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

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.
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. MS-T series offers wider operating temperature range, -40°C to 85°C.

**TS lithium rechargeable battery**: 1.5V type. Charge voltage range from 1.5V to 3.0V is supported while high reliability is maintained.

**ML lithium rechargeable battery**: Reflowable lithium rechargeable battery. Nominal capacity 1.0mAh. 3.1V charge (maximum).

**CPX capacitor**: Low ESR, low leak current chip type Electric Double Layer Capacitor. Discharge by larger current is possible. Charge by very small power source with several micro watts is possible. (Energy harvesting.)

**CPH capacitor**: Small and thin size chip type Electric Double Layer Capacitor. Excellent long term reliability, humidity resistance achieved by its superior air-tight packaging.

Rechargeable battery and capacitor sizes

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

<table>
<thead>
<tr>
<th>Height</th>
<th>Chip type</th>
<th>Φ4.8mm</th>
<th>Φ5.8mm</th>
<th>Φ6.8mm</th>
<th>Φ9.5mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4mm</td>
<td>MS414GE</td>
<td>MS518SE</td>
<td>MS614SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2mm</td>
<td>MS412FE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.9mm</td>
<td>CPH3225A</td>
<td>CPX3225A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Applications

- Smartphone
- Digital still camera
- Tablet
- Video camera
- GPS-Car navigation system
- Watch
**Example of a recommended application circuit: for RTC backup**

*Reverse Current Protection CMOS Voltage Regulator S-13R1, made by SII Semiconductor Corporation.*

*This circuit diagram is a reference example. See the data sheet of each product before using it.*

**Example of RTC backup time, using MS414GE/MS614SE**

RTC used: CMOS real time clock IC S-35390A, made by SII Semiconductor Corporation.
Clock operating voltage: 1.1 to 5.5V, current consumption: 0.25μA
Crystal used: SSP-T7-FL, made by Seiko Instruments Inc.
CL = 6.0pF, R1 = 65kΩ max.

*This graph is a rough indication. The operating time varies depending on the actual service conditions.*
1. Charging circuit for MS / ML / TS Lithium Rechargeable Battery

The charging voltage “Vo” must not be higher than 3.3V (MS series) / 3.1V (ML414H) / 3.0V (TS series). A resistor must be inserted to regulate the charging current, because our rechargeable batteries have a limit for charging current. Please see the below table for recommended resistor values. Those values are minimum for each battery type and “Vo” in the charging circuit. For example, MS614SE and Vo 3.3V, the resistor value should be 620 ohm or more.

**MS lithium rechargeable battery / ML lithium rechargeable battery**

<table>
<thead>
<tr>
<th>Vo (V)</th>
<th>MS414GE Resistor (ohm)</th>
<th>MS412FE Resistor (ohm)</th>
<th>MS515SE Resistor (ohm)</th>
<th>MS614SE Resistor (ohm)</th>
<th>MS621ZE Resistor (ohm)</th>
<th>MS920SE Resistor (ohm)</th>
<th>ML414H Resistor (ohm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td>2,000</td>
<td>2,000</td>
<td>1,500</td>
<td>620</td>
<td>620</td>
<td>620</td>
<td>prohibited</td>
</tr>
<tr>
<td>3.2</td>
<td>1,600</td>
<td>1,600</td>
<td>1,000</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>prohibited</td>
</tr>
<tr>
<td>3.1</td>
<td>1,600</td>
<td>1,600</td>
<td>820</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>3,000</td>
</tr>
<tr>
<td>3.0</td>
<td>1,500</td>
<td>1,500</td>
<td>750</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>3,000</td>
</tr>
<tr>
<td>2.9</td>
<td>1,500</td>
<td>1,500</td>
<td>750</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>3,000</td>
</tr>
<tr>
<td>2.8</td>
<td>1,500</td>
<td>1,500</td>
<td>750</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>3,000</td>
</tr>
</tbody>
</table>

**TS lithium rechargeable battery**

<table>
<thead>
<tr>
<th>Vo (V)</th>
<th>TS621E Resistor (ohm)</th>
<th>TS920E Resistor (ohm)</th>
<th>Vo (V)</th>
<th>TS621E Resistor (ohm)</th>
<th>TS920E Resistor (ohm)</th>
<th>Vo (V)</th>
<th>TS621E Resistor (ohm)</th>
<th>TS920E Resistor (ohm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>10,000</td>
<td>12,000</td>
<td>2.4</td>
<td>7,500</td>
<td>9,100</td>
<td>1.8</td>
<td>4,300</td>
<td>5,600</td>
</tr>
<tr>
<td>2.9</td>
<td>10,000</td>
<td>11,000</td>
<td>2.3</td>
<td>6,800</td>
<td>8,200</td>
<td>1.7</td>
<td>3,600</td>
<td>5,100</td>
</tr>
<tr>
<td>2.8</td>
<td>9,100</td>
<td>11,000</td>
<td>2.2</td>
<td>6,200</td>
<td>7,500</td>
<td>1.6</td>
<td>3,000</td>
<td>4,700</td>
</tr>
<tr>
<td>2.7</td>
<td>9,100</td>
<td>10,000</td>
<td>2.1</td>
<td>5,600</td>
<td>7,500</td>
<td>1.5</td>
<td>2,700</td>
<td>4,300</td>
</tr>
<tr>
<td>2.6</td>
<td>8,200</td>
<td>10,000</td>
<td>2.0</td>
<td>5,100</td>
<td>6,800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>7,500</td>
<td>9,100</td>
<td>1.9</td>
<td>4,700</td>
<td>6,200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please use a diode that has very low Vf (forward voltage drop), to prevent losing the actual charging voltage to battery. Discharge capacity depends on charging voltage. Lower charging voltage may cause lower discharge capacity. Please see Charge Voltage Characteristics data for respective battery series. (Page 7, Page 10, and Page 13)

