PRODUCT PREVIEW

DALLAS SEMICONDUCTOR

DS2437K
Smart Battery Monitor Evaluation Kit

FEATURES

- Demonstrates Real Time Measurements of:
  - Battery Voltage
  - Battery Current
  - Temperature
  - Battery Capacity
  - Charge and Discharge Current Accumulators
  - Real–time Clock
- Programs and verifies DS2437 EEPROM values
- Operates with a PC compatible host system

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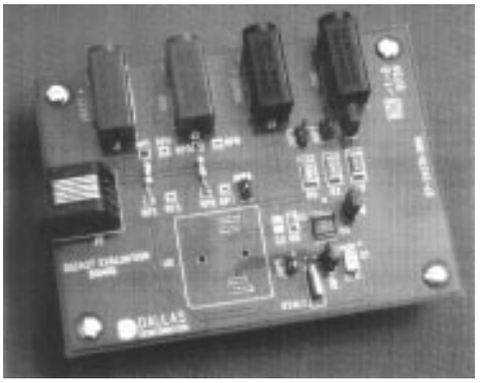


Evaluation Kit Contents

1. 1 pc. DS2437K circuit board
2. 2 pcs. 3.5 floppy diskettes with DS2437K Software
3. 1 pc. DS9097U Universal Serial Port Adapter
4. 1 pc. RJ–11 Phone Cable

Equipment Needed

To use the DS2437K, you will also need:

1. An IBM–compatible computer running Microsoft Windows 95 with a 3.5 floppy drive and an available serial port.
2. A battery or power supply with suitable connectors to fit the banana jacks on the Evaluation Board.

INTRODUCTION

The DS2437K Evaluation Kit makes performance evaluation, software development, and prototyping with the DS2437 Smart Battery Monitor easy. The 3" by 4" circuit board interfaces to an IBM compatible computer through a DS9097U Universal Serial Port Adapter and an RJ–11 cable connection. Two floppy disks contain the software to run the DS2437K under Windows 95. Two select modes allow to run the software either in demonstration or in design mode. Select an appropriate C–rate with three current sense resistors, that are already mounted and only need a jumper set. Attach a voltage source, such as a battery or external power supply between 2.7V and 10V, to the DS2437, using common banana jack connectors. Through jumper selection, test drive the on–board DS2437 or choose to program additional DS2437. A provision for a 16–pin SSOP test socket has been made on the printed circuit board to allow programming of prototypes.

The DS2437K Evaluation Board comes populated with one DS2437 and the associated resistors, capacitors, jumpers and crystal. A zero–Ohm jumper is in place for R3 and R4. R7 and R8 are not installed. The user may be prompted by the software to place a voltage divider in these positions depending on the maximum battery voltage. The SSOP Socket, U2, is not included in the kit but can be acquired separately from the following source. This socket is useful for programming additional parts with this kit.

SSOP Socket:
Part Number: OTS–16(34)0.65–01
Supplier: Enplas
Contact: www.enplas.com

Tel: 408–749–8124
or 603–635–7526

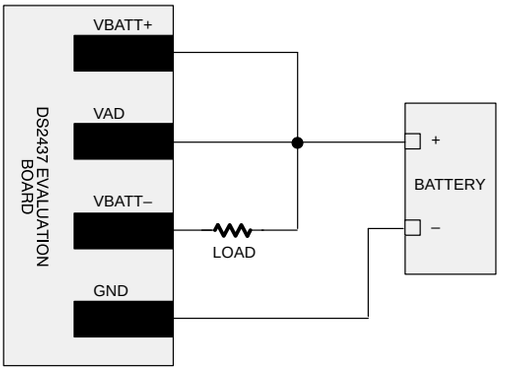
Fax: 408–749–8125
or 603–635–7738

On the Evaluation Board, there are a series of jumpers that allow the user to select different uses of the board. Jumpers 1, 2, and 3 are connected to the three sense resistors that are connected in parallel to one another. Various resistance levels can be obtained by differing the combination of the jumpers that are inserted at any given time. The software will identify which jumpers should be in place according to the C Rate that is desired. The following current sense resistor values can be achieved to select between 500 mAh and 3,500 mAh:

