2 cells lithium-ion/lithium-polymer battery protection IC
MM3220 Series

Outline

MM3220 series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion or Lithium-polymer battery.

The overcharge, overdischarge, discharging overcurrent, short, charging, and overcurrent(optional) of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected. Each of these IC composed of four voltage detectors, short detection circuit, reference voltage sources, oscillator, counter circuit and logical circuits.

Features   (Unless otherwise specified, Topr=+25°C)

(1) Range and accuracy of detection / release voltage

●Overcharge detection voltage	4.0V to 4.5V, 5mV steps	Accuracy±20mV
		Accuracy±25mV (Topr=−5 to +60°C)
●Overcharge release voltage	3.9V to 4.5V, 50mV steps	Accuracy±30mV
●Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±35mV
●Overdischarge release voltage	2.0V to 3.5V, 50mV steps	Accuracy±100mV
●Discharging overcurrent detection voltage 1	+50mV to +300mV, 5mV steps	Accuracy±10mV
●Discharging overcurrent detection voltage 2 *1	+50mV to +700mV, 50mV steps	Accuracy TYP±20%
●Charging overcurrent detection voltage *1	−300mV to −50mV, 5mV steps	Accuracy±20mV
●Short detection voltage	0.9V fixed	Accuracy±100mV
		Accuracy±300mV *2

(2) Range of detection delay time

●Overcharge detection delay time	Selection from 0.25s, 1.0s, 1.2s, 4.5s
●Overdischarge detection delay time	Selection from 20ms, 24ms, 96ms, 125ms, 144ms
●Discharging overcurrent detection delay time 1	Selection from 8ms, 12ms, 16ms, 20ms, 48ms
●Discharging overcurrent detection delay time 2	Selection from 0.5ms, 1ms , 1.5ms , 2ms , 4ms
●Charging overcurrent detection delay time	Selection from 4ms, 6ms, 8ms, 16ms
●Short detection delay time	400µs fixed

(3) Low current consumption

●Normal mode	Typ. 4.0µA, Max. 8.0µA
●Stand-by mode	Max. 0.1µA
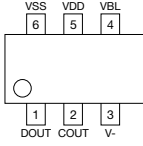
(4) Absolute maximum ratings

●VDD pin	VSS−0.3V to +12V
●COUT pin and V− pin	VDD−28V to VDD+0.3V
●DOUT pin	VSS−0.3V to VDD+0.3V
● Storage temperature	−55°C to +125°C
● Operation temperature	−40°C to +85°C

*1   Optional function

*2   When the discharging overcurrent detection voltage 2 function having

Pin Assignment

Top view SOT-26A	Pin No.	Function
	1	Output of overdischarge detection (Output type is CMOS)
	2	Output of overcharge detection (Output type is CMOS)
VSS 6 VDD 5 VBL 4	3	Input terminal connected to charger negative voltage
	4	Input terminal of the low side cell
1 DOUT 2 COUT 3 V-	5	Input terminal of the high side cell (Supply terminal)
	6	VSS terminal (Connected to ground)

Selection Guide (3000pcs/Reel)

Product name	Package	Detection / Release voltage								0V battery charge function	Delay time combination *1
		Overcharge detection voltage [V]	Overcharge release voltage [V]	Overdischarge detection voltage [V]	Overdischarge release voltage [V]	Overcurrent detection voltage on discharging 1 [V]	Overcurrent detection voltage on discharging 2 [V]	Charging Overcurrent Detection voltage[V]	Short detection voltage [V]		
		Vdet1H Vdet1L	Vrel1H Vrel1L	Vdet2H Vdet2L	Vrel2H Vrel2L	Vdet3-1	Vdet3-2	Vdet4	Vshort		
MM3220B01NRH	SOT-26A	4.300	4.100	2.000	2.000	0.220			0.90	Permission	3
MM3220C01NRH	SOT-26A	4.300	4.100	2.000	2.000	0.085	0.450		0.90	Permission	4
MM3220C02NRH	SOT-26A	4.300	4.100	2.000	2.000	0.100	0.200		0.90	Permission	5
MM3220C03NRH	SOT-26A	4.300	4.100	2.000	2.000	0.100	0.200		0.90	Permission	6
MM3220D01NRH	SOT-26A	4.250	4.100	3.000	3.000	0.200			0.90	Permission	7
MM3220D05NRH	SOT-26A	4.250	4.100	2.500	2.500	0.150			0.90	Permission	7
MM3220F01NRH	SOT-26A	4.225	4.075	2.550	2.550	0.200			0.90	Permission	7
MM3220G01NRH	SOT-26A	4.290	4.050	3.000	3.200	0.200		−0.200	1.10	Permission	2
MM3220G06NRH	SOT-26A	4.250	4.100	2.500	3.000	0.150		−0.100	0.90	Permission	9
MM3220G07NRH	SOT-26A	4.400	4.250	2.500	3.000	0.150		−0.100	0.90	Permission	9
MM3220H01NRH	SOT-26A	4.225	4.075	3.000	3.000	0.200		−0.200	1.10	Permission	11
MM3220H02NRH	SOT-26A	4.300	4.150	2.400	2.400	0.200		−0.200	1.10	Prohibition	11
MM3220H03NRH	SOT-26A	4.250	4.100	3.200	3.200	0.200		−0.200	1.10	Permission	11
MM3220H04NRH	SOT-26A	4.230	4.080	2.400	2.400	0.200		−0.200	1.10	Prohibition	11
MM3220H06NRH	SOT-26A	4.230	4.080	2.865	2.865	0.200		−0.200	1.10	Prohibition	11
MM3220H09NRH	SOT-26A	4.225	4.150	2.600	2.600	0.250		−0.200	1.10	Prohibition	12
MM3220H10NRH	SOT-26A	4.250	4.175	2.600	2.600	0.250		−0.200	1.10	Prohibition	12
MM3220H11NRH	SOT-26A	4.300	4.150	2.300	2.300	0.150		−0.150	0.90	Permission	13
MM3220H13NRH	SOT-26A	4.250	4.050	2.400	2.400	0.200		−0.200	1.10	Permission	2
MM3220H15NRH	SOT-26A	4.280	4.130	2.800	2.800	0.150		−0.150	0.50	Prohibition	1
MM3220J01NRH	SOT-26A	4.275	4.275	2.500	2.500	0.085		−0.060	0.30	Prohibition	8
MM3220K01NRH	SOT-26A	4.300	4.100	2.000	2.000	0.125	0.300	−0.090	0.90	Permission	10
MM3220M01NRH	SOT-26A	4.280	4.080	2.000	2.000	0.200		−0.100	1.00	Prohibition	2
MM3220M04NRH	SOT-26A	4.280	4.080	2.600	2.600	0.135		−0.085	0.80	Prohibition	2
MM3220N01NRH	SOT-26A	4.250	4.100	2.500	3.000	0.150			0.90	Permission	7
MM3220Z01NRH	SOT-26A	4.300	4.100	2.000	2.000	0.100	0.180		0.90	Permission	6

