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ABLIC Inc. CMOS IC 2022 Product Catalogue 4-2 Lithium-ion Battery Protection ICs
### Features

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.5 V to 4.6 V (5 mV step)  
  - Overdischarge detection voltage: 2.0 V to 3.4 V (10 mV step)  
  - Discharge overcurrent detection voltage: 0.015 V to 0.200 V (5 mV step)  
  - Load short-circuiting detection voltage: 0.065 V to 0.500 V (25 mV step)  
  - Charge overcurrent detection voltage: -0.200 V to -0.015 V (5 mV step)  
  - Detection delay times: Generated only by an internal circuit (external capacitors are unnecessary).

- **0 V battery charge function**: Available, inhibited

- **Power-down function**:
  - Available, unavailable

- **Release condition of discharge overcurrent status**: Load disconnection, charger connection

- **Release voltage of discharge overcurrent status**: V_{NOV}, V_{DOV}

- **High-withstand voltage**: VM pin and CO pin: Absolute maximum rating 28 V

- **Wide operation temperature range**: Ta = -40°C to +85°C

- **Low current consumption**:
  - During operation: 1.5 μA typ., 3.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 500 nA max. (Ta = +25°C)

- **Lead-free (Sn 100%), halogen-free**

---

### Notes

1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
   (Overcharge hysteresis voltage can be selected from a range of 0 V to 0.4 V in 50 mV step.)

2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
   (Overdischarge hysteresis voltage can be selected from a range of 0 V to 0.7 V in 100 mV step.)

3. Load short-circuiting detection voltage = Discharge overcurrent detection voltage + 0.025 × n
   (n can be selected from any integer value greater or equal to 2)

---

### Pinouts

**SOT-23-6**
- pins: 1 DO, 2 VM, 3 CO, 4 NC, 5 VSS, 6 VM

**SNT-6A**
- pins: 1 NC, 2 CO, 3 DO, 4 VSS, 5 VDD, 6 VM

**HSNT-6A(1212)**
- pins: 1 NC, 2 CO, 3 DO, 4 VSS, 5 VDD, 6 VM

---

### Additional Features

- **Overcharge release voltage** = Overcharge detection voltage – Overcharge hysteresis voltage
  (Overcharge hysteresis voltage can be selected from a range of 0 V to 0.4 V in 50 mV step.)

- **Overdischarge release voltage** = Overdischarge detection voltage + Overdischarge hysteresis voltage
  (Overdischarge hysteresis voltage can be selected from a range of 0 V to 0.7 V in 100 mV step.)

- **Load short-circuiting detection voltage** = Discharge overcurrent detection voltage + 0.025 × n
  (n can be selected from any integer value greater or equal to 2)
### S-82B1A Series

**Features**
- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3,500 V to 4,600 V (5 mV step)
  - Accuracy: ±20 mV
  - Overcharge release voltage: 3,100 V to 4,600 V
  - Accuracy: ±50 mV
  - Overdischarge detection voltage: 2,000 V to 3,400 V (10 mV step)
  - Accuracy: ±50 mV
  - Overdischarge release voltage: 0.010 V to 0.100 V (1 mV step)
  - Accuracy: ±100 mV
  - Discharge overcurrent detection voltage: 
    - 1st: 0.010 V to 0.100 V (1 mV step)
    - 2nd: 0.050 V to 0.500 V (5 mV step)
  - Load short-circuiting detection voltage: 0.010 V to –0.100 V (1 mV step)
  - Accuracy: ±3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
  - CTL pin control logic: Active "H", active "L"
  - CTL pin internal resistance value: 1.0 MΩ, 2.0 MΩ, 3.0 MΩ, 4.0 MΩ, 5.0 MΩ
  - 0 V battery charge: Enabled, inhibited
  - Power-down function: Available, unavaliable
  - Release condition of discharge overcurrent status: Load disconnection, charger connection
  - Release voltage of discharge overcurrent status: 
    - Discharge overcurrent detection voltage 1 \( (V_{\text{DOV1}}) \),
    - Discharge overcurrent release voltage \( (V_{\text{ROV}}) = V_{\text{DD}} \times 0.8 \) (typ.)
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 500 nA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

**Pin connections**
- SNT-6A
  - 1 VM
  - 2 CO
  - 3 DO
  - 4 VSS
  - 5 VDD
  - 6 CTL

### S-82B1B Series

**Features**
- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3,500 V to 4,600 V (5 mV step)
  - Accuracy: ±20 mV
  - Overcharge release voltage: 3,100 V to 4,600 V
  - Accuracy: ±50 mV
  - Overdischarge detection voltage: 2,000 V to 3,400 V (10 mV step)
  - Accuracy: ±50 mV
  - Overdischarge release voltage: 0.010 V to 0.100 V (1 mV step)
  - Accuracy: ±100 mV
  - Discharge overcurrent detection voltage 1 \( (V_{\text{DOV1}}) \),
  - Discharge overcurrent release voltage \( (V_{\text{ROV}}) = V_{\text{DD}} \times 0.8 \) (typ.)
- Overdischarge release voltage = Overdischarge detection voltage
- Overdischarge release voltage = Overdischarge detection voltage
- Charge overcurrent detection voltage 1 \( (V_{\text{IOV1}}) \),
  - 0.100 V to −0.010 V (1 mV step)
- Charge overcurrent release voltage \( (V_{\text{ROV}}) = V_{\text{DD}} \times 0.8 \) (typ.)
- Load short-circuiting detection voltage: 0.010 V to –0.100 V (1 mV step)
- Overcharge release voltage = Overcharge detection voltage
- Overcharge release voltage = Overcharge detection voltage
- Power-saving function
- Power-down function
- Release condition of discharge overcurrent status is selectable: Load disconnection, charger connection
- Release voltage of discharge overcurrent status is selectable: 
  - Discharge overcurrent detection voltage 1 \( (V_{\text{DOV1}}) \),
  - Discharge overcurrent release voltage \( (V_{\text{ROV}}) = V_{\text{DD}} \times 0.8 \) (typ.)
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 50 nA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

**Pin connections**
- SNT-6A
  - 1 VM
  - 2 CO
  - 3 DO
  - 4 VSS
  - 5 VDD
  - 6 PS

---

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

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Refer to the datasheet of each product for details.
### Features

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
  - Accuracy: ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V
  - Accuracy: ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V
  - Accuracy: ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V
  - Accuracy: ±100 mV
  - Discharge overcurrent detection voltage: 0.003 V to 0.100 V
  - Accuracy: ±50 mV
  - Load short-circuiting detection voltage: 0.010 V to 0.200 V
  - Accuracy: ±7 mV
  - Charge overcurrent detection voltage: -0.100 V to -0.003 V
  - Accuracy: ±3 mV

- **Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

- **Charge-discharge control function**
  - CTL pin control logic: Active "H", active "L"
  - CTL pin internal resistance connection: 1.0 MΩ, 2.0 MΩ, 3.0 MΩ, 4.0 MΩ, 5.0 MΩ
  - PS pin control logic: Active "H", active "L"
  - PS pin internal resistance connection: 1.0 MΩ, 2.0 MΩ, 3.0 MΩ, 4.0 MΩ, 5.0 MΩ

- **Discharge overcurrent control function**
  - Release condition of discharge overcurrent status: Load disconnection, charger connection
  - Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage \(V_{	ext{DIOV}}\)
  - Release voltage of discharge overcurrent status: Discharge overcurrent release voltage \(V_{\text{RIOV}}\) = \(V_{DD}\ × 0.8\) (typ.)

- **0 V battery charge:**
  - Enabled, inhibited

- **Power-down function:**
  - Available, unavailable

- **High-withstand voltage:**
  - VM pin, CO pin: Absolute maximum rating 28 V

- **Wide operation temperature range:**
  - \(Ta = -40°C\) to \(+85°C\)

- **Low current consumption**
  - During operation: 600 nA typ., 990 nA max. (\(Ta = +25°C\))
  - During power-down: 50 nA max. (\(Ta = +25°C\))
  - During overdischarge: 500 nA max. (\(Ta = +25°C\))

- **Lead-free (Sn 100%), halogen-free**

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
   (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
   (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

---

### BATTERY PROTECTION IC WITH POWER-SAVING FUNCTION FOR 1-CELL PACK

#### Features

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
  - Accuracy: ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V
  - Accuracy: ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V
  - Accuracy: ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V
  - Accuracy: ±100 mV
  - Discharge overcurrent detection voltage: 0.003 V to 0.100 V
  - Accuracy: ±50 mV
  - Load short-circuiting detection voltage: 0.010 V to 0.200 V
  - Accuracy: ±7 mV
  - Charge overcurrent detection voltage: -0.100 V to -0.003 V
  - Accuracy: ±3 mV

- **Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

- **Power-saving function**
  - PS pin control logic: Active "H", active "L"
  - PS pin internal resistance connection: 1.0 MΩ, 2.0 MΩ, 3.0 MΩ, 4.0 MΩ, 5.0 MΩ

- **Discharge overcurrent control function**
  - Release condition of discharge overcurrent status: Load disconnection, charger connection
  - Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage \(V_{	ext{DIOV}}\)
  - Release voltage of discharge overcurrent status: Discharge overcurrent release voltage \(V_{\text{RIOV}}\) = \(V_{DD}\ × 0.8\) (typ.)

- **0 V battery charge:**
  - Enabled, inhibited

- **Power-down function:**
  - Available, unavailable

- **High-withstand voltage:**
  - VM pin and CO pin: Absolute maximum rating 28 V

- **Wide operation temperature range:**
  - \(Ta = -40°C\) to \(+85°C\)

- **Low current consumption**
  - During operation: 50 nA max. (\(Ta = +25°C\))
  - During power-saving: 50 nA max. (\(Ta = +25°C\))

- **Lead-free (Sn 100%), halogen-free**

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
   (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
   (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)
## S-82M1A Series

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<td>Overcharge detection voltage</td>
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<tr>
<td>Overcharge release voltage</td>
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<tr>
<td>Overdischarge detection voltage</td>
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<tr>
<td>Overdischarge release voltage</td>
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<tr>
<td>Discharge overcurrent detection voltage</td>
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<tr>
<td>Load short-circuiting detection voltage</td>
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<tr>
<td>Charge overcurrent detection voltage</td>
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<tr>
<td>Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).</td>
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<td>0 V battery charge:</td>
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<td>Power-down function:</td>
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<td>High-withstand voltage:</td>
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<td>Wide operation temperature range:</td>
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<td>Low current consumption</td>
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<td>During operation:</td>
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<td>During power-down:</td>
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<td>During overdischarge:</td>
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<tr>
<td>Lead-free (Sn 100%), halogen-free</td>
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</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

### Pin Assignments

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## S-82A1A Series

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</tr>
<tr>
<td>Discharge overcurrent detection voltage 2</td>
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<tr>
<td>Load short-circuiting detection voltage</td>
</tr>
<tr>
<td>Charge overcurrent detection voltage</td>
</tr>
<tr>
<td>Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).</td>
</tr>
<tr>
<td>0 V battery charge:</td>
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<td>Power-down function:</td>
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<tr>
<td>Release condition of discharge overcurrent status:</td>
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<tr>
<td>Release voltage of discharge overcurrent status:</td>
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<td>High-withstand voltage:</td>
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<tr>
<td>Wide operation temperature range:</td>
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<tr>
<td>Low current consumption</td>
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<tr>
<td>During operation:</td>
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<tr>
<td>During power-down:</td>
</tr>
<tr>
<td>During overdischarge:</td>
</tr>
<tr>
<td>Lead-free, Sn 100%, halogen-free*3</td>
</tr>
</tbody>
</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

