

# Product Catalogue

## Battery Protection ICs

2020-2021



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## S-8240A Series

### BATTERY PROTECTION IC FOR 1-CELL PACK

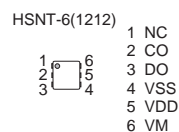
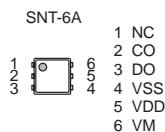
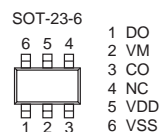
#### Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.400 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage	0.015 V to 0.200 V (5 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.065 V to 0.500 V (25 mV step) <sup>*3</sup>	Accuracy $\pm 40$ mV
Charge overcurrent detection voltage	-0.200 V to -0.015 V (5 mV step)	Accuracy $\pm 5$ 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 $\mu\text{A}$ typ., 3.0 $\mu\text{A}$ 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

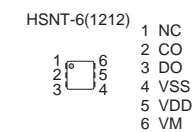
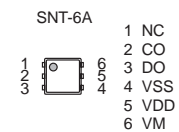
#### Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.5 V to 4.6 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.1 V to 4.6 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.0 V to 3.4 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.0 V to 3.4 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage	0.015 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.065 V to 0.500 V (25 mV step) <sup>*3</sup>	Accuracy $\pm 40$ mV
Charge overcurrent detection voltage	-0.100 V to -0.015 V (1 mV step)	Accuracy $\pm 3$ 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 $\mu\text{A}$ typ., 3.0 $\mu\text{A}$ 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

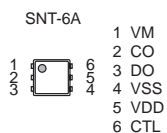
- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy $\pm 20$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ 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 $\Omega$ , 2.0 M $\Omega$ , 3.0 M $\Omega$ , 4.0 M $\Omega$ , 5.0 M $\Omega$
  - 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.)
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  - 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 $\mu\text{A}$ typ., 4.0 $\mu\text{A}$ 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

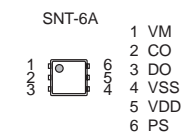
- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy $\pm 20$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ 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 $\Omega$ , 2.0 M $\Omega$ , 3.0 M $\Omega$ , 4.0 M $\Omega$ , 5.0 M $\Omega$
  - 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.)
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  - 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 $\mu\text{A}$ typ., 4.0 $\mu\text{A}$ 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-82A1A Series

## BATTERY PROTECTION IC FOR 1-CELL PACK

## ● Features

- High-accuracy voltage detection circuit
 

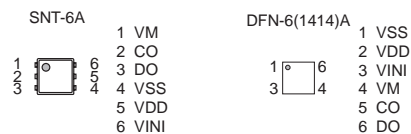
Overcharge detection voltage	3.5 V to 4.6 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.1 V to 4.6 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.0 V to 3.4 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy $\pm 20$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ 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 $\mu\text{A}$ typ., 4.0 $\mu\text{A}$ 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<sup>\*3</sup>

\*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 $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy $\pm 20$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ 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 $\mu\text{A}$ typ., 4.0 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
During power-down:	50 nA max. ( $T_a = +25^\circ\text{C}$ )
During overdischarge:	1.0 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
- Lead-free, Sn 100%, halogen-free<sup>\*3</sup>

\*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

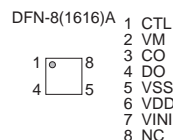
## ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy $\pm 5$ mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy $\pm 20$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ 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 $\Omega$ to 10 M $\Omega$ (1 M $\Omega$ step)
CTL pin voltage "H":	V <sub>SS</sub> + 0.7 V, V <sub>DD</sub> - 0.9 V
CTL pin voltage "L":	V <sub>SS</sub> + 0.7 V, V <sub>DD</sub> - 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<sub>DI0V1</sub>), discharge overcurrent release voltage (V<sub>RI0V</sub>) = V<sub>DD</sub>  $\times$  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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	1.0 $\mu$ A max. (Ta = +25°C)
- Lead-free, halogen-free<sup>3</sup>
  - Overcharge release voltage = Overcharge detection voltage - Overcharge hysteresis voltage  
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
  - Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage  
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)
  - Refer to "■ Product Name Structure" for details.



## S-82F1B Series

## BATTERY PROTECTION IC FOR 1-CELL PACK

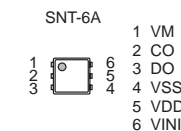
## ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.5$ 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 <sub>RI0V</sub> = V <sub>DD</sub> $\times$ 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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free
  - Overcharge release voltage = Overcharge detection voltage - Overcharge hysteresis voltage  
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
  - Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage  
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)



## S-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 $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
 

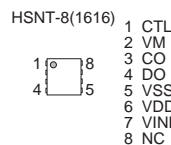
CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M $\Omega$ to 10 M $\Omega$ (1 M $\Omega$ step)
- Discharge overcurrent control function
 

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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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
 

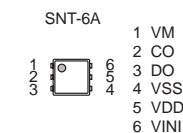
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.5$ 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: 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 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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 $\pm 1.5$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
 

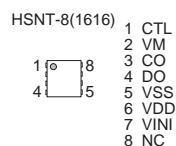
CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1 M $\Omega$ to 10 M $\Omega$ (1 M $\Omega$ step)
- Discharge overcurrent control function
 

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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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
 

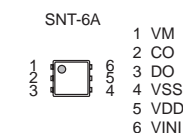
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 1.5$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.0$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.0$ 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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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 $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.0$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.0$ mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
 

