

Product Catalog

Lithium-ion Battery Protection ICs

2025

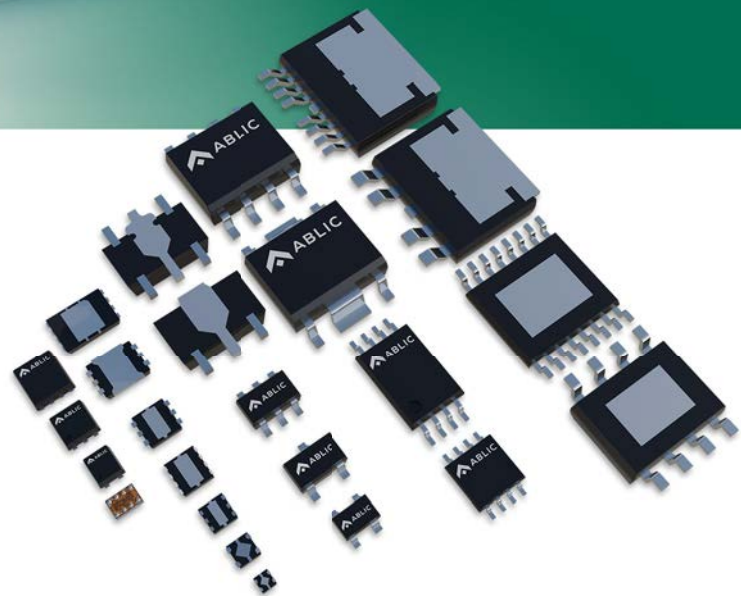


Table of Contents

Features	Series Name	Page
Product Lineup		
Lithium-ion Battery Protection ICs		III
Lithium-ion Battery Protection ICs		
Battery Protection IC for 1-Cell Pack	S-82Y1C Series	1
Battery Protection IC for 1-Cell Pack	S-82Y1B Series	2
Battery Protection IC with Charge-Discharge Control Function for 1-Cell Pack	S-82P1A Series	3
Battery Protection IC for 1-Cell Pack	S-82P1B Series	4
Battery Protection IC with Charge-Discharge Control Function for 1-Cell Pack	S-82K1A Series	5
Battery Protection IC for 1-Cell Pack	S-82K1B Series	6
Battery Protection IC with Charge-Discharge Control Function for 1-Cell Pack	S-82H1A Series	7
Battery Protection IC for 1-Cell Pack	S-82H1B Series	8
Battery Protection IC with Charge-discharge Control Function for 1-Cell Pack	S-82F1A Series	9
Battery Protection IC for 1-Cell Pack	S-82F1B Series	10
Battery Protection IC for 1-Cell Pack with Load Monitoring Pin	S-82F1C Series	11
Battery Protection IC with Charge-Discharge Control Function for 1-Cell Pack	S-82C1E Series	12
Battery Protection IC for 1-Cell Pack	S-82C1F Series	13
Battery Protection IC for 1-Cell Pack	S-82M1A Series	14
Battery Protection IC for 1-Cell Pack	S-82A1A Series	15
Battery Protection IC for 1-Cell Pack	S-821AA Serie	16
Battery Protection IC for 1-Cell Pack	S-821BA Series	17
Battery Protection IC with Temperature Protection Function for 1-Cell Pack	S-82D1A Series	18
Battery Protection IC with Alarm Function for 1-Cell Pack	S-82V1A Series	19
Battery Protection IC with Alarm Function for 1-Cell Pack	S-82U1A Series	20
Battery Protection IC with Alarm Function for 1-Cell Pack	S-82T1A Series	21
Battery Protection IC with Battery Voltage Monitoring Pin for 1-Cell Pack	S-82S1A Series	22
Battery Protection IC with Battery Voltage Monitoring Pin for 1-Cell Pack	S-82R1A Series	23
Battery Protection IC with Charge-Discharge Control Function for 1-Cell Pack	S-82N1A Series	24
Battery Protection IC with Power-Saving Function for 1-Cell Pack	S-82N1B Series	25
Battery Protection IC with Charge-discharge Control Function for 1-Cell Pack	S-82B1A Series	26
Battery Protection IC with Power-saving Function for 1-Cell Pack	S-82B1B Series	27
Battery Protection IC with Alarm Function for 1-Cell Pack	S-82L1A Series	28
Battery Protection IC for 1-cell Pack	S-8240A Series	29
Battery Protection IC for 1-cell Pack	S-8240B Series	30
Battery Protection IC for 1-Cell Pack	S-8261 Series	31
Charge-discharge Current Path Separation Circuit Compatible Battery Protection IC for 1-Cell Pack	S-82G1A Series	32
Charge-discharge Current Path Separation Circuit Compatible Battery Protection IC for 1-Cell Pack	S-82G1B Series	33
Battery Monitoring IC for 1-cell Pack	S-8259A Series	34
Battery Protection IC for 1-Cell Pack (Secondary Protection)	S-8216A Series	35
Battery Protection IC for 1-cell Pack (Secondary Protection)	S-8206A Series	36
Battery Protection IC for 2-Serial-Cell Pack	S-82A2A/B/C Series	37
Battery Protection IC for 2-Serial-Cell Pack	S-82B2A/B Series	38
Battery Protection IC for 2-serial-cell Pack	S-82C2A Series	39
Battery Protection IC for 2-serial-cell Pack	S-82C2B/C Series	40
Battery Protection IC for 2-serial-cell Pack	S-8252 Series	41
Battery Protection IC for 2-Serial or 3-Serial Cell Pack	S-8253C/D Series	42
Battery Protection IC For 3-series Cell Pack	S-8203A Series	43
Battery Protection IC for 3-Serial or 4-Serial-Cell Pack	S-8204A Series	44
Battery Protection IC for 3-Serial or 4-Serial-Cell Pack	S-8204B Series	45
Battery Protection IC for 3-Serial or 4-Serial-Cell Pack	S-8254A Series	46
Battery Protection IC for 3-serial to 5-serial Cell Pack	S-8245A/C Series	47
Battery Protection IC for 3-serial to 5-serial Cell Pack	S-8245B/D Series	48
Battery Protection IC for 4-serial to 5-serial Cell Pack	S-82B4A/5A Series	49
Battery Protection IC for 4-serial to 5-serial Cell Pack	S-82C4A/5A Series	50

Features	Series Name	Page
Battery Protection IC for 4-Series or 5-Series Cell Pack	S-8205A/B Series	51
Battery Monitoring IC for 3-serial to 5-serial Cell Pack	S-8255A Series	52
Battery Monitoring IC for 3-serial to 5-serial Cell Pack	S-8255B Series	53
Battery Monitoring IC for 3-serial to 5-serial Cell Pack	S-82H5B Series	54
Battery Monitoring IC for 3-serial to 5-serial Cell Pack	S-82F5B Series	55
Battery Monitoring IC for 3-Serial to 5-Serial Cell Pack	S-8225A Series	56
Battery Monitoring IC for 3-Serial to 5-Serial Cell Pack	S-8225B Series	57
Battery Protection IC with Cell-Balance Function	S-8209A Series	58
Battery Protection IC with Cell-Balance Function	S-8209B Series	59
Battery Monitoring IC	S-8229A Series	60
Battery Protection IC for 3-serial or 4-serial Cell Pack with Constant Voltage Output Pin for Real-time Clock Enabling Any Order of Battery Connection (Secondary Protection)	S-82K3/K4 Series	61
Battery Protection IC for 3-serial or 4-serial Cell Pack with Constant Voltage Output Pin for Real-time Clock (Secondary Protection)	S-82H4 Series	62
Battery Protection IC For 2-serial / 3-Serial Cell Pack (Secondary Protection)	S-8223A/B/C/D Series	63
Battery Protection IC for 2-Serial to 4-Serial-cell Pack (Secondary Protection)	S-8224A/B Series	64
Battery Protection IC for 2-Serial to 4-Serial-cell Pack (Secondary Protection)	S-8264A/B/C Series	65
Battery Protection IC for 1 to 4 Cells (Secondary Protection)	S-8244 Series	66
Battery Monitoring IC for 3-serial to 5-serial Cell Pack (Secondary Protection)	S-82M5B Series	67
Battery Monitoring IC for 3-serial to 5-serial Cell Pack (Secondary Protection)	S-82K5B Series	68
Battery Protection IC with Cell Balancing Function for 3-serial to 5-serial Cell Pack (Secondary Protection)	S-8265C Series	69
Battery Protection IC for 3-serial to 5-serial Cell Pack (Secondary Protection)	S-82P5B Series	70
Battery Protection IC for 3-serial to 5-serial Cell Pack	S-8215C Series	71
Battery Protection IC for 3-Serial to 5-Serial Cell Pack (Secondary Protection)	S-8215A Series	72
Overcurrent Monitoring IC For Multi-serial-cell Pack	S-8269B Series	73
Overcurrent Monitoring IC For Multi-Serial-Cell Pack	S-8239A Series	74
Overcurrent Monitoring IC For Multi-Serial-Cell Pack	S-8239B Series	75
Package List		76

Lithium-ion Battery Protection ICs

[Lithium-ion Battery Protection ICs on ablic.com](http://www.ablic.com)

Series Name	Features	Application	Overcharge detection voltage min. [V]	Overcharge detection voltage max. [V]	Overcharge detection voltage accuracy ±[mV]	Overdischarge detection voltage min. [V]	Overdischarge detection voltage max. [V]	Overdischarge detection voltage accuracy ±[mV]	Overcurrent detection voltage min. [V]	Overcurrent detection voltage max. [V]	Overcurrent detection voltage accuracy ±[mV]	Overcharge detection delay	Operation temp. min. [°C]	Operation temp. max. [°C]	Package	Page
S-82Y1C	Battery protection	1-cell (Sense resistor type)	3.50	4.80	10	2.0	3.0	50	0.003	0.050	0.50	Built-in delay timer	-40	85	HSNT-6(1618)	1
S-82Y1B	Battery protection	1-cell (Sense resistor type)	3.50	4.80	15	2.0	3.0	50	0.003	0.050	0.50	Built-in delay timer	-40	85	SNT-6A, HSNT-6(1618)	2
S-82P1A	Battery protection	1-cell (Sense resistor type)	3.50	4.80	15	2.0	3.0	50	0.003	0.100	0.75	Built-in delay timer	-40	85	HSNT-8(1616)	3
S-82P1B	Battery protection	1-cell (Sense resistor type)	3.50	4.80	15	2.0	3.0	50	0.003	0.100	0.75	Built-in delay timer	-40	85	HSNT-6(1618), SNT-6A	4
S-82K1A	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.00	Built-in delay timer	-40	85	HSNT-8(1616)	5
S-82K1B	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.00	Built-in delay timer	-40	85	SNT-6A, HSNT-6(1618)	6
S-82H1A	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	7
S-82H1B	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	SNT-6A	8
S-82F1A	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	9
S-82F1B	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	SNT-6A	10
S-82F1C	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	11
S-82C1E	Battery protection	1-cell (Sense resistor type)	3.50	4.60	20	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	DFN-8(1616)	12
S-82C1F	Battery protection	1-cell (Sense resistor type)	3.50	4.60	20	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-6A, DFN-6(1414)A	13
S-82M1A	Battery protection	1-cell (Sense resistor type)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	14
S-82A1A	Battery protection	1-cell (Sense resistor type)	3.50	4.60	20	2.0	3.0	50	0.010	0.100	3.00	Built-in delay timer	-40	85	SNT-6A, DFN-6(1414)A	15
S-821AA	Battery protection	1-cell (High-side protection)	3.50	4.80	15	2.0	3.0	50	-0.003	-0.100	1.00	Built-in delay timer	-40	85	SNT-8A, WLP-8V	16
S-821BA	Battery protection	1-cell (High-side protection)	3.50	4.80	15	2.0	3.0	50	-0.003	-0.100	0.75	Built-in delay timer	-40	85	SNT-8A, WLP-8V	17
S-82D1A	Battery protection	1-cell (Temperature protection function)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	18
S-82V1A	Battery protection	1-cell (Alarm function)	3.50	4.80	12	2.0	3.0	50	0.003	0.100	0.75	Built-in delay timer	-40	85	HSNT-8(1616)	19
S-82U1A	Battery protection	1-cell (Alarm function)	3.50	4.80	12	2.0	3.0	50	0.003	0.100	1.00	Built-in delay timer	-40	85	HSNT-8(1616)	20
S-82T1A	Battery protection	1-cell (Alarm function)	3.50	4.80	12	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	21
S-82S1A	Battery protection	1-cell (Cell voltage monitor)	3.50	4.80	15	2.0	3.0	50	0.003	0.100	1.00	Built-in delay timer	-40	85	HSNT-8(1616)	22
S-82R1A	Battery protection	1-cell (Cell voltage monitor)	3.50	4.80	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	23
S-82N1A	Battery protection	1-cell	3.50	4.60	15	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	24
S-82N1B	Battery protection	1-cell	3.50	4.60	15	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	25
S-82B1A	Battery protection	1-cell	3.50	4.60	20	2.0	3.0	50	0.010	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	26
S-82B1B	Battery protection	1-cell	3.50	4.60	20	2.0	3.0	50	0.010	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	27
S-82L1A	Battery protection	1-cell (Alarm function)	4.20	4.60	12	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-6A	28
S-8240A	Battery protection	1-cell	3.50	4.60	20	2.0	3.4	50	0.015	0.200	5.00	Built-in delay timer	-40	85	SOT-23-6, SNT-6A, HSNT-6(1212)	29
S-8240B	Battery protection	1-cell	3.50	4.60	20	2.0	3.4	50	0.015	0.100	3.00	Built-in delay timer	-40	85	SNT-6A, HSNT-6(1212)	30
S-8261	Battery protection	1-cell	3.60	4.50	25	2.0	3.0	50	0.050	0.300	15.00	Built-in delay timer	-40	85	SOT-23-6	31
S-82G1A	Battery protection	1-cell (Charge-discharge current path separation)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	32
S-82G1B	Battery protection	1-cell (Charge-discharge current path separation)	3.50	4.60	15	2.0	3.0	50	0.003	0.100	1.50	Built-in delay timer	-40	85	HSNT-8(1616)	33
S-8259A	Voltage monitoring	1-cell	3.50	4.60	20	2.0	3.4	50	-	-	-	Built-in delay timer	-40	85	SOT-23-6	34

