TEXAS INSTRUMENTS

bq26220EVM-001

Single Cell Battery Monitor Evaluation Module

User's Guide

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During normal operation, some circuit components may have case temperatures greater than 70°C. The EVM is designed to operate properly with certain components above 70°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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bq26220EVM-001 Single Cell Battery Monitor Evaluation Module

Portable Power

Contents

1 bq26220EVM–001 Battery Monitor Evaluation Module 5
2 Circuit Module 6
3 EVM Hardware and Software Setup 9
4 Operation 11

1 Introduction

The bq26220EVM-001 is a complete evaluation system for the bq26220 flash-based battery monitoring IC. The EVM includes one bq26220 circuit module, an EV2200 PC interface board for gas-gauge evaluation, a PC serial cable, and Windows-based PC software.The circuit module includes one bq26220 and all other components on-board necessary to monitor capacity and other critical parameters in a one-cell Li-Ion battery pack.The circuit module connects directly across the cell in a battery. With the EV2200 interface board and software, the user can read the bq26220 data registers and evaluate the functions of the bq26220 under different charge and discharge conditions

1.1 Features

The following list highlights some of the features of the bq26220 single cell battery monitor.

- Complete evaluation system for the bq26220 battery monitor IC
- Populated circuit module for quick setup
- PC software and interface board for easy evaluation
- Software allows data logging for system analysis

1.2 Kit Contents

- bq26220 circuit module with sense resistor
- EV2200 PC interface board
- Set of evaluation software disks entitled EV2200–26220
- PC serial cable
- Set of support documentation

1.3 Ordering Information

Table 1. Ordering Information

EVM Part Number	Additional Devices	Chemistry	Pack Voltage	Capacity
bq26220EVM–001	None	Li-Ion/NiMH/NiCd	2.6 V to 4.5 V	Any

2 Circuit Module

The circuit module in the bq26220EVM-001 is a complete and compact example solution for battery monitoring of a single-cell Li-on pack.The circuit module incorporates a bq26220 battery monitor IC and all other components necessary to accurately protect and monitor the charge and discharge of one Li-Ion cell. This EVM can also be used for 3-series NiMH applications.

Contacts on the circuit module provide direct connection to the cell (BAT+, BAT–) and the serial communications port (HDQ).The system load and charger connect across PACK+ and PACK–.

2.1 Pin Descriptions

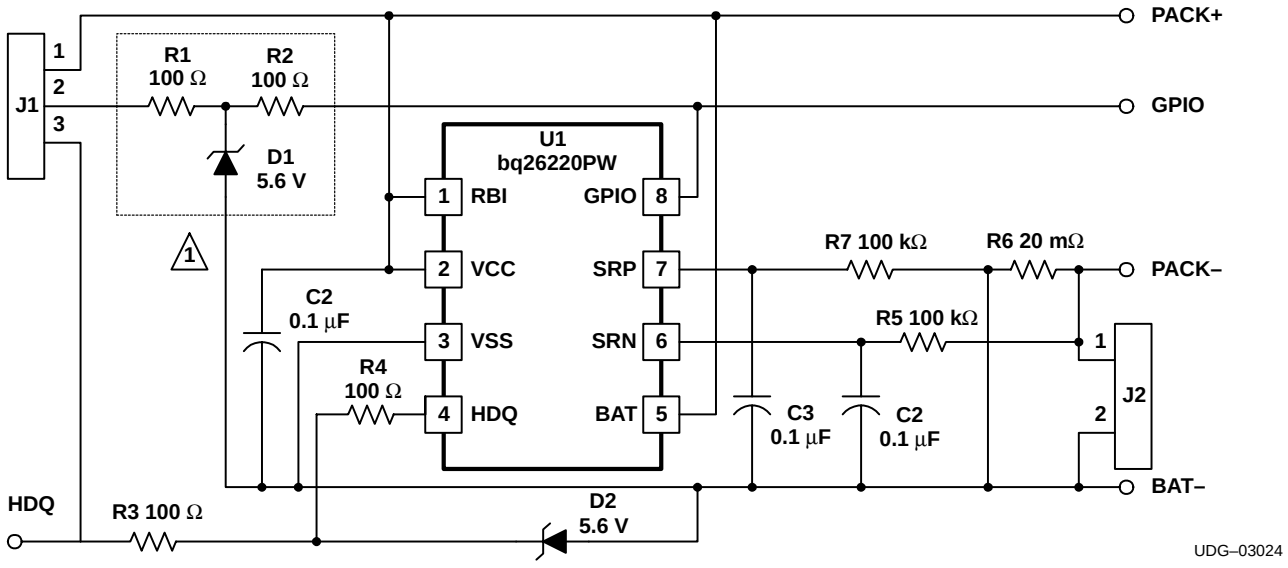
- BAT+/PACK+ Cell positive/pack positive
- BAT– Cell negative
- PACK– Pack negative
- HDQ Serial communications port
- STAT Status output
- GPIO Programmable input/output port