JUMPER CHART FOR C–RATE SELECTION
Table 1

J1 0.100	**J2** 0.050	**J1** 0.025	**R_{SENSE}** Ohms	**C–rate** mAh
X	X	X	0.0143	3,500
–	X	X	0.0167	3,000
X	–	X	0.020	2.500
–	–	X	0.025	2,000
X	X	–	0.033	1,500
–	X	–	0.050	1,000
X	–	–	0.100	500

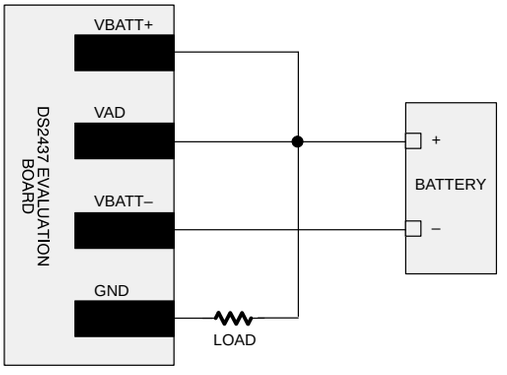
BATTERY CONNECTION TO SIMULATE CHANGING Figure 1



Additionally, a set of jumpers is on the Evaluation Board so that either the DS2437 on the Evaluation Board, or an additional DS2437 that can be placed on a socket, can be used. Only one DS2437 can be accessed at a given time with this Evaluation Kit. Jumpers 4 and 7 should be in place for the on board DS2437 to be used, while Jumpers 5 and 6 should be left off. Jumpers 5 and 6 should be in place to use the additional socket, while Jumpers 4 and 7 should be excluded.

The Evaluation Board can simulate charging and discharging to the DS2437 depending on how the current is routed from the battery to the Evaluation Board as illustrated in Figures 1 and 2. Actual charging of the battery requires additional hardware and is not a function of this Evaluation Kit.

BATTERY CONNECTION TO SIMULATE DISCHARGING Figure 2



Set Up and Installation

Note: The DS2437 program is a 32–bit application which will run only under Microsoft Windows 95.

Insert DS2437K Disk 1 into your floppy drive and open the Disk 1 folder. Run Setup.exe and the installation process will be launched. Follow the prompts on the screen to complete the installation.

After the installation is complete, open the DS2437K folder and Run DS2437K.exe . A splash screen, containing information about the Evaluation Kit, should appear as the program is being loaded.

Selecting the Com Port

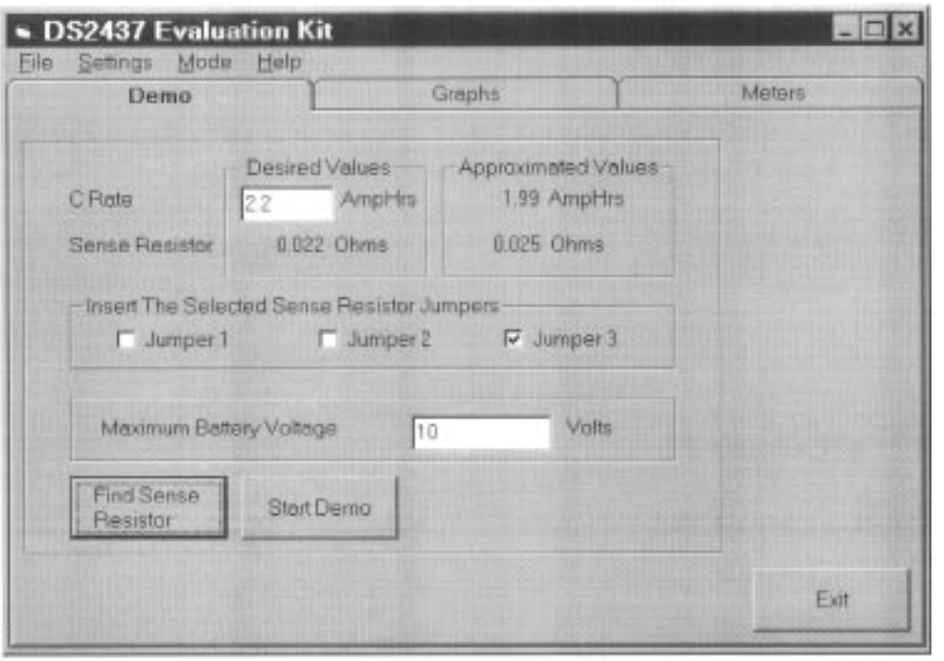
Prior to any communication with the DS2437, it is important to set up the correct communication port. Com Port 1 is the default port for the Evaluation Kit. A different port can be selected by clicking the Settings option on the Menu and then selecting the appropriate port that is available on the system in use. Demo Mode.