Series Name	Features	Application	Overcharge detection voltage min. [V]	Overcharge detection voltage max. [V]	Overcharge detection voltage accuracy ±[mV]	Overdischarge detection voltage min. [V]	Overdischarge detection voltage max. [V]	Overdischarge detection voltage accuracy ±[mV]	Overcurrent detection voltage min. [V]	Overcurrent detection voltage max. [V]	Overcurrent detection voltage accuracy ±[mV]	Overcharge detection delay	Operation temp. min. [°C]	Operation temp. max. [°C]	Package	Page
S-8216A	Secondary protection	1-cell	4.00	5.00	15	-	-	-	0.003	0.100	1.50	Built-in delay timer	-40	85	SNT-6A	35
S-8206A	Secondary protection	1-cell	3.50	5.00	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-6A, HSNT-6(1212)	36
S-82A2A/B/C	Battery protection	2-cell (Sense resistor type)	3.50	4.80	15	2.0	3.0	50	0.003	0.100	1.00	Built-in delay timer	-40	85	SNT-8A, HSNT-8(1616)	37
S-82B2A/B	Battery protection	2-cell (Sense resistor type)	3.50	4.80	20	2.0	3.0	50	0.003	0.100	3.00	Built-in delay timer	-40	85	SNT-8A, HSNT-8(1616)	38
S-82C2A	Battery protection	2-cell	3.50	4.80	20	2.0	3.0	50	0.003	0.400	3.00	Built-in delay timer	-40	85	SOT-23-6, SNT-6A	39
S-82C2B/C	Battery protection	2-cell	3.50	4.80	20	2.0	3.0	50	0.003	0.400	3.00	Built-in delay timer	-40	85	SNT-8A, HSNT-8(1616)	40
S-8252	Battery protection	2-cell	3.55	4.60	20	2.0	3.0	50	0.050	0.400	10.00	Built-in delay timer	-40	85	SOT-23-6, SNT-6A	41
S-8253C/D	Battery protection	2-cell, 3-cell	3.90	4.40	25	2.0	3.0	80	0.050	0.300	25.00	Built-in delay timer	-40	85	8-pin TSSOP	42
S-8203A	Battery protection	3-cell	3.55	4.50	25	2.0	3.2	80	0.050	0.300	15.00	External delay capacitor	-40	85	16-pin TSSOP	43
S-8204A	Battery protection	3-cell, 4-cell	3.80	4.60	25	2.0	3.0	80	0.050	0.300	15.00	External delay capacitor	-40	85	16-pin TSSOP	44
S-8204B	Battery protection	3-cell, 4-cell	3.65	4.60	25	2.0	3.0	80	0.050	0.300	15.00	External delay capacitor	-40	85	16-pin TSSOP	45
S-8254A	Battery protection	3-cell, 4-cell	3.90	4.45	25	2.0	3.0	80	0.050	0.300	25.00	External delay capacitor	-40	85	16-pin TSSOP	46
S-8245A/C	Battery protection	3-cell, 4-cell, 5-cell (Temperature protection function)	3.55	4.60	20	2.0	3.2	80	0.020	0.300	10.00	External delay capacitor	-40	85	24-pin SSOP	47
S-8245B/D	Battery protection	3-cell, 4-cell, 5-cell (Temperature protection function)	3.55	4.60	20	2.0	3.2	80	0.020	0.300	10.00	External delay capacitor	-40	85	24-pin SSOP	48
S-82B4A/5A	Battery protection	4-cell, 5-cell	3.90	4.50	20	2.0	3.2	50	0.010	0.200	5.00	External delay capacitor	-40	85	16-pin TSSOP	49
S-82C4A/5A	Battery protection	4-cell, 5-cell (Temperature protection function)	3.90	4.50	20	2.0	3.2	50	0.010	0.200	5.00	External delay capacitor	-40	85	16-pin TSSOP	50
S-8205A/B	Battery protection	4-cell, 5-cell	3.55	4.40	25	2.0	3.2	80	0.050	0.300	15.00	External delay capacitor	-40	85	16-pin TSSOP	51
S-8255A	Voltage monitoring	3-cell, 4-cell, 5-cell (Temperature protection function)	3.55	4.60	20	2.0	3.2	80	-	-	-	External delay capacitor	-40	85	20-pin TSSOP	52
S-8255B	Voltage monitoring	3-cell, 4-cell, 5-cell (Temperature protection function)	3.55	4.60	20	2.0	3.2	80	-	-	-	External delay capacitor	-40	85	20-pin TSSOP	53
S-82H5B	Voltage monitoring	3-cell, 4-cell, 5-cell	3.50	4.70	15	1.5	3.2	80	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	54
S-82F5B	Voltage monitoring	3-cell, 4-cell, 5-cell	3.50	4.70	20	1.5	3.2	80	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	55
S-8225A	Voltage monitoring	3-cell, 4-cell, 5-cell	3.50	4.40	20	2.0	3.2	80	-	-	-	External delay capacitor	-40	85	16-pin TSSOP	56
S-8225B	Voltage monitoring	3-cell, 4-cell, 5-cell	3.50	4.40	20	2.2	3.2	80	-	-	-	External delay capacitor	-40	85	16-pin TSSOP	57
S-8209A	Voltage monitoring	Cell-balance function	3.55	4.40	25	2.0	3.0	50	-	-	-	External delay capacitor	-40	85	8-pin TSSOP, SNT-8A	58
S-8209B	Voltage monitoring	Cell-balance function	3.55	4.40	25	2.0	3.0	50	-	-	-	External delay capacitor	-40	85	8-pin TSSOP, SNT-8A	59

Series Name	Features	Application	Overcharge detection voltage min. [V]	Overcharge detection voltage max. [V]	Overcharge detection voltage accuracy ±[mV]	Overdischarge detection voltage min. [V]	Overdischarge detection voltage max. [V]	Overdischarge detection voltage accuracy ±[mV]	Overcurrent detection voltage min. [V]	Overcurrent detection voltage max. [V]	Overcurrent detection voltage accuracy ±[mV]	Overcharge detection delay	Operation temp. min. [°C]	Operation temp. max. [°C]	Package	Page
S-8229A	Voltage monitoring	Battery monitoring	-	-	-	-	-	-	-	-	-	--	-40	85	SOT-23-6, SNT-6A	60
S-82K3/K4	Secondary protection	3-cell, 4-cell (With constant voltage output pin for RTC, enabling any order of battery connection)	3.60	4.80	15	-	-	-	-	-	-	Built-in delay timer	-40	85	DFN-8(2020)A, HSNT-8(1616)	61
S-82H4	Secondary protection	3-cell, 4-cell (With constant voltage output pin for RTC)	3.60	4.80	15	-	-	-	-	-	-	Built-in delay timer	-40	85	DFN-8(2020)A, HSNT-8(1616)	62
S-8223A/B/C/D	Secondary protection	2-cell, 3-cell	3.60	4.70	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-6A	63
S-8224A/B	Secondary protection	2-cell, 3-cell, 4-cell	3.60	4.70	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A	64
S-8264A/B/C	Secondary protection	2-cell, 3-cell, 4-cell	4.20	4.80	25	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, 8-pin TSSOP	65
S-8244	Secondary protection	1-cell, 2-cell, 3-cell, 4-cell	3.70	4.50	25	-	-	-	-	-	-	External delay capacitor	-40	85	SNT-8A, TMSOP-8	66
S-82M5B	Secondary protection	3-cell, 4-cell, 5-cell	3.50	4.70	15	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	67
S-82K5B	Secondary protection	3-cell, 4-cell, 5-cell	3.50	4.70	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	68
S-8265C	Secondary protection	3-cell, 4-cell, 5-cell (Cell-balance function)	2.75	4.70	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	69
S-82P5B	Secondary protection	3-cell, 4-cell, 5-cell	2.70	4.70	15	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	70
S-8215C	Secondary protection	3-cell, 4-cell, 5-cell	2.70	4.70	20	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	71
S-8215A	Secondary protection	3-cell, 4-cell, 5-cell	3.60	4.70	25	-	-	-	-	-	-	Built-in delay timer	-40	85	SNT-8A, TMSOP-8	72
S-8269B	Overcurrent monitoring	For multi-serial-cell pack	-	-	-	-	-	-	0.003	0.100	1.50	Built-in delay timer	-40	85	SNT-6A	73
S-8239A	Overcurrent monitoring	For multi-serial-cell pack	-	-	-	-	-	-	0.040	0.300	15.00	Built-in delay timer	-40	85	SOT-23-6	74
S-8239B	Overcurrent monitoring	For multi-serial-cell pack	-	-	-	-	-	-	0.040	0.300	15.00	Built-in delay timer	-40	85	SOT-23-6	75

S-82Y1C Series

BATTERY PROTECTION IC FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Use of an external overcurrent detection resistor enables this IC to provide high-accuracy overcurrent protection with less impact from temperature changes.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 10 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 50 mV (0.25 mV step)	Accuracy ± 0.5 mV
Discharge overcurrent 2 detection voltage	6 mV to 100 mV (0.5 mV step)	Accuracy ± 1.5 mV
Load short-circuiting detection voltage	15 mV to 100 mV (1 mV step)	Accuracy ± 3.0 mV
Charge overcurrent detection voltage	-50 mV to -3 mV (0.25 mV step)	Accuracy ± 0.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-6D (HSNT-6(1618))

S-82Y1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Use of an external overcurrent detection resistor enables this IC to provide high-accuracy overcurrent protection with less impact from temperature changes.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 50 mV (0.25 mV step)	Accuracy ± 0.5 mV
Discharge overcurrent 2 detection voltage	6 mV to 100 mV (0.5 mV step)	Accuracy ± 1.5 mV
Load short-circuiting detection voltage	15 mV to 100 mV (1 mV step)	Accuracy ± 3.0 mV
Charge overcurrent detection voltage	-50 mV to -3 mV (0.25 mV step)	Accuracy ± 0.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- HSNT-6D (HSNT-6(1618))
- SNT-6A

S-82P1A Series

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

The S-82P1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82P1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82P1A Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	3 mV to 100 mV (0.25 mV step)	Accuracy ± 0.75 mV
Discharge overcurrent detection voltage 2	6 mV to 100 mV (0.5 mV step)	Accuracy ± 2 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.25 mV step)	Accuracy ± 0.75 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 6 M Ω (1 M Ω step)
- Discharge overcurrent control function

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82P1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82P1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82P1B Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	3 mV to 100 mV (0.25 mV step)	Accuracy ± 0.75 mV
Discharge overcurrent detection voltage 2	6 mV to 100 mV (0.5 mV step)	Accuracy ± 2 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.25 mV step)	Accuracy ± 0.75 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function
 - Release condition of discharge overcurrent status: Load disconnection
 - Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - During operation: 2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
 - During power-down: 50 nA max. ($T_a = +25^\circ\text{C}$)
 - During overdischarge: 0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- HSNT-6D (HSNT-6(1618))
- SNT-6A

S-82K1A Series

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

The S-82K1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82K1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82K1A Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy ± 1.0 mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy ± 1.0 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function

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

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

During operation:	2.0 μ A typ., 4.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82K1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82K1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82K1B Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy ± 1.0 mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy ± 1.0 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function
 - Release condition of discharge overcurrent status: Load disconnection
 - Release voltage of discharge overcurrent status: $V_{RIOV} = V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - During operation: 2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
 - During power-down: 50 nA max. ($T_a = +25^\circ\text{C}$)
 - During overdischarge: 0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- HSNT-6D (HSNT-6(1618))
- SNT-6A

S-82H1A Series

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

The S-82H1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82H1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82H1A Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

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

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

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

During operation:	2.0 μ A typ., 4.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82H1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82H1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82H1B Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

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

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82F1A Series

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

The S-82F1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82F1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82F1A Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

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

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

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

During operation:	2.0 μ A typ., 4.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82F1B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82F1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82F1B Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent detection voltage 1	0.003 V to 0.100 V (0.5 mV step)	Accuracy ± 1.5 mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (0.5 mV step)	Accuracy ± 1.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
- Discharge overcurrent control function
 - Release condition of discharge overcurrent status: Load disconnection
 - Release voltage of discharge overcurrent status: $V_{RIOV} = V_{DD} \times 0.80$ typ.
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - During operation: 2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
 - During power-down: 50 nA max. ($T_a = +25^\circ\text{C}$)
 - During overdischarge: 0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82F1C Series

BATTERY PROTECTION IC FOR 1 CELL PACK WITH LOAD MONITORING PIN

The S-82F1C Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82F1C Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82F1C Series has a load monitoring pin (VM2 pin) allowing for discharge overcurrent status release through determination of VM2 pin voltage drops.