2.2 Circuit Module Schematic

The schematic shows the circuit for the bq26220EVM-001 implementation.

2.2.1 Schematic

Figure 1 is the bq26220EVM-001 (SLUP165) circuit module schematic diagram.



NOTE: R1, R2, and D1 are required for external use only.

Figure 1. bq26220EVM–001 Schematic

2.3 Circuit Module Physical Layouts

This section contains the board layout and assembly drawings for the bq26220EVM-001 circuit module (SLUP165)

2.3.1 Board Layout

Figure 2 shows the PCB layers and assembly drawing for the circuit module.

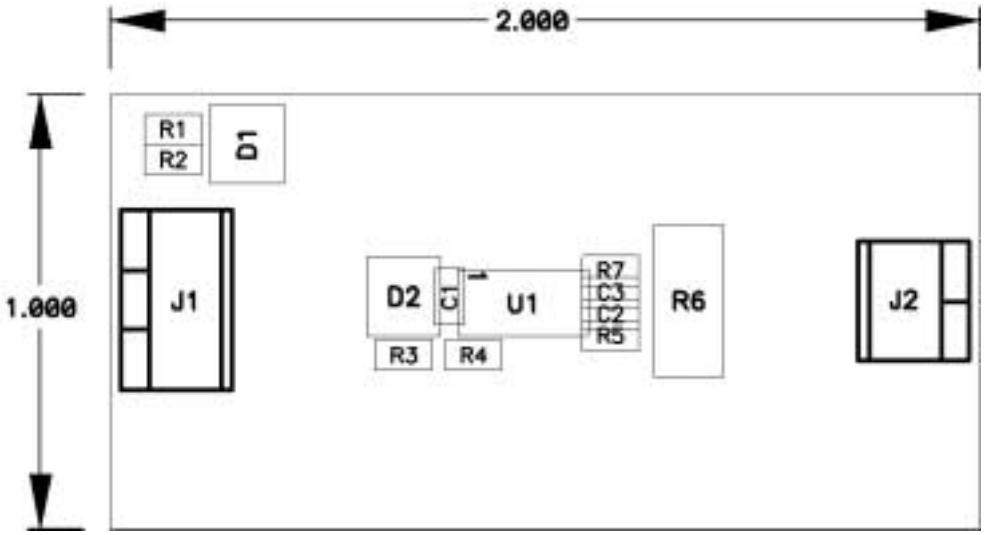


Figure 2. Top Assembly

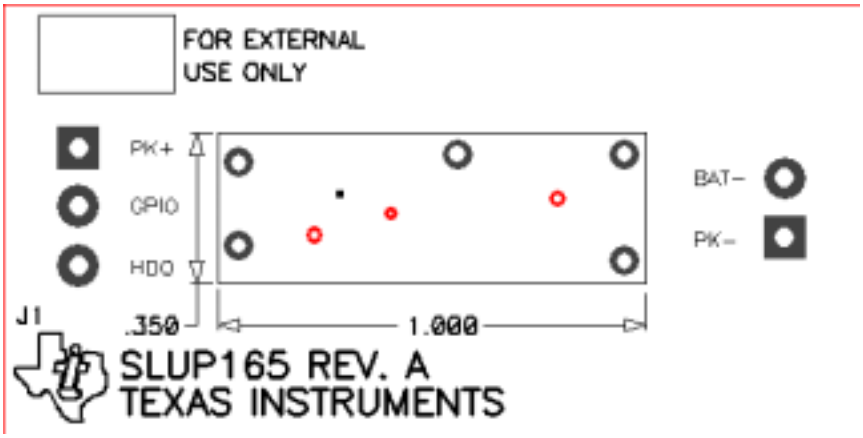


Figure 3. Silk 1

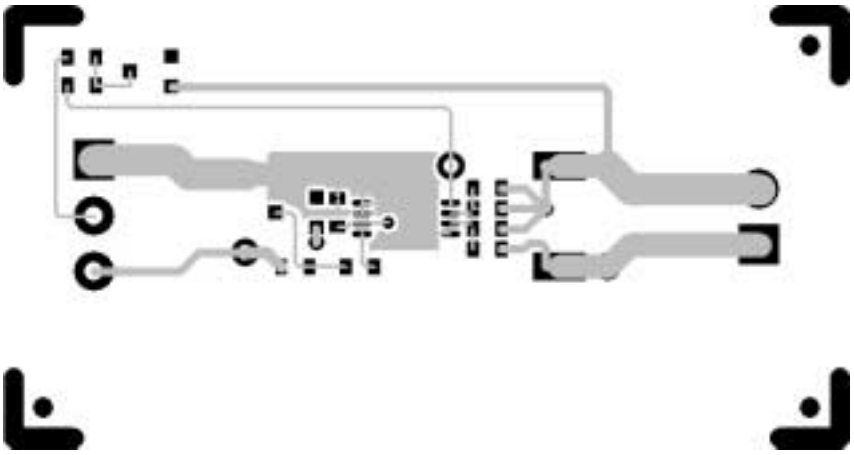


Figure 4. Layer 1

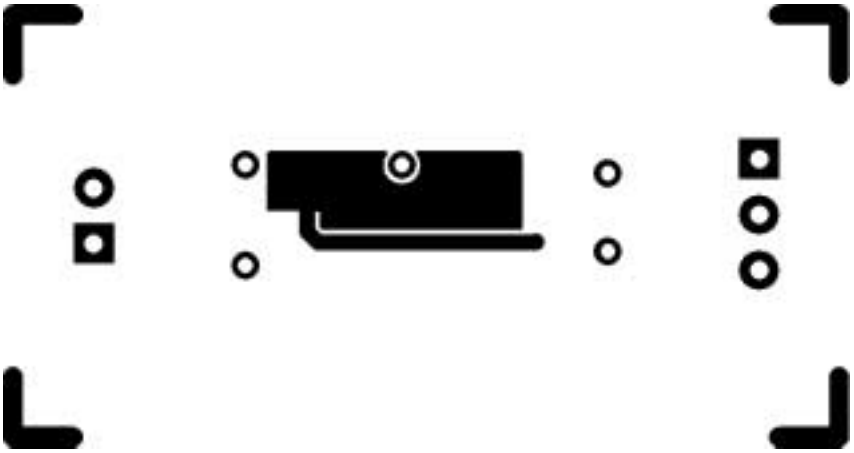


Figure 5. Layer 2

2.4 List of Materials

Table 2. List of Materials

Ref Des	Qty-001	Description	MFG	MFG Part#	Size
PCB	1	Printed-circuit board, 0.031, FR4, SMOBC, HASL	Any		See FAB DWG
