

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

MC3761 series

Outline

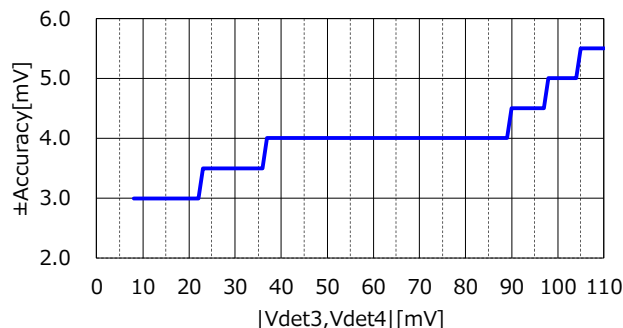
MC3761 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

1) Range and accuracy of detection/release voltage

• Overcharge detection voltage	4.20V to 4.70V, 5mV steps	Accuracy ±20mV
• Overcharge release voltage	Vdet1-0.4V to Vdet1, 100mV step	Accuracy -30/+20mV
• Overdischarge detection voltage	2.00V to 3.30V, 50mV step	Accuracy ±30mV
• Overdischarge release voltage	Vdet2+0.4V to Vdet2, 100mV step	Accuracy -30/+40mV
• Discharging overcurrent detection voltage (Discharge current limit)	+8mV to +110mV, 1mV step (0.14A to 1.95A)	Accuracy ※1
• Charging overcurrent detection voltage (Charge current limit)	-100mV to -8mV, 1mV step (0.14A to 1.75A)	Accuracy ※1
• Short detection voltage	0.040V to 0.700V, 5mV step	Accuracy ±20 to 50mV



※1

These range and accuracy are the one of the standard setting. It may differ each product. Please refer to an individual specifications about detail parameters.

2) Range of detection delay time

• Overcharge detection delay time	1.0s fixed
• Overdischarge detection delay time	Selection from 20ms, 96ms, 144ms
• Discharging overcurrent detection delay time	Selection from 6ms, 8ms, 12ms, 16ms, 20ms, 32ms, 128ms, 256ms, 512ms
• Charging overcurrent detection delay time	Selection from 8ms, 16ms, 32ms
• Short detection delay time	150us to 550us, 50us step





- 3) 0V battery charge function Selection from "Prohibition" or "Permission"

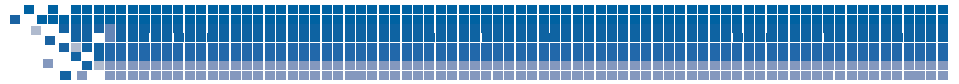
- 4) Low current consumption
 - Normal mode Typ. 1.0uA, Max. 1.4uA
 - Stand-by mode Max. 0.025uA (In case Overdischarge latch function "Enable")
Max. 0.550uA (In case Overdischarge latch function "Disable")

- 5) MOS-FET
 - Source to Source on state resistance Typ. 56.5mΩ (@VDD=3.5V)

- 6) Package type
 - PLP-6J 1.40 × 2.00 × 0.50 [mm]

Pin explanations

PLP-6J	Pin No.	Symbol	Function
	1	S1	Source terminal of discharge FET
	2	VSS	Negative power supply voltage input terminal
	3	VDD	Positive power supply voltage input terminal
	4	NC	No connection
	5	VM	Charger negative voltage input terminal
	6	S2	Source terminal of charge FET
	-	D	Drain terminal of discharge FET and charge FET



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	12	V
VM terminal voltage	VM	VDD-24	VDD+0.3	V
Drain-source voltage	VDSS	-	24	V
Source current	IS	-	2.0	A
Storage temperature	Tstg	-55	125	°C

