1 cell lithium–ion/lithium–polymer battery protection IC

MC3011 Series

Outline

MC3011 series are protection IC with integrated MOS-FET for protection of the rechargeable lithium-ion or lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell lithium–ion or lithium–polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.15V to 4.50V, 5mV steps ..... Accuracy±22mV
  Accuracy±27mV (Topr=–5°C to +60°C)
- Overcharge release voltage ..... 4.00V to 4.35V *1 ..... Accuracy±50mV
- Overdischarge detection voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Overdischarge release voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Discharging overcurrent detection voltage ..... Selection from 30mV to 130mV, 1mV ..... Accuracy±6mV
- Charging overcurrent detection voltage * ..... Selection from –130mV to –30mV, 1mV .... Accuracy±9mV
- Short detection voltage ..... Selection from 0.36V, 0.56V, 0.90V ..... Accuracy±100mV

*1 Hysteresis voltagebetween Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.
*2 Please inquire to us about details of the setting of Overdischarge detection and release voltage.

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 1.0s, 4.5s, 6.25s
- Overdischarge detection delay time ..... Selection from 100ms, 256ms
- Discharging overcurrent detection delay time ... Selection from 8ms, 12ms, 16ms, 20ms, 34ms
- Charging overcurrent detection delay time..... Selection from 8.5ms, 25ms, 32.5ms
- Short detection delay time..... Selection from 0.50ms, 0.75ms

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition”

(4) The overcharge detection delay timer reset time function (function for the pulse charge) is provided. fixed

(5) Low current consumption

- Normal mode .....Typ. 3.0μA, Max. 5.2μA
- Stand-by mode .....Max. 0.1μA
  (For “Charger connection release” the overdischarge release condition.)
  Max. 0.5μA
  (For “Voltage release” the overdischarge release condition.)

(6) MOS-FET

- Source to Source on state resistance.....Typ. 13.4mΩ (@VDD=3.7V)

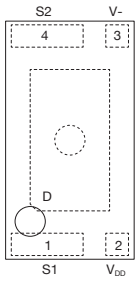
(7) Absolute maximum ratings

- VCC pin.....–0.3V to +12V
- V- pin.....VDD-24V to VDD+0.3V
- Drain-source voltage.....Max. 24V
- Drain current .....Max. 9A
- Total Power Dissipation .....Max. 1.0W
- Storage temperature.....–40°C to +125°C
- Operation temperature.....–40°C to +85°C

Pin assignment

PLP-4D

(Top view)



Pin no.	Symbol	Function
1	S1	S1 is a source pin of Discharge MOS-FET and a negative power supply, which is connected to the negative terminal of the battery.
2	VDD	VCC is a positive power supply pin, which is connected to the positive terminal of the battery through Rvcc (330 to 470 ohm).
3	V−	V− is an input pin that detects overcurrent. This pin is connected to the source terminal of Charge MOS-FET through Ridt (2.7 kohm).
4	S2	S2 is a source pin of Charge MOS-FET, which is connected to a negative power supply terminal of chargers.
–	D	D is a common pin of two drains of Charge MOS-FET and Discharge MOS-FET. D must be open electrically.

