

NiMH Battery Charger Demo Board – Using HT46R52A

D/N: HA0084E

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, the Nickel Metal Hydride (NiMH) batteries, which offers the advantage of higher capacity, cost-effectiveness and environmental friendly, replace the conventional one-time batteries.

Demo Board Features

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

- Fix current charging, 70mA for slow charging mode and 575mA for fast charging mode
- Discharging before charging feature selectable to eliminate the battery memory effects, discharging current is 50mA.
- Battery V detecting to check whether battery is fully charged
- The charging time is set to be about 6 hours after which the charging process will automatically stop.
- Two indicator LEDs are provided to indicate the charging status.
- Charging one battery at a time.

Charger Introduction

Using the fix current mode to charge one NiMH battery. Once a battery is inserted, the charger will start to charge. Discharging prior to charging is selectable by user. To protect the battery, if the battery voltage is greater than 1.25V than fast charging mode is used otherwise slow charging mode is used.

Charger Functional Description

Charging Method

The HT46R52A uses the fix current method to make the NiMH battery charger. The HT46R52A uses a PWM output and one ADC input to control the charging current. There are 4 ADC channels for external analog signal to detect the battery voltage. If $-V$ is detected, that means the battery is fully charged. The 12-bit ADC has a resolution of 1.2mV.

