

Network  
Components  
Business Unit

## Micro Batteries

Product Catalogue

2004-2005

- CMOS IC
- Quartz Crystals
- Custom LCD Module
- **Micro Batteries**
- Materials



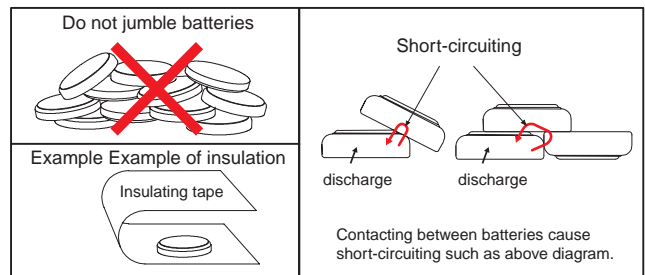
# Precautions for Your Safety

SMP (SII Micro Parts Ltd.) Lithium rechargeable batteries (MS, RB, HB, TS, NBS) contain flammable organic solvents. For your safety, please follow following prohibitions.

## WARNING!

- **Do not charge by high current or high voltage.**  
Doing so may generate gas inside the battery, resulting swelling, catching fire, heat generation or bursting.
- **Do not heat, disassemble nor dispose of in fire**  
Doing so damages the insulation materials and may cause catching fire, heat generation, leakage or bursting.
- **Do not solder directly to the battery**  
If soldering is performed directly to the battery, the battery is heated up, consequently causes leakage, explosion or fire due to overheating from internal short-circuiting.
- **Do not short.**  
If the (+) and (-) come into contact with metal materials, short-circuiting occurs. As a result, catching fire, heat generation, leakage or bursting may occur.
- **Keep batteries out of children's reach.**  
If leaked liquid is ingested or a battery is swallowed, consult a physician immediately.
- **Do not reverse placement of (+) and (-)**  
If the (+) and (-) side of the battery is reverse inserted, it may cause a short-circuiting or over discharge of the battery on some equipment and it may induce overheating, explosion or fire.

- **Do not discharge by force**  
If the battery is discharged by direct connection to an external power supply etc., voltage of the battery will decline lower than 0 volts (electrical reversal) and will cause the battery case to expand, overheat, leak, explode or burn.
- **In case of leakage or a strange-smell, keep away from fire to prevent ignition of any leaked electrolyte.**
- **In case of disposal, insulate between (+) and (-) of battery by an insulating**  
Jumbling batteries or with other metal materials cause short-circuiting. As a result, catching fire, heat generation, leakage or bursting may occur.



## CAUTION!

- **If leaked liquid gets in the eyes, wash them with clean water and consult a physician immediately.**
- **Do not use new and used batteries together. Do not use different types of batteries together.**  
It may cause catching fire, heat generation, leakage or bursting.
- **If you connect two or more batteries in series or parallel, please consult us in advance.**  
It may cause bursting or catching fire due unbalanced load or voltage.
- **Do not use nor leave the batteries in direct sunlight nor in high-temperature areas.**  
It may cause catching fire, heat generation, leakage or bursting.

- **Do not apply strong pressure to the batteries nor handle roughly.**  
It may cause catching fire, heat generation, leakage or bursting.
- **Avoid contact with water.**  
It may cause heat generation.
- **Keep batteries away from direct sunlight, high temperature and humidity.**  
It may cause heat generation or performance deterioration.

### For prevention the performance deterioration of battery

- **Pay attention to mat or sheet for ESD**  
Battery with tabs or battery on PCB may short circuit on the mat for ESD. As a result the voltage of cell drops down.
- **Pay attention to soldering by tips**  
Do no touch the battery by solder chips, in case of soldering another components after equipping battery. Basically, keep any high temperature process away from battery.

- **Pay attention to material of jig for pick and place**  
Use nonconductive material of jig for pick and place of batteries, for short-circuit protect. If short circuit of battery is occurred, the voltage of battery drops down quickly but raises gradually.
- **Pay attention to washing and drying**  
Some detergent or high temperature drying cause deterioration of battery. If you need to wash batteries, consult us.

### International Transportation and Disposal

#### International Air/Marine/Ground Transportation

Regarding the transport of Lithium battery, organizations like IATA, ICAO, IMO, DOT have determined transport regulations, based on the United Nations Regulations. The SMP Lithium rechargeable batteries can be transported being not subject to the provisions of dangerous goods, if they meet the following requirements.

(a) **<Lithium content>** The Lithium-equivalent content is not more than 1.0g.

(b) **<Safety Certification>** Each battery is of a type proved to meet the requirements of each test in the UN Manual of Tests and Criteria, Part 3, sub-section 38.3.

(c) **<Strong packaging>** Batteries are separated so as to prevent short circuits and are packed in strong packaging.

(d) **<Caution Label>** Each package must be marked indicating that it contains lithium batteries and that special procedures should be followed in the event that the package is damaged.

(e) **<Not Restricted Declaration>** Each shipment must be accompanied with a document indicating that the packages contain lithium batteries and that special procedures should be fol-

lowed in the event that a package is damaged.

- (f) **<Package Drop Test>** Each packages is capable of withstanding a 1.2 m drop test in any orientation without damage to batteries contained.
- (g) **<Weight Limit>** Except in the case of packed with equipment, packages may not exceed 30 kg gross mass.
- (h) **<Transport to U.S.A.>** When you transport to U.S.A., emergency contact information must be indicated on the required documents.

**For further information, please consult with us.**

#### Disposal

Recent environment protection concerns have increased globally and waste and recycling are regulated in the world. The current regulations differ in each country, state and local municipality. Please consult local regulations and authorities for recommended disposal of batteries. If you are in question of application or safety of our batteries, please consult your local authorities.

## Precautions for Your Safety

SMP (SII Micro Parts Ltd.) capacitors (XC, XH) contain flammable organic solvents. For your safety, please follow following prohibitions.

### WARNING!

- **Do not charge by high current or high voltage.**  
Doing so may generate gas inside the capacitor, resulting swelling, catching fire, heat generation or bursting.
- **Do not reverse placement of (+) and (-)**  
SII capacitors have polarity. If the (+) and (-) side of the capacitor is reverse inserted, it may cause a short-circuiting or over discharge of the capacitor on some equipment and it may induce overheating, explosion or fire.
- **Do not solder directly to the capacitor**  
If soldering is performed directly to the capacitor, the capacitor is heated up, consequently cause leakage, explosion or fire due to overheating from internal short-circuiting.
- **Keep capacitors out of children's reach.**  
If leaked liquid is ingested or a capacitor is swallowed, consult a physician immediately.
- **Do not heat, disassemble nor dispose of in fire**  
Doing so damages the insulation materials and may cause catching fire, heat generation, leakage or bursting.
- **Do not discharge by force**  
If the capacitor is discharged by direct connection to an external power supply etc., voltage of the capacitor will decline lower than 0 volts (electrical reversal) and will cause the capacitor case to expand, overheat, leak, explode or burn.
- **In case of leakage or a strange-smell, keep away from fire to prevent ignition of any leaked electrolyte.**

### CAUTION!

- **If leaked liquid gets in the eyes, wash them with clean water and consult a physician immediately.**
- **Do not use nor leave the capacitors in direct sunlight nor in high-temperature areas.**  
It may cause catching fire, heat generation, leakage or bursting.
- **Do not use new and used capacitors together. Do not use different types of capacitors together.**  
It may cause catching fire, heat generation, leakage or bursting.
- **If you connect two or more capacitors in series or parallel, please consult us in advance.**  
It may cause bursting or catching fire due unbalanced load or voltage.
- **Keep capacitors away from direct sunlight, high temperature and humidity.**  
It may cause heat generation or performance deterioration.

## Precautions for Your Safety

For using SII Silver Oxide batteries, please follow following prohibitions.

### WARNING!

- **Do not heat, disassemble nor dispose of in fire**  
Doing so damages the insulation materials and may cause catching fire, heat generation, leakage or bursting.
- **Do not short.**  
If the (+) and (-) come into contact with metal materials, short-circuiting occurs. As a result, catching fire, heat generation, leakage or bursting may occur.
- **Keep batteries out of children's reach.**  
If leaked liquid is ingested or a battery is swallowed, consult a physician immediately.
- **If leaked liquid, alkaline, get in the eyes, do not rub them, wash them with clean water and consult a physician immediately.**
- **If leaked liquid, alkaline, stick upon wears, for protecting irritation, wash them with clean water immediately.**

### CAUTION!

- **Do not reverse placement of (+) and (-)**
- **Do not solder directly to the battery**
- **Do not use new and used batteries together. Do not use different types of batteries together.**
- **Do not charge.**
- **Do not use nor leave the batteries in direct sunlight nor in high-temperature areas.**
- **Keep batteries away from direct sunlight, high temperature and humidity.**
- **Avoid letting battery contact with water.**
- **Make sure to insert batteries without having (+) and (-) come in contact with metal parts of equipment.**
- **Read the equipment instruction manual and precautions carefully before use. Some usage or types of equipment do not suit the specifications or performance of these batteries.**
- **Remove batteries from the equipment, if finish using. Do not leave batteries connecting with equipment after using.**
- **In case of disposal, insulate between (+) and (-) of battery by an insulating**



## GENERAL DESCRIPTION

SII Micro Parts Ltd. has commercialized a highly reliable silver oxide battery in response to quartz watches. Since then the company has expanded its microbattery business. With rapid progress in LSI technologies, highly advanced microbatteries are now being strongly demanded for sophisticated electronic instruments and equipment. The company continues its best efforts to develop high performance microbatteries which meet any users' needs and requirements.

This brochure introduces silver oxide batteries, manganese silicon lithium rechargeable batteries, titanium silicon lithium rechargeable batteries, reflowable capacitors, and reflowable lithium rechargeable batteries.

We would like to continuously develop higher performance micro battery and widen product lineup. Please feel free to contact us.

## CONTENTS

Safety Precautions for handling Battery and Capacitor .....	2
Lineup of Micro Batteries and Capacitors .....	5
<b>New</b> Lower Voltage Lithium Rechargeable Battery ...	6
MS Lithium Rechargeable Battery .....	8
Battery Holder .....	13
Reflowable RB lithium Rechargeable Battery .....	14
Pb-free reflowable HB lithium Rechargeable Battery .....	16
Reflowable XC Capacitor (2.5V Rated Voltage Type) .....	18
Reflowable XH Capacitor (3.3V High-Rated Voltage Type) .....	20
Pb-free reflowable XH**H Capacitor (3.3V Rated Voltage type) ....	22
Silver Oxide Battery .....	24
Environmental Policy .....	26
Check Sheet for Selecting Micro Battery .....	27

## FEATURES

### 1. Superior leakage resistance

Electrolytic leakage may lower the contact with terminals of the electronic instruments which use microbatteries. This interrupts the stable operations. Special sealing materials and processing technologies are employed in the manufacture of our batteries.

### 2. Large capacity

In order to extend the operating time of the machinery and equipment with-in the limited battery space, batteries need large capacity.

Our microbatteries have large capacity. It is obtained by our original design technologies and by use of high purity materials.

### 3. Stable operating voltage

The battery Voltage depends on the temperature and the depth of discharge. Since the change of the voltage affects characteristics of machinery and equipment, the operating voltage must be stable.

Our microbatteries have a stable operating voltage over a wide temperature range and in a depth of discharge.

### 4. High reliability

Batteries are required to have high performance in any event, that is, high reliability.

Our microbatteries are manufactured under our high quality control.

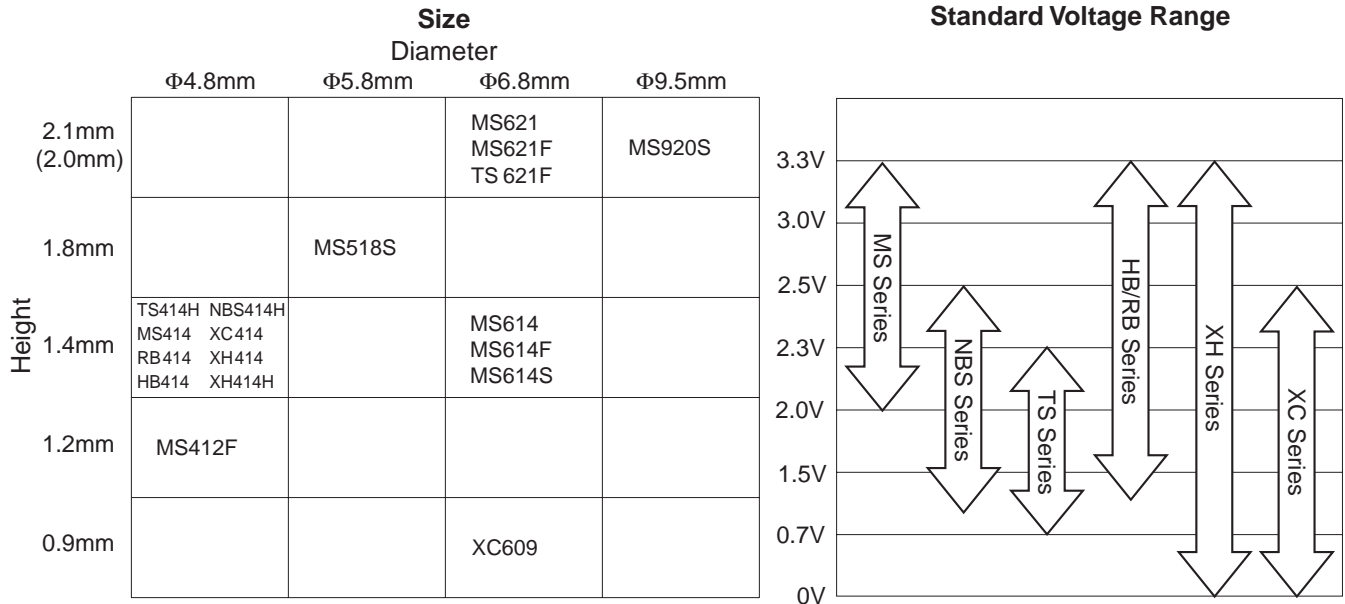
Only batteries with high quality are delivered to customers.



