User's Guide
SLUU242B – May 2006 – Revised October 2013

bq20z70EVM-001 SBS 1.1 Impedance Track™ Technology Enabled Battery Management Solution Evaluation Module

This EVM is a complete evaluation system for the bq20z70/bq29330/bq29412 battery management system. The EVM includes one bq20z70/bq29330/bq29412 circuit module, a current sense resistor, two thermistors, and Windows®-based PC software. The circuit module includes one bq20z70 IC, one bq29330 IC, one bq29412 IC, and all other onboard components necessary to monitor and predict capacity, perform cell balancing, monitor critical parameters, protect the cells from overcharge, over discharge, short circuit, and overcurrent in 2-, 3- or 4-series cell Li-ion or Li-polymer battery packs. The circuit module connects directly across the cells in a battery. An EV2300 board for gas gauge interface is required to interface this EVM with the PC and can be purchased separately. With the EV2300 interface board and software, the user can read the bq20z70 data registers, program the chipset for different pack configurations, log cycling data for further evaluation, and evaluate the overall functionality of the bq20z70/bq29330/bq29412 solution under different charge and discharge conditions.

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Impedance Track is a trademark of Texas Instruments.
Windows is a registered trademark of Microsoft Corporation.

1 Features

- Complete evaluation system for the bq20z70 SBS 1.1-compliant advanced gas gauge with Impedance Track Technology, bq29330 analog front end (AFE) and protection IC, and bq29412 independent overvoltage protection IC
- Populated circuit module for quick setup
- PC software and interface board for easy evaluation
- Software that allows data logging for system analysis

1.1 Kit Contents

- bq20z70/bq29330/bq29412 circuit module
- Software CD with the evaluation software
- Set of support documentation

1.2 Ordering Information

Table 1. Ordering Information

EVM PART NUMBER	CHEMISTRY	CONFIGURATION	CAPACITY
bq20z70EVM-001	Li-ion	2, 3, or 4 cell	Any

2 bq20z70/bq29330-Based Circuit Module

The bq20z70/bq29330/bq29412-based circuit module is a complete and compact example solution of a bq20z70 and bq29330 circuit for battery management and protection of Li-ion or Li-polymer packs. The circuit module incorporates a bq20z70 battery monitor IC, bq29330 AFE and protection IC, bq29412 independent overvoltage protection IC, and all other components necessary to accurately predict the capacity of 2-, 3-, or 4-series cells.

2.1 Circuit Module Connections

Contacts on the circuit module provide the following connections:

- Direct connection to the cells: 1N (BAT–), 1P, 2P, 3P, 4P (BAT+)
- To the serial communications port (SMBC, SMBD, VSS)
- The system load and charger connect across PACK+ and PACK–
- To the system present pin (SYS PRES)

2.2 Pin Descriptions

PIN NAME	DESCRIPTION
1N	–ve connection of first (bottom) cell
1P	+ve connection of first (bottom) cell
2P	+ve connection of second cell
3P	+ve connection of third cell
4P	+ve connection of fourth (top) cell
SMBC	Serial communication port clock
SMBD	Serial communication data port
VSS	Pack negative terminal
PACK–	Pack negative terminal
SYS PRES	System present pin (if low, system is present)
PACK+	Pack positive terminal

3 bq20z70/bq29330 Circuit Module Schematic

This section contains information for modifying and choosing a precharge mode for bq20z70/bq29330/bq29412 implementation.

3.1 Schematic

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

3.2 Choosing Particular Precharge Mode

The chipset supports both a charger that has a precharge mode and one that does not. The EVM by default supports a charger that does not have a precharge mode. This is configured by grounding the PMS pin with a resistor. R12 and Q2 are used as the precharge current path in order to sustain sufficient Pack+ voltage when the battery voltage is too low to power up the bq29330 IC.

If the charger has a precharge function, R12 and FET Q2 are not used. The PMS pin must be pulled high to disable ZVCHG output. The charge FET Q1 is used as the precharge FET, and the charger must control the precharge current and voltage.

Note: The configuration at PMS pin is a hardware level control. Once the bq20z70 is up and running, the firmware may change the precharge settings. Please refer to bq20z70 datasheet for further information.

3.3 Testing Fuse-Blowing Circuit

To prevent the loss of board functionality during the fuse-blowing test, the actual chemical fuse is not provided in the circuit. FET Q4 drives TP3 low if a fuse-blow condition occurs; so monitoring TP3 can be used to test this condition.

4 Circuit Module Physical Layouts and Bill of Materials

This section contains the board layout, bill of materials, and assembly drawings for the bq20z70/ bq29330/ bq29412 circuit module.

NOTE: For the battery pack designer: D3 is not recommended, and should be shorted out if the DSG FET does not have built-in zener diode protection.

4.1 Board Layout

This section shows the dimensions, PCB layers, and assembly drawing for the bq20z70/bq29330 module.

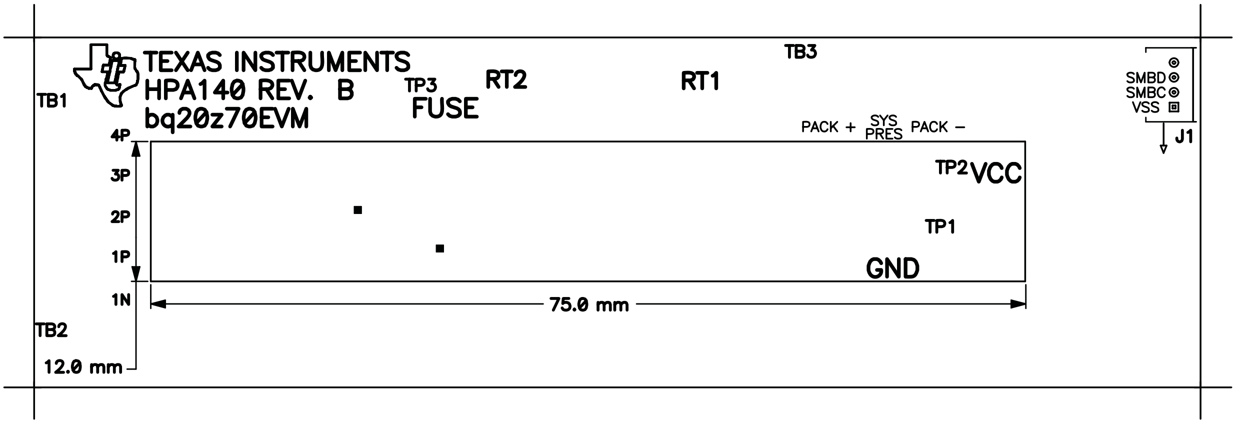


Figure 1. bq20z70EVM-001 Layout (Silk Screen)

