# bq2026 Evaluation Software

The purpose of the bq2026 evaluation board and the bq2026EVM evaluation software is to demonstrate the functionality of the bq2026. The bq2026 evaluation board supports both the bq2026DBZR (SOT23-3) and bq2026LPR (TO-92) packages but only one package can be evaluated/programmed at any time.

The bq2026 is a 1.5K-bit serial EPROM containing a factory-programmed, unique 48-bit identification number, 8-bit family code, and a 64-bit status register.

The bq2026 is ideal for applications such as battery pack configuration parameters, record maintenance, asset tracking, product revision status, and access-code security.

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# 1 Kit Contents

1. bq2026EVM REVA board
2. Personal computer (PC) interface board EV2300
3. USB cable (type A-B)

# 2 bq2026-Based Circuit Module

The bq2026-based circuit module is ideal for programming the 1.5K-bit EPROM and the STATUS bytes of the bq2026 IC. The circuit module includes a SOT23 single socket, a bq2026 IC, a Zener diode for host protection during EPROM programming, and a programming circuit that generates a 12-V pulse when used with a power supply and a control signal. In a typical application, only the bq2026 IC and a pullup resistor is required.

## *2.1 Test Points*

**Table 1. Test Points**

| Test Point | Signal Name | Description |
|---|---|---|
| J1-1 | VSS | Device ground |
| J1-2 | PROG | Input for timing of EPROM programming pulse |
| J1-3 | SDQ | SDQ single-wire communication bus |
| J2-1 | 12V | High voltage for EPROM programming |
| J2-2 | VSS | Programming ground |
| J3 | | Connect for EPROM programming |

# 3 bq2026EVM Circuit Module Schematic

The schematic shows the circuit for the bq2026 implementation.

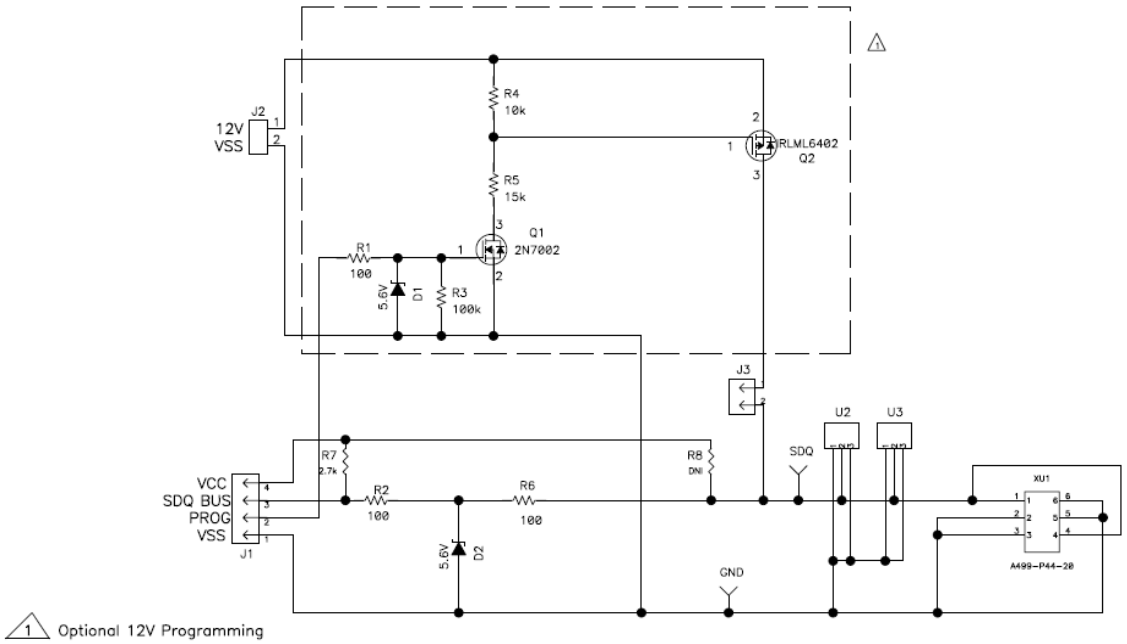


**Figure 1. bq2026EVM Schematic**

## 4 bq2026EVM Circuit Module Physical Layouts

This section contains the board layout and assembly drawings for the bq2026EVM circuit module.

