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

MM3746 series

Outline

  MM3746 series are protection ICs with charger pump and drive high side N channel FET for Lithium-ion and Lithium-polymer secondary battery. This IC is most suitable for the intelligent battery pack with which I communicate data between the battery pack and the system.And MM3746 series has a temperature detection by using a NTC Thermistor, protects the battery pack and system from over temperature.

Features   (Unless otherwise specified,Ta=25℃)

1) Range and accuracy of detection/release voltage

・Overcharge detection voltage	4.2V to 4.6V, 5mV steps	Accuracy±15mV
・Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±40mV
・Discharging overcurrent detection voltage	+10mV to +150mV, 1mV steps	Accuracy±⊿V *1
・Charging overcurrent detection voltage	-150mV to -10mV, 1mV steps	Accuracy±⊿V *1
・Short detection voltage	+40mV to +300mV, 50mV steps	Accuracy±5mV
・0V battery charge inhibition battery voltage	1.3V fixed	Accuracy±150mV
・Temperature detection	55℃～85℃	Accuracy±5℃

   *1 Current detection voltage Accuracy
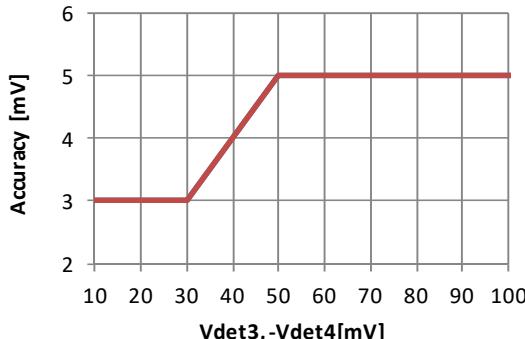
2) Range of detection delay time

・Overcharge detection delay time	1.02s fixed
・Overdischarge detection delay time	Selection from 16ms, 32ms, 128ms
・Discharging overcurrent detection delay time	Selection from 8ms, 16ms, 32ms, 128ms, 256ms, 512ms, 1024ms, 3072ms
・Charging overcurrent detection delay time	8ms fixed
・Short detection delay time	Selection from 250us to 500us
・Abnormally temperature detection delay time	Selection from 128ms, 256ms, 512ms, 1024ms

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3) Low current consumption
　　・Normal mode　　　　　　　　　Typ. 6.0uA, Max. 10.0uA
　　・Stand-by mode　　　　　　　　Max. 0.1uA (In case Overdischarge latch function Enable.)
　　　　　　　　　　　　　　　　　　　Max. 1.2uA (In case Overdischarge latch function Disable.)
5) Package type
　　・WLCSP-10A　　　　　　　　　　1.50 × 1.10 × 0.28 [mm]
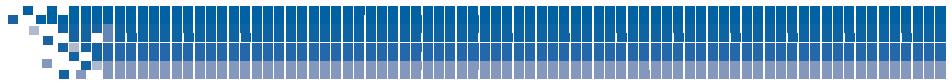
Pin explanations

WLCSP-10A	Pin No.	Symbol	Function
	A1	VSS	Negative power supply voltage input terminal
	A2	VDD	Positive power supply voltage input terminal
	A3	COUT	Charge FET control terminal
	B1	TH	Temperature level detect terminal
	B3	CS	Current level detect terminal
	C1	CN	Flying capacitor connecting terminal
	C3	DOUT	Discharge FET control terminal
	D1	CP	Flying capacitor connecting terminal
	D2	VOUT	Charge pump output terminal
	D3	V+	Charger positive voltage input terminal
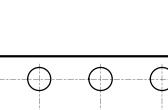
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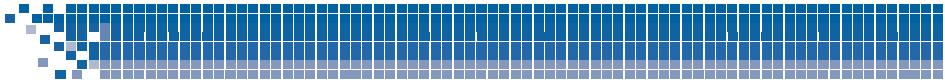
Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	12	V
V+ terminal	V+	VSS-0.3	VSS+28	V
COUT terminal	VCOUT	VSS-0.3	VSS+28	V
DOUT terminal	VDOUT	VSS-0.3	VSS+28	V
CS terminal	VCS	VSS-0.3	VSS+0.3	V
TH terminal	VTH	VSS-0.3	VSS+0.3	V
VOUT terminal	VOUT	VSS-0.3	VSS+28	V
CP terminal	VCP	VSS-0.3	VSS+28	V
CN terminal	VCN	VSS-0.3	VSS+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			1.15	1.30	1.45	V
COUT output resistance L	RcoL	ICOUT=30uA, VDD=4.6V	-	5.0	20.0	kΩ
COUT output resistance H	RcoH	ICOUT=-30uA, VDD=4.0V	-	5.0	20.0	kΩ
DOUT output resistance L	RdoL	IDOUT=30uA, VDD=1.8V	-	5.0	20.0	kΩ
DOUT output resistance H	RdoH	IDOUT=-30uA, VDD=4.0V	-	5.0	20.0	kΩ
Current consumption						
Current consumption	Idd	VDD=4.0V, V-=0V	-	6.0	10.0	uA
Current consumption at stand-by	Is	Vdet2=Vrel2	-	-	0.1	uA
		Vdet2≠Vrel2	-	0.6	1.2	uA
Detection/Release voltage						
Overcharge detection voltage	Vdet1		Typ-0.015	Vdet1	Typ+0.015	V
Overcharge release voltage	Vrel1		Typ-0.020	Vrel1	Typ+0.015	V
Overdischarge detection voltage	Vdet2		Typ-0.040	Vdet2	Typ+0.040	V
Overdischarge release voltage	Vrel2		Typ-0.040	Vrel2	Typ+0.050	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-0.005	Vshort	Typ+0.005	V
Abnormally temperature detection	Tdet		Typ-5	Vshort	Typ+5	℃
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*0.8	tVshort	Typ*1.2	ms
Abnormally temperature detection delay time	tVtdet		Typ*0.7	tVtdet	Typ*1.3	us