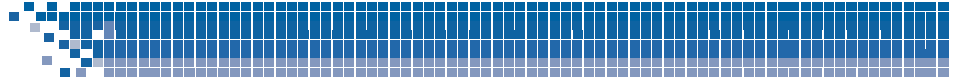
Recommended Operating Conditions

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

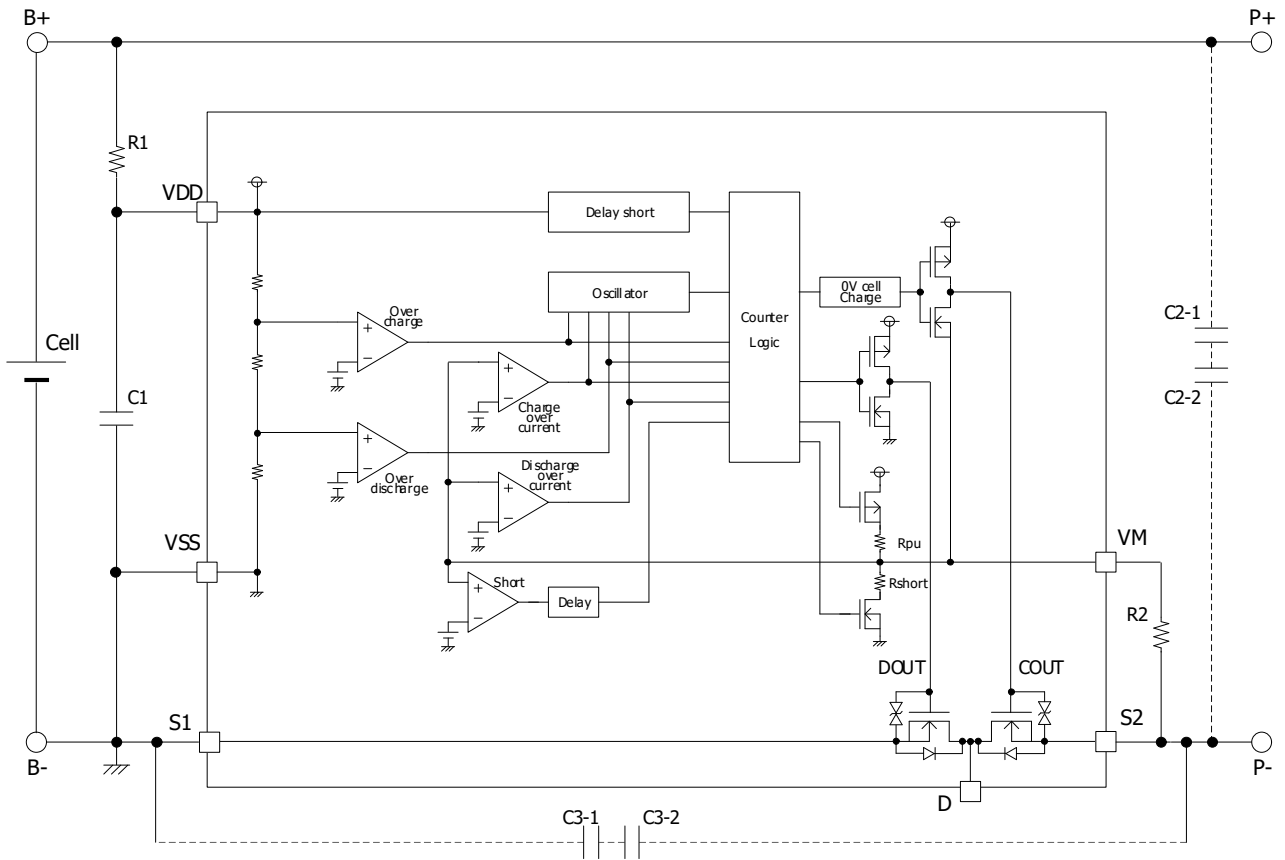
Electrical characteristics

(Unless otherwise specified, Ta=25°C)

Parameter	Symbol	Note	Min	Typ	Max	Unit
Current consumption						
Current consumption	I _{dd}	VDD=4.0V, VM=0V	-	1.0	1.4	μA
Current consumption at stand-by	I _{stb}	V _{det2} = V _{rel2}	-	-	0.025	μA
		V _{det2} ≠ V _{rel2}	-	-	0.550	μA
Detection/Release voltage						
Overcharge detection voltage	V _{det1}		Typ-0.020	V _{det1}	Typ+0.020	V
Overcharge release voltage	V _{rel1}	V _{det1} = V _{rel1}	Typ-0.030	V _{rel1}	Typ+0.020	V
		V _{det1} ≠ V _{rel1}	Typ-0.030		Typ+0.030	V
Overdischarge detection voltage	V _{det2}		Typ-0.030	V _{det2}	Typ+0.030	V
Overdischarge release voltage	V _{rel2}	V _{det2} = V _{rel2}	Typ-0.030	V _{rel2}	Typ+0.040	V
		V _{det2} ≠ V _{rel2}	Typ-0.090		Typ+0.090	V
Discharge Overcurrent detection voltage	V _{det3}		Typ-ΔV	V _{det3}	Typ+ΔV	V
Charge Overcurrent detection voltage	V _{det4}		Typ-ΔV	V _{det4}	Typ+ΔV	V
Short detection voltage	V _{short}		Typ-0.050	V _{short}	Typ+0.050	V
0V battery charge inhibition battery voltage	V _{st}		0.60	0.90	1.20	V
0V battery charge permission charger voltage	V _{st}		-	-	1.60	V
Detection delay time						
Overcharge detection delay time	t _{Vdet1}		Typ*0.8	t _{Vdet1}	Typ*1.2	s
Overdischarge detection delay time	t _{Vdet2}		Typ*0.8	t _{Vdet2}	Typ*1.2	ms
Discharging overcurrent detection delay time	t _{Vdet3}		Typ*0.8	t _{Vdet3}	Typ*1.2	ms
Charging overcurrent detection delay time	t _{Vdet4}		Typ*0.8	t _{Vdet4}	Typ*1.2	ms
Short detection delay time	t _{Vshort}		Typ*0.7	t _{Vshort}	Typ*1.3	us
MOS-FET						
Drain current of cut off	I _{DSS}	V _{DS} =24V	-	-	1.0	μA
Source to source on state resistance 45	R _{SS(on)45}	V _{DD} =4.5V, I _S =1.0A	46.0	52.5	61.0	mΩ
Source to source on state resistance 35	R _{SS(on)35}	V _{DD} =3.5V, I _S =1.0A	48.0	56.5	67.0	mΩ
Source to source on state resistance 25	R _{SS(on)25}	V _{DD} =2.5V, I _S =1.0A	50.0	68.0	87.0	mΩ
Body diode forward voltage	V _F	I _S =1A	0.55	0.70	1.00	V



Block diagram / Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	100	1k	Ω
C1	Capacitor	0.01	0.1	1.0	μF
R2	Resistor	-	1k	-	Ω
C2/C3	Capacitor	0.01	0.1	1.0	μF

※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.