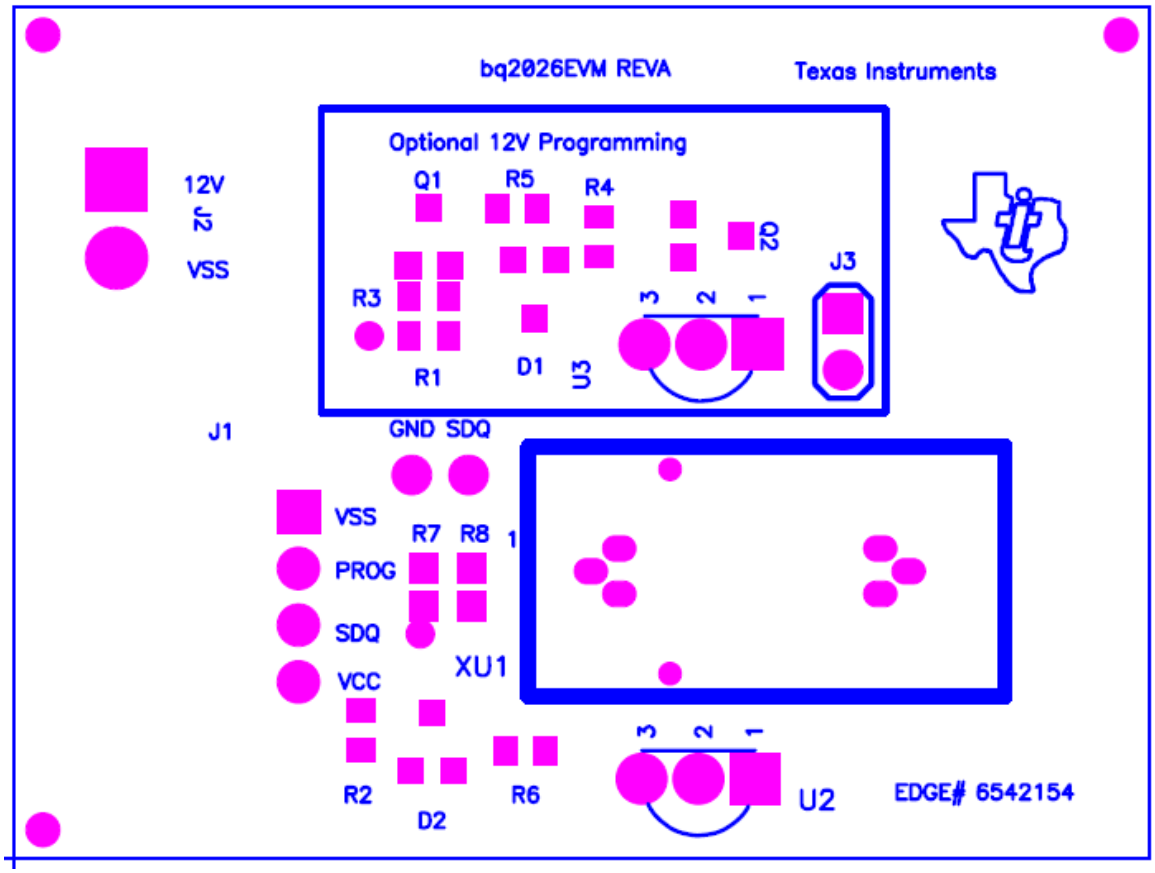


**Figure 2. bq2026EVM Silk Screen**

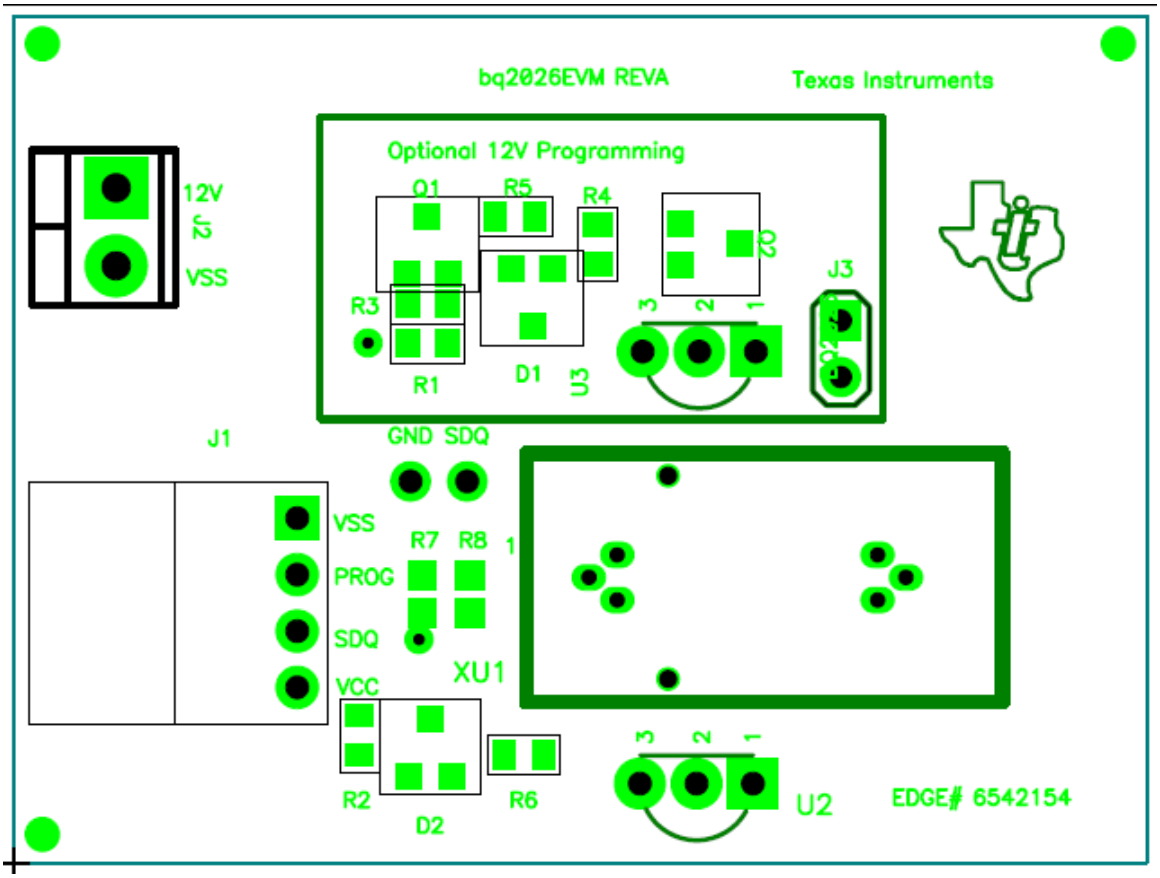


**Figure 3. bq2026EVM Top Assembly**

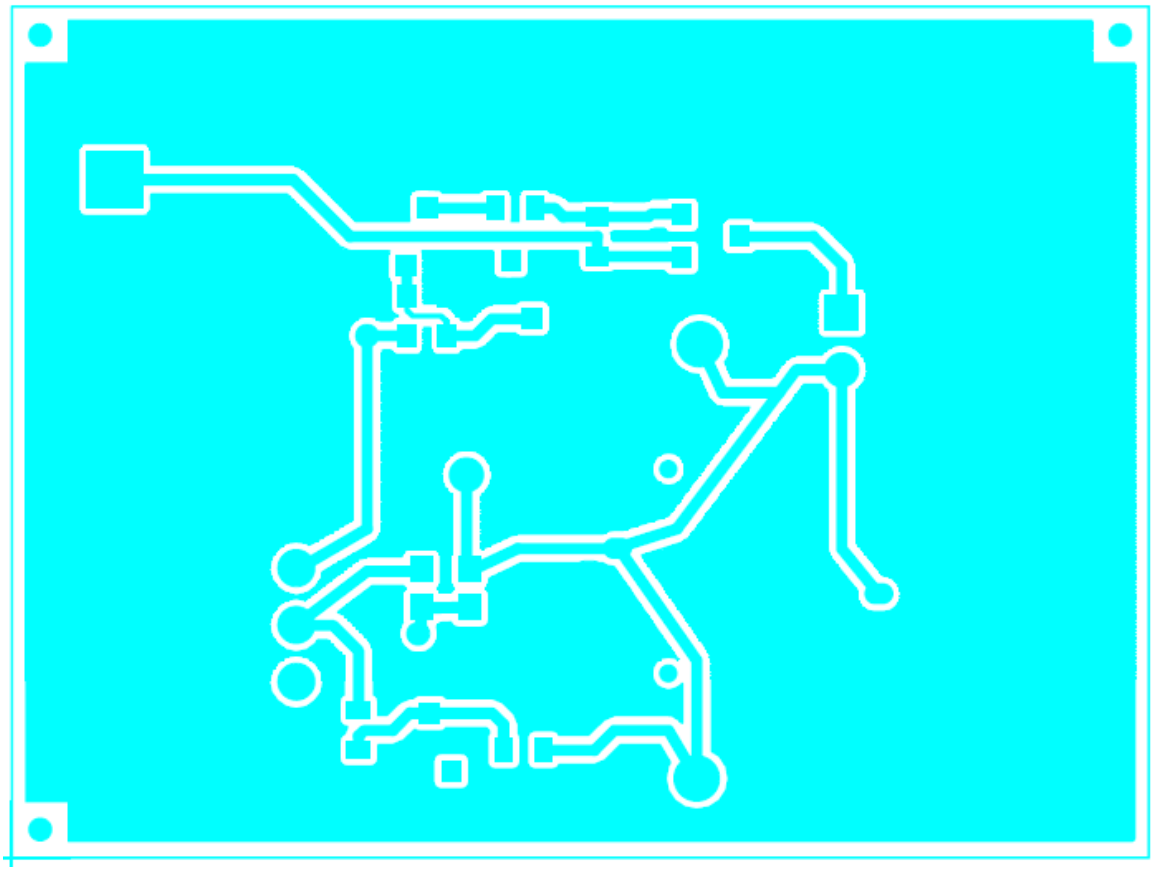

**Figure 4. bq2026EVM Top Layer**

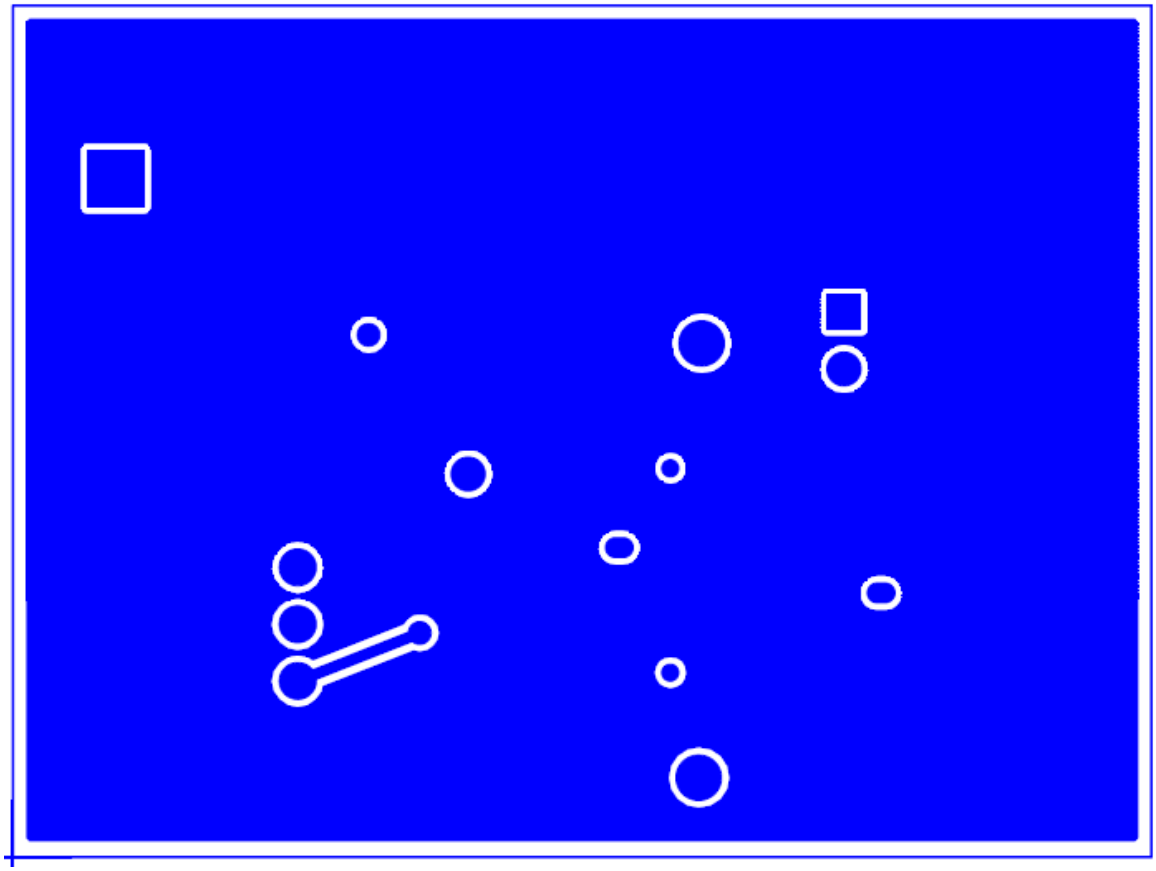

**Figure 5. bq2026EVM Bottom Layer**

## 5 bq2026EVM Circuit Module Bill of Materials

Table 2 presents the bill of materials required for the bq2026EVM circuit module.

**Table 2. Bill of Materials**

| Count | RefDes | Description | Size | MFR | Part Number |
|---|---|---|---|---|---|
| 2 | D1, D2 | Diode, Zener, 5.6-V, 350-mW | SOT-23 | Diodes, Inc. | BZX84C5V6 |