■ Features

- High-accuracy voltage detection circuit

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

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82C1E Series

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

The S-82C1E Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82C1E Series realizes high-accuracy overcurrent protection with less effect from temperature change.

The S-82C1E Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function

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

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- DFN-8(1616)A

S-82C1F Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82C1F Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82C1F Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

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

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-6A
- DFN-6(1414)A

S-82M1A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82M1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82M1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation:	600 nA typ., 990 nA max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	500 nA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82A1A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-82A1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, the S-82A1A Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.5 V to 4.6 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.1 V to 4.6 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.0 V to 3.0 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.0 V to 3.4 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: Discharge overcurrent detection voltage 1 (V_{DIOV1}), discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, Sn 100%, halogen-free^{*3}

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-6A
- DFN-6(1414)A

S-821AA Series

BATTERY PROTECTION IC FOR 1-CELL PACK

This IC is high-side protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuit, delay circuit, and triple boost charge pump to drive an external charge / discharge FET. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, this IC realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ±15 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ±75 mV
Discharge overcurrent 1 detection voltage	-3 mV to -100 mV (0.25 mV step)	Accuracy ±1 mV
Discharge overcurrent 2 detection voltage	-6 mV to -100 mV (0.5 mV step)	Accuracy ±3 mV
Load short-circuiting detection voltage	-20 mV to -100 mV (1 mV step)	Accuracy ±5 mV
Charge overcurrent detection voltage	3 mV to 100 mV (0.25 mV step)	Accuracy ±1 mV
0 V battery charge inhibition battery voltage	1.45 V to 2.00 V ^{*3} (50 mV step)	Accuracy ±50 mV
- Overheat detection function: Available, unavailable
- High-accuracy temperature detection circuit with an external NTC thermistor
(Resistance: 100 kΩ ±1% or 470 kΩ ±1% at 25°C, B-constant: ±1%)

Overheat detection temperature	+65°C to +85°C (5°C step)	Accuracy ±3°C
Overheat release temperature	+55°C to +80°C (5°C step) ^{*4}	Accuracy ±5°C
- Internal charge pump: Triple boost (regulation voltage = V_{DD} + 4.2 V)
- 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, charger connection
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Power-saving function: Available, unavailable
- PS pin internal resistance connection

In normal status:	Pull-up, pull-down
In power-saving status:	Pull-up, pull-down
- PS pin internal resistance value: 1 MΩ to 10 MΩ (1 MΩ step)
- PS pin control logic: Active "H", active "L"
- High-withstand voltage: VM pin, CO pin and DO pin: absolute maximum rating 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation:	6.0 μA typ., 10 μA max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	1.0 μA max. (Ta = +25°C)
During power-saving:	50 nA max. (Ta = +25°C)
- Lead-free, Sn100%, halogen-free^{*5}

- *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. Overdischarge detection voltage - 0.25 V ≥ 0 V battery charge inhibition battery voltage
- *4. Overheat release temperature = Overheat detection temperature - 5°C or 10°C
- *5. Refer to "■ Product Name Structure" for details.

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- WLP-8V

S-821BA Series

BATTERY PROTECTION IC FOR 1-CELL PACK

This IC is high-side protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuit, delay circuit, and triple boost charge pump to drive an external charge / discharge FET. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, this IC realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	-3 mV to -100 mV (0.25 mV step)	Accuracy ± 0.75 mV
Discharge overcurrent 2 detection voltage	-6 mV to -100 mV (0.5 mV step)	Accuracy ± 2 mV
Load short-circuiting detection voltage	-20 mV to -100 mV (1 mV step)	Accuracy ± 4 mV
Charge overcurrent detection voltage	3 mV to 100 mV (0.25 mV step)	Accuracy ± 0.75 mV
0 V battery charge inhibition battery voltage	1.45 V to 2.00 V ^{*3} (50 mV step)	Accuracy ± 50 mV
- Overheat detection function: Available, unavailable
- High-accuracy temperature detection circuit with an external NTC thermistor
(Resistance: 100 k Ω $\pm 1\%$ or 470 k Ω $\pm 1\%$ at 25°C, B-constant: $\pm 1\%$)

Overheat detection temperature	+65°C to +85°C (5°C step)	Accuracy $\pm 3^\circ\text{C}$
Overheat release temperature	+55°C to +80°C (5°C step) ^{*4}	Accuracy $\pm 5^\circ\text{C}$
- Internal charge pump: Triple boost (regulation voltage = $V_{DD} + 4.2$ V)
- 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, charger connection
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Power-saving function: Available, unavailable
- PS pin internal resistance connection

In normal status:	Pull-up, pull-down
In power-saving status:	Pull-up, pull-down
- PS pin internal resistance value: 1 M Ω to 10 M Ω (1 M Ω step)
- PS pin control logic: Active "H", active "L"
- High-withstand voltage: VM pin, CO pin and DO 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:	6.0 μA typ., 10 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	1.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-saving:	50 nA max. ($T_a = +25^\circ\text{C}$)
- Lead-free, Sn100%, halogen-free^{*5}

- *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. Overdischarge detection voltage - 0.25 V \geq 0 V battery charge inhibition battery voltage
- *4. Overheat release temperature = Overheat detection temperature - 5°C or 10°C
- *5. Refer to "■ Product Name Structure" for details.

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- WLP-8V

S-82D1A Series

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

The S-82D1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes temperature protection circuits, high-accuracy voltage detection circuits, and delay circuits. Temperature protection is possible by connecting an NTC thermistor to the dedicated connection pin. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

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

High temperature charge-discharge inhibition temperature	+40°C to +85°C (1°C step)	Accuracy ±3°C*1
High temperature charge inhibition temperature	+40°C to +85°C (1°C step)	Accuracy ±3°C*1
Low temperature charge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy ±3°C*1
Low temperature charge-discharge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy ±3°C*1
- High-accuracy voltage detection circuit

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

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

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- Discharge overcurrent status reset function by CTL pin: Available, unavailable
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- High-withstand voltage: VM pin and CO pin: Absolute maximum rating 28.0 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

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

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82V1A Series

BATTERY PROTECTION IC WITH ALARM FUNCTION FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, This IC realizes high-accuracy overcurrent protection with less effect from temperature change.

The alarm function enables the voltage detection immediately before the overcharge detection.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Overcharge release voltage	3.100 V to 4.800 V* ¹	Accuracy ± 50 mV
Alarm detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Alarm hysteresis voltage	0 V, 0.010 V, 0.020 V	Accuracy ± 5 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V* ²	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.25 mV step)	Accuracy ± 0.75 mV
Discharge overcurrent 2 detection voltage	6 mV to 100 mV (0.5 mV step)	Accuracy ± 1.5 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 4 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.25 mV step)	Accuracy ± 0.75 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Alarm function

AO pin output logic:	Active "H", active "L"
AO pin output form:	CMOS output, Nch open-drain output
Connection when AO pin = "L":	VSS pin, VM pin
Charge control function:	Available, unavailable
- High-withstand voltage: VM pin, CO pin and AO 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:	2.5 μA typ., 5.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82U1A Series

BATTERY PROTECTION IC WITH ALARM FUNCTION FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, This IC realizes high-accuracy overcurrent protection with less effect from temperature change.

The alarm function enables the voltage detection immediately before the overcharge detection.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Overcharge release voltage	3.100 V to 4.800 V* ¹	Accuracy ± 50 mV
Alarm detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Alarm hysteresis voltage	0 V, 0.010 V, 0.020 V	Accuracy ± 5 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V* ²	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ± 1 mV
Discharge overcurrent 2 detection voltage	10 mV to 100 mV (1 mV step)	Accuracy ± 2 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 4.5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.5 mV step)	Accuracy ± 1 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Alarm function

AO pin output logic:	Active "H", active "L"
AO pin output form:	CMOS output, Nch open-drain output
Connection when AO pin = "L":	VSS pin, VM pin
Charge control function:	Available, unavailable
- High-withstand voltage: VM pin, CO pin and AO 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:	2.5 μA typ., 5.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82T1A Series

BATTERY PROTECTION IC WITH ALARM FUNCTION FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

By using an external overcurrent detection resistor, This IC realizes high-accuracy overcurrent protection with less effect from temperature change.

The alarm function enables the voltage detection immediately before the overcharge detection.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Overcharge release voltage	3.100 V to 4.800 V* ¹	Accuracy ± 50 mV
Alarm detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ± 12 mV
Alarm hysteresis voltage	0 V, 0.010 V, 0.020 V	Accuracy ± 5 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V* ²	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ± 1.5 mV
Discharge overcurrent 2 detection voltage	10 mV to 100 mV (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.5 mV step)	Accuracy ± 1.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

Release condition of discharge overcurrent status:	Load disconnection
Release voltage of discharge overcurrent status:	Discharge overcurrent release voltage (V_{RIOV}) = $V_{DD} \times 0.8$ (typ.)
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Alarm function

AO pin output logic:	Active "H", active "L"
AO pin output form:	CMOS output, Nch open-drain output
Connection when AO pin = "L":	VSS pin, VM pin
Charge control function:	Available, unavailable
- High-withstand voltage: VM pin, CO pin and AO 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:	2.5 μA typ., 5.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82S1A Series

BATTERY PROTECTION IC WITH BATTERY VOLTAGE MONITORING PIN FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Overheat protection is possible by connecting an NTC thermistor to the NTC thermistor connection pin (TH pin.)

The battery voltage monitoring pin (BS pin) enables accurate voltage monitoring.

■ Features

- With battery voltage monitoring pin
- High-accuracy overheat protection circuit by an external NTC thermistor

Overheat detection temperature	+45°C to +85°C (1°C step)	Accuracy ±3°C*1
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- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ±15 mV
Overcharge release voltage	3.100 V to 4.800 V ²	Accuracy ±50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V ³	Accuracy ±75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ±1 mV
Discharge overcurrent 2 detection voltage	6 mV to 100 mV (0.5 mV step)	Accuracy ±2 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ±5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.5 mV step)	Accuracy ±1 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

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

During operation:	4.5 μA typ., 6.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

When an NTC thermistor listed in **Table 5** 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82R1A Series

BATTERY PROTECTION IC WITH BATTERY VOLTAGE MONITORING PIN FOR 1-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Overheat protection is possible by connecting an NTC thermistor to the NTC thermistor connection pin (TH pin.)

The battery voltage monitoring pin (BS pin) enables accurate voltage monitoring.

■ Features

- With battery voltage monitoring pin
- High-accuracy overheat protection circuit by an external NTC thermistor

Overheat detection temperature	+45°C to +85°C (1°C step)	Accuracy ±3°C*1
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- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.800 V (5 mV step)	Accuracy ±15 mV
Overcharge release voltage	3.100 V to 4.800 V*2	Accuracy ±50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ±50 mV
Overdischarge release voltage	2.000 V to 3.400 V*3	Accuracy ±75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ±1.5 mV
Discharge overcurrent 2 detection voltage	10 mV to 100 mV (0.5 mV step)	Accuracy ±3 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ±5 mV
Charge overcurrent detection voltage	−100 mV to −3 mV (0.5 mV step)	Accuracy ±1.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Discharge overcurrent control function

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

During operation:	4.5 μA typ., 6.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

When an NTC thermistor listed in **Table 5** 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82N1A Series

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

The S-82N1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The S-82N1A Series has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy ± 3 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - Charge-discharge control function

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - Discharge overcurrent control function

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

During operation:	600 nA typ., 990 nA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82N1B Series

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

The S-82N1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The S-82N1B Series has an input pin for power-saving signal (PS pin), allowing for reduction of current consumption by using an external signal to start the power-saving function.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.200 V (1 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy ± 3 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - Power-saving function

PS pin control logic:	Active "H", active "L"
PS pin internal resistance connection:	Pull-up, pull-down
PS pin internal resistance value:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
 - Discharge overcurrent control function

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

During operation:	600 nA typ., 990 nA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During power-saving:	50 nA max. ($T_a = +25^\circ\text{C}$)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82B1A Series

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

The S-82B1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The S-82B1A Series has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Charge-discharge control function

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance:	Pull-up, pull-down
CTL pin internal resistance value:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status:

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

During operation:	2.0 μ A typ., 4.0 μ 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82B1B Series

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

The S-82B1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The S-82B1B Series has an input pin for power-saving signal (PS pin), allowing for reduction of current consumption by using an external signal to start the power-saving function.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Discharge overcurrent detection voltage 1	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent detection voltage 2	0.030 V to 0.200 V (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	0.050 V to 0.500 V (5 mV step)	Accuracy ± 20 mV
Charge overcurrent detection voltage	-0.100 V to -0.010 V (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- Power-saving function

PS pin control logic is selectable:	Active "H", active "L"
PS pin internal resistance connection is selectable:	Pull-up, pull-down
PS pin internal resistance value is selectable:	1.0 M Ω , 2.0 M Ω , 3.0 M Ω , 4.0 M Ω , 5.0 M Ω
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function
- Release condition of discharge overcurrent status is selectable: Load disconnection, charger connection
- Release voltage of discharge overcurrent status is selectable:

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-82L1A Series

BATTERY PROTECTION IC WITH ALARM FUNCTION FOR 1-CELL PACK

The S-82L1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The alarm function enables the voltage detection immediately before the overcharge detection.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	4.200 V to 4.600 V (5 mV step)	Accuracy ± 12 mV
Overcharge release voltage	4.000 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
Alarm status detection voltage	4.200 V to 4.600 V (5 mV step)	Accuracy ± 12 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.010 V to 0.100 V (5 mV step)	Accuracy ± 7 mV
Charge overcurrent detection voltage	-0.100 V to -0.003 V (1 mV step)	Accuracy ± 3 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - 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
 - Alarm function

AO pin output logic:	Active "L"
AO pin output form:	CMOS output, Nch open-drain output
Connection when AO pin = "L":	VSS pin, VM pin
 - High-withstand voltage: VM pin, CO pin and AO 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:	800 nA typ., 1500 nA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-8240A Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-8240A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits.