# Lineup of Micro Batteries and Capacitors

## Features of Micro Battery and Capacitor

- MS Series** : 3V Type. Obtains small size, large capacity and highly long cycle life. Also superior in Over-discharge characteristics.
- RB Series** : Reflowable rechargeable battery with wide charging voltage range (1.8V to 3.3V).
- HB Series** : Pb-free reflowable rechargeable battery with wide charging voltage range (1.8V to 3.3V).
- TS Series** : 1.5V Type. Wide charging voltage range from 1.5V to 3.0V with high reliability.
- XC Series** : Smallest and thinnest size in reflowable capacitor with a rated voltage of 2.5V.
- XH Series** : Reflowable capacitor obtaining both high rated voltage of 3.3V and high energy density.
- XH \*\* H Series** : Pb-free reflowable capacitor obtaining both high rated voltage of 3.3V and high energy density.
- SR Series** : Wide variation of products which obtain high reliability gained through our watch Production.



## Fitting List by Applications

Usage	Application	SR	TS	MS	RB/HB	XC	XH	Necessary Features
Backup use	GSM		○	○	○	○	○	Long cycle life and Over-discharge
	PDC/CDMA		○	○				Small and Large capacity
	Telephone			○	○		○	Long cycle life and large capacity
	Digital Camera			○	○	○	○	Long cycle life
	VCR Camera			○				Long cycle life and large capacity
	Camera					○	○	Long cycle life and Over-discharge
	TV/VTR			○		○	○	Long cycle life
	GPS				○	○	○	Long cycle life
	PDA				○	○	○	Large capacity
	Personal Computer				○			Large capacity
	FAX				○	○	○	Long cycle life and large capacity
	PC Card				○	○	○	Long cycle life
	Long time backup				○	○		Large capacity
Short time backup				○	○	○	Long cycle life	
Power Supply	Watch	○	○			○		Large capacity and small self-discharge, Over-discharge, stable.
Battery Type		Main	Recharge-able	Recharge-able	Recharge-able	Capaci-tor	Capaci-tor	

# NEW Lower Voltage Lithium Rechargeable Battery

Responding to market demand for lower voltage power supply, we have developed 3 new Lithium Rechargeable Backup Battery Products.

These new products can work very well when charged at < 2.0V.



## TS621F

### FEATURES

- Can be charged at lower voltage
- High Capacity
- Long Cycle Life

### APPLICATIONS

- Power supply back up for Cellular phone, PHS, wireless phone



## TS414H/NBS414H <Pb Free Reflowable>

### FEATURES

- Can be charged at lower voltage
- Pb Free Reflowable
- The very small tabs (IV01E) can reduce the occupied area in PCB.

### APPLICATIONS

- Power supply back up for Cellular phone, PHS, wireless phone

## • <1.5V Type> TS621F

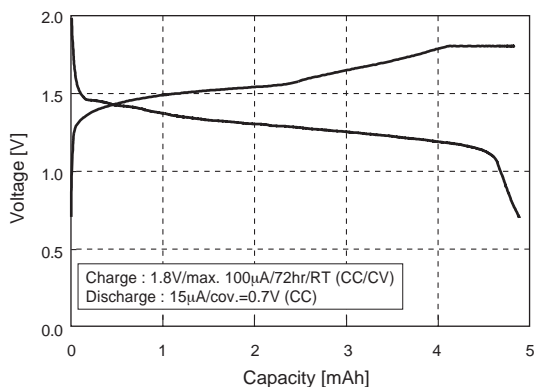
### SPECIFICATIONS

Type	Nominal Voltage (V)	Nominal Capacity (Voltage Range) (mAh)	Internal* Impedance ( $\Omega$ )	Standard Charge Discharge Current (mA)	Cycle Life (Time)	Diameter (mm)	Height (mm)	Weight (g)
TS621F	1.5	4.2 (2.3-1.0)	80	0.015	1000 ( 20% D.O.D ) 50 ( 100% D.O.D )	6.8	2.1	0.22

\* Internal Impedance is measured using AC (Altering Current) method at the fully charged state.

## CHARACTERISTICS

Charge-Discharge Characteristics

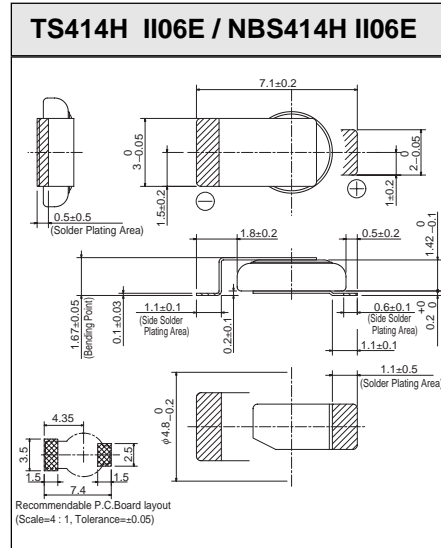
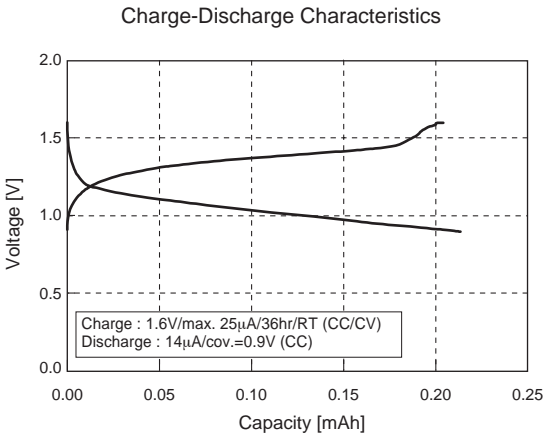


**<1.5V Type> Pb-free Reflowable TS414H**  
**SPECIFICATIONS**

Type	Nominal Voltage (V)	Nominal Capacity (Voltage Range) (mAh)	Internal* Impedance ( $\Omega$ )	Standard Charge Discharge Current (mA)	Cycle Life (Time)	Diameter (mm)	Height (mm)	Weight (g)
T414H	1.5	0.2 (1.6-0.9)	350	0.005	1000 ( 20% D.O.D ) 100 ( 100% D.O.D )	4.8	1.4	0.07

\* Internal Impedance is measured using AC (Altering Current) method at the fully charged state.

**CHARACTERISTICS**



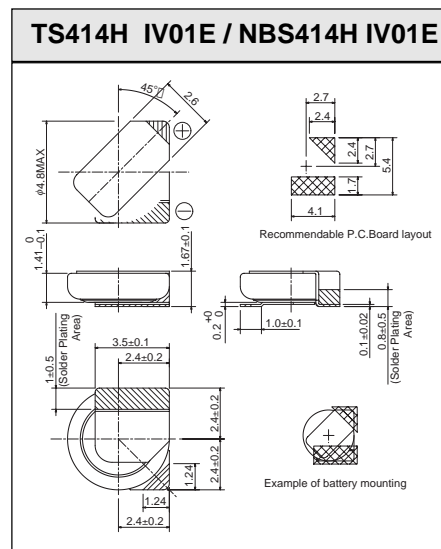
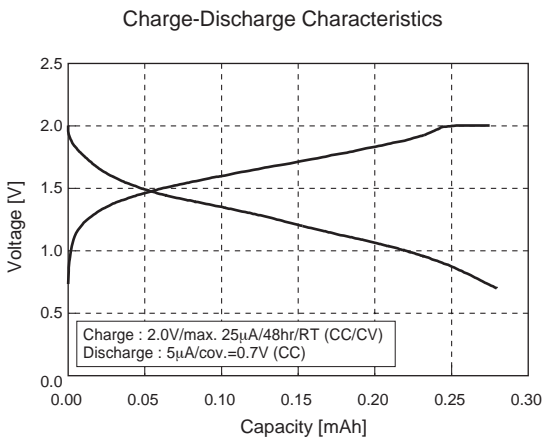
\* Unit of dimensions : mm

**<2.0V Type> Pb-free Reflowable NBS414H**  
**SPECIFICATIONS**

Type	Nominal Voltage (V)	Nominal Capacity (Voltage Range) (mAh)	Internal* Impedance ( $\Omega$ )	Standard Charge Discharge Current (mA)	Cycle Life (Time)	Diameter (mm)	Height (mm)	Weight (g)
NBS414H	2.0	0.2 (2.0-1.0)	280	0.005	1000 ( 20% D.O.D ) 100 ( 100% D.O.D )	4.8	1.4	0.07

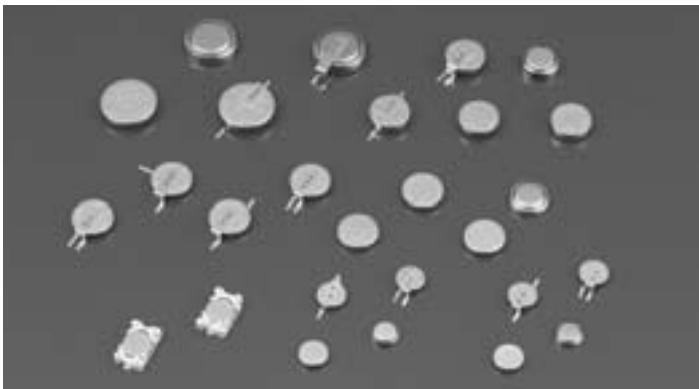
\* Internal Impedance is measured using AC (Altering Current) method at the fully charged state.

**CHARACTERISTICS**

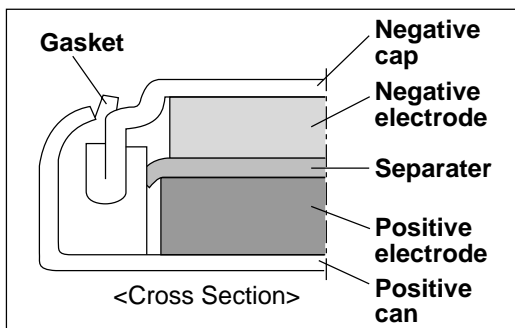


\* Unit of dimensions : mm

# MS Lithium Rechargeable Battery <3V Type>



SII Micro Parts Ltd. own developed MS(Manganese Silicon) Lithium rechargeable battery addresses the demand most effectively. The battery uses silicon oxide as anode and lithium manganese composite oxide as cathode. As a result, it offers longer cycle-life and highly stable over-discharge characteristics.



## FEATURES

- Large discharge capacity:  
Large discharge capacity for high operational voltage range of 2.0V to 3.3V.
- Long cycle-life:  
Over 200 times cycle-life under the charge/discharge condition at 2.0V to 3.3V (D.O.D 100%).
- Excellent over-discharge characteristics:  
Continued stable capacity characteristics after the battery is over-discharged down to 0.0V.
- Wide range of operating temperature  
From -20°C to 60°C  
If you would like to use beyond the temperature range, please consult with us.
- Approved product by UL

Manganese Silicon Lithium Battery (MS series) is approved by UL(Underwriters Laboratories Inc.)

UL File MH 15628

MS412F/MS414/MS518S/MS614/MS614F/  
MS614S/MS621/MS621F/MS920S

## APPLICATIONS

- Back up power supply for memory or clock in various electronic equipment e.g. cellular-phones, cordless phones, PHS, pagers, memory-cards, FAX machines, personal computers, PDA, Video cameras, digital cameras, tuners, handy terminals etc.
- Combined use with solar cells.
- Main power source for small and slim portable equipment.

## SPECIFICATIONS

Type	Nominal Voltage (v)	Nominal Capacity (mAh)*1	Internal Impedance (Ω)*2	Standard Charge/Discharge Current (mA)	Maximum Discharge Current (continuous) (mA)*3	Cycle Life (Times)*4		Standard Charge Voltage (V)	Size(mm)		Weight (g)
						100%*5 D.O.D (Depth of Discharge)	20%*5 D.O.D (Depth of Discharge)		Diameters	Height	
MS412F	3	1.0	100	0.010	0.10	200	1000	3.1	4.8	1.2	0.07
MS414	3	0.25	100	0.010	0.10	200	1000	3.3	4.8	1.4	0.07
MS518S	3	3.4	60	0.010	0.15	100	1000	3.1	5.8	1.8	0.13
MS614	3	2.3	50	0.025	0.25	200	1000	3.3	6.8	1.4	0.17
MS614F	3	3.0	80	0.025	0.25	200	1000	3.1	6.8	1.4	0.16
MS614S	3	3.4	80	0.025	0.25	200	1000	3.1	6.8	1.4	0.17
MS621	3	4.0	50	0.025	0.25	200	1000	3.3	6.8	2.1	0.23
MS621F	3	5.5	80	0.025	0.25	200	1000	3.1	6.8	2.1	0.23
MS920S	3	11.0	35	0.050	0.80	100	1000	3.1	9.5	2.1	0.47

\*1 Nominal Capacity indicates Typical value of Capacity whose voltage range is 3.3V to 2.0V, /F type and .S type 3.1V to 2.0 V.

\*2 Internal Impedance is measured using AC (Alternating Current) method at the fully charged state.

\*3 Maximum discharge current indicates the value of current for approximately 50% of nominal Capacity.

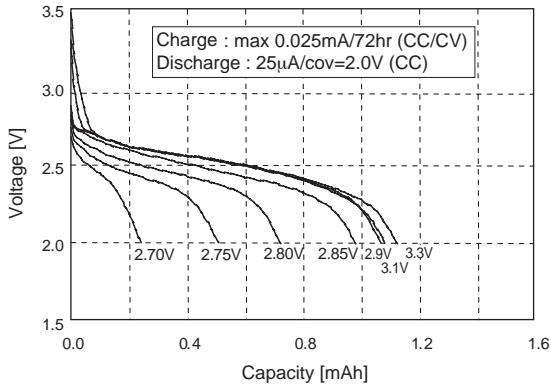
\*4 Cycle Life Times indicates the times of Charge-Discharge repeating for approximately 50% of the Capacity value in the Spec Sheet.