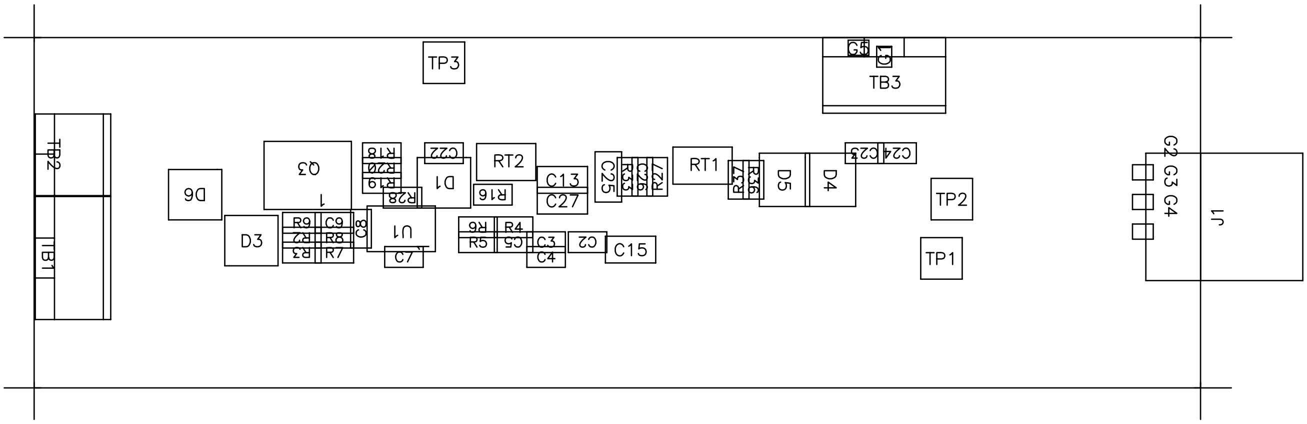


Figure 2. Top Assembly

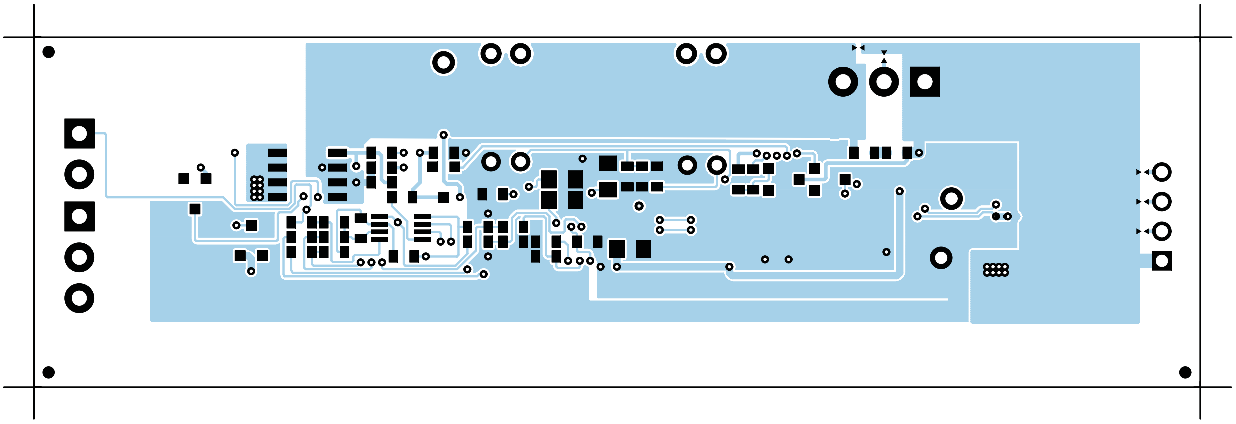


Figure 3. Top Layer

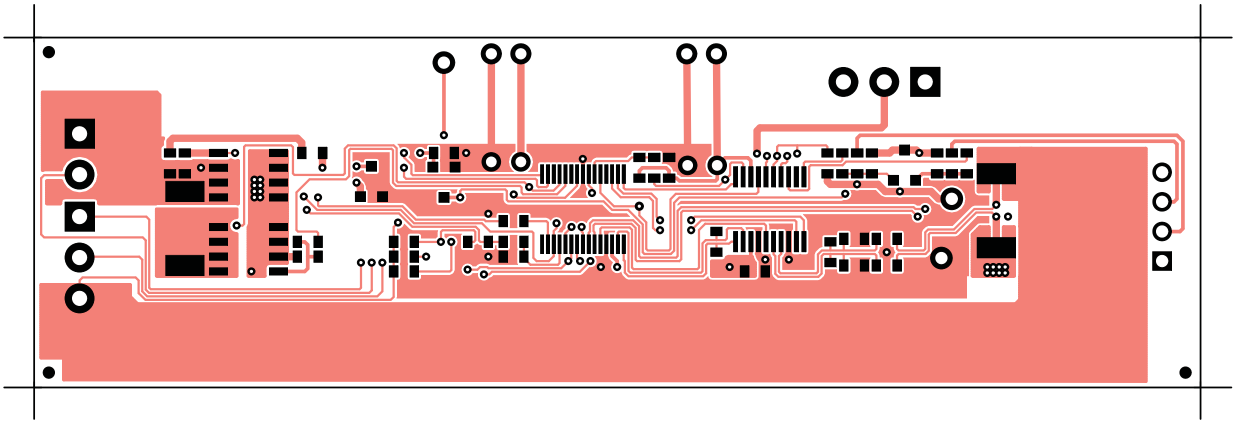


Figure 4. Bottom Layer

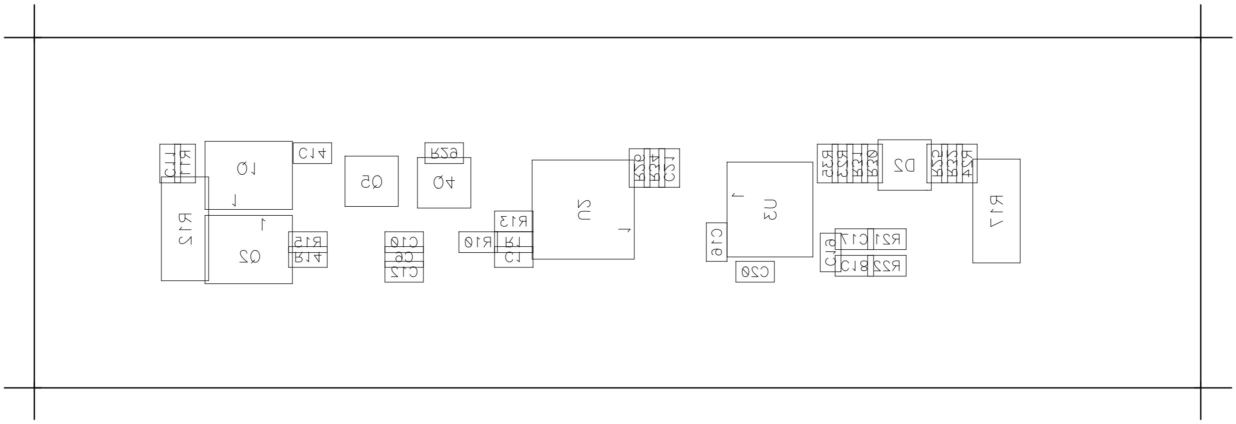


Figure 5. Bottom Assembly

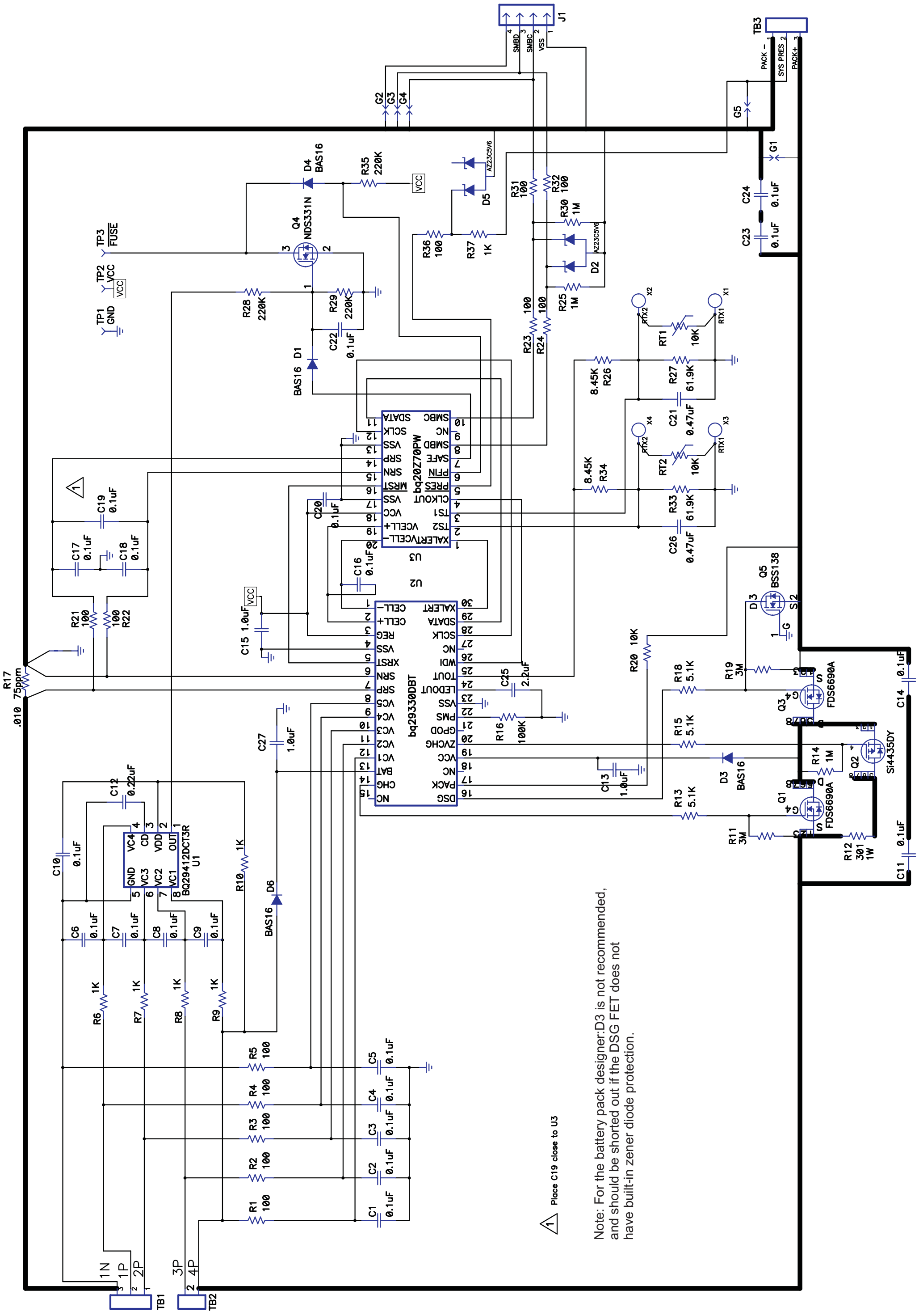
4.2 Bill of Materials

Table 2. Bill of Materials

Count	Ref Des	Value	Description	Size	Part No.	MFR
20	C1–C11, C14, C16–C20, C22–C24	0.1 µF	Capacitor, ceramic, 0.1 µF, 50 V, X7R, 20%	0603	STD	Any
1	C12	0.22 µF	Capacitor, ceramic, 0.22 µF, 25 V, X7R, 20%	0603	STD	Any
3	C13, C15, C27	1.0 µF	Capacitor, ceramic, 1.0 µF, 25 V, X7R, 20%	0805	STD	Any
2	C21, C26	0.47 µF	Capacitor, ceramic, 0.47 µF, 16 V, X7R, 20%	0603	STD	Any
1	C25	2.2 µF	Capacitor, ceramic, 2.2 µF, 10 V, X7R, 20%	0805	STD	Any
4	D1, D3, D4, D6	BAS16	Diode, Switching, 150-mA, 75-V, 350 mW	SOT23	BAS16	Vishay-Liteon
2	D2, D5	AZ23C5V6	Diode, dual, zener, 5.6V, 300mW	SOT23	AZ23C5V6	Vishay-Telefunken
1	J1	22-05-3041	Header, friction lock assembly, 4-pin right angle	0.400 x 0.500	22-05-3041	Molex
2	Q1, Q3	FDS6690A	MOSFET, N-ch, Logic Level, Power Trench, 30 V, 11 A, 12.5 mΩ	SO8	FDS6690A	Fairchild
1	Q2	Si4435DY	MOSFET, P-ch, 30 V, 8 A, 20 mΩ	SO8	Si4435DY	Siliconix
1	Q4	NDS331N	MOSFET, N-ch, 20 V, 1.3 A, 0.16 Ω	SOT23	NDS331N	Fairchild
1	Q5	BSS138	MOSFET, N-ch, 50 V, 0.22 A, 6 Ω	SOT23	BSS138	Fairchild
12	R1–R5, R21–R24, R31, R32, R36	100	Resistor, chip, 100 Ω, 1/16 W, 5%	0603	STD	STD
2	R11, R19	3M	Resistor, chip, 3 MΩ, 1/16 W, 5%	0603	STD	STD
1	R12	301	Resistor, chip, 301 Ω, 1 W, 1%	2512	WSL-2512-301	Vishay
3	R13, R15, R18	5.1K	Resistor, chip, 5.1 kΩ, 1/16 W, 5%	0603	STD	STD
3	R14, R25, R30	1M	Resistor, chip, 1 MΩ, 1/16 W, 5%	0603	STD	STD
1	R16	100K	Resistor, chip, 100 kΩ, 1/16 W, 5%	0603	STD	STD
1	R17	0.010 75ppm	Resistor, chip, 0.010 Ω, 1 W, 1%	2512	WSL-2512-010	Vishay
1	R20	10K	Resistor, chip, 10 kΩ, 1/16 W, 5%	0603	STD	STD