The S-8240A Series is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection circuit

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

During operation:	1.5 μA typ., 3.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SOT-23-6
- SNT-6A
- HSNT-6(1212)

S-8240B Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-8240B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits.

The S-8240B Series is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection circuit

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

During operation:	1.5 μA typ., 3.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	500 nA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-6A
- HSNT-6 (1212)

S-8261 Series

BATTERY PROTECTION IC FOR 1-CELL PACK

The S-8261 Series is a lithium-ion / lithium polymer rechargeable battery protection IC incorporating high-accuracy voltage detection circuit and delay circuits.

The S-8261 Series is suitable for protection of single-cell lithium-ion / lithium polymer battery packs from overcharge, overdischarge and overcurrent.

■ Features

- (1) Internal high accuracy voltage detection circuit
 - Overcharge detection voltage 3.900 V to 4.500 V (applicable in 5 mV step) Accuracy: ± 25 mV (+25°C) and ± 30 mV (–5°C to +55°C)
 - Overcharge hysteresis voltage 0.1 V to 0.4 V*1 Accuracy: ± 25 mV
The overcharge hysteresis voltage can be selected from the range 0.1 V to 0.4 V in 50 mV step.
 - Overdischarge detection voltage 2.000 V to 3.000 V (applicable in 10 mV step) Accuracy: ± 50 mV
 - Overdischarge hysteresis voltage 0.0 V to 0.7 V*2 Accuracy: ± 50 mV
The overdischarge hysteresis voltage can be selected from the range 0.0 V to 0.7 V in 100 mV step.
 - Overcurrent 1 detection voltage 0.050 V to 0.300 V (applicable in 10 mV step) Accuracy: ± 15 mV
 - Overcurrent 2 detection voltage 0.500 V (fixed) Accuracy: ± 100 mV
- (2) High-withstand voltage (VM pin and CO pin: Absolute maximum rating = 28 V)
- (3) Delay times (overcharge: t_{CU} , overdischarge: t_{DL} , overcurrent 1: t_{IOV1} , overcurrent 2: t_{IOV2}) 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 V typ.) (Charger detection function).
 - When the output voltage of the DO pin is high and the voltage at the VM pin is equal to or lower than the charger detection voltage (–0.7 V typ.), the output voltage of the CO pin goes low (Abnormal charge current detection function).
- (8) Low current consumption
 - Operation mode 3.5 μ A typ., 7.0 μ A max.
 - Power-down mode 0.1 μ A max.
- (9) Wide operating temperature range –40°C to +85°C
- (10) Lead-free, Sn 100%, halogen-free*3

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

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

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

■ Applications

- Lithium-ion rechargeable battery packs
- Lithium polymer rechargeable battery packs

■ Package

- SOT-23-6

S-82G1A Series

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

The S-82G1A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Using the S-82G1A Series makes it possible to configure a protection circuit which separates the charge and discharge current paths.

Independent charge current path suppresses heat generation during charging.

The S-82G1A Series also has an input pin for charge-discharge control signal, allowing for charge-discharge control with an external signal.

■ Features

- High-accuracy voltage detection circuit

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

CTL pin control logic is selectable:	Active "H", active "L"
CTL pin internal resistance connection is selectable:	Pull-up, pull-down
CTL pin internal resistance value is selectable:	1 M Ω to 10 M Ω (1 M Ω step)
Charge-discharge inhibition status release function by VMD pin is selectable:	Available, unavailable
Transition from charge-discharge inhibition status to discharge overcurrent status is selectable:	Available, unavailable
- Discharge overcurrent control function

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

During operation:	2.0 μ A typ., 4.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	0.5 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-82G1B Series

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

The S-82G1B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 1-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Using the S-82G1B Series makes it possible to configure a protection circuit which separates the charge and discharge current paths.

Independent charge current path suppresses heat generation during charging.

■ Features

- High-accuracy voltage detection circuit

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

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

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	0.5 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- HSNT-8(1616)

S-8259A Series

BATTERY MONITORING IC FOR 1-CELL PACK

The S-8259A Series is an IC including high-accuracy voltage detection circuits and delay circuits.

The S-8259A Series is suitable for monitoring overcharge and overdischarge for 1-cell lithium-ion / lithium polymer rechargeable battery packs.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 4.600 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage	2.000 V to 3.400 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- CO pin output logic: Active "H", active "L"
- Wide operation temperature range: Ta = -40°C to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	1.5 μA typ., 3.0 μA max. (Ta = $+25^{\circ}\text{C}$)
During overdischarge:	2.0 μA max. (Ta = $+25^{\circ}\text{C}$)
- 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 0.1 V to 0.7 V in 100 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SOT-23-6

S-8216A Series

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

The S-8216A Series is used for secondary protection of lithium-ion / lithium polymer rechargeable batteries, and incorporates a high-accuracy voltage detection circuit and a delay circuit.

The S-8216A Series has functions with an overcharge detection and a discharge overcurrent detection.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	4.000 V to 5.000 V (5 mV step)	Accuracy ±15 mV
Overcharge release voltage	3.600 V to 4.950 V*1	Accuracy ±50 mV
Discharge overcurrent detection voltage	0.003 V to 0.100 V (0.5 mV step)	Accuracy ±1.5 mV
- Detection delay time is generated only by an internal circuit (external capacitors are unnecessary).
- Output logic is selectable: Active "H", active "L"
- Output form: CMOS output
- Wide operation temperature range: $T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	2.0 μA typ., 4.0 μA max. ($T_a = +25^{\circ}\text{C}$)
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- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0.05 V to 0.4 V in 50 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-8206A Series

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

The S-8206A Series is used for secondary protection of lithium-ion / lithium polymer rechargeable batteries, and incorporates a high-accuracy voltage detection circuit and a delay circuit.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage	3.500 V to 5.000 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage	3.100 V to 4.950 V ^{*1}	Accuracy ± 50 mV
- Detection delay time is generated only by an internal circuit (external capacitors are unnecessary).
- Output logic: Active "H", active "L"
- Output form: CMOS output, Nch open-drain output
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation:	1.5 μA typ., 3.0 μA max. ($T_a = +25^\circ\text{C}$)
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- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0.05 V to 0.4 V in 50 mV step.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-6A
- HSNT-6 (1212)

S-82A2A/B/C Series

BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 2-serial-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Use of an external overcurrent detection resistor enables this IC to provide high-accuracy overcurrent protection with less impact from temperature changes.

The S-82A2A/C Series has an input pin for charge-discharge control signal (CTL pin), allowing for charge-discharge control with an external signal. The S-82A2B Series has an input pin for power-saving signal (PS pin), allowing for reduction of current consumption by using an external signal to start the power-saving function.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage n	3.500 V to 4.800 V (5 mV step)	Accuracy ± 15 mV
Overcharge release voltage n	3.100 V to 4.800 V*1	Accuracy ± 50 mV
Overdischarge detection voltage n	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage n	2.000 V to 3.400 V*2	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ± 1.0 mV
Discharge overcurrent 2 detection voltage	10 mV to 100 mV (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.5 mV step)	Accuracy ± 1.0 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - Charge-discharge control function (S-82A2A/C Series)

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - Power-saving function (S-82A2B Series)

PS pin control logic:	Active "H", active "L"
PS pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: S-82A2A/C Series: Available, unavailable
S-82A2B Series: Available
 - 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:	3.0 μ A typ., 6.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	1.0 μ A max. (Ta = +25°C)
During power-saving (S-82A2B Series):	50 nA max. (Ta = +25°C)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

Remark n = 1, 2

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- HSNT-8(1616)

S-82B2A/B Series

BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 2-serial-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Use of an external overcurrent detection resistor enables this IC to provide high-accuracy overcurrent protection with less impact from temperature changes.

The S-82B2A Series has an input pin for charge-discharge control signal (CTL pin), allowing for charge-discharge control with an external signal. The S-82B2B Series has an input pin for power-saving signal (PS pin), allowing for reduction of current consumption by using an external signal to start the power-saving function.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage n	3.500 V to 4.800 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage n	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage n	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 100 mV (0.5 mV step)	Accuracy ± 3.0 mV
Discharge overcurrent 2 detection voltage	10 mV to 100 mV (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	20 mV to 100 mV (1 mV step)	Accuracy ± 10 mV
Charge overcurrent detection voltage	-100 mV to -3 mV (0.5 mV step)	Accuracy ± 3.0 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - Charge-discharge control function (S-82B2A Series)

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - Power-saving function (S-82B2B Series)

PS pin control logic:	Active "H", active "L"
PS pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: S-82B2A Series: Available, unavailable
S-82B2B Series: Available
 - 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:	3.0 μ A typ., 6.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	1.0 μ A max. (Ta = +25°C)
During power-saving (S-82B2B Series):	50 nA max. (Ta = +25°C)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

Remark n = 1, 2

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- HSNT-8(1616)

S-82C2A Series

BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 2-serial-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage n	3.500 V to 4.800 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage n	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage n	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 400 mV (1 mV step)	Accuracy ± 3 mV
Discharge overcurrent 2 detection voltage	10 mV to 400 mV (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	20 mV to 800 mV (5 mV step)	Accuracy ± 10 mV
Charge overcurrent detection voltage	-400 mV to -3 mV (1 mV step)	Accuracy ± 3 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Release voltage of discharge overcurrent status: Discharge overcurrent release voltage (V_{RIOV}), discharge overcurrent 1 detection voltage (V_{DIOV1})
- 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:	3.0 μA typ., 6.0 μA max. ($T_a = +25^\circ\text{C}$)
During power-down:	50 nA max. ($T_a = +25^\circ\text{C}$)
During overdischarge:	2.0 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

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

Remark n = 1, 2

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SOT-23-6
- SNT-6A

S-82C2B/C Series

BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

This IC is a protection IC for lithium-ion / lithium polymer rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 2-serial-cell lithium-ion / lithium polymer rechargeable battery packs from overcharge, overdischarge, and overcurrent.

The S-82C2B Series has an input pin for charge-discharge control signal (CTL pin), allowing for charge-discharge control with an external signal. The S-82C2C Series has an input pin for power-saving signal (PS pin), allowing for reduction of current consumption by using an external signal to start the power-saving function.

■ Features

- High-accuracy voltage detection circuit

Overcharge detection voltage n	3.500 V to 4.800 V (5 mV step)	Accuracy ± 20 mV
Overcharge release voltage n	3.100 V to 4.800 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n	2.000 V to 3.000 V (10 mV step)	Accuracy ± 50 mV
Overdischarge release voltage n	2.000 V to 3.400 V ^{*2}	Accuracy ± 75 mV
Discharge overcurrent 1 detection voltage	3 mV to 400 mV (1 mV step)	Accuracy ± 3.0 mV
Discharge overcurrent 2 detection voltage	10 mV to 400 mV (1 mV step)	Accuracy ± 5 mV
Load short-circuiting detection voltage	20 mV to 800 mV (5 mV step)	Accuracy ± 10 mV
Charge overcurrent detection voltage	-400 mV to -3 mV (1 mV step)	Accuracy ± 3.0 mV
 - Detection delay times are generated only by an internal circuit (external capacitors are unnecessary).
 - Charge-discharge control function (S-82C2B Series)

CTL pin control logic:	Active "H", active "L"
CTL pin internal resistance connection:	Pull-up, pull-down
CTL pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - Power-saving function (S-82C2C Series)

PS pin control logic:	Active "H", active "L"
PS pin internal resistance value:	1 M Ω to 10 M Ω (1 M Ω step)
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: S-82C2B Series: Available, unavailable
S-82C2C Series: Available
 - 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:	3.0 μ A typ., 6.0 μ A max. (Ta = +25°C)
During power-down:	50 nA max. (Ta = +25°C)
During overdischarge:	1.0 μ A max. (Ta = +25°C)
During power-saving (S-82C2C Series):	50 nA max. (Ta = +25°C)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.4 V in 50 mV step.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 100 mV step.)

