

AN-1296 LP3945/LP3946 Evaluation Kit

1 LP3945/LP3946 Overview

The Texas Instruments LP3945 and LP3946 are complete charge management systems that safely charge and maintain a Li-Ion battery or a Ni-MH (LP3945 only) battery pack. The LP3945 offers the flexibility of programming charge current, battery type, battery regulation voltage and End-Of-Charge (EOC) termination selection through the use of I²C interface. On the LP3946, these parameters are programmed at the factory per customer specification. For more information on these products, see *Battery Charge Management System* ([SNOSA63](#)).

2 Evaluation Kit Overview

The LP39345/46 Evaluation Kit supports complete functional evaluation of the power management IC. All user accessible functions of the circuit can be controlled and some parameters can be programmed via the use of the I²C interface port (LP3945 only). The PC software provided emulates the I²C bus communication protocol. Hand shaking logic to interface to PC's parallel port and all necessary level shifting is provided.

The LP3945 evaluation kit consists of evaluation PCB and PC software. The LP3946 evaluation kit contains only the evaluation PCB.

3 Getting Started

The following instructions show how to use the LP3945 evaluation kit in default conditions. The battery charger on LP3945 and LP3946 operate in default mode independent of an external controller. Please use the ESD protection (ground cable) to prevent any unwanted damaging ESD events.

1. Connect a power supply (4.5V to 6.0V) to “Adaptor” and “GND” pins located at the upper section of the PCB. Power supply's negative terminal should be connected to “GND” and positive to “Adaptor”.
2. Connect a Li-Ion battery pack to “BATT” and “GND” pin located at the lower section of the PCB. The battery pack's negative terminal should be connected to “GND” and positive to “BATT”.
3. The evaluation board is now ready for operation. Turning ON the power supply will start the charge cycle if battery is not fully charged.
4. Install the evaluation software on a PC by following the instruction on the “Evaluation Board Software Installation” section.
5. To control and program other functions and parameters available on LP3945, connect the LPT cable to the evaluation board and the LPT port of your PC.
6. Start the software by double-clicking on its icon.
7. The evaluation board is now ready to use and the LP3945 can be programmed and controlled through the PC software.

4 Evaluation Board Software Installation

The battery charger on LP3945 and LP3946 operate in default mode independent of an external controller. The default settings are specified in the datasheet and in this document, and are highlighted with **bold** face letters. To change the default settings in LP3945, a controller with I²C communication protocol or a PC with I²C bus emulator/driver can be used to communicate commands with LP3945.

A CD ROM provided in this evaluation package contains the necessary software to emulate an I²C port using the parallel port on a PC. Software will run on PC's with **Windows 95/98/Me** system software. In order to run on **NT** class operating systems such as **NT4**, **Windows 2000**, or **Windows XP**, a kernel mode driver must be installed and configured. The kernel mode driver provides access to the parallel port. Any kernel mode driver can be used. UserPort is provided on the CD ROM as the kernel driver for the user's convenience. Please read the documentation carefully before installing and using kernel mode driver. Do NOT install the UserPort software, if Windows 95/98/98SE or Windows Me is the operating system on the computer to be installed.

Software will be installed in PROGRAMS directory (default setting). It is strongly recommended to reboot the computer once the software is installed.