2	R26, R34	8.45K	Resistor, chip, 8.45 kΩ, 1/16 W, 1%	0603	STD	STD
2	R27, R33	61.9K	Resistor, chip, 61.9 kΩ, 1/16 W, 1%	0603	STD	STD
3	R28, R29, R35	220K	Resistor, chip, 220 kΩ, 1/16 W, 5%	0603	STD	STD
6	R6–R10, R37	1K	Resistor, Chip 1 kΩ, 1/16W, 5%	0603	STD	STD
2	RT1, RT2	10K	Thermistor, 10 kΩ	0.095 x 0.150	NTC103AT	Sematec
2	TB1, TB3	ED1515	Terminal block, 3 pin, 6 A, 3,5 mm	0.41 x 0.25	ED1515	OST
1	TB2	ED1514	Terminal block, 2 pin, 6 A, 3,5 mm	0.27 x 0.25	ED1514	OST
1	TP1	GND	Test point, White, Thru Hole Color Keyed	0.100 × 0.100 in	5002	Keystone
1	TP2	VCC	Test point, White, Thru Hole Color Keyed	0.100 × 0.100 in	5002	Keystone
1	TP3	~FUSE	Test point, White, Thru Hole Color Keyed	0.100 × 0.100 in	5002	Keystone
1	U1		IC, voltage protection for 2, 3, or 4 cell Li-Ion, 2nd protection, 4.45 OVP ±25 mV	MSOP-08 (DCT3)	BA29412DT3R	TI
1	U2		IC, 2, 3, or 4 cell series protection control AFE	TSSOP-30	bq29330DBT	TI
1	U3		IC, SBS 1.1-Compliant GG Enabled with Impedance Track™ technology, use with the bq29330	TSSOP-20	bq20z70PW	TI
		Connector				
2	J5 mate	Connector, Female, 0.100 centers			Molex	22-01-3407
8	N/A	Terminals, crimp, tin			Molex	08-50-0114
	N/A	Wire, insulated 24 AWG. red, 18 inches (±3 inches) (USB_5V)			Alpha	1854-3
	N/A	Wire, insulated 24 AWG. white, 18 inches (±3 inches) (SCL)			Alpha	1854-1
	N/A	Wire, insulated 24 AWG. black, 18 inches (±3 inches) (GND)			Alpha	1854-2
	N/A	Wire, insulated 24 AWG. brown, 18 inches (±3 inches) (SDA)			Alpha	1854-7
1	N/A	Heatsink, 1 inch			Any	Any
Notes:						
1.	These assemblies are ESD sensitive; observe ESD precautions.					
2.	This assembly must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.					

Table 2. Bill of Materials (continued)

Count	Ref Des	Value	Description	Size	Part No.	MFR