Remark n = 1, 2

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- HSNT-8(1616)

S-8252 Series

BATTERY PROTECTION IC FOR 2-SERIAL-CELL PACK

The S-8252 Series is a protection IC for 2-serial-cell lithium-ion / lithium polymer rechargeable batteries and includes high-accuracy voltage detection circuits and delay circuits.

The S-8252 Series is suitable for protecting 2-serial-cell rechargeable lithium-ion / lithium polymer battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection function for each cell

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

During operation:	8.0 μ A max. (Ta = +25°C)
During power-down:	0.1 μ A max. (Ta = +25°C)
 - Lead-free (Sn 100%), halogen-free
- *1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage 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.)

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SOT-23-6
- SNT-6A

S-8253C/D Series

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

The S-8253C/D Series is a protection ICs for 2-series or 3-series cell lithium-ion rechargeable battery and includes high-accuracy voltage detector and delay circuit.

This IC is suitable for protecting lithium-ion battery packs from overcharge, overdischarge and overcurrent.

■ Features

- (1) High-accuracy voltage detection for each cell
 - Overcharge detection voltage n (n = 1 to 3) 3.900 V to 4.400 V (50 mV step) Accuracy ± 25 mV
 - Overcharge release voltage n (n = 1 to 3) 3.800 V to 4.400 V ^{*1} Accuracy ± 50 mV
 - Overdischarge detection voltage n (n = 1 to 3) 2.000 V to 3.000 V (100 mV step) Accuracy ± 80 mV
 - Overdischarge release voltage n (n = 1 to 3) 2.000 V to 3.400 V ^{*2} Accuracy ± 100 mV
- (2) Three-level overcurrent detection (Including load short circuiting detection)
 - Overcurrent detection voltage 1 0.050 V to 0.300 V (50 mV step) Accuracy ± 25 mV
 - Overcurrent detection voltage 2 0.500 V (Fixed)
 - Overcurrent detection voltage 3 1.200 V (Fixed)
- (3) Delay time (Overcharge, overdischarge, overcurrent) is available by only using an internal circuit. (External capacitors are unnecessary).
- (4) Charge / discharge operation can be inhibited by the control pin.
- (5) 0 V battery charge function available / unavailable is selectable.
- (6) High-withstand voltage Absolute maximum rating 26 V
- (7) Wide range of operating voltage 2 V to 24 V
- (8) Wide range of operating temperature -40°C to $+85^{\circ}\text{C}$
- (9) Low current consumption
 - During operation 28 μA max. ($+25^{\circ}\text{C}$)
 - During power-down 0.1 μA max. ($+25^{\circ}\text{C}$)
- (10) Lead-free, Sn100%, halogen-free^{*3}

*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.

■ Applications

- Lithium-ion rechargeable battery packs
- Lithium polymer rechargeable battery packs

■ Package

- 8-Pin TSSOP

S-8203A Series

BATTERY PROTECTION IC FOR 3-SERIES CELL PACK

The S-8203A Series includes high-accuracy voltage detection circuits and delay circuits, in single use, makes it possible for users to monitor the status of 3-series cell lithium-ion rechargeable battery.

The S-8203A Series is suitable for protecting lithium-ion rechargeable battery pack from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 3)	3.55 V to 4.50 V ^{*1} (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 3)	3.30 V to 4.50 V ^{*2}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 3)	2.0 V to 3.2 V ^{*1} (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 3)	2.0 V to 3.4 V ^{*3}	Accuracy ±100 mV
- Discharge overcurrent detection in 2-step

Discharge overcurrent detection voltage	0.05 V to 0.30 V ^{*4} (50 mV step)	Accuracy ±15 mV
Short-circuiting detection voltage	0.50 V to 1.0 V ^{*4} (100 mV step)	Accuracy ±100 mV
- Charge overcurrent detection function

Charge overcurrent detection voltage	–0.30 V to –0.05 V (50 mV step)	Accuracy ±30 mV
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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: 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 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.

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 16-Pin TSSOP

S-8204A Series

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

The S-8204A Series includes high-accuracy voltage detection circuits and delay circuits, in single use, makes it possible for users to monitor the status of 3-series or 4-series cell lithium-ion rechargeable battery. By switching the voltage level which is applied to the SEL pin, users are able to use the S-8204A Series either for 3-series or 4-series cell pack.

By cascade connection using the S-8204A Series, it is also possible to protect 6-series or more cells*¹ lithium-ion rechargeable battery pack.

- *1. Refer to the application note for connection examples of protection circuit for 6-series or more cells.
In case of protecting 5-series cell lithium-ion rechargeable battery pack, contact our sales office.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 4)	3.8 V to 4.6 V (50 mV step)	Accuracy ± 25 mV
Overcharge release voltage n (n = 1 to 4)	3.6 V to 4.6 V* ¹	Accuracy ± 50 mV
Overdischarge detection voltage n (n = 1 to 4)	2.0 V to 3.0 V (100 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n (n = 1 to 4)	2.0 V to 3.4 V* ²	Accuracy ± 100 mV
- Discharge overcurrent detection function in 3-step

Discharge overcurrent detection voltage 1	0.05 V to 0.30 V (50 mV step)	Accuracy ± 15 mV
Discharge overcurrent detection voltage 2	0.5 V (fixed)	Accuracy ± 100 mV
Load short-circuit detection voltage	1.0 V (fixed)	Accuracy ± 300 mV
- Charge overcurrent detection function

Charge overcurrent detection voltage	-0.25 V to -0.05 V (50 mV step)	Accuracy ± 30 mV
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- Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent detection delay time 2, charge overcurrent detection delay time
(Load short-circuit detection delay time is internally fixed.)
- Switchable between 3-series and 4-series cell by using the SEL pin
- Independent charge and discharge control by the control pins
- High-withstand voltage Absolute maximum rating: 24 V
- Wide operation voltage range 2 V to 22 V
- Wide operation temperature range Ta = -40°C to +85°C
- Low current consumption

During operation	33 μ A max. (Ta = +25°C)
During power-down	0.1 μ A max. (Ta = +25°C)
- Lead-free, Sn 100%, halogen-free*³

*1. Overcharge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.
(Overcharge hysteresis voltage = Overcharge detection voltage - Overcharge release voltage)

*2. Overdischarge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.
(Overdischarge hysteresis voltage = Overdischarge release voltage - Overdischarge detection voltage)

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

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 16-Pin TSSOP

S-8204B Series

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

The S-8204B Series includes high-accuracy voltage detection circuits and delay circuits, in single use, makes it possible for users to monitor the status of 3-series or 4-series cell lithium-ion rechargeable battery. By switching the voltage level which is applied to the SEL pin, users are able to use the S-8204B Series either for 3-series or 4-series cell pack.

By cascade connection using the S-8204B Series, it is also possible to protect 6-series or more cells^{*1} lithium-ion rechargeable battery pack.

- *1. Refer to the application note for connection examples of protection circuit for 6-series or more cells.
In case of protecting 5-series cell lithium-ion rechargeable battery pack, contact our sales office.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 4)	3.65 V to 4.6 V (50 mV step)	Accuracy ±25 mV
Overcharge release voltage n (n = 1 to 4)	3.5 V to 4.6 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n (n = 1 to 4)	2.0 V to 3.0 V (100 mV step)	Accuracy ±80 mV
Overdischarge release voltage n (n = 1 to 4)	2.0 V to 3.4 V ^{*2}	Accuracy ±100 mV
- Discharge overcurrent detection in 3-step

Discharge overcurrent detection voltage 1	0.05 V to 0.30 V (50 mV step)	Accuracy ±15 mV
Discharge overcurrent detection voltage 2	0.5 V (fixed)	Accuracy ±100 mV
Load short-circuit detection voltage	1.0 V (fixed)	Accuracy ±300 mV
- Settable by external capacitor; overcharge detection delay time, overdischarge detection delay time, discharge overcurrent detection delay time 1, discharge overcurrent detection delay time 2 (Load short-circuit detection delay time is internally fixed.)
- Switchable between 3-series and 4-series cell by using the SEL pin
- Independent charge and discharge control by the control pins
- Power-down function "available" / "unavailable" is selectable
- High-withstand voltage Absolute maximum rating: 24 V
- Wide operation voltage range 2 V to 22 V
- Wide operation temperature range Ta = -40°C to +85°C
- Low current consumption

During operation	33 μA max. (Ta = +25°C)
During power-down	0.1 μA max. (Ta = +25°C)
- Lead-free, Sn 100%, halogen-free^{*3}

*1. Overcharge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or in 0.1 V to 0.4 V in 50 mV step.
(Overcharge hysteresis voltage = Overcharge detection voltage – Overcharge release voltage)

*2. Overdischarge hysteresis voltage n (n = 1 to 4) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.
(Overdischarge hysteresis voltage = Overdischarge release voltage – Overdischarge detection voltage)

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

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 16-Pin TSSOP

S-8254A Series

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

The S-8254A Series is a protection IC for 3-serial- or 4-serial-cell lithium-ion / lithium polymer rechargeable batteries and includes a high-accuracy voltage detector and delay circuit.

The S-8254A Series protects both 3-serial or 4-serial cells using the SEL pin for switching.

■ Features

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

• Overcharge detection voltage n (n = 1 to 4)	3.90 V to 4.45 V (50 mV step)	Accuracy ±25 mV
• Overcharge release voltage n (n = 1 to 4)	3.80 V to 4.45 V ^{*1}	Accuracy ±50 mV
• Overdischarge detection voltage n (n = 1 to 4)	2.0 V to 3.0 V (100 mV step)	Accuracy ±80 mV
• Overdischarge release voltage n (n = 1 to 4)	2.0 V to 3.4 V ^{*2}	Accuracy ±100 mV
- (2) Three-level overcurrent protection

• Overcurrent detection voltage 1	0.05 V to 0.30 V (50 mV step)	Accuracy ±25 mV
• Overcurrent detection voltage 2	0.5 V	Accuracy ±100 mV
• Overcurrent detection voltage 3	$V_{VC1} - 1.2 V$	Accuracy ±300 mV
- (3) Delay times for overcharge detection, overdischarge detection and overcurrent detection 1 can be set by external capacitors (delay times for overcurrent detection 2 and 3 are fixed internally).
- (4) Switchable between a 3-serial cell and 4-serial cell using the SEL pin
- (5) Charge/discharge operation can be controlled via the control pins.
- (6) 0 V battery charge Enabled, inhibited
- (7) Power-down function Available
- (8) High-withstand voltage Absolute maximum rating : 26 V
- (9) Wide operating voltage range 2 V to 24 V
- (10) Wide operating temperature range -40°C to $+85^{\circ}\text{C}$
- (11) Low current consumption

• During operation	30 μA max. ($+25^{\circ}\text{C}$)
• During power-down	0.1 μA max. ($+25^{\circ}\text{C}$)
- (12) Lead-free, Sn100%, halogen-free^{*3}

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

(Overcharge hysteresis voltage = Overcharge detection voltage – Overcharge release voltage)

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

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

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

■ Applications

- Lithium-ion rechargeable battery packs
- Lithium polymer rechargeable battery packs

■ Package

- 16-Pin TSSOP

S-8245A/C Series

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

The S-8245A/C Series is a protection IC for 3-serial to 5-serial cell lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 3-serial to 5-serial cell lithium-ion rechargeable battery packs from overcharge, overdischarge, and overcurrent. Cascade connection using the S-8245A/C Series realizes protecting 6-serial or more cells lithium-ion rechargeable battery packs.

Connecting an NTC, it allows for the temperature detection at four different points: high temperature detection during charging, low temperature detection during charging, high temperature detection during discharging, and low temperature detection during discharging.

■ Features

- High-accuracy voltage detection for each cell

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

Discharge overcurrent 1 detection voltage:	0.020 V to 0.300 V (10 mV step)	Accuracy ±10 mV
Discharge overcurrent 2 detection voltage:	0.040 V to 0.500 V (20 mV step)	Accuracy ±15 mV
Load short-circuiting detection voltage:	0.100 V to 1.000 V (25 mV step)	Accuracy ±50 mV
- Charge overcurrent detection:

Charge overcurrent detection voltage:	−0.300 V to −0.020 V (10 mV step)	Accuracy ±10 mV
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- Each delay time is settable by an external capacitor
(Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- CIT pin internal resistance value is selectable: 831 kΩ typ., 8.31 MΩ typ.
- CO and DO pin output voltage is limited to 15 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Protection of 6-serial or more cells is possible by cascade connection
- Temperature detection is possible at four different points by connecting an NTC

High temperature detection ratio during charging / discharging:	0.600 to 0.900 (0.005 step)	Accuracy ±0.005
Low temperature detection ratio during charging / discharging:	0.030 to 0.400 (0.005 step)	Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption

During operation:	20 μA max. (Ta = +25°C)
During power-down:	0.5 μA max. (Ta = +25°C)
During power-saving:	0.1 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

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

■ Application

- Lithium-ion rechargeable battery pack

■ Package

- 24-Pin SSOP

S-8245B/D Series

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

The S-8245B/D Series is a protection IC for 3-serial to 5-serial cell lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 3-serial to 5-serial cell lithium-ion rechargeable battery packs from overcharge, overdischarge, and overcurrent.