Terminal	1	Terminal block 3.5 mm	On Shore	ED555/2DS	3.5 mm × 2
Terminal	1	Terminal block 3.5 mm	On Shore	ED555/2DS	3.5 mm × 3
C1, C2, C3	3	Capacitor, ceramic, 0.1 µF, 16 V, ±10%, X7R	Panasonic	ECJ-1VB1C104K	603
R6	1	Resistor, 0.020 Ω, 1/2 W, 1%	IRC	LR2010-01-R020-F	2010
R5, R7	2	Resistor, 100 kΩ, 1/16 W, 5%	Panasonic	ERJ-3GSYJ104	603
R1, R2, R3, R4	4	Resistor, 100 Ω, 1/16 W, 5%	Venkel	ERJ-3GSYJ101	603
D1, D2	2	Diode, zener, 5.6 V	Zetex	BZX84C5V6	SPT-23
U1	1	Integrated circuit, gas gauge, bq26220PW	TI	bq26220PW	TSSOP-8
Component count	16				

Assembly Notes:

1. This assembly is ESD sensitive.
2. This assembly must comply with IPC–A–610 class 2 or better.
3. This assembly must be clean of flux residues and contaminants.
4. Use of no-clean flux is not acceptable.

2.5 Performance Specification Summary

This section summarizes the performance specifications of the bq26220EVM-001 circuit module. Table 3 gives the performance specifications of the circuit.

