Date	Dec. 30, 2003	Ver	1.0

Specification

1. Customer : _____

2. Product : **NiMH 10S1P Battery Pack (3,800mAh)**

3. Model : **NM36S-38**

4.Reviewed By : _____

Emerging Power, Inc.
www.emergingpower.com
200 Holt street
Hackensack, NJ 07601
Tel: 201-441-3590 Fax: 201-441-3592

1. Scope

This Product Specification ('Specification' hereinafter) covers the requirements for the rechargeable lithium-ion battery Hard Pack ('Pack' hereinafter) manufactured and supplied by Emerging Power, Inc.

The pack contains lithium-ion battery cells, safety devices, and protection circuit units

2. Descriptions and Model name

2.1.	Description	Nickel Metal Hydride rechargeable battery pack
2.2.	Battery Cell Configuration	10S1P
2.3.	Model name	NM36S-38

3. Ratings

3.1.	Normal Capacity	3,800mAh
3.2.	Minimum Capacity	3,600mAh
3.3.	Charging Voltage	18V
3.4.	Norminal Voltage	12V
3.5.	Charging Method	CC (Constant-Current)
3.6.	Charging Current	2000mA ± 200mA
3.7.	Maximum Charge Current	3800mA
3.8.	Maximum Discharge Current	2000mA
3.9.	Discharge Cut-off Voltage	9.0V
3.10.	Internal Resistance (impedance)	≤ 500mΩ
3.11.	Weight	≤ 600g
3.12.	Operating Temperature	
	Standard Charge	0 ~ 45 °C
	Standard Discharge	-10 ~ 60 °C
3.13.	Storage Temperature	
	-20 ~ 25 °C	≤ 1 Year
	-20 ~ 45 °C	≤ 3 Months
	-20 ~ 60 °C	≤ 1 Month
3.14.	Storage Humidity	20 ~ 85 %RH (not condensed)

4. Smart Battery System Support

4.1. General

This pack have a Smart Function Module with SMBus Interface. And supports the Smart Battery Data(SBData revision 1.0 fully compatible) commands, SBData charge control function. And the Battery state of charge, remaining capacity, remaining time, chemistry, and manufacturer information are available over the serial link.

4.2. Major Feature

Provides accurate measurement of the electrical properties in the packs such as voltage, current, temperature, full capacity, remaing capacity and time.

Four segment LED display for remaining capacity. Battery charge state can be directly indicated using a four segment LED dispaly to graphically depict battery full-to-emptry in 25% increments.

Fully compatible with SMBus(System Management Bus) v1.0.

Fully compatible with SBS(Smart Battery System) v1.0 include charger control, multi-master

4.3. Customized Pack Support

We provides the customizing and optimizing for the special machine such as Note PC, Electric Tools and others. Can get the maximum efficiency and safety.

Please contact us to get the detailed information

5. Outline Dimension

W x L x H = 89.0±0.5 x 148.5±0.5 x 19.0±0.5 (mm) (Refer to attached drawings.)

6. Appearance

Any critical cosmetic damage must not found from the appearance of the products

7. Standard test condition

7.1. Test sample condition

The battery used for the test shall be manufactured and delivered no later than one month.

7.2. Environmental condition

Unless otherwise specified, all tests stated in the specification are conducted at temperature 25± 5°C and humidity 65± 20%RH and charged state.

7.3. Test equipment condition

The grade of voltmeter and ammeter used in the test shall be higher than class 0.5, a high impedance type.

8. Characteristics

8.1. Standard Charge

"Standard Charge" means charging the pack with the constant current 1000mA until a full charge condition detected.

The full charge condition is detected as below

- Pack temerature is higher than 55°C while charging (Maximum T Control).
- Pack temperature is increased by 1°C/min or higher (dT/dt Control).
- Pack voltage is decresed by 50mV while charging (-dV Control).
- Full Charge Detected by the smart module in the battery pack.

8.2. Initial Capacity

"Initial Capacity" is defined as the initial discharge capacity of the pack which is measured in discahrge current of 760mA with 9.0V cut-off at 25°C within **1~2 hour after the standard charge. The initial Discharge time shall be longer than 270Min.**

8.3. Cycle Life

Cycle life is defined by the discharge time one day after 299 Cycles and **measured under the same condition in 8.2.**

The discharge time of the 300th is more than 210min.