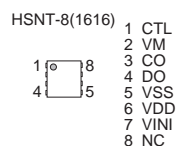
CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance:	Pull-up, pull-down
CTL pin internal resistance value:	1 M $\Omega$ to 10 M $\Omega$ (1 M $\Omega$ step)
- Discharge overcurrent control function
 

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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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
 

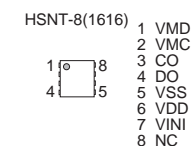
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function
 

Load short-circuiting detection 2 function is selectable:	Available, unavailable
Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	$V_{RIOV} = V_{DD} \times 0.8$
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VMC pin, VMD pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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 $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy $\pm 3$ mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function
 

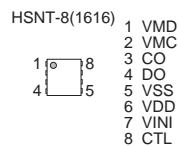
CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1 M $\Omega$ to 10 M $\Omega$ (1 M $\Omega$ step)
Charge-discharge inhibition status release function by VMD pin is selectable:	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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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
 

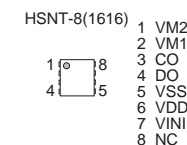
Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (1 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy $\pm 1.5$ 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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	2.0 $\mu$ A typ., 4.0 $\mu$ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu$ 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 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°C to +85°C (1°C step)	Accuracy $\pm 3^{\circ}\text{C}^{*1}$
High temperature charge inhibition temperature	+40°C to +85°C (1°C step)	Accuracy $\pm 3^{\circ}\text{C}^{*1}$
Low temperature charge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy $\pm 3^{\circ}\text{C}^{*1}$
Low temperature charge-discharge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy $\pm 3^{\circ}\text{C}^{*1}$
- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.100 V to 4.600 V <sup>2</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.000 V to 3.400 V <sup>3</sup>	Accuracy $\pm 75$ mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy $\pm 1.5$ 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 $\Omega$ to 5 M $\Omega$ (1 M $\Omega$ 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 28.0 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 

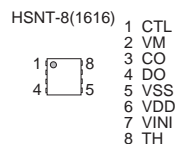
During operation:	2.5 $\mu\text{A}$ typ., 5.0 $\mu\text{A}$ max. (Ta = +25°C)
During power-down:	100 nA max. (Ta = +25°C)
During overdischarge:	0.5 $\mu\text{A}$ max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

\*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 $\pm 20$ mV
Overcharge release voltage	3.100 V to 4.950 V <sup>1</sup>	Accuracy $\pm 50$ 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 $\mu\text{A}$ typ., 3.0 $\mu\text{A}$ 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 0.05 V to 0.4 V in 50 mV step.)



## S-8216A Series

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

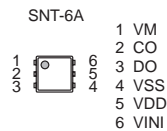
#### ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	4.000 V to 5.000 V (5 mV step)	Accuracy $\pm 15$ mV
Overcharge release voltage	3.600 V to 4.950 V <sup>1</sup>	Accuracy $\pm 50$ mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (0.5 mV step)	Accuracy $\pm 1.5$ 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 $\mu$ A typ., 4.0 $\mu$ 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 0.05 V to 0.4 V in 50 mV step.)



## S-8200A Series

### BATTERY PROTECTION IC FOR 1-CELL PACK

#### ● Features

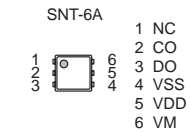
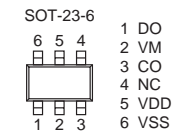
- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.5 V to 4.5 V (5 mV step)	Accuracy $\pm 20$ mV (Ta = +25°C)
		Accuracy $\pm 25$ mV (Ta = -10°C to +60°C)
Overcharge release voltage	3.1 V to 4.5 V <sup>1</sup>	Accuracy $\pm 30$ mV
Overdischarge detection voltage	2.0 V to 3.4 V (10 mV step)	Accuracy $\pm 35$ mV
Overdischarge release voltage	2.0 V to 3.4 V <sup>2</sup>	Accuracy $\pm 50$ mV
Discharge overcurrent detection voltage	0.05 V to 0.20 V (10 mV step)	Accuracy $\pm 10$ mV
Charge overcurrent detection voltage	-0.20 V to -0.05 V (25 mV step)	Accuracy $\pm 15$ 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: Ta = -40°C to +85°C
- Low current consumption
 

During operation	2.8 $\mu$ A typ., 5.0 $\mu$ A max. (Ta = +25°C)
During power-down	0.1 $\mu$ 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 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

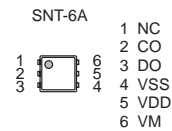
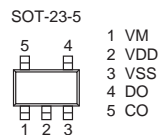
BATTERY PROTECTION IC  
FOR 1-CELL PACK

## ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.9 V to 4.5 V (5 mV step)	Accuracy $\pm 25$ mV ( $T_a = +25^\circ\text{C}$ ) Accuracy $\pm 30$ mV ( $T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$ )
Overcharge release voltage	3.8 V to 4.43 V <sup>1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.0 V to 3.4 V <sup>2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage	0.05 V to 0.30 V (10 mV step)	Accuracy $\pm 15$ mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy $\pm 200$ mV
Charge overcurrent detection voltage	-0.1 V (fixed)	Accuracy $\pm 30$ 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 $\mu\text{A}$ typ., 5.5 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
During power-down	0.2 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
  - Lead-free, Sn 100%, halogen-free<sup>\*3</sup>
- \*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

