1cell Li-ion/Li-polymer battery protection IC
ME01 Series

Outline

The ME01 series are protection IC using high voltage CMOS process which has OTP (One Time Programmable) ROM built-in for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion or Lithiumpolymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, and short protection 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. It's possible by OTP technology to detect unusual state of a Li-ion battery with very high accuracy.
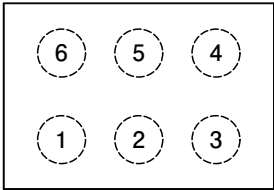
Features   (Unless otherwise specified, Topr=+25℃)

(1) Range and accuracy of detection voltage
   - Overcharge detection voltage   4.1V to 4.6V, 5mV steps   Accuracy±8mV(Ta=–5℃ to +55℃)
   - Overcharge release hysteresis voltage   0V, 100mV, or 200mV   Accuracy±30mV
   - Overdischarge detection voltage   2.0V to 3.0V, 100mV steps   Accuracy±35mV
   - Overdischarge release hysteresis voltage   0V, 200mV, 400mV, or 600mV   Accuracy±35mV(In case Vdet2=Vrel2)
                                                                             Accuracy±65mV(In case Vdet2≠Vrel2)
   - Discharging overcurrent detection voltage 20mV to 80mV, 1mV steps   Accuracy±3mV(In case Vdet3≦30mV)
                                                                             Accuracy±10%(In case Vdet3>30mV)
   - Charging overcurrent detection voltage   –80mV to –20mV, 1mV steps   Accuracy±3mV(In case Vdet3≧–30mV)
                                                                             Accuracy±10%(In case Vdet3<–30mV)
   - Short detection voltage   50mV to 200mV, 5mV steps   Accuracy±10%

(2) Delay time setting
   - Overcharge detection delay time   1.02s, or 4.61s
   - Overdischarge detection delay time   16ms, 64ms, or 128ms
   - Discharging overcurrent 1 detection delay time   8ms, 16ms, 32ms, 160ms, 256ms, 512ms 1024ms, or 2048ms
   - Charging overcurrent detection delay time   8ms, 16ms, or 32ms
   - Short detection delay time   250μs to 500μs

(3) Current consumption
   - Normal mode   Typ. 3.5μA, Max. 6.0μA
   - Stand-by mode   Max. 0.1μA (In case Overdischarge latch function Enable)
                               Max. 0.5μA (In case Overdischarge latch function Disable)

(4) 0V battery Charge function   Selectable "Permission" or "Prohibition"

(5) Absolute maximum ratings
   - VDD pin   VSS–0.3V to +8V
   - COUT pin and V– pin   VDD–28V to VDD+0.3V
   - DOUT pin   VSS–0.3V to VDD+0.3V
   - TEST pin   VSS–0.3V to VDD+0.3V
   - Storage temperature   –55℃ to +125℃
   - Operation temperature   –40℃ to +85℃

   * Please refer to the "PRODUCT LINE UP" for details of each rank.
     Please inquire to us, if you need another spec.

Pin Assignment

Top view WLCSP-6C	Pin No.	Symbol	Function
	1	V−	Charger negative voltage input terminal
	2	VDD	Positive power supply voltage input terminal
	3	VSS	Negative power supply voltage input terminal
	4	DOUT	Discharge FET control terminal
	5	TEST	Test mode control terminal
	6	COUT	Charge FET control terminal

Top view WLCSP-6C:
⑥ ⑤ ④
① ② ③

Product Line up

Product name	Package	0V battery charge inhibition voltage	Auto release function		Hys-Cancel		Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Shortdetection voltage	Delay time table *1
			Overcharge	Overdischarge	Overcharge	Overdischarge	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	
							V	V	V	V	V	V	V	
ME01ARJD01LR	WLCSP-6C	1.3V	Disable	Disable	Disable	Disable	4.340	4.340	2.600	2.600	0.035	−0.035	0.060	A

*1：Delay time table

	tVdet1 [s]	tVrel1 [ms]	tVdet2 [ms]	tVrel2 [ms]	tVdet3 [ms]	tVrel3 [ms]	tVdet4 [ms]	tVrel4 [ms]	tshort [µs]
A	1.024	2.00	64.00	4.50	32.00	1.00	4.00	1.00	300

Please inquire to us, if you need another spec.