*3. Refer to “Product Name Structure” for details.
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<th><strong>BATTERY PROTECTION IC FOR 1-CELL PACK</strong></th>
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<tr>
<td><strong>Overcharge detection voltage</strong></td>
<td>3.500 V to 4.600 V (5 mV step)</td>
</tr>
<tr>
<td><strong>Overcharge release voltage</strong></td>
<td>3.100 V to 4.600 V</td>
</tr>
<tr>
<td><strong>Over discharge detection voltage</strong></td>
<td>2.000 V to 3.000 V (10 mV step)</td>
</tr>
<tr>
<td><strong>Over discharge release voltage</strong></td>
<td>2.000 V to 3.400 V</td>
</tr>
<tr>
<td><strong>Discharge overcurrent detection voltage 1</strong></td>
<td>0.010 V to 0.100 V</td>
</tr>
<tr>
<td><strong>Discharge overcurrent detection voltage 2</strong></td>
<td>0.030 V to 0.200 V</td>
</tr>
<tr>
<td><strong>Load short-circuiting detection voltage</strong></td>
<td>0.050 V to 0.500 V</td>
</tr>
<tr>
<td><strong>Charge overcurrent detection voltage</strong></td>
<td>-0.100 V to -0.010 V</td>
</tr>
<tr>
<td><strong>Detection delay times</strong></td>
<td>Generated via an internal circuit (external capacitors are unnecessary).</td>
</tr>
<tr>
<td><strong>0 V battery charge</strong></td>
<td>Enabled, inhibited</td>
</tr>
<tr>
<td><strong>Power-down function</strong></td>
<td>Available, unavailable</td>
</tr>
<tr>
<td><strong>Release condition of discharge overcurrent status</strong></td>
<td>Load disconnection, charger connection</td>
</tr>
<tr>
<td><strong>Release voltage of discharge overcurrent status</strong></td>
<td>Discharge overcurrent detection voltage 1 (V&lt;sub&gt;DOOVC1&lt;/sub&gt;)</td>
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<tr>
<td></td>
<td>Discharge overcurrent release voltage (V&lt;sub&gt;DOOVC2&lt;/sub&gt;) = V&lt;sub&gt;DD&lt;/sub&gt; x 0.8 (typ.)</td>
</tr>
<tr>
<td><strong>High-withstand voltage</strong></td>
<td>VM pin and CO pin: Absolute maximum rating 28 V</td>
</tr>
<tr>
<td><strong>Low current consumption</strong></td>
<td>During operation: 2.0 µA typ., 4.0 µA max. (Ta = +25°C)</td>
</tr>
<tr>
<td></td>
<td>During power-down: 50 nA max. (Ta = +25°C)</td>
</tr>
<tr>
<td></td>
<td>During overdischarge: 1.0 µA max. (Ta = +25°C)</td>
</tr>
<tr>
<td><strong>Lead-free, Sn 100%, halogen-free</strong></td>
<td></td>
</tr>
</tbody>
</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

*3. Refer to "Product Name Structure* for details.

---

<table>
<thead>
<tr>
<th><strong>Features</strong></th>
<th><strong>WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overcharge detection voltage</strong></td>
<td>3.500 V to 4.600 V (5 mV step)</td>
</tr>
<tr>
<td><strong>Overcharge release voltage</strong></td>
<td>3.100 V to 4.600 V</td>
</tr>
<tr>
<td><strong>Over discharge detection voltage</strong></td>
<td>2.000 V to 3.000 V (10 mV step)</td>
</tr>
<tr>
<td><strong>Over discharge release voltage</strong></td>
<td>2.000 V to 3.400 V</td>
</tr>
<tr>
<td><strong>Discharge overcurrent detection voltage 1</strong></td>
<td>0.010 V to 0.100 V</td>
</tr>
<tr>
<td><strong>Discharge overcurrent detection voltage 2</strong></td>
<td>0.030 V to 0.200 V</td>
</tr>
<tr>
<td><strong>Load short-circuiting detection voltage</strong></td>
<td>0.050 V to 0.500 V</td>
</tr>
<tr>
<td><strong>Charge overcurrent detection voltage</strong></td>
<td>-0.100 V to -0.010 V</td>
</tr>
<tr>
<td><strong>Detection delay times</strong></td>
<td>Generated via an internal circuit (external capacitors are unnecessary).</td>
</tr>
<tr>
<td><strong>Charge-discharge control function</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CTL pin control logic</strong></td>
<td>Active &quot;H&quot;, active &quot;L&quot;</td>
</tr>
<tr>
<td><strong>CTL pin internal resistance connection</strong></td>
<td>Pull-up, pull-down</td>
</tr>
<tr>
<td><strong>CTL pin internal resistance value</strong></td>
<td>1.0 MΩ to 10 MΩ (1 MΩ step)</td>
</tr>
<tr>
<td><strong>CTL pin voltage &quot;H&quot;</strong></td>
<td>V&lt;sub&gt;SS&lt;/sub&gt; = 0.7 V, V&lt;sub&gt;DD&lt;/sub&gt; = 0.9 V</td>
</tr>
<tr>
<td><strong>CTL pin voltage &quot;L&quot;</strong></td>
<td>V&lt;sub&gt;SS&lt;/sub&gt; = 0.7 V, V&lt;sub&gt;DD&lt;/sub&gt; = 0.9 V</td>
</tr>
<tr>
<td><strong>0 V battery charge</strong></td>
<td>Enabled, inhibited</td>
</tr>
<tr>
<td><strong>Power-down function</strong></td>
<td>Available, unavailable</td>
</tr>
<tr>
<td><strong>Release condition of discharge overcurrent status</strong></td>
<td>Load disconnection, charger connection</td>
</tr>
<tr>
<td><strong>Release voltage of discharge overcurrent status</strong></td>
<td>Discharge overcurrent detection voltage 1 (V&lt;sub&gt;DOOVC1&lt;/sub&gt;), discharge overcurrent release voltage (V&lt;sub&gt;DOOVC2&lt;/sub&gt;) = V&lt;sub&gt;DD&lt;/sub&gt; x 0.8 (typ.)</td>
</tr>
<tr>
<td><strong>Discharge overcurrent status reset function by CTL pin</strong></td>
<td>Available, unavailable</td>
</tr>
<tr>
<td><strong>High-withstand voltage</strong></td>
<td>VM pin and CO pin: Absolute maximum rating 28 V</td>
</tr>
<tr>
<td><strong>Low current consumption</strong></td>
<td>During operation: 2.0 µA typ., 4.0 µA max. (Ta = +25°C)</td>
</tr>
<tr>
<td></td>
<td>During power-down: 50 nA max. (Ta = +25°C)</td>
</tr>
<tr>
<td></td>
<td>During overdischarge: 1.0 µA max. (Ta = +25°C)</td>
</tr>
<tr>
<td><strong>Lead-free, halogen-free</strong></td>
<td></td>
</tr>
</tbody>
</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

*3. Refer to "Product Name Structure* for details.
### Features

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
  - Accuracy: ±15 mV  
  - Overcharge release voltage: 3.100 V to 4.600 V  
  - Accuracy: ±50 mV  
  - Overdischarge detection voltage: 2.000 V to 3.000 V (10 mV step)  
  - Accuracy: ±50 mV  
  - Overdischarge release voltage: 0.003 V to 0.100 V (0.5 mV step)  
  - Accuracy: ±75 mV  
  - Discharge overcurrent detection voltage: 0.010 V to 0.100 V (1 mV step)  
  - Accuracy: ±3 mV  
  - Charge overcurrent detection voltage: −0.100 V to −0.003 V (0.5 mV step)  
  - Accuracy: ±1.5 mV  

- **Detection delay times are generated only by an internal circuit (external capacitors are unnecessary)**

- **Overcharge release voltage**: Overcharge detection voltage − Overcharge hysteresis voltage  
  - (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

- **Overdischarge release voltage**: Overdischarge detection voltage + Overdischarge hysteresis voltage  
  - (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

### S-82F1B Series

**BATTERY PROTECTION IC FOR 1-CELL PACK**

- **Features**
  - Overcharge detection voltage
  - Overcharge release voltage
  - Overdischarge detection voltage
  - Overdischarge release voltage
  - Discharge overcurrent detection voltage
  - Load short-circuiting detection voltage
  - Charge overcurrent detection voltage
  - Charge overcurrent release voltage
  - Charge overdischarge detection voltage
  - Charge overdischarge release voltage
  - Overvoltage detection
  - Low current consumption
  - High-withstand voltage
  - Wide operation temperature range

### S-82F1A Series

**WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK**

- **Features**
  - Overcharge detection voltage
  - Overcharge release voltage
  - Overdischarge detection voltage
  - Overdischarge release voltage
  - Discharge overcurrent detection voltage
  - Load short-circuiting detection voltage
  - Charge overcurrent detection voltage
  - Charge overcurrent release voltage
  - Charge overdischarge detection voltage
  - Charge overdischarge release voltage
  - Overvoltage detection
  - Low current consumption
  - High-withstand voltage
  - Wide operation temperature range

*1. Overcharge release voltage = Overcharge detection voltage − Overcharge hysteresis voltage  
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage  
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

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**AB LIC Inc.**

CMOS IC 2022 Product Catalogue

**4-8**

Lithium-ion Battery Protection ICs
High-accuracy voltage detection circuit

- Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  Accuracy ±15 mV
- Overcharge release voltage: 3.100 V to 3.400 V²  Accuracy ±50 mV
- Overdischarge detection voltage: 3.100 V to 3.400 V²  Accuracy ±75 mV
- Overdischarge release voltage: 0.003 V to 0.100 V (1 mV step)  Accuracy ±1.5 μA
- Charge overcurrent detection voltage: -0.003 V to -0.100 V (0.5 mV step)  Accuracy ±15 mV

Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).

- Discharge overcurrent control function
  - Release condition of discharge overcurrent status: Load disconnection
  - Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V_{RIOV}) = VDD \times 0.8 (typ.)

- Charge-discharge control function
  - CTL pin control logic is selectable: Active "H", active "L"
  - CTL pin internal resistance connection is selectable: Pull-up, pull-down
  - CTL pin internal resistance value is selectable: 1 MΩ to 10 MΩ (1 MΩ step)

- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

- Load-short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  Accuracy ±3 μA

- Charge overcurrent detection voltage: 0.010 V to 0.100 V (1 mV step)  Accuracy ±3 μA

- Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  Accuracy ±5 mV

- Charge overcurrent detection voltage: 0.010 V to 0.100 V (1 mV step)  Accuracy ±3 mV

- Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
  - Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.

- Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.

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**S-82H1A Series**

- BATTERY PROTECTION IC WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK

Features

- Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  Accuracy ±15 mV
- Overcharge release voltage: 3.000 V to 3.400 V²  Accuracy ±50 mV
- Overdischarge detection voltage: 2.000 V to 2.400 V²  Accuracy ±75 mV
- Overdischarge release voltage: 0.003 V to 0.100 V (0.5 mV step)  Accuracy ±1.5 mV
- Charge overcurrent detection voltage: -0.003 V to -0.100 V (0.5 mV step)  Accuracy ±1.5 mV

- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).

- Charge-discharge control function
  - CTL pin control logic is selectable: Active "H", active "L"
  - CTL pin internal resistance connection is selectable: Pull-up, pull-down
  - CTL pin internal resistance value is selectable: 1 MΩ to 10 MΩ (1 MΩ step)

- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

- Lead-free (Sn 100%), halogen-free
### S-82K1B Series

**BATTERY PROTECTION IC FOR 1-CELL PACK**

**Features**

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
    Accuracy: ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V  
    Accuracy: ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V (5 mV step)  
    Accuracy: ±75 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V  
    Accuracy: ±75 mV
  - Discharge overcurrent detection voltage 1: 0.003 V to 0.100 V (0.5 mV step)  
    Accuracy: ±1.0 mV
  - Discharge overcurrent detection voltage 2: 0.010 V to 0.100 V (1 mV step)  
    Accuracy: ±3 mV
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  
    Accuracy: ±5 mV
  - Charge overcurrent detection voltage: −0.100 V to −0.003 V (0.5 mV step)  
    Accuracy: ±1.0 mV

- **Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

- **Discharge overcurrent control function**
  - Release condition of discharge overcurrent status: Load disconnection
  - Release voltage of discharge overcurrent status: $V_{NOV} = VDD \times 0.8$ (typ.)

