

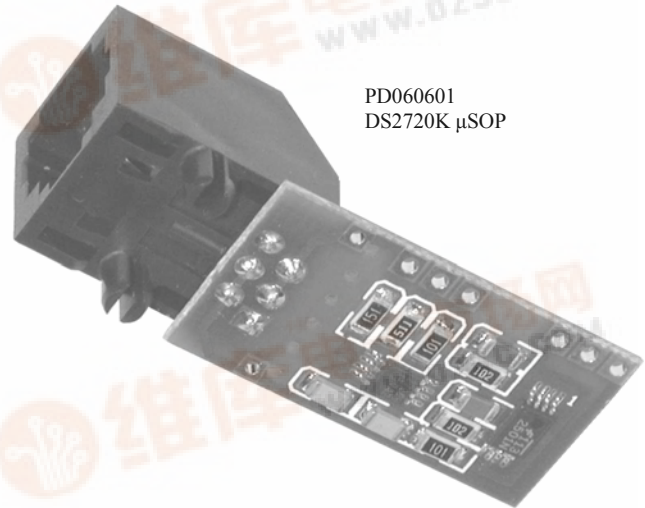


## DS2720K Li+ Battery Protector Evaluation Kit

[www.maxim-ic.com](http://www.maxim-ic.com)

### FEATURES

- Demonstrates the Capabilities of the DS2720 Li+ Battery Monitor, Including:
  - Information Storage
  - Identification
  - Overvoltage/Undervoltage Protection
  - Overcurrent/Short-Circuit Protection
  - Overtemperature Protection
  - Multiple Pack Management
  - Depleted Cell Recovery
- Interfaces to the Serial Port of a PC Running Windows 95, 98, 2000, NT, or XP



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### EVALUATION KIT CONTENTS

- 1 pc.  $\mu$ SOP Evaluation Board
- 1 pc. DS9123 Serial Port Adapter
- 1 pc. RJ-11 Phone Cable
- 1 pc. DS2720K CD containing:
  - DS2720K Evaluation Software
  - DS2720 Related Documentation

### EQUIPMENT NEEDED

1. An IBM-compatible PC running Windows 95, 98, 2000, NT, or XP with a CD-ROM drive and an available serial port.
2. Cables with mini-grabber style clips or the ability to solder directly to connection pads.
3. A Li+ or Li-polymer battery and a power supply and/or load circuit.

### INTRODUCTION

The DS2720K evaluation kit makes performance evaluation, software development, and prototyping with the DS2720 Li+ battery protector easy. The evaluation board interfaces to an IBM-compatible PC through a DS9123 serial port adapter and RJ-11 cable connection. The provided CD-ROM contains all related data sheets along with the evaluation software, which can be run under any Windows environment. The DS2720K evaluation software gives the user complete control of all functions of the DS2720. Separate control tabs allow the user access to all EEPROM memory and register locations. The evaluation board circuit is designed to provide the user with a complete cell pack circuit and protect the DS2720 from ESD damage. Kit demonstration boards will vary as they are improved upon over time. For information on the demonstration board circuits refer to the documentation directory on the DS2720K CD-ROM.



## SETUP AND INSTALLATION

### BOARD CONNECTIONS

Connections to the  $\mu$ SOP demonstration board are best made either by soldering directly to the pads or by using cables with mini-grabber clips. Communication to the  $\mu$ SOP board can be accomplished either through the RJ-11 jack by connecting the provided two conductor cable or by wiring directly to the DQ and PAC- pads. In the latter case, the size of the board can be reduced by snapping off the RJ-11 jack along the break line, see (Figure 1). To utilize the demonstration software, the DQ and PAC- lines must be connected to the DS9123 communication brick using either of the two methods described.

