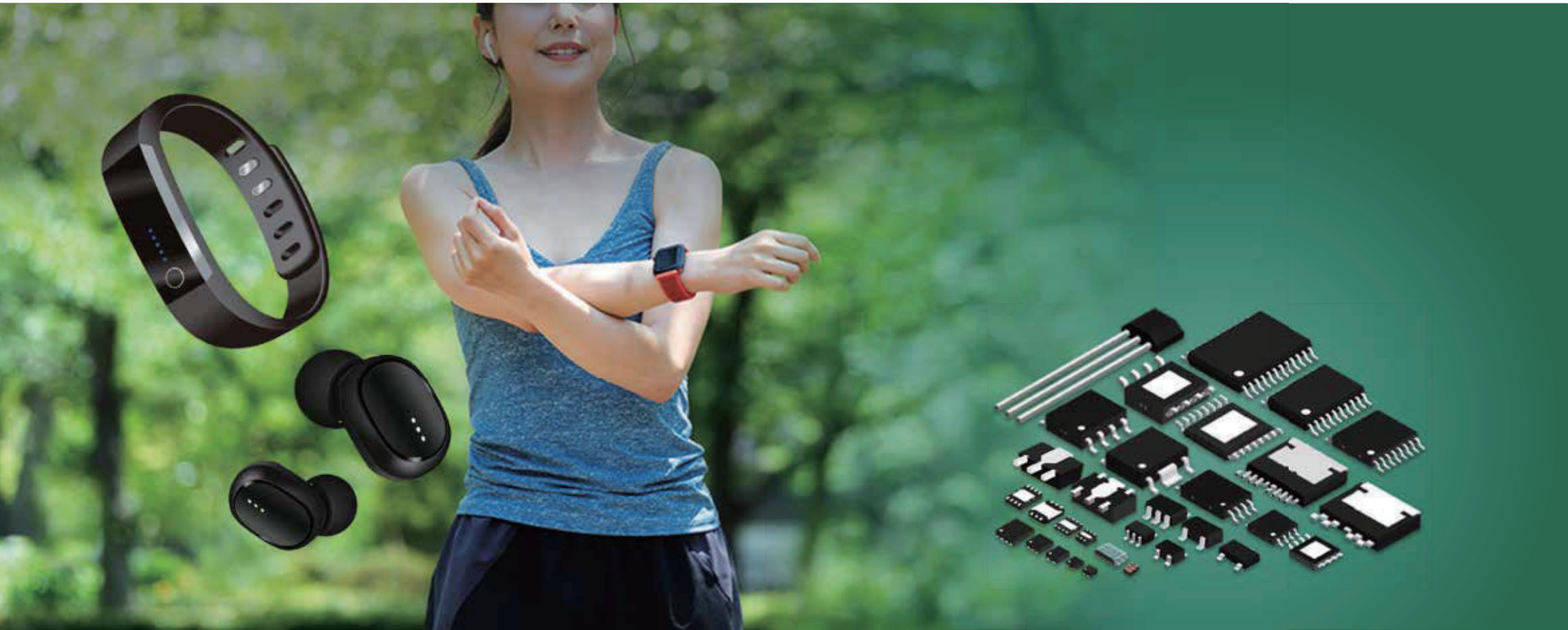


Product Catalog

Lithium-ion Battery Protection ICs

2022



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S-8240A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

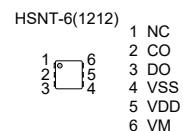
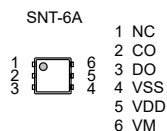
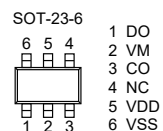
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.400 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.015 V to 0.200 V (5 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.065 V to 0.500 V (25 mV step) ^{*3}	Accuracy ± 40 mV
Charge overcurrent detection voltage	-0.200 V to -0.015 V (5 mV step)	Accuracy ± 5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: V_{RIOV} , V_{DIOV}
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	1.5 μA typ., 3.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
- 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 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 + $0.025 \times n$
(n can be selected from any integer value greater or equal to 2)



S-8240B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

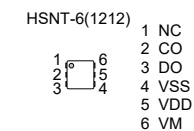
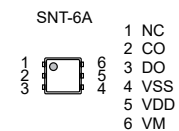
Overcharge detection voltage	3.5 V to 4.6 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.1 V to 4.6 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.0 V to 3.4 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.0 V to 3.4 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.015 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.065 V to 0.500 V (25 mV step) ^{*3}	Accuracy ± 40 mV
Charge overcurrent detection voltage	-0.100 V to -0.015 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- Release condition of discharge overcurrent status is selectable: Load disconnection, charger connection
- Release voltage of discharge overcurrent status is selectable: V_{RIOV} , V_{DIOV}
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	1.5 μA typ., 3.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
- 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 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 + $0.025 \times n$
(n can be selected from any integer value greater or equal to 2)



S-82B1A Series**BATTERY PROTECTION IC
WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK****● Features**

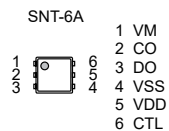
- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent 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).
 - 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:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: Available, unavailable
 - Release condition of discharge overcurrent status: Load disconnection, charger connection
 - Release voltage of discharge overcurrent status:

Discharge overcurrent detection voltage 1 (V_{DIOV1}),	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
--	---
 - High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
 - Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
 - 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-82B1B Series****BATTERY PROTECTION IC
WITH POWER-SAVING FUNCTION FOR 1-CELL PACK****● Features**

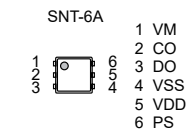
- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent 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).
 - Power-saving function

PS pin control logic is selectable:	Active "H", active "L"
PS pin internal resistance connection is selectable:	Pull-up, pull-down
PS pin internal resistance value is selectable:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - 0 V battery charge function is selectable: Available, unavailable
 - 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_{DIOV1}),	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
--	---
 - High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
 - Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During power-saving:	50 nA max. ($T_a = +25^\circ\text{C}$)
 - 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-82N1A Series**BATTERY PROTECTION IC
WITH CHARGE-DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK****Features**

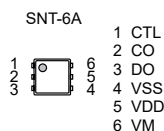
- High-accuracy voltage detection circuit

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 ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 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 connection:	Pull-up, pull-down
CTL pin internal resistance value:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - 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_{DIOV}), Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	600 nA typ., 990 nA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
 - 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-82N1B Series****BATTERY PROTECTION IC
WITH POWER-SAVING FUNCTION
FOR 1-CELL PACK****Features**

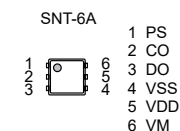
- High-accuracy voltage detection circuit

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 ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	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:	Pull-up, pull-down
PS pin internal resistance value:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - 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_{DIOV}), Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	600 nA typ., 990 nA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During power-saving:	50 nA max. ($T_a = +25^\circ\text{C}$)
 - 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

BATTERY PROTECTION IC
FOR 1-CELL PACK

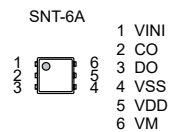
● Features

- 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 ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 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:	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.)