\*5 100% and 20% are based on nominal Capacity.

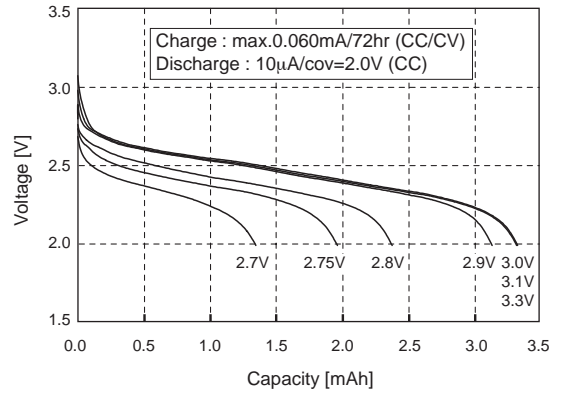


# Discharge Characteristics at Various Charge Voltage

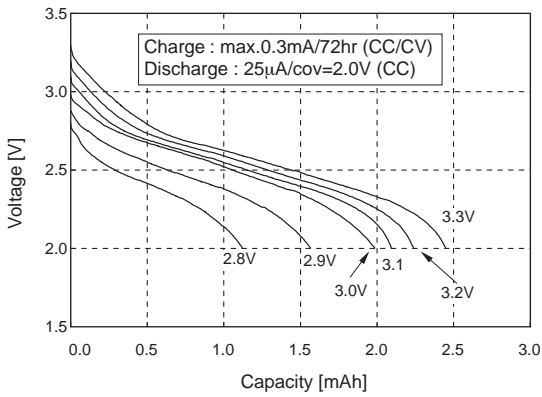
**MS412F**



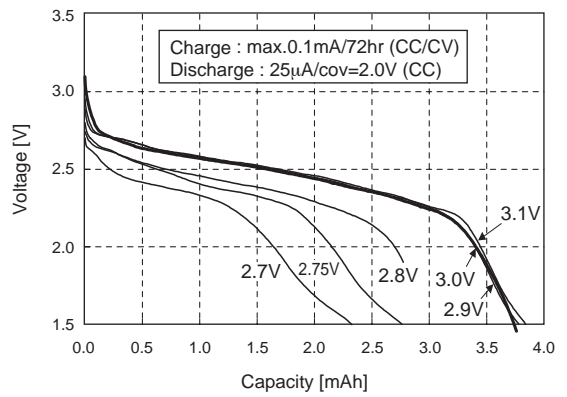
**MS518S**



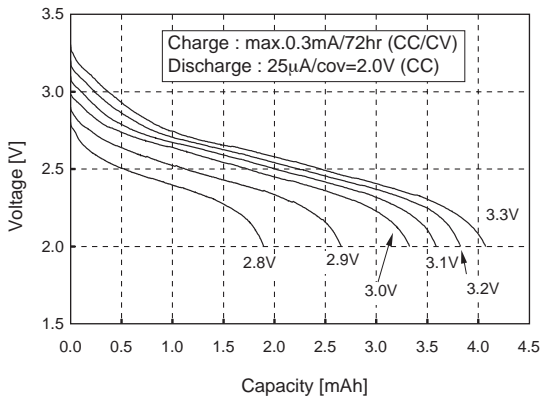
**MS614**



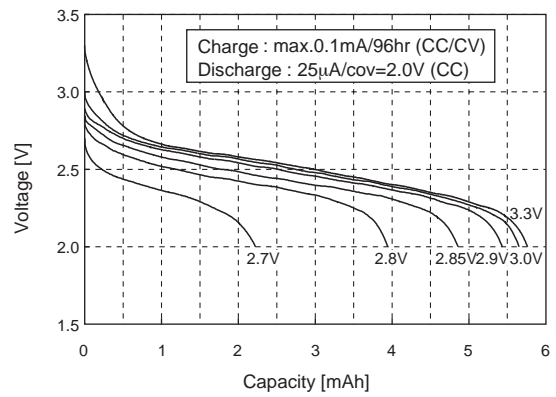
**MS614S**



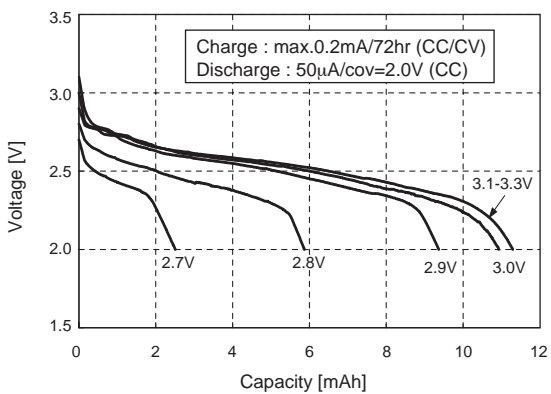
**MS621**



**MS621F**



**MS920S**



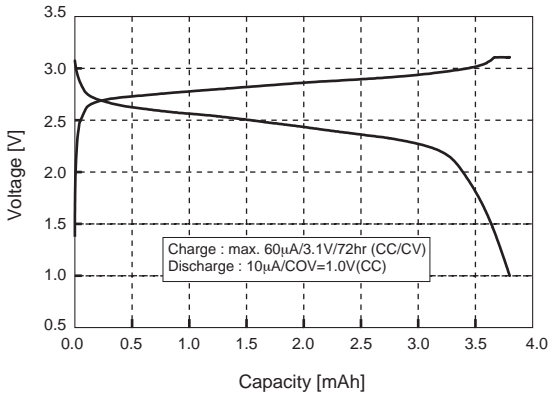
\* cov : Cut Off Voltage

# MS Lithium Rechargeable Battery <3V Type>

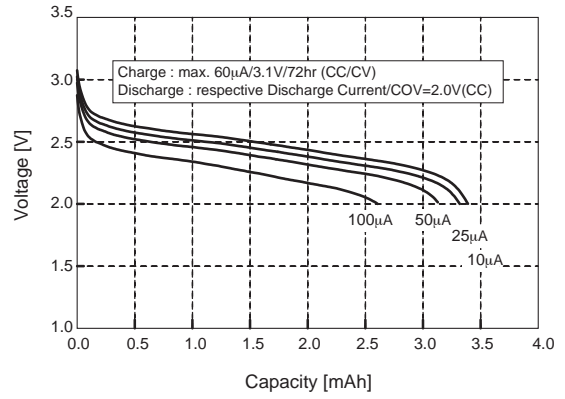
## CHARACTERISTICS

### MS518S

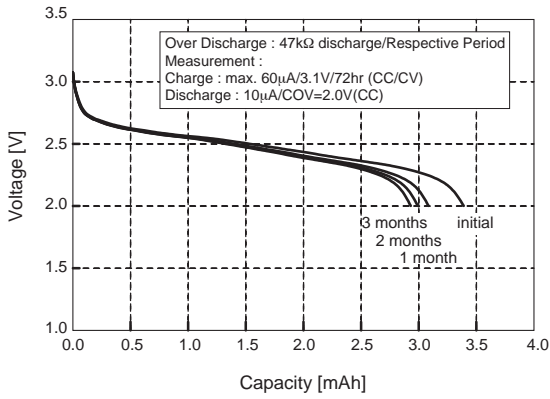
Charge-Discharge Characteristics



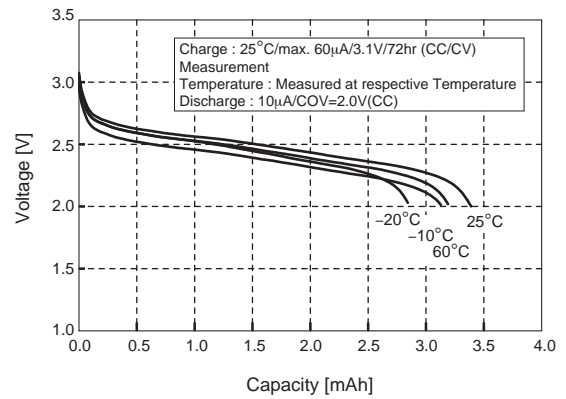
Discharge Characteristics at Various Discharge Current



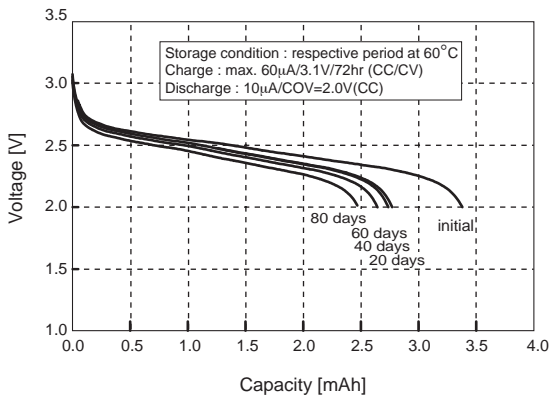
Over Discharge Characteristics



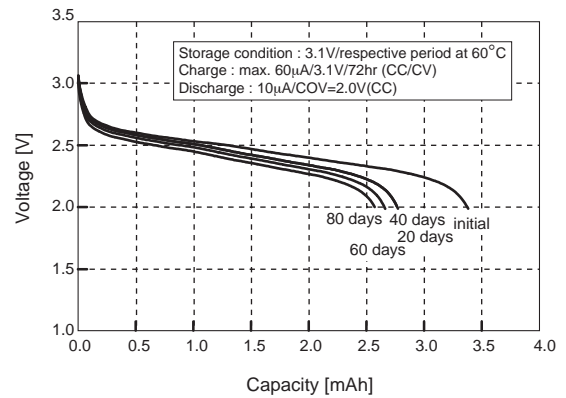
Temperature Characteristics



High Temperature (60°C) Storage Characteristics



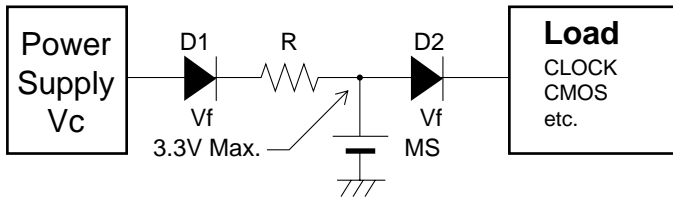
Over Charge Storage Characteristics



# MS Lithium Rechargeable Battery <3V Type>

## CHARGING CIRCUIT

### ◆ Standard Charging Circuit Settings List for Using MS Rechargeable Battery with Constant Voltage and Constant Resistance.

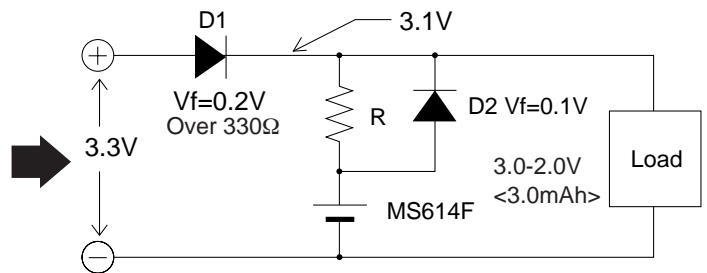
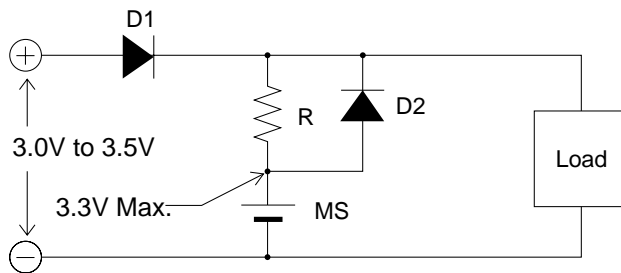


Charging Voltage : 3.3V (3.1V) Max.  
 Charging current limiting resistance : R  
 D1 : Diode (Item of smaller Vf, Ir is recommendable)  
 D2 : Using a schottky type of smaller Vf will lead better performance

Type	Charging Voltage Range (V)	Recommendable Charging Current (mA) At Battery Voltage of 3.0V $I_c$	Maximum Charging Current (mA)	
			At the Battery Voltage of 3.0V $I_u$	At the Battery Voltage of 0V $I_L$
MS412F	2.8 to 3.3	0.08max.	0.15	2
MS414	2.8 to 3.3	0.08max.	0.15	2
MS518S	2.8 to 3.1	0.15 max.	0.3	6
MS614, 614F, 614S	2.8 to 3.3	0.30max.	0.5	10
MS621, 621F	2.8 to 3.3	0.30max.	0.5	10
MS920S	2.8 to 3.3	0.40max.	0.5	10

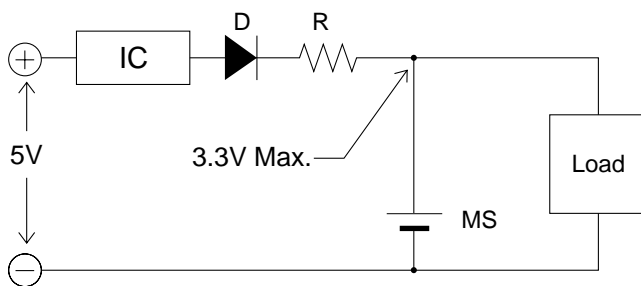
As for the minimum limit resistance R, please use the value which satisfies the following two formula;  
 1) In the case a battery voltage is 3.0V:  
 $R > (V_c - 3.0 - V_f) / I_u$   
 2) In the case a battery voltage is 0V:  
 $R > (V_c - V_f) / I_L$   
 Also for the recommendable limit resistance, please use  $I_c$  instead of  $I_u$  in the formula 1).