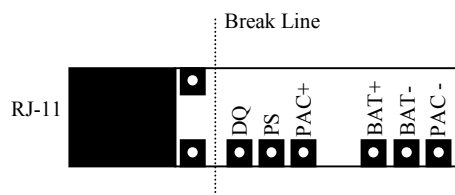


Figure 1. Communication Connections

Figures 2a and 2b show the recommended circuits to simulate charging and discharging. The Li+ cell is connected between the BAT+ and BAT- pads. The battery charger/power supply or circuit load is connected between the PAC+ and PAC- pads. The evaluation software can be run in either configuration as long as a cell is connected between the BAT+ and BAT- terminals providing a minimum of 2.5V to power the DS2720. Refer to the datasheet for the operation of the PS pin. Leaving it unconnected does not interfere with the operation of the demonstration board.

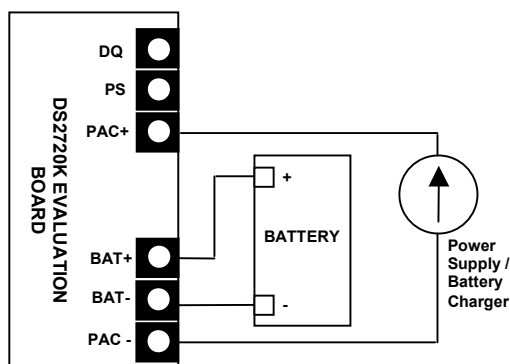


Figure 2a. Charging Circuit

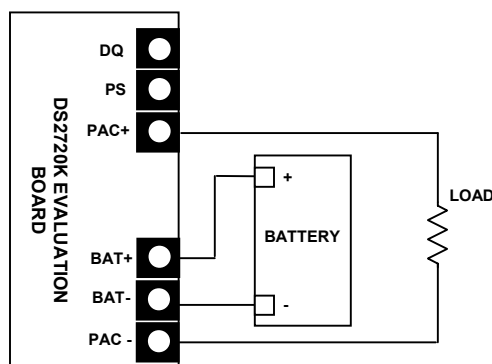


Fig 2b. Discharging Circuit

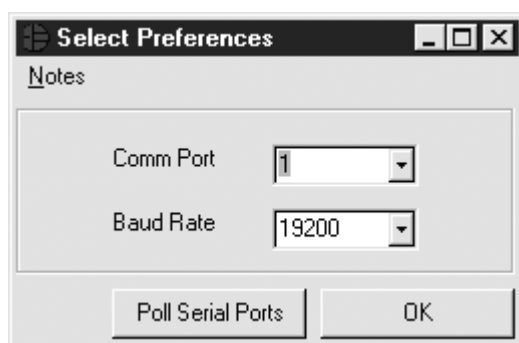
### SOFTWARE INSTALLATION

To install the DS2720K software, exit all programs currently running and insert the DS2720K CD into your computer's CD-ROM. The auto run software on the CD will give an option to install DS2720K or the user can run SETUP.EXE from the setup directory and the installation process begins. Follow the prompts to complete the installation. The DS2720K software can be uninstalled in the Add/Remove Programs tool in the Control Panel. After the installation is complete, open the DS2720K folder and run DS2720K.EXE or select DS2720K from the program menu. A splash screen containing information about the evaluation kit appears as the program is being loaded. The Documentation directory located on the CD contains all relevant data sheets and application notes on the DS2720 and DS2720K. They are stored in Adobe Acrobat format for easy viewing.

### SELECTING THE COM PORT

The first time the software runs, the Serial Port Settings window appears. In this window, select the COM port to which the DS9123 is attached and the desired communication rate; then hit OK. The DS2720K software saves this COM port selection and automatically uses the selection each time the program starts.

To change the COM port later, click the Preferences option on the menu bar, select Serial Port Settings, and then select the appropriate port. To attempt to automatically locate the DS9123, click the Poll Serial Ports button. Warning—automatically polling for the DS9123 can disrupt other devices connected to your computer's COM ports.



## MENUS

Several pull down menu options have been provided to simplify use of the DS2720K software for the user. Their functions are individually detailed below.

### FILE MENU



The File Menu allows the user to store information from a file directly into the Device Setup and Battery Data sections under the Pack Info Tab or take the same Pack Information and store to a file. These functions do not directly write or read the DS2720. It is still necessary for the user to store or recall this information to or from the device by issuing a WRITE or READ command under the Pack Info Tab.