3.	This assembly 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 J5 mate, 4-24 AWG wires, and crimp terminals. Wire colors for pin numbers are listed below. The wire assembly shall have a J5 mate on each end. • Red – Pin 4 (Signal USB_5V) • Brown – Pin 3 (Signal Data) • White – Pin 2 (Signal Clock) • Black – Pin 1 (GND)					
6.	RT1/RT2 should be assembled horizontally laying flat against the board edge with the sensing tip out.					



Place C19 close to U3

Note: For the battery pack designer:D3 is not recommended, and should be shorted out if the DSG FET does not have built-in zener diode protection.

Figure 6. Schematic

4.3 bq20z70/bq29330/bq29412 Circuit Module Performance Specification Summary

This section summarizes the performance specifications of the bq20z70/ bq29330/bq29412 circuit module.

Table 3. Performance Specification Summary

Specification	Min	Typ	Max	Units
Input voltage Pack+ to Pack-	6	15	25	V
Charge and discharge current	0	2	7	A

5 EVM Hardware and Software Setup

This section describes how to install the bq20z70EVM-001 PC software, and how to connect the different components of the EVM.

5.1 System Requirements

The bq20z70EVSW requires Windows 2000 or Windows XP. Drivers for Windows 98SE are provided, but Microsoft no longer supports Windows 98; and there may be issues in Windows 98 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 bq20z70 tool folder on power.ti.com. Use the following steps to install the bq20z70EVSW software:

1. Copy the files from the CD into the temporary directory you selected, in the folder "bq20z70 EV SW Install", double-click on *bqEVSWSetup00.09.32.exe* and follow the installer instructions to complete the bq20z70 EVSW installation.
2. If the EV2300 was not previously installed, after bq20z70 EVSW installation, a TI USB DRIVER INSTALLER will pop up. Click "Yes" for the agreement message and follow its instructions.
3. Plug the EV2300 into a USB port.
4. The Win98 Driver can be found in the archive Win98EV2300Drivers-DocUpdateDec1703.zip under the "EV2300 Drivers" folder.