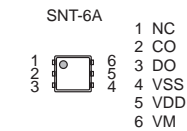
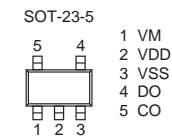
BATTERY PROTECTION IC  
FOR 1-CELL PACK

## ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.6 V to 4.5 V (5 mV step)	Accuracy $\pm 25$ mV ( $T_a = +25^\circ\text{C}$ ) Accuracy $\pm 30$ mV ( $T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$ )
Overcharge release voltage	3.5 V to 4.4 V <sup>1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.0 V to 3.4 V <sup>2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage	0.05 V to 0.30 V (10 mV step)	Accuracy $\pm 15$ mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy $\pm 200$ 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 $\mu\text{A}$ typ., 5.5 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
During power-down	0.2 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
  - Lead-free, Sn 100%, halogen-free<sup>\*3</sup>
- \*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

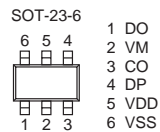
## ● Features

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

\*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

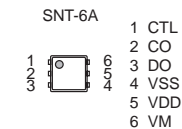
## ● Features

- High-accuracy voltage detection circuit
 

Overcharge detection voltage	3.5 V to 4.5 V (5 mV step)	Accuracy $\pm 20$ mV ( $T_a = +25^{\circ}\text{C}$ ) Accuracy $\pm 25$ mV ( $T_a = -10^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ )
Overcharge release voltage	$3.1\text{ V to }4.5\text{ V}^1$	Accuracy $\pm 30$ mV
Overdischarge detection voltage	2.0 V to 3.4 V (10 mV step)	Accuracy $\pm 35$ mV
Overdischarge release voltage	$2.0\text{ V to }3.4\text{ V}^2$	Accuracy $\pm 50$ mV
Discharge overcurrent detection voltage	0.05 V to 0.20 V (10 mV step)	Accuracy $\pm 10$ mV
Load short-circuiting detection voltage	0.5 V (fixed)	Accuracy $\pm 100$ mV
Charge overcurrent detection voltage	$-0.20\text{ V to }-0.05\text{ V}$ (25 mV step) $-0.16\text{ V to }-0.08\text{ V}$ (40 mV step)	Accuracy $\pm 15$ mV
  - Detection delay times are generated only by an internal circuit (External capacitors are unnecessary). Accuracy  $\pm 20\%$
  - Discharge control function
 

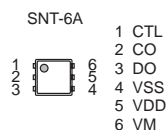
CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1.0 M $\Omega$ , 2.5 M $\Omega$ , 5.0 M $\Omega$
Discharge inhibition status latch function is selectable:	Available, unavailable
  - 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 $\mu\text{A typ.}$ , 5.5 $\mu\text{A max.}$ ( $T_a = +25^{\circ}\text{C}$ )
During power-down:	0.1 $\mu\text{A max.}$ ( $T_a = +25^{\circ}\text{C}$ )
  - 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.)

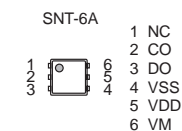


**S-8250A Series****BATTERY PROTECTION IC  
WITH DISCHARGE CONTROL FUNCTION FOR 1-CELL PACK****● Features**

- High-accuracy discharge overcurrent detection circuit  
Discharge overcurrent detection voltage 0.050 V to 0.150 V (1 mV step) Accuracy  $\pm 10$  mV ( $T_a = +25^\circ\text{C}$ )  
(Power supply voltage dependency can be set in accordance with ON resistance of the charge-discharge control FET.)
  - High-accuracy voltage detection circuit  
Overcharge detection voltage 4.100 V to 4.600 V (5 mV step) Accuracy  $\pm 20$  mV ( $T_a = +25^\circ\text{C}$ )  
Accuracy  $\pm 25$  mV ( $T_a = -10^\circ\text{C}$  to  $+60^\circ\text{C}$ )  
Overcharge release voltage 3.700 V to 4.600 V<sup>\*1</sup> Accuracy  $\pm 30$  mV  
Overdischarge detection voltage 2.000 V to 2.800 V (10 mV step) Accuracy  $\pm 50$  mV  
Overdischarge release voltage 2.000 V to 3.000 V<sup>\*2</sup> Accuracy  $\pm 100$  mV  
Load short-circuiting detection voltage 0.250 V to 0.500 V (50 mV step) Accuracy  $\pm 50$  mV  
Charge overcurrent detection voltage  $-0.200$  V to  $-0.025$  V (25 mV step) Accuracy  $\pm 15$  mV
  - Detection delay times are generated only by an internal circuit (External capacitors are unnecessary).
  - 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 $\Omega$ , 2.0 M $\Omega$ , 3.0 M $\Omega$ , 4.0 M $\Omega$ , 5.0 M $\Omega$   
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: 2.0  $\mu\text{A}$  typ., 4.0  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )  
During power-down: 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 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.)