The Demo Mode of the Evaluation Kit is set up to allow the user to observe the basic functionality of the DS2437 and is the default Mode of the Kit. To begin the demonstration, the C Rate and Maximum Battery Voltage fields will need to be filled in, as illustrated in Figure 3.

The FIND SENSE RESISTANCE Button calculates the sense resistance from the desired C Rate. It then takes that resistance level and finds the closest approximation that is available on the Evaluation Board through a combination of the three sense resistors. Also, it indicates which of the three sense resistor jumpers (Jumpers 1, 2, and 3) should be in place for that particular resistance. The C Rate is then recalculated from the actual sense resistance that is obtained on the board.

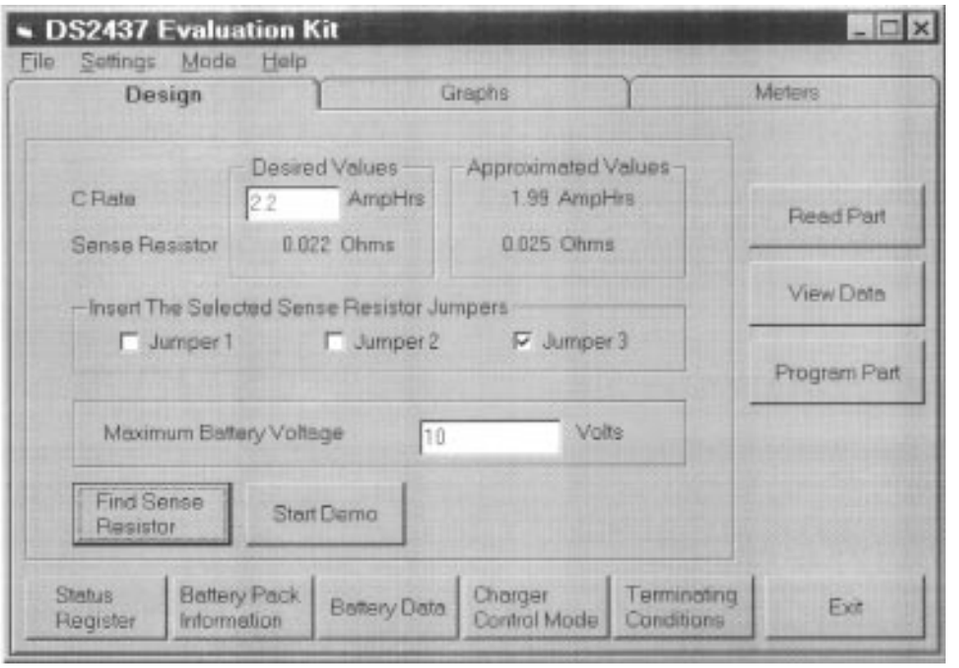
The START DEMO button starts the demonstration and switches over to the Graphs Screen so that the data can be monitored as it is continuously received from the DS2437. The Demo Screen, the Graphs Screen and the Meters Screen can all be viewed while in either the Demo Mode or the Design Mode.

DEMO MODE SCREE Figure 3



In the event that the Maximum Battery Voltage is above 10 Volts, the program will prompt the user to insert two resistors onto the Evaluation Board in order to set up a voltage divider. After the voltage divider is in place, the output voltage will be scaled according to the voltage divider so that the observed voltage remains accurate to the actual battery voltage.