If files were downloaded from the Web:

1. Open the archive containing the installation package, and copy its contents in a temporary directory.
2. Follow the preceding steps 1 - 4.

6 Troubleshooting Unexpected Dialog Boxes

Ensure that the files were extracted from the zip file using the *Preserve Folder names* option.

Ensure that all the files were extracted from the zip file.

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 bq20z70EVM-001 comprises three hardware components: the bq20z70/bq29330/bq29412 circuit module, the EV2300 PC interface board (purchased separately), and the PC.

7.1 Connecting the bq20z70/bq29330/bq29412 Circuit Module to a Battery Pack

Figure 7 shows how to connect the bq20z70/bq29330/bq29412 circuit module to the cells and system load/charger.

The cells should be connected in the following order:

1. 4-Cell Pack: 1N (BAT-), 1P, and 2P (see Section 2.1 for definitions).
2. 3-Cell Pack: 1N (BAT-), 1P, 2P, and then connect 4P and 3P together.
3. 2-Cell Pack: 1N (BAT-), 1P, and then connect 4P, 3P, and 2P together

To start charge or discharge test, connect SYS PRES pin to PACK- pin to set SYS PRES state. To test sleep mode, disconnect the SYS PRES pin.

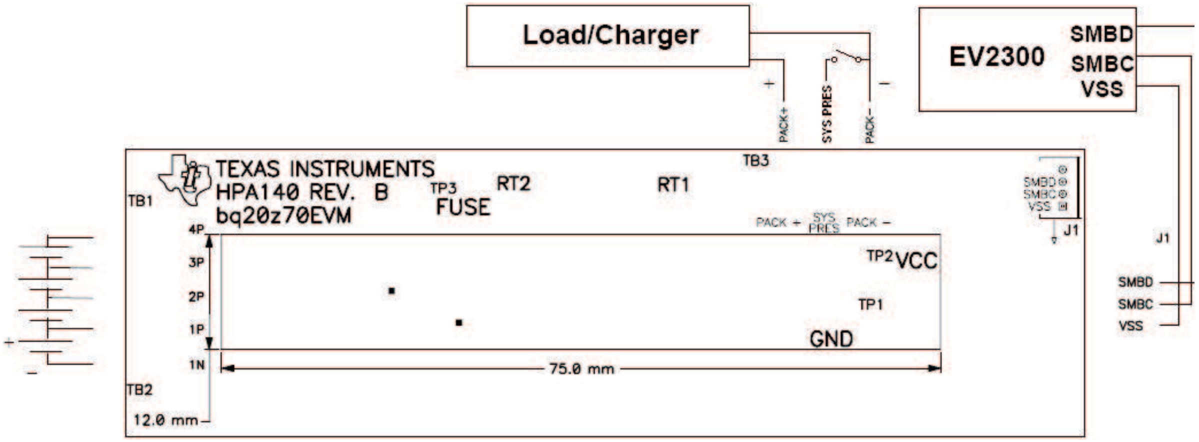


Figure 7. bq20z70/bq29330 Circuit Module Connection to Cells and System Load/Charger

7.2 PC Interface Connection

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

1. Connect the bq20z70/bq29330-based smart battery to the EV2300 using wire leads as shown in Table 4.

Table 4. Circuit Module to EV2300 Connections

bq20z70/bq29330-Based Battery	EV2300
SMBD	SMBD
SMBC	SMBC
VSS	GND

2. Connect the PC USB cable to the EV2300 and the PC USB port.

The bq20z70EVM-001 is now set up for operation.

8 Operation

This section details the operation of the bq20z70 EVSW software. Note: the EV2300 driver does not support Windows Sleep or Hibernate. In case there is a problem communicating with the EV2300 or the EVM, first unplug the USB cable then plug it back in. If the problem persists, check whether the EVM is in Shutdown mode. The bq20z70 can be waken up by momentarily applying a voltage higher than 5.5V (but less than 25V) at Pack+ pin of the EVM.

8.1 Starting the Program

With the EV2300 and the bq20z70 EVM connected to the computer, run bq20z70 EVSW from the Start | Programs | Texas Instruments | bq20z70 EVSW menu sequence. The SBS Data 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 via 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 bq20z70 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 interval are specified under the |Options| menu with the maximum value of 65535 milliseconds. The *Log* interval cannot be smaller than the scan interval because this results in the same value being logged at least twice.

Name	Value	Unit	Log	Scan
Manufacturer Access	0000	hex	☑	☑
Remaining Cap. Alarm	300	mAh	☑	☑
Remaining Time Alarm	10	min	☑	☑
Battery Mode	6081	hex	☑	☑
At Rate	0	mA	☑	☑
At Rate Time To Full	65535	min	☑	☑
At Rate Time To Empty	65535	min	☑	☑
At Rate OK	1		☑	☑
Temperature	24.35	°C	☑	☑
Voltage	15513	mV	☑	☑
Current	0	mA	☑	☑
Average Current	0	mA	☑	☑
Max Error	100	%	☑	☑
Relative State of Charge	66	%	☑	☑
Absolute State of Charge	58	%	☑	☑
Remaining Capacity	2515	mAh	☑	☑
Full charge Capacity	3834	mAh	☑	☑

Name	Value	Unit	Log	Scan
Run time To Empty	65535	min	☑	☑
Average Time to Empty	65535	min	☑	☑
Average Time to Full	65535	min	☑	☑
Charging Current	0	mA	☑	☑
Charging Voltage	0	mV	☑	☑
Battery Status	48C0	hex	☑	☑
Cycle Count	0		☑	☑
Cell Voltage 4	3928	mV	☑	☑
Cell Voltage 3	3869	mV	☑	☑
Cell Voltage 2	3865	mV	☑	☑
Cell Voltage 1	3852	mV	☑	☑
FET Control	0000	hex	☑	☑
Safety Status	0000	hex	☑	☑
PFStatus	0000	hex	☑	☑
Operation Status	0040	hex	☑	☑
Charging Status	0000	hex	☑	☑