S-82A1A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.5 V to 4.6 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.1 V to 4.6 V ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent 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).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage 1 (V_{BIOV1}), discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (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 μ A typ., 4.0 μ A 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^{*3}

- *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.



S-82C1F Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

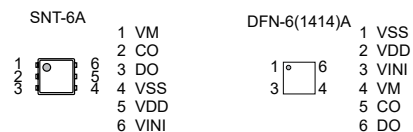
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent 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).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage 1 (V_{DIOV1}), discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	1.0 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, Sn 100%, halogen-free^{*3}

*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.



S-82C1E 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 ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent 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).
- Charge-discharge control function

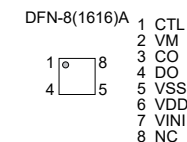
CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1.0 M Ω to 10 M Ω (1 M Ω step)
CTL pin voltage "H":	$V_{SS} + 0.7$ V, $V_{DD} - 0.9$ V
CTL pin voltage "L":	$V_{SS} + 0.7$ V, $V_{DD} - 0.9$ V
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage 1 (V_{DIOV1}), discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- Discharge overcurrent status reset function by CTL pin: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	1.0 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, halogen-free^{*3}

*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.



S-82F1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

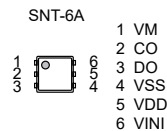
- High-accuracy voltage detection circuit

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 ^{*1}	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 ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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)
- Discharge overcurrent control function
 - Release condition of discharge overcurrent status: Load disconnection
 - Release voltage of discharge overcurrent status: $V_{RIOV} = V_{DD} \times 0.80$ typ.
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82F1A 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 ^{*1}	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 ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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).
- Charge-discharge control function

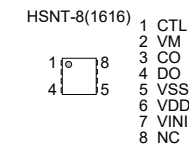
CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	$V_{RIOV} = V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82H1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

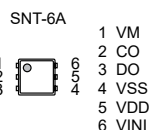
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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).
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82H1A 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 ^{*1}	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 ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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).
- Charge-discharge control function

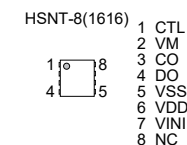
CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1 M Ω to 10 M Ω (1 M Ω step)
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	$V_{RIOV} = V_{DD} \times 0.8$
- Discharge overcurrent status reset function by CTL pin is selectable: Available, unavailable
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82K1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

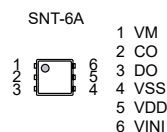
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ±15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ±75 mV
Discharge 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:	$V_{RIOV} = V_{DD} \times 0.8$ (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: $T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^{\circ}\text{C}$)
During power-down:	50 nA max. ($T_a = +25^{\circ}\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^{\circ}\text{C}$)
- 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-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 ^{*1}	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 ^{*2}	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

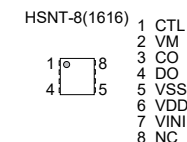
CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	$V_{RIOV} = V_{DD} \times 0.8$ (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: $T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^{\circ}\text{C}$)
During power-down:	50 nA max. ($T_a = +25^{\circ}\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^{\circ}\text{C}$)
- 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-82P1B Series

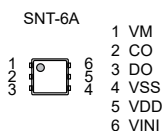
BATTERY PROTECTION IC FOR 1-CELL PACK

● 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 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ±75 mV
Discharge overcurrent detection voltage 1	3 mV to 100 mV (0.25 mV step)	Accuracy ±0.75 mV
Discharge overcurrent detection voltage 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 overcurrent 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).
 - Discharge overcurrent control function
 - Release condition of discharge overcurrent status: Load disconnection
 - Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V_{Riov}) = $V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
 - 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-82P1A Series

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

● Features

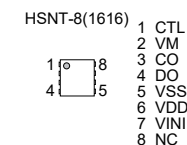
- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 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 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ±75 mV
Discharge overcurrent detection voltage 1	3 mV to 100 mV (0.25 mV step)	Accuracy ±0.75 mV
Discharge overcurrent detection voltage 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 overcurrent 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 M Ω to 6 M Ω (1 M Ω step)
 - Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{Riov}) = $V_{DD} \times 0.8$ (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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
 - 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-82G1B Series

CHARGE-DISCHARGE CURRENT PATH SEPARATION CIRCUIT COMPATIBLE
BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- High-accuracy voltage detection circuit

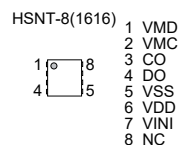
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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

CHARGE-DISCHARGE CURRENT PATH SEPARATION CIRCUIT COMPATIBLE
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 ^{*1}	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 ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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).
- Charge-discharge control function

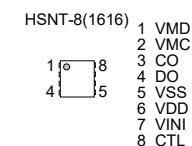
CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1 M Ω to 10 M Ω (1 M Ω step)
Charge-discharge inhibition status release function by VMD pin is selectable:	Available, unavailable
Transition from charge-discharge inhibition status to discharge overcurrent status is selectable:	Available, unavailable
- 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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82F1C Series

BATTERY PROTECTION IC FOR 1 CELL PACK
WITH LOAD MONITORING PIN

● Features

- High-accuracy voltage detection circuit

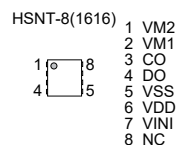
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ¹	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ²	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (1 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	-0.100 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

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	$V_{RIOV} = V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM1 pin, VM2 pin, and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- 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-82D1A Series

BATTERY PROTECTION IC
WITH TEMPERATURE PROTECTION FUNCTION FOR 1-CELL PACK

● Features

- High-accuracy temperature protection circuit by an external NTC thermistor

High temperature charge-discharge inhibition temperature	$+40^\circ\text{C}$ to $+85^\circ\text{C}$ (1°C step)	Accuracy $\pm 3^\circ\text{C}^{\dagger 1}$
High temperature charge inhibition temperature	$+40^\circ\text{C}$ to $+85^\circ\text{C}$ (1°C step)	Accuracy $\pm 3^\circ\text{C}^{\dagger 1}$
Low temperature charge inhibition temperature	-40°C to $+10^\circ\text{C}$ (1°C step)	Accuracy $\pm 3^\circ\text{C}^{\dagger 1}$
Low temperature charge-discharge inhibition temperature	-40°C to $+10^\circ\text{C}$ (1°C step)	Accuracy $\pm 3^\circ\text{C}^{\dagger 1}$
- 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 ²	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 ³	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 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	-0.100 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).
- 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 M Ω to 5 M Ω (1 M Ω step)
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (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 28.0 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

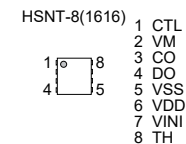
During operation:	2.5 μA typ., 5.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	100 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

*1. Temperature detection accuracy varies with NTC thermistor specifications.