- **0 V battery charge**: Enabled, inhibited

- **Power-down function**: Available, unavailable

- **High-withstand voltage**: VM pin and CO pin: Absolute maximum rating 28 V

- **Wide operation temperature range**: $Ta = −40°C$ to $+85°C$

- **Low current consumption**
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

- **Lead-free (Sn 100%), halogen-free**

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### S-82K1A Series

**BATTERY PROTECTION IC WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK**

**Features**

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
    Accuracy: ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V  
    Accuracy: ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.000 V (10 mV step)  
    Accuracy: ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V  
    Accuracy: ±75 mV
  - Discharge overcurrent detection voltage 1: 0.003 V to 0.100 V (0.5 mV step)  
    Accuracy: ±1.0 mV
  - Discharge overcurrent detection voltage 2: 0.010 V to 0.100 V (1 mV step)  
    Accuracy: ±3 mV
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  
    Accuracy: ±5 mV
  - Charge overcurrent detection voltage: −0.100 V to −0.003 V (0.5 mV step)  
    Accuracy: ±1.0 mV

- **Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

- **Charge-discharge control function**
  - CTL pin control logic: Active "H", active "L"
  - CTL pin internal resistance: Pull-up, pull-down
  - CTL pin internal resistance value: 1 MΩ to 10 MΩ (1 MΩ step)

- **Discharge overcurrent control function**
  - Release condition of discharge overcurrent status: Load disconnection
  - Release voltage of discharge overcurrent status: $V_{NOV} = VDD \times 0.8$ (typ.)
  - Discharge overcurrent status reset function by CTL pin: Available, unavailable
  - 0 V battery charge: Enabled, inhibited
  - Power-down function: Available, unavailable

- **High-withstand voltage**: VM pin and CO pin: Absolute maximum rating 28 V

- **Wide operation temperature range**: $Ta = −40°C$ to $+85°C$

- **Low current consumption**
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

- **Lead-free (Sn 100%), halogen-free**

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*S1. Overcharge release voltage = Overcharge detection voltage − Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*S2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

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**S-82K1B Series**

- SNT-6A 1 VM
- 2 CO
- 3 DO
- 4 VSS
- 5 VDD
- 6 VINI

**S-82K1A Series**

- HSNT-8(1616)
  1 CTL
  2 VM
  3 CO
  4 DO
  5 VSS
  6 VDD
  7 VINI
  8 NC

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ABLIC Inc.  CMOS IC 2022 Product Catalogue  4-10  Lithium-ion Battery Protection ICs

Refer to the datasheet of each product for details.
S-82P1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

**Features**

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.800 V (5 mV step)  Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.800 V*1  Accuracy ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V*2  Accuracy ±75 mV
  - Load short-circuiting detection voltage: 20 mV to 100 mV (1 mV step)  Accuracy ±5 mV
  - Charge overcurrent detection voltage: 3 mV to 100 mV (0.25 mV step)  Accuracy ±0.75 mV
  - Discharge overcurrent detection voltage 1: 6 mV to 100 mV (0.5 mV step)  Accuracy ±2 mV
  - Charge overdischarge detection voltage: −100 mV to −3 mV (0.25 mV step)  Accuracy ±0.75 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
  - CTL pin control logic: Active "H", active "L*
  - CTL pin internal resistance connection: Pull-up, pull-down
  - CTL pin internal resistance value: 1 MΩ to 6 MΩ (1 MΩ step)
- Lead-free (Sn 100%), halogen-free

*SNT-6A

**Features**

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.800 V (5 mV step)  Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.800 V*1  Accuracy ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V*2  Accuracy ±75 mV
  - Load short-circuiting detection voltage: 20 mV to 100 mV (1 mV step)  Accuracy ±5 mV
  - Charge overcurrent detection voltage: −3 mV (0.25 mV step)  Accuracy ±0.75 mV
  - Discharge overcurrent detection voltage 1: 6 mV to 100 mV (0.5 mV step)  Accuracy ±2 mV
  - Discharge overcurrent detection voltage 2: 2.6 mV to 100 mV (0.5 mV step)  Accuracy ±2 mV
  - Load short-circuiting detection voltage: 20 mV to 100 mV (1 mV step)  Accuracy ±5 mV
  - Charge overdischarge detection voltage: −100 mV to −3 mV (0.25 mV step)  Accuracy ±0.75 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
  - CTL pin control logic: Active "H", active "L*
  - CTL pin internal resistance connection: Pull-up, pull-down
  - CTL pin internal resistance value: 1 MΩ to 6 MΩ (1 MΩ step)
- Lead-free (Sn 100%), halogen-free

*SNT-8(1616)}
### S-82G1B Series

**Features**

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step) Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V (5 mV step) Accuracy ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.000 V (10 mV step) Accuracy ±15 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±75 mV
  - Discharge overcurrent detection voltage: 0.003 V to 0.100 V (0.1 mV step) Accuracy ±15 mV
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step) Accuracy ±5 mV
  - Battery charge detection voltage: –0.100 V to –0.010 V (1 mV step) Accuracy ±3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).

**Discharge overcurrent control function**

- Load short-circuiting detection 2 function is selectable: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status:
  \[ V_{RIOV} = V_{DD} \times 0.8 \]
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VMC pin, VMD pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = –40°C to +85°C
- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

### S-82G1A Series

**Features**

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step) Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V (5 mV step) Accuracy ±50 mV
  - Overdischarge detection voltage: 2.000 V to 3.000 V (10 mV step) Accuracy ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±75 mV
  - Discharge overcurrent detection voltage 1: 0.003 V to 0.100 V (0.1 mV step) Accuracy ±15 mV
  - Load short-circuiting detection voltage 2: 0.020 V to 0.100 V (1 mV step) Accuracy ±5 mV
  - Charge overcurrent detection voltage 1: –0.100 V to –0.010 V (1 mV step) Accuracy ±3 mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±75 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±75 mV
  - Discharge overcurrent detection voltage 2: 0.010 V to 0.100 V (1 mV step) Accuracy ±5 mV
  - Load short-circuiting detection voltage 2: 0.010 V to 0.100 V (1 mV step) Accuracy ±5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).

**Charge-discharge control function**

- CTL pin control logic is selectable: Active "H", active "L"
- CTL pin internal resistance connection is selectable: Pull-up, pull-down
- Load short-circuiting detection 2 function is selectable: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection
- Charge-discharge inhibition status release function by VMD pin is selectable: Available, unavailable
- Transition from charge-discharge inhibition status to discharge overcurrent status is selectable: Available, unavailable
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VMC pin, VMD pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = –40°C to +85°C
- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

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**HSNT-8(1616)**

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<th>VMC</th>
<th>CO</th>
<th>DO</th>
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<th>VDD</th>
<th>VIN</th>
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<td>4</td>
<td>5</td>
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**HSNT-8(1616)**

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<tr>
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**CMOS IC 2022 Product Catalogue**

**Lithium-ion Battery Protection ICs**

**ABLIC Inc.**
**Features**

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
    Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V (5 mV step)  
    Accuracy ±50 mV
  - Overdischarge detection voltage: 0.200 V to 3.000 V (10 mV step)  
    Accuracy ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V  
    Accuracy ±15 mV
  - Charge overcurrent detection voltage: −0.100 V to −0.003 V (1 mV step)  
    Accuracy ±1.5 mV
  - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
  - Discharge overcurrent control function
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  
    Accuracy ±15 mV
  - Charge overdischarge detection voltage: −0.100 V to −0.003 V (0.5 mV step)  
    Accuracy ±1.5 mV

**S-82F1C Series**

**S-82D1A Series**

**Features**

- High-accuracy temperature protection circuit by an external NTC thermistor
  - High temperature charge-discharge inhibition temperature: +40°C to +85°C (1°C step)  
    Accuracy ±3°C
  - High temperature charge inhibition temperature: +40°C to +85°C (1°C step)  
    Accuracy ±3°C
  - Low temperature charge inhibition temperature: −40°C to +10°C (1°C step)  
    Accuracy ±3°C
  - Low temperature charge-discharge inhibition temperature: −40°C to +10°C (1°C step)  
    Accuracy ±3°C

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step)  
    Accuracy ±15 mV
  - Overcharge release voltage: 3.100 V to 4.600 V (5 mV step)  
    Accuracy ±50 mV
  - Overdischarge detection voltage: 0.200 V to 3.000 V (10 mV step)  
    Accuracy ±50 mV
  - Overdischarge release voltage: 2.000 V to 3.400 V  
    Accuracy ±75 mV
  - Charge overcurrent detection voltage: −0.100 V to −0.003 V (1 mV step)  
    Accuracy ±15 mV
  - Discharge overcurrent detection voltage: 0.010 V to 0.100 V (1 mV step)  
    Accuracy ±15 mV
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  
    Accuracy ±15 mV
  - Charge overdischarge detection voltage: −0.100 V to −0.003 V (0.5 mV step)  
    Accuracy ±15 mV

**S-82F1C Series**

**S-82D1A Series**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- CTL pin control logic: Active "H", active "L"
- CTL pin internal resistance: Pull-up, pull-down
- CTL pin internal resistance value: 1 MΩ to 5 MΩ (1 MΩ)

**S-82F1C Series**

**S-82D1A Series**

**Lead-free (Sn 100%), halogen-free**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- Charge-discharge control function
- Discharge overcurrent control function
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status: V\text{reov} = V_o × 0.8 (typ.)
- VM pin, VM2 pin, and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.0 μA typ., 4.0 μA max. (Ta = +25°C)
  - During power-down: 50 nA max. (Ta = +25°C)
  - Overdischarge: 0.5 μA max. (Ta = +25°C)

**S-82F1C Series**

**S-82D1A Series**

**Lead-free (Sn 100%), halogen-free**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- Charge-discharge control function
- Discharge overcurrent control function
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V\text{reov}) = V_o × 0.8 (typ.)
- Overdischarge status reset function by CTL pin: Available, unavailable
- O V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28.0 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.5 μA typ., 5.0 μA max. (Ta = +25°C)
  - During power-down: 100 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

**S-82F1C Series**

**S-82D1A Series**

**Lead-free (Sn 100%), halogen-free**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- Charge-discharge control function
- Discharge overcurrent control function
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V\text{reov}) = V_o × 0.8 (typ.)
- Overdischarge status reset function by CTL pin: Available, unavailable
- O V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28.0 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.5 μA typ., 5.0 μA max. (Ta = +25°C)
  - During power-down: 100 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

**Lead-free (Sn 100%), halogen-free**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- Charge-discharge control function
- Discharge overcurrent control function
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V\text{reov}) = V_o × 0.8 (typ.)
- Overdischarge status reset function by CTL pin: Available, unavailable
- O V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28.0 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.5 μA typ., 5.0 μA max. (Ta = +25°C)
  - During power-down: 100 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)

**Lead-free (Sn 100%), halogen-free**

**Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).**

**Charge-discharge control function**

- Charge-discharge control function
- Discharge overcurrent control function
- Release condition of discharge overcurrent status: Load disconnection
- Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V\text{reov}) = V_o × 0.8 (typ.)
- Overdischarge status reset function by CTL pin: Available, unavailable
- O V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28.0 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - During operation: 2.5 μA typ., 5.0 μA max. (Ta = +25°C)
  - During power-down: 100 nA max. (Ta = +25°C)
  - During overdischarge: 0.5 μA max. (Ta = +25°C)
S-8206A Series

**Features**
- High-accuracy voltage detection circuit
- Overcharge detection voltage: 3.500 V to 5.000 V (5 mV step)  ±20 mV
- Overcharge release voltage: 3.100 V to 4.950 V  ±50 mV
- Detection delay time is generated only by an internal circuit (external capacitors are unnecessary).
- Output logic: Active "H", active "L"
- Output form: CMOS output, Nch open-drain output
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption: 1.5 μA typ., 3.0 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0.05 V to 0.4 V in 5 mV step.)