5 I²C Address and PC Parallel Port Settings

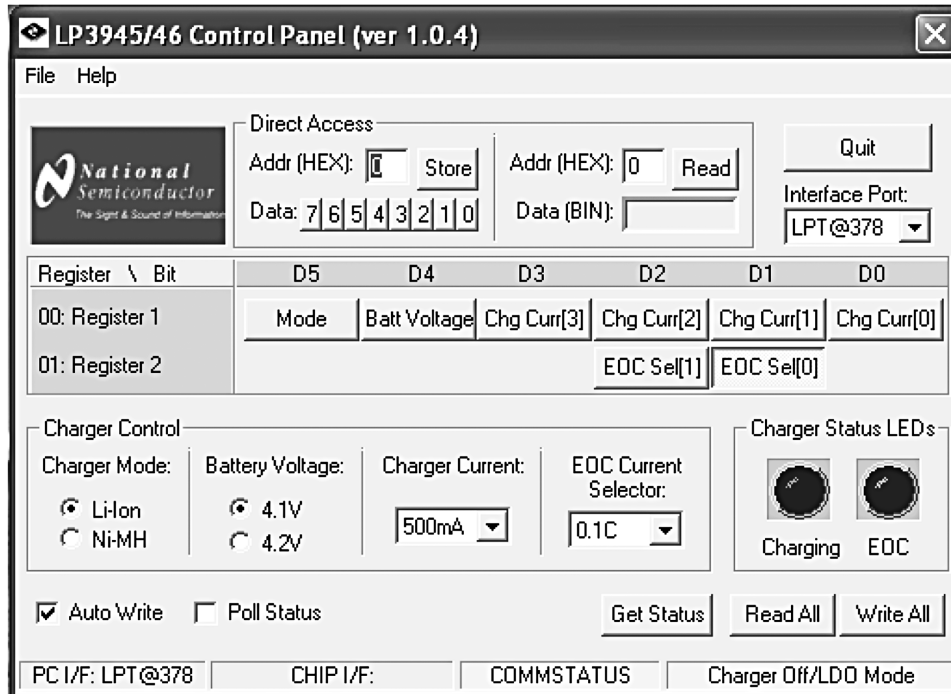
The I²C address for the LP3945 is defaulted to "LP3945B 0x45". The parallel port of the PC should be set to SPP (output only) mode in the computer's BIOS. Note that SPP mode is also referred to as Standard, AT, Output Only, depending on the BIOS.

The default parallel port address for the evaluation software is 0x378. (0x denotes the hexadecimal numbering system.) Computers like some IBM ThinkPad laptops, have their parallel port base address as 0x3BC. The evaluation software has a menu called "PortAddr" that allows either 0x378 or 0x3BC to be selected. The evaluation software's default setting is 0x378, and the software will always start with the 0x378 address code.

6 Control Panel

The LP3945 functions and programming parameters can be controlled from this control panel, [Figure 1](#). The software permits the flexibility of programming in hex codes as well as the convenience of a menu driven operation.

There are two registers in the LP3945. Register 1 controls the charge current, battery voltage, and battery type. Register 2 controls the End-Of-Charge current. Data can be entered in hex code in the “Write” input box. Alternatively, it can be selected from the pull down menu. To execute the selection, write or read buttons must be clicked. If a read instruction is issued, the read back result will be displayed in the “Read Binary” box next to the read button.



When the LP3945 is powered up initially, it operates on default values as shown.

