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

MM3723 series

Outline

The MM3723 series integrates into 1.09mm × 0.81mm × 0.46mm WLCSP Package. It's using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion and Lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent and short protection of the rechargeable one-cell Lithium-ion and Lithium-polymer battery can be detected.

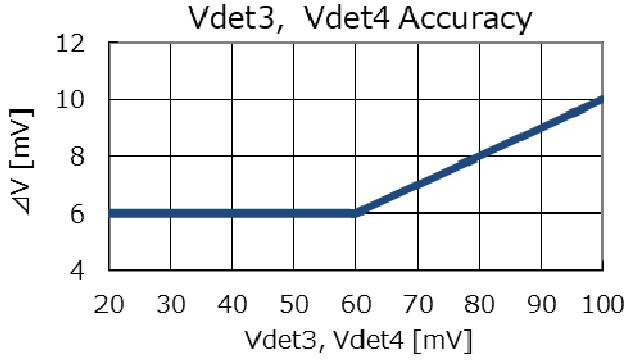
Features

(Unless otherwise specified,Ta=25℃)

1) Range and accuracy of detection/release voltage

・Overcharge detection voltage	3.6V to 4.6V, 5mV steps	Accuracy±12mV
・Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±35mV
・Discharging overcurrent detection voltage	+20mV to +100mV, 1mV steps	Accuracy±⊿V *1
・Charging overcurrent detection voltage	-100mV to -20mV, 1mV steps	Accuracy±⊿V *1
・Short detection voltage	+100mV to +300mV, 10mV steps	Accuracy±8%

*1 Current detection voltage Accuracy



2) Range of detection delay time

・Overcharge detection delay time	Selection from 1.0s, 1.2s, 4.0s
・Overdischarge detection delay time	Selection from 20ms, 24ms, 32ms, 96ms, 128ms
・Discharging overcurrent detection delay time	Selection from 8ms, 12ms, 16ms, 20ms, 256ms, 512ms
・Charging overcurrent detection delay time	Selection from 4ms, 6ms, 8ms, 10ms, 12ms, 16ms, 96ms
・Short detection delay time	Selection from 250us to 400us

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

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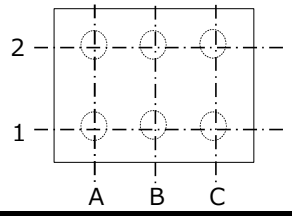
4) Low current consumption

・ Normal mode	Typ. 2.5uA, Max. 4.0uA
・ Stand-by mode	Max. 0.1uA (In case Overdischarge latch function Enable.)
	Max. 0.6uA (In case Overdischarge latch function Disable.)

5) Package type

・ WLCSP-6B	1.09 × 0.81 × 0.46 [mm]

Pin explanations

SSON-6J	Pin No.	Symbol	Function
	A1	V-	Charger negative voltage input terminal
	A2	COUT	Charge FET control terminal
	B1	VDD	Positive power supply voltage input terminal
	B2	TEST	Test mode control terminal
	C1	VSS	Negative power supply voltage input terminal
	C2	DOUT	Discharge FET control terminal

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	12	V
V- terminal	V-	VDD-28	VDD+0.3	V
COUT terminal	VCOUT	VDD-28	VDD+0.3	V
DOUT terminal	VDOUT	VSS-0.3	VDD+0.3	V
Storage temperature	Tstg	-55	125	℃