**S-8250B Series****BATTERY PROTECTION IC FOR 1-CELL PACK****● Features**

- High-accuracy discharge overcurrent detection circuit  
Discharge overcurrent detection voltage 0.050 V to 0.150 V (1 mV step) Accuracy  $\pm 10$  mV ( $T_a = +25^\circ\text{C}$ )  
(Power supply voltage dependency can be set in accordance with ON resistance of the charge-discharge control FET.)
  - High-accuracy voltage detection circuit  
Overcharge detection voltage 4.100 V to 4.600 V (5 mV step) Accuracy  $\pm 20$  mV ( $T_a = +25^\circ\text{C}$ )  
Accuracy  $\pm 25$  mV ( $T_a = -10^\circ\text{C}$  to  $+60^\circ\text{C}$ )  
Overcharge release voltage 3.700 V to 4.600 V<sup>\*1</sup> Accuracy  $\pm 30$  mV  
Overdischarge detection voltage 2.000 V to 2.800 V (10 mV step) Accuracy  $\pm 50$  mV  
Overdischarge release voltage 2.000 V to 3.000 V<sup>\*2</sup> Accuracy  $\pm 100$  mV  
Load short-circuiting detection voltage 0.250 V to 0.500 V (50 mV step) Accuracy  $\pm 50$  mV  
Charge overcurrent detection voltage  $-0.200$  V to  $-0.025$  V (25 mV step) Accuracy  $\pm 15$  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
  - High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V  
 $T_a = -40^\circ\text{C}$  to  $+85^\circ\text{C}$
  - Low current consumption  
During operation: 2.0  $\mu\text{A}$  typ., 4.0  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )  
During power-down: 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 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.)



## S-8252 Series

BATTERY PROTECTION IC  
FOR 2-SERIAL-CELL PACK

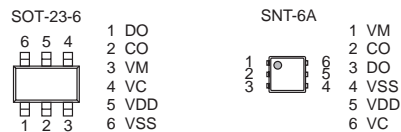
## ● Features

- 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 $\pm 20$ mV (Ta = +25°C)
		Accuracy $\pm 25$ mV (Ta = -10°C to +60°C)
Overcharge release voltage n (n = 1, 2)	3.150 V to 4.600 V <sup>1</sup>	Accuracy $\pm 30$ mV
Overdischarge detection voltage n (n = 1, 2)	2.000 V to 3.000 V (10 mV steps)	Accuracy $\pm 50$ mV
Overdischarge release voltage n (n = 1, 2)	2.000 V to 3.400 V <sup>2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent detection voltage	0.050 V to 0.400 V (10 mV steps)	Accuracy $\pm 10$ mV
Load short-circuiting detection voltage	0.500 V to 0.900 V (50 mV steps)	Accuracy $\pm 100$ mV
Charge overcurrent detection voltage	-0.400 V to -0.050 V (25 mV steps)	Accuracy $\pm 20$ 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: Ta = -40°C to +85°C
- Low current consumption
 

During operation:	8.0 $\mu$ A max. (Ta = +25°C)
During power-down:	0.1 $\mu$ A 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, 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-8262A Series

BATTERY PROTECTION IC  
FOR 2-SERIAL-CELL PACK

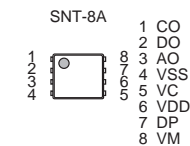
## ● Features

- High-accuracy voltage detection function for each cell
 

Overcharge detection voltage n (n = 1, 2)	3.900 V to 4.500 V (5 mV steps)	Accuracy $\pm 20$ mV (Ta = +25°C)
		Accuracy $\pm 25$ mV (Ta = -10°C to +60°C)
Overcharge release voltage n (n = 1, 2)	3.800 V to 4.500 V <sup>1</sup>	Accuracy $\pm 30$ mV
Overdischarge detection voltage n (n = 1, 2)	2.000 V to 3.000 V (10 mV steps)	Accuracy $\pm 50$ mV
Overdischarge release voltage n (n = 1, 2)	2.000 V to 3.400 V <sup>2</sup>	Accuracy $\pm 100$ mV
Discharge overcurrent 1 detection voltage	0.050 V to 0.200 V (10 mV steps)	Accuracy $\pm 10$ mV
Discharge overcurrent 2 detection voltage	0.200 V to 0.400 V (20 mV steps)	Accuracy $\pm 20$ mV
Load short-circuiting detection voltage	0.700 V (fixed)	Accuracy $\pm 100$ mV
Charge overcurrent detection voltage	-0.400 V to -0.050 V (25 mV steps)	Accuracy $\pm 20$ 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.
- Wide operating temperature range: Ta = -40°C to +85°C
- Low current consumption
 

During operation	8.0 $\mu$ A max. (Ta = +25°C)
During power-down	0.1 $\mu$ A 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, 2) can be selected as 0 V or from a range of 0.1 V to 0.4 V in 25 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.)





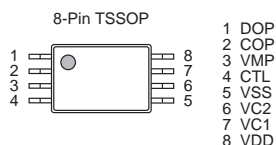
## S-8253C/D Series

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  $\pm 25$  mV
  - Overcharge release voltage n (n = 1 to 3) 3.800 V to 4.400 V<sup>\*1</sup> Accuracy  $\pm 50$  mV
  - Overdischarge detection voltage n (n = 1 to 3) 2.000 V to 3.000 V (100 mV step) Accuracy  $\pm 80$  mV
  - Overdischarge release voltage n (n = 1 to 3) 2.000 V to 3.400 V<sup>\*2</sup> Accuracy  $\pm 100$  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  $\pm 25$  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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- (9) Low current consumption
  - During operation 28  $\mu\text{A}$  max. ( $+25^{\circ}\text{C}$ )
  - During power-down 0.1  $\mu\text{A}$  max. ( $+25^{\circ}\text{C}$ )
- (10) Lead-free, Sn100%, halogen-free<sup>3</sup>