Connecting an NTC, it allows for the temperature detection at four different points: high temperature detection during charging, low temperature detection during charging, high temperature detection during discharging, and low temperature detection during discharging.

■ Features

- High-accuracy voltage detection for each cell

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

Discharge overcurrent 1 detection voltage:	0.020 V to 0.300 V (10 mV step)	Accuracy ±10 mV
Discharge overcurrent 2 detection voltage:	0.040 V to 0.500 V (20 mV step)	Accuracy ±15 mV
Load short-circuiting detection voltage:	0.100 V to 1.000 V (25 mV step)	Accuracy ±50 mV
- Charge overcurrent detection:

Charge overcurrent detection voltage:	−0.300 V to −0.020 V (10 mV step)	Accuracy ±10 mV
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- Each delay time is settable by an external capacitor
(Load short-circuiting detection delay time and temperature detection delay time are internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery charge function is selectable: Available, unavailable
- Power-down function is selectable: Available, unavailable
- CIT pin internal resistance value is selectable: 831 kΩ typ., 8.31 MΩ typ.
- CO and DO pin output voltage is limited to 15 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Temperature detection is possible at four different points by connecting an NTC

High temperature detection ratio during charging / discharging:	0.600 to 0.900 (0.005 step)	Accuracy ±0.005
Low temperature detection ratio during charging / discharging:	0.030 to 0.400 (0.005 step)	Accuracy ±0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = −40°C to +85°C
- Low current consumption

During operation:	20 μA max. (Ta = +25°C)
During power-down:	0.5 μA max. (Ta = +25°C)
During power-saving:	0.1 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

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

■ Application

- Lithium-ion rechargeable battery pack

■ Package

- 24-Pin SSOP

S-82B4A/5A Series

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

This IC is a protection IC for lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. It is suitable for protecting 4-serial or 5-serial cell lithium-ion rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection for each cell

Overcharge detection voltage n	3.900 V to 4.500 V (25 mV step)	Accuracy ±20 mV
Overcharge release voltage n	3.500 V to 4.500 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n	2.000 V to 3.200 V (100 mV step)	Accuracy ±50 mV
Overdischarge release voltage n	2.000 V to 3.400 V ^{*2}	Accuracy ±100 mV
 - Three-level discharge overcurrent detection

Discharge overcurrent 1 detection voltage	10 mV to 200 mV (5 mV step)	Accuracy ±5 mV
Discharge overcurrent 2 detection voltage	20 mV to 300 mV (5 mV step)	Accuracy ±10 mV
Load short-circuiting detection voltage	50 mV to 400 mV (10 mV step)	Accuracy ±20 mV
 - Charge overcurrent detection

Charge overcurrent detection voltage	-200 mV to -10 mV (5 mV step)	Accuracy ±5 mV
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 - Discharge overcurrent 1 detection delay time is settable by an external capacitor (The other delay time are internally fixed)
 - Power saving control by a control pin
 - 0 V battery charge: Enabled, inhibited
 - Power-down function: Available, unavailable
 - Release condition of discharge overcurrent status: Load disconnection, charger connection
 - Output voltage of CO and DO pin is limited to VC2 pin voltage. (S-82B5A Series)
 - High-withstand voltage: Absolute maximum rating 28.0 V
 - Wide operating voltage range: 5.0 V to 24.0 V
 - Wide operation temperature range: Ta = -40°C to +85°C
 - Low current consumption

During operation:	4.0 μA typ., 8.0 μA max. (Ta = +25°C)
During power-down:	0.1 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 can be selected from a range of 0 V to 0.4 V in 50 mV steps.)
- *2. Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage
(Overdischarge hysteresis voltage n can be selected from a range of 0 V to 0.7 V in 100 mV steps.)

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery packs

■ Package

- 16-Pin TSSOP

S-82C4A/5A Series

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

This IC is a protection IC for lithium-ion rechargeable batteries, which includes temperature protection circuits, high-accuracy voltage detection circuits, and delay circuits. Temperature protection is possible by connecting an NTC thermistor to the dedicated connection pin. It is suitable for protecting 4-serial or 5-serial cell lithium-ion rechargeable battery packs from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection for each cell

Overcharge detection voltage n	3.900 V to 4.500 V (25 mV step)	Accuracy ±20 mV
Overcharge release voltage n	3.500 V to 4.500 V ^{*1}	Accuracy ±50 mV
Overdischarge detection voltage n	2.000 V to 3.200 V (100 mV step)	Accuracy ±50 mV
Overdischarge release voltage n	2.000 V to 3.400 V ^{*2}	Accuracy ±100 mV
- Three-level discharge overcurrent detection

Discharge overcurrent 1 detection voltage	10 mV to 200 mV (5 mV step)	Accuracy ±5 mV
Discharge overcurrent 2 detection voltage	20 mV to 300 mV (5 mV step)	Accuracy ±10 mV
Load short-circuiting detection voltage	50 mV to 400 mV (10 mV step)	Accuracy ±20 mV
- Charge overcurrent detection

Charge overcurrent detection voltage	-200 mV to -10 mV (5 mV step)	Accuracy ±5 mV
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- Discharge overcurrent 1 detection delay time is settable by an external capacitor (The other delay time are internally fixed)
- Power saving control by a control pin
- 0 V battery charge: Enabled, inhibited
- Power-down function: Available, unavailable
- Release condition of discharge overcurrent status: Load disconnection, charger connection
- Output voltage of CO and DO pin is limited to VC2 pin voltage. (S-82C5A Series)
- Detecting temperature is possible with connecting an NTC thermistor at four different points of high-and-low temperatures during charging and of high-and-low temperatures during charge-discharge.

High temperature charge-discharge inhibition temperature	+40°C to +85°C (1°C step)	Accuracy ±3°C ^{*3}
High temperature charge inhibition temperature	+40°C to +85°C (1°C step)	Accuracy ±3°C ^{*3}
Low temperature charge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy ±3°C ^{*3}
Low temperature charge-discharge inhibition temperature	-40°C to +10°C (1°C step)	Accuracy ±3°C ^{*3}
- High-withstand voltage: Absolute maximum rating 28.0 V
- Wide operating voltage range: 5.0 V to 24.0 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation:	5.0 μA typ., 10 μA max. (Ta = +25°C)
During power-down:	0.1 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 can be selected from a range of 0 V to 0.4 V in 50 mV steps.)

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

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

When an NTC thermistor listed in **Table 2** is connected, the detection temperature and accuracy can be achieved.

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery packs

■ Package

- 16-Pin TSSOP

S-8205A/B Series

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

The S-8205A/B Series includes high-accuracy voltage detection circuits and delay circuits, in single use, makes it possible for users to monitor the status of 4-series or 5-series cell lithium-ion rechargeable battery.

The S-8205A/B Series is suitable for protecting lithium-ion rechargeable battery pack from overcharge, overdischarge, and overcurrent.

■ Features

- High-accuracy voltage detection function for each cell

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

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

Charge overcurrent detection voltage	−0.300 V to −0.050 V (50 mV step)	Accuracy ±30 mV
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- Settable by external capacitor; Overcharge detection delay time, Overdischarge detection delay time, Discharge overcurrent detection delay time, Charge overcurrent detection delay time
(Load short circuit detection delay time is internally fixed.)
- S-8205A Series: used for 4-series cell, S-8205B Series: used for 5-series cell
- Independent charging and discharge control by the control pins
- 0 V battery charge Enabled, inhibited
- Power-down function Available, unavailable
- High-withstand voltage Absolute maximum rating : 28 V
- Wide range of operation voltage 2 V to 24 V
- Wide range of operation temperature Ta = −40°C to +85°C
- Low current consumption

During operation	40 μA max. (Ta = +25°C)
During power-down	0.1 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

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

*3. Overdischarge hysteresis voltage n (n = 1 to 5) is selectable in 0 V, or in 0.2 V to 0.7 V in 100 mV step.
(Overdischarge hysteresis voltage = Overdischarge release voltage – Overdischarge detection voltage)

*4. The discharge overcurrent detection voltage and load short circuit detection voltage are not selectable if the voltage difference between them is 0.3 V or less.

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 16-Pin TSSOP

S-8255A Series

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

The S-8255A Series is a monitoring IC for 3-serial to 5-serial cell lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. The S-8255A Series can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable battery packs. Cascade connection using the S-8255A Series realizes monitoring 6-serial or more cells lithium-ion rechargeable battery packs.

Connecting an NTC, it allows for the temperature detection at four different points: high temperature detection during charging, low temperature detection during charging, high temperature detection during discharging, and low temperature detection during discharging.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ± 20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n (n = 1 to 5):	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
- Each delay time is settable by external capacitor (Temperature detection delay time is internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery detection function is selectable: Available, unavailable
- CO and DO pin output voltage is limited to 8 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Monitoring of 6-serial or more cells is possible by cascade connection
- Temperature detection is possible at four different points by connecting an NTC

High temperature detection ratio during charging / discharging:	0.600 to 0.900 (0.005 step)	Accuracy ± 0.005
Low temperature detection ratio during charging / discharging:	0.030 to 0.400 (0.005 step)	Accuracy ± 0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	19 μA max. (Ta = $+25^{\circ}\text{C}$)
During power-saving:	0.1 μA max. (Ta = $+25^{\circ}\text{C}$)
- 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)

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 20-Pin TSSOP

S-8255B Series

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

The S-8255B Series is a monitoring IC for 3-serial to 5-serial cell lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits. The S-8255B Series can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable battery packs.

Connecting an NTC, it allows for the temperature detection at four different points: high temperature detection during charging, low temperature detection during charging, high temperature detection during discharging, and low temperature detection during discharging.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 5):	3.550 V to 4.600 V (50 mV step)	Accuracy ± 20 mV
Overcharge release voltage n (n = 1 to 5):	3.150 V to 4.600 V ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n (n = 1 to 5):	2.000 V to 3.200 V (100 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n (n = 1 to 5):	2.000 V to 3.400 V ^{*2}	Accuracy ± 100 mV
- Each delay time is settable by external capacitor (Temperature detection delay time is internally fixed)
- Independent control of charge inhibition, discharge inhibition, and power-saving by each control pin
- 0 V battery detection function is selectable: Available, unavailable
- CO and DO pin output voltage is limited to 8 V max. respectively
- Switching control for 3-serial to 5-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin
- Temperature detection is possible at four different points by connecting an NTC

High temperature detection ratio during charging / discharging:	0.600 to 0.900 (0.005 step)	Accuracy ± 0.005
Low temperature detection ratio during charging / discharging:	0.030 to 0.400 (0.005 step)	Accuracy ± 0.005
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 5 V to 24 V
- Wide operation temperature range: Ta = -40°C to $+85^{\circ}\text{C}$
- Low current consumption

During operation:	19 μA max. (Ta = $+25^{\circ}\text{C}$)
During power-saving:	0.1 μA max. (Ta = $+25^{\circ}\text{C}$)
- 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)

■ Application

- Rechargeable lithium-ion battery pack

■ Package

- 20-Pin TSSOP

S-82H5B Series

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

This IC includes high-accuracy voltage detection circuits and delay circuits, and can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable batteries through small 8-pin packages.

Short-circuiting between cells makes it possible for serial connection of 3-cell to 5-cell.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.500 V to 4.700 V (5 mV step)	Accuracy ± 15 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 20 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n ^{*1}	3.100 V to 4.700 V	Accuracy ± 50 mV
Overdischarge detection voltage n	1.500 V to 3.200 V (50 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n ^{*2}	1.500 V to 3.900 V (100 mV step)	Accuracy ± 100 mV
- 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
Overdischarge detection delay time:	128 ms, 256 ms, 0.5 s, 1 s
- CO and DO pin output voltage is limited to 7.5 V max. respectively
- CO pin, DO pin output form: CMOS output, Nch open-drain output
- CO pin, DO pin output logic: Active "H", active "L"
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 24 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation (3.4 V for each cell):	7.0 μA max.
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- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0 mV to 400 mV 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 mV to 700 mV in 100 mV step.)

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-82F5B Series

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

This IC includes high-accuracy voltage detection circuits and delay circuits, and can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable batteries through small 8-pin packages.

Short-circuiting between cells makes it possible for serial connection of 3-cell to 5-cell.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.500 V to 4.700 V (5 mV step)	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n ^{*1}	3.100 V to 4.700 V	Accuracy ± 50 mV
Overdischarge detection voltage n	1.500 V to 3.200 V (50 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n ^{*2}	1.500 V to 3.900 V (100 mV step)	Accuracy ± 100 mV
- 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
Overdischarge detection delay time:	128 ms, 256 ms, 0.5 s, 1 s
- CO and DO pin output voltage is limited to 7.5 V max. respectively
- CO pin, DO pin output form: CMOS output, Nch open-drain output
- CO pin, DO pin output logic: Active "H", active "L"
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 24 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation (3.4 V for each cell):	7.0 μA max.
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- Lead-free (Sn 100%), halogen-free

*1. Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage
(Overcharge hysteresis voltage can be selected from a range of 0 mV to 400 mV 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 mV to 700 mV in 100 mV step.)

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-8225A Series

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

The S-8225A Series includes high-accuracy voltage detection circuits and delay circuits, and can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable battery in single use. By switching the voltage level which is applied to the SEL1 pin and SEL2 pin, users are able to use the S-8225A Series for 3-serial to 5-serial cell pack.