| 1 | J3 | Header, 2-pin, 100-mil spacing, (36-pin strip) | 0.100 x 2 | Sullins | PTC36SAAN |
| 3 | R1, R2, R6 | Resistor, Chip, 100-Ω, 1/16-W, 5% | 603 | Std | Std |
| 1 | R3 | Resistor, Chip, 100-kΩ, 1/16-W, 5% | 603 | Std | Std |
| 1 | R4 | Resistor, Chip, 10-kΩ, 1/16-W, 5% | 603 | Std | Std |
| 1 | R5 | Resistor, Chip, 15-kΩ, 1/16-W, 5% | 603 | Std | Std |
| 0 | R7*, R8* | Resistor, Chip, 2.7-kΩ, 1/16-W, 5% | 603 | Std | Std |
| 1 | XU1 | Socket, SOT-23, 6P | SOT-23-6 | WELLS-CTI | 499-P44-20 |
| 1 | J1 | Header, Friction Lock Ass'y, 4-pin Right Angle | 0.400 x 0.500 | Molex | 22-05-3041 |
| 1 | J2 | Terminal Block, 2-pin, 6-A, 3.5-mm | 0.27 x 0.25 inch | OST | ED1514 |
| 0 | GND* | Test Point, Black, 1-mm | 0.038 | Keystone | 5001 |
| 0 | SDQ* | Test Point, Red, 1-mm | 0.038 | Keystone | 5000 |
| 2 | U2,U3* | Socket Pin - Install First | DIA_038, PIN_013-020, EXP_146, B125 | Tyco | 50935 |
| 1 | Q1 | MOSFET, N-ch, 60-V, 115-mA, 1.2-Ω | SOT23 | Vishay-Liteon | 2N7002-7-F |
| 1 | Q2 | MOSFET, Pch, -20-V, 3.7-A, 65 mΩ | SOT23 | IR | IRLML6402 |
| 1 | -- | PCB, 2 In x 1.25 In x 0.125 In | | Any | bq2026EVM Board |
| 1 | N/A | Shunt, 100-mil, Black | 0.1 | 3M | 929950-00 |

**Table 2. Bill of Materials (continued)**

| Count | RefDes | Description | Size | MFR | Part Number |
|---|---|---|---|---|---|
| 1 | U1 | bq2026, IC, 1.5K Serial EPROM With SDQ Interface | SOT-23 | TI | bq2026DBZR |

# 6 bq2026EVM Circuit Module Performance Specification Summary

**Table 3. Performance Specification Summary**

| Specification | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Voltage Pullup ($V_{UP}$) | 2.65 | | 5.5 | V |
| Programming Voltage($V_{PP}$) | 11.5 | | 12 | V |

# 7 bq2026EVM Hardware and Software Setup

## 7.1 Drivers and Software Installation`

This section describes how to install the bq2026EVM PC software and how to connect the different components of the EVM.