Flags / Status Bits

Battery Status - SCANNING

OCA	TCA	-	OTA	TDA	-	RCA	RTA
INIT	DSG	FC	FD	EC3	EC2	EC1	EC0

Operation Status - SCANNING

PRES	FAS	SS	CSV	-	LDMD	-	-
WAKE	DSG	XDSG	-	-	-	VOK	QEN

PF status - SCANNING

-	-	-	-	SOCD	SOCC	-	AFE_C
DFF	DFETF	CFETF	-	SOTD	SOTC	SOV	PFIN

FET Control - SCANNING

-	-	-	-	-	-	-	-
-	-	-	OD	ZVCHG	CHG	DSG	RSVD

Safety status - SCANNING

OTD	OTC	OCD	OCC	-	-	-	-
CUV	COV	PF	-	WDF	AOCD	SCC	SCD

Charging Status - SCANNING

XCHG	CHGSUSP	PCHG	MCHG	-	-	FCHG	-
-	CB	-	-	-	-	OC	-

Battery Mode - SCANNING

CapM	ChgM	AM	-	-	-	PB	CC
CF	-	-	-	-	-	PBS	ICC

Scan On

Device:700, Ver:1.00

Communication OK.

SBS Task Progress: 75%

02:38:16 PM

Figure 8. SBS Data Screen

This screen shows the SBS data set along with additional ManufacturersAccess() command information such as individual cell measurements. Additional Flag and Static data can be viewed by selecting the appropriate tab at the bottom of the SBS screen.

Data such as SBS.ManufacturerName( ) is static and does not change. This data is viewed separately using the *Static Data* tab available at the bottom of the screen.

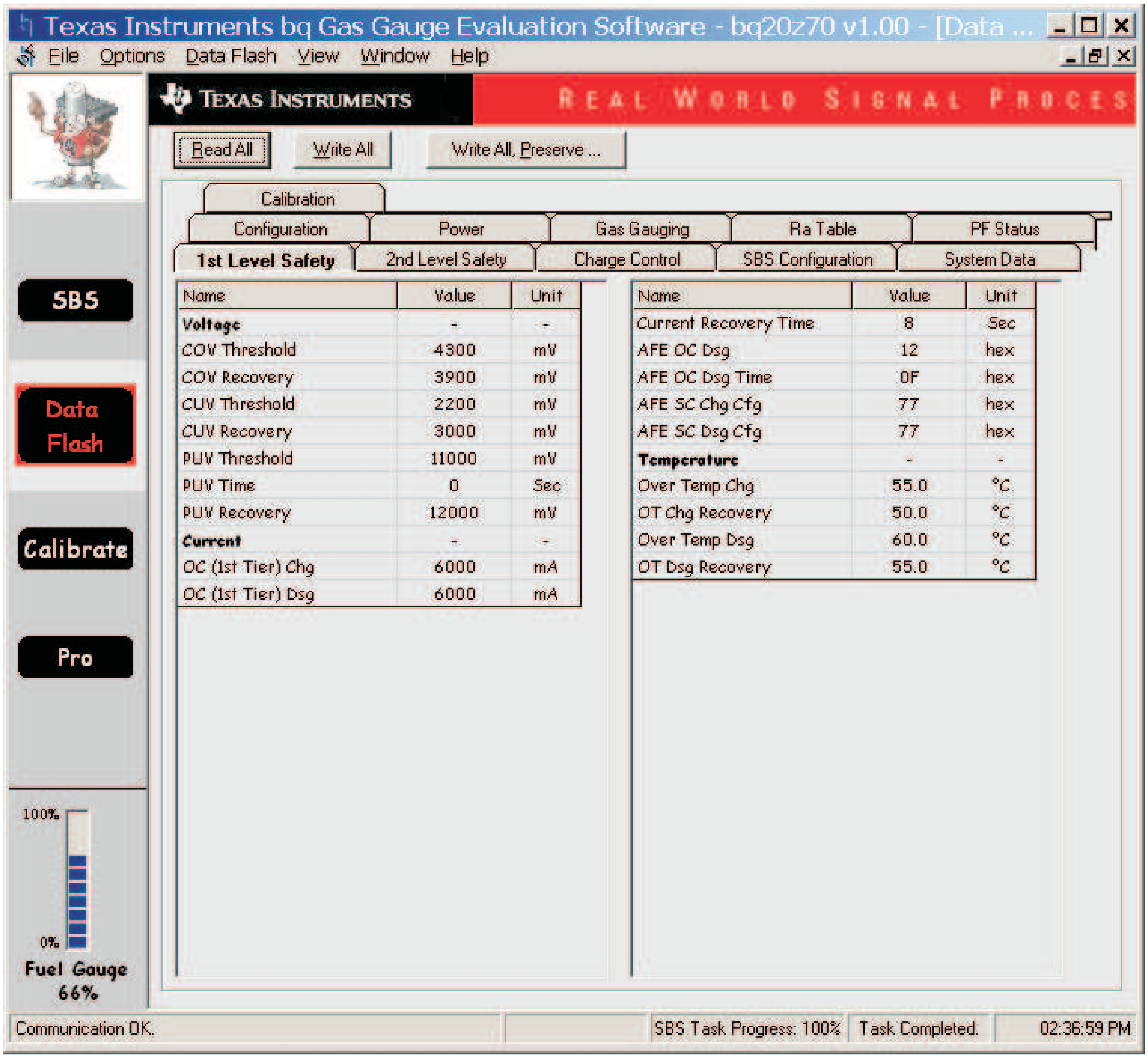
Dragging the splitter bar (line that separates the Flags/Static data from SBS values) changes the height of the Flags/Static Data display. Selecting |View| then |Auto Arrange| returns the splitter bar to its original location.

8.2 Setting Programmable bq20z70 and bq29330 Options

The bq20z70 data flash comes configured per the default settings detailed in the bq20z70 data sheet (SLUS686). Ensure that the settings are correctly changed to match the pack and application for the bq20z70/bq29330 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.



Name	Value	Unit
Voltage	-	-
COV Threshold	4300	mV
COV Recovery	3900	mV
CUV Threshold	2200	mV
CUV Recovery	3000	mV
PUV Threshold	11000	mV
PUV Time	0	Sec
PUV Recovery	12000	mV
Current	-	-
OC (1st Tier) Chg	6000	mA
OC (1st Tier) Dsg	6000	mA

Name	Value	Unit
Current Recovery Time	8	Sec
AFE OC Dsg	12	hex
AFE OC Dsg Time	0F	hex
AFE SC Chg Cfg	77	hex
AFE SC Dsg Cfg	77	hex
Temperature	-	-
Over Temp Chg	55.0	°C
OT Chg Recovery	50.0	°C
Over Temp Dsg	60.0	°C
OT Dsg Recovery	55.0	°C

Communication OK. | SBS Task Progress: 100% | Task Completed. | 02:36:59 PM

Figure 9. Data Flash Screen, 1st Level Safety Class

To read all the data from the bq20z70 data flash, click on menu option | Data Flash | Read All |.

