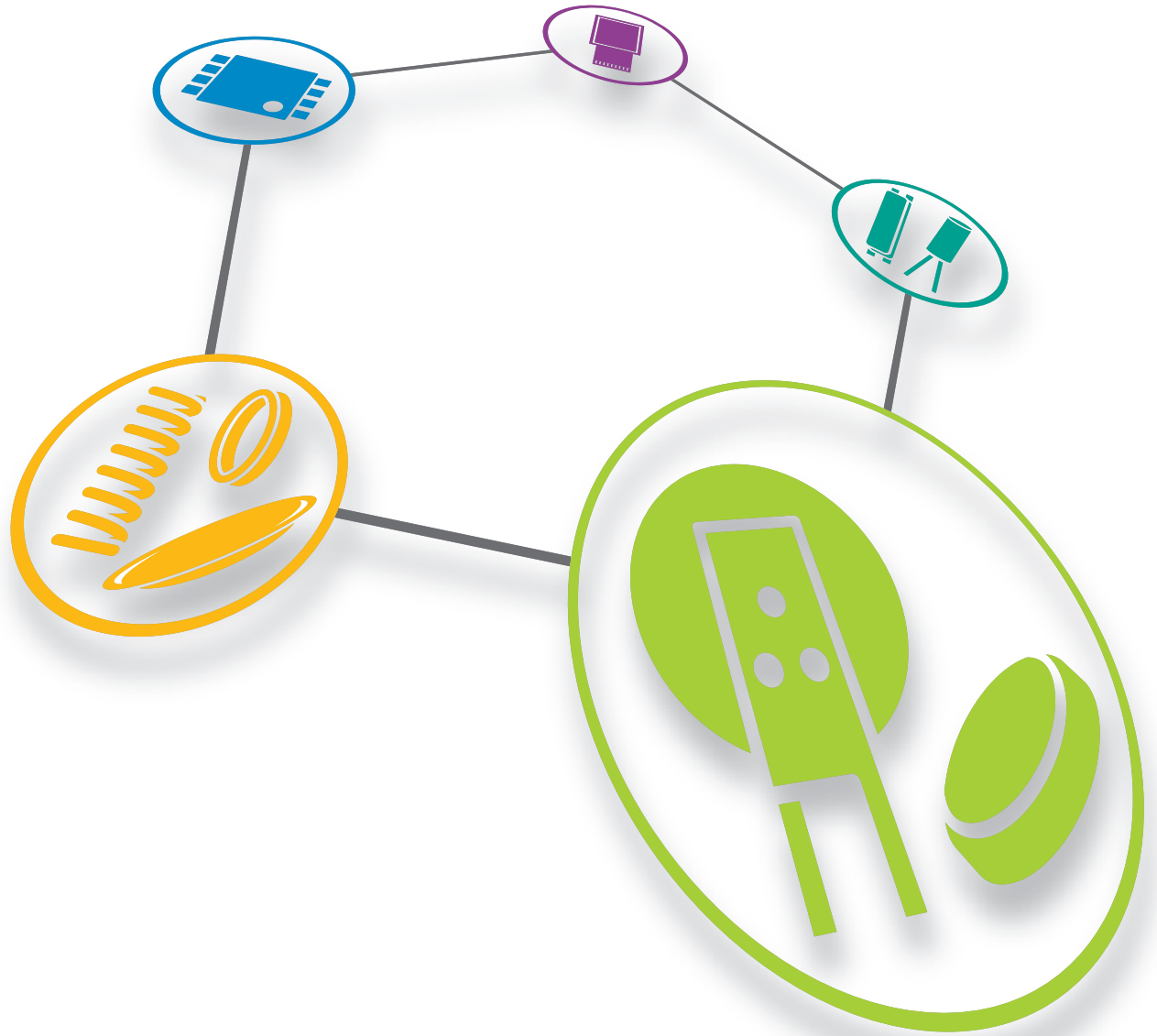


SII



Micro Battery

Product Catalogue 2007-2008



We value the "takumi" spirit.

Seiko Instruments Inc.

NEW



High withstanding ϕ 4mm diameter capacitor

XH414HG

The XH414HG is a 4.8mm-diameter, 1.4mm-high 3.3V type coin-shaped capacitor. Compared to its predecessor (the XH414H), the XH414HG features excellent high current discharge characteristics ranging from 3.3V to 0V. Pb-free reflow (260°C peak temperature) is also supported. It is ideal for memory and RTC backup for cellphone and small portable devices.

FEATURES

- ◆ RoHS directive compliant
- ◆ Pb-free reflowable
- ◆ WEEE not applicable
- ◆ Long cycle life
- ◆ Maximum voltage: 3.3V

APPLICATIONS

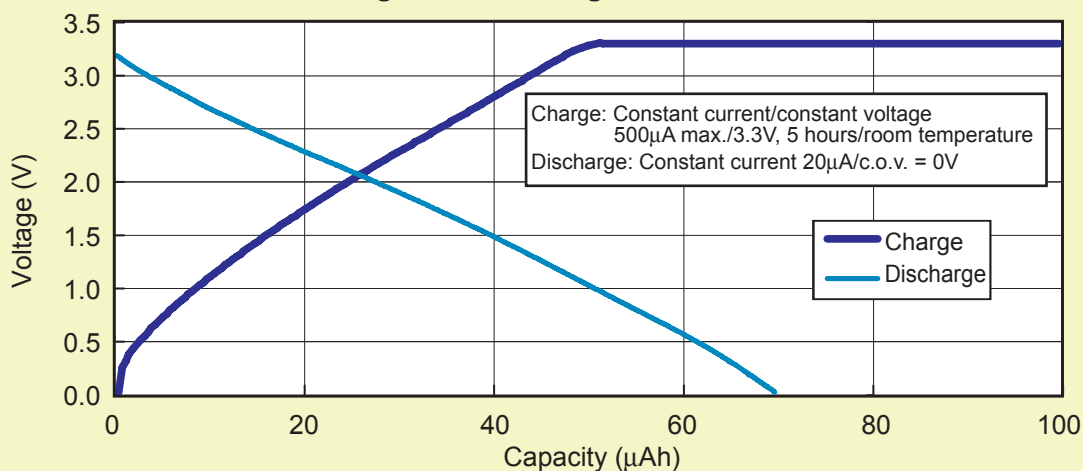
Backup Power for RTC (Real Time Clock) and Memory
Cellphone, Digital still camera
MP3 player, PDA etc.

SPECIFICATIONS

Type	Maximum Allowable Voltage	Capacity (Voltage Range) Capacitance	Internal Impedance	Size		Weight
				Diameter	Height	
XH414HG	3.3V	27 μ Ah (3.3V-2.0V) 0.08F	100 Ω	4.8mm	1.4mm	0.06g

CHARACTERISTICS

Charge and Discharge Characteristics



<APPLICATION NOTES>

• Prohibition ripple charging

A ripple (high frequency fluctuation of voltage) in the charge voltage extremely lowers the capacitor performance. Be sure to charge capacitors with a stable voltage.

• Charge voltage

The age deterioration of the capacitor depends on the charge voltage. The age deterioration is accelerated as charge voltage goes higher.

• Usage environment

Aging degradation of the capacitor varies depending on the usage environment (temperature and humidity). Contact us for further details.



A few decades ago, we commercialized a highly reliable silver oxide battery to meet the requirement of quartz watch development. Since then, we have expanded our microbattery offering and technology to support the increased diversity in electronic products available today.

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

We plan to continuously develop higher performance microbatteries and widen our products lineup to keep up with our emerging technologies.

Please feel free to contact us with any questions you may have.

FEATURES

1. Superior leakage resistance

Even a slight leakage from a battery may interfere with the connections made by the battery terminals, resulting in unstable device operation. Seiko Instruments Inc. offers micro batteries that are highly leak-resistant due to special sealing materials and processing technologies.

2. Large capacity

In order to extend the operating time of devices with limited battery space, the market demands high volumetric efficiency. We offer large-capacity microbatteries developed with proprietary technology utilizing high-purity materials.

3. Stable operating voltage

Carefully compounded ingredients allow each of our micro batteries to have a stable operating voltage over both a wide temperature range and depth of discharge.

4. High reliability

Our micro batteries are manufactured under an integrated system featuring strict quality control, which starts with component manufacturing, through assembly and on to rigorous out-going inspection.

CONTENTS

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MS Lithium Rechargeable Battery	6
HB Lithium Rechargeable Battery	10
TS Lithium Rechargeable Battery	12
TS-H Lithium Rechargeable Battery	13
XH-HG Capacitor	14
Silver Oxide Battery : SEIZAIKEN	18
Precautions for Your Safety	21

Microbattery and Capacitor Lineup

MICROBATTERY AND CAPACITOR FEATURES

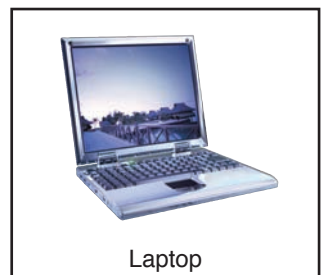
- MS lithium rechargeable battery** : 3V type. Large capacity and high cycle life characteristics in a compact body with excellent overdischarge characteristics featured.
- HB lithium rechargeable battery** : Pb-free reflowable rechargeable batteries made possible by a heat-resistant design, offering a wide charge voltage range and excellent cycle life.
- TS lithium rechargeable battery** : 1.5V type. Charge voltage range from 1.5V to 3.0V is supported while high reliability is achieved.
- TS-H lithium rechargeable battery** : Pb-free reflowable. Sufficient charge/discharge characteristics even under a charge voltage of 1.5V.
- XH-HG capacitor** : Pb-free reflowable capacitor made possible by a heat-resistant design. High capacity and long cycle characteristics are offered.
- Silver oxide battery**: Highly reliable, with a wide selection of variations