### ◆ Circuit Example in the case of using 3V for Power Supply.

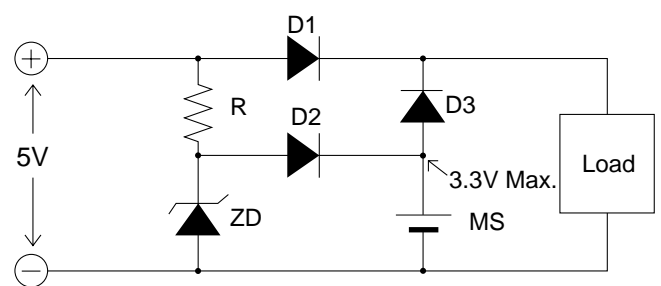


### ◆ Circuit Example in the case of using 5V for Power Supply.

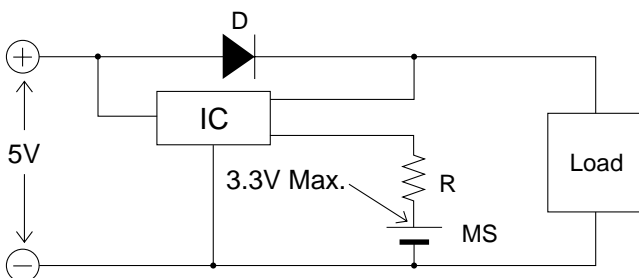
(1) with using voltage regulator IC



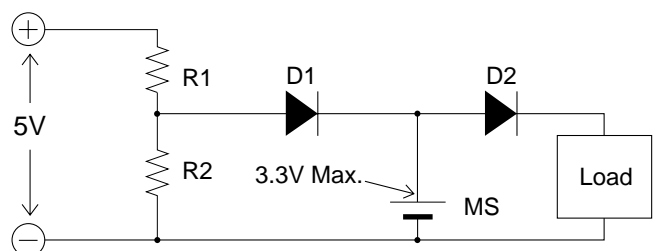
(2) with using Zener diode



(3) with using charge/discharge control IC

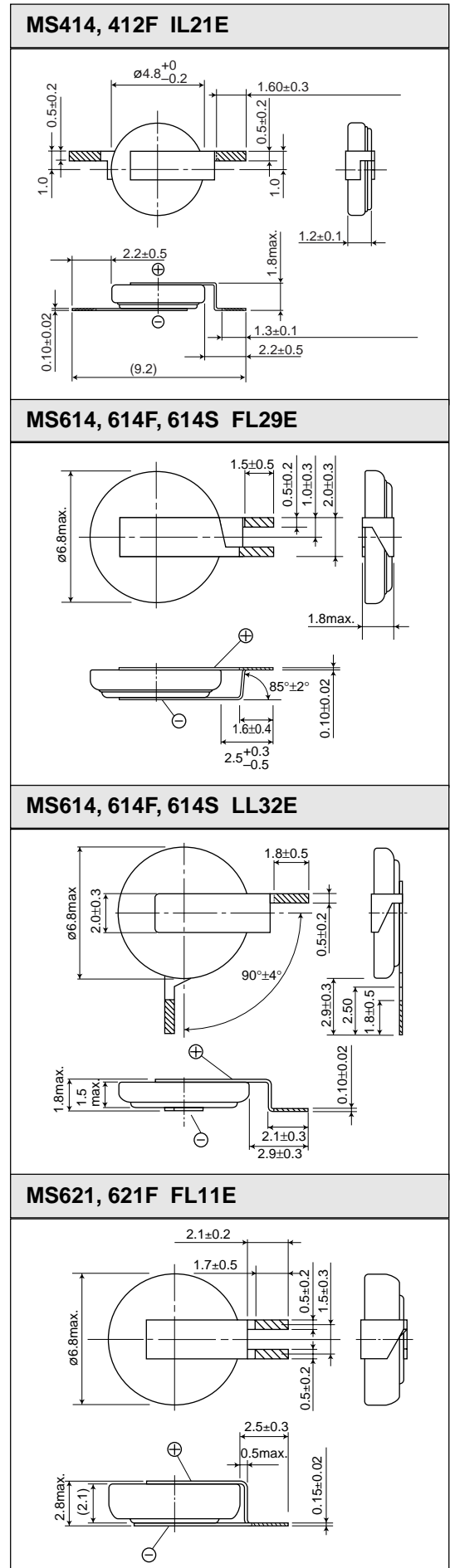
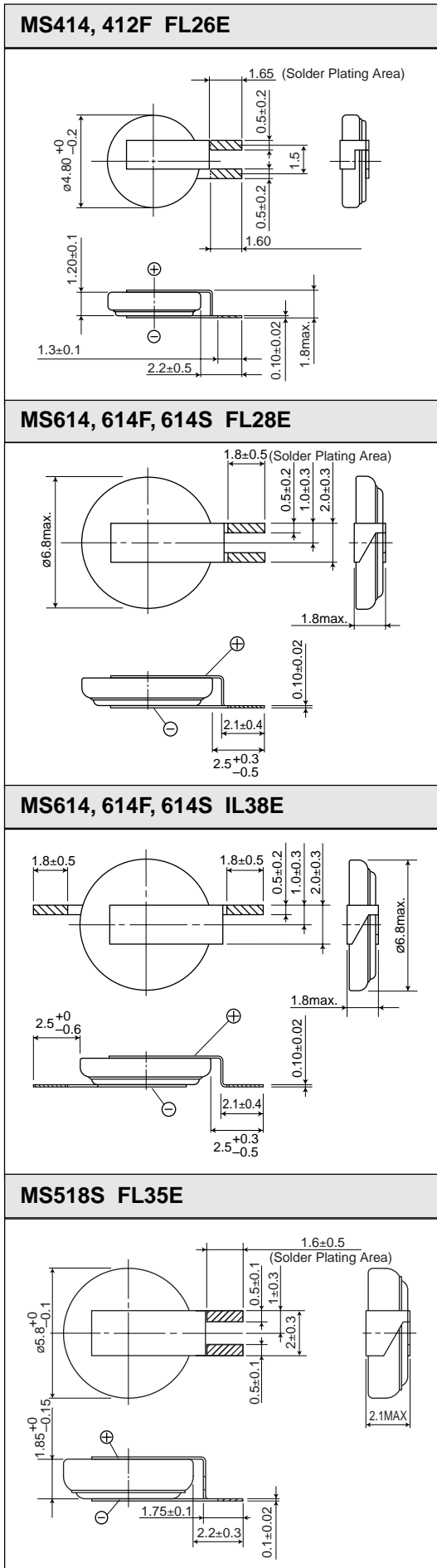


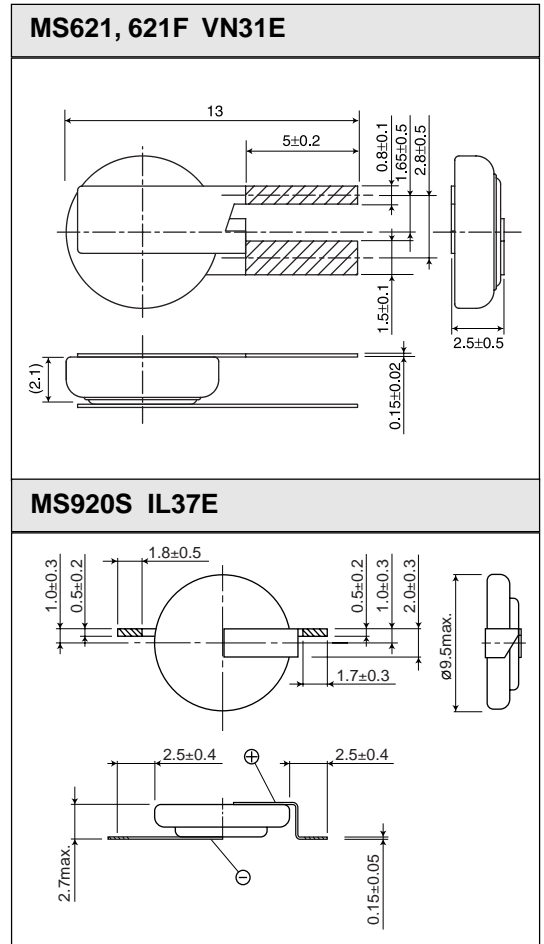
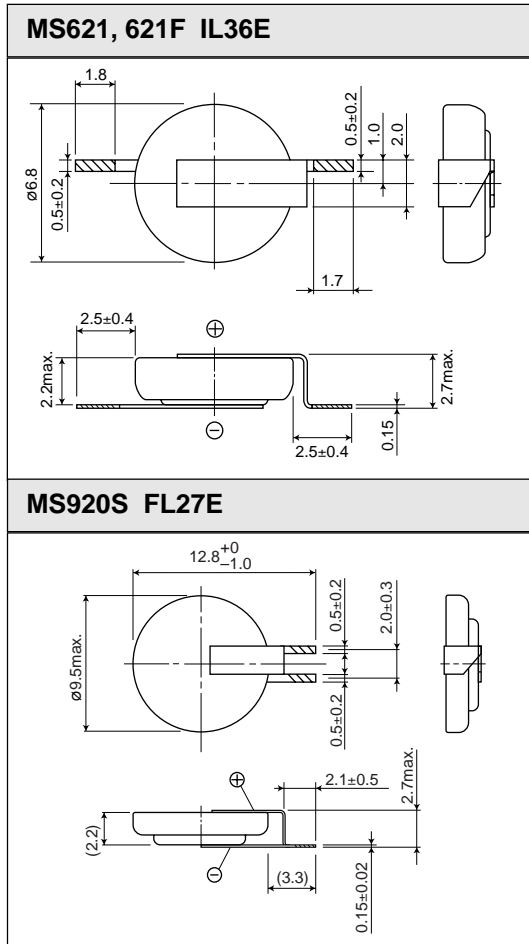
(4) with using divided resistance for voltage



# MS Lithium Rechargeable Battery <3V Type>

## ■ DIMENSIONS OF STANDARD TAB-WELD FOR MANGANESE SILICON LITHIUM BATTERY

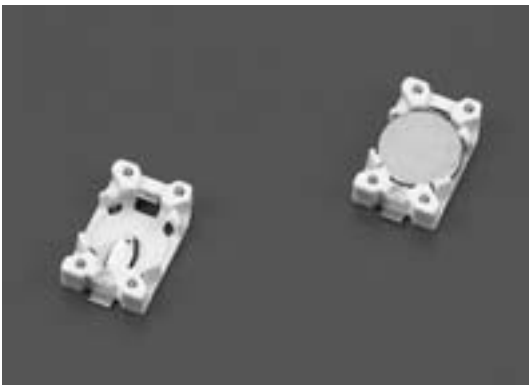




- Hatched parts are solder plated. (Sn 100%)
- For any optional terminal shapes, please consult with us.
- Unit of dimensions: mm

## BATTERY HOLDER

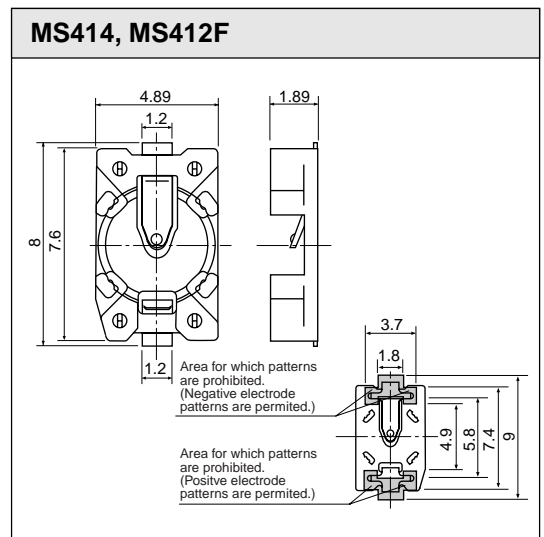
BH0414



Using precision technology the holder realizes less-space and high reliability and obtains high mounting functionality.

### <Specifications>

Item	Standard
With Standing Voltage	DC500V/minute
Contact Resistance	Less than 100mΩ
Insulation Resistance	More than 100MΩ
Operational Temperature Range	-40°C ~ +85°C
Reflow Soldering Temperature	245°C



### <Applicable Batteries>

MS414, MS412F

### <Features>

- Thin: 1.89mm Height after mounting
- Easy for Automatic mounting: Able to insert battery vertically
- Embossed Tape Package

# Reflowable RB Lithium Rechargeable Battery



## FEATURES

- Reflowable : Superior heat resistance without deterioration of battery performance due to reflow soldering.
- Wide Range of charging voltage : Wide range voltage (1.8V to 3.3V) allows to be used for various applications
- High Capacity : Ten times higher than capacitor in 0.3mAh typ. (charge:3V cut off 1.2V)
- Long cycle life : More than 1,000 times charge/discharge cycle (10% D.O.D)
- Excellent over discharge characteristics
- Wide range of operating temperature From  $-20^{\circ}\text{C}$  to  $60^{\circ}\text{C}$   
If you would like to use beyond the temperature range, please consult with us.
- Approved product by UL :  
UL file No. MH15628

RB Lithium rechargeable battery allows reflow soldering for automatic mounting, by adopting highly heat-resistant material and precise sealing technology. RB Series features high capacity and long cycle life with possible charging voltage range from 1.8V to 3.3V, which is most suitable for backup use of real time clock and SRAM etc.

## APPLICATIONS

Power supply back up use for Cellular phone, Wireless phone, PHS, Digital still Camera, PDA, MD player.

## SPECIFICATIONS

Type	Nominal Voltage (V)	Nominal Capacity (Voltage Range) (mAh)	Internal*2 Impedance ( $\Omega$ )	Standard Charge Discharge Current (mA)	Cycle Life (Time)*1	Diameter (mm)	Height (mm)	Weight (g)
RB414	3.0	0.3 (3.0-1.2) 0.2 (2.5-1.2) 0.14 (3.0-2.0)	170	0.005	1000 ( 10% D.O.D ) 100 ( 100% D.O.D )	4.8	1.4	0.07

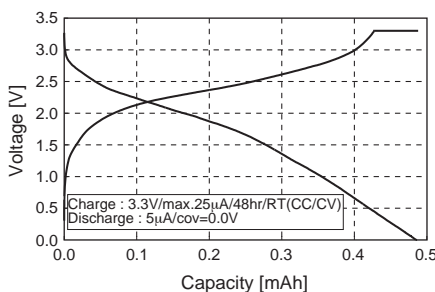
\*1 D.O.D.: Depth of Discharge

\*2 Internal Impedance is measured using AC (Altering Current) method at the fully charged state.