8.4. Initial internal impedance

Internal impedance shall be checked at 1000Hz with standard charge state. **The initial internal impedance of the pack is lower than 500mΩ**.

8.5. Discharge capacity with temperature

This means relative value of discharge time at various temperature compared with the discharge time at 25°C (100%).

Discharge current 760mA with 9.0V cutoff

Temperature	-10°C	25°C	45°C	60°C
Relative Capacity	**60%**	**100%**	**95%**	**90%**

8.6. Storage characteristics

The fully charged pack stored at 25°C for 30 days. And Remaining capacity is measured. Remaining Capacity (after storage) is more than 2,880mAh.

9. Safety test

9.1 Overcharge Test

Method : Apply charge to continuous until the thermal protection is operated.

Criteria : No leakage, flame, fire is allowed.

9.2 Over Current Test

Mehod : Short-ircuit the fully charged pack by connecting positive and negative terminals with 50Ω wire for 1 hours.

Criteria : Internal Over-current Protector shall operate and descrease the discharge current. No damage such as leakage, flame, and fire is allowed.

9.3 Over Discharge Test

Method: Discharge the pack to voltage less than 3.0V

Criteria: No damage such as leakage, flame, and fire is allowed.

10. Mechanical Characteristics

10.1 Drop Test

Method : Drop the full charged pack onto the concrete floor from 0.76m heights at any directions for 3 times.

Criteria : No leakage, OCV higher than 12.0V, and internal impedance lower than 500mΩ

10.2 Vibration Test

Method : This means the endurance of the pack against vibration.

Frequency and amplitude : 10Hz → 55Hz → 10Hz/0.8mm.

Sweep speed : 1±0.055Hz/min.

Criteria : No leakage, OCV higher than 12.0V, and internal impedance lower than 500mΩ

11. Shipment

The battery shall be shipped in about 40~80% charged state.

12. Caution and prohibition

Before using and handing the pack, see carefully attached “Handling Instruction Guide for NiMH Battery Pack”

For safety reasons, rechargeable batteries are shipped in a low remaing capacity state. Please charge before use. The battery pack needs to be fully charged and discharged up to 3 times for the max. performanceat full capacity. The battery pack is initializied before shipment but if kept being used without fully charged and discharged state for long time, the accuacy for the capacity loss will be occured. In order to recover to original performance can be made hrough a few times cycles of full charging and discharging.

13. Others

13.1 Storage for a long term

If the pack is kept for a long term (3 months or more), it is strongly recommended that the pack be preserved at dry and low temperature atomsphere.

13.2 Warranty

Emerging Power, Inc. will be responsible for replacing the pack against defects or poor workmanship for 6 months from the date of shipping. Any other problem caused by malfunction of the equipment or misuse of the battery is not under this warranty.

Handling Instruction Guide for NiMH Battery Pack

1. General

Battery packs supplied by Emergingpower, Inc have to be handle carefully according to the specification. Here are some more to be followed.

2. Storage of pack

The packs are requested to be stored under the following conditions:

a. Indoor storage in a cool circumstances without direct sun light on the packs or cartons.

b. Store batteries in a dry location with low humidity, and a temperature range of –20°C to +30°C.

In case of the long term storage

a. As a long-term storage can accelerate battery self-discharge and lead to the deactivation of the batteries. To minimize the deactivation effect, store battery packs in a temperature range of +10°C to +30°C.

b. When charging the battery for the first time after long-term storage, deactivation of the packs may result in the decreased capacity. To recover capacity degration upto original performance, please go through repeatied several cycles of full charging and discharging.

c. In caseof more than 6 months storage, please charge the battery at least once fore every 6 months to prevent leakage and deterioration in performance due to self-discharging.

3. Charging pack

a. Use suitable charger with the specified voltage and current for charging. We strongly recommend EP smart battery charger.

If you want to get more information, please contact us.

b. **Never attempt reverse charging**. Charging with polarity reversed can cause a reversal in battery polarity, causing gas pressure inside of the battery to rise, which can be led to leakage of the batteries.

c. Avoid overcharging. Repeated overcharging can be led to battery deterioration and Over-heat can be occured.

d. Charging efficiency drops at temperatures above 40°C.