By cascade connection using the S-8225A Series, it is also possible to protect 6-serial or more cells lithium-ion rechargeable battery pack.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 5)	3.500 V to 4.400 V (50 mV step)	
	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$), ± 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 ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n (n = 1 to 5)	2.000 V to 3.200 V (100 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n (n = 1 to 5)	2.100 V to 3.400 V ^{*2}	Accuracy ± 100 mV
 - Overcharge detection delay time and overdischarge detection delay time can be set by external capacitor.
 - Switchable between 3-serial to 5-serial cell by using the SEL1 pin and the SEL2 pin
 - Cascade connection is available.
 - The CO pin and the DO pin are controlled by the CTLC pin and the CTLD pin, respectively.
 - Output voltage of the CO pin and the DO pin is limited to 12 V max.
 - High-withstand voltage Absolute maximum rating: 28 V
 - Wide operation voltage range 4 V to 26 V
 - Wide operation temperature range $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation ($V_1 = V_2 = V_3 = V_4 = V_5 = 3.4$ V)	22 μA 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 μA 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)

■ Application

- Lithium-ion rechargeable battery pack

■ Package

- 16-Pin TSSOP

S-8225B Series

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

The S-8225B Series includes high-accuracy voltage detection circuits and delay circuits, and can monitor the status of 3-serial to 5-serial cell lithium-ion rechargeable battery in single use. By switching the voltage level which is applied to the SEL1 pin and SEL2 pin, users are able to use the S-8225B Series for 3-serial to 5-serial cell pack.

■ Features

- High-accuracy voltage detection function for each cell

Overcharge detection voltage n (n = 1 to 5)	3.5 V to 4.4 V (50 mV step)	
	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$), ± 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 ^{*1}	Accuracy ± 50 mV
Overdischarge detection voltage n (n = 1 to 5)	2.2 V to 3.2 V (100 mV step)	Accuracy ± 80 mV
Overdischarge release voltage n (n = 1 to 5)	2.2 V to 3.4 V ^{*2}	Accuracy ± 100 mV
 - Overcharge detection delay time and overdischarge detection delay time can be set by external capacitor.
 - Switchable between 3-serial to 5-serial cell by using the SEL1 pin and the SEL2 pin
 - The CO pin and the DO pin are controlled by the CTLC pin and the CTLD pin, respectively.
 - Output voltage of the CO pin and the DO pin is limited to 12 V max.
 - Output logic is selectable. Active "H", active "L"
 - High-withstand voltage Absolute maximum rating: 28 V
 - Wide operation voltage range 4 V to 26 V
 - Wide operation temperature range $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
 - Low current consumption

During operation ($V_1 = V_2 = V_3 = V_4 = V_5 = 3.4$ V)	20 μA 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 μA 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)

■ Application

- Lithium-ion rechargeable battery pack

■ Package

- 16-Pin TSSOP

S-8209A Series

BATTERY PROTECTION IC WITH CELL-BALANCE FUNCTION

The S-8209A Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes a high-accuracy voltage detection circuit and a delay circuit.

The S-8209A Series has a transmission function and two types of cell-balance function so that users are also able to configure a protection circuit with series multi-cell.

■ Features

- High-accuracy voltage detection circuit

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

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

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

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

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- 8-Pin TSSOP
- SNT-8A

S-8209B Series

BATTERY PROTECTION IC WITH CELL-BALANCE FUNCTION

The S-8209B Series is a protection IC for lithium-ion / lithium polymer rechargeable batteries and includes a high-accuracy voltage detection circuit and a delay circuit.

The S-8209B Series has a transmission function and two types of cell-balance function so that users are also able to configure a protection circuit with series multi-cell.

■ Features

- High-accuracy voltage detection circuit

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

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

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

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

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

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

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Packages

- SNT-8A
- 8-Pin TSSOP

S-8229A Series

BATTERY MONITORING IC

The S-8229A Series is a battery monitoring IC developed using CMOS technology. Compared with conventional CMOS voltage detectors, the S-8229A Series is ideal for the applications that require high-withstand voltage due to its maximum operation voltage as high as 24 V.

The S-8229A Series is capable of confirming the voltage in stages since it detects three voltage values.

■ Features

- Detection voltage accuracy: $\pm 1.0\%$
- Hysteresis characteristics: V_{HYS1} to $V_{HYS3} = 0 \text{ mV}, 50 \text{ mV}, 300 \text{ mV}, 400 \text{ mV}, 500 \text{ mV}$
- Current consumption:
 - During operation: $I_{DD1} = 9.0 \mu\text{A max.}$ ($-V_{DETtotal}^{*1} \geq 42 \text{ V}$)
 - $I_{DD1} = 11.0 \mu\text{A max.}$ ($-V_{DETtotal}^{*1} < 42 \text{ V}$)
 - During power-off: $I_{DD2} = 0.1 \mu\text{A max.}$
- Operation voltage range: $V_{DD} = 3.6 \text{ V to } 24 \text{ V}$
- Detection voltage:
 - $-V_{DET1(S)}$ to $-V_{DET2(S)} = 10.5 \text{ V to } 21.5 \text{ V}$ (0.1 V step)
 - $-V_{DET3(S)} = 7.5 \text{ V to } 21.5 \text{ V}$ (0.1 V step)
- Output form: Nch open-drain output
- Output logic^{*2}: Full charge all on, full charge all off
- Operation temperature range: $T_a = -40^\circ\text{C to } +85^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

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

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

*2. Full charge all on: When the input voltage is equal to or higher than each of the three detection voltage values,

$$V_{OUT1} = V_{OUT2} = V_{OUT3} = V_{SS}.$$

Full charge all off: When the input voltage is equal to or higher than each of the three detection voltage values,

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

■ Application

- Rechargeable lithium-ion battery pack

■ Packages

- SOT-23-6
- SNT-6A

S-82K3A/K4A Series

BATTERY PROTECTION IC FOR 3-SERIAL OR 4-SERIAL CELL PACK
WITH CONSTANT VOLTAGE OUTPUT PIN FOR REAL-TIME CLOCK ENABLING ANY ORDER OF BATTERY CONNECTION
(SECONDARY PROTECTION)

This IC is used for secondary protection of lithium-ion rechargeable batteries, and incorporates high-accuracy voltage detection circuits and delay circuits. The S-82K3A Series enable connection of 3-serial cell, and the S-82K4A Series enable connection of 4-serial cell.

This IC provides a wake-up function to prevent the fuse from blowing during battery connection, and allows the lithium battery to be connected in any order.

Since this IC also comes with a constant voltage output circuit, it can be used as a constant-voltage power supply for an external RTC (Real-Time clock IC).

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.600 V to 4.800 V (5 mV step)	Accuracy ± 15 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 20 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n*1	3.600 V to 4.800 V	Accuracy ± 50 mV
VRTC pin shutdown voltage n	2.500 V to 2.800 V (100 mV step)	Accuracy ± 50 mV
- The wake-up function monitoring battery connection prevents CO pin output errors during battery connection
- Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)

Overcharge detection delay time, VRTC pin shutdown delay time:	1 s, 2 s, 4 s, 6 s
Overcharge timer reset function:	Available, unavailable
- CO pin output voltage is limited to 7.5 V max.
- VRTC pin output voltage: 1.800 V to 3.300 V (100 mV step) Accuracy $\pm 2\%$ ($T_a = +25^\circ\text{C}$)
- VRTC pin output current: 2 mA max.
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation ($V_{\text{CU}} - 1.0$ V for each cell):	4.0 μA max.
During VRTC pin shutdown ($V_{\text{RSD}} - 1.0$ V for each cell):	1.0 μA max.
- 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.)

Remark n = 1, 2, 3, 4

■ Application

- Lithium-ion rechargeable battery packs (for secondary protection)

■ Packages

- DFN-8(2020)A
- HSNT-8(1616)

S-82H4A Series

BATTERY PROTECTION IC FOR 3-SERIAL OR 4-SERIAL CELL PACK WITH CONSTANT VOLTAGE OUTPUT PIN FOR REAL-TIME CLOCK (SECONDARY PROTECTION)

This IC is used for secondary protection of lithium-ion rechargeable batteries, and incorporates high-accuracy voltage detection circuits and delay circuits.

Short-circuiting between the VC1 and VC2 pins makes it possible to serially connect three cells.

Since this IC also comes with a constant voltage output circuit, it can be used as a constant-voltage power supply for an external RTC (Real-Time clock IC).

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.600 V to 4.800 V (5 mV step)	Accuracy ± 15 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n ^{*1}	3.600 V to 4.800 V	Accuracy ± 50 mV
VRTC pin shutdown voltage n	2.500 V to 2.800 V (100 mV step)	Accuracy ± 50 mV
- Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)

Overcharge detection delay time, VRTC pin shutdown delay time:	1 s, 2 s, 4 s, 6 s
--	--------------------
- Overcharge timer reset function: Available, unavailable
- CO pin output voltage is limited to 7.5 V max.
- VRTC pin output voltage: 1.800 V to 3.300 V (100 mV step) Accuracy $\pm 2\%$ ($T_a = +25^\circ\text{C}$)
- VRTC pin output current: 2 mA max.
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation ($V_{\text{CU}} - 1.0$ V for each cell):	4.0 μA max.
During VRTC pin shutdown ($V_{\text{RSD}} - 1.0$ V for each cell):	1.0 μA max.
- 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.)

- Remark**
1. The order of battery connection of this IC is limited. Customers who desire a product that does not limit the order of battery connection should consider the S-82K3A/K4A Series of products instead.
 2. $n = 1, 2, 3, 4$

■ Application

- Lithium-ion rechargeable battery packs (for secondary protection)

■ Packages

- DFN-8(2020)A
- HSNT-8(1616)

S-8223A/B/C/D Series

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

The S-8223A/B/C/D Series is used for secondary protection of lithium-ion rechargeable batteries, and incorporates high-accuracy voltage detection circuits and delay circuits.

Short-circuits between cells accommodate series connection of two cells or three cells.

The S-8223B/D Series limits its CO pin output voltage to 11.5 V max., so a FET with the gate withstand voltage of 12 V can be used.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n (n = 1 to 3)	3.600 V to 4.700 V (50 mV step)	Accuracy ± 20 mV (Ta = +25°C)	Accuracy ± 25 mV (Ta = -10°C to +60°C)
Overcharge hysteresis voltage n (n = 1 to 3)*1	0.0 mV to -550 mV (50 mV step)		
	-300 mV to -550 mV	Accuracy $\pm 20\%$	
	-100 mV to -250 mV	Accuracy ± 50 mV	
	-50 mV	Accuracy ± 25 mV	
	0.0 mV	Accuracy -25 mV to +20 mV	
- Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)

Overcharge detection delay time is selectable:	1 s, 2 s, 4 s, 6 s, 8 s
Overcharge release delay time is selectable:	2 ms, 64 ms
- Built-in timer reset delay circuit
- Output form is selectable (S-8223A/C Series): CMOS output, Nch open-drain output
- Output logic is selectable (S-8223A/C Series): Active "H", active "L"
- CO pin output voltage is limited to 11.5 V max. (S-8223B/D Series)*2
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation (V _{CU} - 1.0 V for each cell):	0.25 μ A typ., 0.5 μ A max. (Ta = +25°C)
During overdischarge (V _{CU} \times 0.5 V for each cell):	0.3 μ A max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

(Overcharge detection voltage n) + (Overcharge hysteresis voltage n) \geq 3.4 V

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

■ Application

- Lithium-ion rechargeable battery packs (for secondary protection)

■ Package

- SNT-6A

S-8224A/B Series

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

The S-8224A/B Series is used for secondary protection of lithium-ion rechargeable batteries, and incorporates high-accuracy voltage detection circuits and delay circuits.

Short-circuits between cells accommodate series connection of two cells to four cells.

The S-8224B Series limits its CO pin output voltage to 11.5 V max., so a FET with the gate withstand voltage of 12 V can be used.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n (n = 1 to 4)	3.600 V to 4.700 V (50 mV step)	Accuracy ± 20 mV (Ta = +25°C)
		Accuracy ± 25 mV (Ta = -10°C to +60°C)
Overcharge hysteresis voltage n (n = 1 to 4)*1		
	0.0 mV to -550 mV (50 mV step)	
	-300 mV to -550 mV	Accuracy $\pm 20\%$
	-100 mV to -250 mV	Accuracy ± 50 mV
	-50 mV	Accuracy ± 25 mV
	0.0 mV	Accuracy -25 mV to +20 mV
- Delay times for overcharge detection are generated only by an internal circuit (external capacitors are unnecessary)

Overcharge detection delay time is selectable:	1 s, 2 s, 4 s, 6 s, 8 s
Overcharge release delay time is selectable:	2 ms, 64 ms
- Overcharge timer reset function: Available, unavailable
- 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)*2
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 28 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation (V _{CU} - 1.0 V for each cell):	0.25 μ A typ., 0.6 μ A max. (Ta = +25°C)
During overdischarge (V _{CU} \times 0.5 V for each cell):	0.3 μ A 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.