2. Charging circuit for CPH capacitor

You do not need to insert a resistor to regulate charging current. Our CPH capacitor do not have a limit for charging current. The charging voltage “Vo” must not be higher than 3.3V. Please use a diode that has very low Vf (forward voltage drop), to prevent losing the actual charging voltage to capacitor. This guidance is for CPH capacitors. For CPX capacitor or other capacitors, please contact us.
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 (over 50 cycles for MS414GE) under charge/discharge conditions of 3.1V 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
- Approved by UL (Underwriters Laboratories Inc.) UL File No. MH15628

APPLICATIONS

Backup power for Real Time Clock, or memory

Security Camera, Digital Camera, Action Camera, GPS equipments, Event Data Recorder, Handy Terminal, PC, Smart phone.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Nominal Capacity (mAh)¹</th>
<th>Nominal Impedance (Ω)²</th>
<th>Standard Discharge Current (mA)</th>
<th>Maximum Discharge Current (Continuous) (mA)³</th>
<th>Cycle Life (Time)*4</th>
<th>Size (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS414GE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>2.0</td>
<td>100</td>
<td>0.010</td>
<td>0.05</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>MS412FE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>1.0</td>
<td>100</td>
<td>0.010</td>
<td>0.10</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>MS518SE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>3.4</td>
<td>60</td>
<td>0.010</td>
<td>0.15</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>MS614SE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>3.4</td>
<td>80</td>
<td>0.015</td>
<td>0.25</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>MS621FE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>5.5</td>
<td>80</td>
<td>0.015</td>
<td>0.25</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>MS920SE</td>
<td>3</td>
<td>2.8 to 3.3 (3.1)</td>
<td>11.0</td>
<td>35</td>
<td>0.050</td>
<td>0.80</td>
<td>100</td>
<td>1000</td>
</tr>
</tbody>
</table>

¹ Nominal capacity: Typical value of discharge capacity between 3.1V 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.

Please see Page 5 for resistor value. Contact us for further details.

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

MS Lithium Rechargeable Batteries are not reflovable. Please mount them on PCB by hand soldering.
DISCHARGE CHARACTERISTICS (CHARGE VOLTAGE DEPENDENCE)

**MS414GE**

*Charge: max. 0.05mA/60 hours (CC/CV)*
*Discharge: 10µA/c.o.v. = 2.0V (CC)*

**Charge**
- Voltage: 3.5V
- Capacity: 3.0V
- Voltage: 3.1V
- Capacity: 2.8V
- Voltage: 2.9V
- Capacity: 2.6V
- Voltage: 3.0V
- Capacity: 2.5V

**Discharge**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**MS518SE**

*Charge: max. 0.08mA/72 hours (CC/CV)*
*Discharge: 10µA/c.o.v. = 2.0V (CC)*

**Charge**
- Voltage: 3.5V
- Capacity: 3.0V
- Voltage: 3.1V
- Capacity: 2.8V
- Voltage: 2.9V
- Capacity: 2.6V
- Voltage: 3.0V
- Capacity: 2.5V

**Discharge**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**MS614SE**

*Charge: max. 0.1mA/96 hours (CC/CV)*
*Discharge: 15µA/c.o.v. = 2.0V (CC)*

**Charge**
- Voltage: 3.5V
- Capacity: 3.0V
- Voltage: 3.1V
- Capacity: 2.8V
- Voltage: 2.9V
- Capacity: 2.6V
- Voltage: 3.0V
- Capacity: 2.5V

**Discharge**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**MS621FE**

*Charge: max. 0.1mA/96 hours (CC/CV)*
*Discharge: 15µA/c.o.v. = 2.0V (CC)*

**Charge**
- Voltage: 3.5V
- Capacity: 3.0V
- Voltage: 3.1V
- Capacity: 2.8V
- Voltage: 2.9V
- Capacity: 2.6V
- Voltage: 3.0V
- Capacity: 2.5V

**Discharge**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**MS920SE**

*Charge: max. 0.2mA/96 hours (CC/CV)*
*Discharge: 50µA/c.o.v. = 2.0V (CC)*

**Charge**
- Voltage: 3.5V
- Capacity: 3.0V
- Voltage: 3.1V
- Capacity: 2.8V
- Voltage: 2.9V
- Capacity: 2.6V
- Voltage: 3.0V
- Capacity: 2.5V

**Discharge**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

* c.o.v. : Cut off Voltage
**CHARACTERISTICS**

### MS614SE

**Charge/discharge characteristics**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Charge: max. 0.1mA/3.1V, 96 hours (CC/CV)  
Discharge: 15µA/c.o.v. = 1.5V (CC)

**Discharge Characteristics at Various Discharge Current**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Charge: max. 0.1mA/3.1V, 96 hours (CC/CV)  
Discharge: respective current/c.o.v. = 1.5V (CC)