To write to a data flash location, 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.

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 can also be retrieved in this way, imported, and written to the bq20z70 using the | Write All | button.

The configuration information of the bq29330 and module calibration data is also held in the bq20z70 data flash.

The bq20z70 allows for an automatic data flash export function, similar to the SBS Data 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 seconds. The AutoExport filename is also set under the | Options menu |.

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

If the data flash screen is blank, then the bq20z70 that is being used may not be supported by the bqEVSW version that is being used. An upgrade may be required.

9 Calibration Screen

9.1 How to Calibrate

Before the bq20z70 is calibrated:

- Connect a load to Pack- and Pack+ that draws approximately 2 A and measures discharge current to use the FETs.
- Connect a current source to Batt- and Pack- to calibrate without using the FETs.
- Measure the pack voltage from Batt+ to Batt- (Total of Cell voltages).
- Measure the temperature of the pack.
- These steps may or may not be required, depending on the type of calibration being performed.

9.2 To Calibrate the bq20z70

Select the types of calibration to be performed.

Enter the measured values for the types selected (Except for *CC Offset Calibration*).

If *Voltage Calibration* is selected, then enter the number of cells on the pack.

If *Temperature Calibration* is selected, then select the sensor that is to be calibrated.

If the load is connected between Pack+ and Pack-, then select the *Use FETs* check box.

Press the *Calibrate Part* button.

9.3 Board Offset Calibration

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

Remove load/external voltage.

Press the *Software Board Offset Calibration* button.

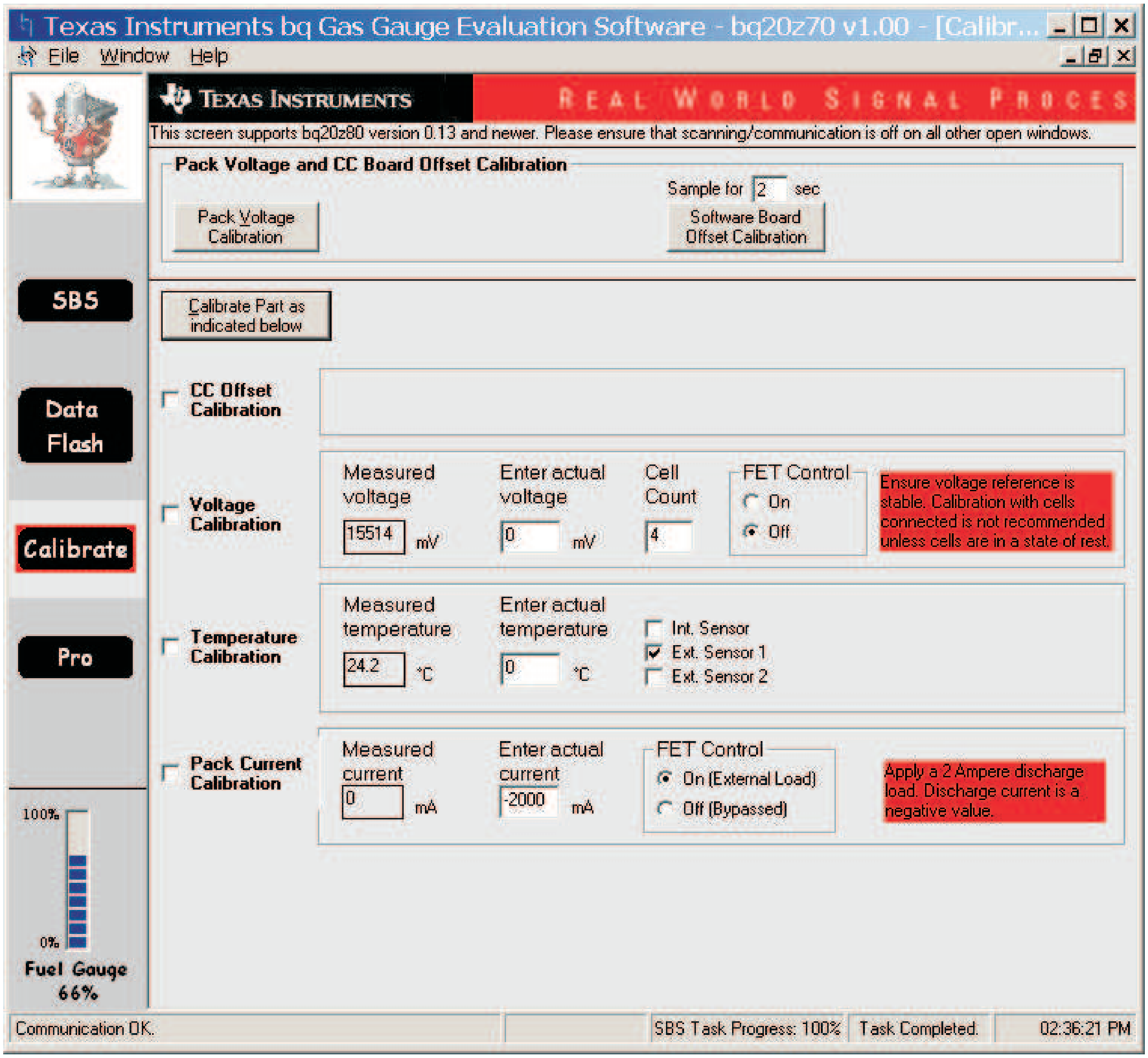
9.4 Pack Voltage Calibration

This calibrates the voltage at the AFE Pack pin.

Make sure *Voltage Calibration* has been performed for the pack. If *Voltage Calibration* is not performed, then *Pack Voltage Calibration* calibrates incorrectly.

Remove load/external voltage applied between Pack+ and Pack-.

Press the *Pack Voltage* button to calibrate.



This screen supports bq20z80 version 0.13 and newer. Please ensure that scanning/communication is off on all other open windows.