S-8216A Series

**Features**
- High-accuracy voltage detection circuit
- Overcharge detection voltage: 4.000 V to 5.000 V (5 mV step)  ±15 mV
- Overcharge release voltage: 3.800 V to 4.950 V  ±50 mV
- Discharge overcurrent detection voltage: 0.003 V to 0.100 V (0.5 mV step)  ±1.5 mV
- Detection delay time is generated only by an internal circuit (external capacitors are unnecessary).
- Output logic is selectable: Active "H", active "L"
- Output form: CMOS output
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption: 2.9 μA typ., 4.0 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0.05 V to 0.4 V in 50 mV step.)
High-accuracy voltage detection circuit
Overcharge detection voltage 3.5 V to 4.5 V (5 mV step) Accuracy ±20 mV (Ta = +25°C)
Overcharge release voltage 3.1 V to 4.5 V
Overdischarge detection voltage 2.0 V to 3.4 V (10 mV step) Accuracy ±35 mV
Overdischarge release voltage 2.0 V to 3.4 V
Discharge overcurrent detection voltage 0.05 V to 0.20 V (10 mV step) Accuracy ±10 mV
Charge overcurrent detection voltage 0.20 V to 0.05 V (25 mV step) Accuracy ±15 mV
Detection delay times are generated only by an internal circuit (external capacitors are unnecessary). Accuracy ±20%

High-withstand voltage (VM pin and CO pin: Absolute maximum rating = 28 V)
0 V battery charge function “available” / “unavailable” is selectable.
Power-down function “available” / “unavailable” is selectable.
Wide operation temperature range Ta = +40°C to +85°C
Low current consumption During operation 2.8 μA typ., 5.0 μA max. (Ta = +25°C)
During power-down 0.1 μA max. (Ta = +25°C)
Lead-free (Sn 100%), halogen-free

Detection delay times are generated only by an internal circuit (external capacitors are unnecessary). Accuracy ±20%

Overcharge release voltage = Overcharge detection voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
Overdischarge release voltage = Overdischarge detection voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

---

SOT-23-5
1 VM
2 VDD
3 CO
4 DO
5 VDD
6 VM

SNT-6A
1 NC
2 DO
3 NC
4 VDD
5 VDD
6 VM

---

Widen operation temperature range Ta = +40°C to +85°C
Low current consumption During operation 3.0 μA typ., 5.5 μA max. (Ta = +25°C)
During power-down 0.2 μA max. (Ta = +25°C)
Lead-free, Sn 100%, halogen-free

---

Refer to "Product Name Structure" for details.
**S-8211D Series**

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-accuracy voltage detection circuit</strong></td>
</tr>
<tr>
<td>Overcharge detection voltage 3.6 V to 4.5 V (5 mV step) Accuracy 25 mV</td>
</tr>
<tr>
<td>Overcharge release voltage 3.5 V to 4.4 V</td>
</tr>
<tr>
<td>Overdischarge detection voltage 2.0 V to 3.0 V (10 mV step) Accuracy 50 mV</td>
</tr>
<tr>
<td>Overdischarge release voltage 2.0 V to 3.4 V</td>
</tr>
<tr>
<td>Discharge overcurrent detection voltage 0.05 V to 0.30 V (10 mV step) Accuracy 15 mV</td>
</tr>
<tr>
<td>Overcurrent 1 detection voltage 0.050 V to 0.300 V (applicable in 10 mV step) Accuracy 15 mV</td>
</tr>
<tr>
<td>Overcurrent 2 detection voltage 0.500 V (fixed) Accuracy 200 mV</td>
</tr>
<tr>
<td>Detection delay times are generated only by an internal circuit (external capacitors are unnecessary). Accuracy 20%</td>
</tr>
<tr>
<td>Overcharge hysteresis voltage can be selected from the range 0.1 V to 0.4 V (applicable in 100 mV step) Accuracy 50 mV</td>
</tr>
<tr>
<td>Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step. Accuracy 50 mV</td>
</tr>
<tr>
<td>Lead-free, Sn 100%, halogen-free</td>
</tr>
</tbody>
</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

*3. Refer to "Product Name Structure" for details.

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**S-8211D Series**

**Product Name Structure**

<table>
<thead>
<tr>
<th>SOT-23-6</th>
<th>SNT-6A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 VM</td>
<td>1 NC</td>
</tr>
<tr>
<td>2 VDD</td>
<td>2 CO</td>
</tr>
<tr>
<td>3 VSS</td>
<td>3 DO</td>
</tr>
<tr>
<td>4 DO</td>
<td>4 VSS</td>
</tr>
<tr>
<td>5 CO</td>
<td>5 VDD</td>
</tr>
<tr>
<td>6 VM</td>
<td>6 VSS</td>
</tr>
</tbody>
</table>

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**S-8261 Series**

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal high accuracy voltage detection circuit</strong></td>
</tr>
<tr>
<td>Overcharge detection voltage 3.900 V to 4.500 V (applicable in 5 mV step) Accuracy 25 mV</td>
</tr>
<tr>
<td>Overdischarge detection voltage 2.000 V to 3.000 V (applicable in 10 mV step) Accuracy 50 mV</td>
</tr>
<tr>
<td>Overcharge hysteresis voltage 0.1 V to 0.4 V (applicable in 100 mV step) Accuracy 50 mV</td>
</tr>
<tr>
<td>Overdischarge hysteresis voltage 0.0 V to 0.7 V</td>
</tr>
<tr>
<td>Overdischarge release voltage 0.500 V (fixed)</td>
</tr>
<tr>
<td>Overcurrent 1 detection voltage 0.050 V to 0.300 V (applicable in 10 mV step) Accuracy 15 mV</td>
</tr>
<tr>
<td>Overcurrent 2 detection voltage 0.500 V (fixed) Accuracy 200 mV</td>
</tr>
<tr>
<td>High-accuracy voltage detection circuit</td>
</tr>
<tr>
<td>Overcharge detection voltage 3.6 V to 4.5 V (5 mV step) Accuracy 25 mV</td>
</tr>
<tr>
<td>Overcharge release voltage 3.5 V to 4.4 V</td>
</tr>
<tr>
<td>Overdischarge detection voltage 2.0 V to 3.0 V (10 mV step) Accuracy 50 mV</td>
</tr>
<tr>
<td>Overdischarge release voltage 2.0 V to 3.4 V</td>
</tr>
<tr>
<td>Discharge overcurrent detection voltage 0.05 V to 0.30 V (10 mV step) Accuracy 15 mV</td>
</tr>
<tr>
<td>Overcurrent 1 detection voltage 0.050 V to 0.300 V (applicable in 10 mV step) Accuracy 15 mV</td>
</tr>
<tr>
<td>Overcurrent 2 detection voltage 0.500 V (fixed) Accuracy 200 mV</td>
</tr>
<tr>
<td>Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step. Accuracy 50 mV</td>
</tr>
<tr>
<td>Lead-free, Sn 100%, halogen-free</td>
</tr>
</tbody>
</table>

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (where overcharge release voltage < 3.8 V is prohibited.)

*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage (where overdischarge release voltage > 3.4 V is prohibited.)

*3. Refer to "Product Name Structure" for details.

---

**Product Name Structure**

<table>
<thead>
<tr>
<th>SOT-23-6</th>
<th>SNT-6A</th>
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<tbody>
<tr>
<td>1 DO</td>
<td>1 NC</td>
</tr>
<tr>
<td>2 VM</td>
<td>2 CO</td>
</tr>
<tr>
<td>3 CO</td>
<td>3 DO</td>
</tr>
<tr>
<td>4 DP</td>
<td>4 VSS</td>
</tr>
<tr>
<td>5 VDD</td>
<td>5 VSS</td>
</tr>
<tr>
<td>6 VSS</td>
<td>6 VSS</td>
</tr>
</tbody>
</table>
### Features

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage: 3.5 V to 4.5 V (5 mV step)  
    - Accuracy: ±20 mV (Ta = +25°C)  
    - Overcharge release voltage: 3.1 V to 4.5 V (10 mV step)  
      - Accuracy: ±30 mV (Ta = +25°C)
  - Overdischarge detection voltage: 2.0 V to 3.4 V (10 mV step)  
    - Accuracy: ±35 mV
  - Overdischarge release voltage: 2.0 V to 3.4 V (10 mV step)  
    - Accuracy: ±50 mV
  - Load short-circuiting detection voltage: 0.5 V (fixed)  
    - Accuracy: ±100 mV
  - Charge overcurrent detection voltage: 0.05 V to 0.20 V (10 mV step)  
    - Accuracy: ±10 mV
  - Discharge overcurrent detection voltage: 0.05 V to 0.20 V (10 mV step)  
    - Accuracy: ±10 mV
  - Charge overcurrent detection voltage: 0.16 V to 0.08 V (40 mV step)  
    - Accuracy: ±15 mV

- **Detection delay times** are generated only by an internal circuit (External capacitors are unnecessary).
  - Accuracy: ±20%

- **Discharge control function**
  - Active "H", active "L"  
  - CTL pin control logic is selectable: Pull-up, pull-down
  - CTL pin internal resistance connection is selectable: 1.0 MΩ, 2.5 MΩ, 5.0 MΩ
  - Discharge inhibition status latch function is selectable: Available, unavailable
  - Power-down function is selectable: Available, unavailable
  - Release condition of discharge overcurrent status is selectable: Load disconnection, charger connection
  - Lead-free (Sn 100%), halogen-free

- **High-withstand voltage**
  - VM pin and CO pin: Absolute maximum rating: 28 V

- **Wide operation temperature range**
  - Ta = −40°C to +85°C

- **Low current consumption**
  - During operation: 2.8 μA typ., 5.5 μA max. (Ta = +25°C)
  - During power-down: 0.1 μA max. (Ta = +25°C)

- **Load short-circuiting detection voltage**
  - 0.05 V to 0.20 V (10 mV step)  
    - Accuracy: ±100 mV

- **Overdischarge release voltage**
  - 2.0 V to 3.4 V (10 mV step)  
    - Accuracy: ±100 mV

- **Overdischarge hysteresis voltage**
  - (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV steps.)

- **Overcharge release voltage = Overcharge detection voltage − Overcharge hysteresis voltage**
  - (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV steps.)

- **Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage**
  - (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV steps.)

<table>
<thead>
<tr>
<th>SOT-23-6</th>
<th>SNT-6A</th>
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<tr>
<td>1</td>
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<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**S-8252 Series**

- **High-accuracy voltage detection function for each cell**
  - Overcharge detection voltage n (n = 1, 2) : 3.55 V to 4.60 V (5 mV steps)  
    - Accuracy: ±20 mV (Ta = +25°C)
  - Overcharge release voltage n (n = 1, 2) : 3.55 V to 4.60 V (5 mV steps)  
    - Accuracy: ±20 mV (Ta = +25°C)
  - Overdischarge detection voltage n (n = 1, 2) : 2.00 V to 3.00 V (10 mV steps)  
    - Accuracy: ±50 mV
  - Overdischarge release voltage n (n = 1, 2) : 2.00 V to 3.00 V (10 mV steps)  
    - Accuracy: ±100 mV
  - Charge overcurrent detection voltage: ±0.00 V to ±0.05 V (25 mV steps)  
    - Accuracy: ±120 mV
  - Charge overcurrent detection function: Available, unavailable

- **Detection delay times** are generated only by an internal circuit (external capacitors are unnecessary).
  - Accuracy: ±20%

- **High-withstand voltage (VM pin and CO pin):** Absolute maximum rating: 28 V
  - Lead-free (Sn 100%), halogen-free

- **0 V battery charge**
  - Available, inhibited

- **Wide operation temperature range**
  - Ta = −40°C to +85°C

- **Low current consumption**
  - During operation: 8.0 μA max. (Ta = +25°C)
  - During power-down: 0.1 μA max. (Ta = +25°C)

- **Lead-free (Sn 100%), halogen-free**

- **Overcharge release voltage**
  - Overcharge detection voltage = Overcharge release voltage − Overcharge hysteresis voltage
  - (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV steps.)