**Overdischarge Characteristics**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Overdischarge: 18kΩ discharge/respective period  
Charge: max. 0.1mA/3.1V, 96 hours (CC/CV)  
Discharge: 15µA/c.o.v. = 2.0V (CC)

**Discharge Temperature Characteristics**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Charge: max. 0.1mA/3.1V, 96 hours, RT (CC/CV)  
Discharge: 15µA/c.o.v. = 2.0V, respective temperature (CC)

**High Temperature (60°C) Storage Characteristics**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Storage condition: respective period at 60°C  
Charge: max. 0.1mA/3.1V, 96 hours (CC/CV)  
Discharge: 15µA/c.o.v. = 2.0V (CC)

**Floating Characteristics (60°C, applied voltage 3.1V)**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Storage conditions: Each period at 60°C, applied voltage 3.1V  
Charge: max. 0.1mA/3.1V, 96 hours (CC/CV)  
Discharge: 15µA/c.o.v. = 2.0V (CC)
**DIMENSIONS OF STANDARD TERMINALS OF MS LITHIUM RECHARGEABLE BATTERIES**

<table>
<thead>
<tr>
<th>Battery Type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS414GE FL26E</td>
<td>2.0 ± 0.3, 1.0 ± 0.3, 0.5 ± 0.1, 0.5 ± 0.1, 0.15 ± 0.02, 1.75 ± 0.1, 2.2 ± 0.5, 0.96 ± 0.2, 1.6 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS412FE FL26E</td>
<td>2.0 ± 0.3, 1.0 ± 0.3, 0.5 ± 0.1, 0.5 ± 0.1, 0.15 ± 0.02, 1.75 ± 0.1, 2.2 ± 0.5, 0.96 ± 0.2, 1.6 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS518SE FL35E</td>
<td>2.0 ± 0.3, 1.0 ± 0.3, 0.5 ± 0.1, 0.5 ± 0.1, 0.15 ± 0.02, 1.75 ± 0.1, 2.2 ± 0.3, 0.96 ± 0.2, 1.6 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS614SE FL28E</td>
<td>2.1 ± 0.4, 1.1 ± 0.2, 0.5 ± 0.1, 0.5 ± 0.1, 0.15 ± 0.02, 1.8 ± 0.5, 1.7 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS621FE / MS621T FL11E</td>
<td>2.1 ± 0.3, 2.5 ± 0.3, 1.8 ± 0.5, 1.7 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS920SE / MS920T FL27E</td>
<td>12.8 ± 1.2, 2.1 ± 0.5, 5.5 ± 0.2, 5.8 ± 0.1, 0.5 ± 0.2, 1.8 ± 0.5, 1.7 ± 0.5 (Sn plated portion)</td>
</tr>
<tr>
<td>MS614SE</td>
<td>1.4 ± 0.1, 0.96 ± 0.2</td>
</tr>
<tr>
<td>MS621FE</td>
<td>2.5 ± 0.2, 0.96 ± 0.2</td>
</tr>
</tbody>
</table>

- Units: mm
- The hatched parts are tin plated (Sn: 100%).

MS Lithium Rechargeable batteries are also available as bare cell (without terminals).
MS Lithium Rechargeable Battery  MS-T series  <Wider Temperature Range>  3V Type

MS920T / MS621T

**FEATURES**

- RoHS Compliant
- Approved by UL (Underwriters Laboratories Inc.)
  UL File No. MH15628

**APPLICATIONS**

Backup power for Real Time Clock, or memory

*Application>*

Automotive equipment, Security cameras, electronic power, gas and water meters, electronic devices where PCB temperature increases.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Nominal Capacity (mAh)</th>
<th>Internal Impedance (Ω)</th>
<th>Operating Temperature Range</th>
<th>Size (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diameter</td>
<td>Height</td>
</tr>
<tr>
<td>MS621T</td>
<td>3</td>
<td>3.0</td>
<td>80</td>
<td>−40°C to +85°C</td>
<td>6.8</td>
<td>2.1</td>
</tr>
<tr>
<td>MS920T</td>
<td>3</td>
<td>6.5</td>
<td>60</td>
<td>−40°C to +85°C</td>
<td>9.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

* Please confirm the operating conditions, etc. with your contact at SII. We would like to provide the detail characteristics of MS920T and MS621T.

1. Nominal capacity: Typical value of discharge capacity between 3.1V and 2.0V
2. 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.
   Please see Page 19 for resister value. Contact us for further details.
   If a constant current charge is required, contact us for more information.

MS Lithium Rechargeable Batteries are not reflowable. Please mount them on PCB by hand soldering.

**CHARACTERISTICS**

- Charge Voltage Characteristics

**MS621T**

Charge: max. 100µA/respective voltage/ 96 hours/RT(CC/CV)
Discharge: 15µA/c.o.v.=2.0V/RT (CC)

**MS920T**

Charge: max. 200µA/respective voltage/ 72 hours/RT(CC/CV)
Discharge: 25µA/c.o.v.=2.0V/RT (CC)
**CHARACTERISTICS**

- **Discharge characteristics (-40°C capacity)**
  - MS621T maintains about 1.2mAh at -40°C.