DESIGN MODE SCREEN Figure 4



Design Mode

A more intimate look at the functionality of the DS2437, such as its programmability, can be observed in the Design Mode. The Design Mode can be accessed through clicking on the Mode option on the Menu and then selecting the Design Mode. Once this selection is made, the Demo Screen will become the Design Screen, as shown in Figure 4. The Graphs and Meters Screens will not be altered by the mode selection.

The main difference in the Demo and Design modes is that the Design Mode allows the user to set the data, program the DS2437 and read the data from the DS2437. The user will notice a series of new buttons that appear on the Design Screen. These buttons allow access memory space of the DS2437 for reading or writing battery specific data.

Setting the Data

Note: Of the data that is programmed to the EEPROM in this Evaluation Kit, only the Status Register is required. The other data is application specific and may be omitted or altered depending on the needs of the application. The manner in which the memory is allocated in this Evaluation Kit is outlined in detail in Application Note 110 that can be obtained from the Dallas Semiconductor Home Page at:
http://www.dalsemi.com/DocControl/PDFs/app110.pdf

The row of buttons that is located at the bottom of the Design Screen provides the user with a simple manner to set up and view data that is to be programmed or has been read from the EEPROM of the DS2437. The Data is divided into five categories: Status Register, Battery Pack Information, Battery Data, Charger Control Mode,

and Terminating Conditions. Each time one of these buttons is pressed, a new screen appears that contains various fields that are to be filled by the user depending on the data that is to be stored in the DS2437.

Most fields have an associated Tool Tip that can be viewed by holding the mouse pointer on the label next to the respective field. The Tool Tip will indicate what units or what format (i.e., decimal, hexadecimal, or a character string) the data should be entered in. Unless stated otherwise, assume that the values should be entered in decimal format.

After entering the data, clicking the VIEW DATA button on the Design Screen will allow the user to view all the data that has been entered before the DS2437 is programmed. The data cannot be altered at this screen, but the user can go back and alter the information before the data is programmed.

Programming the DS2437

Once all the data has been entered, clicking on the PROGRAM PART button actually programs the data into the EEPROM of the DS2437. At that time, the value of the sense resistor will be calculated, if it has not been done already.

If a value is entered into a field that is larger than the specified range, the program will bring attention to this error so that it can be corrected before the part is programmed. The part will not be programmed if a field contains a value outside of the allowable range. The programmable range should accommodate any reasonable value that is desired to be stored in the EEPROM.

Note: Simply programming the values into the DS2437 EEPROM does not establish a way to handle events that meet or do not meet the specifications. Additional software must be developed to handle the various situations according to the needs of the application.

Saving/Opening Configurations

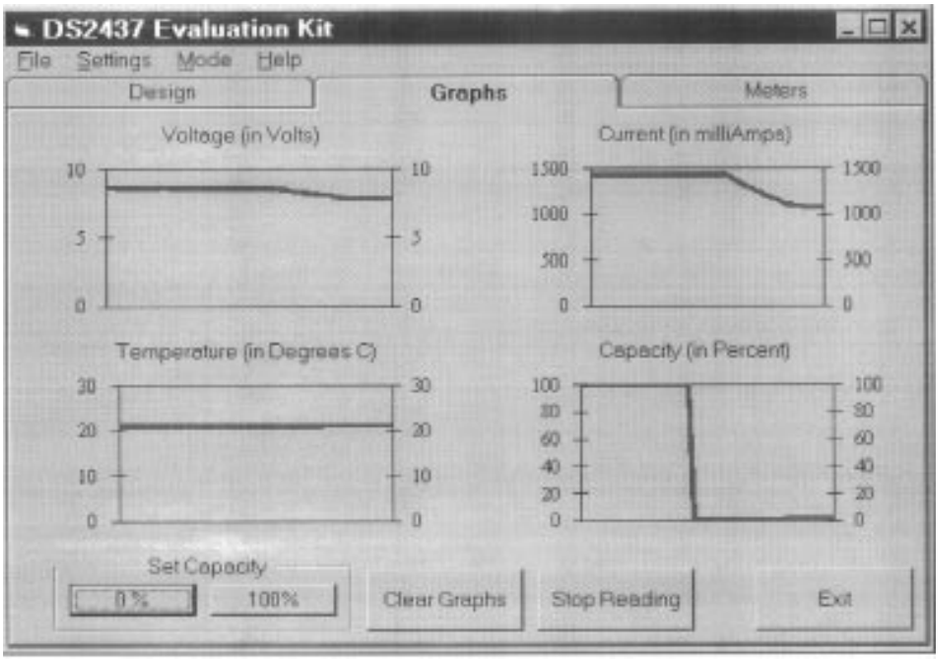
In order to save a Design configuration, simply click on the File menu and select Save. This will bring up a Save Dialog Box which enables the file to be saved under any name in any folder. Then to recall that specific configuration, simply click on the File menu, select Open and choose the correct file name and the fields will be repopulated with the saved configuration.