- **Overdischarge release voltage**
  - Overdischarge detection voltage + Overdischarge hysteresis voltage
  - (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV steps.)
### S-8253C/D Series

#### Features

1. High-accuracy voltage detection for each cell
   - Overcharge detection voltage n (n = 1 to 3) 3.900 V to 4.400 V (50 mV step)  Accuracy ±25 mV
   - Overcharge release voltage n (n = 1 to 3) 3.800 V to 4.400 V  Accuracy ±50 mV
   - Overdischarge detection voltage n (n = 1 to 3) 2.000 V to 3.000 V (100 mV step)  Accuracy ±80 mV
   - Overdischarge release voltage n (n = 1 to 3) 2.000 V to 3.400 V  Accuracy ±100 mV

2. Three-level overcurrent detection (Including load short circuiting detection)
   - Overcurrent detection voltage 1 0.050 V to 0.300 V (50 mV step)  Accuracy ±25 mV
   - Overcurrent detection voltage 2 0.500 V (Fixed)
   - Overcurrent detection voltage 3 1.200 V (Fixed)

3. Delay time (Overcharge, overdischarge, overcurrent) is available by only using an internal circuit. (External capacitors are unnecessary).

4. Charge / discharge operation can be inhibited by the control pin.

5. V battery charge function available / unavailable is selectable.

6. High-withstand voltage Absolute maximum rating 26 V

7. Wide range of operating voltage 2 V to 24 V

8. Wide range of operating temperature −40°C to +85°C

9. Low current consumption
   - During operation 28 μA max. (+25°C)
   - During power-down 0.1 μA max. (+25°C)

10. Lead-free, Sn100%, halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
    (Overcharge hysteresis voltage n (n = 1 to 3) can be selected in 0 V, or in 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage
    (Overdischarge hysteresis voltage n (n = 1 to 3) can be selected in 0 V, or in 0.2 V to 0.7 V in 100 mV step.)

*3. Refer to “Product Name Structure” for details.

#### Pin Diagram

- **8-Pin TSSOP**
  - 8-Pin TSSOP
  - Pins: DOP, COP, VMP, VSS, VC2, VC1, VDD, VSS

- **16-Pin TSSOP**
  - 16-Pin TSSOP
  - Pins: VM, CTI, NPI, VIN1, VIN2, VDD, VSS, VC4, CTLC, CDT, CCT, VC2, VC1, VDD, VSS

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### S-8203A Series

#### Features

- High-accuracy voltage detection function for each cell
  - Overcharge detection voltage n (n = 1 to 3) 3.55 V to 4.50 V (50 mV step)  Accuracy ±25 mV
  - Overcharge release voltage n (n = 1 to 3) 3.30 V to 4.50 V  Accuracy ±50 mV
  - Overdischarge detection voltage n (n = 1 to 3) 2.0 V to 3.2 V (100 mV step)  Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 3) 2.0 V to 3.4 V  Accuracy ±100 mV

- Charge overcurrent detection in 2 steps
  - Discharge overcurrent detection voltage 0.05 V to 0.30 V (50 mV step)  Accuracy ±15 mV
  - Short-circuiting detection voltage 0.50 V to 1.0 V (100 mV step)  Accuracy ±100 mV

- Charge overcurrent detection function
  - Charge overcurrent detection voltage −0.30 V to −0.05 V (50 mV step)  Accuracy ±30 mV

- Selectable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time, charge overcurrent detection delay time
  (Load short-circuiting detection delay time is internally fixed.)

- Independent charge and discharge control by the control pin

- 0 V battery charge: Enabled, inhibited

- Power-down function: Available, unavailable

- High-withstand voltage: Absolute maximum rating 28 V

- Wide operation voltage range: 2 V to 24 V

- Wide operation temperature range: Ta = −40°C to +85°C

- Low current consumption
  - During operation: 40 μA max. (Ta = +25°C)
  - During power-down: 0.1 μA max. (Ta = +25°C)

- Lead-free, Sn100%, halogen-free

*1. The overcharge detection voltage n (n = 1 to 3) and overdischarge detection voltage n (n = 1 to 3) cannot be selected if the voltage difference between them is 0.6 V or lower.

*2. Overcharge hysteresis voltage n (n = 1 to 3) can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.

*3. Overdischarge hysteresis voltage n (n = 1 to 3) can be selected as 0 V or from a range of 0.2 V to 0.7 V in 100 mV step.

*4. The discharge overcurrent detection voltage and load short-circuiting detection voltage cannot be selected if the voltage difference between them is 0.3 V or lower.
**Features**

1. High-accuracy voltage detection for each cell
   - Overcharge detection voltage n (n = 1 to 4) 3.9 V to 4.45 V (50 mV step) Accuracy ±25 mV
   - Overcharge release voltage n (n = 1 to 4) 3.8 V to 4.45 V¹ Accuracy ±50 mV
   - Overdischarge detection voltage n (n = 1 to 4) 2.0 V to 3.0 V (100 mV step) Accuracy ±80 mV
   - Overdischarge release voltage n (n = 1 to 4) 2.0 V to 3.4 V² Accuracy ±100 mV
2. Three-level overcurrent protection
   - Overcurrent detection voltage 1 0.05 V to 0.30 V (50 mV step) Accuracy ±25 mV
   - Overcurrent detection voltage 2 0.5 V Accuracy ±100 mV
   - Overcurrent detection voltage 3 Vci = −1.2 V Accuracy ±300 mV
3. Delay times for overcharge detection, overdischarge detection and overcurrent detection can be set by external capacitors (delay times for overcurrent detection 2 and 3 are fixed internally).
4. Switchable between a 3-series and 4-series cell using the SEL pin
5. Charge/discharge operation can be controlled via the control pins.
6. 0 V battery charge Enabled, inhibited
7. Power-down function Available
8. High-withstand voltage Absolute maximum rating: 26 V
9. Wide operating voltage range 2 V to 24 V
10. Wide operating temperature range −40°C to +85°C
11. Low current consumption
   - During operation 30 µA max. (+25°C)
   - During power-down 0.1 µA max. (+25°C)
12. Lead-free, Sn 100%, halogen-free³

*1. Overcharge hysteresis voltage n (n = 1 to 4) can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV steps. (Overcharge hysteresis voltage = Overcharge detection voltage – Overcharge release voltage)
*2. Overdischarge hysteresis voltage n (n = 1 to 4) can be selected as 0 V or from a range of 0.2 V to 0.7 V in 100 mV steps. (Overdischarge hysteresis voltage = Overdischarge release voltage – Overdischarge detection voltage)

³. Refer to "Product Name Structure" for details.

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**Features**

- High-accuracy voltage detection function for each cell
  - Overcharge detection voltage n (n = 1 to 4) 3.8 V to 4.6 V (50 mV step) Accuracy ±25 mV
  - Overcharge release voltage n (n = 1 to 4) 3.8 V to 4.6 V¹ Accuracy ±50 mV
  - Overdischarge detection voltage n (n = 1 to 4) 2.0 V to 3.0 V (100 mV step) Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 4) 2.0 V to 3.4 V² Accuracy ±100 mV
- Discharge overcurrent detection function in 3-step
  - Discharge overcurrent detection voltage 1 0.05 V to 0.30 V (50 mV step) Accuracy ±15 mV
  - Discharge overcurrent detection voltage 2 0.5 V (fixed) Accuracy ±100 mV
  - Load short-circuit detection voltage 1.0 V (fixed) Accuracy ±300 mV
- Charge overcurrent detection function
  - Charge overcurrent detection voltage −0.25 V to −0.05 V (50 mV step) Accuracy ±30 mV
  - Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time, discharge overdischarge detection delay time 2, charge overcurrent detection delay time
  - Load short-circuit detection delay time is internally fixed.
- Switchable between 3-series and 4-series cell by using the SEL pin
- Independent charge and discharge control by the control pins
- High-withstand voltage Absolute maximum rating: 24 V
- Wide operating voltage range 2 V to 22 V
- Wide operation temperature range Ta = −40°C to +85°C
- Low current consumption
  - During operation 33 µA max. (Ta = +25°C)
  - During power-down 0.1 µA max. (Ta = +25°C)
- Lead-free, Sn 100%, halogen-free³

*1. Overcharge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or from a range of 0.1 V to 0.4 V in 50 mV step.
*2. Overdischarge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or from a range of 0.2 V to 0.7 V in 100 mV step.
*3. Refer to "Product Name Structure" for details.
### Features
- **High-accuracy voltage detection function for each cell**
  - Overcharge detection voltage \( n (n = 1 \text{ to } 4) \) \( 3.65 \text{ V to 4.6 V} \) (50 mV step) \( \pm \) 25 mV
  - Overcharge release voltage \( n (n = 1 \text{ to } 4) \) \( 3.5 \text{ V to 4.6 V} \) \( \pm \) 50 mV
  - Overdischarge detection voltage \( n (n = 1 \text{ to } 4) \) \( 2.0 \text{ V to 3.0 V} \) (100 mV step) \( \pm \) 90 mV
  - Overdischarge release voltage \( n (n = 1 \text{ to } 4) \) \( 2.0 \text{ V to 3.4 V} \) \( \pm \) 100 mV
- **Discharge overcurrent detection in 3-step**
  - Discharge overcurrent detection voltage \( 1 \) \( 0.05 \text{ V to 0.30 V} \) (50 mV step) \( \pm \) 15 mV
  - Discharge overcurrent detection voltage \( 2 \) \( 0.5 \text{ V (fixed)} \) \( \pm \) 100 mV
  - Overload short-circuit detection voltage \( 1.0 \text{ V (fixed)} \) \( \pm \) 300 mV
- **Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent detection delay time 2**
  - (Load short-circuit detection delay time is internally fixed.)
- **Switchable between 3-series and 4-series cell by using the SEL pin**
- **Independent charge and discharge control by the control pins**
- **Power-down function "available" / "unavailable" is selectable**
- **High-withstand voltage**
  - Absolute maximum rating: 24 V
- **Wide operation voltage range**
  - 2 V to 22 V
- **Wide operation temperature range**
  - \( Ta = -40\text{°C} \text{ to } +85\text{°C} \)
- **Low current consumption**
  - During operation: 33 \( \mu \text{A max.} \) (\( Ta = +25\text{°C} \))
  - During power-down: 0.1 \( \mu \text{A max.} \) (\( Ta = +25\text{°C} \))
- **Lead-free, Sn 100%, halogen-free**

*1. Overcharge hysteresis voltage \( n (n = 1 \text{ to } 4) \) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.\n
*2. Overdischarge hysteresis voltage \( n (n = 1 \text{ to } 4) \) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.\n
*3. Refer to "Product Name Structure" for details.

### S-8204B Series

**BATTERY PROTECTION IC**

FOR 3-SERIES OR 4-SERIES CELL PACK

### S-8205A/B Series

**BATTERY PROTECTION IC**

FOR 4-SERIES OR 5-SERIES CELL PACK

### Features
- **High-accuracy voltage detection function for each cell**
  - Overcharge detection voltage \( n (n = 1 \text{ to } 5) \) \( 3.550 \text{ V to 4.500 V} \) (50 mV step) \( \pm \) 25 mV
  - Overcharge release voltage \( n (n = 1 \text{ to } 5) \) \( 3.300 \text{ V to 4.500 V} \) \( \pm \) 50 mV
  - Overdischarge detection voltage \( n (n = 1 \text{ to } 5) \) \( 2.000 \text{ V to 3.200 V} \) (100 mV step) \( \pm \) 80 mV
  - Overdischarge release voltage \( n (n = 1 \text{ to } 5) \) \( 2.000 \text{ V to 3.400 V} \) \( \pm \) 100 mV
- **Discharge overcurrent detection in 2-step**
  - Discharge overcurrent detection voltage 1 \( 0.05 \text{ V to 0.30 V} \) (50 mV step) \( \pm \) 15 mV
  - Short circuit detection voltage \( 0.050 \text{ V to 0.300 V} \) (50 mV step) \( \pm \) 50 mV
  - Overdischarge detection voltage \( n (n = 1 \text{ to } 5) \) \( 2.000 \text{ V to 3.400 V} \) (100 mV step) \( \pm \) 80 mV
  - Overdischarge release voltage \( n (n = 1 \text{ to } 5) \) \( 2.000 \text{ V to 3.400 V} \) \( \pm \) 100 mV
- **Overcharge hysteresis voltage \( n (n = 1 \text{ to } 4) \) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step. \( \pm \) 30 mV
- **Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent detection delay time 2**
  - (Load short-circuit detection delay time is internally fixed.)
- **Switchable between 3-series and 4-series cell by using the SEL pin**
- **Independent charge and discharge control by the control pins**
- **Power-down function “available” / “unavailable” is selectable**
- **High-withstand voltage**
  - Absolute maximum rating: 28 V
- **Wide operation voltage range**
  - 2 V to 24 V
- **Wide operation temperature range**
  - \( Ta = -40\text{°C} \text{ to } +85\text{°C} \)
- **Low current consumption**
  - During operation: 40 \( \mu \text{A max.} \) (\( Ta = +25\text{°C} \))
  - During power-down: 0.1 \( \mu \text{A max.} \) (\( Ta = +25\text{°C} \))
- **Lead-free, Sn 100%, halogen-free**

*1. The overcharge detection voltage \( n (n = 1 \text{ to } 5) \) and overdischarge detection voltage \( n (n = 1 \text{ to } 5) \) are not selectable if the voltage difference between them is 0.6 V or less.