- **High temperature characteristics (85°C storage)**
  - MS-T series's capacity retention ratio after High temperature storage were greatly improved.
  - *85°C use of Conventional MS series is not guaranteed.*

*Charge Discharge condition
MS920T
Charge: 3.1V, 72 hours, max. 200 μA, RT
Discharge: 25 μA, c.o.v.=2.0V, RT

MS621T
Charge: 3.1V, 96 hours, max. 100 μA, RT
Discharge: 15 μA, c.o.v.=2.0V, RT

**c.o.v.…cut off voltage**
**TS Lithium Rechargeable Battery**

**TS621E / TS920E**

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.

### FEATURES
- Low-voltage rechargeable
- High capacity
- Long cycle life: at least 1000 cycles (20% D.O.D.)
- RoHS Compliant
- Approved by UL (Underwriters Laboratories Inc.)

UL File No. MH15628 (TS621E only)

### APPLICATIONS
- Solar Watch (as main battery)
- Small mobile equipment (backup power supply for Real Time Clock)

**<Application>**
- Security Camera, Digital Camera, Action Camera, GPS equipments, Event Data Recorder, Handy Terminal, PC, Smart phone.

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Internal Impedance*1 (Ω)</th>
<th>Nominal Capacity (Voltage Range V) (mAh)</th>
<th>Standard Discharge Current (mA)</th>
<th>Cycle Life*2 (Time)</th>
<th>Diameter (mm)</th>
<th>Height (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS621E</td>
<td>1.5</td>
<td>50</td>
<td>1.5 (1.5 to 1.0) 2.5 (2.3 to 1.0)</td>
<td>0.025</td>
<td>1000 (20% D.O.D.)/ 100 (100% D.O.D.)</td>
<td>6.8</td>
<td>2.1</td>
<td>0.23</td>
</tr>
<tr>
<td>TS920E</td>
<td>1.5</td>
<td>20</td>
<td>5.5 (2.3 to 1.0)</td>
<td>0.05</td>
<td>1000 (20% D.O.D.)/ 50 (100% D.O.D.)</td>
<td>9.5</td>
<td>2.0</td>
<td>0.46</td>
</tr>
</tbody>
</table>

*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.

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

**TS Lithium Rechargeable Batteries are not reflowable. Please mount them on PCB by hand soldering.**

### CHARACTERISTICS

- Charge/discharge characteristics

**TS621E**

Charge: max. 200μA/2.3V/48 hours (CC/CV)
Discharge: 50μA/c.o.v. *= 1.0V (CC)

**TS920E**

Charge: max. 200μA/2.3V/72 hours (CC/CV)
Discharge: 50μA/c.o.v. *= 1.0V (CC)

* c.o.v. : Cut off Voltage
CHARACTERISTICS

- Charge Voltage Characteristics

**TS621E**

<table>
<thead>
<tr>
<th>Charge Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2000</td>
</tr>
<tr>
<td>1.5</td>
<td>1600</td>
</tr>
<tr>
<td>2.0</td>
<td>1200</td>
</tr>
<tr>
<td>2.5</td>
<td>800</td>
</tr>
<tr>
<td>3.0</td>
<td>400</td>
</tr>
</tbody>
</table>

**TS920E**

<table>
<thead>
<tr>
<th>Charge Voltage (V)</th>
<th>Capacity (mAh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2000</td>
</tr>
<tr>
<td>1.5</td>
<td>1600</td>
</tr>
<tr>
<td>2.0</td>
<td>1200</td>
</tr>
<tr>
<td>2.5</td>
<td>800</td>
</tr>
<tr>
<td>3.0</td>
<td>400</td>
</tr>
</tbody>
</table>

STANDARD TERMINALS

**TS621E FL11E**

- Units: mm
- The hatched parts are tin plated (Sn: 100%).

**TS920E FL27E**

- Units: mm
- The hatched parts are tin plated (Sn: 100%).
ML Lithium Rechargeable Battery

ML414H

ML414H is environment-friendly rechargeable battery that can be reflowed with lead-free solder.

FEATURES

- **Reflowable:**
  Superior heat resistance (260°C peak) allows reflow soldering by Pr-free solder
- **Large Capacity:** 1.0mAh (typical)
  (3.1V charge - 2.0V Cut-off)
- **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**
- **Approved by UL (Underwriters Laboratories Inc.)**
  UL File No. MH15628

APPLICATIONS

Backup power for Real Time Clock, or memory

<Application>
Security Camera, Digital Camera, Action Camera, GPS equipments, Event Data Recorder, Handy Terminal, PC, Smart phone.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Charge Voltage$^3$ (V)</th>
<th>Nominal Capacity (Voltage Range V) (mAh)</th>
<th>Internal Impedance$^1$ (Ω)</th>
<th>Standard Discharge Current (mA)</th>
<th>CycleLife$^2$ (Time)</th>
<th>Diameter (mm)</th>
<th>Height (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML414H</td>
<td>3</td>
<td>2.7 to 3.1</td>
<td>1.0 (3.1 to 2.0)</td>
<td>600</td>
<td>0.005</td>
<td>300 (100% D.O.D.)</td>
<td>4.8</td>
<td>1.4</td>
<td>0.07</td>
</tr>
</tbody>
</table>

$^1$. 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.

Max. charging voltage of ML414H is 3.1V.

CHARACTERISTICS

- **Charge/discharge characteristics**

  - Charge: max. 35μA/3.1V/72 hours (CC/CV)
  - Discharge: 5μA/c.o.v. = 2.0V (CC)

  * c.o.v. : Cut off Voltage

STANDARD TERMINALS

ML414H IV01E

Recommended board layout (Tolerance: ±0.05)

- Units: mm
- The hatched parts are tin plated (Sn: 100%).