Figure 1. Control Panel

7 LP3946 Evaluation Board Schematic

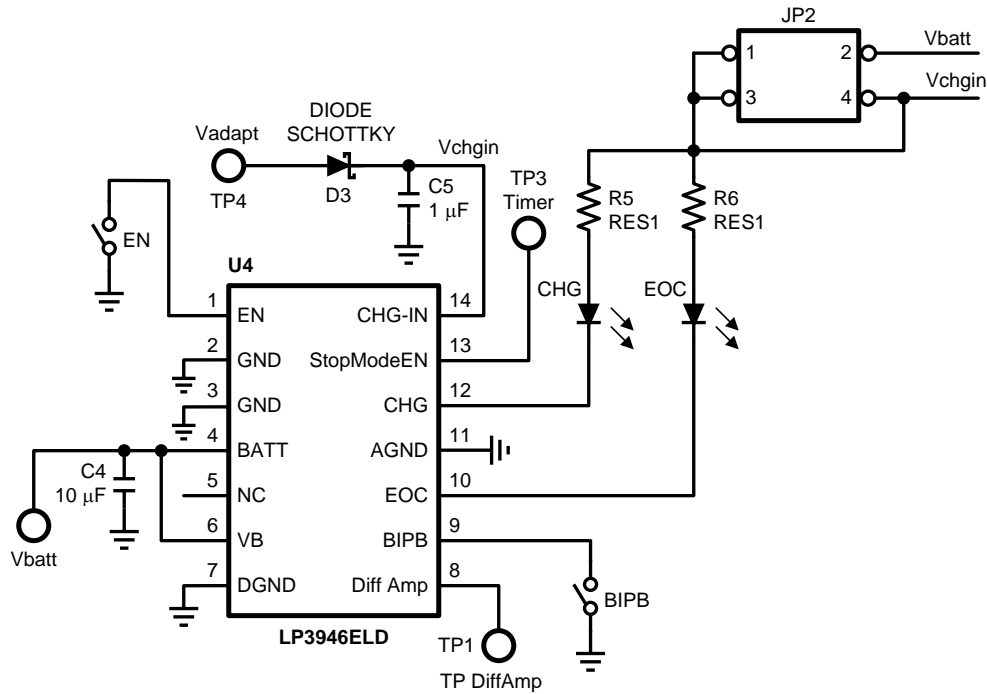


Figure 2. LP3946 Evaluation Board Schematic

Table 1. Bill of Material for LP3946

Designator	Description	Footprint	Comment
C4	10uF, ceramic	0805	TDK C2012X5R0J106M
C5	1uF, ceramic	0805	TDK C2012X5R0J105M
R3, R4	100k	805	
D3	SCHOTTKY Rectifier	805 2x	On Semi MBRM120
JP2, (EN, BIPB)	HEADER 2 x 2		SPC Tech
JP cap	Jumper	NA	SPC Tech
U1	Battery Charger	LDA14A	Texas Instruments LP3946ILD