■ Application

- Lithium-ion rechargeable battery packs (for secondary protection)

■ Package

- SNT-8A

S-8264A/B/C Series

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

The S-8264A/B/C Series is used for secondary protection of lithium-ion rechargeable batteries, and incorporates a high-accuracy voltage detection circuit and a delay circuit.

Short-circuiting between cells makes it possible for serial connection of two cells to four cells.

■ 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 \pm 0.210 V, –0.390 \pm 0.160 V, –0.260 \pm 0.110 V, –0.130 \pm 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 μ A max. (+25°C)
 - At 2.3 V for each cell 4.0 μ A max. (+25°C)
- (10) Lead-free, Sn 100%, halogen-free*1

*1. Refer to “■ Product Name Structure” for details.

■ Application

- Lithium-ion rechargeable battery packs (for secondary protection)

■ Packages

- SNT-8A
- 8-Pin TSSOP

S-8244 Series

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

The S-8244 Series is used for secondary protection of lithium-ion batteries with from one to four cells, and incorporates a high-precision voltage detector circuit and a delay circuit. Short-circuiting between cells makes it possible for serial connection of one to four cells.

■ Features

- | | |
|--|---|
| (1) Internal high-precision voltage detector circuit | |
| • Overcharge detection voltage range: | 3.700 V to 4.550 V: Accuracy of ± 25 mV (at +25°C)
(at a 5 mV/step) Accuracy of ± 50 mV (at -40°C to +85°C) |
| • Hysteresis: | 5 types
0.38 \pm 0.1 V, 0.25 \pm 0.07 V, 0.13 \pm 0.04 V, 0.045 \pm 0.02 V, None |
| (2) High-withstand voltage: | Absolute maximum rating: 26 V |
| (3) 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) |
| (4) Delay time during detection: | Can be set by an external capacitor. |
| (5) Low current consumption: | At 3.5 V for each cell: 3.0 μ A max. (+25°C)
At 2.3 V for each cell: 2.4 μ A max. (+25°C) |
| (6) 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) |
| (7) Lead-free (Sn 100%), halogen-free | |

■ Applications

- Lithium ion rechargeable battery packs (secondary protection)

■ Packages

- SNT-8A
- TMSOP-8

S-82M5B Series

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

This IC is used for secondary protection of lithium-ion rechargeable batteries, incorporating high-accuracy voltage detection circuits and delay circuits in a small 8-pin package.

Short-circuiting between cells makes it possible for serial connection of 3-cell to 5-cell.

By cascade connection of these ICs, it is possible to protect 6-serial or more cells lithium-ion rechargeable battery packs.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.500 V to 4.700 V (5 mV steps)	Accuracy ± 15 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 20 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n*1	3.100 V to 4.700 V	Accuracy ± 50 mV
- Delay times for overcharge detection 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
----------------------------------	--------------------------------
- CO pin output voltage is limited to 7.5 V max.
- Overcharge timer reset function: Available, unavailable
- High withstand voltage: Absolute maximum rating 28 V
- Wide operating voltage range: 3.6 V to 24 V
- Wide operating temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation (3.4 V for each cell):	5.0 μA max.
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- Lead-free (Sn 100%), halogen-free

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

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-82K5B Series

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

This IC is used for secondary protection of lithium-ion rechargeable batteries, incorporating high-accuracy voltage detection circuits and delay circuits in a small 8-pin package.

Short-circuiting between cells makes it possible for serial connection of 3-cell to 5-cell.

By cascade connection of these ICs, it is possible to protect 6-serial or more cells lithium-ion rechargeable battery packs.

■ Features

- High-accuracy voltage detection circuit for each cell

Overcharge detection voltage n	3.500 V to 4.700 V (5 mV steps)	Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$)
		Accuracy ± 25 mV ($T_a = -10^\circ\text{C}$ to $+60^\circ\text{C}$)
Overcharge release voltage n ^{*1}	3.100 V to 4.700 V	Accuracy ± 50 mV
- Delay times for overcharge detection 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
----------------------------------	--------------------------------
- CO pin output voltage is limited to 7.5 V max.
- Overcharge timer reset function: Available, unavailable
- High withstand voltage: Absolute maximum rating 28 V
- Wide operating voltage range: 3.6 V to 24 V
- Wide operating temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption

During operation (3.4 V for each cell):	5.0 μA max.
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- Lead-free (Sn 100%), halogen-free

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

Remark n = 1, 2, 3, 4, 5

■ Applications

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-8265C Series

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

The S-8265C Series is a secondary protection IC with cell balancing function for lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits, delay circuits, and FETs for cell balancing discharge. The cell balancing function is effective for balancing the voltage of serially connected batteries. Short-circuiting between cells enables cell balancing for serial connection of three cells to five cells.

■ Features

- High-accuracy voltage detection circuit for each cell

Cell balancing detection voltage n (n = 1 to 5):	2.700 V to 4.650 V (5 mV step)	Accuracy ±20 mV (Ta = +25°C) Accuracy ±25 mV (Ta = -10°C to +60°C)
Cell balancing release voltage n (n = 1 to 5)*1:	2.700 V to 4.650 V	Accuracy ±50 mV (Ta = +25°C)
Overcharge detection voltage n (n = 1 to 5)*2:	2.750 V to 4.700 V (5 mV step)	Accuracy ±20 mV (Ta = +25°C) Accuracy ±25 mV (Ta = -10°C to +60°C)
Overcharge release voltage n (n = 1 to 5)*3, *4:	2.750 V to 4.700 V	Accuracy ±50 mV (Ta = +25°C)
- Built-in cell balancing discharging FET for each cell
- Output form: CMOS output, Nch open-drain output
- Output logic: Active "H", active "L"
- Built-in test mode function to check cell balancing detection voltage and overcharge detection voltage with shortened delay time
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption

During operation:	0.3 μA typ., 0.7 μA max. (Ta = +25°C)
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- 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.

■ Application

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-82P5B Series

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

This IC is used for secondary protection of lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits.

Short-circuiting between cells makes it possible for serial connection of three cells to five cells.

■ 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 ±15 mV (Ta = +25°C)
	Accuracy ±20 mV (Ta = -10°C to +60°C)
 - Overcharge release voltage n (n = 1 to 5)*1:

2.700 V to 4.700 V	Accuracy ±50 mV (Ta = +25°C)
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- Overcharge detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
 - Overcharge detection delay time: 0.5 s, 1 s, 2 s, 4 s, 6 s, 8 s
- Output form: CMOS output, Nch open-drain output
- Output logic: Active "H", active "L"
- Built-in test mode function to check overcharge detection voltage with shortened delay time
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 - During operation: 1.2 μA typ., 2.4 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

■ Application

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-8215C Series

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

The S-8215C Series is used for secondary protection of lithium-ion rechargeable batteries, which includes high-accuracy voltage detection circuits and delay circuits.

Short-circuiting between cells makes it possible for serial connection of three cells to five cells.

■ Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 5):

2.700 V to 4.700 V (5 mV step)	Accuracy ±20 mV (Ta = +25°C)
	Accuracy ±25 mV (Ta = -10°C to +60°C)
 - Overcharge release voltage n (n = 1 to 5)*1:

2.700 V to 4.700 V	Accuracy ±50 mV (Ta = +25°C)
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- Overcharge detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
 - Overcharge detection delay time: 0.5 s, 1 s, 2 s, 4 s, 6 s, 8 s
- Output form: CMOS output, Nch open-drain output
- Output logic: Active "H", active "L"
- Built-in test mode function to check overcharge detection voltage with shortened delay time
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: Ta = -40°C to +85°C
- Low current consumption
 - During operation: 0.3 μA typ., 0.7 μA max. (Ta = +25°C)
- Lead-free (Sn 100%), halogen-free

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

■ Application

- Lithium-ion rechargeable battery pack

■ Packages

- TMSOP-8
- SNT-8A

S-8215A Series

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

The S-8215A Series is used for secondary protection of lithium-ion rechargeable batteries, and incorporates high-accuracy voltage detection circuits and delay circuits.

Short-circuiting between cells makes it possible for serial connection of three cells to five cells.

■ Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 5)
 - 3.600 V to 4.700 V (50 mV step)
 - Accuracy ± 25 mV ($T_a = +25^\circ\text{C}$)
 - Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
 - Overcharge hysteresis voltage n (n = 1 to 5)
 - 0.0 mV to -550 mV (50 mV step)
 - -300 mV to -550 mV Accuracy $\pm 20\%$
 - -100 mV to -250 mV Accuracy ± 50 mV
 - 0.0 mV to -50 mV Accuracy ± 25 mV
- Delay times for overcharge detection can be set by an internal circuit only (External capacitors are unnecessary).
- Output form is selectable: CMOS output, Nch open-drain output, Pch open-drain output
- Output logic is selectable: Active "H", active "L"
- High-withstand voltage: Absolute maximum rating 28 V
- Wide operation voltage range: 3.6 V to 26 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - At $V_{CUH} - 1.0$ V for each cell: 3.0 μA max. ($T_a = +25^\circ\text{C}$)
 - At 2.3 V for each cell: 1.7 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free

■ Application

- Lithium-ion rechargeable battery pack (for secondary protection)

■ Packages

- TMSOP-8
- SNT-8A

S-8269B Series

OVERCURRENT MONITORING IC FOR MULTI-SERIAL-CELL PACK

The S-8269B Series is an overcurrent monitoring IC for multi-serial-cell pack including high-accuracy voltage detection circuits and delay circuits.

By using an external overcurrent detection resistor, the S-8269B Series realizes high-accuracy overcurrent protection with less effect from temperature change.

■ Features

- High-accuracy voltage detection circuit

Discharge overcurrent detection voltage 1	0.0030 V to 0.1000 V (0.5 mV step)	Accuracy ± 1.5 mV
Discharge overcurrent detection voltage 2	0.010 V to 0.100 V (1 mV step)	Accuracy ± 3 mV
Load short-circuiting detection voltage	0.020 V to 0.100 V (1 mV step)	Accuracy ± 5 mV
Charge overcurrent detection voltage	-0.1000 V to -0.0030 V (0.5 mV step)	Accuracy ± 1.5 mV
- Detection delay times are generated only by an internal circuit (external capacitors are unnecessary)
- Discharge overcurrent control function

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

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

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SNT-6A

S-8239A Series

OVERCURRENT MONITORING IC FOR MULTI-SERIAL-CELL PACK

The S-8239A Series is an overcurrent monitoring IC for multi-serial-cell pack including high-accuracy voltage detection circuits and delay circuits.

The S-8239A Series is suitable for protection of lithium-ion / lithium polymer rechargeable battery packs from overcurrent.

■ 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
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- High-withstand voltage: VM pin, DO pin: Absolute maximum rating 28 V
- Delay times are generated only by an internal circuit (External capacitors are unnecessary).
- Low current consumption

During normal operation:	7.0 μA max.
During UVLO operation:	6.0 μA max.
- Output logic: Active "L", Active "H"
- Wide operation temperature range: Ta = -40°C to +85°C
- Lead-free (Sn 100%), halogen-free

*1. Overcurrent 1 detection voltage ≤ 0.06 V should be satisfied in the case of overcurrent 2 detection voltage = 0.1 V.
Overcurrent 1 detection voltage $\leq 0.85 \times$ overcurrent 2 detection voltage - 0.05 V should be satisfied in the case of overcurrent 2 detection voltage ≥ 0.2 V.

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

- SOT-23-6

S-8239B Series

OVERCURRENT MONITORING IC FOR MULTI-SERIAL-CELL PACK

The S-8239B Series is an overcurrent monitoring IC for multi-serial-cell pack including high-accuracy voltage detection circuits and delay circuits.

The S-8239B Series is suitable for protection of lithium-ion / lithium polymer rechargeable battery packs from overcurrent.

■ 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
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- 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 μ A max.
During power-down:	0.1 μ A max.
- Output logic: Active "L"
- Wide operation temperature range: Ta = -40°C to $+85^{\circ}\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. Overcurrent 1 detection voltage ≤ 0.06 V should be satisfied in the case of overcurrent 2 detection voltage = 0.1 V.
Overcurrent 1 detection voltage $\leq 0.85 \times$ overcurrent 2 detection voltage $- 0.05$ V should be satisfied in the case of overcurrent 2 detection voltage ≥ 0.2 V.

■ Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

■ Package

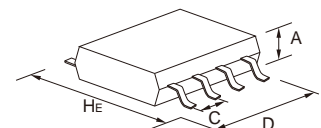
- SOT-23-6

Package List

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)	
			H _E	D	A (max.)	C	
Lead insertion type	3	TO-92	14.5	5.2	4.2	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	
	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-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	
	Non-lead type	6	6-Pin HSON(A)	3.0	2.9	0.9	0.95
		4	SNT-4A	1.6	1.2	0.5	0.65
		6	SNT-6A	1.8	1.57	0.5	0.5
		6	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-6A	2.46	1.96	0.5	0.5	
6		HSNT-6(1212)	1.2	1.2	0.4	0.4	
6		HSNT-6D (HSNT-6(1618))	1.8	1.6	0.4	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(1616)B	1.6	1.6	0.41	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(2020)A	2.0	2.0	0.6	0.5	
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	

Remarks 1. For more details, please refer to our website. [Package List on ablic.com](http://ablic.com)

2. Please contact our sales representatives regarding WLP package products.



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