Rechargeable battery and capacitor sizes

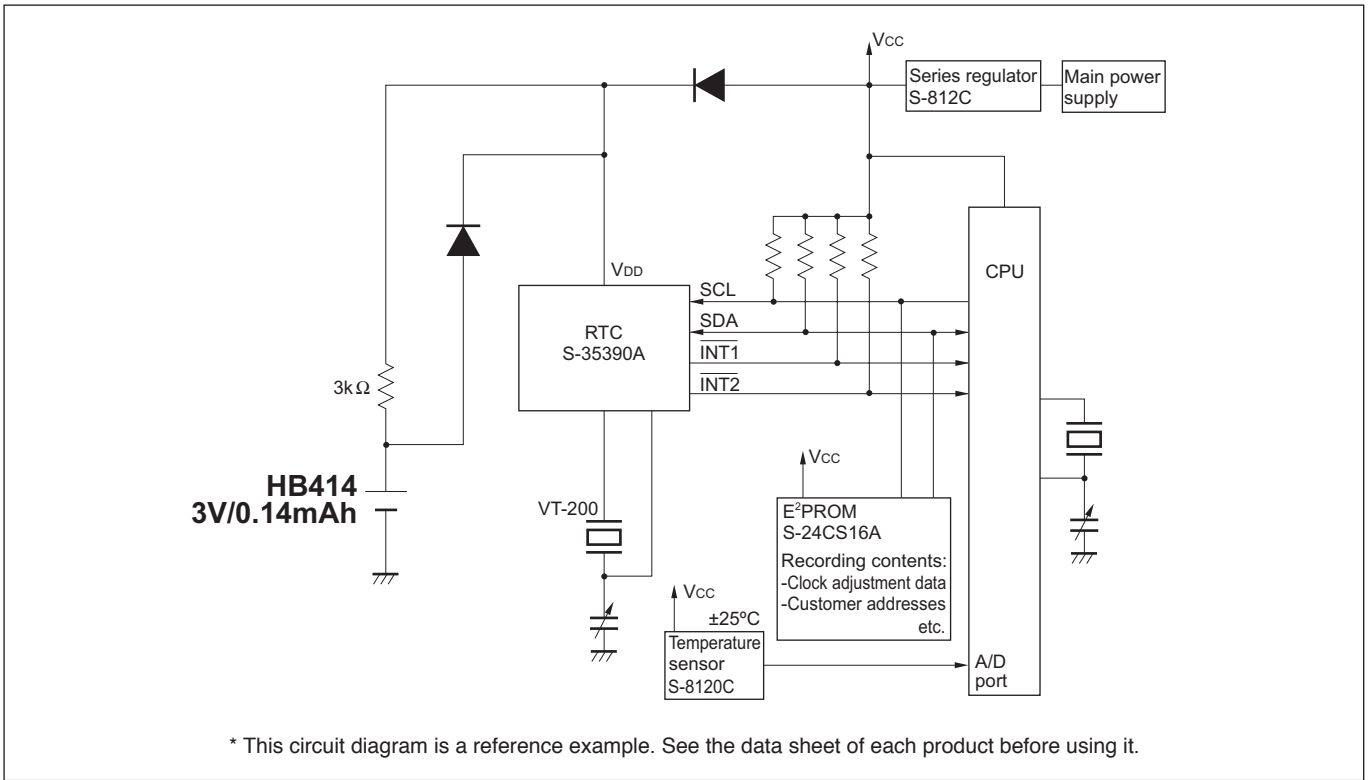
*The circles in the table show actual battery and capacitor sizes.

		SIZE Diameter			
		Φ4.8mm	Φ5.8mm	Φ6.8mm	Φ9.5mm
Height	2.1mm (2.0mm)			MS621FE TS 621FE	MS920SE
	1.8mm		MS518SE TS518FE		
	1.4mm	TS414H HB414 XH414HG		MS614E MS614SE	
	1.2mm	MS412FE			
	0.9mm	XH409HG Under development			

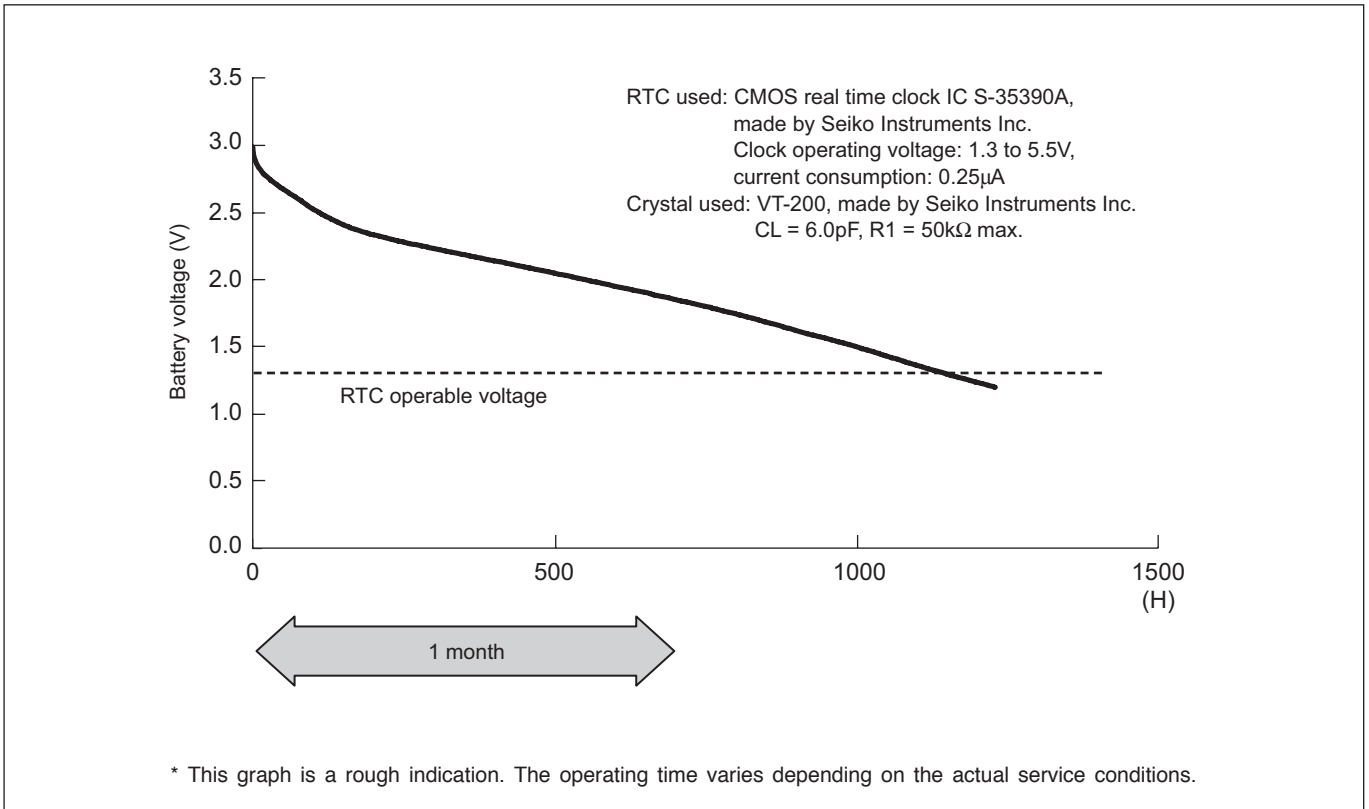
Applications



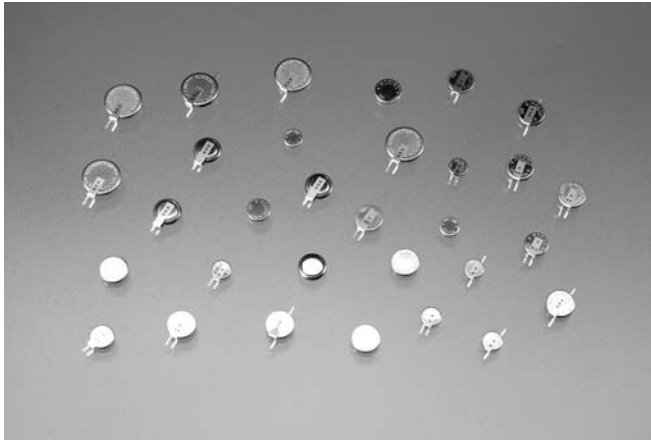
Example of a recommended application circuit: for RTC backup



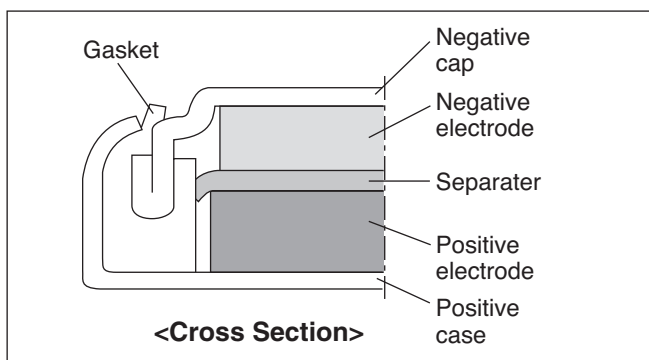
Example of RTC backup time, using HB414



MS412FE/MS518SE/MS614E/MS614SE/MS621FE/MS920SE



MS (Manganese Silicon) lithium rechargeable batteries, developed by Seiko Instruments Inc., use silicon oxide as the anode and a lithium manganese composite oxide as the cathode. As a result, they offer long cycle life and highly stable overdischarge characteristics.



FEATURES

- Large discharge capacity :
For high operational voltage range of 3.3V to 2.0V.
- Long cycle life :
Cycle life of over 100 cycles under charge/discharge conditions of 3.3V to 2.0V (D.O.D.100%).
- Excellent overdischarge characteristics :
Continued stable capacity characteristics even after the battery is overdischarged down to 0.0V.
- Operation over a wide temperature range:
Operating temperature range : -20°C to +60°C
Consult us for using the battery at a temperature beyond the above temperature range.
- RoHS Compliant

APPLICATIONS

- Backup power supply for memory or clock function in various types of electronic equipment for mobile communication, office automation, audio-visual equipment, mobile information equipment, etc. (cellphone, PHS, cordless phone, pager, memory card, fax machine, PC, video camera, digital camera, tuner, handy terminal, PDA, etc.)
- Hybrid power supply in combination with solar cells.
- Main power supply for small and slim portable equipment.

SPECIFICATIONS

Type	Nominal Voltage (V)	Charge Voltage (Standard Charge Voltage) ^{*6} (V)	Nominal Capacity (mAh) ^{*1}	Internal Impedance (Ω) ^{*2}	Standard Charge/Discharge Current (mA)	Maximum Discharge Current (Continuous) (mA) ^{*3}	Cycle Life (Time) ^{*4}		Size (mm)		Weight (g)
							100% ^{*5} D.O.D. (Depth of Discharge)	20% ^{*5} D.O.D. (Depth of Discharge)	Diameter	Height	
MS412FE	3	2.8 to 3.3 (3.1)	1.0	100	0.010	0.10	100	1000	4.8	1.2	0.07
MS518SE	3	2.8 to 3.3 (3.1)	3.4	60	0.010	0.15	100	1000	5.8	1.8	0.13
MS614E	3	2.8 to 3.3 (3.3)	2.3	50	0.015	0.25	100	1000	6.8	1.4	0.17
MS614SE	3	2.8 to 3.3 (3.1)	3.4	80	0.015	0.25	100	1000	6.8	1.4	0.17
MS621FE	3	2.8 to 3.3 (3.1)	5.5	80	0.015	0.25	100	1000	6.8	2.1	0.23
MS920SE	3	2.8 to 3.3 (3.1)	11.0	35	0.050	0.80	100	1000	9.5	2.1	0.47

*1. Nominal capacity: Typical value of discharge capacity between 3.1V and 2.0V (Note that the discharge capacity of MS614E is between 3.3V and 2.0V.)

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

*3. Maximum discharge current indicates the value of a current for approximately 50% of the nominal capacity.

*4. Cycle Life indicates the times charge/discharge is repeated for approximately 50% of the capacity values in the specification sheet.

*5. 100% and 20% are based on nominal capacity.

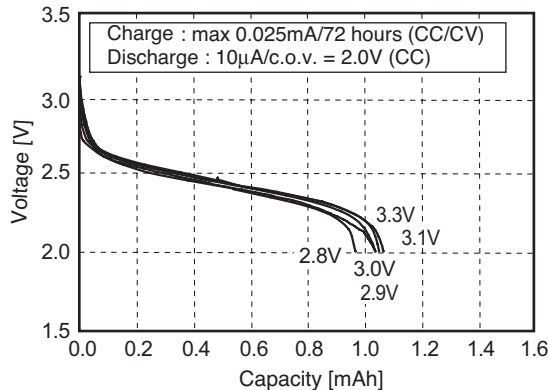
*6. A constant voltage charge is recommended, but due to a limit in charge current, it is necessary to insert a resistor to regulate the charge current.