### REGISTERS MENU



The Registers Menu gives immediate access to the status and function registers of the DS2720. Selecting any of the registers will open an individual control window giving the user a description of each register bit and the ability to read or write it. See the protection register window example.

## STATUS REGISTER

Bit	Register Name	Value / Command
Bit 5	PMOD	Sleep Mode is : Disabled
Bit 4	RNAOP	Read Net Address Opcode Set to : 33h
Bit 3	SWEN	SWAP Command is : Disabled

Buttons: Recall & Read Address 31h, Write & Copy Address 31h, Read Address 01h, Done

The present state of all register bits are displayed immediately upon opening the register window. R/W locations contain a selection field to allow the user to determine their state. Pressing either the APPLY or OK button in the EEPROM Register or Special Feature Register windows will automatically update and read the corresponding register inside the DS2720. The Status register is updated from values in user EEPROM address 0x31h. Its window contains extra options to write or read this location independently of the register.

## PREFERENCES MENU



The Preferences Menu allows the user to change COM port settings at any time. Edit Preferences opens the Select Preferences window. See the “Selecting the COM Port” section for details.

## HELP MENU

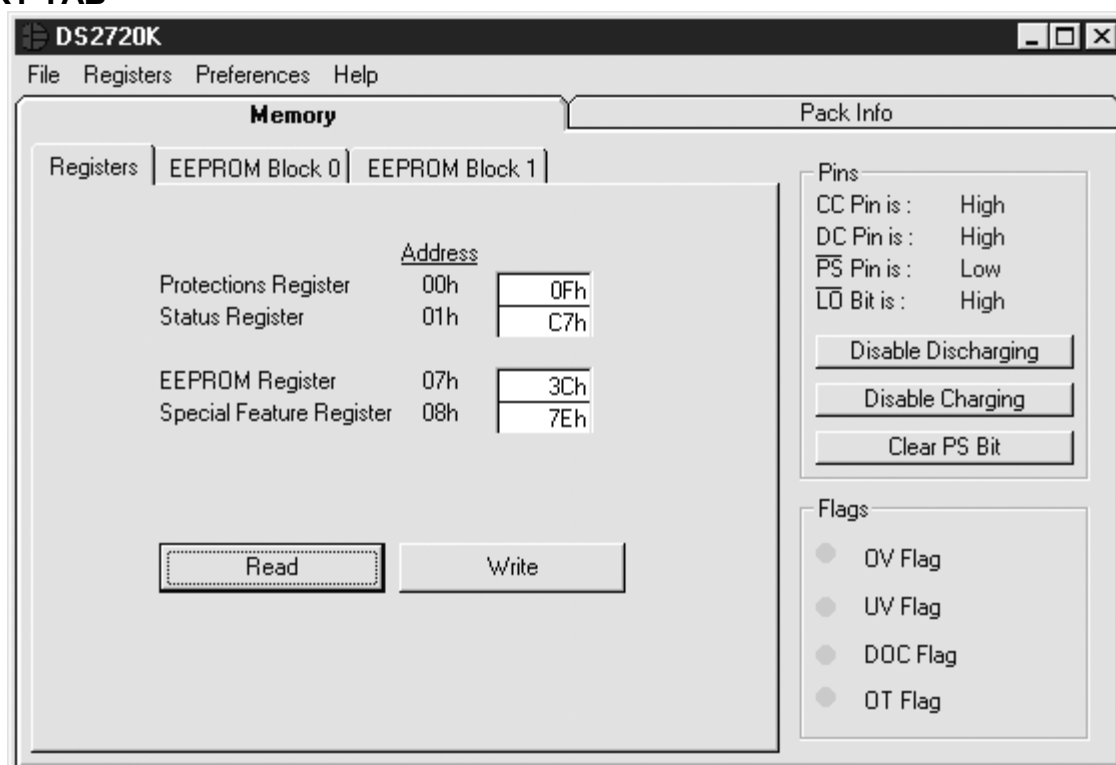


Selecting the About topic from the Help Menu will open a window containing information about this program and Dallas Semiconductor.

