

- ✧ Please design all applications of the Lithium-ion battery protection ICs including the S-8231 Series, S-8232 Series, S-8233A Series, S-8233B Series, S-8233C Series and S-8491 Series with safety in mind.
- ✧ Please ask us, our representative or our distributor of your accessing web-site, if you need more detailed data sheets.

BATTERY PROTECTION IC (FOR A SINGLE-CELL PACK)**S-8231 SERIES**

The 8231 is a series of lithium-ion rechargeable battery protection ICs incorporating high-accuracy voltage detection circuits and delay circuits. It is suitable for a single-cell lithium-ion battery pack.

■ Features

- (1) Internal high-accuracy voltage detection circuit
 - ♦ Over charge detection voltage 4.00 V \pm 25 mV to 4.60 V \pm 25 mV
5 mV- step
 - ♦ Over charge release voltage 3.70 V \pm 50 mV to 4.60 V \pm 50m V
5 mV- step

(The Over charge release voltage can be selected within the range where the difference from Over charge detection voltage is 0 to 0.3 V)
 - ♦ Over discharge detection voltage 1.70 V \pm 80 mV to 2.50 V \pm 80 mV
50 mV- step
 - ♦ Over discharge release voltage 1.70 V \pm 100 mV to 3.50 V \pm 100 mV
50 mV - step

(The over discharge release voltage can be selected within the range where a difference from over discharge detection voltage is 0 to 1.0V)
 - ♦ Over current detection voltage 1 0.06 V \pm 20 mV to 0.30 V \pm 20 mV
5 mV-step
- (2) High input-voltage device (absolute maximum rating: 18 V)
- (3) Wide operating voltage range: 1.5 V to 16 V
- (4) The delay time for every detection can be set via an external capacitor.
Each delay time for Over charge detection, Over discharge detection, Over current detection are "Proportion of hundred to ten to One." or "Proportion of fifty to ten to One."
- (5) Two over current detection levels (protection for short-circuiting)
- (6) Internal auxiliary over voltage detection circuit (Fail safe for over voltage)
- (7) Internal charge circuit for 0V battery (Unavailable is option)
- (8) Low current consumption
 - ♦ Operation 7.5 μ A typ. 13.7 μ A max. (-40 to +85 °C)
 - ♦ Power-down mode 0.2 nA typ. 0.14 μ A max. (-40 to +85 °C)
- (9) MSOP package (8-pin) 4.0 mm \times 2.95 mm

■ Applications

Lithium-ion rechargeable battery packs

- The Information herein is subject to change without notice.

■ Selection Guide(12 Nov , 1997)

Table1

Model/Item	Over charge detection voltage	Over charge release voltage	Over discharge detection voltage	Over discharge release voltage	Over current detection voltage1	Over charge detection delay (C2=0.047μ-F)	0V battery charging function
S-8231AAFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.70V±100mV	0.100V±20mV	1.0 sec	Available
S-8231ABFN	4.35V±25mV	4.10±50mV	2.30V±80mV	3.00V±100mV	0.100V±20mV	1.0 sec	Available
S-8231ACFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.50V±100mV	0.120V±20mV	0.5 sec	Unavailable
S-8231ADFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.50V±100mV	0.240V±20mV	0.5 sec	Unavailable
S-8231AEFN	4.25V±25mV	3.95±50mV	2.30V±80mV	3.00V±100mV	0.100V±20mV	1.0 sec	Available
S-8231AGFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.70V±100mV	0.150V±20mV	1.0 sec	Available
S-8231AHFN	4.35V±25mV	4.28±50mV	2.30V±80mV	2.80V±100mV	0.100V±20mV	1.0 sec	Available
S-8231AIFN	4.25V±25mV	4.05V *2	2.30V±80mV	2.70V±100mV	0.150V±20mV	1.0 sec	Available
S-8231AJFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.50V±100mV	0.120V±20mV	0.5 sec	Available
S-8231AKFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.50V±100mV	0.240V±20mV	0.5 sec	Available
S-8231ALFN	4.295V±25mV	4.20±50mV *3	2.50V±80mV	3.00V±100mV	0.150V±20mV	1.0 sec	Unavailable
S-8231AMFN	4.25V±25mV	4.05±50mV	2.30V±80mV	2.70V±100mV	0.130V±20mV	1.0 sec	Unavailable
S-8231ANFN	4.35V±25mV	4.10±50mV	2.30V±80mV	3.00V±100mV	0.100V±20mV	0.5 sec	Unavailable
S-8231AOFN	4.295V±25mV	4.295V *1,3	2.30V±80mV	3.00V±100mV	0.300V±20mV	1.0 sec	Unavailable
S-8231AQFN	4.20V±25mV	4.10±50mV	2.30V±80mV	2.50V±100mV	0.200V±20mV	1.0 sec	Unavailable
S-8231ARFN	4.20V±25mV	4.10±50mV	2.30V±80mV	2.50V±100mV	0.100V±20mV	1.0 sec	Unavailable
S-8231ASFN	4.12V±25mV	4.12 *1,3	2.30V±80mV	2.50V±100mV	0.200V±20mV	1.0 sec	Unavailable
S-8231ATFN	4.35V±25mV	4.10±50mV	2.30V±80mV	3.00V±100mV	0.250V±20mV	1.0 sec	Available
S-8231AVFN	4.28V±25mV	4.05±50mV	2.30V±80mV	2.70V±100mV	0.130V±20mV	1.0 sec	Unavailable
S-8231AWFN	4.28V±25mV	4.18±50mV	2.30V±80mV	2.90V±100mV	0.080V±20mV	1.0 sec	Unavailable

*1) Without over charge detection / release hysteresis.