4. Protection from unexpected damaged on the battery pack

a. (+) and/or (-) terminals must not be connected in metal wire, necklace, or chains.

b. Do not drop packs from height to prevent them from possible malfunction or damage.

c. Do not twist or bend packs to prevent possible damage.

5. For Safety

a. Do not disassemble packs.

b. Do not use pack when something abnormal found such as smells, deformation, discoloration, and so on.

c. Do not re-use NiMH cells or other parts after removing from the packs.

d. When the electrolyte leakage occurs, do not touch the liquid.

e. Once watered, packs may have potential malfunctions. Do not use those packs.

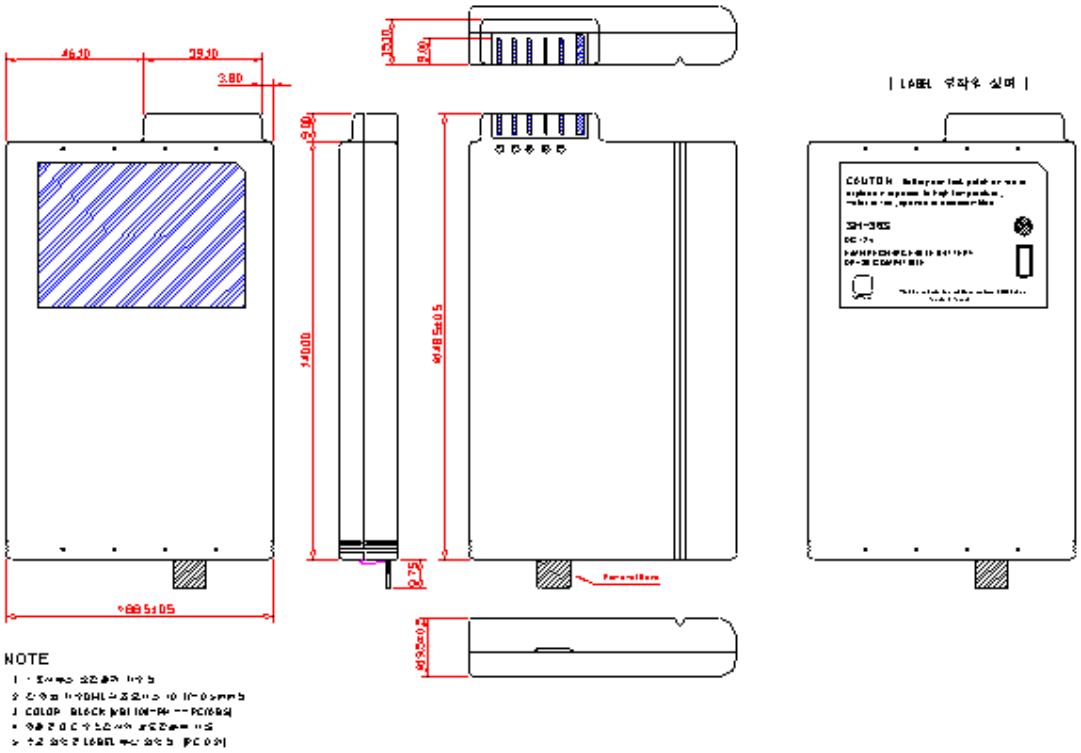
f. Do not have packs in the hot-temperature (60°C or more).

g. Do not put packs into fire.

h. Do not crush/nail packs.

i. Do not apply solder directly to packs.

OUT VIEW DRAWING AND PARTS LIST



No.	Part Name	Specification	Qty.	Remark
1	NiMH Cell	HHR-380A, 3800mAh	10 ea	Panasonic, Japan
2	Smart Module	SH36S (bq2040)	1 ea	Saehan, Korea
3	Connector	146800-1	1 ea	AMP, Japan
4	FPCB	W20xL20x0.2t	1 ea	Woosu, Korea
5	PTC	420	1 ea	Raychem, USA
6	Thermal Fuse	G4A50, 93 deg.C	1 ea	
7	Nickel Tap	4 kinds	14 ea	
8	Wire	AWG22, 2 kinds	80 mm	
9	Insulation Tape	W15xL50x0.15t	1 ea	
10	Case	-	1 set	Material : PC
11	Removal Band	W4xL50x0.2t	1 ea	Material : Nylon
12	Label	SH36S	1 ea	Hanvit, Korea