Units: mm
CPX Capacitor

CPX3225A

Chip-type Electric Double Layer Capacitor (EDLC), CPX series offers low internal impedance and very small leak current. CPX Capacitors allow discharge current up to several tens of mAs, and super rapid charging by small electromotive force.

FEATURES

1. Large discharge current and super rapid charging achieved by low internal impedance

2. Small leak current
   CPX capacitor allows sufficient charging with several micro watts of energy harvesting power source.

3. Long life span, high reliability
   Superior air-tight ceramic package reduces storage deterioration in high temperature / high humidity environments, assuring long term reliability.

4. Reflowable, small and thin
   The chip-type design makes it possible to reflow.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Par number</th>
<th>Maximum Use Voltage (V)</th>
<th>Capacitance (mF)</th>
<th>Internal Impedance (ESR) (Ω)</th>
<th>Size (LxWxH) (mm)</th>
<th>Operating Temperature Range</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPX3225A752D</td>
<td>2.6</td>
<td>7.5</td>
<td>25</td>
<td>3.2x2.5x0.9</td>
<td>-30°C to +70°C</td>
<td>0.024</td>
</tr>
</tbody>
</table>

APPLICATIONS

• Power backup of instantaneous battery detachment
• Power assist for main battery
• Electric storage device for energy harvesting
• Peak load leveling of primary battery

Suggested Applications

• Handy terminals, Payment terminals
• Wireless sensor network devices
• NFC-enabled mobile devices
• Battery powered medical devices etc.
CPH3225A is thinnest and smallest chip-type electric double layer capacitor. The unique ceramic packaging with superior air-tightness is used. As the result, it offers leakage resistance and humidity resistance. Also, by optimizing its materials, a 1 minute rapid charge stores approximately 85% of full capacity. Its heat-resistant design allows for Pb-free reflowable SMT board attachment.

### FEATURES

- Small and thin size
- Excellent leakage resistance and humidity resistance
- Reflowable: Superior heat resistance (260°C peak) allows reflow soldering by Pr-free solder
- 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

For use the battery at a temperature out of the above temperature range, please consult us.

- RoHS Compliant

### APPLICATIONS

Backup Power for various devices.
Super small size power supply.

Smartphone, Tablet, Cellphone, Personal computer, IC card, Game machine, Handy terminal, Video camera, various kinds of small appliance, etc.

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Use Voltage (V)</th>
<th>Nominal Capacity (Voltage Range) Capacitance</th>
<th>Internal Impedance*&lt;Nominal&gt; (Ω)</th>
<th>Size(L × W × H) (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPH3225A</td>
<td>3.3</td>
<td>4.6µAh (3.3V-1.8V)</td>
<td>160</td>
<td>3.2 × 2.5 × 0.9</td>
<td>0.025</td>
</tr>
</tbody>
</table>

* Value measured using AC (Alternating Current) method at the discharged 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

- **Charge: max. 1 mA/3.3V/2 hours (CC/CV)**
- **Discharge: 5µA/c.o.v. = 0V (CC)**

* c.o.v.: Cut off Voltage
CHARACTERISTICS

Charge Time Characteristics

![Graph showing charge time characteristics](image)

- Charge: max. 10mA/3.3V respective charge time (CC/CV)
- Discharge: 5µA/c.o.v. = 2.0V (CC)

Float-Charge Characteristics (60°C, 90%RH)

![Graph showing float charge characteristics](image)

- Storage condition: 60°C/90%RH/3.3V applied
- Charge: max. 1mA/3.3V/2 hours (CC/CV)
- Discharge: 5µA/c.o.v. = 2.0V (CC)

REFLOW SOLDERING CONDITIONS

Reflow Profile Example

![Graph showing reflow profile example](image)

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

Recommended Reflow Conditions

![Graph showing recommended reflow conditions](image)

- The peak temperature is within five seconds.
- Max. 260°C (within 5 seconds)

DIMENSIONS

**CPH3225A**

- Units: mm

![Dimensions diagram](image)
Mercury Free Silver Oxide Battery: SEIZAIKEN

FEATURES

• Able to discharge mA level of pulse current
• Small diameter (11.6mm and less)
  - Height ranges from 1.25mm to 5.4mm.
  - Diameter ranges from 4.8mm to 11.6mm.
• Large energy density

APPLICATIONS

Devices that require high discharge pulsing
<Examples>
Stylus pen for tablets, disposable devices, thermometers, ....