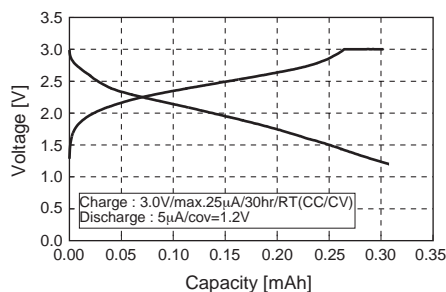
## CHARACTERISTICS

### Charge-Discharge Characteristics

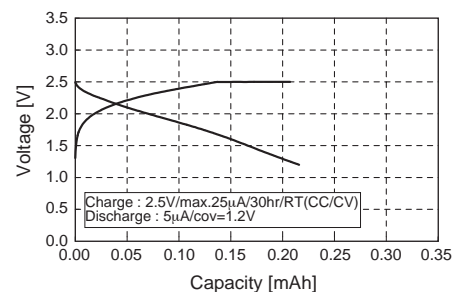
#### 1. 3.3V



#### 2. 3.0V



#### 3. 2.5V







# Pb-free Reflowable HB Lithium Rechargeable Battery



For protecting the global environment, We developed Lithium rechargeable battery which allows Pb-free reflow soldering (automatic mounting by Pb-free solder)  
HB414 is the Pb-free reflowable Lithium rechargeable battery, by adopting highly heat resistant material and precise sealing technology.  
HB series features high capacity and long cycle life with possible charging voltage range from 1.8V to 3.3V, which is most suitable for backup use of real time clock and SRAM etc.

## FEATURES

- Pb-free reflowable  
Superior heat resistance (260°C peak) allows reflow soldering by Pb-free solder.
- Wide Range of charging voltage : Wide range voltage (1.8V to 3.3V) allows to be used for various applications
- High Capacity :  
Ten times higher than capacitor in 0.3mAh typ. (charge:3V cut off 1.2V)
- Long cycle life :  
More than 1,000 times charge/discharge cycle (10% D.O.D)
- Excellent over discharge characteristics
- Wide range of operating temperature  
From -20°C to 60°C  
If you would like to use beyond the temperature range, please consult with us.
- Approved product by UL :  
UL file No. 15628

## APPLICATIONS

Power supply back up use for Cellular phone, Wireless phone, PHS, Digital still Camera, PDA, MD player.

## SPECIFICATIONS

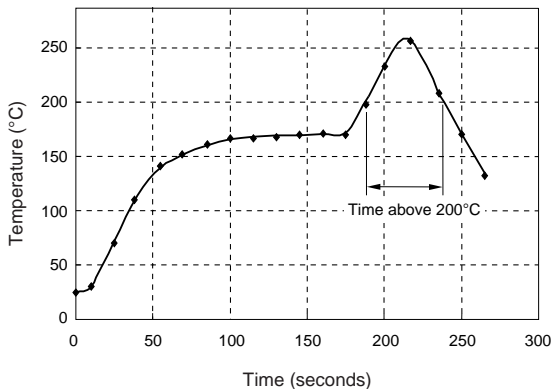
Type	Nominal Voltage (V)	Nominal Capacity (Voltage Range) (mAh)	Internal*2 Impedance (Ω)	Standard Charge Discharge Current (mA)	Cycle Life (Time)*1	Diameter (mm)	Height (mm)	Weight (g)
HB414	3.0	0.3 (3.0-1.2)	280	0.005	1000 ( 10% D.O.D )	4.8	1.4	0.07
		0.2 (2.5-1.2)			100 ( 100% D.O.D )			
		0.14 (3.0-2.0)						

\*1 D.O.D.: Depth of Discharge

\*2 Internal Impedance is measured using AC (Altering Current) method at the fully charged state.

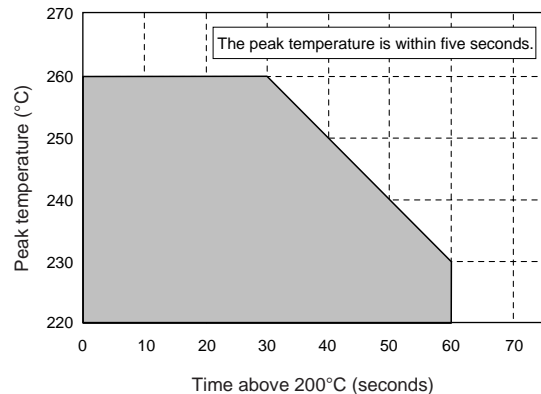
## REFLOW SOLDERING CONDITION

Reflow Soldering Temperature Profile Example



The times of repeated reflow soldering must be two times or less.  
The Temperature must be measured at top of the cell.

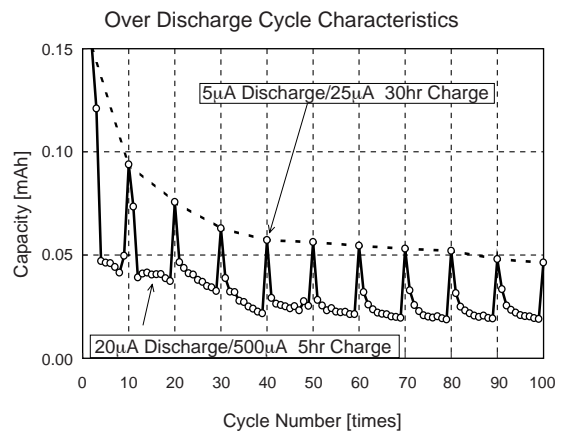
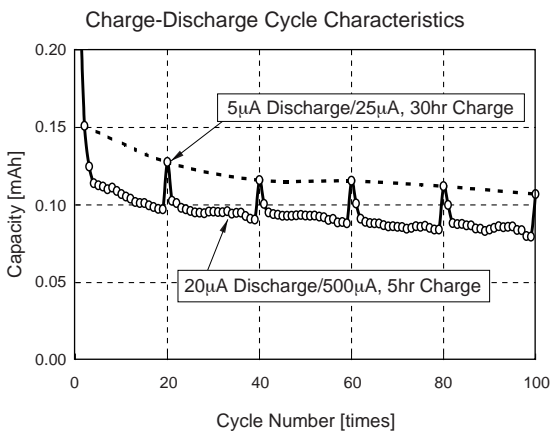
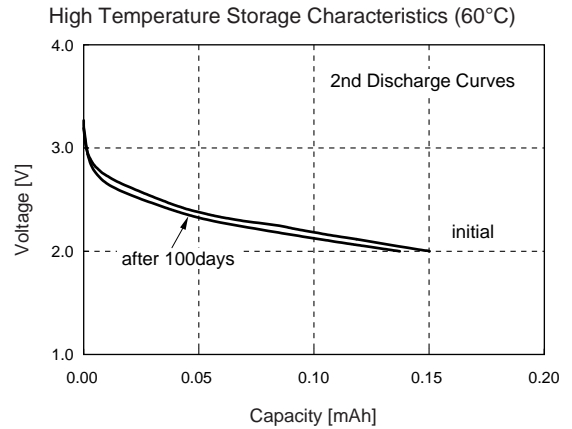
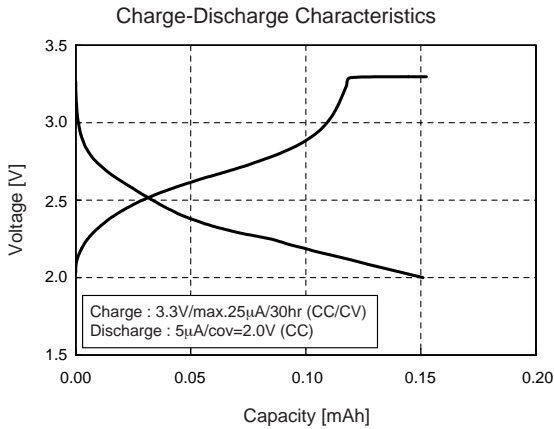
Recommended Reflow Condition



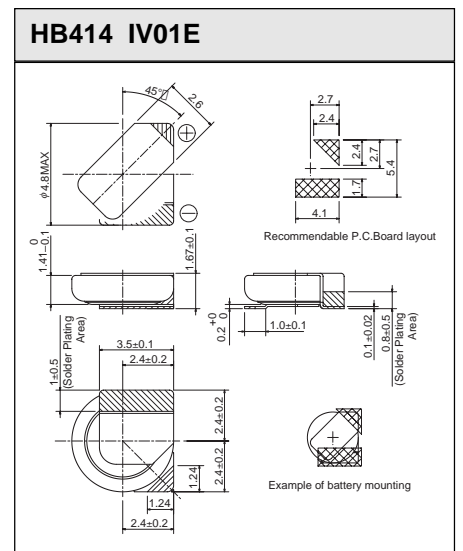
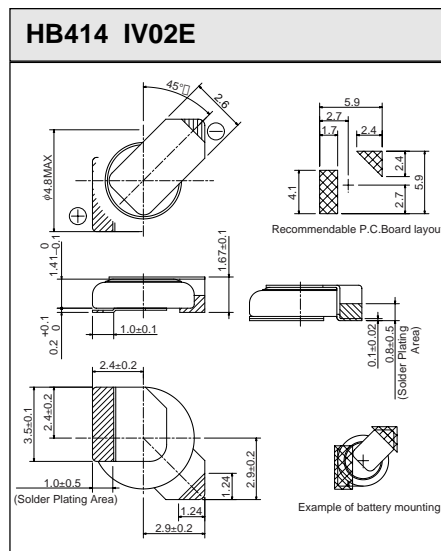
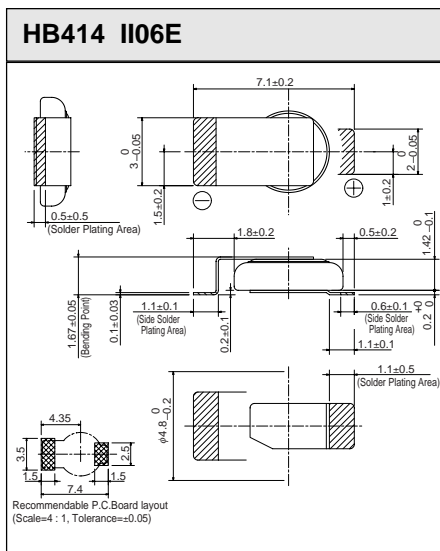
Recommended Reflow Condition

Peak Temperature	Model	
	HB414	XH414H
Max.260°C	Applicable (within 5 seconds)	

# CHARACTERISTICS

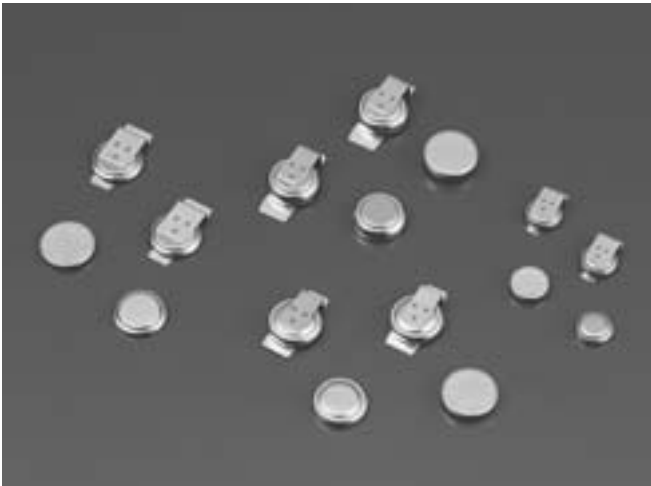


# DIMENSIONS OF STANDARD TAB-WELD FOR REFLOWABLE HB BATTERY



- \* Hatched parts are solder plated. (Sn 100%)
- \* For any optional terminal shapes, please consult with us.
- \* Unit of dimensions : mm

# Reflowable XC Capacitor < 2.5V Rated Voltage Type >



## FEATURES

- Able to conduct reflow soldering
- Low-impedance & Excellent charge-discharge rate. Impedance is less than that of conventional capacitors, and it realizes quick charge, discharge.
- High-rated voltage  
2.5V rated operating voltage allows for flexible design.
- Long cycle life over 100,000times
- Excellent long-term reliability  
There is no characteristic deterioration due to over-charge and overdischarge.
- Charge/discharge circuit is very simple (constant voltage charge)
- Wide range of operating temperature  
From  $-25^{\circ}\text{C}$  to  $70^{\circ}\text{C}$   
If you would like to use beyond the temperature range, please consult with us.

Using chemically-stable large surface area activated carbon as electrode, this new type of capacitor features high-capacitance, low-impedance, high-rated voltage, and long-term reliability through unique sealing technology. Moreover, using original heat resistant materials and cell design, the capacitor allows reflow soldering in response to the demand of automatic mounting.

## APPLICATIONS

- Back up for memory and clock function, in various electronic equipments, cellular phones, cameras, PDA, Faxmachines, VTR, TV, printer, pagers, etc.
- Combined use with solar cells.
- Auxiliary power supply for voltage drop of battery.