Table 3. Performance Specification Summary(1)

Specification	MIN	TYP	MAX	UNIT
Input voltage BAT+/BAT–	2.6		4.5	V
Charge and discharge current			4	A

Note: Maximum charge and discharge current is limited by the PCB design and power dissipation of the 20-mΩ, 1/2 W sense resistor included on the PCB.

3 EVM Hardware and Software Setup

This section describes how to install the EV2200-26220 PC software and how to connect the components of the EVM.

3.1 Software Installation

The following steps install the EV2200-26220 software:

1. Insert disk 1 into a 3 1/2 inch floppy drive.
2. Select the 3 1/2 inch drive using **My Computer**.
3. Double-click on the **Setup.exe** icon.
4. The setup program prompts for the remaining disks and installs a Windows application group.

3.2 Hardware Installation

There are three hardware components to the bq26220EVM-001:

1. The bq26220EVM-001 circuit module
2. The EV2200 PC interface board
3. The PC

3.2.1 Connecting the bq26220EVM-001 Circuit Module to a Battery Pack

Figure 6 shows how to connect the bq26220EVM-001 circuit module to a Li-Ion cell and the system load/charger.

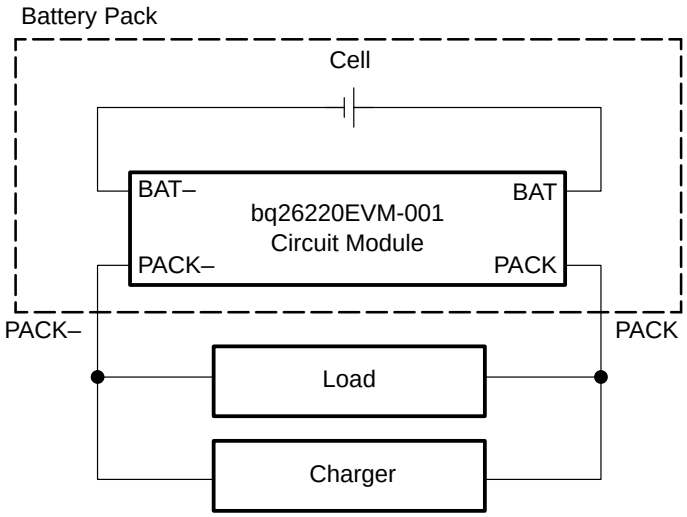


Figure 6. bq26220EVM-001 Circuit Module Connection to Cells and System Load/Charger

3.2.2 PC Interface Connection

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

1. Connect bq26220EVM–001 to the EV2200 using wire leads as in the following table.

Table 4. Circuit Module-to-EV2200 Connection

bq26220 Based Battery	EV2200
HDQ	SMBD/HDQ1
PACK–	VSS

2. Connect the PC serial cable to the EV2200 and the PC COM port.

The bq26220EVM-001 is now set up for operation.

4 Operation

This section details the operation of the bq26220EVM-001 software.

4.1 Starting the Program

Run EV2200–26220 from the **Start|Programs|Texas Instruments|bq26220 Battery Monitor** menu sequence.The software defaults to PC Com port 1 for communication.If the EV2200 is connected to Com port 1, the program should load and display the initial data screen.