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Nominal Capacity (mAh)</th>
<th>Discharge Level</th>
<th>Dimensions (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diameter</td>
<td>Height</td>
</tr>
<tr>
<td>SR ** SW</td>
<td>1.55</td>
<td>5.5 to 160</td>
<td>Low current</td>
<td>4.8 to 11.6</td>
<td>1.25 to 5.40</td>
</tr>
<tr>
<td>SR ** W</td>
<td>1.55</td>
<td>28 to 160</td>
<td>High current</td>
<td>6.8 to 11.6</td>
<td>2.05 to 5.40</td>
</tr>
</tbody>
</table>

CHARACTERISTICS

• Comparisons at 10mA for 1 sec Pulse Discharge and c.o.v. 2.0V

SR920W (2 pcs in series)

Test result of pulse discharge SR920W 25°C

Voltage/V

14,190 times of Pulse

Pulse Number

CR1025

Test result of pulse discharge CR1025 25°C

Voltage/V

2,031 times of Pulse

Pulse Number

• Discharge characteristics

SR920W Discharge characteristics

Voltage (V)

Discharge : Load 156Ω / 23℃

Capacity (mAh)
### Mercury Free Silver Oxide Battery

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

#### Low Drain Battery

<table>
<thead>
<tr>
<th>Model</th>
<th>Characteristics (RT)</th>
<th>Dimensions</th>
<th>C.C.V.*&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>at 24°C (V)</td>
</tr>
<tr>
<td>JIS code</td>
<td>IEC code</td>
<td>Nominal Voltage (V)</td>
<td>Standard Capacity (mAh)</td>
</tr>
<tr>
<td>SR416SW</td>
<td>337</td>
<td>1.55</td>
<td>7.5</td>
</tr>
<tr>
<td>SR421SW</td>
<td>348</td>
<td>1.55</td>
<td>12</td>
</tr>
<tr>
<td>SR512SW</td>
<td>335</td>
<td>1.55</td>
<td>5.5</td>
</tr>
<tr>
<td>SR516SW</td>
<td>317</td>
<td>1.55</td>
<td>12.5</td>
</tr>
<tr>
<td>SR521SW</td>
<td>379</td>
<td>1.55</td>
<td>13</td>
</tr>
<tr>
<td>SR527SW</td>
<td>319</td>
<td>1.55</td>
<td>22</td>
</tr>
<tr>
<td>SR616SW</td>
<td>321</td>
<td>1.55</td>
<td>16</td>
</tr>
<tr>
<td>SR621SW</td>
<td>364</td>
<td>1.55</td>
<td>21</td>
</tr>
<tr>
<td>SR626SW</td>
<td>377</td>
<td>1.55</td>
<td>24</td>
</tr>
<tr>
<td>SR712SW</td>
<td>346</td>
<td>1.55</td>
<td>10</td>
</tr>
<tr>
<td>SR714SW</td>
<td>341</td>
<td>1.55</td>
<td>15</td>
</tr>
<tr>
<td>SR716SW</td>
<td>315</td>
<td>1.55</td>
<td>21</td>
</tr>
<tr>
<td>SR721SW</td>
<td>362</td>
<td>1.55</td>
<td>23</td>
</tr>
<tr>
<td>SR726SW</td>
<td>397</td>
<td>1.55</td>
<td>34</td>
</tr>
<tr>
<td>SR731SW</td>
<td>329</td>
<td>1.55</td>
<td>36</td>
</tr>
<tr>
<td>SR41SW</td>
<td>384</td>
<td>1.55</td>
<td>45</td>
</tr>
<tr>
<td>SR912SW</td>
<td>–</td>
<td>1.55</td>
<td>15</td>
</tr>
<tr>
<td>SR916SW</td>
<td>373</td>
<td>1.55</td>
<td>27</td>
</tr>
<tr>
<td>SR920SW</td>
<td>371</td>
<td>1.55</td>
<td>35</td>
</tr>
<tr>
<td>SR927SW</td>
<td>395</td>
<td>1.55</td>
<td>53</td>
</tr>
<tr>
<td>SR936SW</td>
<td>394</td>
<td>1.55</td>
<td>85</td>
</tr>
<tr>
<td>SR1120SW</td>
<td>381</td>
<td>1.55</td>
<td>53</td>
</tr>
<tr>
<td>SR1130SW</td>
<td>390</td>
<td>1.55</td>
<td>80</td>
</tr>
<tr>
<td>SR43SW</td>
<td>301</td>
<td>1.55</td>
<td>120</td>
</tr>
<tr>
<td>SR44SW</td>
<td>303</td>
<td>1.55</td>
<td>160</td>
</tr>
</tbody>
</table>

*1 The standard capacity is calculated by the measurement result of discharging time with the standard discharge current to the voltage 1.2V.

*2 C.C.V.: Closed Circuit Voltage / Low Drain 2kΩ 7.8ms Pulse

#### High Drain Battery

<table>
<thead>
<tr>
<th>Model</th>
<th>Characteristics (RT)</th>
<th>Dimensions</th>
<th>C.C.V.*&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>at 24°C (V)</td>
</tr>
<tr>
<td>JIS code</td>
<td>IEC code</td>
<td>Nominal Voltage (V)</td>
<td>Standard Capacity (mAh)</td>
</tr>
<tr>
<td>SR626W</td>
<td>376</td>
<td>1.55</td>
<td>28</td>
</tr>
<tr>
<td>SR721W</td>
<td>361</td>
<td>1.55</td>
<td>26</td>
</tr>
<tr>
<td>SR726W</td>
<td>396</td>
<td>1.55</td>
<td>34</td>
</tr>
<tr>
<td>SR41W</td>
<td>392</td>
<td>1.55</td>
<td>45</td>
</tr>
<tr>
<td>SR920W</td>
<td>370</td>
<td>1.55</td>
<td>42</td>
</tr>
<tr>
<td>SR927W</td>
<td>399</td>
<td>1.55</td>
<td>53</td>
</tr>
<tr>
<td>SR1120W</td>
<td>391</td>
<td>1.55</td>
<td>53</td>
</tr>
<tr>
<td>SR1130W</td>
<td>389</td>
<td>1.55</td>
<td>80</td>
</tr>
<tr>
<td>SR43W</td>
<td>386</td>
<td>1.55</td>
<td>120</td>
</tr>
<tr>
<td>SR44W</td>
<td>357</td>
<td>1.55</td>
<td>160</td>
</tr>
</tbody>
</table>

*1 The standard capacity is calculated by the measurement result of discharging time with the standard discharge current to the voltage 1.2V.