## SPECIFICATIONS

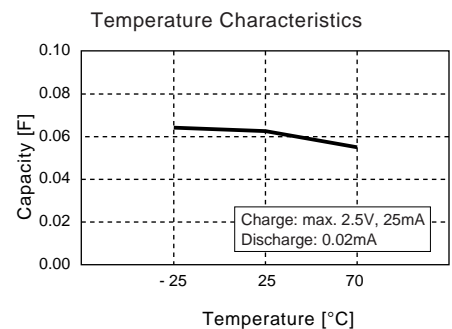
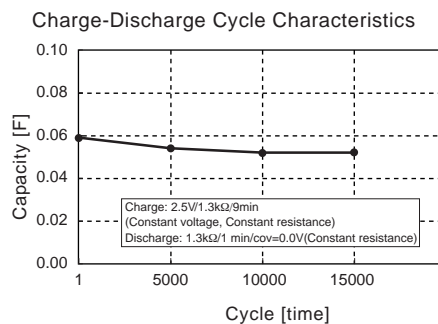
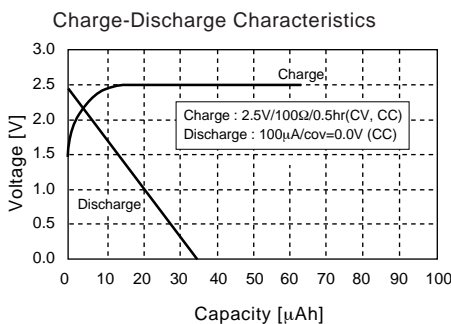
Type	Electrical Characteristics (at Room Temperature)*			Dimensions		Weight (g)
	Rated Operating Voltage (V)	Electrostatic Capacity (F)	Internal*2 Impedance ( $\Omega$ )	Diameter (mm)	Height (mm)	
XC414	2.5	0.06	60	4.8	1.4	0.06
XC609	2.5	0.07	25	6.8	0.9	0.14

\*1 Operating Temperature Range:  $-25^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

\*2 Internal Impedance is measured using AC (Altering Current) method at the discharged state.

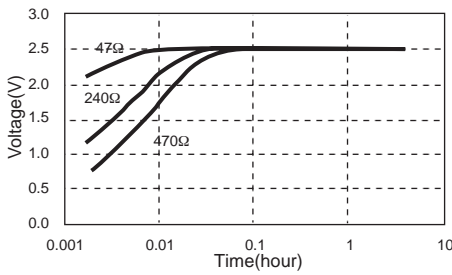
## CHARACTERISTICS

### XC414

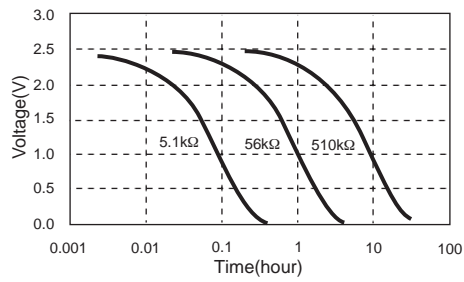


## XC609

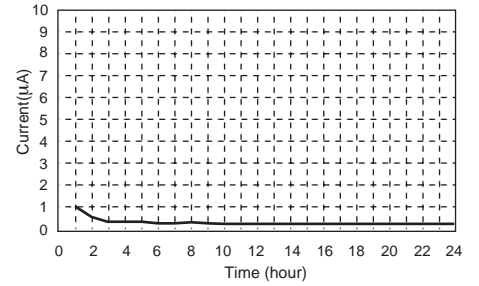
Charge Characteristics (Charge Voltage 2.5V)



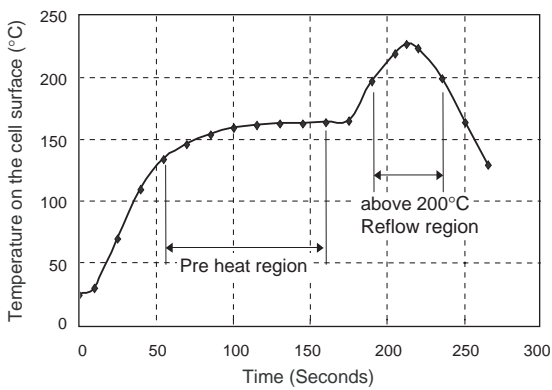
Discharge Characteristics (constant resistance)



Leak Current Characteristics (Charging at 2.5V)

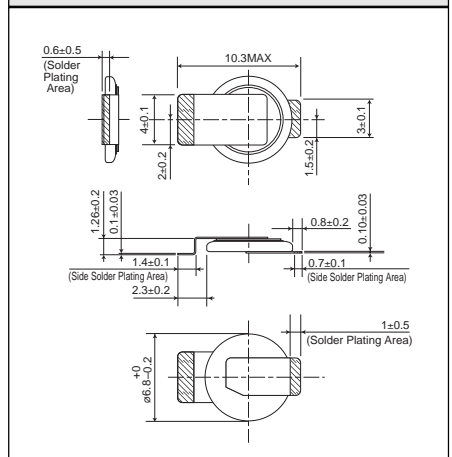


## REFLOW PROFILE SAMPLE



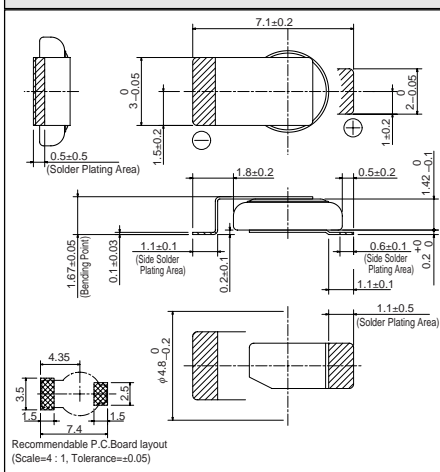
The times of repeated reflow soldering must be two times or less.  
The Temperature must be measured at top of the cell.

## XC609 II38E

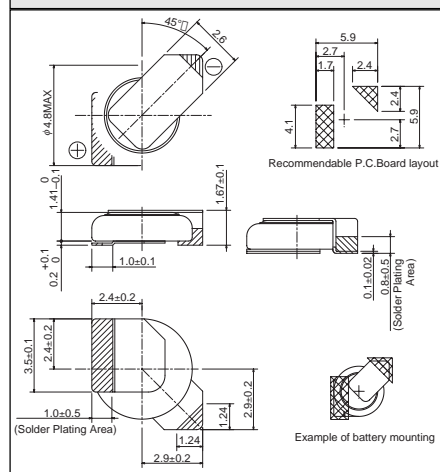


## DIMENSIONS OF STANDARD TAB-WELD FOR REFLOWABLE XC CAPACITOR

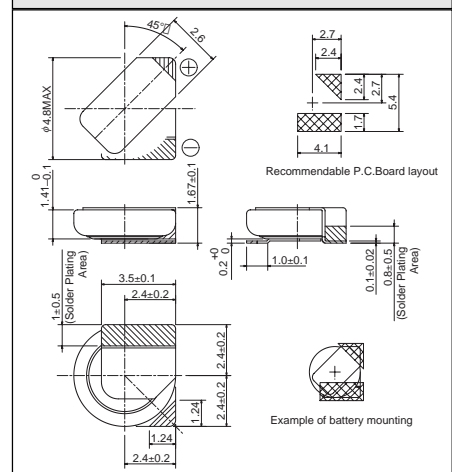
### XC414 II06E



### XC414 IV02E



### XC414 IV01E



- \* Hatched parts are solder plated. (Sn 100%)
- \* For any optional terminal shapes, please consult with us.
- \* Unit of dimensions : mm

# Reflowable XH Capacitor <3.3V High-rated Voltage Type>



Adopting high voltage-resistant material and new design, we realize the XH unit cell that is a high voltage-resistant reflowable capacitor rated to 3.3V. Using chemically-stable large surface area activated carbon as electrode and our original sealing and manufacturing technology, the XH capacitor features high-capacity, low-impedance and long-term reliability. The XH capacitor is most suitable for clock and memory backup in various electronic equipments due to its wide operating voltage.

## FEATURES

- High-rated voltage : Able to be used at wide range voltage form 0V to 3.3V and be used for various applications
- Reflowable
- High Capacity : 0.07F with "414" size (diameter 4.8 mm : height 1.4mm)
- Low Impedance : Quick Charge-Discharge Performance
- Long Cycle Life : More than 10,000 times charge-discharge cycle
- Able to make simple charging circuit (Constant-voltage charging)
- Wide range of operating temperature From  $-25^{\circ}\text{C}$  to  $70^{\circ}\text{C}$   
If you would like to use beyond the temperature range, please consult with us.

## APPLICATIONS

Power supply back up use for Cellular phone, Wireless phone, PHS, PDA, MD player

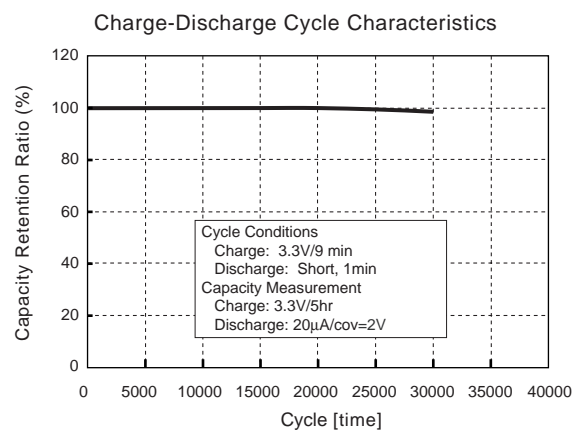
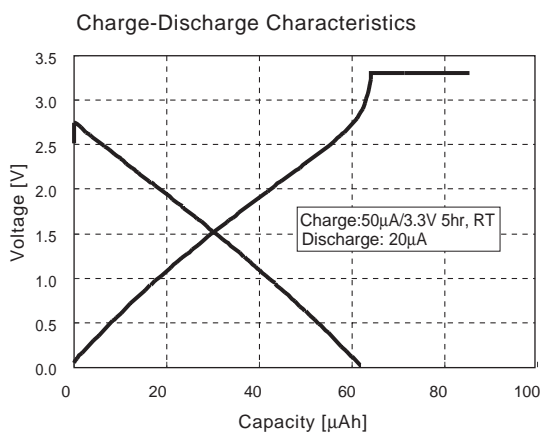
## SPECIFICATIONS

Type	Electrical Characteristics(at Room Temperature)*1			Dimensions		Weight (g)
	Nominal Voltage (V)	Electrostatic Capacity (F)	Internal Impedance*2 ( $\Omega$ )	Diameter (mm)	Height (mm)	
XH414	3.3	0.07	70	4.8	1.4	0.06

\*1 Recommended Operating Temperature Range:  $-25^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

\*2 Internal Impedance is measured using AC (Altering Current) method at the discharged state.

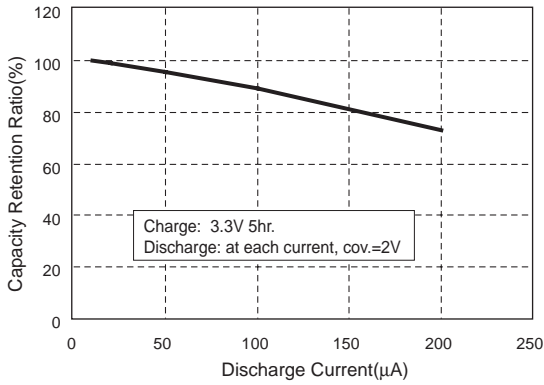
## CHARACTERISTICS



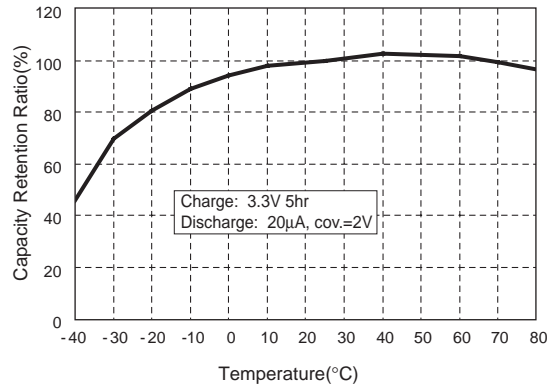


# CHARACTERISTICS

Discharge Current Characteristics

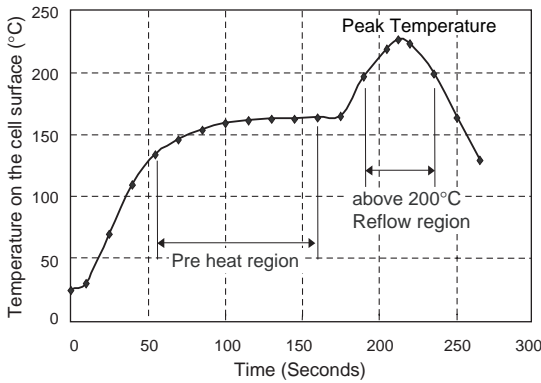


Temperature Characteristics



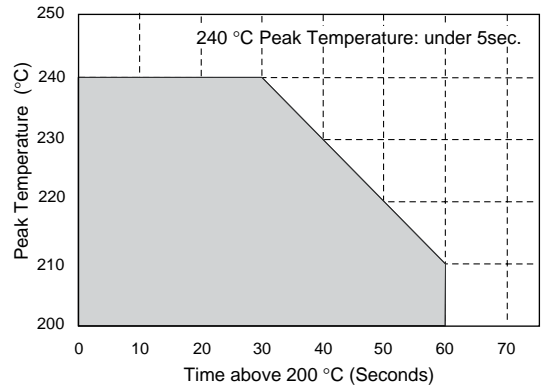
# REFLOW SOLDERING CONDITION

Reflow Soldering Temperature Profile Example



The times of repeated reflow soldering must be two times or less. The Temperature must be measured at top of the cell.

Recommended Reflow Condition



# DIMENSIONS OF STANDARD TAB-WELD FOR REFLOWABLE XH CAPACITOR

### XH414 II06E

Recommendable P.C. Board layout (Scale=4:1, Tolerance=±0.05)

### XH414 IV02E

Recommendable P.C. Board layout

Example of battery mounting

### XH414 IV01E

Recommendable P.C. Board layout

Example of battery mounting

- \* Hatched parts are solder plated. (Sn 100%)
- \* For any optional terminal shapes, please consult with us.
- \* Unit of dimensions : mm

# Pb-free Reflowable Capacitor XH414H <3.3V High-rated Voltage Type>



For protecting the global environment, We developed Capacitor which allows Pb-free reflow soldering (automatic mounting by Pb-free solder)

XH414H is the Pb-free reflowable Capacitor, by adopting highly heat resistant material and precise sealing technology.