Contact us for further details.

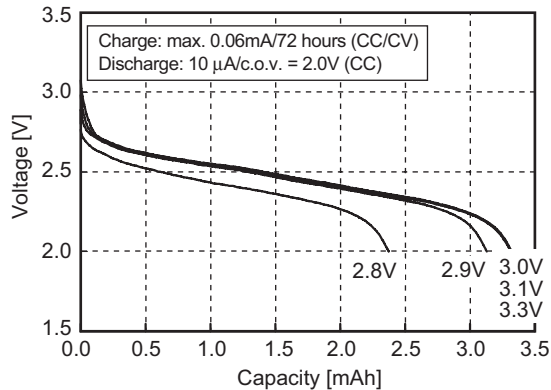
If a constant current charge is required, contact us for more information.

DISCHARGE CHARACTERISTICS (CHARGE VOLTAGE DEPENDENCE)

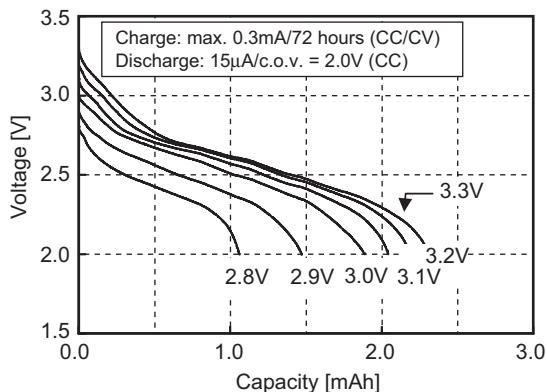
MS412FE



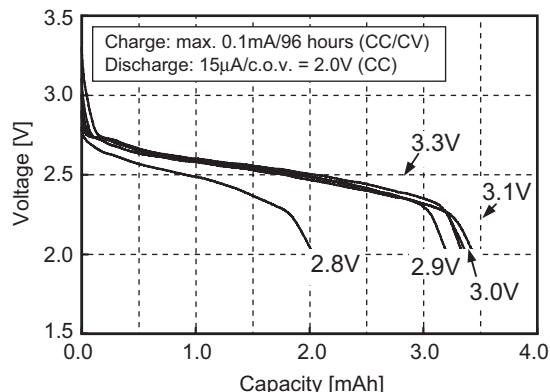
MS518SE



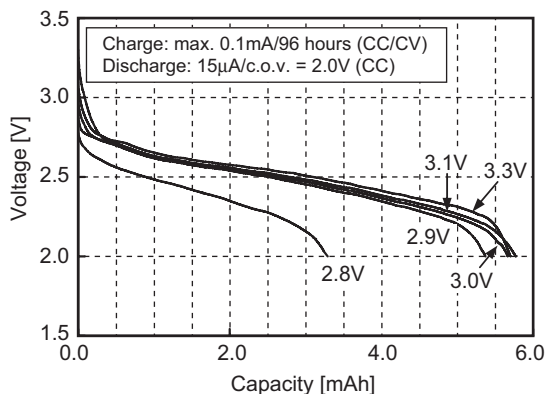
MS614E



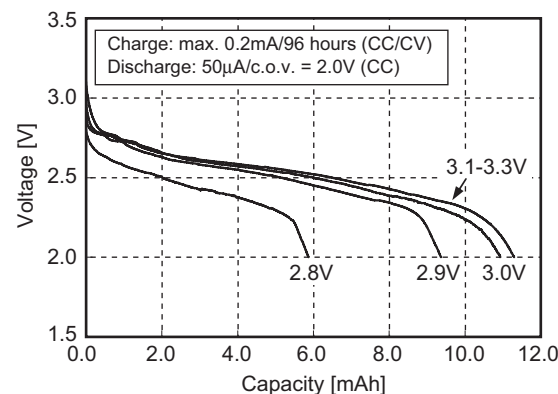
MS614SE



MS621FE



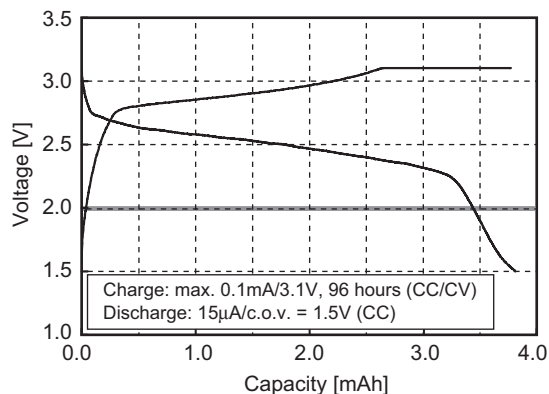
MS920SE



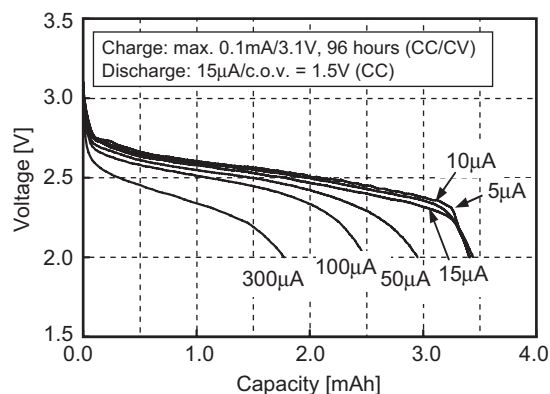
* c.o.v. : Cut Off Voltage (final voltage)

CHARACTERISTICS (MS614SE)

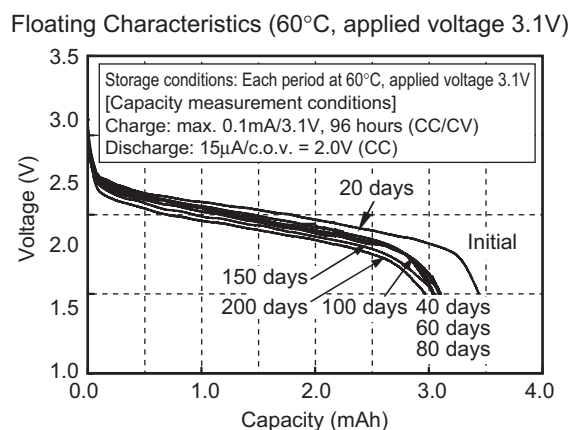
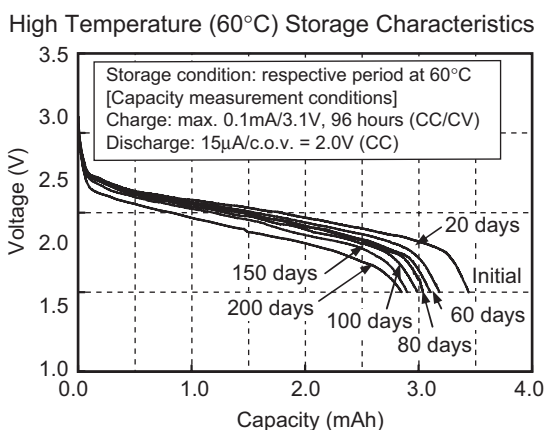
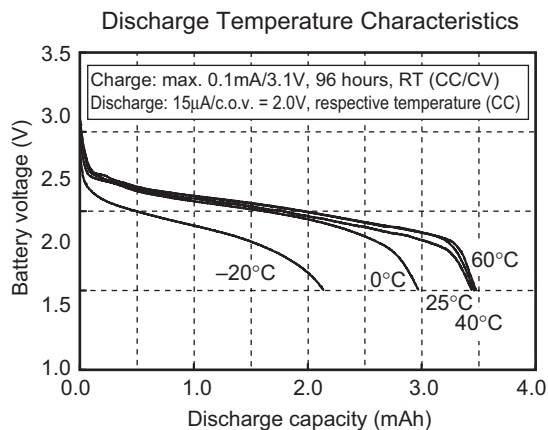
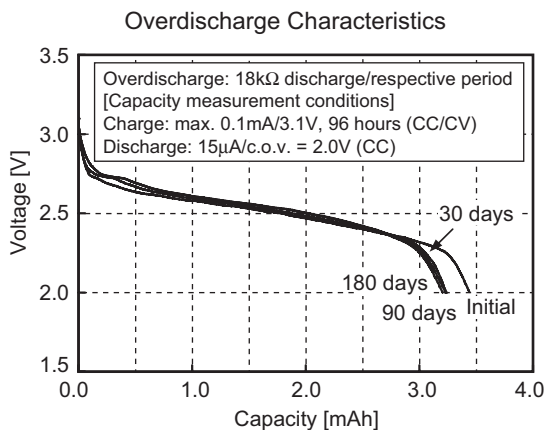
Charge/discharge characteristics



Discharge Characteristics at Various Discharge Current



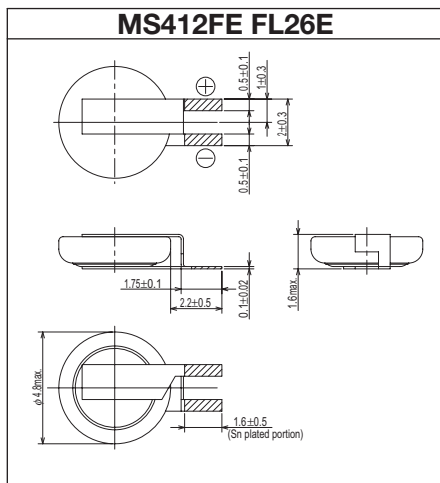
CHARACTERISTICS (MS614SE)



DIMENSIONS OF STANDARD TERMINALS OF MS LITHIUM RECHARGEABLE BATTERIES

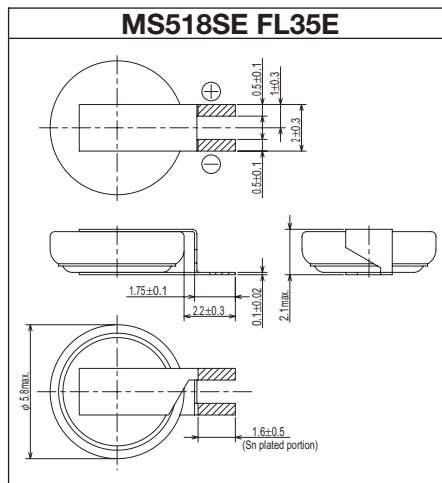
Recommend

MS412FE FL26E

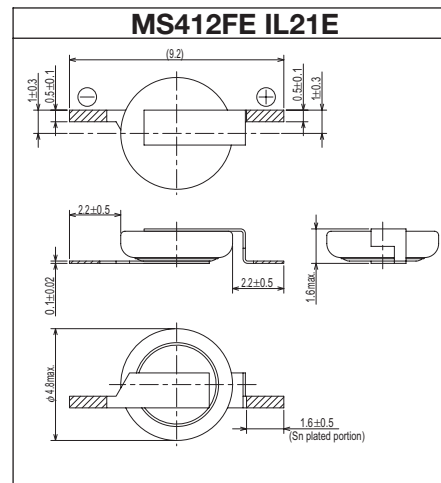


Recommend

MS518SE FL35E



MS412FE IL21E

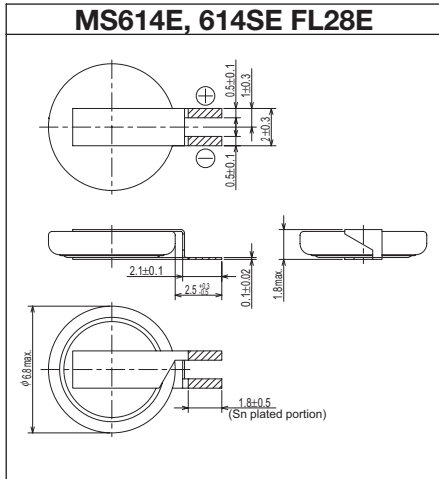


- Contact Seiko Instruments Inc. for batteries with terminals other than the above shapes.
- Units: mm
- The hatched parts are tin plated (Sn: 100%).