Perform the following steps to install the bq2026 evaluation software:

1. Insert the CD ROM into a CD ROM drive.
2. Select the CD ROM drive using *My Computer or File Manager*.
3. Select the ReadMeFirst.txt file.
4. Select the Software/EV2300 Drivers directory of the CD, and run SETUP.EXE.
5. Plug the EV2300 into a USB port.
6. Wait until system prompt *new hardware found* appears. Choose *select location manually*, and use the browse button to point to C:\WINDOWS\TI\USB1.
7. Answer *continue* to the warning that drivers are not certified with Microsoft.
8. After installation finishes, another system prompt *new hardware found* appears. Repeat preceding procedure, but point to C:\WINDOWS\TI\USB2.
9. Answer *continue* to the warning that drivers are not certified with Microsoft. Installation of drivers is now finished.
10. For Windows 98, point to directory TIUSBWin98.
11. After installing the USB drivers for EV2300, double-click on the Setup.exe icon that is under the Software/bq2026 Evaluation Software folder.
12. Follow the instructions on screen during the installation of evaluation software.
13. The setup program installs a Windows application group.

## 7.2 Hardware Connection

The bq2026EVM has three hardware components:

1. The bq2026EVM circuit module
2. The PC interface board, (EV2300)
3. The PC

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

1. Connect the bq2026EVM board with the EV2300 PC interface board using Table 4 as a pin connection guide.
2. Connect the USB cable to the EV2300 and the PC USB port.

The bq2026EVM is now set up for normal operation.

**Table 4. Wire Connection**

| bq2026EVM REVA | EV2300 |
|---|---|
| SDQ | HDQ |
| VSS | GND |
| PROG | VOUT |

To program the EPROM of bq2026EVM, a 12-V pulse must be generated on the SDQ line. The bq2026EVM board has an additional circuit included that permits generating this pulse when using a power supply set to 12 V and the VOUT output of the EV2300. The evaluation software controls this pulse for EPROM programming.

When programming the EPROM, it is expected that a 12-V supply be connected to the bq2026EVM board at the 12-V input terminal of the bq2026EVM board. Ensure that the ground of the power supply is connected to VSS of the board.

A jumper (J3) must be connected when using the EPROM programming circuit.

### 7.2.1 Normal Operation

Normal operation includes performing any of the ROM commands, reading the 1.5K-bit EPROM and reading the EPROM Status Memory.

### 7.2.2 EPROM Programming

To program EPROM registers, a 12-V pulse must be sent across the SDQ line during a write command. See the bq2026 data sheet (SLUS938) for a specific description of EPROM programming requirements. When programming EPROM registers, the following must be ensured:

- J3 jumper is connected.
- VOUT output of EV2300 is connected to PROG input of bq2026EVM board.
- Power supply set to 12 V is connected across the 12-V and VSS inputs of bq2026EVM board.

## 8 Software Operation

Run the program from the Start → Programs → Texas Instruments → bq2026 Evaluation Software menu sequence.

## *8.1 Evaluation Software Pages*

This section describes the function of each page of the evaluation program.

## *8.2 ROM CMD*

This page provides all the ROM commands for bq2026 (see Figure 6).