- \*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
 

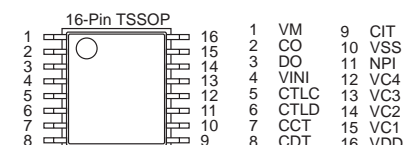
Overcharge detection voltage n (n = 1 to 3)	3.55 V to 4.50 V <sup>*1</sup> (50 mV step)	Accuracy $\pm 25$ mV
Overcharge release voltage n (n = 1 to 3)	3.30 V to 4.50 V <sup>*2</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage n (n = 1 to 3)	2.0 V to 3.2 V <sup>*1</sup> (100 mV step)	Accuracy $\pm 80$ mV
Overdischarge release voltage n (n = 1 to 3)	2.0 V to 3.4 V <sup>*3</sup>	Accuracy $\pm 100$ mV
- Discharge overcurrent detection in 2-step
 

Discharge overcurrent detection voltage	0.05 V to 0.30 V <sup>*4</sup> (50 mV step)	Accuracy $\pm 15$ mV
Short-circuiting detection voltage	0.50 V to 1.0 V <sup>*4</sup> (100 mV step)	Accuracy $\pm 100$ mV
- Charge overcurrent detection function
 

Charge overcurrent detection voltage	$-0.30$ V to $-0.05$ V (50 mV step)	Accuracy $\pm 30$ 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-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 $\mu\text{A}$ max. ( $T_a = +25^{\circ}\text{C}$ )
During power-down:	0.1 $\mu\text{A}$ 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 <sup>*1</sup>	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 <sup>*2</sup>	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 <sub>VC1</sub> - 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<sup>\*3</sup>

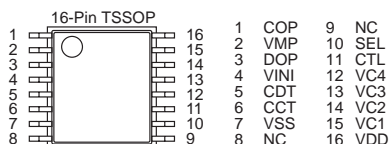
\*1. Overcharge hysteresis voltage n (n = 1 to 4) can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV steps.

(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 <sup>*1</sup>	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 <sup>*2</sup>	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
 

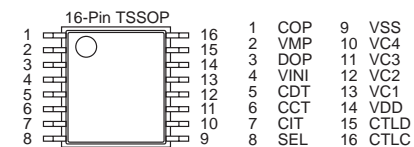
Charge overcurrent detection voltage	-0.25 V to -0.05 V (50 mV step)	Accuracy ±30 mV
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- Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent 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<sup>\*3</sup>

\*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

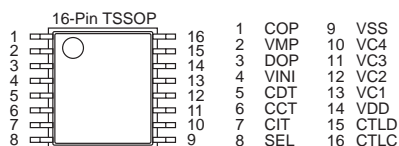
- High-accuracy voltage detection function for each cell
 

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 <sup>*1</sup>	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 <sup>*2</sup>	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<sup>\*3</sup>

- \*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
 

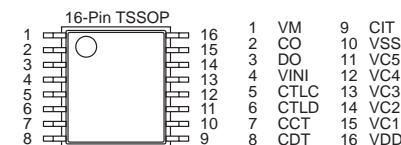
Overcharge detection voltage n (n = 1 to 5)	3.550 V to 4.500 V <sup>*1</sup> (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 5)	3.300 V to 4.500 V <sup>*2</sup>	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5)	2.000 V to 3.200 V <sup>*1</sup> (100 mV step)	Accuracy ±80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

Discharge overcurrent detection voltage	0.050 V to 0.300 V <sup>*4</sup> (50 mV step)	Accuracy ±15 mV
Short circuit detection voltage	0.500 V to 1.000 V <sup>*4</sup> (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
- Power-down function "yes" / "no" is selectable.
- 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

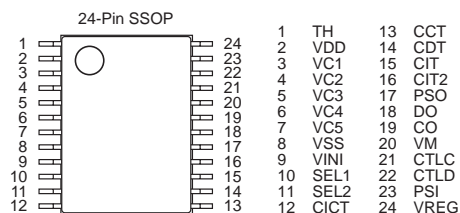
### BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK

#### 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<sup>\*1</sup> 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<sup>\*2</sup> 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
- 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

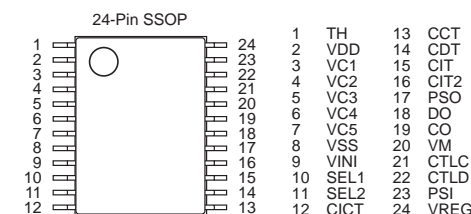
### BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK

#### 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<sup>\*1</sup> 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<sup>\*2</sup> 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
- 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

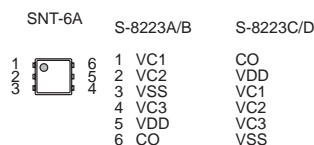
### BATTERY PROTECTION IC FOR 2-SERIAL / 3-SERIAL CELL PACK (SECONDARY PROTECTION)

#### ● 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  $\pm 20$  mV ( $T_a = +25^\circ\text{C}$ )
    - Accuracy  $\pm 25$  mV ( $T_a = -10^\circ\text{C}$  to  $+60^\circ\text{C}$ )
  - Overcharge hysteresis voltage n (n = 1 to 3)<sup>\*1</sup>
    - 0.0 mV to  $-550$  mV (50 mV step)
    - $-300$  mV to  $-550$  mV Accuracy  $\pm 20\%$
    - $-100$  mV to  $-250$  mV Accuracy  $\pm 50$  mV
    - $-50$  mV Accuracy  $\pm 25$  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)<sup>\*2</sup>
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 28 V
- Wide operation temperature range:  $T_a = -40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Low current consumption
  - During operation ( $V_{CU} - 1.0$  V for each cell): 0.25  $\mu\text{A}$  typ., 0.5  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )
  - During overdischarge ( $V_{CU} \times 0.5$  V for each cell): 0.3  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )
- 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)  $\geq 3.4$  V

