

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

MJ3401 series

Outline

MJ3401 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. It's possible by OTP technology to detect unusual state of a Li-ion battery with very high accuracy.

Features

(Unless otherwise specified, Ta=25°C)

1) Range and accuracy of detection/release voltage

• Overcharge detection voltage	4.1V to 4.60V, 5mV steps	Accuracy±10mV
• Overcharge release hysteresis voltage	Selection from 0V, 0.1V, 0.2V	
• Overdischarge detection voltage	2.00V to 3.00V, 100mV step	Accuracy±35mV
• Overdischarge release hysteresis voltage	Selection from 0V, 0.2V, 0.3V, 0.4V	
• Discharging overcurrent detection current	4.0A to 8.0A, 0.1A step *1	
• Charging overcurrent detection current	4.0A to 8.0A, 0.1A step *1	
• Short detection voltage	180mV to 360mV, 10mV step	Accuracy±15mV

*1 Please inquire to us about details of the accuracy of Overcurrent detection current, which is varies depending on the setting value.

2) Range of detection delay time

• Overcharge detection delay time	Selection from 1.024s, 4.60s
• Overdischarge detection delay time	Selection from 20ms, 96ms, 144ms
• Discharging overcurrent detection delay time	Selection from 6ms, 8ms, 12ms, 16ms, 20ms, 32ms, 128ms, 256ms
• Charging overcurrent detection delay time	Selection from 8ms, 16ms, 32ms
• Short detection delay time	Selection from 500us, 820us

3) 0V battery charge function

Selection from "Prohibition" or "Permission"

4) Low current consumption

• Normal mode	Typ. 4.5uA, Max. 7.0uA
• Stand-by mode	Max. 0.1uA (In case Overdischarge latch function "Enable") Max. 0.3uA (In case Overdischarge latch function "Disable")

5) MOS-FET

• Source to Source on state resistance	Typ. 11mΩ (@VDD=3.6V)
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6) Package type

• PLP-6G	4.10 × 2.10 × 0.50 [mm]
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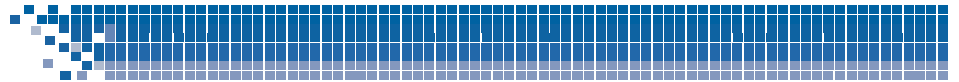




Pin explanations

PLP-6G	Pin No.	Symbol	Function
	1	S1	Source terminal of discharge MOS-FET. Connect to the negative terminal of the battery.
	2	VSS	Negative power supply voltage input terminal. Connect to the negative terminal of the battery.
	3	VPP	Test terminal. VPP terminal must be connected to VSS terminal .
	4	VDD	Positive power supply voltage input terminal. Connect to the positive terminal of the battery through R1.
	5	V-	Charger negative voltage input terminal. Connect to the S2 terminal through R2.
	6	S2	Source terminal of charge MOS-FET. Connect to a negative power supply terminal of charger.
	-	D	Drain terminal of discharge and charge MOS-FET. Drain terminal must be open electrically.





Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	10	V
V- terminal voltage	V-	VDD-24	VDD+0.3	V
Drain-source voltage	VDSS	-	24	V
Source current	IS	-	12	A
Storage temperature	Tstg	-55	125	°C

Recommended Operating Conditions

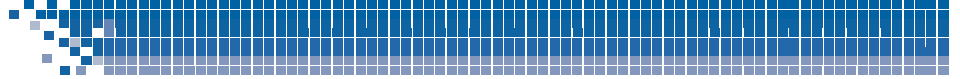
Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	Topr	-40	85	°C
Operating voltage	Vop	1.5	5.5	V

