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

MM3855 series

Outline

MM3855 series are protection ICs with thermal protection and control teminal for charge and discharge off mode for rechargeable Lithium-ion or Lithium-polymer battery.

By using external thermistor, this protects the battery pack and system over temperature. In addition , it reduces the current consumption of system by using charge and dischrge off mode , when the system is shutdown.

Features

(Unless otherwise specified,Ta=25℃)

1) Range and accuracy of detection/release voltage

・Overcharge detection voltage	4.1V to 5.0V, 5mV steps	Accuracy±20mV
・Overdischarge detection voltage	2.1V to 3.0V, 50mV steps	Accuracy±35mV
・Discharging overcurrent detection voltage 1	+6mV to +100mV, 1mV steps	Accuracy±⊿V *1
・Discharging overcurrent detection voltage 2	+15mV to +100mV, 1mV steps	Accuracy±⊿V *1
・Charging overcurrent detection voltage	-100mV to -6mV, 1mV steps	Accuracy±⊿V *1
・Short detection voltage	+30mV to +200mV, 10mV steps	Accuracy±⊿V *1
・0V battery charge inhibition battery voltage	0.9V fixed	Accuracy±300mV

*1 Current detection and Short detection voltage Accuracy
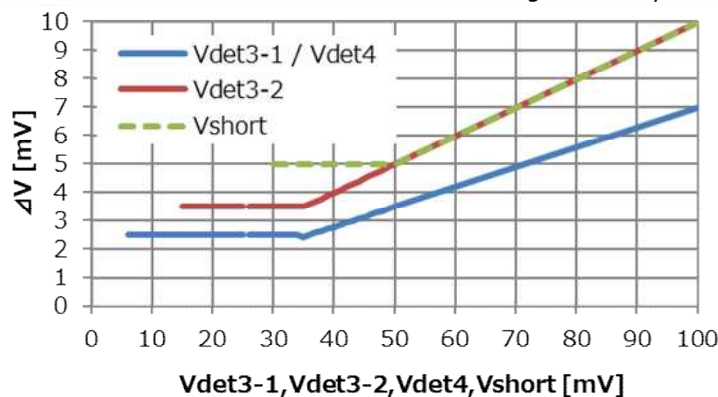
2) Temperature detection function   Selectable "enable" or "disable"
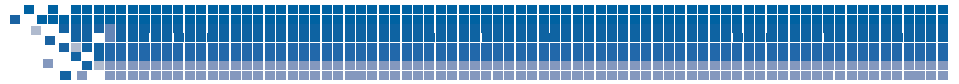
3) 0V battery charge function   Selectable "Permission" or "inhibition"

4) CNT terminal for charge and discharge off mode   CNT terminal set High level, turns to off mode.

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5) Current consumption (Not include NTC bias current)
- Normal mode
  Temperature detection function "enable"   3.0uA typ.   5.0uA max.
  Temperature detection function "disable"   2.5uA typ.   4.5uA max.
- Standby mode
  Overdischarge latch function "enable".   0.1uA max.
  Overdischarge latch function "disable".   0.8uA max.

6) Package type
- SSON-8F/8G   1.60 × 1.60 × 0.55 [mm]

Pin explanations

SSON-8F/8G	Pin No.	Symbol	Function
	1	CNT	Control terminal for charge and discharge FET
	2	VM	Input terminal for charger negative voltage
	3	COUT	Control terminal for charge FET
1 8	4	DOUT	Control terminal for discharge FET
2 7	5	VSS	Input terminal for negative power supply voltage
3 6	6	VDD	Input terminal for positive power supply voltage
4 5	7	CS	Input terminal for overcurrent detection
	8	TH/DS	Input terminal for temperature detection / delay shor

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Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	12	V
VM terminal	VM	VDD-28	VDD+0.3	V
CS terminal	VCS	VSS-0.3	VDD+0.3	V
COUT terminal	VCOUT	VDD-28	VDD+0.3	V
DOUT terminal	VDOUT	VSS-0.3	VDD+0.3	V
CNT terminal	VCNT	VSS-0.3	VDD+0.3	V
TH/DS terminal	VTH/VDS	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	Vst	"inhibition" 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	Temperature detection function "enable"	-	3.0	6.0	uA
		Temperature detection function "disable"	-	2.5	4.5	uA
Current consumption at stand-by	Is	Vdet2＝Vrel2	-	-	0.1	uA
		Vdet2≠Vrel2	-	-	0.8	uA
Detection/Release voltage						
Overcharge detection voltage	Vdet1	Ta=-20～+60℃	Typ-0.020	Vdet1	Typ+0.020	V
Overcharge release voltage	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		Typ-0.065	Vrel2	Typ+0.090	V
Discharging overcurrent detection voltage 1	Vdet3-1		Typ-⊿V	Vdet3-1	Typ+⊿V	V
Discharging overcurrent detection voltage 2	Vdet3-2		Typ-⊿V	Vdet3-2	Typ+⊿V	V
Charging overcurrent detection voltage	Vdet4		Typ-⊿V	Vdet4	Typ+⊿V	V
Short detection voltage	Vshort		Typ-⊿V	Vshort	Typ+⊿V	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 1	tVdet3-1		Typ*0.8	tVdet3-1	Typ*1.2	ms
Discharging overcurrent detection delay time 2	tVdet3-2		Typ*0.8	tVdet3-2	Typ*1.2	ms
Charging overcurrent detection delay time	tVdet4		Typ*0.8	tVdet4	Typ*1.2	ms
Short detection delay time	tVshort		Typ*0.6	tVshort	Typ*1.4	us