DIMENSIONS OF STANDARD TERMINALS OF MS LITHIUM RECHARGEABLE BATTERIES

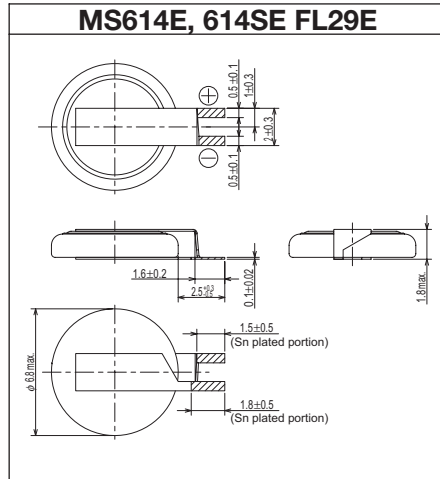
Recommend

MS614E, 614SE FL28E



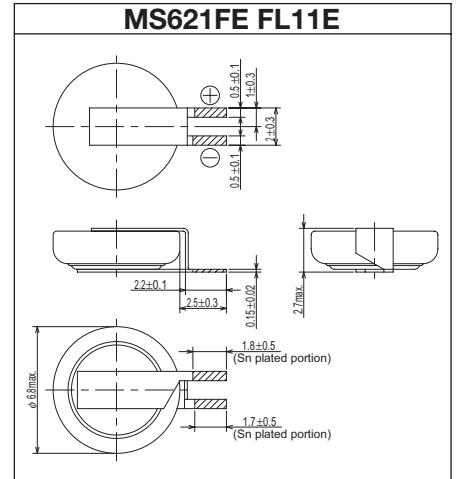
Recommend

MS614E, 614SE FL29E



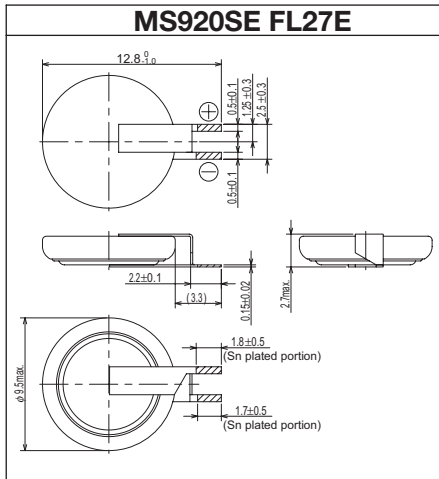
Recommend

MS621FE FL11E

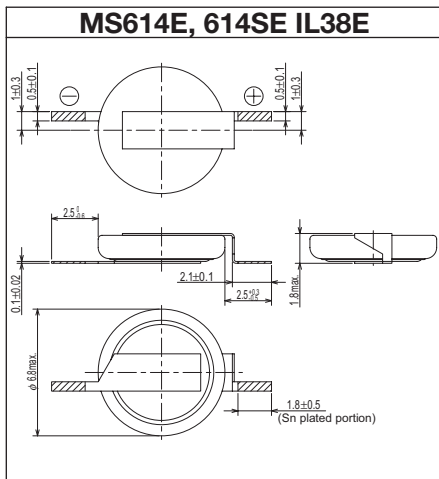


Recommend

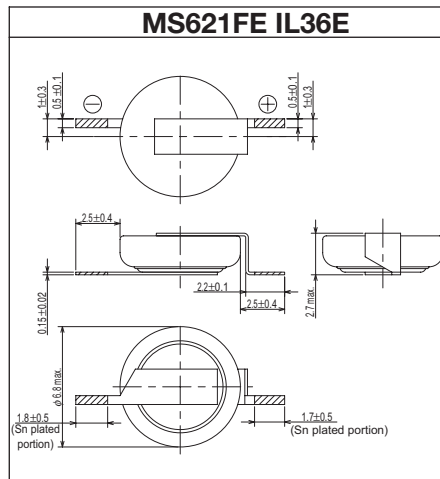
MS920SE FL27E



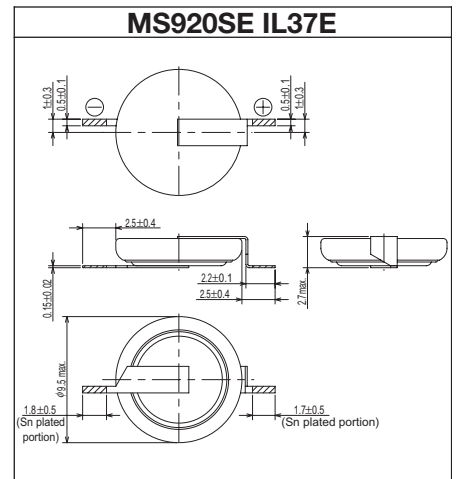
MS614E, 614SE IL38E



MS621FE IL36E



MS920SE IL37E



HB414



HB lithium rechargeable batteries are environment-friendly rechargeable batteries that can be reflowed (automatic mounting by Pb-free soldering) with lead-free solder. Pb-free reflow mounting is achieved by a reinforced heat-resistant structure.

The HB414 features high capacity and a long cycle life with a wide charge voltage range.

FEATURES

- Pb-free reflowable:
Superior heat resistance (260°C peak) allows reflow mounting by Pb-free solder.
- Wide charge voltage range:
Wide charge voltage range allows use with various applications (2.5V to 3.3V).
- High Capacity:
0.3mAh typ. (charge voltage: 3V, cut off: 1.2V)
- Long cycle life:
1,000 cycles or more (10% D.O.D.)
- Excellent overdischarge characteristics
- Wide range of operating temperatures:
Operating temperature range: -20°C to +60°C
For using the battery at a temperature out of the above temperature range, please consult us.
- RoHS Compliant

APPLICATIONS

Backup power supply for memory and clock functions of cellphone, PHS, cordless phone, digital camera, PDA, MD player, game machine, etc.

SPECIFICATIONS

Type	Nominal Voltage (V)	Charge Voltage*3 (V)	Nominal Capacity (Voltage Range V) (mAh)	Internal Impedance*1 (Ω)	Standard Charge/Discharge Current (mA)	Cycle Life*2 (Time)	Diameter (mm)	Height (mm)	Weight (g)
HB414	3.0	2.5 to 3.3	0.3 (3.0 to 1.2) 0.2 (2.5 to 1.2) 0.14 (3.3 to 2.0)	280	0.005	1000 (10% D.O.D.) *4 100 (100% D.O.D.)	4.8	1.4	0.07

*1. Value measured using AC (Alternating Current) method in the fully charged state.

*2. Counts of charge and discharge repetition that maintains about 50% of the minimum guaranteed capacity

*3. A constant voltage charge is recommended, but due to a limit in charge current, it is necessary to insert a resistor to regulate charge current.

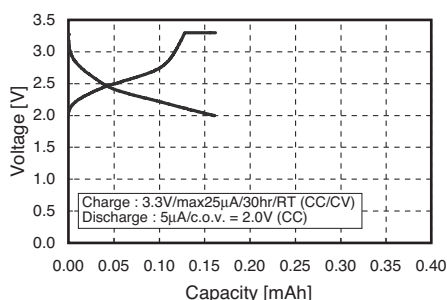
Please contact us for further details.

If a constant current charge is required, please contact us for more information.

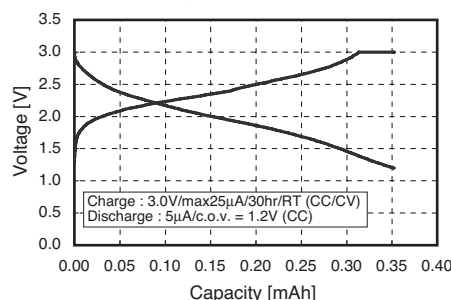
*4. D.O.D. : Depth of Discharge

CHARACTERISTICS

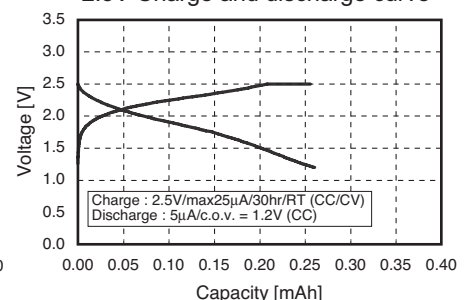
3.3V Charge and discharge curve



3.0V Charge and discharge curve

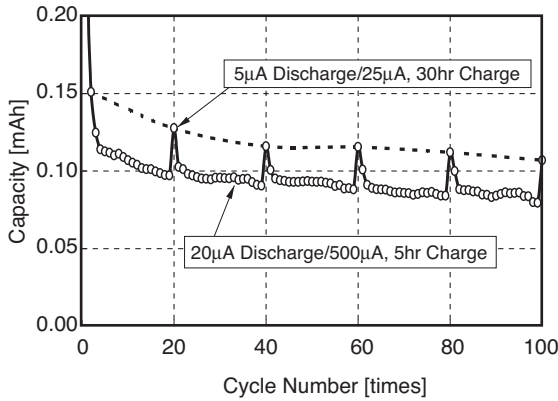


2.5V Charge and discharge curve

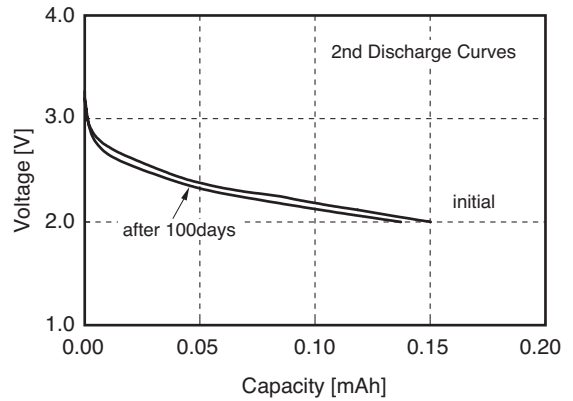


CHARACTERISTICS

Charge/Discharge Cycle Characteristics

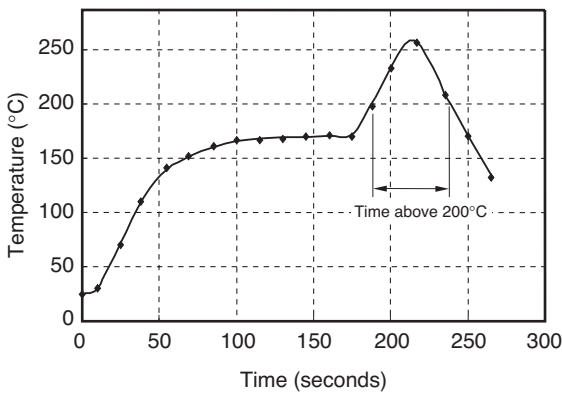


High Temperature Storage Characteristics (60°C)