Reading the DS2437

To read the data that is currently stored in the DS2437, click the READ PART button and the values that are stored in memory will fill the appropriate fields on the Data screen. Additionally, the data will also fill the fields within each of the separate Data Screens and the data can be altered in those locations.

The values will appear in the correct decimal or hexadecimal format in which they were entered. The exception to this is in the fields which allow for the selection of the format. These fields will be returned as hexadecimal values and it is up to the user to interpret those results according to the manner that the data was input.

GRAPHS SCREEN Figure 5

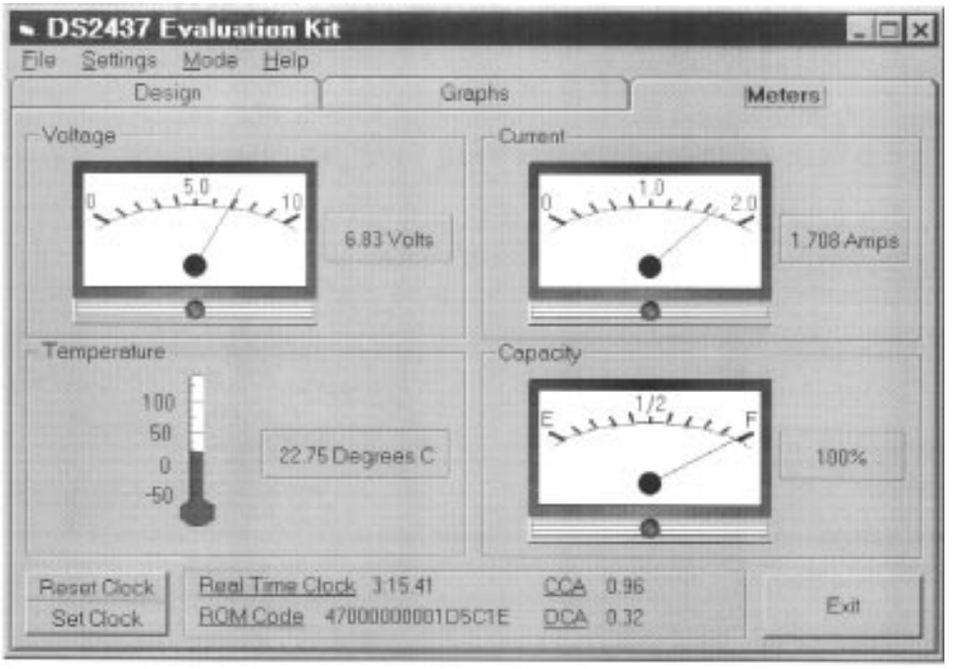


The Graphs Screen displays the last 50 seconds of the real time measurements of the batterys voltage, current, temperature and capacity, as illustrated in Figure 5.

The CLEAR button erases all the data in the graphs and resets all the values to zero. If the screen is viewed prior to the starting of the demonstration, then the demonstration can be started from this screen by clicking on the START READING button. If the demo is running, then that button now serves to STOP READING the real–time data. It then returns to the START READING mode. The SET CAPACITY buttons will set the value in the Integrated Current Accumulator (ICA) to either zero or one hundred, respectively.

