

# **Li Battery Charger Demo Board – Using the HT46R47**

**D/N: HA0051E**

## **Introduction**

The miniaturization of electronics and its resulting major expansion in the use of hand held battery powered products, to mention a few such as digital cameras, PDAs, mobile phones, meters, etc., has brought with it increasing demands for high capacity rechargeable batteries. Among the various types of rechargeable batteries available today, one of the most popular is the Lithium type, a battery technology which offers the advantage of higher capacity when compared to other battery technologies such as Nickel Cadmium or Nickel Metal Hydride types.

The charging process for all rechargeable batteries requires some special considerations and is rarely just a matter of supplying a charge for a fixed period of time. Determining what charging current to use and detecting when the battery is fully charged requires that the battery voltage and charging current is monitored continuously so that correct charging decisions can be made by the charger to allow the battery to be charged safely to its maximum capacity. However, to do so most chargers will normally require the services of a suitable microcontroller and analog to digital converters. Holtek provides a range of A/D microcontroller devices, which are suitable for battery charging applications, one of these is the HT46R47. To assist customers in their development of battery charger applications, Holtek has produced a Li Battery Charger Demo Board, which includes a HT46R47 microcontroller device and all necessary peripheral hardware.

## Demo Board Features

The Li Battery Charger Demo Board contains all the hardware to form a complete Li battery charger system and incorporates a range of features to ensure that Lithium batteries are charged safely to their full capacity. Some of these features are listed below:

- A Li Battery auto-detection function is included, if the voltages between BAT0~BATVSS or between BAT1~BATVSS is found to be greater than 1.1V, then the battery to be charged will be regarded as a Li Battery type.
- If a Li Battery residual voltage of less than 3.7V is detected, a 150mA charging current will be supplied. Otherwise the Battery will be charged in fast-charging mode.
- If a Li Battery residual voltage of greater than 3.7V is detected, a 600mA charging current will be supplied.
- If the Li Battery voltage is charged to 4.2V, then the Li Battery will be charged with steady voltage and charging is complete when the charging current is less than 30mA.
- The fast-charging time is set to be about 2 hours after which the charging process will automatically stop.
- If the Li Battery voltage is higher than 4.17V, the charging process will automatically stop.
- Two Li Batteries can be placed together, but only one Li Battery can be charged at a time with the other battery in a standby state.
- To charge the battery through Channel 0, the Li Battery cathode should be connected to BAT\_VSS and its anode connected to BAT0.
- To charge the battery through Channel 1, the Li Battery cathode should be connected to BAT\_VSS and its anode connected to BAT1.
- Four indicator LEDs are provided to indicate the Demo Board status. After power on, all LEDs will be illuminated for one second then off for another second, after this an auto-detect for Li Batteries will take place. One red and one yellow LED forms a pair of indicator LEDs for each channel, each pair indicates the present condition of each channel.

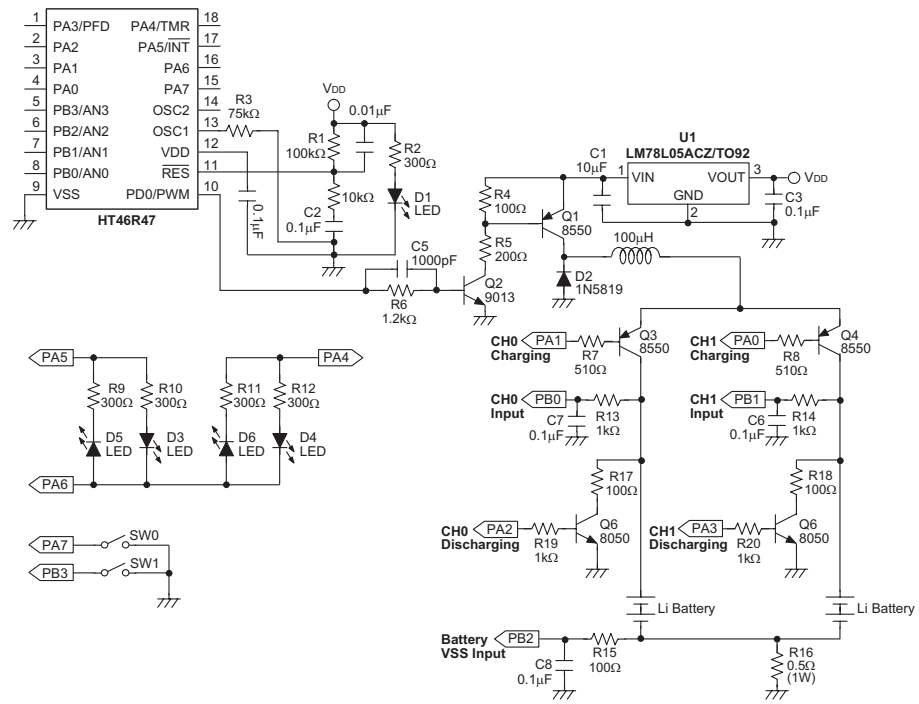
Taking one of the channels as an example, the LED functions are as follows:

Battery Charger State	Red LED	Yellow LED
Disconnect Battery	Off	Off
Standby	On	Off
Charging with 150mA	Flash	On
Charging with 600mA	Off	On
Charging full normally	On	On
Fast-charging time has exceeded 2 hours or battery voltage is greater than 4.17V	On	Off





## Li Battery Charger Demo Board Circuit



## Revision History

### **Revision: V1.00**

Updated Date: 2004/07/21

Modified Contents:

- Modify the battery charger features
  - Slow-charging mode current changed from 50mA to 150mA
  - Fast-charging mode current changed from 300mA to 600mA
  - Constant 4.2V charging, if current is less than 30mA, charging is complete
  - Fast-charging mode time changed from 4 hours to 2 hours
  - If battery voltage is greater than 4.17V, charging stops
- Battery charger circuit modified, R15 changed from 10k $\Omega$  to 100 $\Omega$