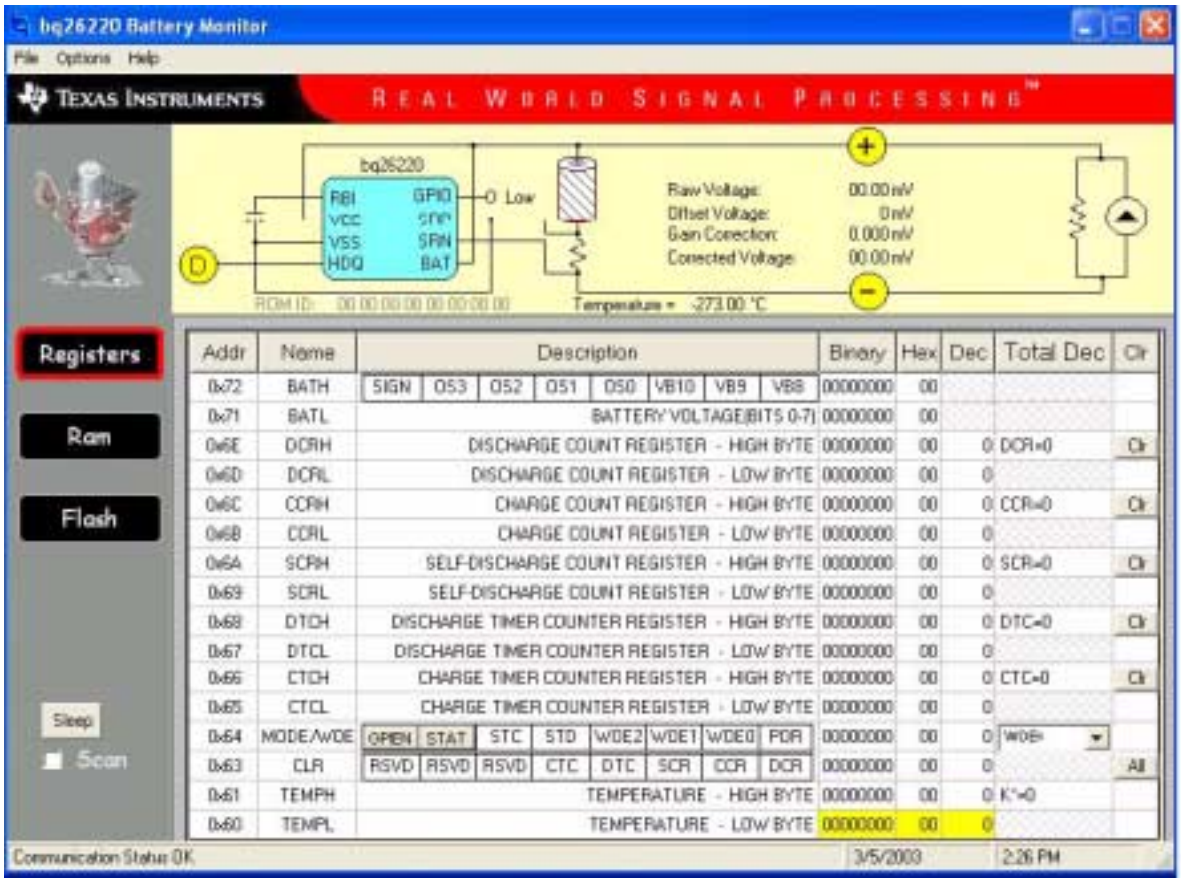


Figure 7. Internal Register Screen

If the EV2200 is connected to PC Com port 2 or no port, the program displays a blank screen in Binary, Hex, Dec, and Total Decimal columns.

Once the appropriate Com Port is selected, the program loads the initial register screen.The com port can be changed by selecting the port under the Options menu.

4.2 Initialization

This section describes the settings required before the bq26220 is evaluated.

4.2.1 Setting Programmable bq26220 Options

4.2.1.1 Wake-Up Threshold

Select the wake-up threshold with the **woe** pulldown tab at location 0x64.This designates the potential across the sense resistor, below which the bq26220 goes to sleep.

4.2.1.2 GPIO and STAT Boxes

To configure the GPIO pin as input or output click on the GPIO box at 0x64 location. To turn off the GPIO as ouput, set the GPIO pin by clicking the STAT box at the 0x64 location. To reset, click the box again.

4.2.2 Register Clearing

Each counter in the bq26220 can be cleared (set to 00) by depressing the adjacent **Clr** button.The **All** button clears all counting registers in one sequence.

4.3 Reading and Writing Flash Memory

The flash memory on the bq26220 can store battery-pack specific parameters that can be used by the host system in its capacity monitoring algorithm.To read the flash memory, click on the **Flash** button to select the flash data screen. Click the **Read Flash** button to read all flash pages or click on the individual page number to read the pages individually.

Each flash location can be modified by clicking on the individual location and entering the new value in hex.

The flash values can be stored to disk as one data file.To do this, select **File|Save Flash File** and enter the file name in the **Store Flash File** window.The file can subsequently be opened using the the **File|Open Flash File** command from the pull down menu.Once the flash file is loaded into the program, the **Write Flash** button can be used to store the data in the bq26220.