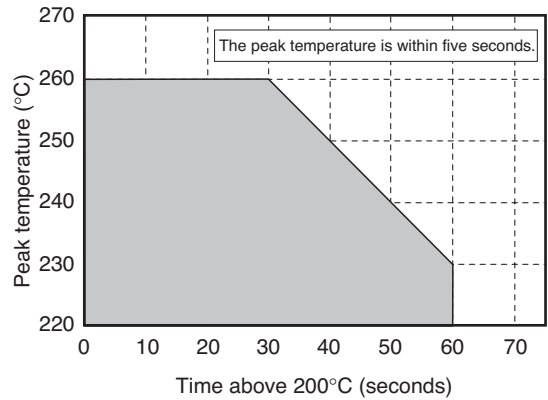


REFLOW SOLDERING CONDITIONS

Reflow Profile Example



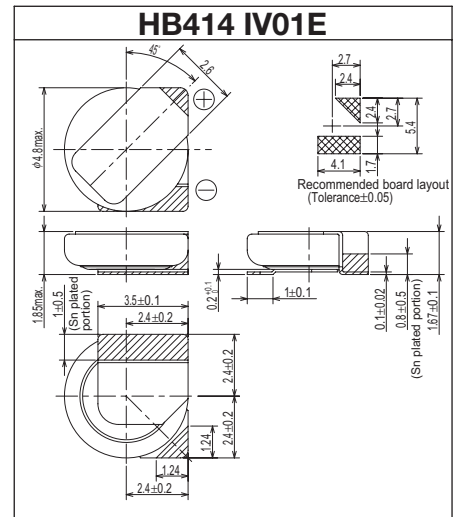
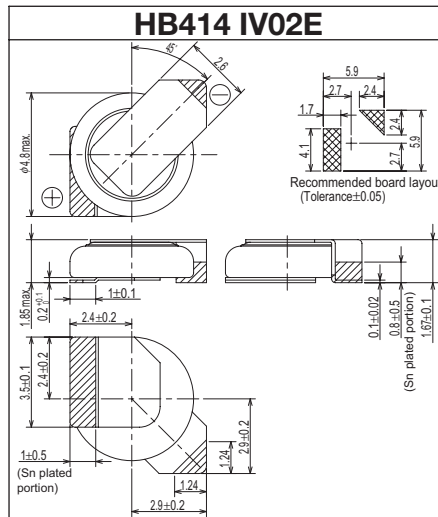
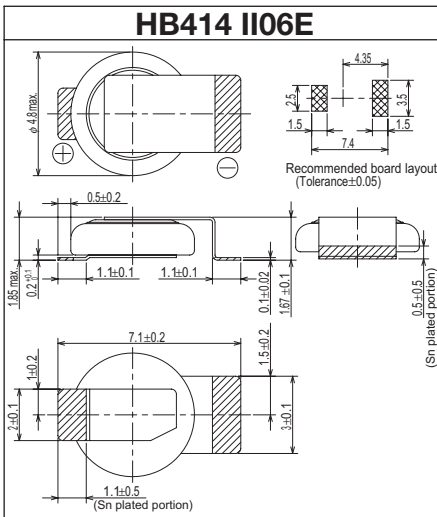
Recommended Reflow Conditions



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

Max. 260 °C (within 5 seconds)

STANDARD TERMINALS



- Please contact Seiko Instruments Inc. for batteries with terminals other than the above shapes.
- Units: mm
- The hatched parts are tin plated (Sn: 100%).

TS518FE/TS621FE



FEATURES

- Low-voltage rechargeable
- High capacity
- Long cycle life: at least 1000 cycles (20% D.O.D.)
- RoHS Compliant

APPLICATIONS

Power backup for the clock function of small portable devices such as cellular and PHS phones

TS lithium rechargeable batteries are high capacity 1.5V type non-reflowable rechargeable batteries that provide sufficient discharge capacity with a charge voltage of less than 2.0V, and are intended for support of recent low-operating-voltage mobile devices.

SPECIFICATIONS

Type	Nominal Voltage (V)	Charge Voltage (V) ^{*3}	Nominal Capacity (Voltage Range V) (mAh)	Internal Impedance ^{*1} (Ω)	Standard Discharge Current (mA)	Cycle Life ^{*2} (Time)	Diameter (mm)	Height (mm)	Weight (g)
TS518FE	1.5	1.5 to 3.0	1.5 (1.5 to 1.0) 2.5 (1.8 to 1.0)	120	0.015	1000 (20% D.O.D.) ^{*4} 50 (100% D.O.D.)	5.8	1.8	0.12
TS621FE	1.5	1.5 to 3.0	4.2 (2.3 to 1.0)	80	0.015	1000 (20% D.O.D.) ^{*4} 50 (100% D.O.D.)	6.8	2.1	0.22

*1. Value measured using an AC (Alternating Current) method in the fully charged state.

*2. Counts of charge and discharge repetition that maintains about 50% of the minimum guaranteed capacity

*3. A constant voltage charge is recommended, but due to a limit in the charge current, it is necessary to insert a resistor to regulate the charge current.

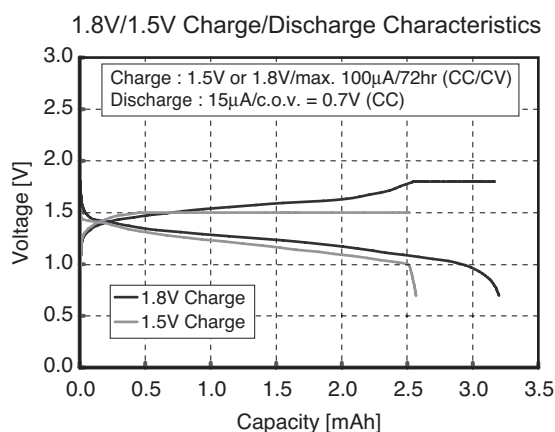
Please contact us for further details.

If a constant current charge is required, please contact us for more information.

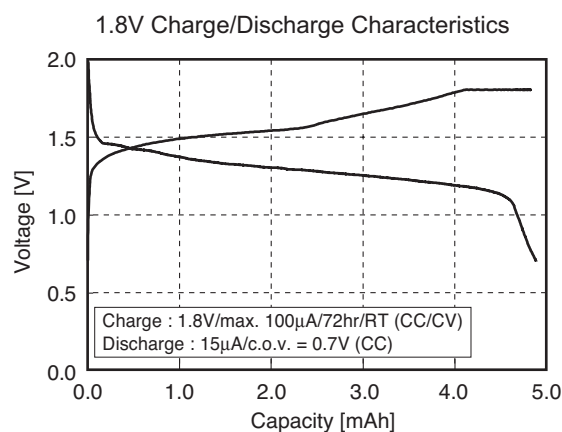
*4. D.O.D. : Depth of Discharge

CHARACTERISTICS

TS518FE

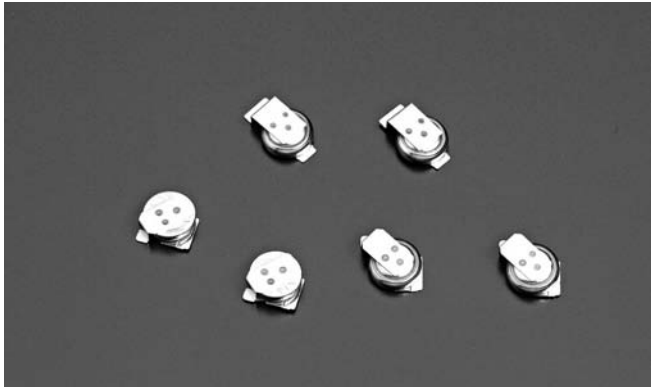


TS621FE



* c.o.v. : Cut Off Voltage

TS414H



FEATURES

- Rechargeable at low voltage
- Pb-free reflowable: 260°C heat resistant design
- Ultra-small terminals (IV01E) allow space-saving
- RoHS Compliant

APPLICATIONS

Power backup for the clock function of small portable devices such as cellphone and PHS phone

TS-H lithium rechargeable batteries are 1.5V high capacity Pb-free reflowable rechargeable batteries with a charge voltage of less than 2.0V intended to support of recent low-operating-voltage mobile devices.

SPECIFICATIONS

Type	Nominal Voltage (V)	Charge Voltage ^{*3} (V)	Nominal Capacity (Voltage Range V) (mAh)	Internal Impedance ^{*1} (Ω)	Standard Discharge Current (mA)	Cycle Life ^{*2} (Time)	Diameter (mm)	Height (mm)	Weight (g)
TS414H	1.5	1.5 to 3.0	0.2 (1.6 to 0.9)	350	0.005	1000 (20% D.O.D.) 100 (100% D.O.D.) ^{*4}	4.8	1.4	0.07

*1. Value measured using AC (Alternating Current) method in the fully charged state.

*2. Counts of charge and discharge repetition that maintains about 50% of the minimum guaranteed capacity

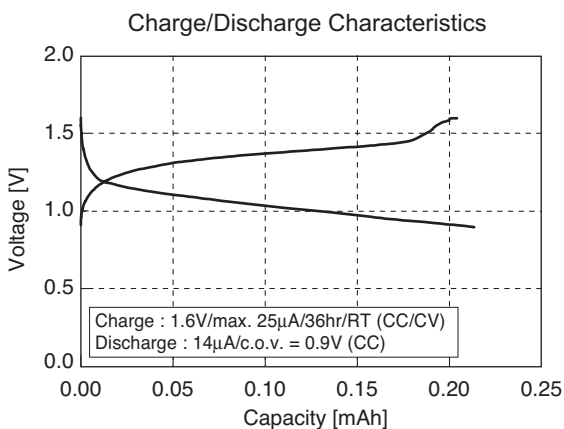
*3. A constant voltage charge is recommended, but due to a limit in charge current, it is necessary to insert a resistor to regulate charge current.

Please contact us for further details.

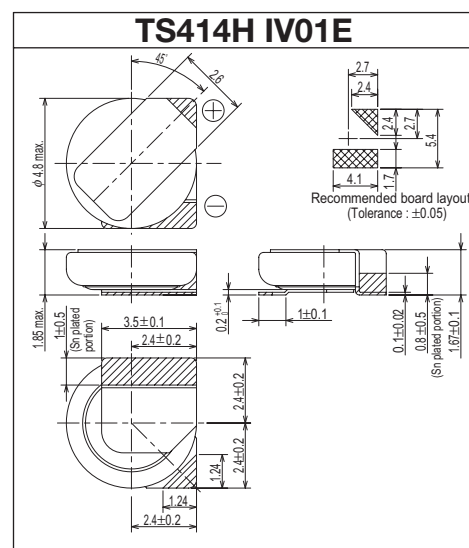
If a constant current charge is required, please contact us for more information.

