

# NI-MH BATTERY DELIVERY SPECIFICATIONS

## *APPROVAL SHEET*

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**PRESENTED TO:**

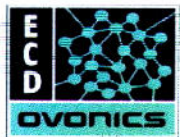
**MODEL NO.:** 1/2 D350 L5 (6.0V 1/2D3500mAh)

**TOTAL PAGES:** 4 pages including this cover page

**PREPARED BY:** Engineering Dept

**DATE:** November 12, 2015

**CHECKED & APPROVED BY:**



*Ovonics Battery Company*

## 1. Scope

This specification governs the performance of the following Nickel-Metal Hydride cylindrical battery cell 6.0V 1/2D3500mAh.

model: 1/2D350 L5

Cell size:D.

The data involving the nominal voltage and the approximate weight of the battery pack.

## 2. Ratings

Description	Unit	Specification	Conditions
Nominal Voltage	V	6.0	Unit pack
Nominal Capacity	mAh	3500	Standard charging / discharging
Minimal Capacity	mAh	3300	Standard charging / discharging
Standard Charge	mA	350 (0.1C)	Ta=0-45°C
	hrs	16	
Rapid Charge	mA	1750(0.5C)	- $\Delta V$ =40~50mv, or Timer cut-off=120% input capacity Temp. cut-off=45~50°C, Ta=10~40°C dT / dt=0.6°C/ min
	minute	144approx.	
Trickle Charge	mA	175(0.05C)	Ta=0~45°C
Discharge Cut-Off Voltage	V	5.0	Less than 1.0C discharge
		4.5	1.0~2.0C discharge
Maximum Continuous Discharge Current	mA	7000 (2.0C)	Ta= -20~50°C
Storage (Percent charged state) 40-60	°C	-20-40	Less than 30 days
		-20-30	Less than 90 days
		-20-25	Less than 360 days
	%	65 ± 20	Relative humidity
Typical Weight	g	380	Approx.

## 3. Performance

Unless otherwise stated, tests should be done within one month of delivery under the following conditions:

Relative humidity : 65+20% RH

Ambient Temperature (Ta) : 20+5°C

\*\*\*Notes: Standard charge / discharge condition

Charge: 350 mA (0.1C) x 16 hrs

Discharge:700 mA (0.2C) to 5.0V/Pack

\*\*\*The batteries must be standard discharged before charging

\*\*\*Battery test vide infra:

Test	Unit	Specification	Conditions	Remarks
Capacity	mAh	≥3300	Standard Charge / Discharge	Up to 3 cycles allowed
Open Circuit Voltage (OCV)	V	≥6.25	Within 1 hr after standard charge	Unit cell
Internal Impedance (Ri)	m Ω	≤80	Upon fully charge (1 Khz)	Unit cell
High Rate(1.0C) Discharge	min	≥54	Standard charge, 1 hr rest before discharge	Dischargecut-off voltage5.0V

Over discharge Over charge	N/A	No leakage nor explosion	350mA (0.1C) charge 1 month
Charge Retention	mAh	$\geq 2100(60\%)$	Standard charge, storage for 28 days at 20°C, standard discharge
	mAh	$\geq 2100(60\%)$	Standard charge, storage for 7 days at 40°C, standard discharge
IEC Cycles Test	cycle	$\geq 500$	IEC 61951-2 (2003) 7.4.1.1
Short Circuit	N/A	Deformation &leakagemay occur but no explosion	After standard charge, short circuit for 1 hr (lead wire = 2.0mm <sup>2</sup> x 20mm)
Vibration Resistance	N/A	$\Delta V < 0.1V$ $\Delta \Omega < 25m\Omega$ No fire No explosion	Charge at 0.1C for 16 hrs, then leave for 24 hrs. Check battery before/after vibration. Amplitude: 1.5mm, Vibration: 3000CPM any direction for 60 minutes
Impact Resistance	N/A	$\Delta V < 0.25V$ $\Delta \Omega < 25m\Omega$ No fire No explosion	Charge at 0.1C for 16 hrs, then leave for 30 minutes. Drop cells three times from a height of 0.5 meter onto a concrete floor. Drop along each direction of the 3 mutually perpendicular axes.

#### 4. Configurations, Dimensions And Markings

Please refer to the related drawing.

#### 5. External Appearance

The cell / battery shall be free from cracks, scars, breakage, rust, discoloration, leakage and deformation.

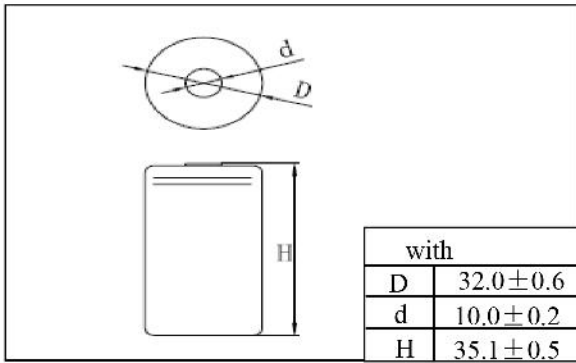
#### 6. Warranty

The quality guarantee period for our products is one year.