## PROGRAM TABS

All functions of the program are divided under two tabs in the main program window. Left click on the appropriate tab to move to the desired function page. The Memory tab displays the contents of every register and memory location inside the DS2720 and allows the user to alter the data. Sub-tabs are available for each memory page. The Pack Information tab gives the user the ability to assign a default device configuration and store that information to the DS2720 and/or a file.

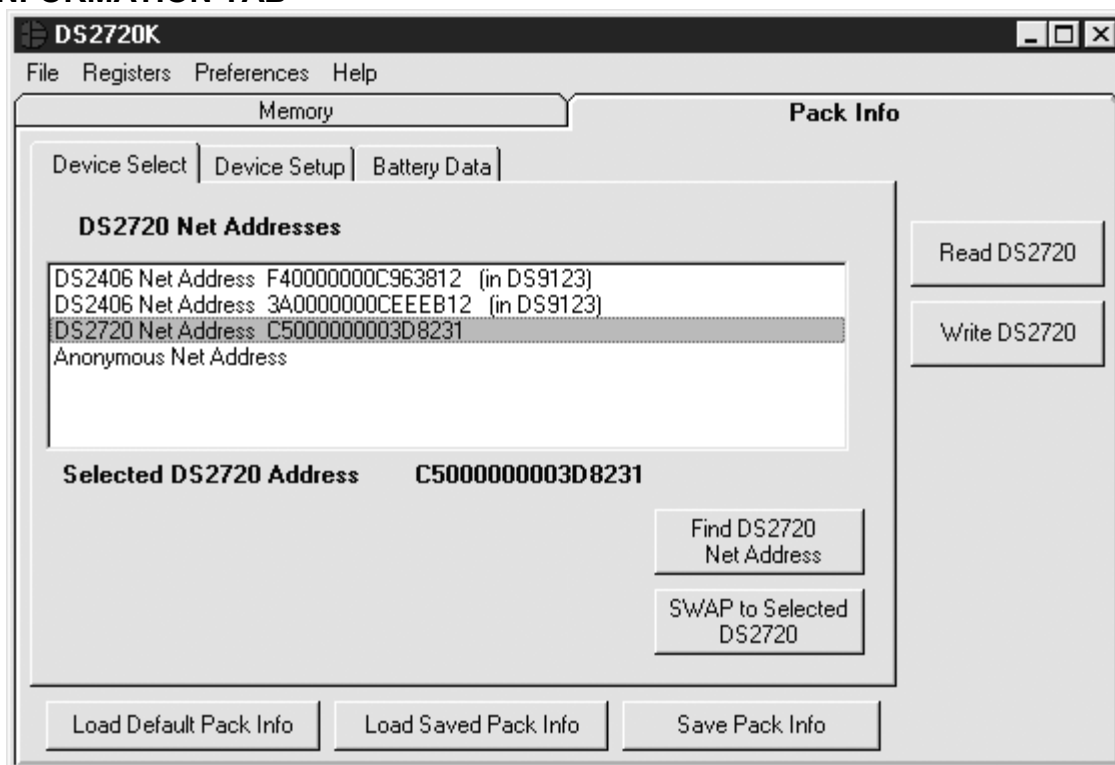
## MEMORY TAB



The Memory Tab gives the user access to all four register and eight EEPROM bytes inside the DS2720. They are separated into three sub-tabs for convenience. Any value can be modified by clicking in that address' text box and typing a new value in hexadecimal format. The Write button will copy the entire block of data to the corresponding location inside the DS2720 (Scratchpad RAM on the EEPROM blocks). The Read button will update the entire block's text boxes with data from the DS2720 (Scratchpad RAM on the EEPROM blocks). Sub-tabs displaying any EEPROM data will also have Copy and Recall buttons to allow the user to transfer the data between Scratchpad and EEPROM memory internal to the DS2720. The Permanently Lock Block 0/1 buttons will permanently store the data currently located in that block's EEPROM if the LOCK bit in the EEPROM register is set. Otherwise this button will do nothing. Warning—this data can never be changed once locked. Verify your data first by issuing a Recall and a Read.