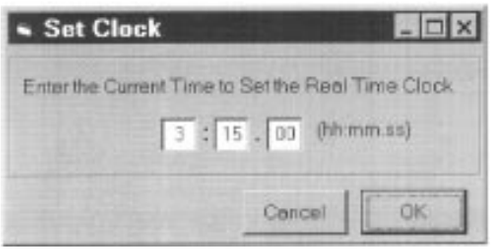
Note: The temperature reading by this Evaluation Kit will not read the battery temperature due to the remote location of the part from the battery. In this case, the ambient temperature is monitored by the DS2437.

METERS SCREEN Figure 6



The Meters Screen displays the latest reading of the batterys voltage, current, temperature and capacity as a digital and analog output. Also displayed on the Meters Screen as a digital output only is the Real–Time Clock and the Charge and Discharge Current Accumulators. The ROM Code of the part that is being monitored is also located at the bottom of this screen. The Meters Screen is displayed in Figure 6.

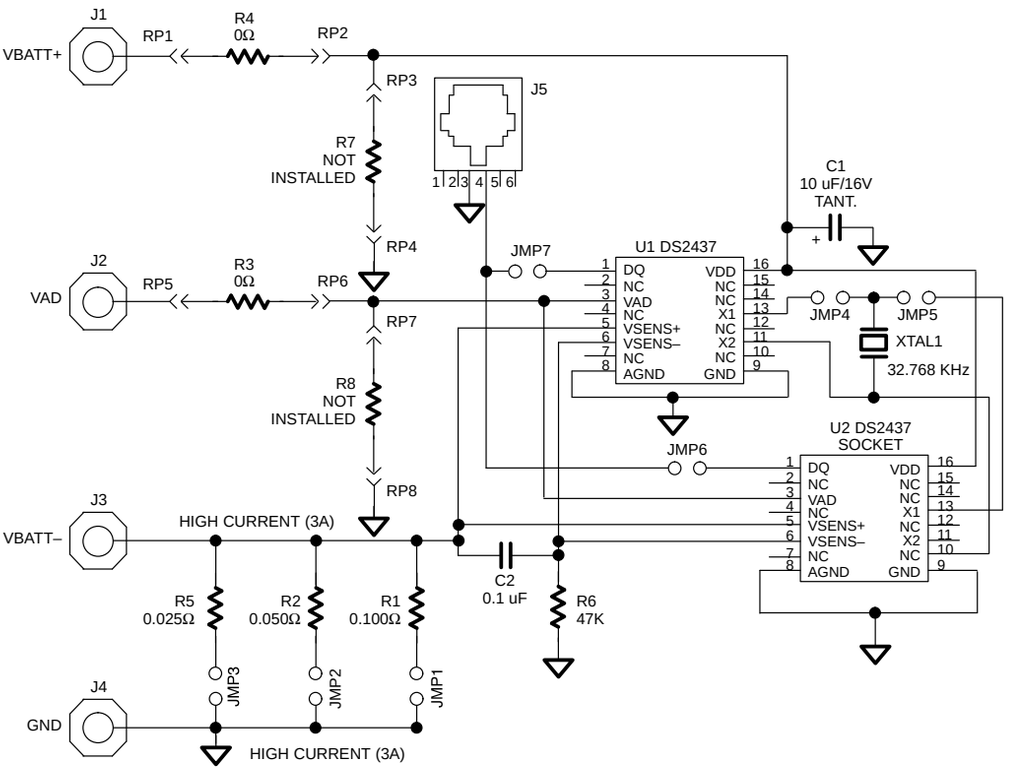
SET CLOCK SCREEN Figure 7



Setting/Resetting the Real–Time Clock

On the Meters Screen there is a digital display of the real–time clock. The clock begins reading when the DS2437 is first connected to the battery. At that time the reading is zero, and the seconds are incremented after that. The RESET CLOCK button allow the user to reset the clock to zero at any time during the operation of the demonstration.

The SET CLOCK button allows the user to set the display to the current time and the real–time clock then increments from that set value so that the actual time can be displayed on the Meters Screen by using the real–time clock that is on board the DS2437. When the SET CLOCK button is pressed, Figure 7 appears and the user is to fill out the appropriate fields with the current time information.

APPENDIX 1

EVALUATION BOARD SCHEMATIC