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

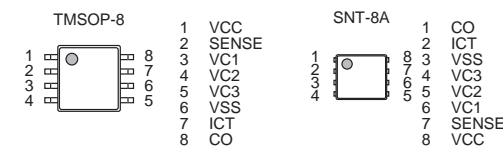


## S-8244 Series

### 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  $\pm 25$  mV (at  $+25^\circ\text{C}$ )  
(at a 5 mV/step) Accuracy of  $\pm 50$  mV (at  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ )
  - Hysteresis: 5 types  
0.38  $\pm$  0.1 V, 0.25  $\pm$  0.07 V, 0.13  $\pm$  0.04 V, 0.045  $\pm$  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  $\mu\text{A}$  max. ( $+25^\circ\text{C}$ )  
At 2.3 V for each cell: 2.4  $\mu\text{A}$  max. ( $+25^\circ\text{C}$ )
- 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



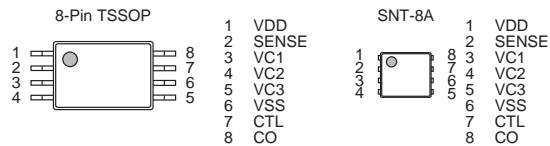
## S-8264A/B/C Series

### 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<sup>\*1</sup>

\*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)

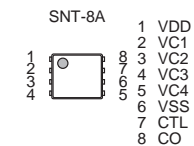
#### ● Features

- 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)<sup>\*1</sup>
    - 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
    - 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
- Output form is selectable (S-8224A Series): CMOS output, Nch open-drain output
- 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)<sup>\*2</sup>
- 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<sub>CU</sub> - 1.0 V for each cell): 0.25 μA typ., 0.6 μA max. (Ta = +25°C)
  - During overdischarge (V<sub>CU</sub> × 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.

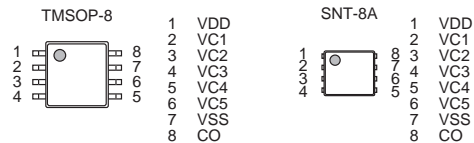
$$(\text{Overcharge detection voltage } n) + (\text{Overcharge hysteresis voltage } n) \geq 3.4 \text{ V}$$

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



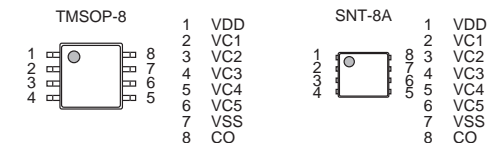
**S-8215A Series****BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK  
(SECONDARY PROTECTION)****● Features**

- 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  $\pm 25$  mV ( $T_a = +25^\circ\text{C}$ )
    - Accuracy  $\pm 30$  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  $\pm 50$  mV
      - $0.0$  mV to  $-50$  mV Accuracy  $\pm 25$  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  $V_{\text{CUIH}} - 1.0$  V for each cell: 3.0  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )
  - At 2.3 V for each cell: 1.7  $\mu\text{A}$  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  $\pm 20$  mV ( $T_a = +25^\circ\text{C}$ )
    - Accuracy  $\pm 25$  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  $\pm 50$  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  $\mu\text{A}$  typ., 0.7  $\mu\text{A}$  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

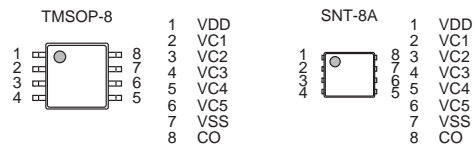
- High-accuracy voltage detection circuit for each cell
  - Cell balancing detection voltage n (n = 1 to 5):
    - 2.700 V to 4.650 V (5 mV step) Accuracy  $\pm 20$  mV (Ta = +25°C)
    - Accuracy  $\pm 25$  mV (Ta = -10°C to +60°C)
  - Cell balancing release voltage n (n = 1 to 5)\*1:
    - 2.700 V to 4.650 V Accuracy  $\pm 50$  mV (Ta = +25°C)
  - Overcharge detection voltage n (n = 1 to 5)\*2:
    - 2.750 V to 4.700 V (5 mV step) Accuracy  $\pm 20$  mV (Ta = +25°C)
    - Accuracy  $\pm 25$  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  $\pm 50$  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  $\mu$ A typ., 0.7  $\mu$ 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

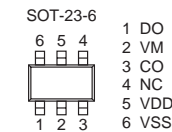
### BATTERY MONITORING IC FOR 1-CELL PACK

#### ● Features

- High-accuracy voltage detection circuit
  - Overcharge detection voltage: 3.500 V to 4.600 V (5 mV step) Accuracy  $\pm 20$  mV
  - Overcharge release voltage: 3.100 V to 4.600 V<sup>1</sup> Accuracy  $\pm 50$  mV
  - Overdischarge detection voltage: 2.000 V to 3.400 V (10 mV step) Accuracy  $\pm 50$  mV
  - Overdischarge release voltage: 2.000 V to 3.400 V<sup>2</sup> Accuracy  $\pm 100$  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  $\mu$ A typ., 3.0  $\mu$ A max. (Ta = +25°C)
  - During overdischarge: 2.0  $\mu$ 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.)