In addition to the read and write data functions the Memory tab also displays the state of the protection circuitry. The Flags box displays the state of all four protector flags: Overvoltage, Undervoltage, Overcurrent, and Overtemperature. When the corresponding light is green, the flag is clear; when it is red, the condition has been tripped. When a flag is tripped, a "Clear Flag" button will appear allowing the user to reset the flag. A flag can only be reset if the condition that caused it to be tripped is no longer present. The Pins box displays the state of the external control pins (CC, DC, and PS) as well as the state of the lowest cell voltage indicator bit (LO). Individual buttons allow the user to override the state of the CC and DC pins and clear the PS pin latch. A protection fault pin state cannot be overridden.

## PACK INFORMATION TAB



The Pack Information tab gives the pack manufacturer the ability to assign default register settings, select a specific device through the SWAP feature, and show how the EEPROM can be used to store cell assembly information.

The Device Select sub-tab allows the user to choose the device on the 1-Wire<sup>®</sup> bus which it will communicate to and demonstrates the SWAP feature of the DS2720. Clicking on the Find DS2720 Net Address button will begin a SEARCH NET ADDRESS operation on the 1-Wire bus. All DS2720s found on the bus will be listed in the Net Addresses field. To communicate to any device on the bus, click on its address inside the Net Addresses field to select it. The program will now use this device for all operations until a different DS2720 is chosen. Clicking on the Swap to Selected DS2720 button will demonstrate the features of the SWAP command provided all DS2720s on the bus have both PMOD and SWEN bits enabled in their status registers. Issuing the SWAP command will cause the selected DS2720 to wake up and enable its control FETs while simultaneously all other devices disable their control FETs and enter sleep mode. To disable all available 2720s select the Anonymous Net Address and SWAP to it.

The Device Setup sub-tab shows the current state of all major features of the DS2720. All status indicators shown here directly mirror their corresponding bits in the Protection, Status, and Special Feature registers. Clicking on any of the status indicators will open the corresponding register window to allow editing. See Registers Menu section. The selection fields on the right hand side of the sub-tab set how the EEPROM backup bits (location 0x31h) will be programmed when the DS2720 is programmed with the pack information.

**DS2720K**

File Registers Preferences Help

Memory Pack Info

Device Select Device Setup Battery Data

Battery Manufacturer: Sanyo

Chemistry: CC/CV 4.2V - 2.9V

Date (mm/dd/yyyy): 2 / 5 / 2002

Rated Capacity (mAh): 520

Read DS2720

Write DS2720

Load Default Pack Info Load Saved Pack Info Save Pack Info

The Battery Data sub-tab demonstrates how the pack manufacturer can use the DS2720's EEPROM fields to store relevant pack information such as assembly date, chemistry, etc. Clicking on the Load Default Pack Info button will enter example data into the information fields of the Device Setup, Battery Data, and Fuel Gauging Data sub-tabs. To change any of this information, simply click on the desired text field and enter the new value. Once all data is in the desired format, click on the Write DS2720 button to copy it to the EEPROM of the DS2720. This information can also be stored to a file and recalled later using the Load/Save Pack Info buttons.

#### MEMORY MAP OF PACK INFORMATION DATA FOR THE DS2720K

Addresses	0x20				
	0x21				
	0x22				
	0x23				
	0x30	Rated Cell Capacity—Divided by 10 to store in 8 bits			
	0x31	Cell Chemistry	PMOD	RNAOP	SWEN
	0x32	Date Code—2 bytes			
	0x33				

The memory map shows the format in which the data is stored within the device. All static data is stored in Block 1 while data which might need to be updated is in Block 0. The pack manufacturer can now permanently lock Block 1 (locations 0x30 to 0x33) to maintain data integrity while leaving Block 0 (locations 0x20 to 0x23) open for access by the host processor. The gray shaded area represents data locations not used by the Pack Information section of the code and is available to the user.