When an NTC thermistor listed in **Table 6** is connected, the detection temperature and accuracy can be achieved.

*2. 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.)

*3. 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-8206A Series

BATTERY PROTECTION IC FOR 1-CELL PACK (SECONDARY PROTECTION)

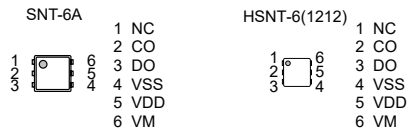
● Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 5.000 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.950 V ^{*1}	Accuracy ± 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

During operation:	1.5 μ A typ., 3.0 μ A max. (Ta = +25°C)
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- 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 0.05 V to 0.4 V in 50 mV step.)



S-8216A Series

BATTERY PROTECTION IC FOR 1-CELL PACK (SECONDARY PROTECTION)

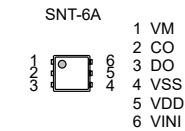
● Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	4.000 V to 5.000 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.600 V to 4.950 V ^{*1}	Accuracy ± 50 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (0.5 mV step)	Accuracy ± 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

During operation:	2.0 μ A typ., 4.0 μ A max. (Ta = +25°C)
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- 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 0.05 V to 0.4 V in 50 mV step.)



S-8200A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

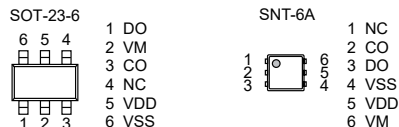
Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.5 V to 4.5 V (5 mV step)	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$) Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage	3.1 V to 4.5 V ^{*1}	Accuracy ± 30 mV
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 ^{*2}	Accuracy ± 50 mV
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 $\pm 20\%$
- 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 $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation	2.8 μA typ., 5.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down	0.1 μA max. ($T_a = +25^\circ\text{C}$)
- 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-8211C Series

BATTERY PROTECTION IC FOR 1-CELL PACK

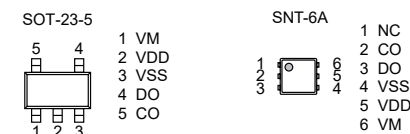
Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.9 V to 4.5 V (5 mV step)	Accuracy ± 25 mV ($T_a = +25^\circ\text{C}$) Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
Overcharge release voltage	3.8 V to 4.43 V ^{*1}	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 ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.05 V to 0.30 V (10 mV step)	Accuracy ± 15 mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy ± 200 mV
Charge overcurrent detection voltage	-0.1 V (fixed)	Accuracy ± 30 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary). Accuracy $\pm 20\%$
- 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 $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation	3.0 μA typ., 5.5 μA max. ($T_a = +25^\circ\text{C}$)
During power-down	0.2 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, Sn 100%, halogen-free^{*3}

- *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.



S-8211D Series

BATTERY PROTECTION IC
FOR 1-CELL PACK

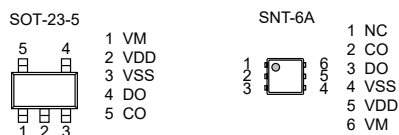
● Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.6 V to 4.5 V (5 mV step)	Accuracy ± 25 mV ($T_a = +25^\circ\text{C}$) Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
Overcharge release voltage	$3.5\text{ V to }4.4\text{ V}^1$	Accuracy ± 50 mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	$2.0\text{ V to }3.4\text{ V}^2$	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.05 V to 0.30 V (10 mV step)	Accuracy ± 15 mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy ± 200 mV Accuracy $\pm 20\%$
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 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 $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation	3.0 μA typ., 5.5 μA max. ($T_a = +25^\circ\text{C}$)
During power-down	0.2 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, Sn 100%, halogen-free^{*3}

- *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.



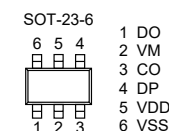
S-8261 Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● Features

- Internal high accuracy voltage detection circuit
 - Overcharge detection voltage 3.900 V to 4.500 V (applicable in 5 mV step) Accuracy: ± 25 mV ($+25^\circ\text{C}$) and ± 30 mV (-5°C to $+55^\circ\text{C}$)
 - Overcharge hysteresis voltage $0.1\text{ V to }0.4\text{ V}^1$ Accuracy: ± 25 mV
The overcharge hysteresis voltage can be selected from the range 0.1 V to 0.4 V in 50 mV step.
 - Overdischarge detection voltage 2.000 V to 3.000 V (applicable in 10 mV step) Accuracy: ± 50 mV
 - Overdischarge hysteresis voltage $0.0\text{ V to }0.7\text{ V}^2$ Accuracy: ± 50 mV
The overdischarge hysteresis voltage can be selected from the range 0.0 V to 0.7 V in 100 mV step.
 - Overcurrent 1 detection voltage 0.050 V to 0.300 V (applicable in 10 mV step) Accuracy: ± 15 mV
 - Overcurrent 2 detection voltage 0.500 V (fixed) Accuracy: ± 100 mV
- High-withstand voltage (VM pin and CO pin: Absolute maximum rating = 28 V)
- Delay times (overcharge: t_{CU} , overdischarge: t_{DL} , overcurrent 1: t_{OV1} , overcurrent 2: t_{OV2}) are generated by an internal circuit. No external capacitor is necessary. Accuracy: $\pm 20\%$
- Three-step overcurrent detection circuit is included (overcurrent 1, overcurrent 2 and load short-circuiting).
- 0 V battery charge function "Available" / "Unavailable" is selectable.
- Power-down function "Yes" / "No" is selectable.
- Charger detection function and abnormal charge current detection function
 - The overdischarge hysteresis is released by detecting negative voltage at the VM pin (-0.7 V typ.) (Charger detection function).
 - When the output voltage of the DO pin is high and the voltage at the VM pin is equal to or lower than the charger detection voltage (-0.7 V typ.), the output voltage of the CO pin goes low (Abnormal charge current detection function).
- Low current consumption
 - Operation mode 3.5 μA typ., 7.0 μA max.
 - Power-down mode 0.1 μA max.
- Wide operating temperature range -40°C to $+85^\circ\text{C}$
- Lead-free, Sn 100%, halogen-free^{*3}

- *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.