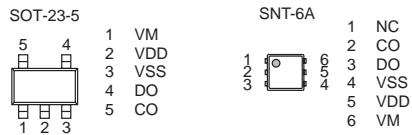
## S-8211E Series

### 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  $\pm 25$  mV (+25°C)  
Accuracy  $\pm 30$  mV (-5°C to +55°C)
  - Overcharge release voltage 3.5 V to 4.4 V<sup>1</sup> Accuracy  $\pm 50$  mV
  - Overdischarge detection voltage 2.0 V to 3.0 V (10 mV step) Accuracy  $\pm 50$  mV
  - Overdischarge release voltage 2.0 V to 3.4 V<sup>2</sup> Accuracy  $\pm 100$  mV
- (2) Detection delay times are generated by an internal circuit (external capacitors are unnecessary) Accuracy  $\pm 20\%$
- (3) Wide operating temperature range -40°C to +85°C
- (4) Low current consumption
  - During operation 3.0  $\mu$ A typ., 5.5  $\mu$ A max. (+25°C)
  - During overdischarge 2.0  $\mu$ A typ., 3.5  $\mu$ A max. (+25°C)
- (5) Output logic of CO pin is selectable. Active "H", Active "L"
- (6) Lead-free, Sn 100%, halogen-free<sup>3</sup>

- \*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.



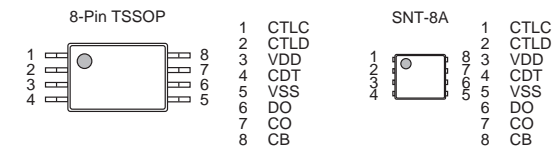
## S-8209A Series

### 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  $\pm 25$  mV
  - Overcharge release voltage\*1 3.50 V to 4.40 V<sup>2</sup> Accuracy  $\pm 50$  mV
  - Cell-balance detection voltage\*1 3.55 V to 4.40 V (5 mV step)<sup>3</sup> Accuracy  $\pm 25$  mV
  - Cell-balance release voltage\*1 3.50 V to 4.40 V<sup>4</sup> Accuracy  $\pm 50$  mV
  - Overdischarge detection voltage 2.0 V to 3.0 V (10 mV step) Accuracy  $\pm 50$  mV
  - Overdischarge release voltage 2.0 V to 3.4 V<sup>5</sup> Accuracy  $\pm 100$  mV
- Settable delay time by external capacitor for output pin
- Control charging, discharging, cell-balance by CTLC pin and CTLD
- Two types of cell-balance function; charge / discharge<sup>6</sup>
- Wide range of operation temperature Ta = -40°C to +85°C
- Low current consumption 7.0  $\mu$ A max.
- Lead-free, Sn 100%, halogen-free<sup>7</sup>

- \*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 $\pm 25$ mV
Overcharge release voltage*1	3.50 V to 4.40 V*2	Accuracy $\pm 50$ mV
Cell-balance detection voltage*1	3.55 V to 4.40 V (5 mV step)*3	Accuracy $\pm 25$ mV
Cell-balance release voltage*1	3.50 V to 4.40 V*4	Accuracy $\pm 50$ mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy $\pm 50$ mV
Overdischarge release voltage	2.0 V to 3.4 V*5	Accuracy $\pm 100$ 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  $\mu\text{A}$  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.)

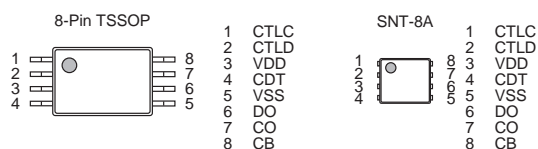
\*3. Select as to overcharge detection voltage > cell-balance detection voltage.

\*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

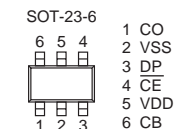
## ● Features

- High-accuracy voltage detection circuit
 

Cell balancing detection voltage: 2.0 V to 4.6 V (5 mV step)	Accuracy $\pm 12$ 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 $\pm 24$ 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 $\pm 12$ 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 $\pm 24$ 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  $\Omega$  typ. between the CB pin and the VSS pin
- Current consumption: 2.0  $\mu\text{A}$  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.)

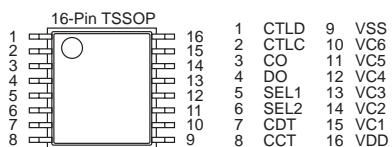


**S-8225A Series****BATTERY MONITORING IC  
FOR 3-SERIAL TO 5-SERIAL CELL PACK****Features**

- 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 $\pm 20$ mV ( $T_a = +25^\circ\text{C}$ ), $\pm 30$ mV ( $T_a = 0^\circ\text{C}$ to $+60^\circ\text{C}$ )
Overcharge release voltage n (n = 1 to 5)	3.300 V to 4.400 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage n (n = 1 to 5)	2.000 V to 3.200 V (100 mV step)	Accuracy $\pm 80$ mV
Overdischarge release voltage n (n = 1 to 5)	2.100 V to 3.400 V <sup>*2</sup>	Accuracy $\pm 100$ 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  
 $T_a = -40^\circ\text{C}$  to  $+85^\circ\text{C}$
  - Low current consumption
 