＊Delay time combination

		1	2	3	4	5	6	7	8	9	10	11	12	13
Overcharge detection delay time	tVdet1	1.0s	1.0s	1.0s	1.13s	1.0s	1.0s	1.15s	0.25s	1.0s	1.15s	1.15s	1.15s	1.0s
Overdischarge detection delay time	tVdet2	128ms	128ms	12ms	10.8ms	12ms	12ms	144ms	20ms	12ms	144ms	144ms	1.15s	96ms
Overcurrent detection delay time on discharging 1	tVdet3-1	9ms	12ms	12ms	10.8ms	48ms	256ms	9ms	6ms	256ms	12ms	9ms	9ms	20ms
Overcurrent detection delay time on discharging 2	tVdet3-2				0.5ms	4ms	2.5ms				0.5ms			
Charging overcurrent detection delay time	tVdet4	8ms	8ms						16ms	8ms	8ms	8ms	8ms	8ms
Short detection delay time	tshort	280μs	300μs	400μs	400μs	400μs	400μs	300μs	400μs	400μs	400μs	300μs	300μs	300μs

Please inquire to us, if you request a rank other than the above.

Application Circuit
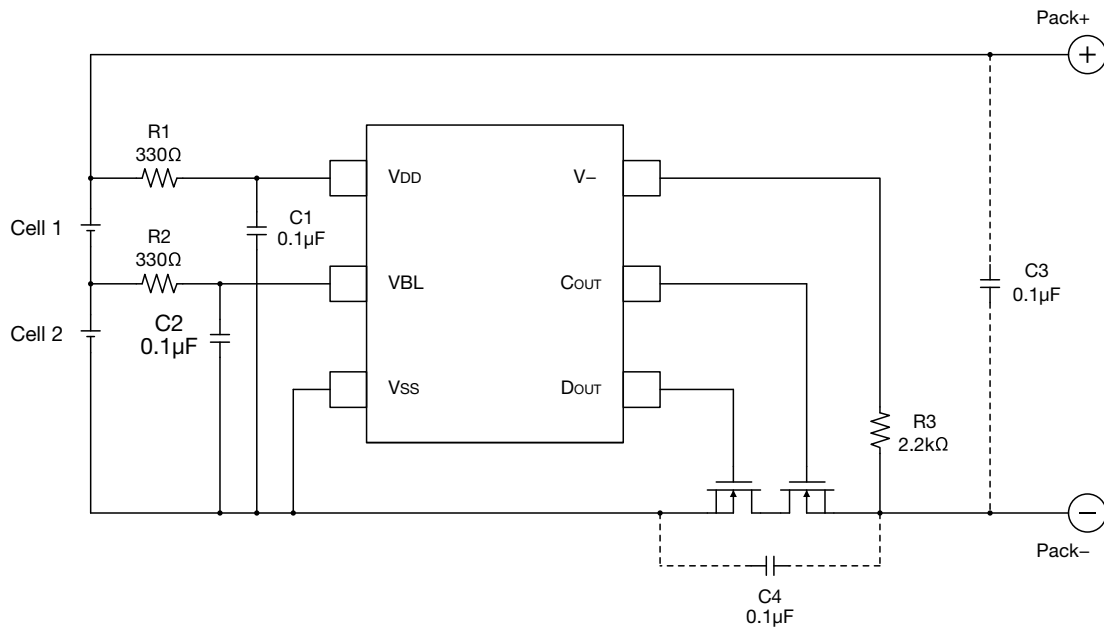
R1 , C1 , R2 , C2 stabilize a supply voltage ripple. However, R1 is enlarged, the detection voltage shifts by voltage when current consumption flows into R1. Please decide it after confirming the characteristic. Moreover, adjust the value of C1 , C2 to 0.01μF or more to do the stability operation, please.

R1 and R3 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R3 may cause a power consumption will be over rating of power dissipation, therefore the `R1+R3` should be more than 1k . Moreover, if R3 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R3 to 10k or less, please.

In the state of overdischarge, The current flows through overdischarge pull-up resistance built into between VDD terminal and V- terminal when the charger is connected. As a result, current that flows into VDD terminal increases. When current increases, the voltage is generated in R1. And hysteresis might be caused. Please use it after confirming the characteristic.

C3 and C4 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.