S-8230A/B Series

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

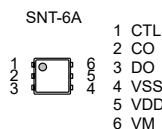
● Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.5 V to 4.5 V (5 mV step)	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$) Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage	3.1 V to 4.5 V ¹	Accuracy ± 30 mV
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 ²	Accuracy ± 50 mV
Discharge overcurrent detection voltage	0.05 V to 0.20 V (10 mV step)	Accuracy ± 10 mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy ± 100 mV
Charge overcurrent detection voltage	-0.20 V to -0.05 V (25 mV step) -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 $\pm 20\%$
 - 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:	1.0 M Ω , 2.5 M Ω , 5.0 M Ω	
Discharge inhibition status latch function is selectable:	Available, unavailable	
 - 0 V battery charge function is selectable: Available, unavailable
 - Power-down function is selectable: Available, unavailable
 - Release condition of discharge overcurrent status is selectable: Load disconnection, charger connection
 - High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
 - Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	2.8 μA typ., 5.5 μA max. ($T_a = +25^\circ\text{C}$)	
During power-down:	0.1 μA max. ($T_a = +25^\circ\text{C}$)	
 - 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-8252 Series

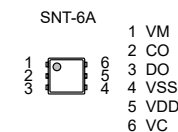
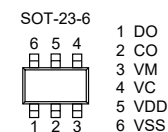
BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

● Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1, 2)	3.550 V to 4.600 V (5 mV steps)	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$) Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n (n = 1, 2)	3.150 V to 4.600 V ¹	Accuracy ± 30 mV
Overdischarge detection voltage n (n = 1, 2)	2.000 V to 3.000 V (10 mV steps)	Accuracy ± 50 mV
Overdischarge release voltage n (n = 1, 2)	2.000 V to 3.400 V ²	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.050 V to 0.400 V (10 mV steps)	Accuracy ± 10 mV
Load short-circuiting detection voltage	0.500 V to 0.900 V (50 mV steps)	Accuracy ± 100 mV
Charge overcurrent detection voltage	-0.400 V to -0.050 V (25 mV steps)	Accuracy ± 20 mV
 - Charge overcurrent detection function: Available, unavailable
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
Accuracy $\pm 20\%$
 - High-withstand voltage (VM pin and CO pin: Absolute maximum rating = 28 V)
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: Available, unavailable
 - Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation:	8.0 μA max. ($T_a = +25^\circ\text{C}$)	
During power-down:	0.1 μA max. ($T_a = +25^\circ\text{C}$)	
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage n (n = 1, 2) can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV steps.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n (n = 1, 2) 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

BATTERY PROTECTION IC
FOR 2-SERIES OR 3-SERIES-CELL PACK

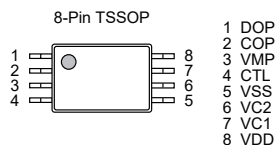
● Features

- (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^{*1} 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^{*2} 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) 0 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 $+85^{\circ}\text{C}$
- (9) Low current consumption
 - During operation 28 μA max. ($+25^{\circ}\text{C}$)
 - During power-down 0.1 μA max. ($+25^{\circ}\text{C}$)
- (10) Lead-free, Sn100%, halogen-free³

*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.



S-8203A Series

BATTERY PROTECTION IC
FOR 3-SERIES CELL PACK

● Features

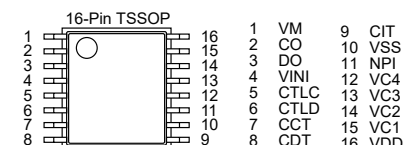
- High-accuracy voltage detection function for each cell
 - Overcharge detection voltage n (n = 1 to 3) 3.55 V to 4.50 V^{*1} (50 mV step) Accuracy ± 25 mV
 - Overcharge release voltage n (n = 1 to 3) 3.30 V to 4.50 V^{*2} Accuracy ± 50 mV
 - Overdischarge detection voltage n (n = 1 to 3) 2.0 V to 3.2 V^{*1} (100 mV step) Accuracy ± 80 mV
 - Overdischarge release voltage n (n = 1 to 3) 2.0 V to 3.4 V^{*3} Accuracy ± 100 mV
- Discharge overcurrent detection in 2-step
 - Discharge overcurrent detection voltage 0.05 V to 0.30 V^{*4} (50 mV step) Accuracy ± 15 mV
 - Short-circuiting detection voltage 0.50 V to 1.0 V^{*4} (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
- Settable 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 pins
 - 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: $T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
 - Low current consumption
 - During operation: 40 μA max. ($T_a = +25^{\circ}\text{C}$)
 - During power-down: 0.1 μA max. ($T_a = +25^{\circ}\text{C}$)
- Lead-free (Sn 100%), halogen-free

*1. The overcharge detection voltage n (n = 1 to 3) and overdischarge detection voltage (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.
(Overcharge hysteresis voltage = Overcharge detection voltage – Overcharge release voltage)

*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.
(Overdischarge hysteresis voltage = Overdischarge release voltage – Overdischarge detection voltage)

*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.



S-8254A Series

BATTERY PROTECTION IC FOR 3-SERIAL- OR 4-SERIAL-CELL PACK

● Features

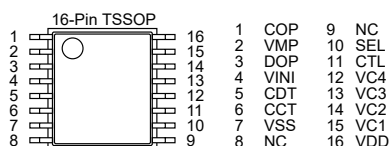
- (1) High-accuracy voltage detection for each cell

• Overcharge detection voltage n (n = 1 to 4)	3.90 V to 4.45 V (50 mV step)	Accuracy ±25 mV
• Overcharge release voltage n (n = 1 to 4)	3.80 V to 4.45 V ^{*1}	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 V ^{*2}	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	V _{VC1} - 1.2 V	Accuracy ±300 mV
- (3) Delay times for overcharge detection, overdischarge detection and overcurrent detection 1 can be set by external capacitors (delay times for overcurrent detection 2 and 3 are fixed internally).
- (4) Switchable between a 3-serial cell and 4-serial 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, Sn100%, halogen-free^{*3}

- *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.