*2. Overcharge hysteresis voltage \( n (n = 1 \text{ to } 5) \) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.\n
*3. Overdischarge hysteresis voltage \( n (n = 1 \text{ to } 5) \) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.\n
*4. Refer to “Product Name Structure” for details.
S-8245A/C Series

**BATTERY PROTECTION IC**
FOR 3-SERIAL TO 5-SERIAL CELL PACK

**Features**

- High-accuracy voltage detection for each cell
  - Overcharge detection voltage n (n = 1 to 5): 3.550 V to 4.600 V (50 mV step)  Accuracy ±20 mV
  - Overcharge release voltage n (n = 1 to 5): 3.150 V to 4.600 V  Accuracy ±50 mV
  - Overdischarge detection voltage n (n = 1 to 5): 2.000 V to 3.200 V (100 mV step)  Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 5): 2.000 V to 3.400 V  Accuracy ±100 mV
- Three-level discharge overcurrent detection:
  - Discharge overcurrent 1 detection voltage: 0.020 V to 0.300 V (10 mV step)  Accuracy ±15 mV
  - Discharge overcurrent 2 detection voltage: 0.040 V to 0.500 V (20 mV step)  Accuracy ±30 mV
- Load short-circuiting detection voltage: 0.500 V to 0.000 V (25 mV step)  Accuracy ±50 mV
- Charge overcurrent detection:
  - Charge overcurrent detection voltage: -0.300 V to -0.020 V (10 mV step)  Accuracy ±10 mV
- Each delay time is settable by an external capacitor
  (Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- CIT pin internal resistance value is selectable: 831 kΩ typ., 8.31 MΩ typ.
- CO and DO pin output voltage is limited to 15 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Protection of 6-serial or more cells is possible by cascade connection
- Temperature detection is possible at four different points by connecting an NTC
  - High temperature detection ratio during charging / discharging: 0.600 to 0.900 (0.005 step)  Accuracy ±0.005
  - Low temperature detection ratio during charging / discharging: 0.000 to 0.400 (0.005 step)  Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
  - During operation: 20 µA max. (Ta = +25°C)
  - During power-down: 0.5 µA max. (Ta = +25°C)
  - During power-saving: 0.1 µA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.7 V in 100 mV step)

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S-8245B/D Series

**BATTERY PROTECTION IC**
FOR 3-SERIAL TO 5-SERIAL CELL PACK

**Features**

- High-accuracy voltage detection for each cell
  - Overcharge detection voltage n (n = 1 to 5): 3.550 V to 4.600 V (50 mV step)  Accuracy ±20 mV
  - Overcharge release voltage n (n = 1 to 5): 3.150 V to 4.600 V  Accuracy ±50 mV
  - Overdischarge detection voltage n (n = 1 to 5): 2.000 V to 3.200 V (100 mV step)  Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 5): 2.000 V to 3.400 V  Accuracy ±100 mV
- Three-level discharge overcurrent detection:
  - Discharge overcurrent 1 detection voltage: 0.020 V to 0.300 V (10 mV step)  Accuracy ±10 mV
  - Discharge overcurrent 2 detection voltage: 0.040 V to 0.500 V (20 mV step)  Accuracy ±15 mV
- Load short-circuiting detection voltage: 0.100 V to 0.000 V (25 mV step)  Accuracy ±50 mV
- Charge overcurrent detection:
  - Charge overcurrent detection voltage: -0.300 V to -0.020 V (10 mV step)  Accuracy ±10 mV
- Each delay time is settable by an external capacitor
  (Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- CIT pin internal resistance value is selectable: 831 kΩ typ., 8.31 MΩ typ.
- CO and DO pin output voltage is limited to 15 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Temperature detection is possible at four different points by connecting an NTC
  - High temperature detection ratio during charging / discharging: 0.600 to 0.900 (0.005 step)  Accuracy ±0.005
  - Low temperature detection ratio during charging / discharging: 0.030 to 0.400 (0.005 step)  Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
  - During operation: 20 µA max. (Ta = +25°C)
  - During power-down: 0.5 µA max. (Ta = +25°C)
  - During power-saving: 0.1 µA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.4 V in 50 mV step)
*2. Overdischarge release voltage = Overdischarge detection voltage – Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.7 V in 100 mV step)
**S-8223A/B/C/D Series**  
**BATTERY PROTECTION IC FOR 2-SERIAL / 3-SERIAL CELL PACK**  
**(SECONDARY PROTECTION)**

**Features**
- High-accuracy voltage detection circuit for each cell
  - Overcharge detection voltage range: 3.600 V to 4.700 V (50 mV step)  
    - Accuracy: ±20 mV (Ta = +25°C)  
  - Overcharge hysteresis voltage range: 0.0 mV to −550 mV (50 mV step)  
    - Accuracy: ±25 mV (Ta = +25°C)  
  - Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)
  - Overcharge detection delay time is selectable: 1 s, 2 s, 4 s, 6 s, 8 s
  - Overcharge release delay time is selectable: 2 ms, 64 ms
  - Built-in timer reset delay circuit
  - Output form is selectable (S-8223A/C Series): CMOS output, Nch open-drain output
  - Output logic is selectable (S-8223A/C Series): Active “H”, active “L”
  - CO pin output voltage is limited to 11.5 V max. (S-8223B/D Series)
  - High-withstand voltage: Absolute maximum rating: 28 V
  - Wide operating voltage range: 3.6 V to 28 V
  - Wide operation temperature range: Ta = −40°C to +85°C
  - Low current consumption:
    - During operation (VCU = 1.0 V for each cell): 0.25 μA typ., 0.5 μA max. (Ta = +25°C)
    - During overdischarge (VCU = 0.5 V for each cell): 0.3 μA max. (Ta = +25°C)
  - Lead-free (Sn 100%), halogen-free

*S1. Select the overcharge hysteresis voltage calculated as the following formula.  
(Overcharge detection voltage n) + (Overcharge hysteresis voltage n) ≥ 3.4 V
*S2. Only output logic active “H” is available.

**S-8244 Series**  
**BATTERY PROTECTION IC FOR 1-SERIAL TO 4-SERIAL-CELL PACK**  
**(SECONDARY PROTECTION)**

**Features**
- (1) Internal high-precision voltage detector circuit
  - Overcharge detection voltage range: 3.700 V to 4.550 V: Accuracy of ±25 mV (at +25°C)  
    - (at a 5 mV/step) Accuracy of ±50 mV (at −40°C to +85°C)
  - Hysteresis: 5 types
    - 0.38 ± 0.1 V, 0.25 ± 0.07 V, 0.13 ± 0.04 V, 0.045 ± 0.02 V, None
  - High-withstand voltage: Absolute maximum rating: 26 V
  - Wide operating voltage range: 3.6 V to 24 V (refers to the range in which the delay circuit can operate normally after overvoltage is detected)
  - Delay time during detection: Can be set by an external capacitor.
  - Low current consumption:
    - At 3.5 V for each cell: 3.0 μA max. (+25°C)
    - At 2.3 V for each cell: 2.4 μA max. (+25°C)
  - Output logic and form: 5 types
    - CMOS output active “H”
    - CMOS output active “L”
    - Pch open drain output active “L”
    - Nch open drain output active “H”
    - Nch open drain output active “L”
  - Lead-free (Sn 100%), halogen-free

**TMSOP-8**
- S-8223AB
- S-8223CD

**S-8244A**
- 1 CO
- 2 ICT
- 3 VC1
- 4 VC2
- 5 VC3
- 6 VSS
- 7 ICT
- 8 SENSE

**SNT-8A**
- 1 CO
- 2 ICT
- 3 VC1
- 4 VC2
- 5 VC3
- 6 VSS
- 7 ICT
- 8 SENSE
### S-8244A/B/C Series

**Features**

1. High-accuracy voltage detection circuit for each cell
   - Overcharge detection voltage \( n = 1 \) to 4
     - 4.200 V to 4.800 V (in 50 mV steps)
     - Accuracy: \( \pm 25 \text{ mV} \) (\( +25°C \)), \( \pm 30 \text{ mV} \) (\( -5°C \) to \( +55°C \))
   - Overcharge hysteresis voltage \( n = 1 \) to 4
     - \(-0.520 \text{ mV}, -0.390 \text{ mV}, -0.260 \text{ mV}, -0.130 \text{ mV} \)

2. Delay times for overcharge detection can be set by an internal circuit only (external capacitors are unnecessary)

3. Output control function via CTL pin
   - (S-8264A Series)
   - (S-8264C Series)

4. Output latch function after overcharge detection
   - (S-8264B Series)

5. Output form and logic
   - CMOS output active “H”
   - CMOS output, Nch open-drain output

6. High-withstand voltage
   - Absolute maximum rating 26 V
   - High-withstand voltage: Absolute maximum rating 28 V

7. Wide operation voltage range
   - 3.6 V to 24 V
   - 3.6 V to 28 V

8. Wide operation temperature range
   - \(-40°C \) to \( +85°C \)
   - \(-40°C \) to \( +85°C \)

9. Low current consumption
   - At 3.5 V for each cell: 5.0 \( \mu \text{A} \) max. (\( +25°C \))
   - At 2.3 V for each cell: 4.0 \( \mu \text{A} \) max. (\( +25°C \))

10. Lead-free, Sn 100%, halogen-free

*1. Refer to "Product Name Structure" for details.

![Diagram](image)

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### S-8224A/B Series

**Features**

- High-accuracy voltage detection circuit for each cell
  - Overcharge detection voltage \( n = 1 \) to 4
    - 3.600 V to 4.700 V (50 mV step)
    - Accuracy: \( \pm 20 \text{ mV} \) (\( +25°C \)), \( \pm 25 \text{ mV} \) (\( -10°C \) to \( +60°C \))
  - Overcharge hysteresis voltage \( n = 1 \) to 4
    - \(-0.0 \text{ mV} \) to \( -550 \text{ mV} \)
    - \(-300 \text{ mV} \) to \( -250 \text{ mV} \)
    - \(-100 \text{ mV} \) to \( -50 \text{ mV} \)
    - \(-50 \text{ mV} \)
    - \(-25 \text{ mV} \) to \( +20 \text{ mV} \)

- Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)
  - Overcharge detection delay time is selectable: 1 s, 2 s, 4 s, 6 s, 8 s
  - Overcharge release delay time is selectable: 1 ms, 2 ms, 4 ms

- Built-in timer reset delay circuit

- Output control function via CTL pin

- Output logic is selectable (S-8224A Series): Active "H", active "L"

- CO pin output voltage is limited to 11.5 V max. (S-8224B Series)

- High-withstand voltage: Absolute maximum rating 28 V

- Wide operation voltage range: 3.6 V to 28 V

- Wide operation temperature range: \( -40°C \) to \( +85°C \)

- Low current consumption
  - During operation (\( \text{VCU} = 1.0 \text{ V} \) for each cell): 0.25 \( \mu \text{A} \) typ., 0.6 \( \mu \text{A} \) max. (\( +25°C \))
  - During overdischarge (\( \text{VCU} = 0.5 \text{ V} \) for each cell): 0.3 \( \mu \text{A} \) max. (\( +25°C \))

- Lead-free (Sn 100%), halogen-free

*1. Select the overcharge hysteresis voltage calculated as the following formula.

\[
\text{Overcharge detection voltage} + \text{Overcharge hysteresis voltage} \geq 3.4 \text{ V}
\]

*2. Only output logic active "H" is available.