The XH414H Capacitor features high-capacity, low-impedance and long term reliability.

It is most suitable for clock and memory backup in various electric equipments due to its wide operating voltage.

## FEATURES

- Pb-free reflowable  
Superior heat resistance (260°C peak) allows reflow soldering by Pb-free solder
- High-rated voltage : Able to be used at wide range voltage form 0V to 3.3V and be used for various applications
- High Capacity : 0.07F with "414" size (diameter 4.8 mm : height 1.4mm)
- Low Impedance :  
Quick Charge-Discharge Performance
- Long Cycle Life :  
More than 10,000 times charge-discharge cycle
- Able to make simple charging circuit (Constant-voltage charging)
- Wide range of operating temperature  
From -25°C to 70°C  
If you would like to use beyond the temperature range, please consult with us.

## APPLICATIONS

Power supply back up use for Cellular phone, Wireless phone, PHS, PDA, MD player

## SPECIFICATIONS

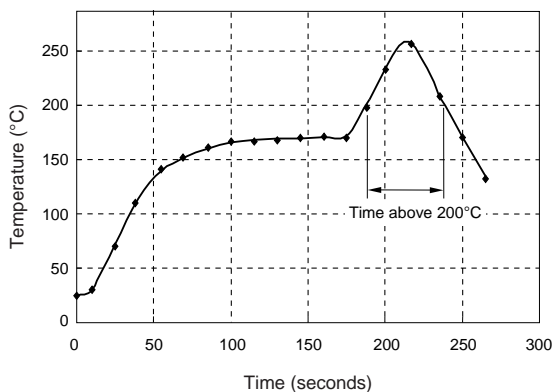
Type	Electrical Characteristics(at Room Temperature)*1			Dimensions		Weight (g)
	Nominal Voltage (V)	Electrostatic Capacity (F)	Internal Impedance*2 (Ω)	Diameter (mm)	Height (mm)	
XH414H	3.3	0.07	70	4.8	1.4	0.07

\*1 Recommended Operating Temperature Range: -25°C to +70°C

\*2 Internal Impedance is measured using AC (Altering Current) method at the discharged state.

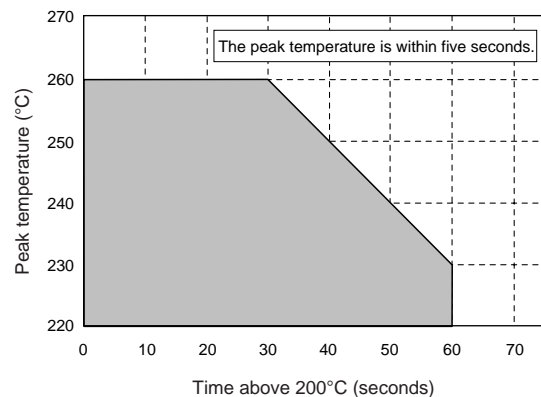
## REFLOW SOLDERING CONDITION

Reflow Soldering Temperature Profile Example



The times of repeated reflow soldering must be two times or less.  
The Temperature must be measured at top of the cell.

Recommended Reflow Condition

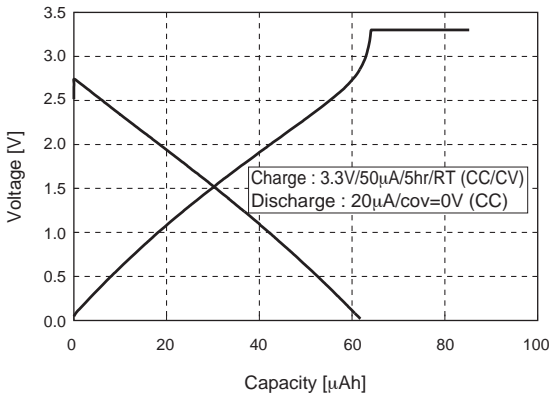


Recommended Reflow Condition

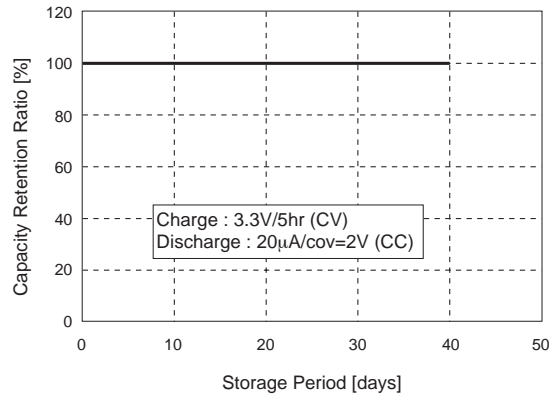
Peak Temperature	Model	
	HB414	XH414H
Max.260°C	Applicable (within 5 seconds)	

# CHARACTERISTICS

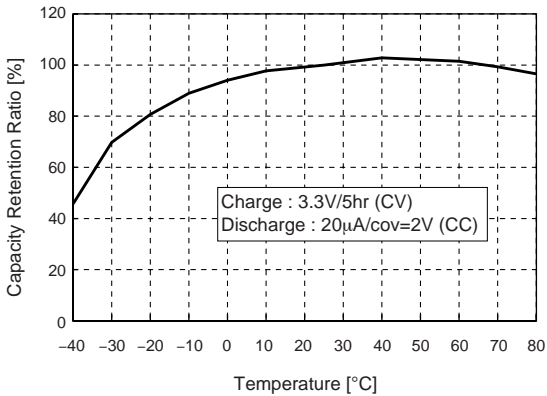
Charge-Discharge Characteristics



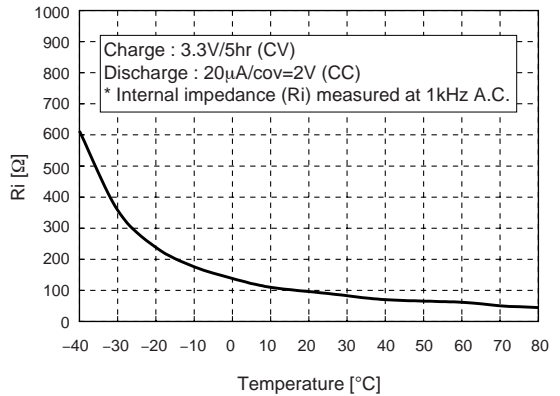
High Temperature Storage Characteristics (70°C)



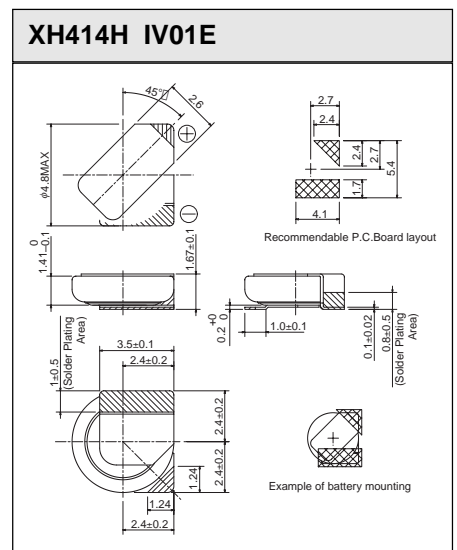
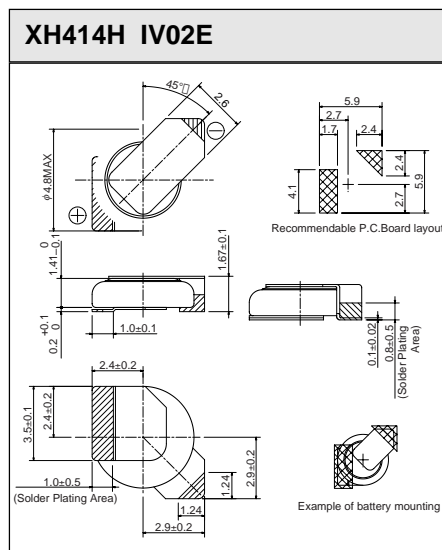
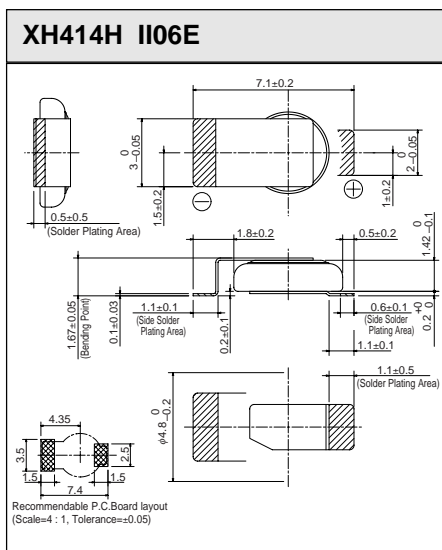
Temperature Characteristics (Discharge Capacity)



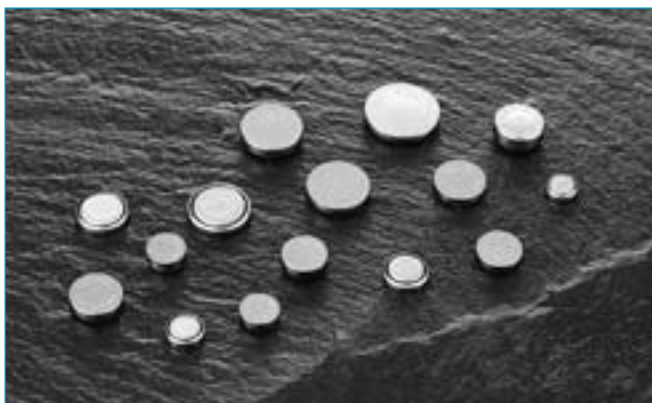
Temperature Characteristics (Internal impedance)



## DIMENSIONS OF STANDARD TAB-WELD FOR REFLOWABLE XH414H CAPACITOR

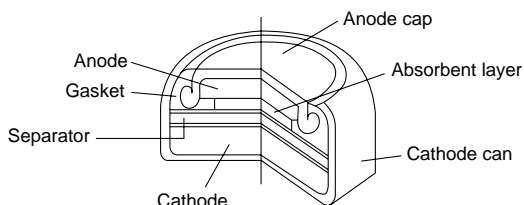


- \* Hatched parts are solder plated. (Sn 100%)
- \* For any optional terminal shapes, please consult with us.
- \* Unit of dimensions : mm



Silver oxide is used as cathode, zinc is used as anode, and sodium hydroxide solution or potassium hydroxide solution is used as electrolyte. These batteries with large capacity and stable voltage characteristics are widely applied to products demanding high accuracy, like quartz watches.

## CROSS SECTION



## FEATURES

- **Large capacity**

Energy density per volume is about 2 times higher than that of alkaline-manganese batteries.

- **Stable operating voltage**

Operating voltage is very stable until the end of discharge.

- **Excellent leakage resistance**

Excellent leakage resistance is achieved by our special sealing materials and superior processing technologies.

- **Excellent pulse load characteristics**

Batteries using potassium hydroxide solution are most suitable for functions which consume relatively high current, such as an alarm-or-backlight-function incorporated into digital quartz watches.

- **A comprehensive variety of products**

The diameter is from 4.8 mm to 11.6mm, the height is from 1.2mm to 3.6mm.

Users can select the most suitable battery for their applications.

## APPLICATIONS

Watches, Clocks, Calculators, Hearing aids, Digital clinical thermometers, Cameras, Electronic games, Card radios, Remote controllers.

## SPECIFICATIONS

	Model No.	Electrical Characteristics (at Room Temperature)			Dimensions		Weight (g)	UCAR No.	C.C.V. (TYP.)*2		Storage loss (MAX) (%/Y)		
		Nominal Voltage (V)	Nominal Capacity*1 (mAh)	Maximum Drain (mA)	Diameter (mm)	Height (mm)			+24°C (V)	-10°C (V)			
Low Drain	SR416SW	1.55	7.5	0.8	4.80	1.65	0.11	—	1.35	1.10	7		
	SR421SW		12			2.15	0.14						
	SR512SW		5.5		5.80	1.25	0.13	335	1.15				
	SR516SW		12.5			1.65	0.18	317	1.10				
	SR521SW		16		6.80	2.15	0.23	379	1.45	1.20			
	SR527SW		22			2.70	0.30	319					
	SR616SW		15		7.90	1.65	0.23	321					
	SR621SW		23			2.15	0.30	364					
	SR626SW		30		9.50	2.60	0.37	377					
	SR712SW		11			1.25	0.24	346					
	SR716SW		21		11.60	1.65	0.33	315					
	SR721SW		28			2.10	0.42	362					
	SR726SW		34		6.80	2.60	0.52	397					
	SR41SW		45			3.60	0.67	384					
	SR916SW		27		7.90	1.65	0.51	373					
	SR920SW		46			2.05	0.58	371					
SR927SW	55	9.50	2.70	0.78	395								
SR1120SW	53		2.05	0.93	381								
High Drain	SR626W	1.55	28	8	6.80	2.60	0.36	376			1.35	1.05	7
	SR721W		26			2.10	0.41						
	SR726W		34		7.90	2.60	0.52	396	1.15				
	SR41W		45			3.60	0.67	392					
	SR920W		42		9.50	2.05	0.56	370	1.40	1.10			
	SR927W		53			2.70	0.77	399			1.05		
	SR1120W		53		15	11.60	2.05	0.93	391	1.20			

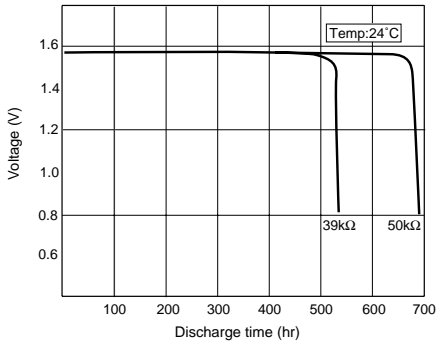
\*1. Discharged to 1.4V

\*2. C.C.V. : Closed Circuit Voltage Low Drain 2kΩ 7.8msec Pulse High Drain 200Ω 5sec.