8 LP3945 Evaluation Board Schematic

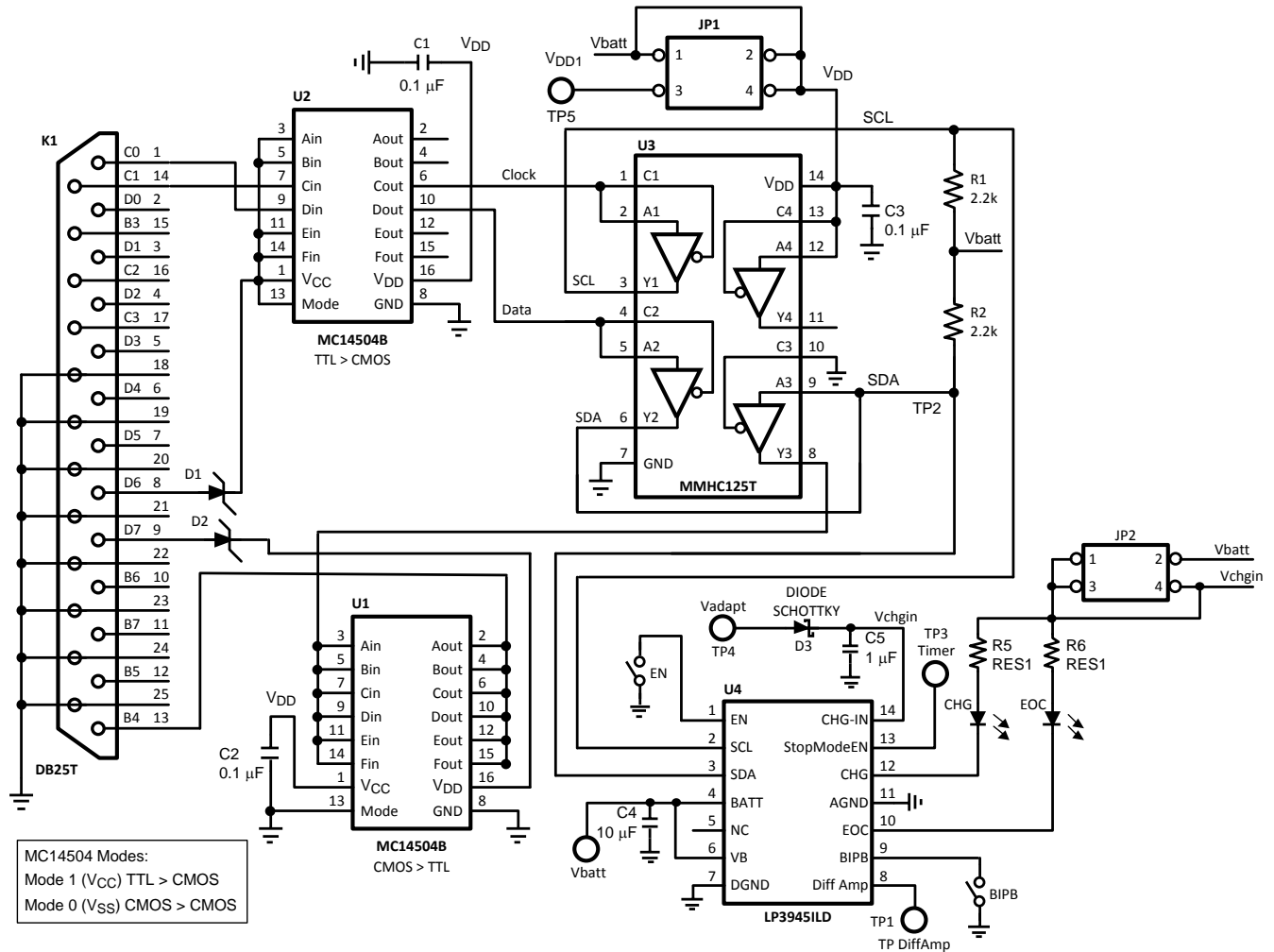


Figure 3. LP3945 Evaluation Board Schematic

Table 2. Bill of Material for LP3945

Designator	Description	Footprint	Comment
C1, C2, C3	0.1 μ F, ceramic	0805	TDK C2012X7R1H104K
C4	10 μ F, ceramic	0805	TDK C2012X5R0J106M
C5	1 μ F, ceramic	0805	TDK C2012X5R0J105M
R1, R2	2.2k	0805	
R3, R4	100k	0805	
R5, R6	5.6k	0805	
D1, D2, D3	SCHOTTKY Rectifier	0805 2x	On Semi MBRM120
CHG	Red LED	0805 2x	Vishay TLMT3100
EOC	Green LED	0805 2x	Vishay TLMC3100
JP1, JP2, (EN, BIPB)	HEADER 2 \times 2		SPC Tech
JP cap	Jumper	NA	SPC Tech
K1	DB25T		SPC Tech
U1	Level Shifter	0.15" SOIC16	On Semi MC14504B
U2	Level Shifter	0.15" SOIC16	On Semi MC14504B
U3	3 state quad buffers	0.15" SOIC14	Fairchild MM74HC125M
U4	Battery Charger	LDA14A	Texas Instruments LP3945ILD

9 Important

If the LP3945 is in constant current mode for more than 5.6 hours and pin 13 (StopModeEN) is pulled **HIGH** (or floating), the charger will turn off and both the red and green LEDs will turn on. This is the recommended mode of operation.

If the LP3945 is in constant current mode for more than 5.6 hours and pin 13 (StopModeEN) is pulled **LOW**, the charger will jump to charge complete mode with the green LED on and red LED off. This is NOT a recommended mode of operation because the battery can potentially be charged longer than it should. User must provide protection against continuously charging a defective battery.

For more detail on the LP3945 charger operation, please refer to the LP3945 datasheet ([SNOSA63](#)).

Pins 2 and 3 in LP3945 are dedicated for I²C interface. The LP3946 does not have that feature. Therefore, these two pins are grounded in the LP3946. To accommodate both products on a single board, pins 2 and 3 have "dual connections". On each pin, there is a via that connects to a signal (for LP3945) and another via that connects to ground (for LP3946). Depending on the product that is mounted on the board, one of the vias will be disconnected.

Each board is assembled and tested at the factory.

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