![Diagram](image)
**S-8215A Series**

**Features**

- High-accuracy voltage detection circuit for each cell
  - Overcharge detection voltage \( n = 1 \) to 5:
    - 3.600 V to 4.700 V (50 mV step)
    - Accuracy ±25 mV (Ta = +25°C)
  - Overcharge hysteresis voltage \( n = 1 \) to 5:
    - 0.0 mV to −550 mV (50 mV step)
      - −300 mV to −550 mV: Accuracy ±20 mV
      - −100 mV to −250 mV: Accuracy ±50 mV
      - 0.0 mV to −50 mV: Accuracy ±25 mV
- Delay times for overcharge detection can be set by an internal circuit only (External capacitors are unnecessary).
- Output form is selectable: CMOS output, Nch open-drain output, Pch open-drain output
- Output logic is selectable: Active "H", active "L"
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption
  - At Vcc = 1.0 V for each cell: 3.0 μA max. (Ta = +25°C)
  - At 2.3 V for each cell: 1.7 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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**S-8215C Series**

**Features**

- High-accuracy voltage detection circuit for each cell
  - Overcharge detection voltage \( n = 1 \) to 5:
    - 2.700 V to 4.700 V (5 mV step)
    - Accuracy ±20 mV (Ta = +25°C)
  - Overcharge hysteresis voltage \( n = 1 \) to 5:
    - 2.700 V to 4.700 V
    - Accuracy ±25 mV (Ta = −10°C to +60°C)
  - Overcharge detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
  - Overcharge detection delay time:
    - 0.5 s, 1 s, 2 s, 4 s, 6 s, 8 s
  - Output form:
    - CMOS output, Nch open-drain output
  - Output logic:
    - Active "H", active "L"
  - Built-in test mode function to check overcharge detection voltage with shortened delay time
  - High-withstand voltage: Absolute maximum rating 28 V
  - Wide operation voltage range: 3.6 V to 26 V
  - Wide operation temperature range: Ta = −40°C to +85°C
  - Low current consumption
    - During operation:
      - 0.3 μA typ., 0.7 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage + Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0 mV to −400 mV in 50 mV step.)
S-8265C Series

**Features**
- High-accuracy voltage detection circuit for each cell
- Cell balancing detection voltage n (n = 1 to 5):
  - 2.700 V to 4.650 V (5 mV step) Accuracy ±20 mV (Ta = +25°C)
  - 2.700 V to 4.650 V Accuracy ±50 mV (Ta = +25°C)
- Cell balancing release voltage n (n = 1 to 5):
  - 2.700 V to 4.650 V Accuracy ±20 mV (Ta = +25°C)
  - 2.700 V to 4.650 V Accuracy ±50 mV (Ta = +25°C)
- Overcharge detection voltage n (n = 1 to 5):
  - 2.750 V to 4.700 V (5 mV step) Accuracy ±20 mV (Ta = +25°C)
  - 2.750 V to 4.700 V Accuracy ±50 mV (Ta = +25°C)
- Overcharge release voltage n (n = 1 to 5):
  - 2.750 V to 4.700 V Accuracy ±50 mV (Ta = +25°C)
- Built-in cell balancing discharging FET for each cell
- Output form: CMOS output, Nch open-drain output
- Output logic: Active “H”, active “L”
- Built-in test mode function to check cell balancing detection voltage and overcharge detection voltage with shortened delay time
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption During operation: 0.3 μA typ., 0.7 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*S1.* Cell balancing release voltage = Cell balancing detection voltage + Cell balancing hysteresis voltage
(Satisfy Overcharge hysteresis voltage can be selected from a range of 0 V to 400 mV in 50 mV step.)

*S2.* Satisfy Overcharge detection voltage ≥ Cell balancing detection voltage + 50 mV when selecting them.

*S3.* Overcharge release voltage = Overcharge detection voltage + Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0 V to 400 mV in 50 mV step.)

*S4.* Satisfy Overcharge release voltage ≥ Cell balancing release voltage + 50 mV when selecting them.

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S-8259A Series

**Features**
- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step) Accuracy ±20 mV
  - Overcharge release voltage: 3.100 V to 4.600 V (10 mV step) Accuracy ±50 mV
  - Overcharge detection voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±50 mV
  - Overcharge release voltage: 2.000 V to 3.400 V (10 mV step) Accuracy ±100 mV
  - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
  - CO pin output logic: Active “H”, active “L”
  - Wide operation temperature range: Ta = -40°C to +85°C
  - Low current consumption
    - During operation: 1.5 μA typ., 3.0 μA max. (Ta = +25°C)
    - During overcharge: 2.0 μA max. (Ta = +25°C)
  - Lead-free (Sn 100%), halogen-free

*S1.* Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0 V to 0.4 V in 50 μV step.)

*S2.* Overcharge release voltage = Overcharge detection voltage + Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0.1 V to 0.7 V in 100 mV step.)

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ABLIC Inc. CMOS IC 2022 Product Catalogue 4-25 Lithium-ion Battery Protection ICs
**Features**

1. **High-accuracy voltage detection circuit**
   - Overcharge detection voltage: 3.6 V to 4.5 V (5 mV step) Accuracy ±25 mV (-25°C)
   - Overcharge release voltage: 3.5 V to 4.4 V (5 mV step) Accuracy ±50 mV
   - Overdischarge detection voltage: 2.0 V to 3.0 V (10 mV step) Accuracy ±50 mV
   - Overdischarge release voltage: 2.0 V to 3.4 V (10 mV step) Accuracy ±100 mV

2. Detection delay times are generated by an internal circuit (external capacitors are unnecessary) Accuracy ±20%

3. *Wide operating temperature range* 40°C to 85°C

4. **Low current consumption**
   - During operation: 3.0 μA typ., 5.5 μA max. (-25°C)
   - During overdischarge: 2.0 μA typ., 3.5 μA max. (-25°C)

5. Output logic of CO pin is selectable. Active “H”, Active “L”

6. **Lead-free, Sn 100%, halogen-free**

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
   (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)

*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
   (Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

*3. Refer to “Product Name Structure” for details.

---

**Features**

- **High-accuracy voltage detection circuit**
  - Overcharge detection voltage\(^1\): 3.55 V to 4.40 V (5 mV step) Accuracy ±25 mV
  - Overcharge release voltage\(^1\): 3.50 V to 4.40 V (5 mV step) Accuracy ±50 mV
  - Cell-balance detection voltage\(^2\): 3.55 V to 4.40 V (5 mV step) Accuracy ±25 mV
  - Cell-balance release voltage\(^3\): 3.50 V to 4.40 V (5 mV step) Accuracy ±25 mV
  - Overdischarge detection voltage: 2.0 V to 3.0 V (10 mV step) Accuracy ±100 mV
  - Overdischarge release voltage: 2.0 V to 3.4 V (10 mV step) Accuracy ±100 mV

- **Settable delay time by external capacitor for output pin**
- **Control charging, discharging, cell-balance by CTLCD pin and CTLD pin**
- **Two types of cell-balance function; charge / discharge\(^6\)**
- **Wide range of operation temperature** Ta = −40°C to +85°C
- **Low current consumption** 7.0 μA max.
- **Lead-free, Sn 100%, halogen-free**\(^7\)

*1. Regarding selection of overcharge detection voltage, overcharge release voltage, cell-balance detection voltage and cell-balance release voltage, refer to Remark 3 in “3. Product name list” of “Product Name Structure”

*2. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
   (Overcharge hysteresis voltage is selectable in 0 V to 0.4 V, in 50 mV step.)

*3. Select as to overcharge detection voltage > cell-balance detection voltage.

*4. Cell-balance release voltage = Cell-balance detection voltage – Cell-balance hysteresis voltage
   (Cell-balance hysteresis voltage is selectable in 0 V to 0.4 V, in 50 mV step.)

*5. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
   (Overdischarge hysteresis voltage is selectable in 0 V to 0.7 V, in 100 mV step.)

*6. Also available the product without discharge cell-balance function

*7. Refer to “Product Name Structure” for details.
### S-8209B Series

**BATTERY PROTECTION IC WITH CELL-BALANCE FUNCTION**

#### Features
- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.55 V to 4.40 V (5 mV step) Accuracy ±25 mV
  - Overcharge release voltage: 3.50 V to 4.40 V (5 mV step) Accuracy ±50 mV
  - Cell-balance detection voltage: 3.55 V to 4.40 V (5 mV step) Accuracy ±25 mV
  - Cell-balance release voltage: 3.50 V to 4.40 V (5 mV step) Accuracy ±50 mV
  - Overdischarge detection voltage: 2.0 V to 3.0 V (10 mV step) Accuracy ±50 mV
  - Overdischarge release voltage: 2.0 V to 3.4 V (5 mV step) Accuracy ±100 mV
- Settable delay time by external capacitor for output pin
- Control charging, discharging, cell-balance by CTLC pin, CTLD pin
- Two types of cell-balance function; charge / discharge
- Wide range of operation temperature Ta = -40°C to +85°C
- Low current consumption 7.0 µA max.
- Lead-free, Sn 100%, halogen-free

*1. Regarding selection of overcharge detection voltage, overcharge release voltage, cell-balance detection voltage and cell-balance release voltage, refer to Remark 3 in "3. Product name list" of "Product Name Structure".

*2. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage is selectable in 0 V to 0.4 V in 50 mV step.)

*3. Select as to overcharge detection voltage > cell-balance detection voltage.

*4. Cell-balance release voltage = Cell-balance detection voltage – Cell-balance hysteresis voltage (Cell-balance hysteresis voltage is selectable in 0 V to 0.4 V in 50 mV step.)

*5. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage is selectable in 0 V to 0.7 V in 100 mV step.)

*6. Also available the product without discharge cell-balance function

*7. Refer to "Product Name Structure" for details.

---

### S-8249 Series

**VOLTAGE MONITORING IC WITH CELL BALANCING FUNCTION**

#### Features
- High-accuracy voltage detection circuit
  - Cell balancing detection voltage: 2.0 V to 4.6 V (5 mV step) Accuracy ±12 mV (2.0 V ≤ VBU ≤ 2.4 V)
  - Cell balancing release voltage: 2.0 V to 4.6 V (Accuracy ±0.5% (2.4 V ≤ VBU ≤ 4.6 V))
  - Overcharge detection voltage: 2.0 V to 4.6 V (5 mV step) Accuracy ±12 mV (2.0 V ≤ VCU ≤ 2.4 V)
  - Overcharge release voltage: 2.0 V to 4.6 V (Accuracy ±0.5% (2.4 V ≤ VCU ≤ 4.6 V))
  - Overcharge release voltage: 2.0 V to 4.6 V (Accuracy ±1.0% (2.4 V ≤ VCL ≤ 4.6 V))
  - Cell balancing release voltage = Cell balancing detection voltage
  - Cell balancing hysteresis voltage
    (Cell balancing hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 50 mV step.)
  - Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 50 mV step.)