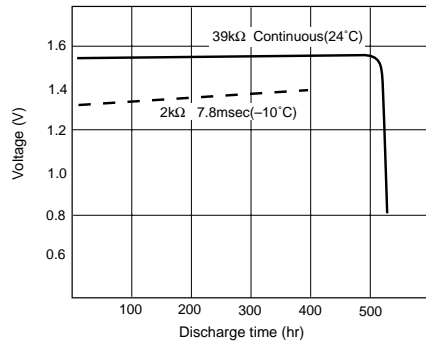
## CHARACTERISTICS

### SR621SW

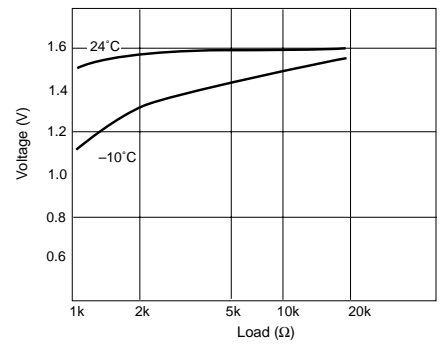
Load-discharge characteristics



Pulse-discharge characteristics

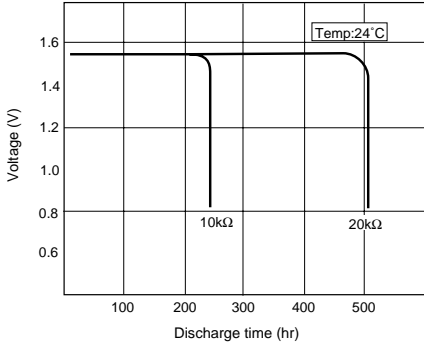


Load-temperature-voltage characteristics

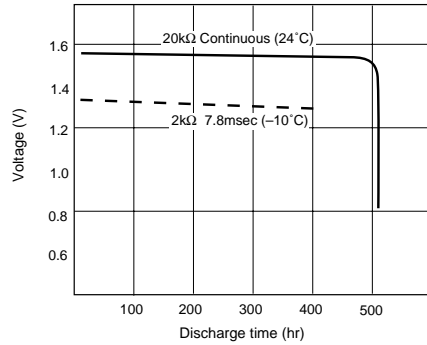


### SR920SW

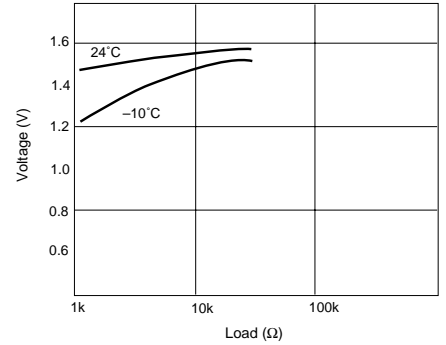
Load-discharge characteristics



Pulse-discharge characteristics

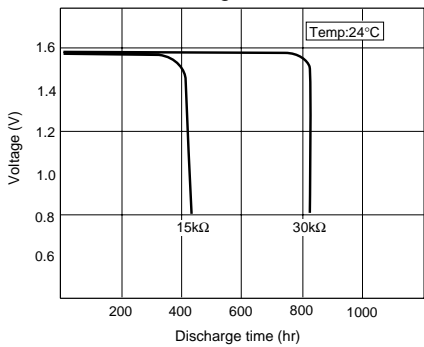


Load-temperature-voltage characteristics

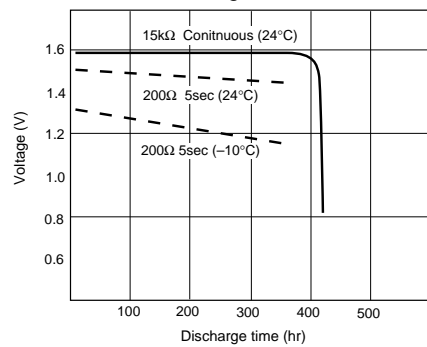


### SR41W

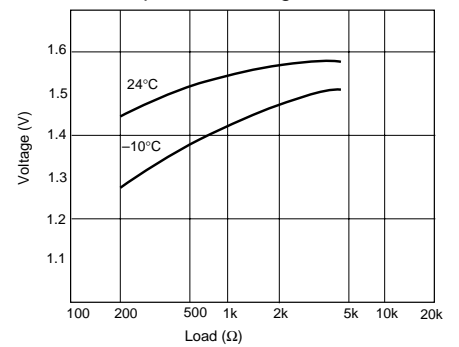
Load-discharge characteristics



Pulse-discharge characteristics

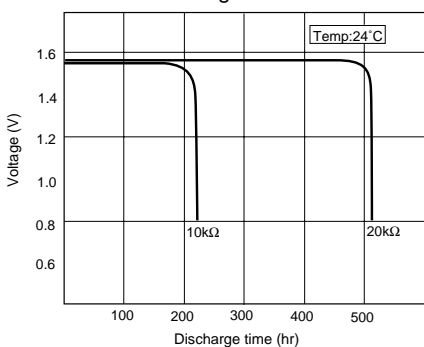


Load-temperature-voltage characteristics

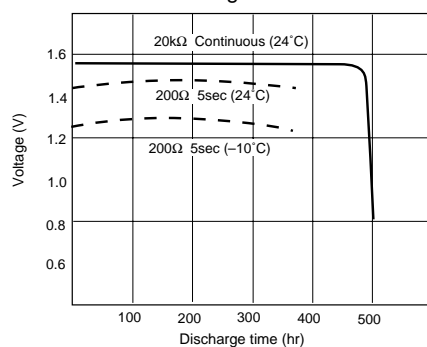


### SR920W

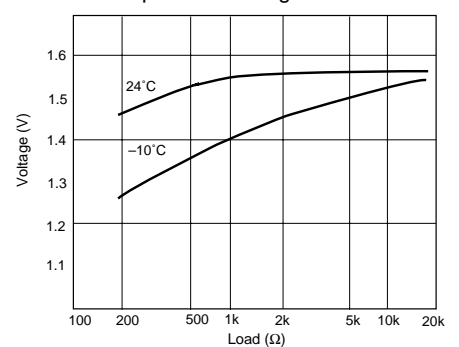
Load-discharge characteristics



Pulse-discharge characteristics



Load-temperature-voltage characteristics



## Environmental Activities at SII Micro Parts Ltd. (SMP)

### SMP's Environmental Policy

Sendai is a beautiful metropolis blessed with glories of green woods. The Hirose-River flowing through the city is one of the clearest streams in Japan where sculpin and sweetfish still enjoy living. SMP is located along the upper stream of the river. As a keenly eco-conscious company, SMP remains vigorously committed to global and local environmental protection by way of blending with the fiery greenness.

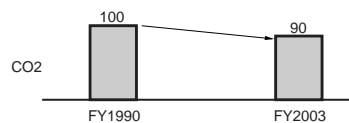
Based on the above policy, the following six environmental approaches are now being implemented throughout SMP.

#### 1. Enrich the Lineup of Eco-Products

- Green products: Enrich the lineup of green products that comply with ISO14021 or its equivalent Environmental Label Type II. Green products will account for 50% or more of the total of our products by the end of FY2004.
- Restricting the use of Hazardous Substances (RoHs) regulation-compliance products: Provide customers with eco-products that comply with toxic chemicals control directives, rules, regulations and standards defined by EU and other foreign countries as well as customers' specific requirements.
- Disposal of waste watch batteries: Collect and dispose of waste watch batteries in cooperation with the Battery Association of Japan.

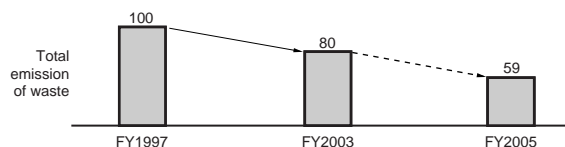
#### 2. Promote Energy Conservation

- Reduce CO<sub>2</sub> emission while advancing an increase in the production output by way of investing in state-of-the-art energy-saving facilities and systems used in the manufacturing processes. SMP achieved a 10% reduction in CO<sub>2</sub> emission in FY2003 for the past 13 years from FY1990.

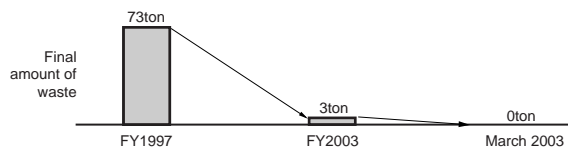


#### 3. Reduce the Total Emission of Waste

- Develop a comprehensive waste reduction and reuse project throughout SPM by providing all employees with proper instructions about waste separation. We achieved a 20% reduction in the total emission of waste, including recycled and valuable resources, in FY2003 for the past 6 years from FY1997.



- Implementing an optimum recycling method in each individual item enabled us to bring residuum down to 3%. We have kept the final disposal amount zero since March 2003.



#### 4. Emission of Chemical Substances

- We have independently established our criteria for reducing chemical substances in accordance with the amount of emission of chemical substances defined in the Pollutant Release and Transfer Register (PRTR) law. To meet our criteria, we have invested in collection systems, analyzers and other related facilities.

#### 5. Green Purchasing

- Proceed with a green purchasing campaign for manufacturing materials and expand its application to other purchased products and materials where appropriately.

#### 6. Green Life

- Triple the frequency of a clean-up and beautification campaign in areas around from once a year with the participation of all employees at SPM.





# Check Sheet for Selecting Micro Battery

Please use check sheet below when you select our Micro Battery for selecting the best suited battery for your use.

## Fax Sheet

SII Micro Parts Ltd. BM Sales Sec. +81-43-211-8035 Battery Sales Person

1. Your company name

2. Which application do you use?

3. Your expected backup period

hour / day / month

4. Your requested delivery

mm / yy

5. Operation voltage of the device for backup

V to V

6. Consumption current at backup time

mA •  $\mu$ A

7. Setting value of charging voltage

V

8. Exist of a back current protection diode

Yes • No

9. Vf characteristics of the back current protection diode(at 10 $\mu$ A)

V

10. Resistance value of charging protection resistance

$\Omega$

11. Limit of charging time

12. Necessary number of cycle

times

13. Other your requests

### Your contact information

Name

Section

Phone

Fax

E-mail



TAKUMI, only achieved by the finest artisans and craftsmen in Japan's long history. Based on our 60 years history of precision watch manufacturing, SII embodies TAKUMI as the core of our DNA.

Our TAKUMI spirit comes to life in all of our components through lower power consumption, high precision and continuous commitment to challenge and improve.



SII Micro Parts Ltd. who manufactures the products described in this catalog holds the ISO-9001 quality management system certificate and the ISO-14001 environmental management system certificate.

### IMPORTANT

1. The information herein is subject to change without notice.
2. Neither reproduction nor duplication of this catalog in whole or part is allowed without the prior written approval of Seiko Instruments Inc.
3. The colors of the products reproduced herein may be different from the actual colors. Check color on actual products before using the product.
4. Circuits and respective application methods described herein are for reference only. Seiko Instruments Inc. is not responsible for any and all infringement or damages to the rights of third parties (including industrial properties) caused by the use of circuits or application methods herein. Seiko Instruments Inc. shall not license any industrial properties owned by Seiko Instruments Inc. or any third party through this catalog.
5. When products described herein include Strategic Products (or Services) stipulated in the Foreign Exchange and Trade Control Law, they shall not be exported without permission of governmental authorities.
6. The products described herein are designed for consumer equipment and cannot be used as part of any device or equipment which influences the human body or requires a significantly high reliability, such as physical exercise equipment, medical equipment, disaster prevention equipment, gas related equipment, vehicles, aircraft and equipment mounted on vehicles.



[www.sii.co.jp/compo](http://www.sii.co.jp/compo)

#### SII Micro Parts Ltd.

BM Sales Department  
1-8, Nakase, Mihama-ku, Chiba-shi, Chiba 261-8507, Japan  
Telephone :+81-43-211-1205 Facsimile :+81-43-211-8035  
E-mail:component@sii.co.jp

#### Seiko Instruments USA Inc.

Electronic Components Div.  
2990 Lomita Blvd., Torrance, CA 90505, U.S.A.  
Telephone :+1-800-934-9334 Facsimile :+1-909-975-5699  
E-mail :info@siu-la.com  
<http://www.sielectroniccomponents.com>

#### Seiko Instruments GmbH

Siemensstraße 9, D-63263 Neu-Isenburg, Germany  
Telephone :+49-6102-297-0 Facsimile :+49-6102-297-320  
E-mail :info@seiko-instruments.de  
<http://www.seiko-instruments.de>

#### Seiko Instruments France S.A.R.L.

55, Rue d'Aguesseau 92774 Boulogne Billancourt Cedex, France  
Telephone :+33-1-41-31-71-30 Facsimile :+33-1-41-31-71-39  
E-mail :info@seiko-instruments.fr  
<http://www.seiko-instruments.fr>

#### Seiko Instruments (H.K.) Ltd.

4-5 / F, Wyler Centre 2,200 Tai Lin Pai Road, Kwai Chung,  
N.T., Kowloon, Hong Kong  
Telephone :+852-2421-8611 Facsimile :+852-2480-5479  
E-mail :sales@sih.com.hk  
<http://www.sih.com.hk>

#### Seiko Instruments Taiwan Inc.

4FL, No.40, Sec. 2, Min-Chuan E. Rd., Taipei 104, Taiwan R.O.C.  
Telephone :+886-2-2563-5001 Facsimile :+886-2-2521-9519  
E-mail :public@sii.co.jp  
<http://www.sii.com.tw>

#### Seiko Instruments Singapore Pte. Ltd.

2, Marsiling Lane, Singapore 739144  
Telephone :+65-6269-1370 Facsimile :+65-6269-9729  
<http://www.sii.com.sg>

(Specification are subject to change without notice.)

Released in September 2004



printed on 100% recycled paper and with soy ink.

No. CAB0409EJ0066-10C