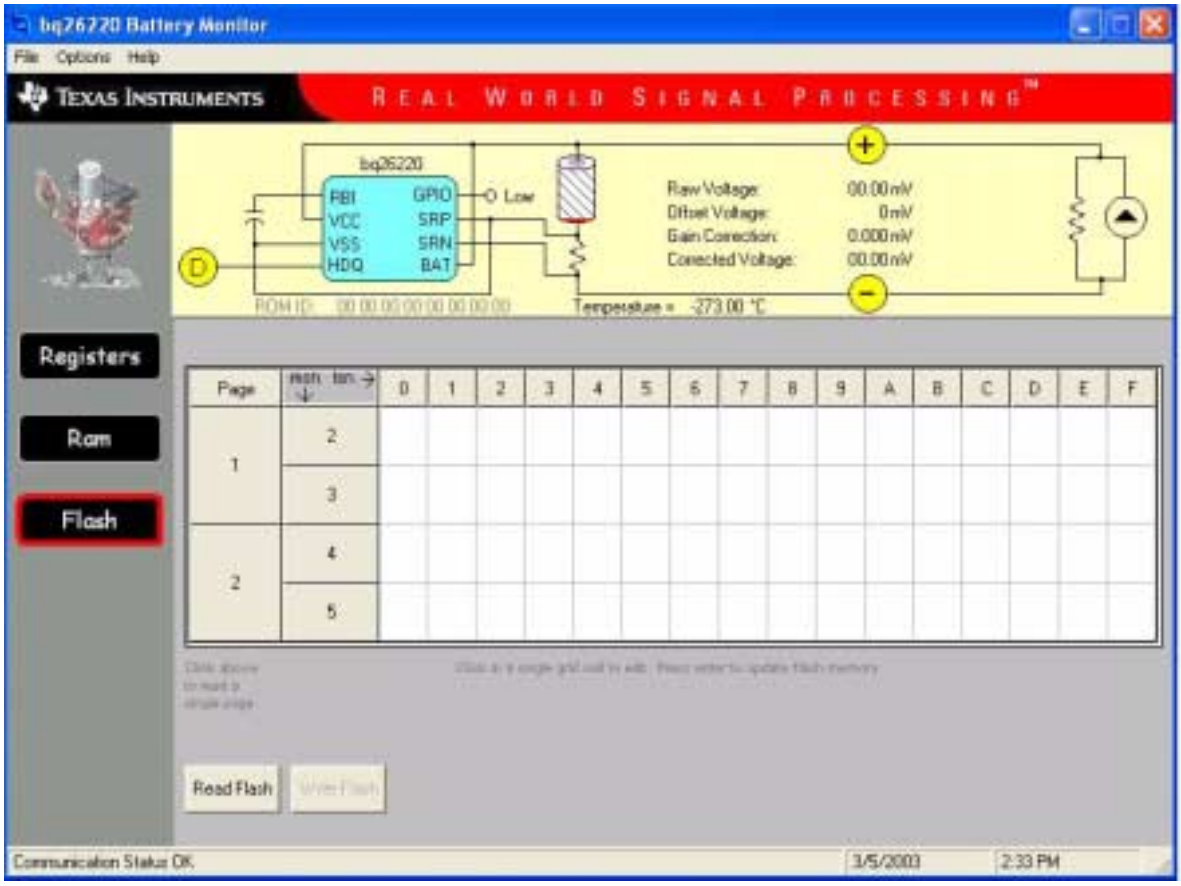


Figure 8. Flash Register Screen

4.4 RAM Addressing

The RAM page of memory can be viewed by selecting the **RAM** data screen.

Click on the **Read RAM** button to read the RAM locations.

Each RAM location can be modified by clicking on the individual location and entering the new value in hex.The RAM values can be stored to disk as one data file.To do this, select **File|Save RAM File** and enter the file name in the **Store Ram File** window.The file can subsequently be opened using the the **File|Open Ram File** command from the pulldown menu. Once the FLASH file is loaded into the program the **Write RAM** button can be used to store the data in the bq26220.

On this screen, two other buttons are available to transfer data RAM to flash page 0 and from flash page 0 to RAM.