*1. Overcharge detection voltage = Cell balancing detection voltage – Cell balancing hysteresis voltage

*2. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage

---

**8-Pin TSSOP**

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<td>VDD</td>
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<td>VSS</td>
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**SOT-23-6**

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<td>6</td>
<td>CB</td>
</tr>
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</table>
Features

- High-accuracy voltage detection function for each cell
  - Overcharge detection voltage n (n = 1 to 5) 3.500 V to 4.400 V (50 mV step)
  - Overcharge release voltage n (n = 1 to 5) Accuracy ±20 mV (Ta = -25°C), ±30 mV (Ta = 0°C to +60°C)
  - Overdischarge detection voltage n (n = 1 to 5) 2.0 V to 3.2 V (100 mV step) Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 5) 2.100 V to 3.400 V² Accuracy ±100 mV
- Overcharge detection delay time and overdischarge detection delay time can be set by external capacitor.
- Switchable between 3-serial to 5-serial cell by using the SEL1 pin and the SEL2 pin
- Cascade connection is available.
- The CO pin and the DO pin are controlled by the CTLC pin and the CTLD pin, respectively.
- Output voltage of the CO pin and the DO pin is limited to 12 V max.
- High-withstand voltage Absolute maximum rating: 28 V
- Wide operation voltage range 4 V to 26 V
- Wide operation temperature range Ta = -40°C to +85°C
- Low current consumption During operation (V1 = V2 = V3 = V4 = V5 = 3.4 V) 22 µA max. (Ta = +25°C)
  - During power-down (V1 = V2 = V3 = V4 = V5 = 1.6 V) 4.5 µA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge hysteresis voltage n (n = 1 to 5) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.
  - Overcharge hysteresis voltage n = Overcharge detection voltage n - Overcharge release voltage n
*2. Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.7 V in 100 mV step.
  - Overdischarge hysteresis voltage n = Overdischarge release voltage n - Overdischarge detection voltage n

S-8225A Series

BATTERY MONITORING IC FOR 3-SERIAL TO 5-SERIAL CELL PACK

16-Pin TSSOP

16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
5 4 3 2 1 6 7 8 9 10 11 12 13 14 15 16

S-8225B Series

BATTERY MONITORING IC FOR 3-SERIAL TO 5-SERIAL CELL PACK

16-Pin TSSOP

16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
5 4 3 2 1 6 7 8 9 10 11 12 13 14 15 16

Features

- High-accuracy voltage detection function for each cell
  - Overcharge detection voltage n (n = 1 to 5) 3.5 V to 4.4 V (50 mV step)
  - Overcharge release voltage n (n = 1 to 5) Accuracy ±20 mV (Ta = -25°C), ±30 mV (Ta = 0°C to +60°C)
  - Overdischarge detection voltage n (n = 1 to 5) 2.2 V to 3.2 V (100 mV step) Accuracy ±80 mV
  - Overdischarge release voltage n (n = 1 to 5) 2.2 V to 3.4 V² Accuracy ±100 mV
- Overcharge detection delay time and overdischarge detection delay time can be set by external capacitor.
- Switchable between 3-serial to 5-serial cell by using the SEL1 pin and the SEL2 pin
- The CO pin and the DO pin are controlled by the CTLC pin and the CTLD pin, respectively.
- Output voltage of the CO pin and the DO pin is limited to 12 V max.
- Output logic is selectable. Active “H”, active “L”
- High-withstand voltage Absolute maximum rating: 28 V
- Wide operation voltage range 4 V to 26 V
- Wide operation temperature range Ta = -40°C to +85°C
- Low current consumption During operation (V1 = V2 = V3 = V4 = V5 = 3.4 V) 20 µA max. (Ta = +25°C)
  - During power-down (V1 = V2 = V3 = V4 = V5 = 1.6 V) 3.0 µA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge hysteresis voltage n (n = 1 to 5) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.
  - Overcharge hysteresis voltage n = Overcharge detection voltage n - Overcharge release voltage n
*2. Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.
  - Overdischarge hysteresis voltage n = Overdischarge release voltage n - Overdischarge detection voltage n
S-8255A Series
FOR 3-SERIAL TO 5-SERIAL CELL PACK

Features

- High-accuracy voltage detection function for each cell
  Overcharge detection voltage n (n = 1 to 5): 3.550 V to 4.600 V (50 mV step) Accuracy ±20 mV
  Overcharge release voltage n (n = 1 to 5): 3.150 V to 4.600 V (50 mV step) Accuracy ±50 mV
  Overdischarge detection voltage n (n = 1 to 5): 2.000 V to 3.400 V (100 mV step) Accuracy ±80 mV
  Overdischarge release voltage n (n = 1 to 5): 2.000 V to 3.400 V² Accuracy ±100 mV
- Each delay time is settable by external capacitor (Temperature detection delay time is internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery detection function is selectable: Available, unavailable
- CO and DO pin output voltage is limited to 8 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Monitoring of 6-serial or more cells is possible by cascade connection
- Temperature detection is possible at four different points by connecting an NTC
- High temperature detection ratio during charging / discharging: 0.600 to 0.900 (0.005 step) Accuracy ±0.005
- Low temperature detection ratio during charging / discharging: 0.030 to 0.400 (0.005 step) Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
  During operation: 19 µA max. (Ta = +25°C)
  During power-saving: 0.1 µA max. (Ta = +25°C)
- Lead-free, halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.4 V in 50 mV step)
*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.7 V in 100 mV step)

S-8255B Series
FOR 3-SERIAL TO 5-SERIAL CELL PACK

Features

- High-accuracy voltage detection function for each cell
  Overcharge detection voltage n (n = 1 to 5): 3.550 V to 4.600 V (50 mV step) Accuracy ±20 mV
  Overcharge release voltage n (n = 1 to 5): 3.150 V to 4.600 V² Accuracy ±50 mV
  Overdischarge detection voltage n (n = 1 to 5): 2.000 V to 3.200 V (100 mV step) Accuracy ±80 mV
  Overdischarge release voltage n (n = 1 to 5): 2.000 V to 3.400 V² Accuracy ±100 mV
- Each delay time is settable by external capacitor (Temperature detection delay time is internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery detection function is selectable: Available, unavailable
- CO and DO pin output voltage is limited to 8 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Temperature detection is possible at four different points by connecting an NTC
- High temperature detection ratio during charging / discharging: 0.600 to 0.900 (0.005 step) Accuracy ±0.005
- Low temperature detection ratio during charging / discharging: 0.030 to 0.400 (0.005 step) Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
  During operation: 19 µA max. (Ta = +25°C)
  During power-saving: 0.1 µA max. (Ta = +25°C)
- Lead-free, halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.4 V in 50 mV step)
*2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V to 0.7 V in 100 mV step)

ABLIC Inc. CMOS IC 2022 Product Catalogue 4-29 Lithium-ion Battery Protection ICs
**Features**

- Built-in high-accuracy voltage detection circuit
  - Overcurrent 1 detection voltage: 0.04 V to 0.30 V (10 mV step) Accuracy ±15 mV
  - Overcurrent 2 detection voltage: 0.1 V to 0.7 V (100 mV step) Accuracy ±100 mV
  - Overcurrent 3 detection voltage: 1.2 V (Fixed) Accuracy ±300 mV
- Built-in three-step overcurrent detection circuit: Overcurrent 1, overcurrent 2, overcurrent 3
- Overcurrent 3 detection function: Available, unavailable
- UVLO (under voltage lock out) function
  - UVLO detection voltage: 2.0 V (Fixed) Accuracy ±100 mV
  - High-withstand voltage: VM pin, DO pin: Absolute maximum rating 28 V
- Delay times are generated only by an internal circuit (External capacitors are unnecessary).
- Low current consumption
  - During normal operation: 7.0 μA max.
  - During UVLO operation: 6.0 μA max.
  - Output logic: Active "L", Active "H"
- Wide operation temperature range: Ta = −40°C to +85°C
- Lead-free (Sn 100%), halogen-free

*1. Overcurrent 1 detection voltage ≤ 0.06 V should be satisfied in the case of overcurrent 2 detection voltage = 0.1 V. Overcurrent 1 detection voltage ≤ 0.85 × overcurrent 2 detection voltage − 0.05 V should be satisfied in the case of overcurrent 2 detection voltage ≤ 0.2 V.

**S-8239B Series**

**Features**

- Built-in high-accuracy voltage detection circuit
  - Overcurrent 1 detection voltage: 0.04 V to 0.30 V (10 mV step) Accuracy ±15 mV
  - Overcurrent 2 detection voltage: 0.1 V to 0.7 V (100 mV step) Accuracy ±100 mV
  - Overcurrent 3 detection voltage: 1.2 V (Fixed) Accuracy ±300 mV
- Built-in three-step overcurrent detection circuit: Overcurrent 1, overcurrent 2, overcurrent 3
- Overcurrent 3 detection function: Available, unavailable
- UVLO (under voltage lock out) function
  - UVLO detection voltage: 2.0 V (Fixed) Accuracy ±100 mV
  - High-withstand voltage: VM pin, DO pin: Absolute maximum rating 28 V
- Delay times are generated only by an internal circuit (External capacitors are unnecessary).
- Low current consumption
  - During normal operation: 7.0 μA max.
  - During power-down: 0.1 μA max.
  - Output logic: Active "L"
- Wide operation temperature range: Ta = −40°C to +85°C
- Lead-free (Sn 100%), halogen-free

*1. Overcurrent 1 detection voltage ≤ 0.06 V should be satisfied in the case of overcurrent 2 detection voltage = 0.1 V. Overcurrent 1 detection voltage ≤ 0.85 × overcurrent 2 detection voltage − 0.05 V should be satisfied in the case of overcurrent 2 detection voltage ≥ 0.2 V.
### Features

- **High-accuracy voltage detection circuit**
  - Discharge overcurrent detection voltage 1: 0.0030 V to 0.1000 V (0.5 mV step)  
    - Accuracy ±1.5 mV
  - Discharge overcurrent detection voltage 2: 0.010 V to 0.100 V (1 mV step)  
    - Accuracy ±3 mV
  - Load short-circuiting detection voltage: 0.020 V to 0.100 V (1 mV step)  
    - Accuracy ±5 mV
  - Charge overcurrent detection voltage: −0.1000 V to −0.0030 V (0.5 mV step)  
    - Accuracy ±1.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
- **Discharge overcurrent control function**
  - Release condition of discharge overcurrent status: Load disconnection
  - Release voltage of discharge overcurrent status: \( V_{DI0V1}, V_{RI0V} = V_{DD} \times 0.8 \) (typ.)
- **High-withstand voltage**:
  - VM pin and CO pin: Absolute maximum rating 28 V
- **Low current consumption**:
  - During operation: 2.0 \( \mu \)A typ., 4.0 \( \mu \)A max. (\( Ta = +25°C \))
  - Wide operation temperature range: \( Ta = −40°C \) to +85°C
- **Lead-free (Sn 100%), halogen-free**

### S-8299A Series

#### Features

- **Detection voltage accuracy**: \( V_{HYS1} \) to \( V_{HYS3} = \) 0 mV, 50 mV, 300 mV, 400 mV, 500 mV
- **Hysteresis characteristics**: \( V_{DET1}= 9.0 \mu A \) max. (\( −V_{DETMIN} < 42 \) V)
  - \( I_{DD1} = 11.0 \mu A \) max. (\( −V_{DETMIN} < 42 \) V)
  - \( V_{DD} = 3.6 \) V to 24 V
- **Detection voltage**: \( −V_{DET1(S)} \) to \( −V_{DET2(S)} = 10.5 \) V to 21.5 V (0.1 V step)
  - \( −V_{DET1(S)} = 7.5 \) V to 21.5 V (0.1 V step)
- **Output form**: Nch open-drain output
- **Output logic**: Full charge all on, full charge all off
- **Operation temperature range**: \( Ta = −40°C \) to +85°C
- **Lead-free (Sn 100%), halogen-free**

### Pin Configuration

**SOT-23-6**

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<thead>
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<th>Pin</th>
<th>Function</th>
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<tr>
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<td>2 CO</td>
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<td>3 DO</td>
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**SNT-6A**

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<td>5</td>
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<td>6</td>
<td>6 VSS</td>
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</table>

\(1. \) \( −V_{DETMIN}: \) Total detection voltage

\(2. \) Full charge all on: When the input voltage is equal to or higher than each of the three detection voltage values, \( V_{OUT1} = V_{OUT2} = V_{OUT3} = V_{SS} \).

Full charge all off: When the input voltage is equal to or higher than each of the three detection voltage values, \( V_{OUT1} = V_{OUT2} = V_{OUT3} = "High-Z" \).
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<th>Package Name</th>
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<th>Pitch (mm)</th>
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