#### 7. Cautions

1. Reverse charging is not acceptable.
2. Charge before use.
3. Do not charge / discharge with more than the specified current.
4. Do not short circuit the cell / battery.
5. Do not incinerate or mutilate the cell / battery.
6. Do not solder directly to the cell / battery.
7. The life expectancy may be reduced if the cell / battery is subjected to adverse conditions, like extreme temperature, deep cycling, excessive overcharge /over-discharge.
8. Store the cell / battery in a cool dry place.
9. Keep away from children. If swallowed, contact a physician at once.

## Dimensions (mm)



Nominal Voltage: 1.2V

Nominal Capacity: 3500 mAh

Minimal Capacity: 3300 mAh

Standard Charge: 350 mA, 16hrs

Rapid Charge: 1750 mA, 2.4 (control required)

Continuous Discharge : less than 7000mA

Final Discharge Voltage : 0.9 V

Weight: 75g (Approx)

Service Life:  $\geq 500$  cycles

(according to IEC discharge characteristics standard)

Internal Resistance:  $12m \Omega$  (Approx)

Ambient Temperature: Standard charge: 0 ~ 45°C

Rapid charge: 10~ 40°C

Discharge: -20 ~ 50°C

Store: (65+20% RH) Less than 30 days: -20 ~40°C

Less than 90 days: -20 ~30°C

Less than 360 days: -20 ~25°C

Note:

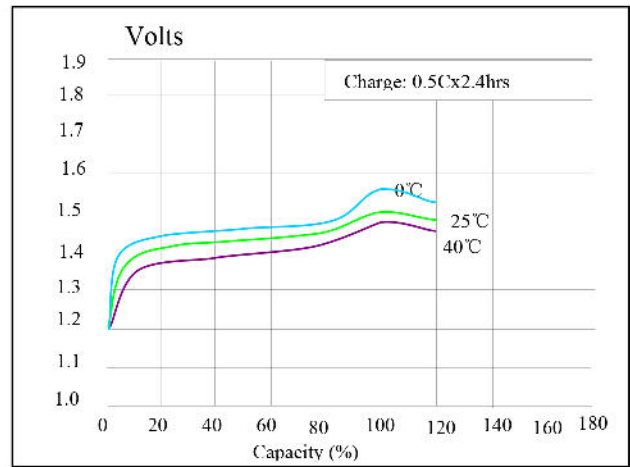
1. After charge at 0.1C for 16hrs and discharge

at 0.2C to 1.0V at 25°C

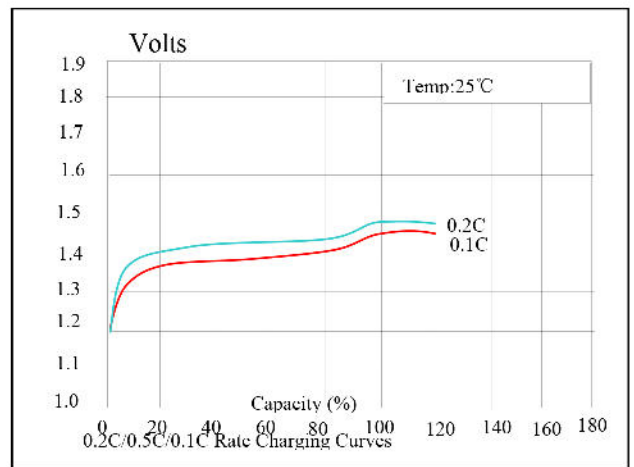
2. Control required: 1) -  $\Delta V$ : 0~ 5mV

2)  $dT / dt$ : 0.6°C / min

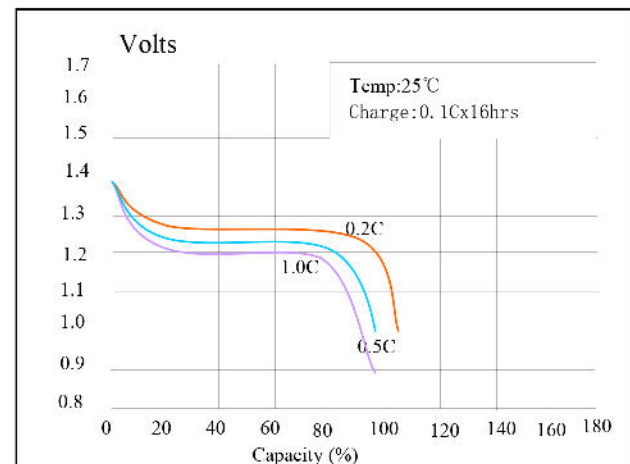
3)  $T_{co}$ : 45°C ~ 50°C



0.5C Rate Charging Curves



0.2C/0.5C/0.1C Rate Charging Curves



0.2C/0.5C/1.0C Rate Discharging Curves