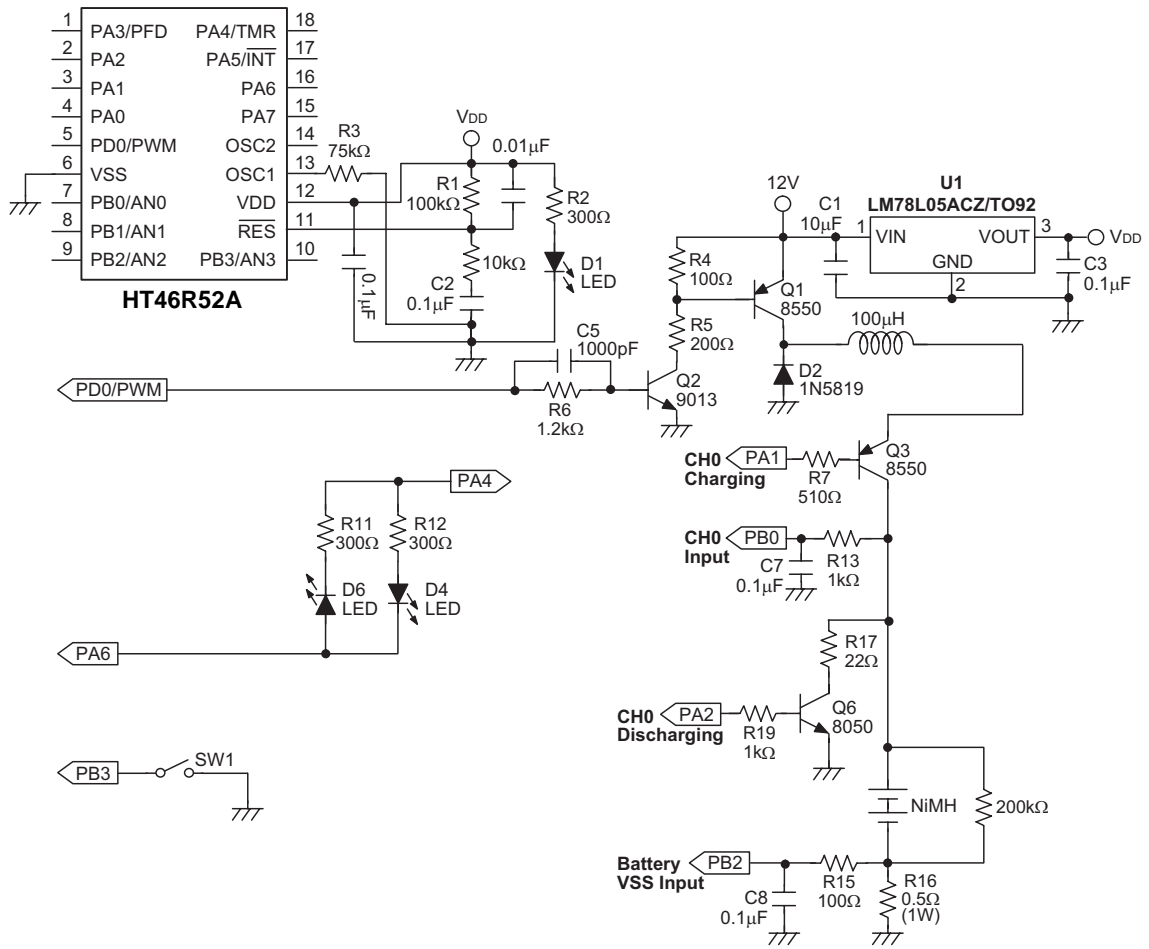
Charging Procedure

- DEMO Board LED off when not powered
- After power-on, Green LED on while other LEDs on for 1 second, then awaiting for NiMH battery insertion
- When battery inserted, start to charge and two LEDs indicating charging status
- When battery is fully charged, charging will stop and two LEDs indicating fully charged
- Remove the NiMH battery and 2 LEDs indicating awaiting for battery insertion status

Charging Status Indicated by 2 LEDs

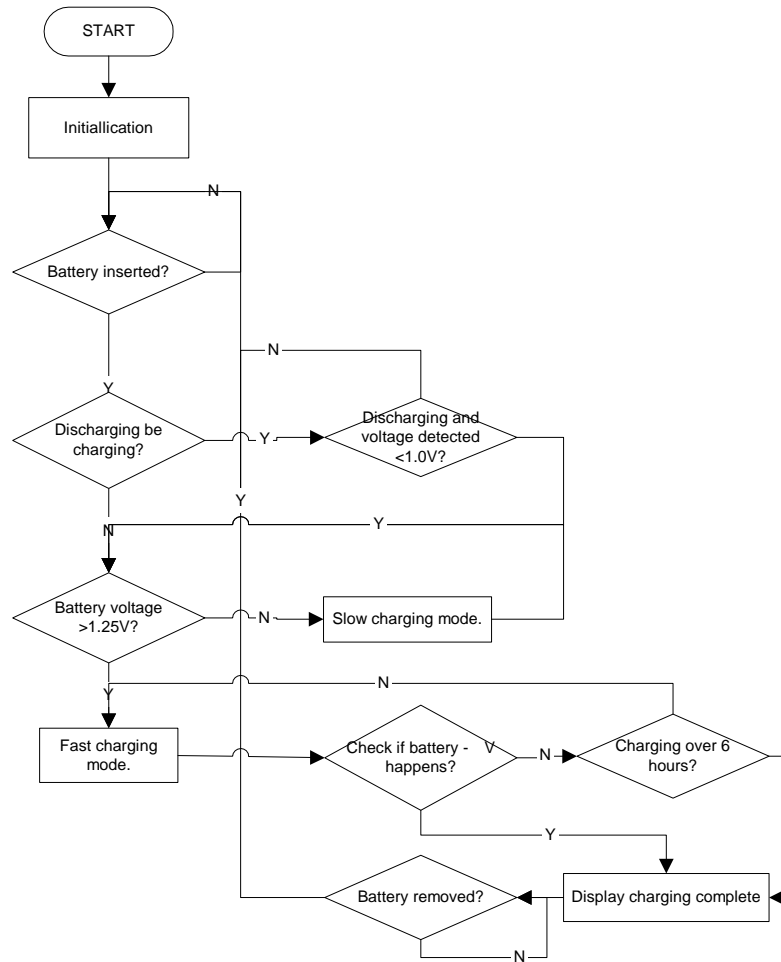
- Both yellow and red LED on: awaiting for battery insertion
- Yellow LED on and red LED off: in fast charging mode
- Both yellow and red LED on: battery is fully charged or has been charged over 6 hours
- Yellow LED on and red LED blinking: in slow charging mode
- Red LED on and yellow LED blinking: in discharging