LINE UP

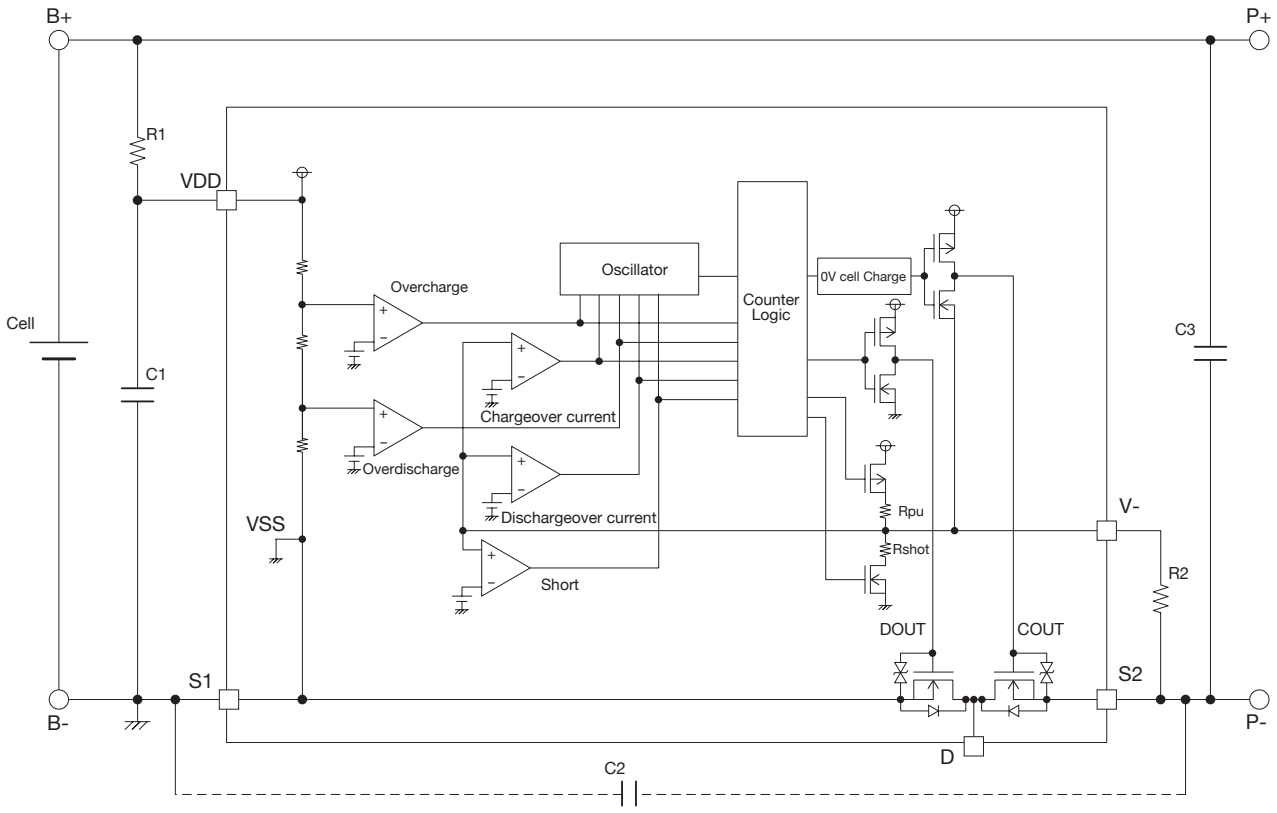
Product name	Package	Optional function		Detection / Release voltage							Detection delay time					Optional function	
		0V battery charge function	Dicharge overcuttent detection voltage becomes dependent on VDD	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.5V)	Charge current limit (@VCC=3.5V)
		*1	*2	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idischg	Icharge
				V	V	V	V	V	V	V	s	ms	ms	ms	µs	A	A
MC3011CL1GAM	PLP-4D	○	○	4.425	4.225	2.500	2.900	0.064	-0.073	0.36	1.0	100	12.0	8.50	500	4.50	5.40

PLP-4D … 5,000pcs/Reel

*1 0V battery charge function ○ Permission × Prohibition
*2 Optional functions ○ Provide × Not provided

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

Typical application circuit



- R1 and C1 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R1 is enlarged, and the value of R1 is adjusted to 1KΩ or less. Moreover, adjust the value of C1 to 0.01μF or more to do the stability operation, please.

- R1 and R2 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 R2 may cause a power consumption will be over rating of power dissipation, therefore the “R1+R2” should be more than 1KΩ. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10KΩ or less, please.

- C2 and C3 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.