*4. D.O.D. : Depth of Discharge

CHARACTERISTICS

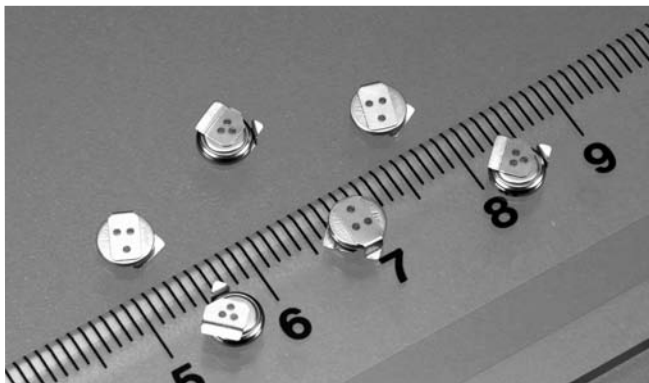


STANDARD TERMINALS



Units: mm

XH414HG/ XH409HG (Under development)



The XH-HG is a capacitor with an excellent large current discharge characteristic at least 3 V, compared to its predecessor (XH414H). It is an environmentally friendly product that is reflow mounted by Pb-free soldering. It features high capacity, and long-term reliability, as well as a wide operating voltage range. It is thus suitable for backup power supply of clock and memory functions of mobile and information devices.

FEATURES

- Pb-free reflowable:
Superior heat resistance (260°C peak) allows reflow soldering by Pb-free solder
- Wide operating voltage range from 0V to 3.3V
- High capacity: 0.08F with "414" size
- Long Cycle Life:
At least 10,000 times of charge/discharge
- Simple charging circuit (constant voltage charging)
- Wide operating temperature range:
Operating temperature range: -20°C to +60°C

APPLICATIONS

Backup power supply for memory and clock functions of cellphone, PHS, cordless phone, digital still camera, PDA, MD player, game machine, and printer, etc.

SPECIFICATIONS

Type	Electrical Specifications (Normal Temperature) ^{*1}			Size		Weight (g)
	Maximum Use Voltage (V)	Capacitance (F)	Internal Impedance ^{*2} (Ω)	Diameter (mm)	Height (mm)	
XH414HG	3.3	0.08	100	4.8	1.4	0.06
XH409HG (under development)	3.3	(0.05)	(100)	4.8	0.9	0.05

*1. Normal temperature: 23°C ± 3°C. Electrical characteristics and aging degradation of the products depend on temperature.

*2. Value measured using AC (Alternating Current) method at the fully charged state.

<APPLICATION NOTES>

• Prohibition ripple charging

A ripple (high frequency fluctuation of voltage) in the charge voltage extremely lowers the capacitor performance.

Be sure to charge capacitors with a stable voltage.

• Charge voltage

The age deterioration of the capacitor depends on the charge voltage.

The age deterioration is accelerated as charge voltage goes higher.

• Usage environment

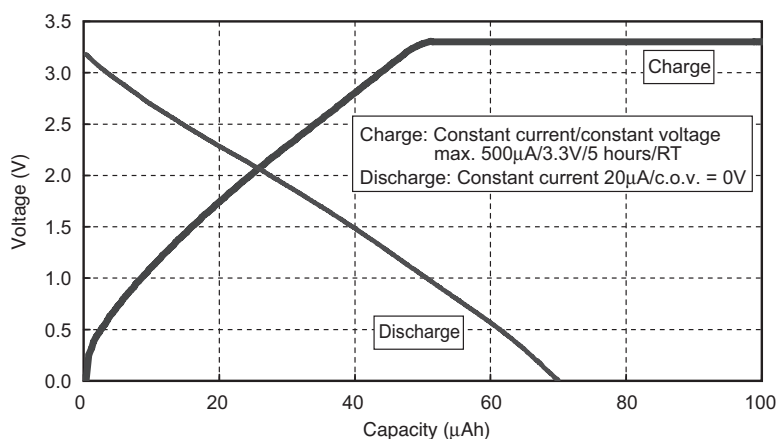
Aging degradation of the capacitor varies depending on the usage environment (temperature and humidity).

Contact us for further details.

CHARACTERISTICS

Charge/discharge characteristics

XH414HG

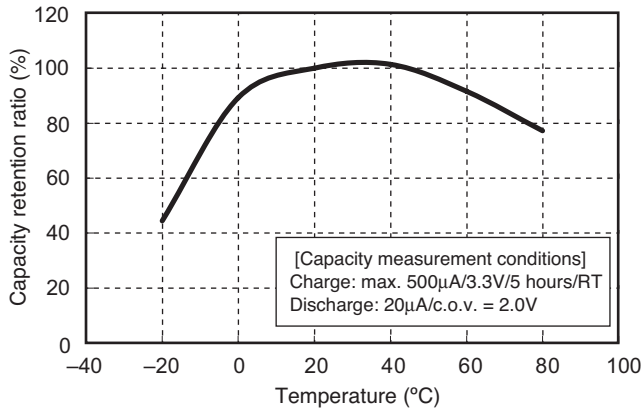


CHARACTERISTICS

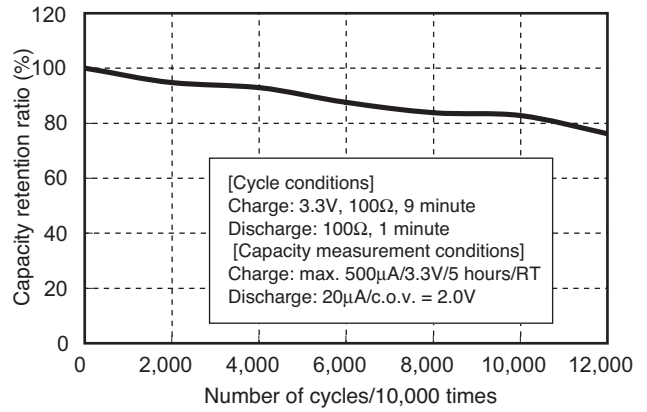
Storage and other characteristics

XH414HG

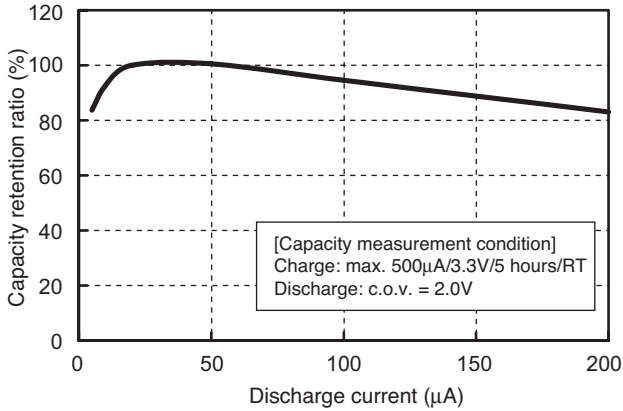
Temperature Characteristics



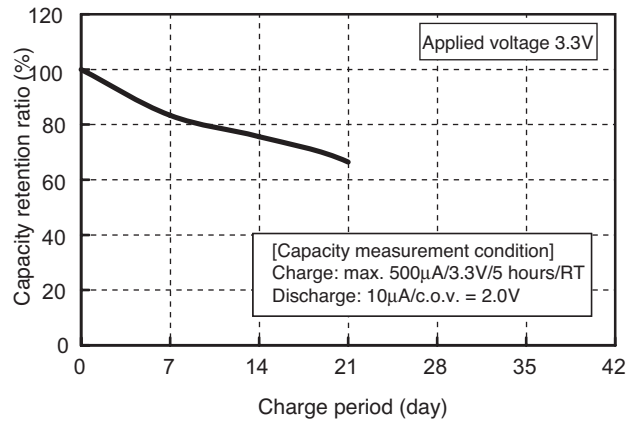
Charge/discharge Cycle Characteristics



Discharge Current Characteristics

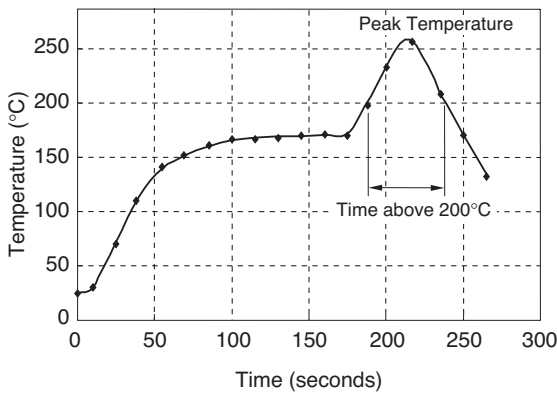


Floating Characteristics (70°C, 50%RH)



