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

MM3856 series

Outline

MM3856 series are Li-ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). MM3856 have two step discharge overcurrent detection. And system is protected appropriately in the next 2 state, Normal discharge mode and large current discharge mode.

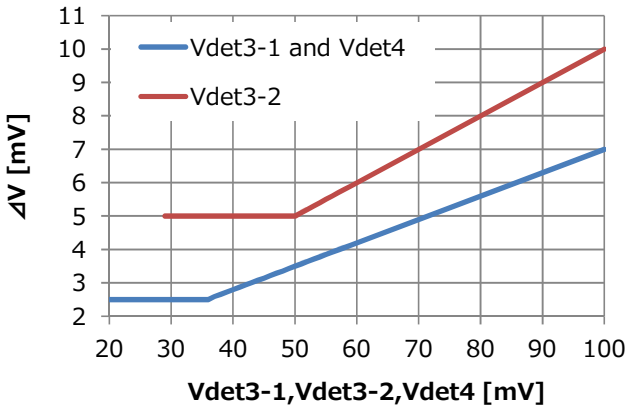
Features

(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	+15mV to +100mV, 1mV steps	Accuracy±⊿V *1
・Discharging overcurrent detection voltage 2	+30mV to +100mV, 1mV steps	Accuracy±⊿V *1
・Charging overcurrent detection voltage	-100mV to -15mV, 1mV steps	Accuracy±⊿V *1
・Short detection voltage	+50mV to +200mV, 50mV steps	Accuracy±⊿V *2
・0V battery charge inhibition battery voltage	1.3V to 1.8V, 0.1V steps	Accuracy±100mV
	0.9V fixed	Accuracy±300mV

*1 Current detection voltage Accuracy



※2 Short detection voltage Accuracy

±20mV

(Discharging overcurrent detection voltage 2 disable.)

±25mV

(Discharging overcurrent detection voltage 2 enable.)

2) 0V battery charge function — Selection from "Prohibition" or "Permission"

3) 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.)

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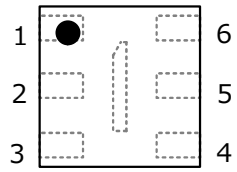
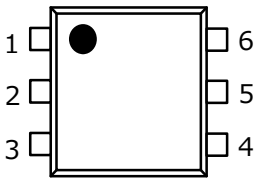
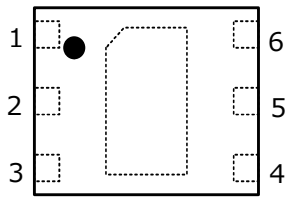
4) Package type

- SSON-6J/6M　　1.40 × 1.40 × 0.55 [mm]
- SON-6C　　1.60 × 2.00 × 0.55 [mm]
- SSON-6U/6V　　1.40 × 1.80 × 0.40 [mm]

Pin explanations

SSON-6J/6M	Pin No.	Symbol	Function
	1	V-	Charger negative voltage input terminal
	2	COUT	Charge FET control terminal
	3	DOUT	Discharge FET control terminal
	4	VSS	Negative power supply voltage input terminal
	5	VDD	Positive power supply voltage input terminal
	6	CS	Current detection terminal

SON-6C	Pin No.	Symbol	Function
	1	V-	Charger negative voltage input terminal
	2	COUT	Charge FET control terminal
	3	DOUT	Discharge FET control terminal
	4	VSS	Negative power supply voltage input terminal
	5	VDD	Positive power supply voltage input terminal
	6	CS	Current detection terminal

SSON-6U/6V	Pin No.	Symbol	Function
	1	V-	Charger negative voltage input terminal
	2	COUT	Charge FET control terminal
	3	DOUT	Discharge FET control terminal
	4	VSS	Negative power supply voltage input terminal
	5	VDD	Positive power supply voltage input terminal
	6	CS	Current detection 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
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
Storage temperature	Tstg	-55	125	℃