*2) Discharging will be unable when over charge detected. (Over charge lock type)

*3) Auxiliary over charge detection voltage(VCUaux) is $VCU_{aux} = VCU(\text{Over charge detection voltage}) \times 1.10$, which is fixed internally.

The others are $VCU_{aux} = VCU \times 1.24$.

Change in the detection voltage is available in products other than the above listed ones.

Please contact with our sales division.

The over discharge detection voltage can be selected within the range from 1.7 to 3.0V. When the Over discharge detection voltage is higher than 2.5V, the Over charge detection voltage and the Over charge release voltage are limited as follows table.

Table 2

Over discharge detection voltage (VDD)	Over charge detection voltage (VCU)	Voltage difference between Over charge detection voltage and Over charge release voltage
1.70 to 2.50 V	4.00 to 4.60 V	0 to 0.30 V
1.70 to 2.70 V	4.00 to 4.50 V	0 to 0.20 V
1.70 to 3.00 V	4.00 to 4.35 V	0 to 0.10 V

■ Block Diagram

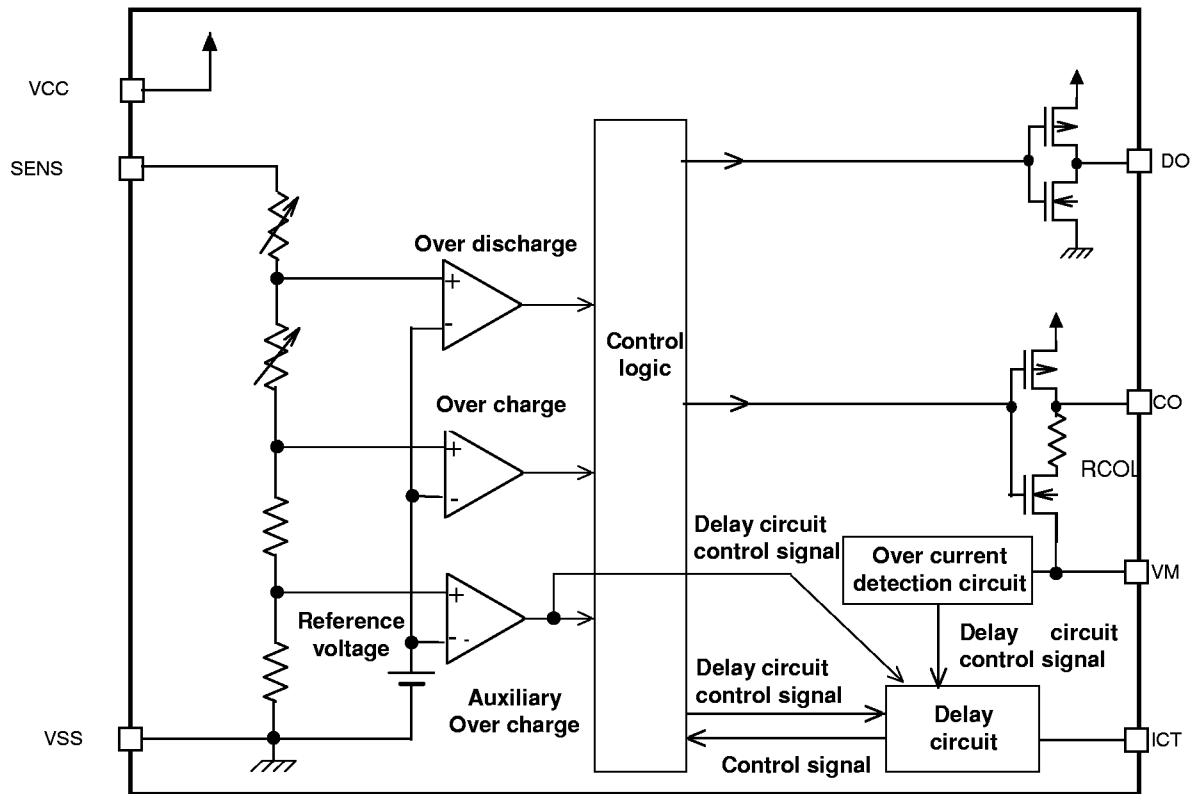


Figure 1

Output impedance when CO terminal output 'L' is higher than DO terminal. Resistor (RCOL) is connected with CO terminal. Please refer 'Electric Characteristics'.