Recommended Operating Conditions

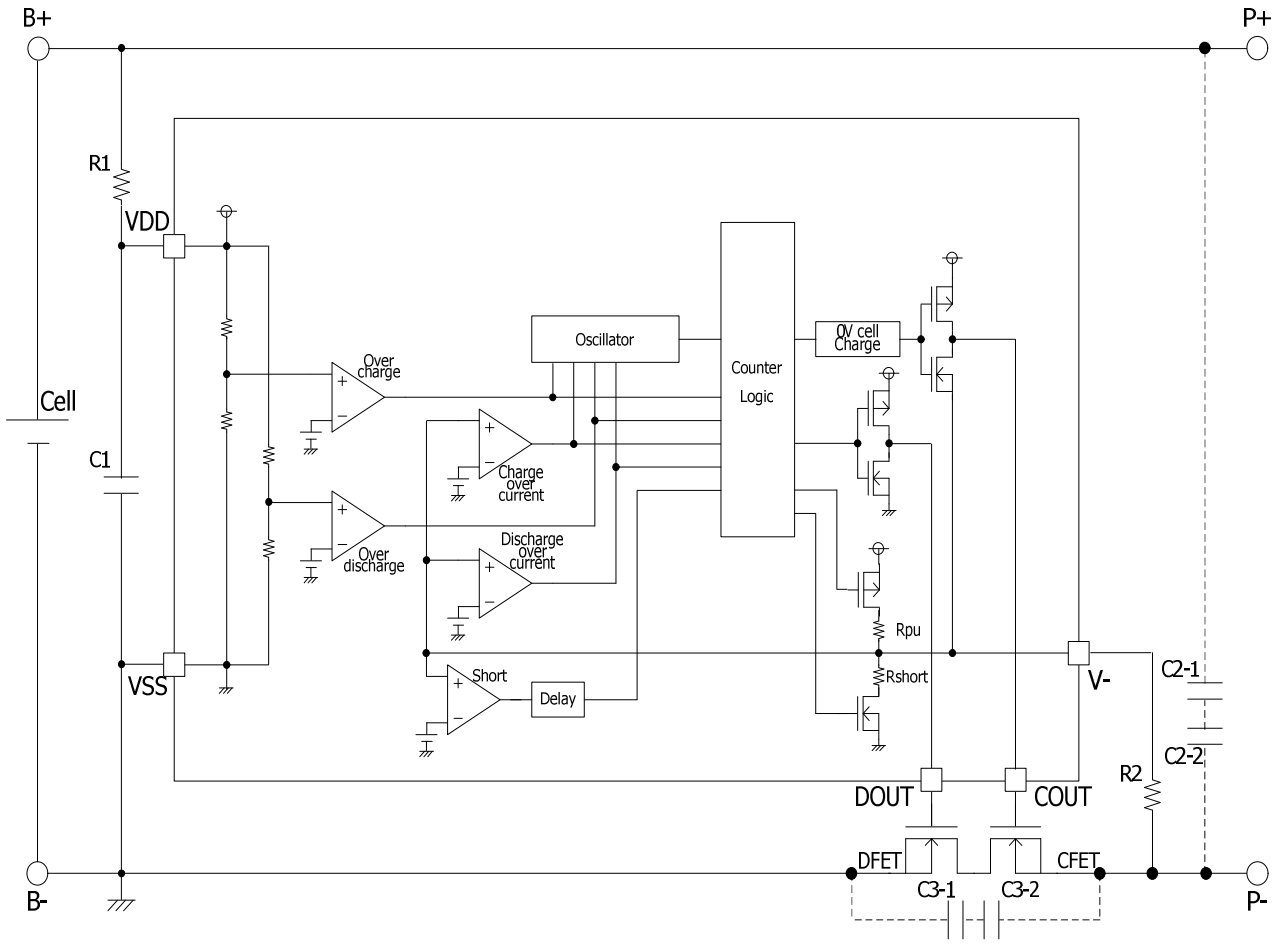
Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	Topr	-40	85	℃
Operating voltage	Vop	1.5	5.5	V

Electrical characteristics

(Unless otherwise specified,Ta=25℃)

Parameter	Symbol	Note	Min	Typ	Max	Unit
Input/Output voltage						
Maximum forbidden voltage for 0V charging		"Prohibition" function	0.6	0.9	1.2	V
Minimum operating voltage for 0V charging		"Permission" function	-	-	1.2	V
COUT L level output voltage	VcoL	ICOUT=30uA, VDD=4.5V	-	0.1	0.5	V
COUT H level output voltage	VcoH	ICOUT=-30uA, VDD=4.0V	VDD-0.5	VDD-0.1	-	V
DOUT L level output voltage	VdoL	IDOUT=30uA, VDD=2.0V	-	0.1	0.5	V
DOUT H level output voltage	VdoH	IDOUT=-30uA, VDD=4.0V	VDD-0.5	VDD-0.1	-	V
Current consumption						
Current consumption	Idd	VDD=4.0V, V-=0V	-	2.5	4.0	uA
Current consumption at stand-by	Is	Vdet2＝Vrel2	-	-	0.1	uA
		Vdet2≠Vrel2	-	0.3	0.6	uA
Detection/Release voltage						
Overcharge detection voltage	Vdet1	Ta=+25℃	Typ-0.020	Vdet1	Typ+0.020	V
		Ta=-20～+60℃	Typ-0.025		Typ+0.025	
Overcharge release voltage	Vrel1	Vdet1≠Vrel1	Typ-0.030	Vrel1	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+0.035	V
Discharging overcurrent detection voltage	Vdet3		Typ-⊿V	Vdet3	Typ+⊿V	V
Charging overcurrent detection voltage	Vdet4		Typ-⊿V	Vdet4	Typ+⊿V	V
Short detection voltag	Vshort		Typ*0.92	Vshort	Typ*1.08	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		Typ*0.7	tVshort	Typ*1.3	us

Block diagram / Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	100	1k	Ω
C1	Capacitor	0.01	0.1	1.0	uF
R2	Resistor	-	1.0k	10k	Ω
C2/C3/C4	Capacitor		0.1		uF

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