Customize range by OTP writing

Parameter	Symbol	customize range
Overcharge detection voltage	Vdet1	4.100V to 4.600V, 5mV step
Overdischarge detection voltage	Vdet2	2.000V to 3.000V, 100mV step
Discharging overcurrent detection voltage	Vdet3	20.0mV to 80.0mV, 1mV step
Charging overcurrent detection voltage	Vdet4	−20.0mV to −80.0mV, 1mV step
Short detection voltage	Vshort	50mV to 200mV, 5mV step
Discharging overcurrent detection delay time	tVdet3	8ms, 16ms, 32ms, 160ms, 256ms, 512ms, 1024ms, 2048ms
Short detection delay time	tVshort	250µs to 500µs, 50µs step

Application Circuit
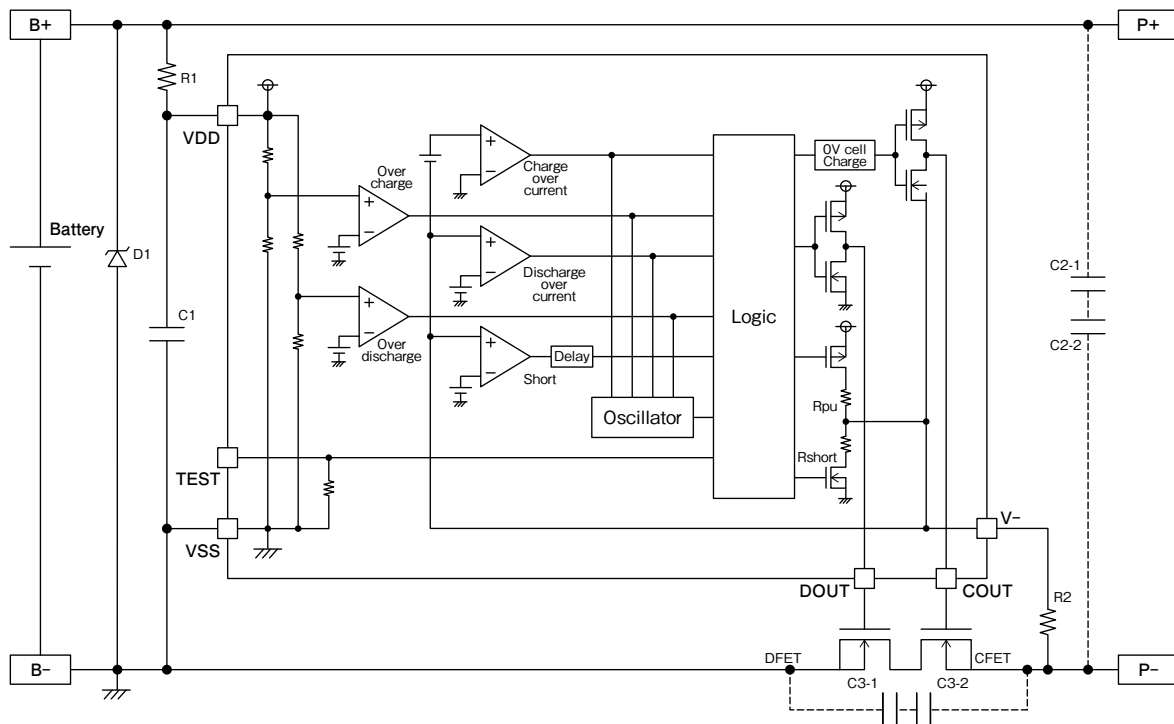
Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor		330Ω		For voltage fluctuation, For ESD
C1	Capacitor	0.1μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor		1.0kΩ	10kΩ	Current limit for charger reverse connection
C2	Capacitor		0.1μF		For exogenous noise
C3	Capacitor		0.1μF		For exogenous noise
D1	Diode		8.0V		For excessive voltage protection
DFET CFET	Nch MOS FET				Charge and discharge control

* This typical application circuit and constant value do not guarantee proper operation.
   Please evaluate thoroughly by actual application to set up constants.

· R1 and C1 stabilize a supply voltage drift. However, the detection voltage rises by the current consumption of IC when R1 is too large, and please use 330ohm for R1. Please use 0.1uF or more for C1 for stable operation.

· R1 and R2 resistors are current limit resistance, if a charger is connected reversely or a high-voltage charger that exceeds the absolute maximum rating is connected. If "R1+R2" is too small, power consumption have potential to exceed allowed power dissipation of IC, and "R1 and R2" should be more than 1kohm. If R2 is too large CFET may not turn off, therefore please use 10kohm or less.

· C2 and C3 have effect that the system stability about voltage ripple and exogenous noise. Please decide that these capacitors should be inserted or not, where should be inserted, and capacitance value in consideration of the system characteristic.