Pack Voltage and CC Board Offset Calibration

Sample for 2 sec

☐ **CC Offset Calibration**

☐ **Voltage Calibration**

Measured voltage 15514 mV

Enter actual voltage 0 mV

Cell Count 4

FET Control ○ On ● Off

Ensure voltage reference is stable. Calibration with cells connected is not recommended unless cells are in a state of rest.

☐ **Temperature Calibration**

Measured temperature 24.2 °C

Enter actual temperature 0 °C

☐ Int. Sensor

☑ Ext. Sensor 1

☐ Ext. Sensor 2

☐ **Pack Current Calibration**

Measured current 0 mA

Enter actual current -2000 mA

FET Control ● On (External Load) ○ Off (Bypassed)

Apply a 2 Ampere discharge load. Discharge current is a negative value.

Fuel Gauge 66%

Communication OK.

SBS Task Progress: 100%

Task Completed.

02:36:21 PM

Figure 10. Calibration Screen

10 Pro (Advanced) Screen

10.1 *SMB Communication*

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

10.2 *Hex/Decimal Converter*

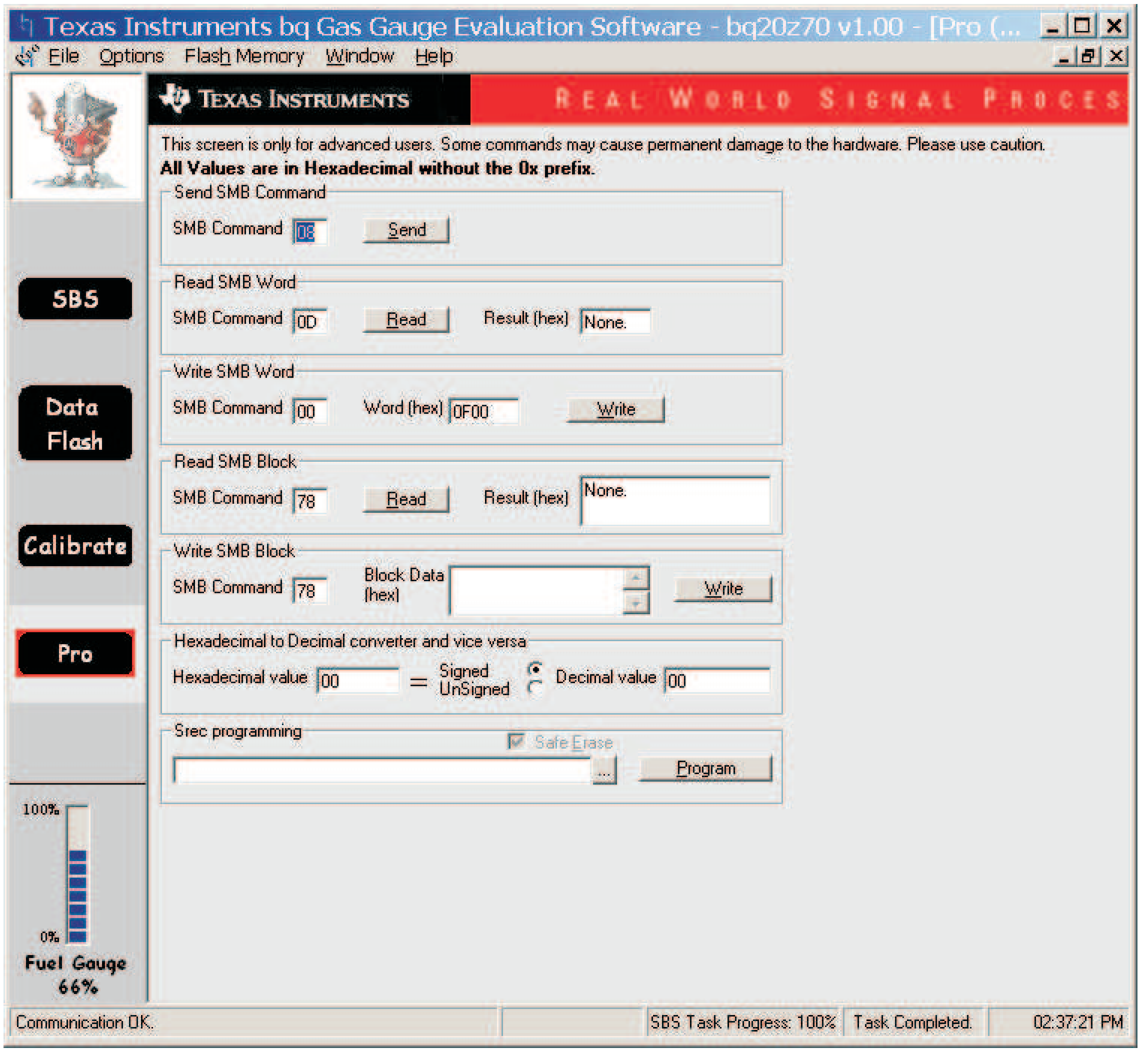
These two boxes convert between hexadecimal (hex) and decimal as soon as values are typed into the boxes. Invalid values may cause erroneous results.

When scaling converted hex values to a higher number of bytes, follow these rules:

- When unsigned is selected, the left pad contains zeroes.
- When signed is selected, the left pad contains zeroes for a positive number, or the left pad contains *F* for negative numbers.

10.3 *Programming*

Allows for device reprogramming from unencrypted and encrypted files.



This screen is only for advanced users. Some commands may cause permanent damage to the hardware. Please use caution.

All Values are in Hexadecimal without the 0x prefix.

Send SMB Command
SMB Command 08

Read SMB Word
SMB Command 0D
Result (hex) None.

Write SMB Word
SMB Command 00
Word (hex) 0F00

Read SMB Block
SMB Command 78
Result (hex) None.

Write SMB Block
SMB Command 78
Block Data (hex)

Hexadecimal to Decimal converter and vice versa
Hexadecimal value 00 = ● Signed ○ UnSigned Decimal value 00

Srec programming
☑ Safe Erase

Communication OK. SBS Task Progress: 100% Task Completed. 02:37:21 PM

Figure 11. Pro (Advanced) Screen

11 Related Documentation from Texas Instruments

To obtain a copy of any of the following TI document, 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 can also be obtained through the TI Web site at www.ti.com.

Documents:	**Literature Number:**
bq20z70 Data Sheet	SLUS686
bq20z70 Technical Reference	SLUU250
bq29330 Data Sheet	SLUS673

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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 EVMs for RF Products 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.

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