</th>
<th>EV2300</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA</td>
<td>PC SDA</td>
</tr>
<tr>
<td>SCL</td>
<td>PC SCL</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

   2. Connect the PC USB cable to the EV2300 or EV2400 and the PC USB port. The bq34z120EVM-001 is now set up for operation.
5.5 Operation

This section details the operation of the bq34z120 EVSW software.

NOTE: Neither the EV2300 or EV2400 driver supports Windows Sleep or Hibernate states. If communicating with the EV2300 or EV2400 or the EVM presents a problem, unplug the USB cable and then plug it back in.

5.5.1 Starting the Program

With the EV2300 or EV2400 and the bq34z120EVM connected to the computer, run bq34z120 EVSW from the Desktop Icon or Start | All Programs | Texas Instruments | bq Evaluation Software menu sequence. The Data RAM Screen 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 using the Options and Set Scan Interval menu selections. The range for this interval is 0 ms to 65535 ms. Only items that are selected for scanning are scanned within this period.

The bq34z120 EVSW provides a logging function that logs the values that were last scanned by the EVSW. To enable this function, click 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 must be manually unchecked.

The logging interval is specified under the Options menu with the maximum value of 65535 ms. The Log interval cannot be smaller than the scan interval because this results in the same value being logged at least twice.
Figure 9 shows the Data RAM set along with additional ManuFacturersAccess() command information, such as individual cell measurements.

Dragging the splitter bar, the line that separates the Flags/Static data from Data RAM values, changes the height of the Flags/Static Data display. Selecting View then Auto Arrange returns the splitter bar to its original location.

5.5.2 Setting Programmable bq34z120 Options

The bq34z120 data flash comes configured according to the default settings detailed in the bq34z120 Wide Range Fuel Gauge with Impedance Track™ Technology Datasheet (SLUSBE0). Ensure that the settings are correctly changed to match the pack and application for the bq34z120 solution being evaluated.

NOTE: Set these options correctly to get the best performance.
Use Figure 10, the Data Flash Screen to configure the settings.

Figure 10. Data Flash Screen, Gas Gauging Class

Click on menu option | Data Flash | Read All | to read all the data from the bq34z120 data flash.

Write to a data flash location by clicking on the desired location and entering the data. Clicking Enter writes the entire tab of flash data. Writing to a data flash location can also be accomplished by selecting menu option | Data Flash | Write All |. The data flash must be read before any writes are performed to avoid having incorrect data written to the device.

The | File | Special Export | menu option allows the data flash to be exported.

Save the data flash configuration 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 bq34z120 using the Write All button.

The configuration information of the bq34z120 data is held in the data flash.

The bq34z120 allows for an automatic data flash export function, similar to the Data RAM logging function. This feature, when selected using | Options | Auto Export |, exports data flash to a sequential series of files named 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 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 AutoExport on and off.

If the data-flash screen is blank, the bq34z120 used may not be supported by the bqEVSW version in use. An upgrade may be required.

5.6 Calibration Screen

5.6.1 How to Calibrate

Calibrate the bq34z120 using appropriate floating power supplies before the cells are attached. Complete the following before the bq34z120 is calibrated:

- Connect and measure a 1- to 2-A stable current source from BAT(–) to PACK(–). The positive lead from the current source is connected to PACK(-) simulating a discharge current.
- Connect and measure a stable voltage source from BAT(+) to BAT(–).
- Measure the temperature near the thermistor.

Whether all of the preceding steps are required depends on the type of calibration being performed.

5.6.2 Calibrating the bq34z120

Calibrate the bq34z120 using the following sequential steps:

1. Select the types of calibration to be performed.
2. Enter the measured values for the types of calibration selected (except for offset calibrations).
3. If Temperature Calibration is selected, select the sensor that is to be calibrated.
4. Click the appropriate button to initiate calibration.
Figure 11. Calibration Screen
5.7  I²C Pro (Advanced) Screen

5.7.1  I²C Communication

The set of read and write operations over I²C bus are not specific to any gas gauge. These are provided as general-purpose communication tools.

5.7.2  Reprogramming

Reprogram the device using the following:

- Ensure that the gauge is in Full Access mode. The SS and FAS flags in the Control Status register must both be unasserted (Green). If not, use the appropriate data block codes to command (0x00) to clear the flags. Type default codes of 0414,3672 into the Write I2C Data Block feature to unseal and ffff, ffff for full access, or into the value field of the control register on the Data Ram screen followed by pressing Enter. Stop the scan during this operation to ensure the words are received consecutively.

- With scanning enabled, using the Write I2C Data Block feature commands the gauge to stop executing and enter ROM mode. Send data block code 0x000f to command 0x00. If successful, the status at the bottom of the screen changes from Communication OK to Communication Error.

- Use the file browser button to locate the desired .senc file, press the Program button.

- When programming is complete, pushing the Execute button initiates program execution. Within a few seconds Communication OK appears in the status area.

- Close and re-open the Evaluation Software to ensure data file synchronization.
When using the HDQ single wire serial communication feature, the mode of the gauge must be changed with a special command. This screen provides a button for this purpose. Note the warning message. The process is not reversible. Once in HDQ mode, the HDQ pro screen is available for testing commands and reprogramming the device. For register scanning and data flash access, use the companion evaluation program for HDQ.

5.8 Send HDQ Screen

When using the HDQ single wire serial communication feature, the mode of the gauge must be changed with a special command. This screen provides a button for this purpose. Note the warning message. The process is not reversible. Once in HDQ mode, the HDQ pro screen is available for testing commands and reprogramming the device. For register scanning and data flash access, use the companion evaluation program for HDQ.
This will change communication from I2C to HDQ8. This operation cannot be reversed.

Change comm to HDQ8

Figure 13. Send HDQ Screen
5.9 bqChem

bqChem provides access to the library of previously characterized Lithium-Ion cell chemistries. bqChem also lets you program the chemical database into the gauge. Users can sort by chemical ID or by cell manufacturer. For help identifying the chemistry for the cells, contact the Texas Instruments field representative.

![Figure 14. bqChem Screen](image-url)
5.10 Related Documentation from Texas Instruments

For related documentation, contact the TI field representative.

Documents:  
- bq34z120/bq30z55-R1 SBS 1.1-Compliant Gas Gauge With Impedance Track™ Datasheet
- EV2300 EVM Interface Board User's Guide
- EV2400 EVM Interface Board User's Guide

Literature Number:  
- SLUSBE0
- SLUU159
- SLUU446
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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.

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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.

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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.
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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.

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EVALUATION BOARD/KIT/MODULE (EVM)
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