*2 C.C.V.: Closed Circuit Voltage / High Drain 2kΩ 7.8ms DC
If you are considering the purchase of one or more of our microbatteries or 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  •  μA

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 10μA)  
   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

<table>
<thead>
<tr>
<th>Your contact information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Section</td>
</tr>
<tr>
<td>Phone</td>
</tr>
<tr>
<td>Fax</td>
</tr>
<tr>
<td>E-mail</td>
</tr>
</tbody>
</table>

If you are considering the purchase of one or more of our microbatteries or 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.
Environmental Activities at Micro-Energy Division

Environment & Quality Policy

Seiko Instruments Inc., 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, to reduce CO₂, and to conserve biodiversity.
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 introduced the SII Green Product Label System which is equivalent to the ISO 14021 Type II environmental label. At the end of FY2006, 100% of our products are certified as SII Green Products. In addition, 42 products are certified as SII "High Grade" Green Products.

2. Reduction of Greenhouse Gas
   - We practice various CO₂ reduction measures like using Eco-machinery. Since 1997, we have successfully reduced a total of 60,700 tons of CO₂. We believe our efforts contribute to the prevention of global warming.

3. 3R Promotion Activity
   - We have promoted the "reduce and reuse" activities and also promoted recycling at the end of the production process. With these activities, we achieved "Zero-emission" in 2004. We have reduced the non-recyclable wastes to less than 1 ton - less than 1% of our 1997 results.

4. Biodiversity Conservation
   - We endeavor to deepen our understanding on the relevancy between biodiversity and our business activities, and to contribute to the conservation of biodiversity by participating local community activities.

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 once a year. In addition, we participate in the clean up activity at Hirose River once a year.

7. Conflict Minerals
   - Recognizing the international importance of conflict minerals issue, we prohibit the use of such minerals.
Precautions for Your Safety

SII Lithium rechargeable batteries (MS, ML, TS) contain flammable organic solvents. For your safety, please follow following prohibitions.

**WARNING!**

1. **Do not charge by high current or high voltage.**
   Doing so may generate gas inside the battery, resulting swelling, fire, heat generation or bursting.

2. **Do not heat, disassemble nor dispose of in fire.**
   Doing so damages the insulation materials and may cause fire, heat generation, leakage or bursting.

3. **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-circuit.

4. **Do not short.**
   If the (+) and (-) come into contact with metal materials, short-circuit occurs. As a result, fire, heat generation, leakage or bursting may occur.

5. **Keep batteries out of children's reach.**
   It is dangerous that children swallow the battery. When you design mechanical hardware around the battery, please fix the battery firmly in order to prevent children from removing it. When you store the batteries, please keep the batteries out of children's reach. If a battery is swallowed, consult a physician immediately.

6. **Do not reverse placement of (+) and (-).**
   If the (+) and (-) side of the battery is reverse inserted, it may cause a short-circuit or over discharge of the battery on some equipment and it may induce overheating, explosion or fire.

**CAUTION!**

1. **If leaked liquid gets in the eyes, wash them with clean water and consult a physician immediately.**

2. **Do not use new and used batteries together. Do not use different types of batteries together.**
   It may cause fire, heat generation, leakage or bursting.

3. **If you connect two or more batteries in series or parallel, please consult us in advance.**
   It may cause bursting or fire due to unbalanced load or voltage.

4. **Do not use nor leave the batteries in direct sunlight nor in high-temperature areas.**
   It may cause fire, heat generation, leakage or bursting.

5. **Do not apply strong pressure to the batteries nor handle roughly.**
   It may cause fire, heat generation, leakage or bursting.

6. **Avoid contact with water.**
   It may cause heat generation.

7. **Keep batteries away from direct sunlight, high temperature and humidity.**
   It may cause heat generation or performance deterioration.

8. **Do not make batteries airtight by sealing it with adhesive or coating agent.**
   It may cause short-circuit because of generated and accumulated electrolyte gas.

For prevention of performance deterioration of battery

1. **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 is reduced.

2. **Pay attention to soldering by tips**
   Do not touch the battery by soldering iron tips directly.
   Keep any high temperature process away from battery.

3. **Pay attention to material of jig for pick and place**
   Use non-conductive material of jig for pick and place of batteries, for short-circuit protect. If short-circuit of battery occurs, the voltage of battery drops down quickly but raises gradually.

4. **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. Regarding air transport, SII Lithium rechargeable batteries can be transported being not subject to the provisions of dangerous goods, if the transportations meet the following requirements.

  Please contact us for more details.

  Regarding marine and ground transport, please contact us for more details, too.

  (a) **<Strong Packaging>** Batteries are separated each other, and are packed in strong packaging so as to prevent short-circuit.

  (b) **<Caution Label>** Lithium battery handling label (IATA prescribed), indicating that the packages contain Lithium batteries, that the packages must be handled with care, and that special procedures should be followed in the event that the package is damaged, and a telephone number for additional information, must be put on each package.