Charger Demo Board Circuit

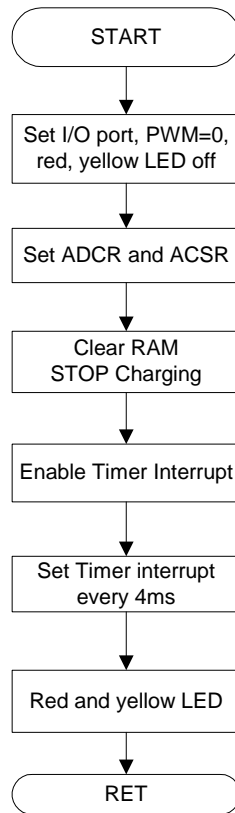


Flowcharts

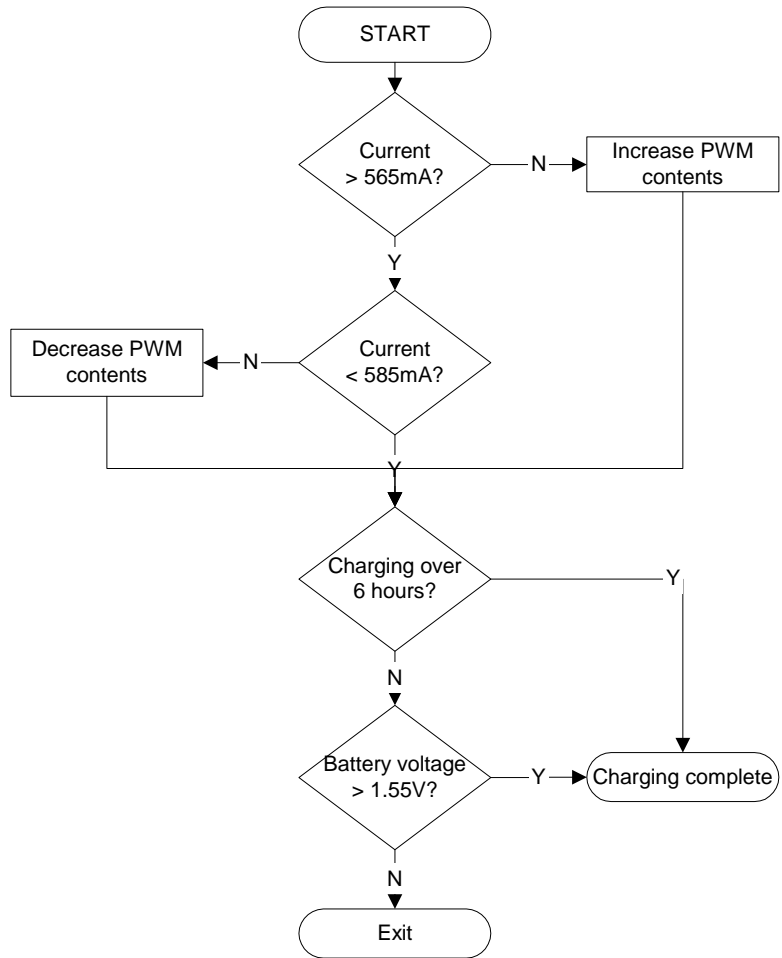
Main Program



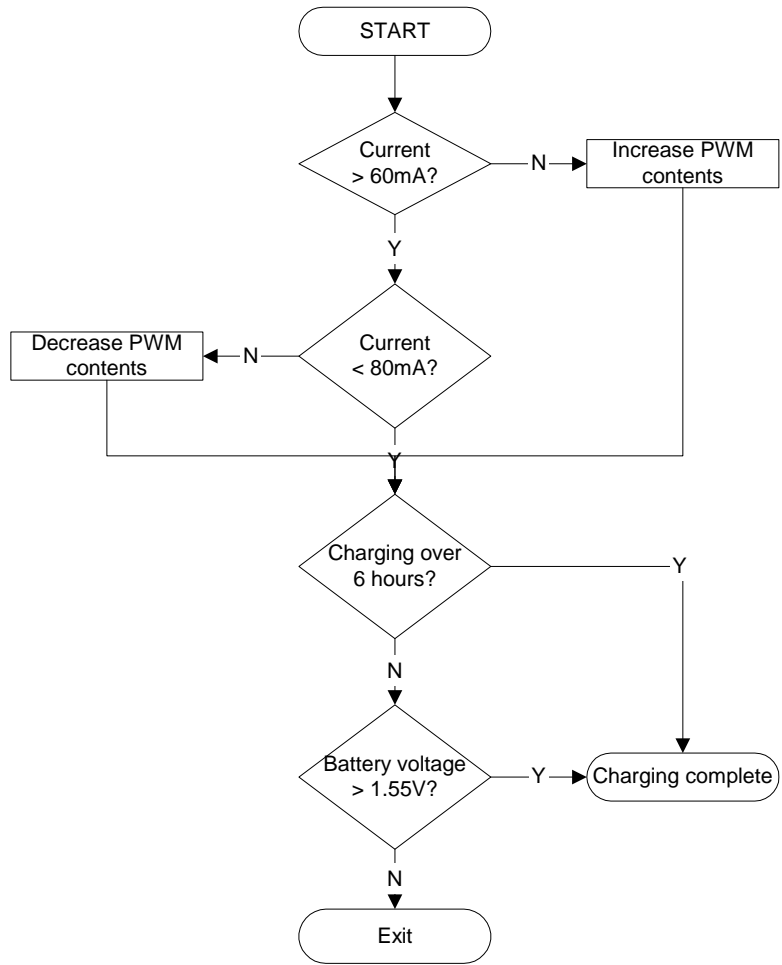
Initialization Procedure



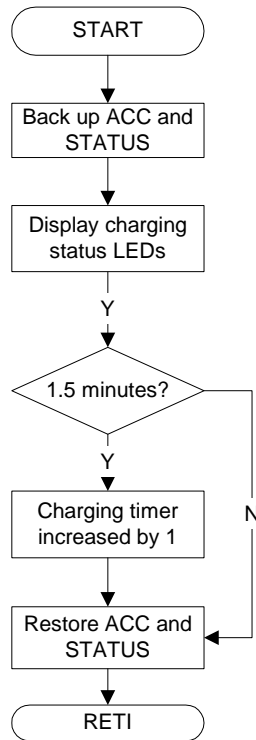
Fast Charging Procedure



Slow Charging Procedure



Timer ISR Procedure



Program Description

HT46R52A NiMH Battery Charger demo program consists of charging_current.asm main program and 3 include files. The ch0_main.asm is the main procedure for charging and sub.asm is a subroutine. The NiMH.inc is the include file for charging parameters and variable declaration shown as below.

Parameter	Default Value	Description
Charging_time	240 ; equal to 6 hours	Setting the charging time, unit is 1.5 minutes.
V48 V155	1270 ; equal to 1.55V	If the battery voltage is greater than 1.55V, stop charging, unit is 1.22mV
V25 V125	1024 ; equal to 1.25V	If the battery voltage is greater 1.25V, fast charging mode, otherwise, slow charging mode, unit is 1.22mV
V22 V115	942 ; equal to 1.15V	After discharging lower to 1.15V, then start to charge, unit is 1.22mV
V03 V01	82 ; equal to 0.1V	Battery voltage greater than 0.1V will be regarded as the insertion of a battery, unit is 1.22mV
Vpk_time	64 ; equal to 64 sec.	Vpk_time after – V will be regarded as fully charged, unit is 1 second.
V20mv	180H ; equal to 29mV	Control slow charging current no less than 58mA, each 10H stands for 2.44mA.
V30mv	200H ; equal to 39mV	Control slow charging current no greater than 78mA, each 10H stands for 2.44mA.
V250mv	E80H ; equal to 283mV	Control fast charging current no less than 566mA, each 10H stands for 2.44mA.
V260mv	F00H ; equal to 293mV	Control fast charging current no greater than 586mA, each 10H stands for 2.44mA.

Revision History

Revision: V1.10

Updated Date: 2008/01/30

Modified Contents: The original part number HT46R52 was changed to HT46R52A.