Block diagram

VDD
Over charge
Over discharge
Thermal protection
TH/DS
VSS
Resistor
Charge over current
Discharge over current1
Discharge over current2
Short1
Comp. for VrelVM
Oscillator
Counter
Logic
Charge and Discharge OFF mode
Short2
0V cell charge
Rpu
Rshort
Iont
CNT
VM
CS
DOUT
COUT

Typical application circuit

B+
P+
R1
Cell
C1
C6 R4
VDD
TH
VSS
CS
DOUT
COUT
C4
Rsns
DFET
C3
CFET
R2
R3 CNT
C5
C2
VM
CNT
B-
P-
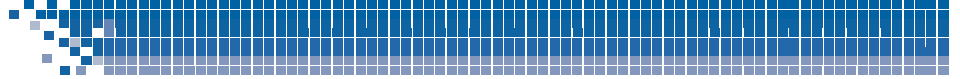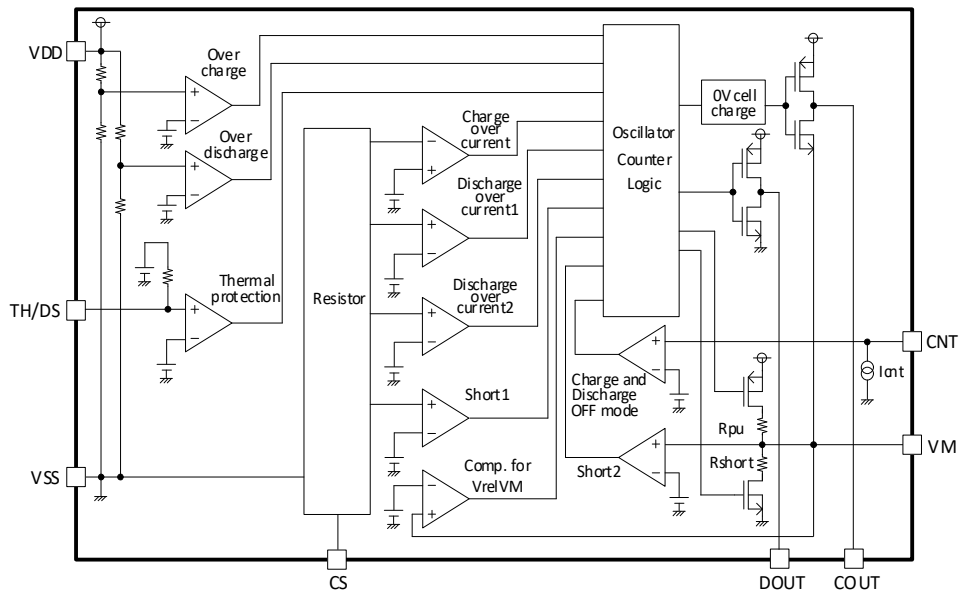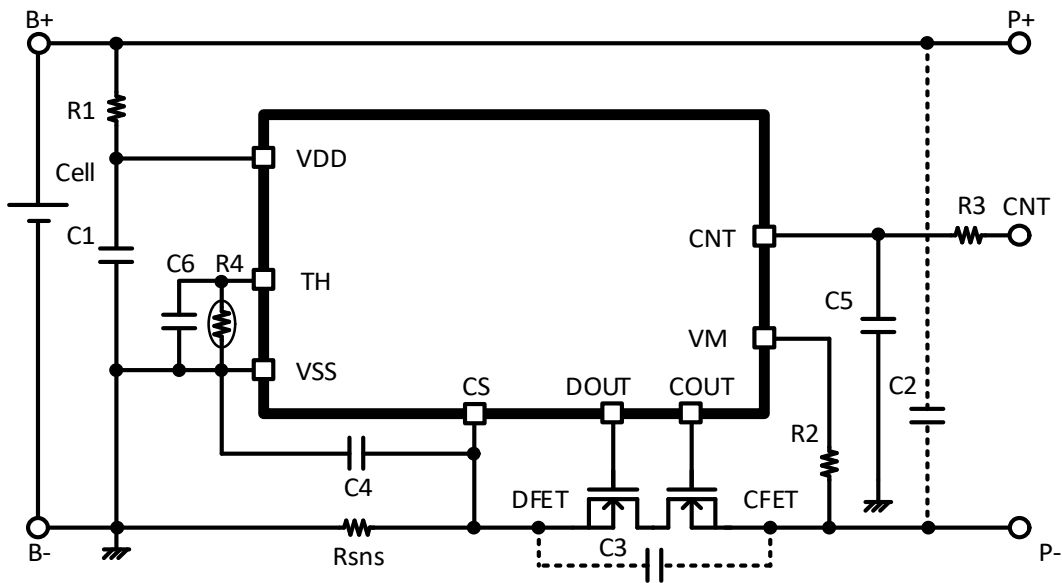
Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	100	1k	Ω
C1/C6	Capacitor	0.01	0.1	1.0	uF
R2/R3	Resistor	-	1.0k	-	Ω
C2/C3/C4/C5	Capacitor		0.1		uF
R4	Thermistor	-	470kΩ B=4700K	-	-

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