

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

MD1421ExxCPAL Series

Outline

MD1421ExxCPAL series are protection IC with integrated MOSFET for protection of the rechargeable lithium-ion or lithiumpolymer 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, $T_{opr}=+25^{\circ}\text{C}$)

(1) Range and accuracy of detection/release voltage

●Overcharge detection voltage	4.10V to 4.45V, 5mV steps	Accuracy \pm 20mV Accuracy \pm 25mV ($T_{opr}=-5^{\circ}\text{C}$ to $+60^{\circ}\text{C}$)
●Overcharge release voltage	3.90V to 4.30V (Note1)	Accuracy \pm 50mV
●Overdischarge detection voltage	2.00V to 3.00V (Note2)	Accuracy \pm 100mV
●Overdischarge release voltage	2.00V to 3.20V (Note2)	Accuracy \pm 100mV
●Discharge overcurrent detection voltage	40mV to 180mV, 5mV steps	Accuracy \pm 5mV
●Charging overcurrent detect voltage	-180mV to -50mV, 5mV step	Accuracy \pm 15mV
●Short detection voltage	Selection from 0.56, 0.90V	Accuracy \pm 100mV
●Over voltage charger detection voltage	VDD-8.0V fixed	Accuracy \pm 2.0V
●Over voltage charger release voltage	VDD-7.3V fixed	Accuracy \pm 1.5V

(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, 1.00ms

(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. 3.0 μ A, Max. 5.2 μ A
●Stand-by mode	Max. 0.1 μ A (For "Charger connection release" the overdischarge release condition.) Max. 0.5 μ A (For "Voltage release" the overdischarge release condition.)

(6) MOS-FET

●Source to Source on state resistance	Typ. 38.0m Ω (@VCC=3.7V)
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(7) Absolute maximum ratings

●VCC pin	-0.3V to +12V
●V- pin	VCC-24V to VCC+0.3V
●Drain-source voltage	Max. 24V
●Drain current	Max. 6V
●Total Power Dissipation	Max. 1.0W
●Storage temperature	-40 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$
●Operation temperature	-40 $^{\circ}\text{C}$ to + 85 $^{\circ}\text{C}$

Note1 : Hysteresis voltage between Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.

Note2 : Please inquire to us about details of the setting of Overdischarge detection and release voltage.

Pin Assignment

Top view PLP-4-1228	Pin No.	Function
	1	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	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- is an input pin that detects overcurrent. This pin is connected to the source terminal of Charge MOS-FET through Ridt (2.7k ohm).
	4	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.

Selection Guide

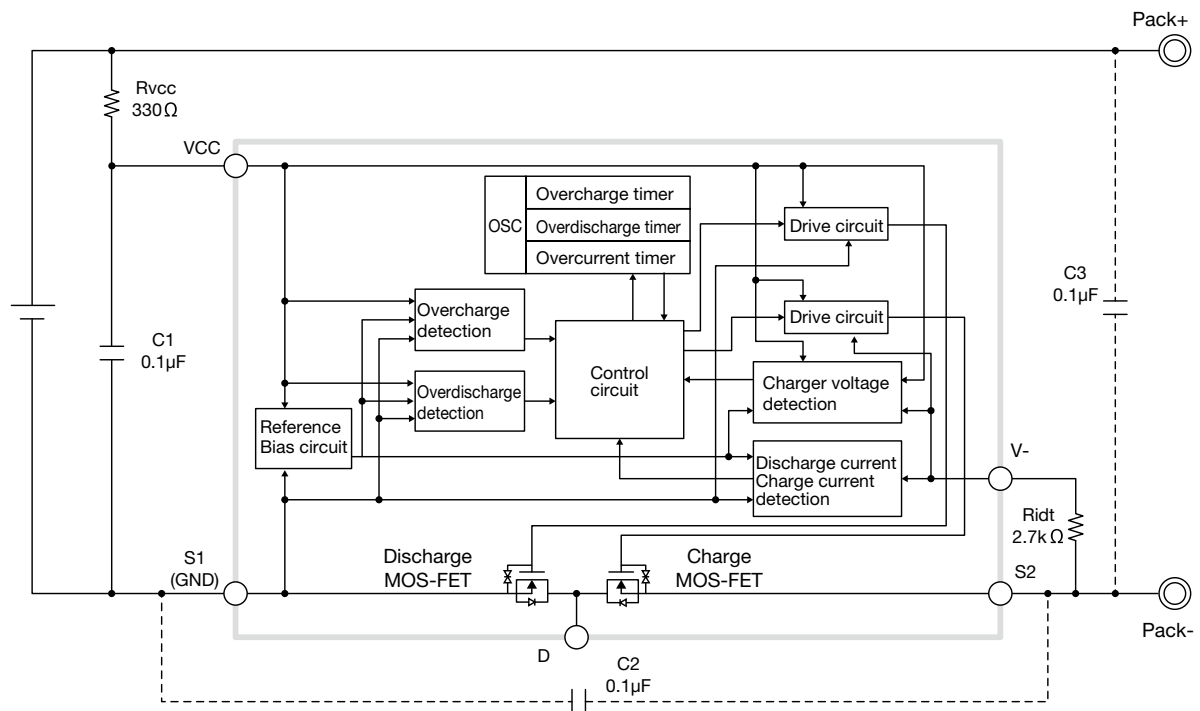
(5000pcs/Reel)

Product name	Package	Optional function		Detection / Release voltage							Detection delay time					Optional function	
		0V battery charge function	Discharge overcurrent detection voltage becomes dependent on VDD	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VCC=3.5V)	Charging overcurrent detection voltage (@VCC=3.5V)	Shortdetection 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)
				V	V	V	V	V	V	V	s	ms	ms	ms	μs	A	A
MD1421E28CPAL-R	PLP-4-1228	○	×	4.375	4.175	3.000	3.000	0.040	-0.050	0.900	1.0	100.0	12.0	8.5	500	1.05	1.30
MD1421E34CPAL-R	PLP-4-1228	○	×	4.375	4.175	3.000	3.200	0.040	-0.050	0.900	1.0	100.0	12.0	8.5	500	1.05	1.30
MD1421E35CPAL-R	PLP-4-1228	× (0.65V)	○	4.425	4.225	2.700	2.700	0.070	-0.070	0.560	1.0	100.0	20.0	8.5	750	1.80	1.80
MD1421E36CPAL-R	PLP-4-1228	○	○	4.425	4.225	2.800	2.800	0.085	-0.095	0.900	1.0	100.0	20.0	8.5	750	2.20	2.45
MD1421E39CPAL-R	PLP-4-1228	× (0.90V)	×	4.280	-	2.700	2.700	0.080	-0.080	0.900	1.0	100.0	20.0	8.5	750	2.05	2.05

Note3 0V battery charge function ○ : Permission × : Prohibition
 Note4 Optional functions ○ : Provided × : Not provided

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

Application Circuit



- The resistors that are inserted into each pin are to protect the IC. They help to remove ESD and latch-up damages.
- The capacitors help to reduce the effects of transient variations in voltage and electromagnetic waves, and to improve ESD tolerance of the IC.
Please use either C2 or C3, or both of them by request of your application.
- These values in the above figure are for example. Please choose appropriate values.