S-8204A Series

BATTERY PROTECTION IC FOR 3-SERIES OR 4-SERIES CELL PACK

● Features

- High-accuracy voltage detection function for each cell

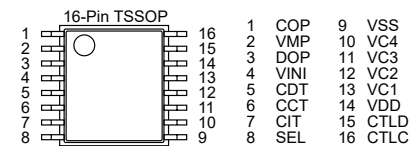
Overcharge detection voltage n (n = 1 to 4)	3.8 V to 4.6 V (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 4)	3.6 V to 4.6 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 4)	2.0 V to 3.0 V (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 4)	2.0 V to 3.4 V ^{*2}	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
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- Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent 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 operation 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-free^{*3}

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



S-8204B Series

BATTERY PROTECTION IC FOR 3-SERIES OR 4-SERIES CELL PACK

● Features

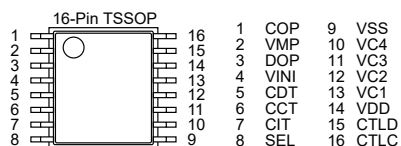
- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 4)	3.65 V to 4.6 V (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 4)	3.5 V to 4.6 V ^{*1}	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 V ^{*2}	Accuracy ±100 mV
- Discharge overcurrent detection 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
- 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°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-free^{*3}

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



S-8205A/B Series

BATTERY PROTECTION IC FOR 4-SERIES OR 5-SERIES CELL PACK

● Features

- High-accuracy voltage detection function for each cell

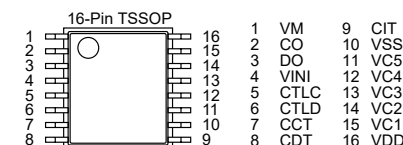
Overcharge detection voltage n (n = 1 to 5)	3.550 V to 4.500 V ^{*1} (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 5)	3.300 V to 4.500 V ^{*2}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5)	2.000 V to 3.200 V ^{*1} (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 5)	2.000 V to 3.400 V ^{*3}	Accuracy ±100 mV
- Discharge overcurrent detection in 2-step

Discharge overcurrent detection voltage	0.050 V to 0.300 V ^{*4} (50 mV step)	Accuracy ±15 mV
Short circuit detection voltage	0.500 V to 1.000 V ^{*4} (100 mV step)	Accuracy ±100 mV
- Charge overcurrent detection

Charge overcurrent detection voltage	-0.300 V to -0.050 V (50 mV step)	Accuracy ±30 mV
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- Settable by external capacitor; Overcharge detection delay time, Overdischarge detection delay time, Discharge overcurrent detection delay time, Charge overcurrent detection delay time
(Load short circuit detection delay time is internally fixed.)
- S-8205A Series: used for 4-series cell, S-8205B Series: used for 5-series cell
- Independent charging and discharge control by the control pins
- 0 V battery charge
Enabled, inhibited
- Power-down function
Available, unavailable
- High-withstand voltage
Absolute maximum rating : 28 V
- Wide range of operation voltage
2 V to 24 V
- Wide range of operation temperature
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 (Sn 100%), halogen-free

- *1. The overcharge detection voltage n (n = 1 to 5) and overdischarge detection voltage (n = 1 to 5) are not selectable if the voltage difference between them is 0.6 V or less.
- *2. 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 = Overcharge detection voltage – Overcharge release voltage)
- *3. 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 = Overdischarge release voltage – Overdischarge detection voltage)
- *4. The discharge overcurrent detection voltage and load short circuit detection voltage are not selectable if the voltage difference between them is 0.3 V or less.



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 ^{*1}	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 ^{*2}	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 1.000 V (25 mV step)	Accuracy ±50 mV
- Charge overcurrent detection:

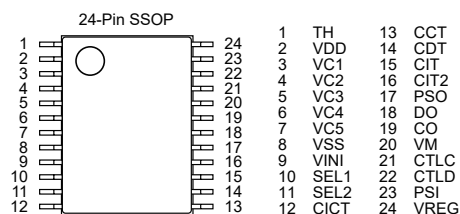
Charge overcurrent detection voltage:	-0.300 V to -0.020 V (10 mV step)	Accuracy ±10 mV
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- Each delay time is settable by an external capacitor
(Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- 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:	0.030 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
(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-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 ^{*1}	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 ^{*2}	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 1.000 V (25 mV step)	Accuracy ±50 mV
- Charge overcurrent detection:

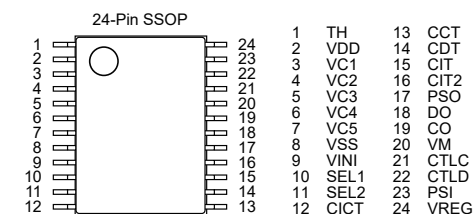
Charge overcurrent detection voltage:	-0.300 V to -0.020 V (10 mV step)	Accuracy ±10 mV
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- Each delay time is settable by an external capacitor
(Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- 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
(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-8223A/B/C/D Series

BATTERY PROTECTION IC FOR 2-SERIAL / 3-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

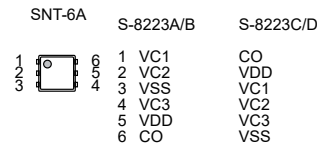
- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 3)

3.600 V to 4.700 V (50 mV step)	Accuracy ±20 mV (Ta = +25°C)
	Accuracy ±25 mV (Ta = -10°C to +60°C)
 - Overcharge hysteresis voltage n (n = 1 to 3)^{*1}

0.0 mV to -550 mV (50 mV step)	
-300 mV to -550 mV	Accuracy ±20%
-100 mV to -250 mV	Accuracy ±50 mV
-50 mV	Accuracy ±25 mV
0.0 mV	Accuracy -25 mV to +20 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: 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)^{*2}
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 - During operation (V_{CU} = 1.0 V for each cell): 0.25 μA typ., 0.5 μA max. (Ta = +25°C)
 - During overdischarge (V_{CU} × 0.5 V for each cell): 0.3 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Select the overcharge hysteresis voltage calculated as the following formula.
 (Overcharge detection voltage n) + (Overcharge hysteresis voltage n) ≥ 3.4 V

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

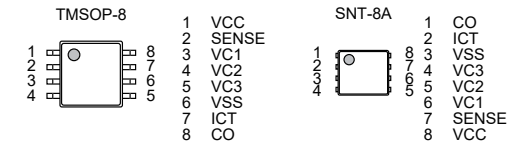


S-8244 Series

BATTERY PROTECTION IC FOR 1-SERIAL TO 4-SERIAL-CELL PACK (SECONDARY PROTECTION)

● Features

- 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"
 (CMOS / Nch open drain output for 0.045 V hysteresis models)
- Lead-free (Sn 100%), halogen-free



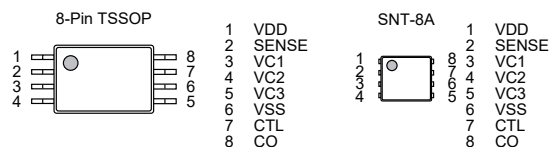
S-8264A/B/C Series

BATTERY PROTECTION IC FOR 2-SERIAL TO 4-SERIAL-CELL PACK (SECONDARY PROTECTION)