Block diagram / Typical application circuit
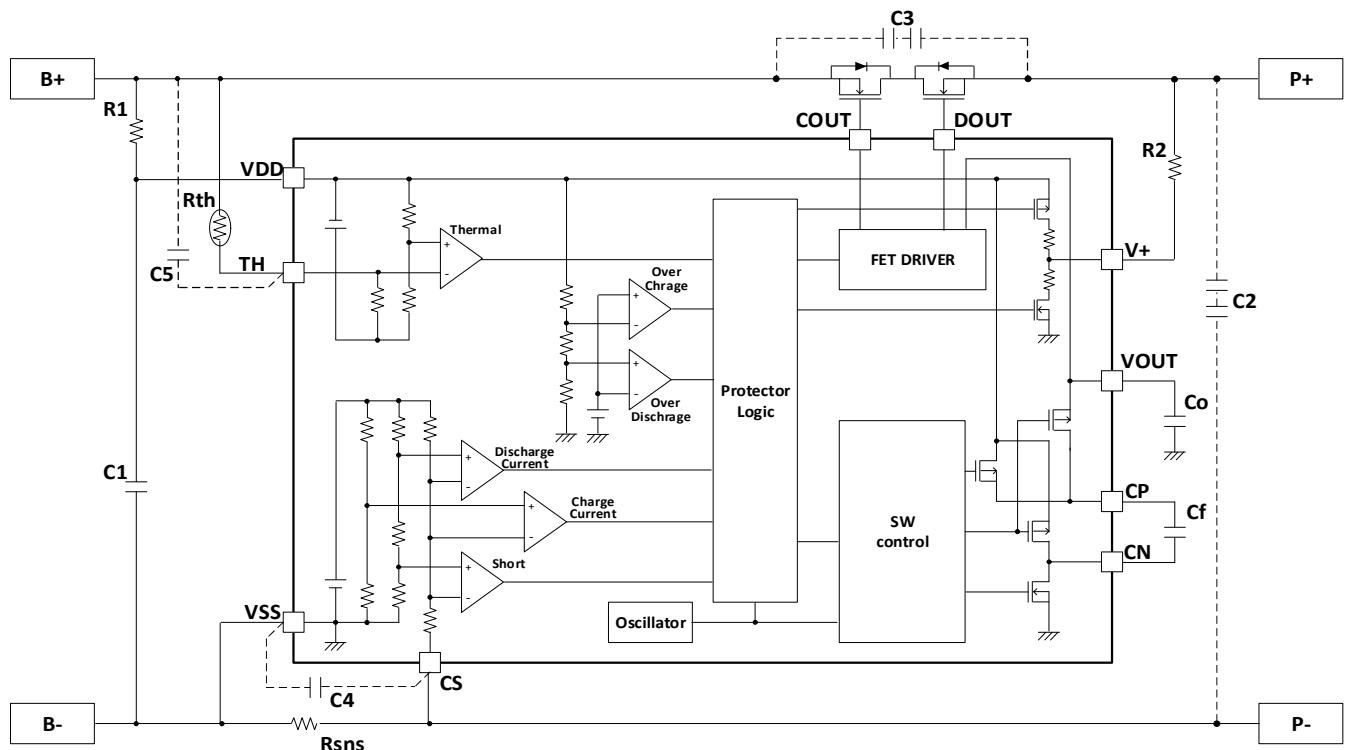
Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	100	300	Ω
C1/C2/C3/C4	Capacitor	-	0.1	-	uF
R2	Resistor	-	1.0k	10k	Ω
C5	Capacitor		47	100	pF
Cf/Co	Capacitor	0.022	0.047	0.1	uF
Rth	NTC Thermistor	-	470kΩ B=4150K	-	-

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