### 8.2.1 Sections Within the ROM CMD Page

**Read ROM —** The ID ROM of the device on the SDQ communication line is displayed when READ ID is clicked.

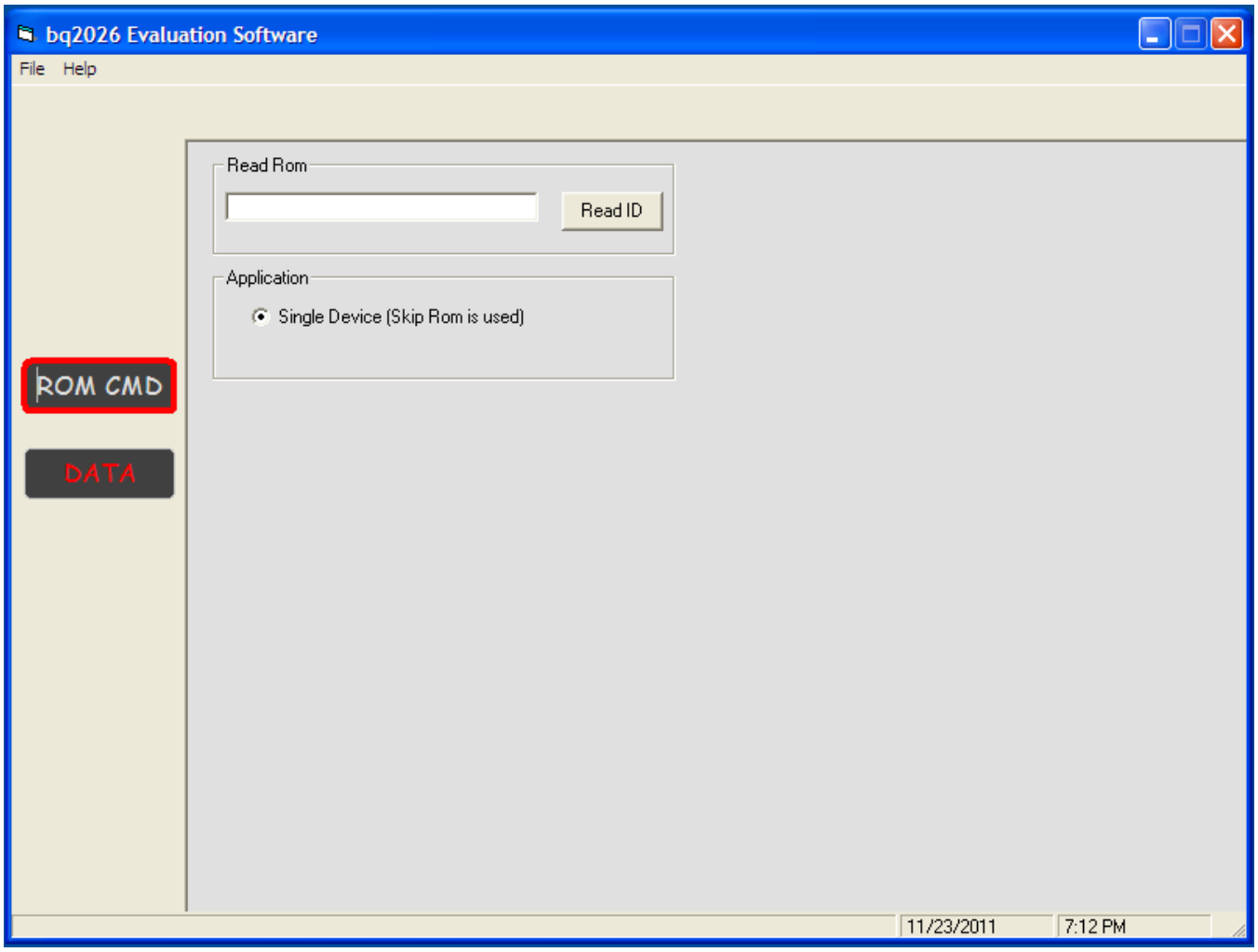


**Figure 6. ROM CMD Page**

## 8.3 DATA

This page (see Figure 7) allows the user to program the 1.5K-bit EPROM with desired values and to program the STATUS bytes. It requires that the hardware is set up as described in the EPROM programming of this user's guide.

### 8.3.1 1.5K-Bit EPROM

The EPROM memory map is organized in six pages of 32 bytes each. All registers can be read by clicking on the Read Memory button. As the registers of a specific page are being read, the page number is highlighted in red.

The two methods of programming the EPROM using the evaluation program follow.

1. Click on a specific grid that corresponds to the register that needs to be written. Write the hexadecimal value of the data that needs to be written, and then press ENTER.
2. The other method of programming the EPROM is by importing a data file that contains all the values to be programmed. The data file has the file extension **.epr**. An example of a data file is included with the evaluation program. To create additional data files, modify the example file so that the values on the right side of the file represent the desired values. Save the file with a different name ensuring that the extension **.epr** is used. To import a file into the grid, go to *File → Open Data File*, and select the appropriate file. Once the file is opened, the grid is filled in with the values contained in the data file.

Click on the *Write Memory* button so that the values are programmed into the EPROM.

A data file can also be saved by going to *File*|*Save Data File*. The data that is saved in the file is the data displayed on the grids representing the EPROM memory map.