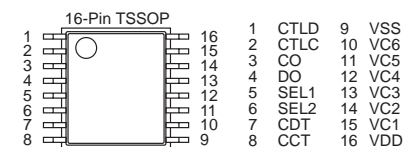
During operation ( $V_1 = V_2 = V_3 = V_4 = V_5 = 3.4$ V)	22 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
During power-down ( $V_1 = V_2 = V_3 = V_4 = V_5 = 1.6$ V)	4.5 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
  - Lead-free (Sn 100%), halogen-free
- \*1. Overcharge hysteresis voltage n (n = 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 $\pm 20$ mV ( $T_a = +25^\circ\text{C}$ ), $\pm 30$ mV ( $T_a = 0^\circ\text{C}$ to $+60^\circ\text{C}$ )
Overcharge release voltage n (n = 1 to 5)	3.3 V to 4.4 V <sup>*1</sup>	Accuracy $\pm 50$ mV
Overdischarge detection voltage n (n = 1 to 5)	2.2 V to 3.2 V (100 mV step)	Accuracy $\pm 80$ mV
Overdischarge release voltage n (n = 1 to 5)	2.2 V to 3.4 V <sup>*2</sup>	Accuracy $\pm 100$ 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  
 $T_a = -40^\circ\text{C}$  to  $+85^\circ\text{C}$
  - Low current consumption
 

During operation ( $V_1 = V_2 = V_3 = V_4 = V_5 = 3.4$ V)	20 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
During power-down ( $V_1 = V_2 = V_3 = V_4 = V_5 = 1.6$ V)	3.0 $\mu\text{A}$ max. ( $T_a = +25^\circ\text{C}$ )
  - 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
 

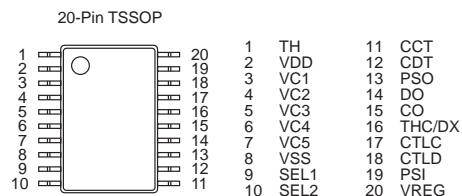
Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ±20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V <sup>*1</sup>	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ±80 mV
Overdischarge release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

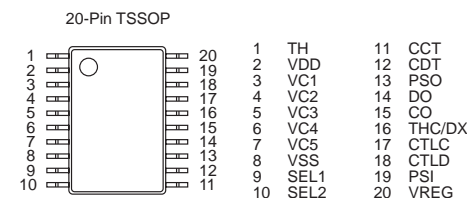
Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ±20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V <sup>*1</sup>	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ±80 mV
Overdischarge release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

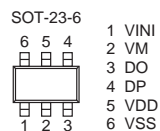
- Built-in high-accuracy voltage detection circuit
 

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  $\leq 0.06$  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  $\geq 0.2$  V.



## S-8239B Series

OVERCURRENT MONITORING IC  
FOR MULTI-SERIAL-CELL PACK

## ● Features

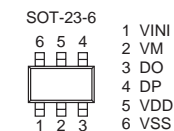
- Built-in high-accuracy voltage detection circuit
 

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  $\leq 0.06$  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  $\geq 0.2$  V.



## S-8269B Series

OVERCURRENT MONITORING IC  
FOR MULTI-SERIAL-CELL PACK

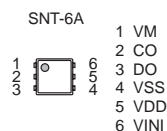
## ● Features

- High-accuracy voltage detection circuit
 

Discharge overcurrent detection voltage 1	0.0030 V to 0.1000 V (0.5 mV step)	Accuracy $\pm 1.5$ mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy $\pm 3$ mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy $\pm 5$ mV
Charge overcurrent detection voltage	-0.1000 V to -0.0030 V (0.5 mV step)	Accuracy $\pm 1.5$ 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 $\mu$ A typ., 4.0 $\mu$ A max. ( $T_a = +25^\circ\text{C}$ )
-------------------	--
- 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:	$I_{DD1} = 9.0$ $\mu$ A max. ( $-V_{DETtotal}^{*1} \geq 42$ V)
During power-off:	$I_{DD2} = 0.1$ $\mu$ 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<sup>\*2</sup>: 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

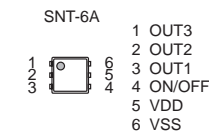
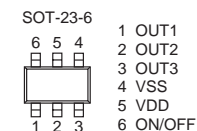
$$-V_{DETtotal} = -V_{DET1(S)} + -V_{DET2(S)} + -V_{DET3(S)}$$

\*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,

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



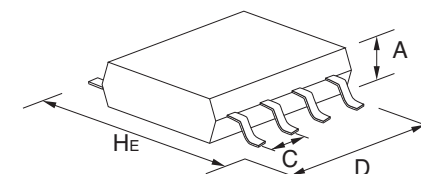


## Package List

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)
			H <sub>E</sub>	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 <sub>E</sub>	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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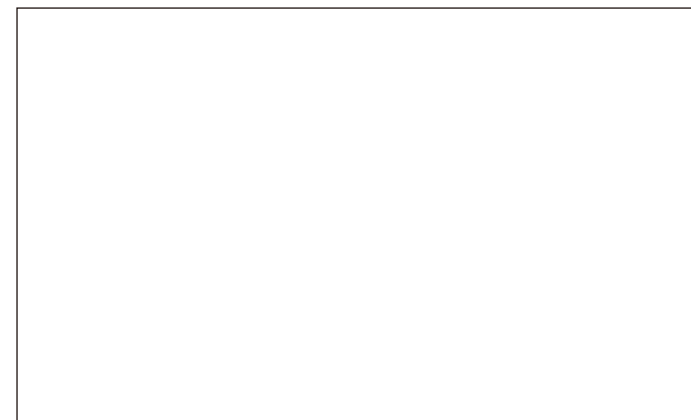
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