● Features

- (1) High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 4)
4.200 V to 4.800 V (in 50 mV steps) Accuracy : ±25 mV (+25°C), Accuracy : ±30 mV (-5°C to +55°C)
 - Overcharge hysteresis voltage n (n = 1 to 4)
-0.520 ±0.210 V, -0.390 ±0.160 V, -0.260 ±0.110 V, -0.130 ±0.06 V, None
- (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 (CTL pin is pulled down internally) (S-8264A Series)
Output control function via CTL pin (CTL pin is pulled up internally) (S-8264C Series)
- (4) Output latch function after overcharge detection (S-8264B Series)
- (5) Output form and logic CMOS output active "H"
- (6) High withstand voltage Absolute maximum rating 26 V
- (7) Wide operation voltage range 3.6 V to 24 V
- (8) Wide operation temperature range -40°C to +85°C
- (9) Low current consumption
 - At 3.5 V for each cell 5.0 µA max. (+25°C)
 - At 2.3 V for each cell 4.0 µA max. (+25°C)
- (10) Lead-free, Sn 100%, halogen-free*1

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



S-8224A/B Series

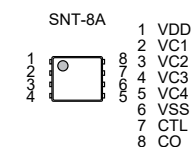
BATTERY PROTECTION IC FOR 2-SERIAL TO 4-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 4)
3.600 V to 4.700 V (50 mV step) Accuracy ±20 mV (Ta = +25°C)
Accuracy ±25 mV (Ta = -10°C to +60°C)
 - Overcharge hysteresis voltage n (n = 1 to 4)*1
0.0 mV to -550 mV (50 mV step) Accuracy ±20%
-300 mV to -550 mV Accuracy ±50 mV
-100 mV to -250 mV Accuracy ±25 mV
-50 mV Accuracy -25 mV to +20 mV
0.0 mV Accuracy -25 mV to +20 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: 2 ms, 64 ms
- Built-in timer reset delay circuit
- Output control function via CTL pin CMOS output, Nch open-drain output
- Output form is selectable (S-8224A Series): Active "H", active "L"
- 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)*2
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 - During operation (V_{CU} - 1.0 V for each cell): 0.25 µA typ., 0.6 µA max. (Ta = +25°C)
 - During overdischarge (V_{CU} × 0.5 V for each cell): 0.3 µA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Select the overcharge hysteresis voltage calculated as the following formula.
(Overcharge detection voltage n) + (Overcharge hysteresis voltage n) ≥ 3.4 V

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

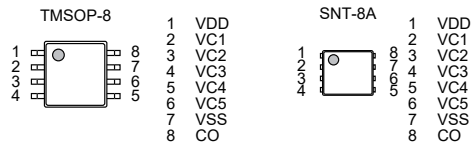


S-8215A Series

BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 5)
 - 3.600 V to 4.700 V (50 mV step)
 - Accuracy ± 25 mV ($T_a = +25^\circ\text{C}$)
 - Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
 - Overcharge hysteresis voltage n (n = 1 to 5)
 - 0.0 mV to -550 mV (50 mV step)
 - -300 mV to -550 mV Accuracy $\pm 20\%$
 - -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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - At $V_{\text{CUI}} - 1.0$ V for each cell: 3.0 μA max. ($T_a = +25^\circ\text{C}$)
 - At 2.3 V for each cell: 1.7 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free



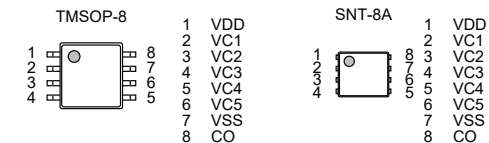
S-8215C Series

BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 5):
 - 2.700 V to 4.700 V (5 mV step) Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$)
 - Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
 - Overcharge release voltage n (n = 1 to 5)*1:
 - 2.700 V to 4.700 V Accuracy ± 50 mV ($T_a = +25^\circ\text{C}$)
- 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: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - During operation: 0.3 μA typ., 0.7 μA max. ($T_a = +25^\circ\text{C}$)
- 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

BATTERY PROTECTION IC WITH CELL BALANCING FUNCTION FOR 3-SERIAL TO 5-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

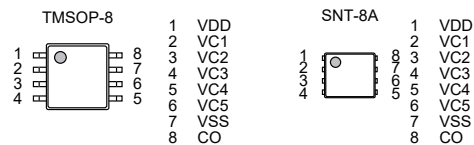
- High-accuracy voltage detection circuit for each cell
 - Cell balancing detection voltage n (n = 1 to 5):
 - 2.700 V to 4.650 V (5 mV step) Accuracy ± 20 mV (Ta = +25°C)
 - Accuracy ± 25 mV (Ta = -10°C to +60°C)
 - Cell balancing release voltage n (n = 1 to 5)*1:
 - 2.700 V to 4.650 V Accuracy ± 50 mV (Ta = +25°C)
 - Overcharge detection voltage n (n = 1 to 5)*2:
 - 2.750 V to 4.700 V (5 mV step) Accuracy ± 20 mV (Ta = +25°C)
 - Accuracy ± 25 mV (Ta = -10°C to +60°C)
 - Overcharge release voltage n (n = 1 to 5)*3, *4:
 - 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 μ A typ., 0.7 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

*2. Satisfy Overcharge detection voltage \geq Cell balancing detection voltage + 50 mV when selecting them.

*3. 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.)

*4. Satisfy Overcharge release voltage \geq Cell balancing release voltage + 50 mV when selecting them.



S-8259A Series

BATTERY MONITORING IC FOR 1-CELL PACK

● Features

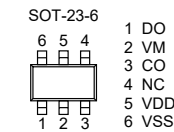
- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.400 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	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 μ A typ., 3.0 μ A max. (Ta = +25°C)
During overdischarge:	2.0 μ A 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 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 0.1 V to 0.7 V in 100 mV step.)



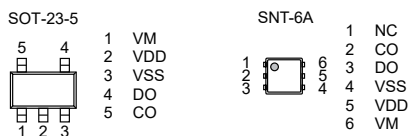
S-8211E Series

BATTERY PROTECTION IC FOR 1-CELL PACK

● 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)
Accuracy ±30 mV (−5°C to +55°C)
 - Overcharge release voltage 3.5 V to 4.4 V^{*1} 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^{*2} 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^{*3}

- *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.



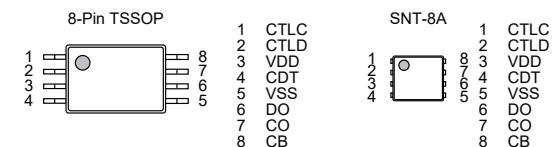
S-8209A Series

BATTERY PROTECTION IC WITH CELL-BALANCE FUNCTION

● 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^{*2} Accuracy ±50 mV
 - Cell-balance detection voltage^{*1} 3.55 V to 4.40 V (5 mV step)^{*3} Accuracy ±25 mV
 - Cell-balance release voltage^{*1} 3.50 V to 4.40 V^{*4} 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} Accuracy ±100 mV
- Settable delay time by external capacitor for output pin
- Control charging, discharging, cell-balance by CTLC 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 ^{*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 ^{*2}	Accuracy ± 50 mV
Cell-balance detection voltage ^{*1}	3.55 V to 4.40 V (5 mV step) ^{*3}	Accuracy ± 25 mV
Cell-balance release voltage ^{*1}	3.50 V to 4.40 V ^{*4}	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}	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^{*6}
- Wide range of operation temperature $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- 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.)