### 8.3.2 Status Bytes

This section allows the user to read or write the EPROM Status bytes of the bq2026. The registers are programmed by clicking on the appropriate grid, entering the desired value, and pressing ENTER.

Note that the status registers are EPROM. Once a bit has been cleared, it cannot be set.

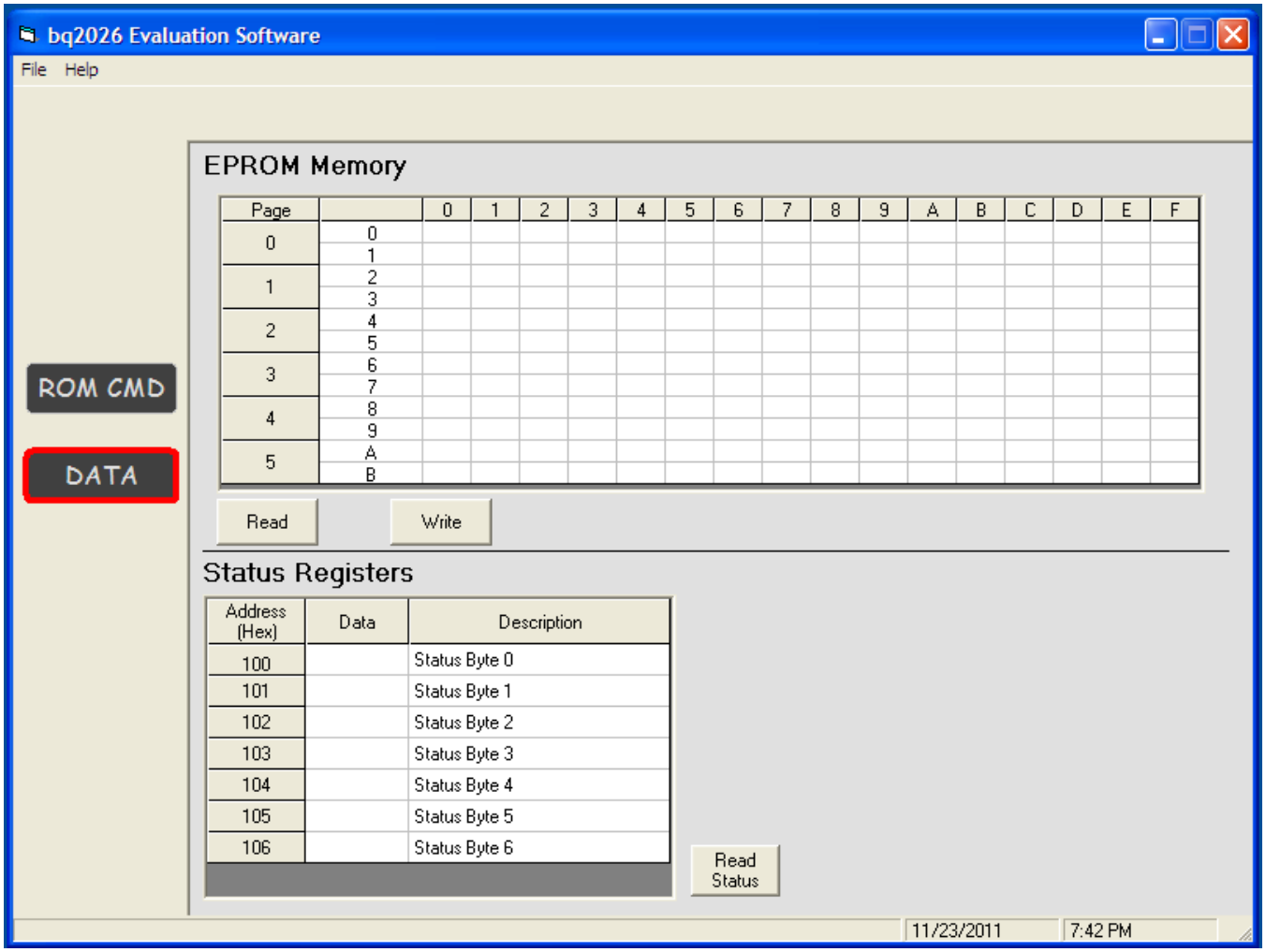


**Figure 7. DATA Page**

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## EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 2.65 V to 5.5 V and the output voltage range of 0 V to 5.5 V .

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, 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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