Recommended Operating Conditions

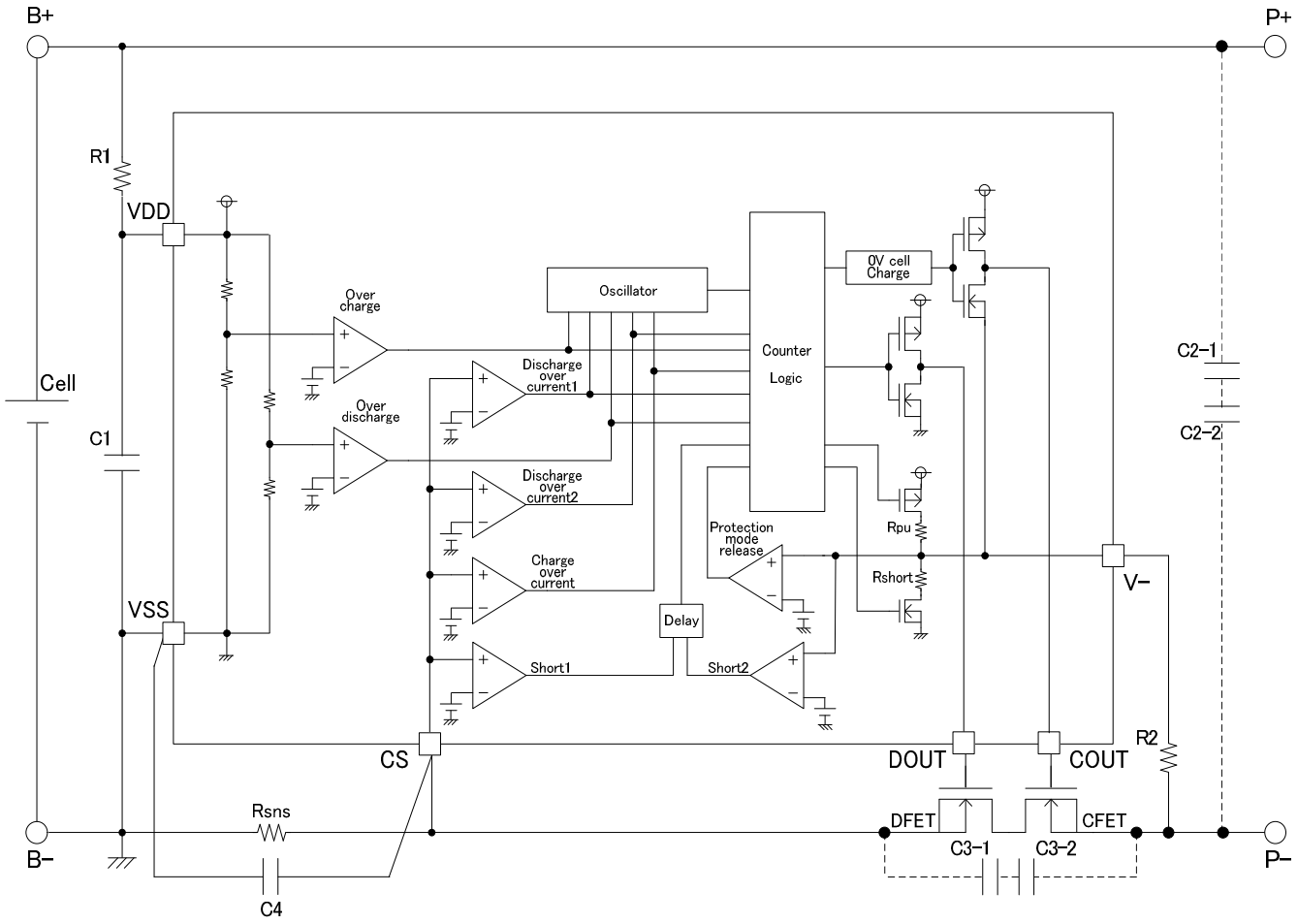
Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	Topr	-40	85	℃
Operating voltage	Vop	1.5	5.5	V

Electrical characteristics

(Unless otherwise specified,Ta=25℃)

Parameter	Symbol	Note	Min	Typ	Max	Unit
Input/Output voltage						
Maximum forbidden voltage for 0V charging	Vst	Vst=1.3V～1.8V	Vst-0.1	Vst	Vst+0.1	V
		Vst=0.9V	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℃				
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	Vdet3-2 function disable	Typ-0.020	Vshort	Typ+0.020	V
		Vdet3-2 function enable	Typ-0.025		Typ+0.025	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*0.7	tVshort	Typ*1.4	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.