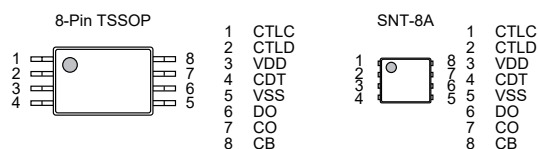
*3. Select as to overcharge detection voltage > cell-balance detection voltage.

*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-8249 Series

VOLTAGE MONITORING IC WITH CELL BALANCING FUNCTION

● Features

- High-accuracy voltage detection circuit

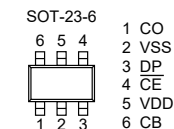
Cell balancing detection voltage: 2.0 V to 4.6 V (5 mV step)	Accuracy ± 12 mV ($2.0\text{ V} \leq V_{BU} < 2.4\text{ V}$)
	Accuracy $\pm 0.5\%$ ($2.4\text{ V} \leq V_{BU} \leq 4.6\text{ V}$)
Cell balancing release voltage: 2.0 V to 4.6 V ^{*1}	Accuracy ± 24 mV ($2.0\text{ V} \leq V_{BL} < 2.4\text{ V}$)
	Accuracy $\pm 1.0\%$ ($2.4\text{ V} \leq V_{BL} \leq 4.6\text{ V}$)
Overcharge detection voltage: 2.0 V to 4.6 V (5 mV step)	Accuracy ± 12 mV ($2.0\text{ V} \leq V_{CU} < 2.4\text{ V}$)
	Accuracy $\pm 0.5\%$ ($2.4\text{ V} \leq V_{CU} \leq 4.6\text{ V}$)
Overcharge release voltage: 2.0 V to 4.6 V ^{*2}	Accuracy ± 24 mV ($2.0\text{ V} \leq V_{CL} < 2.4\text{ V}$)
	Accuracy $\pm 1.0\%$ ($2.4\text{ V} \leq V_{CL} \leq 4.6\text{ V}$)
- Built-in Nch transistor with ON resistance of 5 Ω typ. between the CB pin and the VSS pin
- Current consumption: 2.0 μA max. ($T_a = +25^\circ\text{C}$)
- Delay times are generated only by an internal circuit (External capacitors are unnecessary).
- CO pin output form and output logic are selectable: CMOS output Active "H", active "L"
Nch open-drain output Active "H", active "L"
- Switchable to power-saving mode by using the $\overline{\text{CE}}$ pin
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. 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.)

*2. 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.)

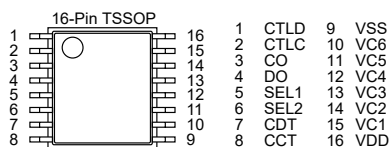


S-8225A Series**BATTERY MONITORING IC
FOR 3-SERIAL TO 5-SERIAL CELL PACK****Features**

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 5)	3.500 V to 4.400 V (50 mV step)	Accuracy ± 20 mV (Ta = +25°C), ± 30 mV (Ta = 0°C to +60°C)
Overcharge release voltage n (n = 1 to 5)	3.300 V to 4.400 V ^{*1}	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)	2.100 V to 3.400 V ^{*2}	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

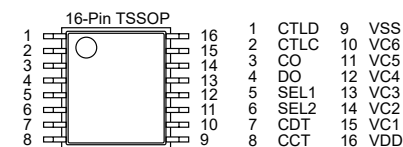
During operation (V1 = V2 = V3 = V4 = V5 = 3.4 V)	22 μ A max. (Ta = +25°C)
During power-down (V1 = V2 = V3 = V4 = V5 = 1.6 V)	4.5 μ A max. (Ta = +25°C)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge hysteresis voltage n (n = 1 to 5) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.
(Overcharge hysteresis voltage = Overcharge detection voltage – Overcharge release voltage)
- *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 = Overdischarge release voltage – Overdischarge detection voltage)

**S-8225B Series****BATTERY MONITORING IC
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)	3.5 V to 4.4 V (50 mV step)	Accuracy ± 20 mV (Ta = +25°C), ± 30 mV (Ta = 0°C to +60°C)
Overcharge release voltage n (n = 1 to 5)	3.3 V to 4.4 V ^{*1}	Accuracy ± 50 mV
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 V ^{*2}	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 μ A max. (Ta = +25°C)
During power-down (V1 = V2 = V3 = V4 = V5 = 1.6 V)	3.0 μ A 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 = Overcharge detection voltage – Overcharge release voltage)
- *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 = Overdischarge release voltage – Overdischarge detection voltage)



S-8255A Series

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

● Features

- High-accuracy voltage detection function for each cell

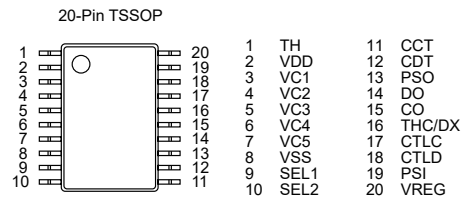
Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ±20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 5):	2.000 V to 3.400 V ^{*2}	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

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

● Features

- High-accuracy voltage detection function for each cell

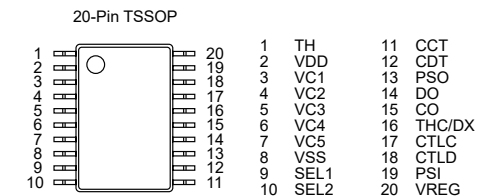
Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ±20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 5):	2.000 V to 3.400 V ^{*2}	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)



S-8239A Series

OVERCURRENT MONITORING IC
FOR MULTI-SERIAL-CELL PACK

● Features

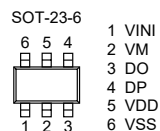
- Built-in high-accuracy voltage detection circuit

Overcurrent 1 detection voltage*1	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 $\leq 0.85 \times$ overcurrent 2 detection voltage - 0.05 V should be satisfied in the case of overcurrent 2 detection voltage ≥ 0.2 V.



S-8239B Series

OVERCURRENT MONITORING IC
FOR MULTI-SERIAL-CELL PACK

● Features

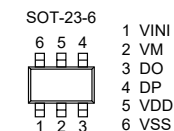
- Built-in high-accuracy voltage detection circuit

Overcurrent 1 detection voltage*1	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 $\leq 0.85 \times$ overcurrent 2 detection voltage - 0.05 V should be satisfied in the case of overcurrent 2 detection voltage ≥ 0.2 V.