Electrical characteristics

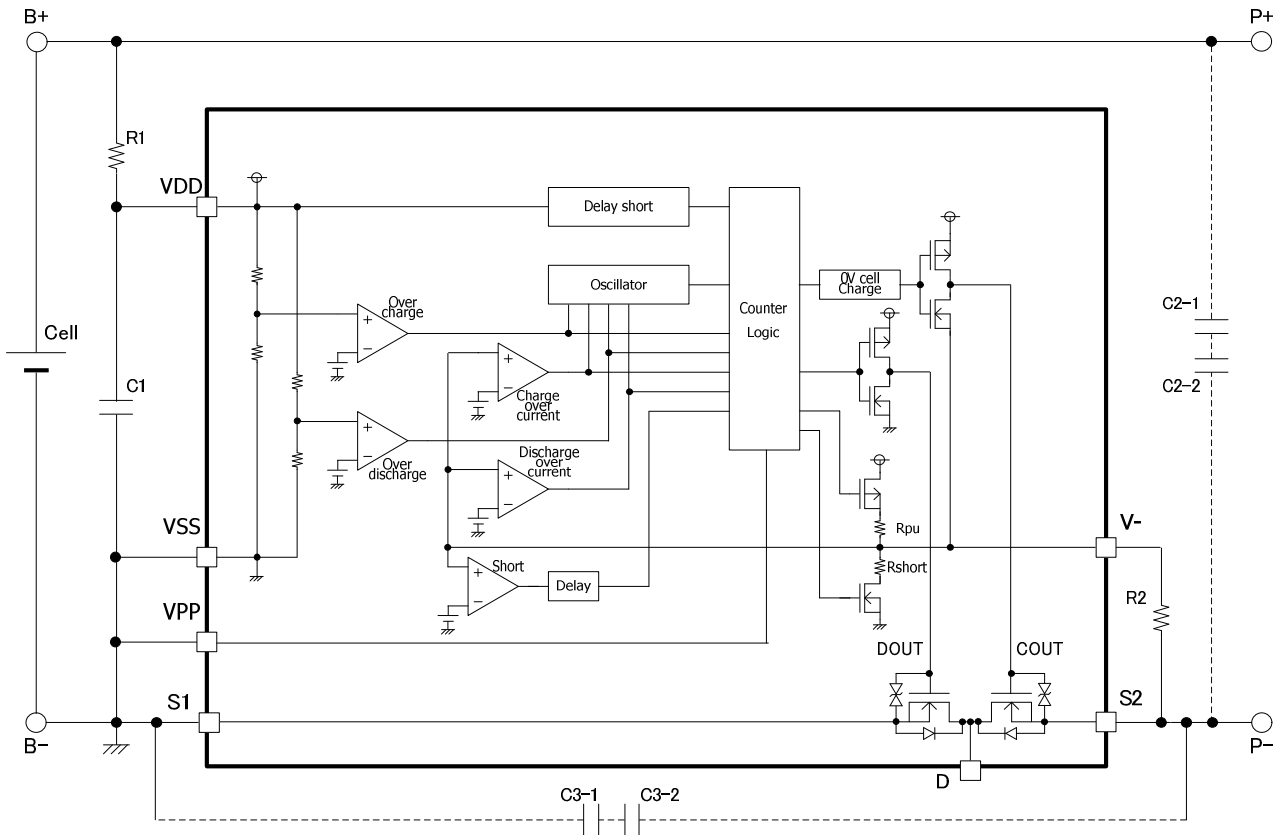
(Unless otherwise specified, Ta=25°C)

Parameter	Symbol	Note	Min	Typ	Max	Unit
Current consumption						
Current consumption	Idd	VDD=4.0V, V-=0V	-	4.5	7.0	µA
Current consumption at stand-by	Istb	Vdet2 = Vrel2	-	-	0.1	µA
		Vdet2 ≠ Vrel2	-	0.15	0.30	µA
Detection/Release voltage						
Overcharge detection voltage	Vdet1		Typ-0.010	Vdet1	Typ+0.010	V
Overcharge release voltage	Vrel1	Vdet1 = Vrel1	Typ-0.030	Vrel1	Typ+0.010	V
		Vdet1 ≠ Vrel1	Typ-0.030		Typ+0.030	V
Overdischarge detection voltage	Vdet2		Typ-0.035	Vdet2	Typ+0.035	V
Overdischarge release voltage	Vrel2	Vdet2 = Vrel2	Typ-0.035	Vrel2	Typ+0.045	V
		Vdet2 ≠ Vrel2	Typ-0.090		Typ+0.090	V
Discharge Overcurrent detection voltage	Vdet3		Idch36*Rsson36 ※2			V
Charge Overcurrent detection voltage	Vdet4		-Ichg36*Rsson36 ※2			V
Short detection voltage	Vshort		Typ-0.015	Vshort	Typ+0.015	V
0V battery charge inhibition battery voltage	Vst		0.60	0.90	1.20	V
			1.10	1.25	1.40	V
0V battery charge permission charger voltage	Vst		-	-	1.60	V
Detection delay time						
Overcharge detection delay time	tVdet1		Typ*0.8	tVdet1	Typ*1.2	s
Overdischarge detection delay time	tVdet2		Typ*0.8	tVdet2	Typ*1.2	ms
Discharging overcurrent detection delay time	tVdet3		Typ*0.8	tVdet3	Typ*1.2	ms
Charging overcurrent detection delay time	tVdet4		Typ*0.8	tVdet4	Typ*1.2	ms
Short detection delay time	tVshort		※2	tVshort	※2	µs
MOS-FET						
Drain current of cut off	IDSS	VDS=24V	-	-	1.0	µA
Source to source on state resistance 45	RSS(on)45	VDD=4.5V, Is=1.0A	7.0	11.0	15.0	mΩ
Source to source on state resistance 35	RSS(on)35	VDD=3.5V, Is=1.0A	7.0	11.0	15.0	mΩ
Source to source on state resistance 25	RSS(on)25	VDD=2.5V, Is=1.0A	7.7	12.7	17.7	mΩ
Body diode forward voltage	VSD	Is=1A	0.45	0.60	0.80	V

※2 Please inquire to us about details of the accuracy of Overcurrent detection current and Short detection delay time, which is varies depending on the setting value.



Block diagram / Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	330	-	Ω
C1	Capacitor	0.01	0.1	1.0	uF
R2	Resistor	-	1.0	10.0	kΩ
C2/C3	Capacitor	0.01	0.1	1.0	uF

※Application hints

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.