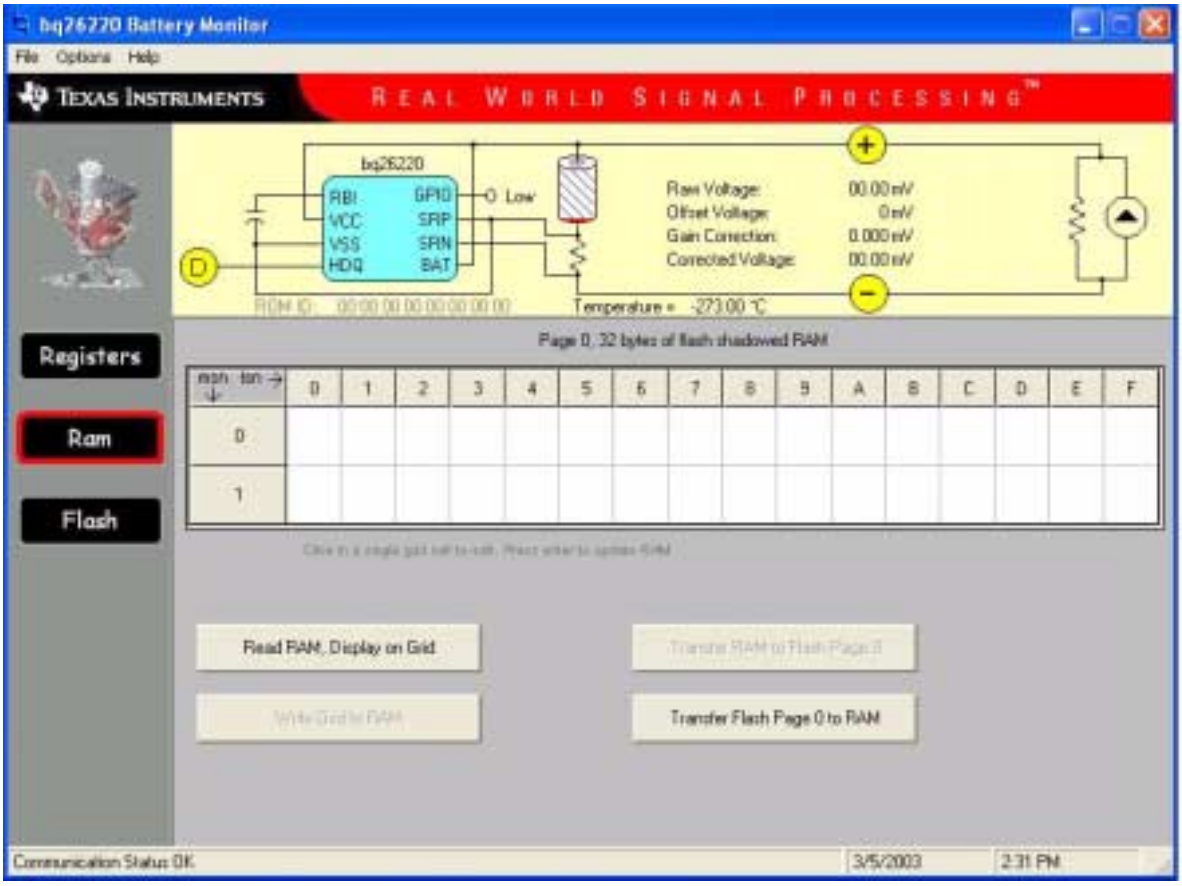


Figure 9. RAM Register Screen

4.5 Data Logging

The bq26220 registers can be logged by using the data log function.To log the data and create a log file

1. Select **Options|Logging Options** to select the registers to log and set the logging interval.
2. **File|Start Data Log** from the pulldown menu.
3. Enter the name of the data log file in the **Name Datalog File** box
4. Click on the **Open** button
5. To stop the data logging, select **File|Close Data Log** from the pulldown menu

The file can be imported into a text editor, spreadsheet, or word processor program.

Example data log:

EV2200–26220 Version: 0.0.1 Texas Instruments bq26220 battery monitor

5/6/02 3:04:23 PM

ROM ID: 32 8C 00 02 01 11 00 26

Sample	Stamp	Elapsed(s)	DCR	CCR	SCR	DTC	CTC	MODE/WOE	CLR	TEMP
1	3:04:33 PM	10	27	3	0	2008	955	78	96	297
2	3:04:43 PM	20	27	3	0	2008	955	78	96	297
3	3:04:53 PM	30	27	3	0	2008	955	78	96	297
4	3:05:03 PM	40	27	3	0	2008	955	78	96	297
5	3:05:13 PM	50	27	3	0	2053	955	78	96	297
6	3:05:23 PM	60	27	3	0	2063	955	78	96	297
7	3:05:33 PM	70	27	3	0	2074	955	78	96	297
8	3:05:43 PM	80	27	3	0	2086	955	78	96	297
9	3:05:53 PM	90	27	3	0	2098	955	78	96	297
10	3:06:03 PM	100	27	3	0	21–7	955	78	96	297
11	3:06:13 PM	110	27	3	0	2123	955	78	96	297
12	3:06:23 PM	120	27	3	0	2134	955	78	96	297

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