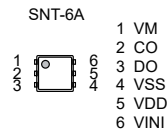
S-8269B Series**OVERCURRENT MONITORING IC
FOR MULTI-SERIAL-CELL PACK****Features**

- 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:	$V_{DIOV1}, V_{RIOV} = V_{DD} \times 0.8$ (typ.)
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Low current consumption

During operation:	2.0 μ A typ., 4.0 μ A max. ($T_a = +25^\circ\text{C}$)
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- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

**S-8229A Series****BATTERY MONITORING IC****Features**

- Detection voltage accuracy: $\pm 1.0\%$
- Hysteresis characteristics: V_{HYS1} to $V_{HYS3} = 0$ mV, 50 mV, 300 mV, 400 mV, 500 mV
- Current consumption:

During operation:	$I_{DD1} = 9.0$ μ A max. ($-V_{DETtotal}^{*1} \geq 42$ V)
During power-off:	$I_{DD2} = 0.1$ μ A max. ($-V_{DETtotal}^{*1} < 42$ V)
- Operation voltage range: $V_{DD} = 3.6$ V to 24 V
- Detection voltage:

$-V_{DET1(S)}$ to $-V_{DET2(S)}$	$= 10.5$ V to 21.5 V (0.1 V step)
$-V_{DET3(S)}$	$= 7.5$ V to 21.5 V (0.1 V step)
- Output form: Nch open-drain output
- Output logic^{*2}: Full charge all on, full charge all off
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. $-V_{DETtotal}$: Total detection voltage

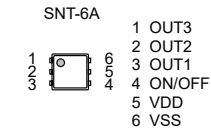
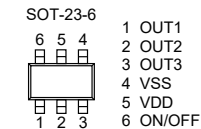
$$-V_{DETtotal} = -V_{DET1(S)} + -V_{DET2(S)} + -V_{DET3(S)}$$

*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,

$$V_{OUT1} = V_{OUT2} = V_{OUT3} = \text{"High-Z"}$$

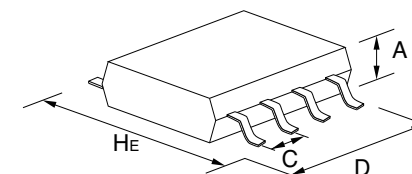


Package List

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)
			H _E	D	A (max.)	C
Lead insertion type	3	TO-92	7.0	5.2	4.2	2.5/1.27
	3	TO-92S	4.95	4.1	1.62	2.5/1.27
Flat-lead type	3	SOT-89-3	4.0	4.5	1.6	1.5
	5	SOT-89-5	4.5	4.5	1.6	1.5
Gull-wing type	4	SC-82AB	2.1	2.0	1.1	1.3
	5	SC-88A	2.1	2.0	1.1	0.65
	3	SOT-23-3	2.8	2.9	1.3	1.9
	3	SOT-23-3S	2.8	2.9	1.2	1.9
	3	TSOT-23-3S	2.85	2.9	0.8	1.9
	5	SOT-23-5	2.8	2.9	1.3	0.95
	6	SOT-23-6	2.8	2.9	1.35	0.95
	6	SOT-23-6W	2.8	2.9	1.3	0.95
	8	8-Pin SOP (JEDEC)	6.0	5.02	1.75	1.27
	8	8-Pin TSSOP	6.4	3.0	1.1	0.65
	8	8-Pin TSSOP	6.4	3.0	1.1	0.65
	16	16-Pin TSSOP	6.4	5.1	1.1	0.65
	20	20-Pin TSSOP	6.4	6.5	1.2	0.65
	24	24-Pin SSOP	7.6	7.9	1.4	0.65
	8	TMSOP-8	4.0	2.9	0.8	0.65
	8	HTMSOP-8	4.0	2.9	0.8	0.65
	16	HTSSOP-16	6.4	5.12	1.1	0.65
	6	HSOP-6	6.0	5.02	1.75	1.91
	8	HSOP-8A	6.0	5.02	1.68	1.27
	8	HSOP-8A	6.0	5.02	1.65	1.27
	8	HSOP-8Q	6.0	5.02	1.68	1.27
	5	TO-252-5S(A)	6.5	6.5	1.4	1.27
	9	TO-252-9S	6.5	6.5	1.4	0.65

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)
			H _E	D	A (max.)	C
Non-lead type	6	6-Pin HSON(A)	3.0	2.9	0.9	0.95
	6	SON-6C	2.55	1.56	0.65	0.5
	4	SNT-4A	1.6	1.2	0.5	0.65
	6	SNT-6A SNT-6A(H)	1.8	1.57	0.5	0.5
	8	SNT-8A	2.46	1.97	0.5	0.5
	4	HSNT-4(0808)	0.8	0.8	0.4	0.4
	4	HSNT-4(0808)B	0.8	0.8	0.41	0.4
	4	HSNT-4(1010)	1.0	1.0	0.4	0.65
	4	HSNT-4(1010)B	1.0	1.0	0.41	0.65
	6	HSNT-6(1212)	1.2	1.2	0.4	0.4
	6	HSNT-6A	2.46	1.96	0.5	0.5
	6	HSNT-6(2025)	2.46	1.96	0.5	0.5
	8	HSNT-8(1616)	1.6	1.6	0.4	0.4
	8	HSNT-8(2030)	3.0	2.0	0.5	0.5
	6	DFN-6(1414)A	1.4	1.4	0.6	0.5
	6	DFN-6(1518)A	1.8	1.5	0.33	0.5
	8	DFN-8(1616)A	1.6	1.6	0.6	0.4
	8	DFN-8(2030)	3.0	2.0	0.5	0.5
	8	DFN-8(2030)A	3.0	2.0	0.6	0.5
	8	DFN-8(2030)B	3.0	2.0	0.8	0.5

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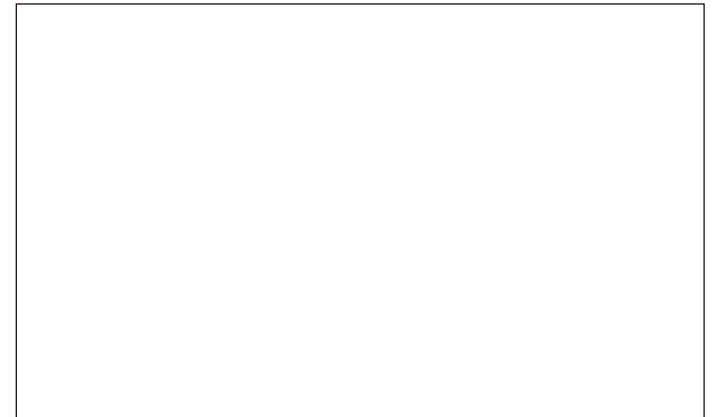
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