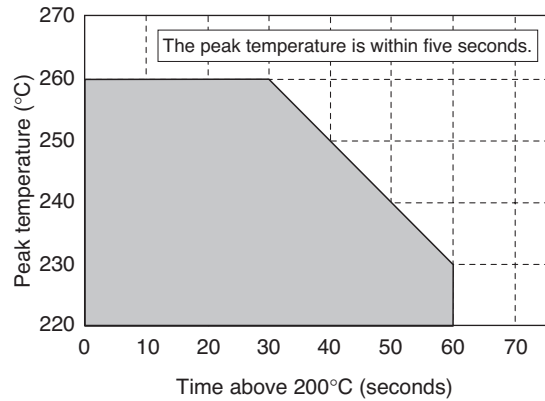
REFLOW SOLDERING CONDITIONS

Reflow Profile Example



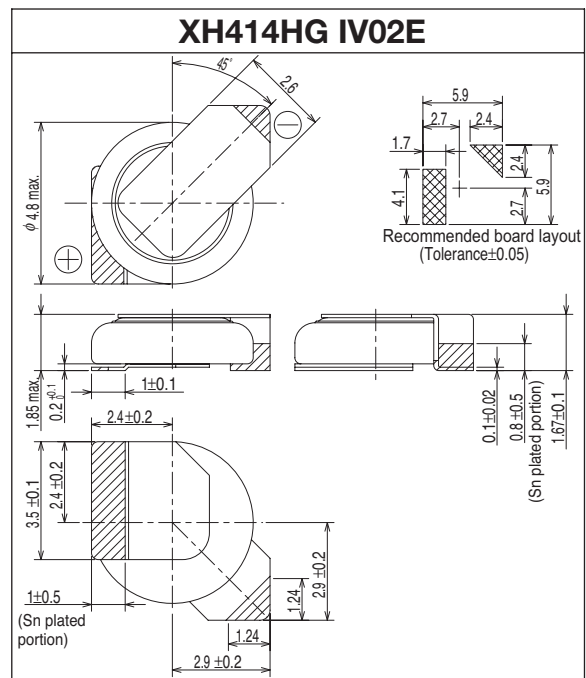
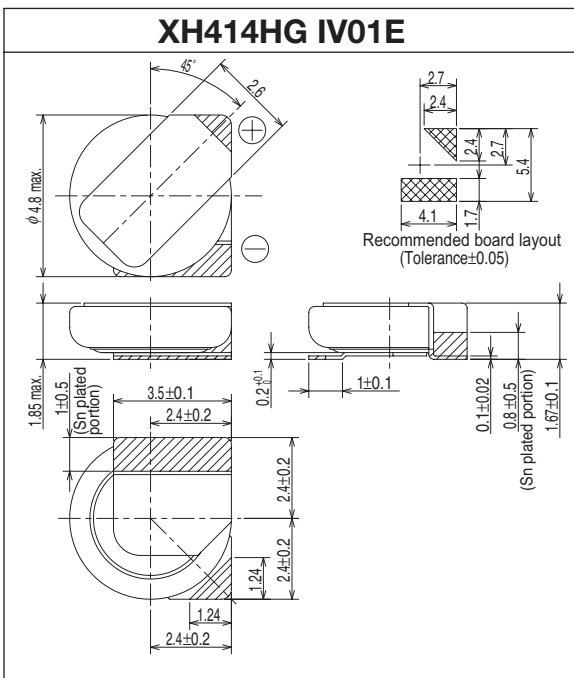
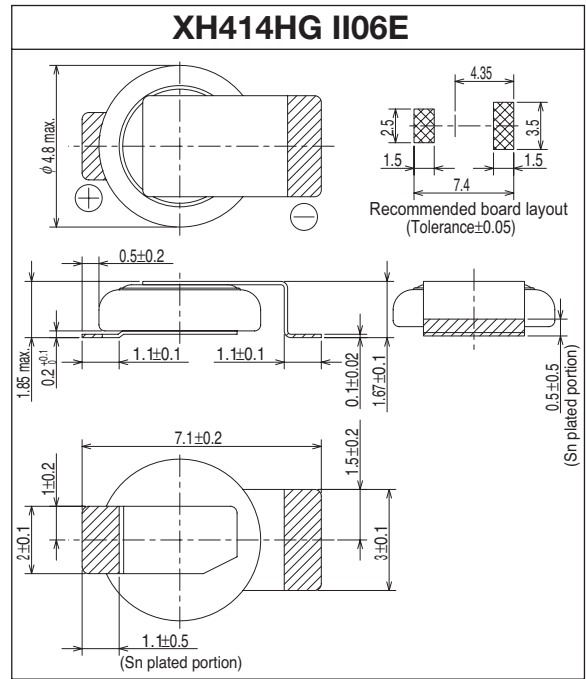
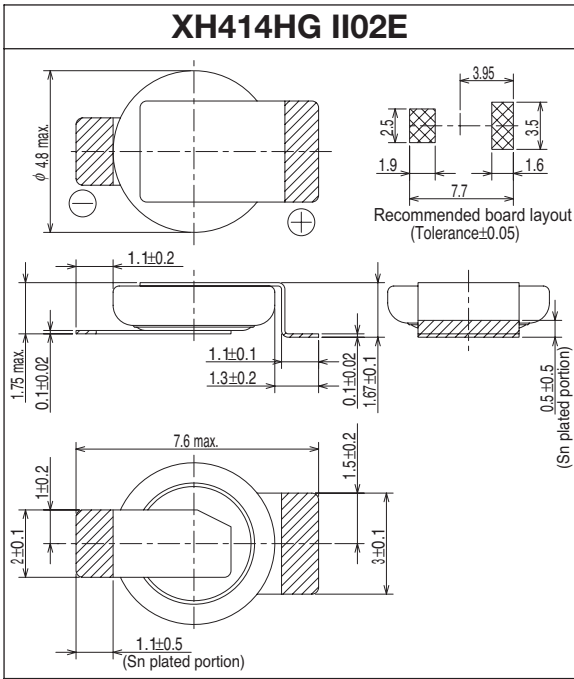
The times of repeated reflow soldering must be two times or less.
The Temperature must be measured at top of the cell.

Recommended Reflow Condition



Max.260°C (within 5 seconds)

STANDARD TERMINALS



- Contact Seiko Instruments Inc. for batteries with terminals other than the above shapes.
- Units: mm
- The hatched parts are tin plated (Sn: 100%).

Microbattery and Capacitor Selection Check Sheet

CHECK SHEET

If you are considering the purchase of one or more of our microbatteries and capacitors, please complete this check sheet and send it to us. We will let you know which products will be optimum for you to use.

Fax Sheet

Micro-Energy Division Sales Sec. +81-43-211-8034 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 date

mm / yy

5. Operation voltage of the device for backup

V to V

6. Consumption current at backup time

mA • μ A

7. Setting value of charging voltage

V

8. Presence of reverse current protection diode

Yes • No

9. Vf characteristics of the reverse current protection diode(at 10 μ A)

V

10. Resistance value of charging protection resistance

Ω

11. Limit of charging time

12. Required cycle life

times

13. Other requests

14. Expected life (e.g., xx years or backup for xx hours)

15. Ambient temperature and humidity

Your contact information

Name

Section

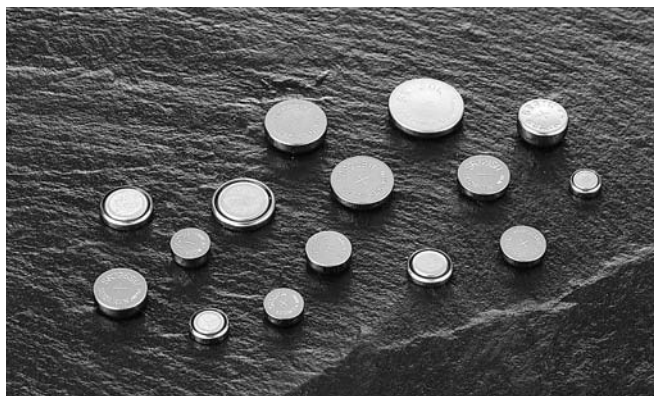
Phone

Fax

E-mail

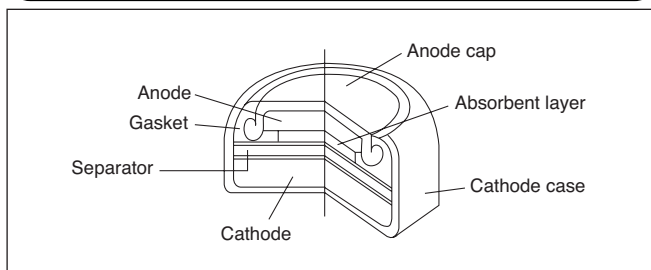
Silver Oxide Battery : SEIZAIKEN

SEIZAIKEN is our trademark for silver oxide battery globally acknowledged in the quartz watch market.



SEIZAIKEN SR Batteries use silver oxide as the cathode, zinc as the anode, and sodium hydroxide solution or potassium hydroxide solution as the electrolyte. These batteries offer a large capacity and stable voltage characteristics. SEIZAIKEN Batteries are widely used in products demanding high accuracy, such as quartz watches.

CROSS SECTION



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					
	SR516SW		12.5			1.65	0.18	317					
	SR521SW		16		2.15	0.23	379						
	SR527SW		22		2.70	0.30	319						
	SR616SW		15		6.80	1.65	0.23	321					
	SR621SW		23			2.15	0.30	364					
	SR626SW		28		2.60	0.37	377						
	SR712SW		11		7.90	1.25	0.24	346					
	SR716SW		21			1.65	0.33	315					
	SR721SW		28		2.10	0.42	362						
	SR726SW		34		2.60	0.52	397						
	SR41SW		45		9.50	3.60	0.67	384					
	SR916SW		27			1.65	0.51	373					
	SR920SW		46		2.05	0.58	371						
	SR927SW		55		2.70	0.78	395						
SR1120SW	53	11.60	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		7.90	2.10	0.41					361	
	SR726W		34	2.60		0.52	396						
	SR41W		45	9.50	3.60	0.67	392						
	SR920W		42		2.05	0.56	370						
	SR927W		53	10	2.70	0.77	399						
	SR1120W				15	11.60	2.05	0.93	391				
										1.40		1.05	
												1.20	

*1. Discharged to 1.2V

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

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

Diameters from 4.8mm to 11.6mm, with heights from 1.2mm to 3.6mm.

Users can select the most suitable battery for their applications.