  (c) **<CAD Label>** “CARGO AIRCRAFT ONLY” Label must be put on each package.

  (d) **<Not Restricted Declaration>** Each shipment must be accompanied with a document indicating that the packages contain Lithium batteries, that the packages must be handled with care, that it must not be transported by passenger flight, and that special procedures should be followed in the event that the package is damaged, and a telephone number for additional information, must be put on each package.

- **<Package Drop Test>** Each package is capable of withstanding a 1.2m drop test in any orientation without damage to batteries contained.

- **<Weight Limit>** Net weight of one package may not exceed 2.5 kg.

- **<One carton per one shipment>** The shipment must be “one carton per one shipment” to be shipped as “Non-dangerous goods”.

  *One shipment* means one airway bill = one invoice.

- **Transport as dangerous goods**
  When you transport SII's Lithium rechargeable batteries by “more than one carton per one shipment”, you will have to arrange it as “Dangerous goods”.

  Requires special procedures, like “Class 9 dangerous goods Label” on carton, and “dangerous goods declaration”.

- **Disposal**
  Recently environmental protection regulations have increased and battery disposals are regulated globally.
  Such regulations are different in each country, state, and municipality.
  Please consult your local authorities regarding the specific regulations in your area.
Micro-Energy Division capacitors (CPH, CPX) contain flammable organic solvents. For your safety, please follow the following precautions.

**WARNING!**

- **Do not charge by higher current or higher voltage than specified.**
  Doing so may generate gas inside the capacitor, resulting in swelling, 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 short-circuit or over discharge of the capacitor on some equipment and it may induce overheating, explosion or fire.
- **Keep capacitors out of children's reach.**
  It is dangerous that children swallow the capacitor. When you design mechanical hardware around the capacitor, please fix the capacitor firmly in order to prevent children from removing it.
- **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 fire, heat generation, leakage or bursting.
- **Do not make the capacitor airtight by sealing it with adhesive agent or coating agent.**
  It may cause short-circuit because of generated and accumulated electrolyte gas.

For using SII Silver Oxide batteries, please follow the following precautions.

**WARNING!**

- **Do not heat, disassemble nor dispose of in fire**
  Doing so damages the insulation materials and may cause fire, heat generation, leakage or bursting.
- **Do not store.**
  If the (+) and (-) come into contact with metal materials, shortcircuit occurs. As a result, fire, heat generation, leakage or bursting may occur.
- **Keep batteries out of children's reach.**
  It is dangerous that children swallow the battery. When you design mechanical hardware around the battery, please fix the battery firmly in order to prevent children from removing it.
- **If leaked liquid, alkaline, get in the eyes, do not rub them, wash them with clean water and consult a physician immediately.**
- **Do not use new and used capacitors together. Do not use different types of capacitors together.**
  It may cause 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 fire due to unbalanced load or voltage.
- **Keep capacitors away from direct sunlight, high temperature and humidity.**
  It may cause heat generation or performance deterioration.

**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 water.**

**CAUTION!**

- **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 using. Some usage or types of equipment do not suit the specifications or performance of these batteries.**
- **Remove batteries from the equipment, if finished 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 without our prior express written consent.

All data, dimensions, characteristics and values shown in this catalogue are for reference only. Please contact your local Seiko Instruments Representative for current detailed specifications.
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.

Seiko Instruments Inc.
Micro-Energy Division
1-8, Nakase, Mihamaku, Chiba-shi, Chiba 261-8507, Japan
Telephone:+81-43-211-1735 Facsimile:+81-43-211-8034

Seiko Instruments (H.K.) Ltd.
4-5/F, Wyler Centre 2, 200 Tai Lin Pai Rd.,
Kwai Chung, N.T., Kowloon, Hong Kong
Telephone: +852-2494-5111
Facsimile: +852-2480-5479
Email:sales@siih.com.hk
http://www.siih.com.hk

Seiko Instruments (Shanghai) Inc.
Room 2701-2703, 27th Floor,
Shanghai Plaza,
138 Mid Huaihai Rd.,
Shanghai 200021, China
Telephone: +86-21-6375-6611
Facsimile: +86-21-6375-6727

Seiko Instruments (H.K.) Ltd.
- Shenzhen Rep. Office
Room 2212-15, Office Tower, Shun Hing
Square Di Wang Commercial Centre,
5002 Shen Nan Dong Road, Shenzhen,
518008, China
Telephone: +86-755-8246-2680
Facsimile: +86-755-8246-5140

Seiko Instruments Taiwan Inc.
12F, No.101, Sec.2, Nanking E. Rd.,
Taipei 104, Taiwan, R.O.C.
Telephone: +886-2-2563-5001
Facsimile: +886-2-2563-5580
Email:public@sii.co.jp
http://www.sii.com.tw

Seiko Instruments GmbH
Siemensstrasse 9
D-63623 Neu Isenburg, Germany
Telephone: +49-6102-297-0
Facsimile: +49-6102-297-50100
Email:info@seiko-instruments.de
http://www.seiko-instruments.de

Seiko Instruments U.S.A., Inc.
21221 S. Western Ave., Suite 250,
Torrance, CA 90501, U.S.A.
Telephone: +1-310-517-7802
Facsimile: +1-310-517-7792
Email:info@seikoinstruments.com
http://www.sii-me.com

(Specifications are subject to change without notice.)

Released in February 2017