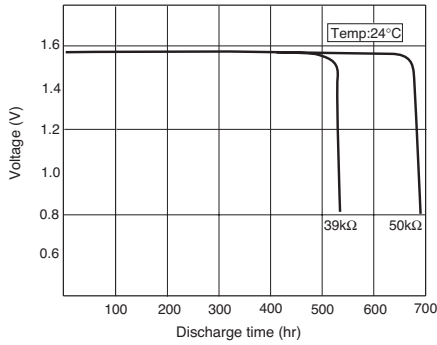
APPLICATIONS

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

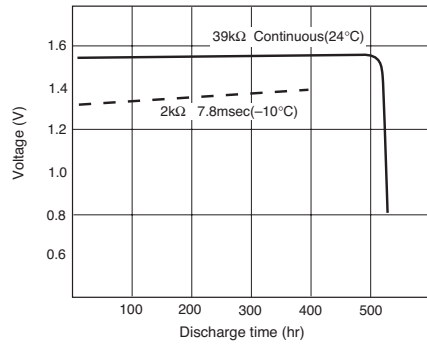
CHARACTERISTICS

SR621SW

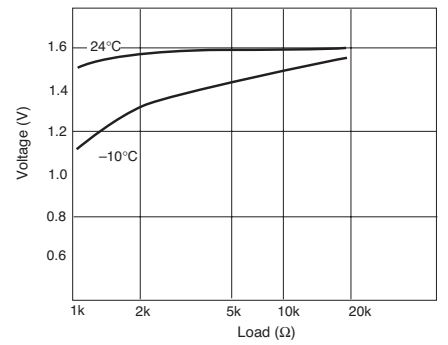
Load-discharge characteristics



Pulse-discharge characteristics

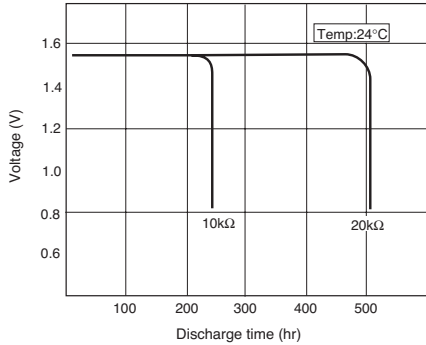


Load-temperature-voltage characteristics

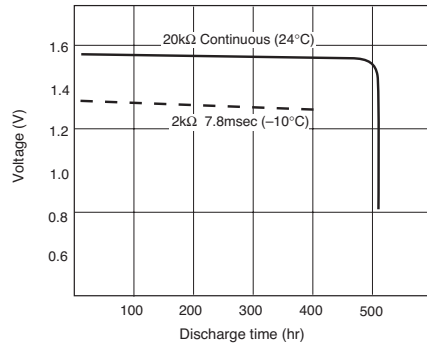


SR920SW

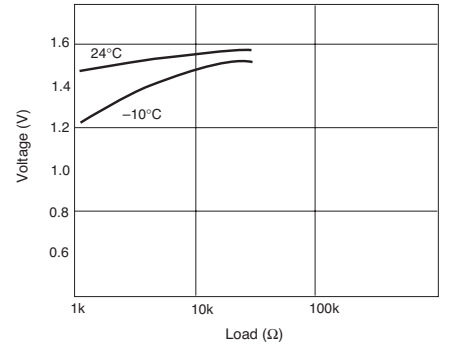
Load-discharge characteristics



Pulse-discharge characteristics

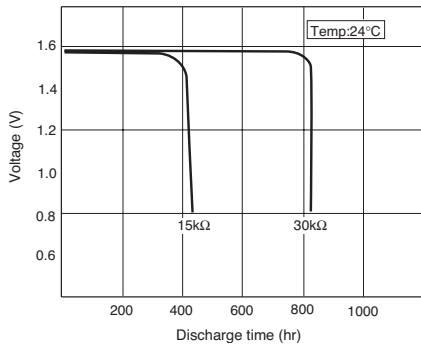


Load-temperature-voltage characteristics

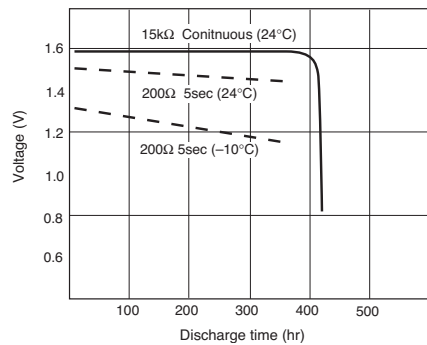


SR41W

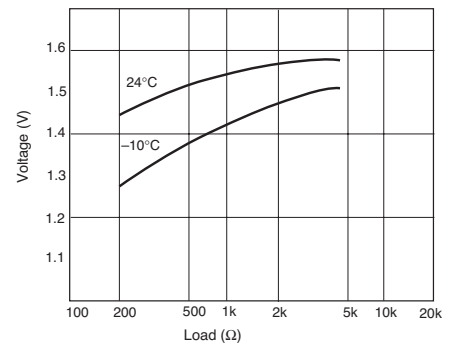
Load-discharge characteristics



Pulse-discharge characteristics

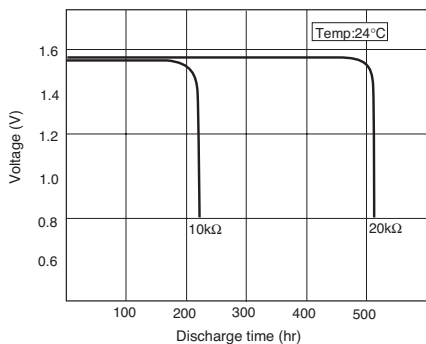


Load-temperature-voltage characteristics

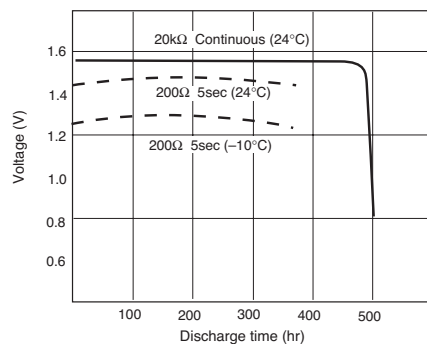


SR920W

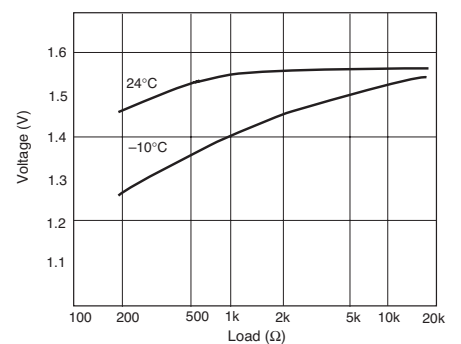
Load-discharge characteristics



Pulse-discharge characteristics



Load-temperature-voltage characteristics



Environmental Activities at Micro-Energy Division

Environment & Quality Policy

Micro-Energy Division is located in Ayashi, a city with beautiful nature, in Miyagi Prefecture. Our aim is to provide customer satisfaction and harmony with the environment through all our products, from Micro battery to other electronic products, and sales activities.

1. We adhere firmly to laws, regulations and customers' specified requirements.
2. We aim to prevent pollution and to reduce CO₂.
3. We set goals, take actions, conduct regular reviews, and improve the system and performance continuously.
4. We contribute to the society by supporting green procurement, developing green products, and promoting green life activity.
5. We adhere to regulations and recommendations regarding Chemical substance content in our products and will promote reduction and replacement.
6. We vigorously educate ourselves and try to engage voluntarily in green life activity.

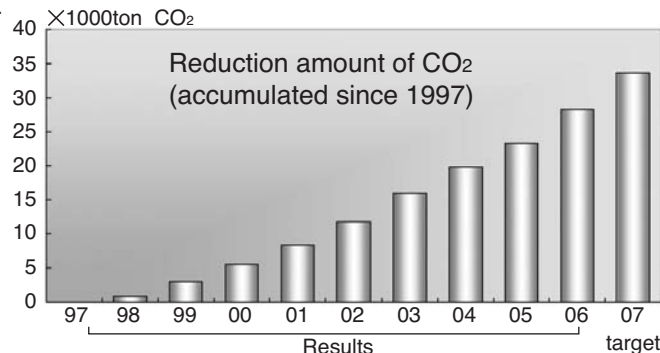
Based on the above policy, the following six environmental approaches are now being implemented throughout Micro-Energy Division.

1. Enrich the line up of Eco-Products

We have applied our company's regulations, which are equivalent to ISO14021 (Type II Environmental Labeling), and at the end of FY2006 green products accounted for 100% of our product line. Our strong commitment to preserving the Environment will continue and will strive to have higher Grade Green Standards.

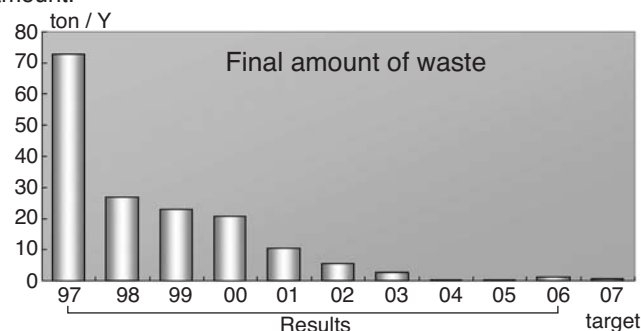
2. Reduction of Greenhouse Gas

While increasing our production volume, we also practice various CO₂ reduction measures like using Eco-machinery. Since 1997, we have successfully reduced a total of 28,000 tons of CO₂. We believe our efforts contribute to the prevention of global warming.



3. 3R Promotion Activity

We promote the reduction in the use of unnecessary goods, and re-use of returned boxes. We also promote recycling at the end of the production process. With these activities, we have reduced the final Non-recyclable byproducts to less than 1% of the 1997 amount.



4. Emission of Chemical Substances

We set up our goal to reduce emissions of chemical substances defined in the Pollutant Release and Transfer Register (PRTR) law, by 50% in three years. In order to achieve this goal, we deploy chemical substance emission reduction procedures.

5. Green Purchasing

We adhere to a green purchasing campaign through the purchase of ingredients, manufacturing materials, and other necessary products, whenever appropriate.

6. Green Life

With the participation of all of Micro-Energy Division members, we deploy a clean-up and beautification campaign in all areas surrounding our factory twice a year. In addition, we have recently participated in the cleanup activity at Hirose River.

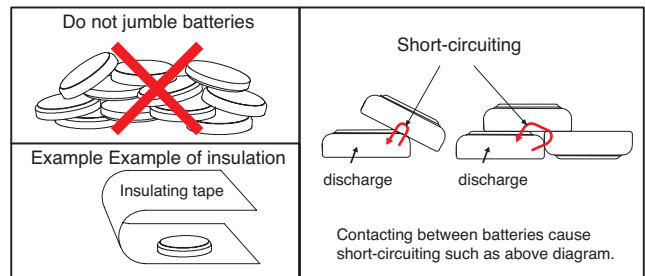
Precautions for Your Safety

Micro-Energy Division Lithium rechargeable batteries (MS, HB, TS, TS-H) contain flammable organic solvents. For your safety, please follow the 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 causing 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 of 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 the cell drops down.
- **Pay attention to soldering by tips**
Do not touch the battery by solder chips, when 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 may 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 SII Micro Parts Ltd Lithium rechargeable batteries can be transported being not subject to the provisions of dangerous goods, if they meet the following requirements.
- <Lithium content>** The Lithium-equivalent content is not more than 1.0g.
 - <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.
 - <Strong packaging>** Batteries are separated so as to prevent short circuits and are packed in strong packaging.
 - <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.
 - <Not Restricted Declaration>** Each shipment must be accompanied with a document indicating that the packages contain lithium batteries and that special procedures should be

- followed in the event that a package is damaged.
- <Package Drop Test>** Each packages is capable of withstanding a 1.2 m drop test in any orientation without damage to batteries contained.
 - <Weight Limit>** Except in the case of packed with equipment, packages may not exceed 30 kg gross mass.
 - <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

Micro-Energy Division capacitors (XH-HG) contain flammable organic solvents. For your safety, please follow the following prohibitions.

WARNING!

- **Do not charge by high current or high voltage.**
Doing so may generate gas inside the capacitor, resulting in 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.

For using SII Silver Oxide batteries, please follow the 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 material.**

IMPORTANT

1. The information herein is subject to change without notice.
2. Neither reproduction, duplication nor unauthorized use 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 ("Products") may be different from the actual colors. Check colors on actual products before using the Products.
4. Circuits and respective application methods described herein are for reference only. Seiko Instruments Inc. shall not be liable for any damages or losses resulting from any claim by third parties that any Products or application methods described herein infringe any right intellectual property

- right. All intellectual property rights with respect to the Products belong exclusively to Seiko Instruments Inc.
- Seiko Instruments Inc. does not grant users of the Products any right or license to the Products hereunder.
5. When Products 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 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.

Micro-Energy Division PRODUCT LINEUP

All products comply with the RoHS directive

Silver Oxide Battery



Having a high energy density per unit volume, the large electric capacity of these batteries is about twice that of alkaline-manganese batteries. Moreover, their voltage characteristics are stable, so they are mainly used in quartz watches, which require high accuracy, but they are also used in other precision devices, such as clinical thermometers.

Applications

- Quartz watches requiring high accuracy
- Thermometers



Rechargeable Battery / Capacitor



From the smallest and thinnest heat-resistant reflowable batteries, we offer a wide product lineup to meet market ranging needs. The quality and reliability of our rechargeable batteries are so high that they enjoy the market share in the world. They are used in a broad wide range of applications, such as cell phones, digital cameras, Portable GPS, and others.

Applications

- Cellphone
- Digital camera
- GPS



Magnet (Rare Earth Magnet)



Manufactured by an integrated process extending from raw materials to finishing, our DIANET is a samarium-cobalt (SmCo) magnet offering high performance, accuracy, and quality.

DIANET is used in stepping motors for wristwatches, but it is used in other, ever expanding, applications, including micro-electronic parts for audio and telecommunications devices; reflow-mounted thin, compact devices; and microelectromechanical systems (MEMS).

Applications

- Motors
- Audio devices
- Telecommunication systems
- Other state-of-the-art devices and systems



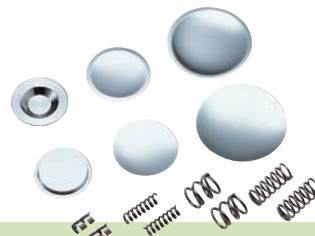
Special Metal Material



Our special metal materials were originally developed as springs for mechanical watches. Their superior properties of elasticity, durability, corrosion and heat resistance allow them to be used in a broad spectrum of fields, including medical materials, small precision springs, and metallic diaphragms.

Applications

- Materials for medical materials
- Super-precision springs
- Metallic diaphragms





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.



Micro-Energy Division who manufactures the products described in this catalog holds the ISO 9001 quality management system certificate, and the ISO 14001 environmental management systems certificate.



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(Specification are subject to change without notice.)

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