



1cell Li-ion/Li-polymer battery protection IC

MM3852 series

Outline

MM3852 series are protection ICs with thermal protection for rechargeable Lithium-ion or Lithium-polymer battery. By using external thermistor, this protects the battery pack and system over temperature.

Features

(Unless otherwise specified, Ta=25 degC)

•Detection voltage	Range	Accuracy
Overcharge detection voltage	4.2V to 5.0V, 1mV steps	+/-10mV(Ta=0 to +50 degC)
Overdischarge detection voltage	2.0V to 3.4V, 5mV steps	+/-35mV
Discharging overcurrent detection voltage	10mV to +150mV, 1mV steps	+/-2mV(Ta=0 to +50 degC)
Charging overcurrent detection voltage	-10mV to -150mV, 1mV steps	+/-3mV(Ta=0 to +50 degC)
Short detection voltage	40mV to 300mV, 5mV steps	+/-3mV(Ta=0 to +50 degC)
0V battery charge inhibition battery voltage	1.25V to 2.00V, 0.05V steps	+/-0.05V(Ta=0 to +50 degC)
Abnormal temperature detection 1	50 to +85 degC, 5 degC steps	+/-3 degC *1
Abnormal temperature detection 2	50 to +85 degC, 5 degC steps	+/-3 degC *1

*1 NTC Thermistor :R=100, 220, 470kohm+/-1% at 25degC, B-Constant= Typ.+/-1% at 25 to 50 degC

•0V battery charge function	Selectable "Permission" or "inhibition"
•Current consumption at Ta=-40 to 25 degC	
Normal mode	3.5uA ty 6.0uA max.
Standby mode	40nA max.

Package type

•WLCSP-8C/8D/8G	1.51 × 0.92 × 0.36 [mm]
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Features

*Parameter setting table

Parameter	Symbol	Method	Setting range	Note
Overcharge detection voltage	Vdet1	Fuse	4.200V ~ 4.800V, 1mVstep	Accuracy: +/-10mV at Ta=0 ~ 50°C
		Metal Fuse	4.800V ~ 5.000V, 1mVstep	
Overcharge release	OCVREL	Fuse	A) No Hysteresis latch B) Auto release	A) Vdet1=Vrel1 B) Vdet1>Vrel1 Hysteresis is canceled, when charger is removed.
Overdischarge detection voltage	Vdet2	Fuse	2.000V ~ 3.400V, 5mVstep	Accuracy: +/-35mV at Ta=25°C
Overdischarge release	ODVREL	Fuse	A) No Hysteresis Latch B) Hysteresis Latch	A) Vdet2=Vrel2 B) Vdet2<Vrel2 Hysteresis is not canceled even if charger is connected.
Discharging overcurrent detection voltage	Vdet3	Fuse	10.0mV ~ 150.0mV, 1mVstep	Accuracy: +/-2.0mV at Ta=0~50°C
Discharging overcurrent release	DOCREL	Fuse	A) Connected charger B) Auto release	A) V- is pull up to VDD by Rpu B) V- is pull down to VSS by Rpd.
Charging overcurrent detection voltage	Vdet4	Fuse	-10.0mV ~ -70.0mV, 1mVstep	Accuracy: +/-3mV at Ta=0~50°C
		Metal Fuse	-70.0mV ~ -150mV, 1mVstep	
Charging overcurrent release	COCREL	Fuse	Remove charger and Connected load	
Short detection voltage	Vshort	Fuse	40mV ~ 300mV, 5mVstep	Accuracy: +/-3mV at Ta=0~50°C
Overcharge detection delay time	tVdet1	-	256ms, 512ms, 1.02s, 2.05s	Default setting : 1.02s Accuracy: +/-20% at Ta=25°C
Overdischarge detection delay time	tVdet2	Fuse	16ms, 32ms, 128ms	Accuracy: +/-20% at Ta=25°C
Discharging overcurrent detection delay time	tVdet3	Fuse	8ms, 16ms, 32ms, 128ms, 256ms, 512ms, 1024ms, 3072ms	Accuracy: +/-20% at Ta=25°C
Charging overcurrent detection delay time	tVdet4	Fuse	8ms, 16ms, 32ms	Default setting : 8ms Accuracy: +/-20% at Ta=25°C
Short detection delay time	tVshort	Fuse	250 ~ 500us, 10us step	Accuracy: +/-30% at Ta=25°C
0V battery charging function	0VCHG	Fuse	permission Inhibition: 1.25 ~ 2.00V, 0.05Vstep	Accuracy: +/-0.05V at Ta=0~50°C
Abnormal temperature detection 1	Tdet1	Fuse	50~85°C, 5°C step	
Abnormal temperature release 1	Trel1	-	Tdet-5°C Fixed	
Abnormal temperature protection1	THP1	Metal	A) Charge OFF, B) Discharge OFF C) Charge and discharge OFF	In case C), High temperature detection 2 is not defined.
Abnormal temperature detection 2	Tdet2	Fuse	50~85°C, 5°C step	
Abnormal temperature release 2	Trel2	-	Tdet-5°C Fixed	
Abnormal temperature protection2	THP2	-	Charge and discharge OFF	
Abnormal temperature detection delay time	tTdet	Fuse	136ms, 264ms, 512ms, 1024ms	
Abnormal temperature release delay time	tTrel	-	136ms Fixed	

fig1. Overcharge hysteresis

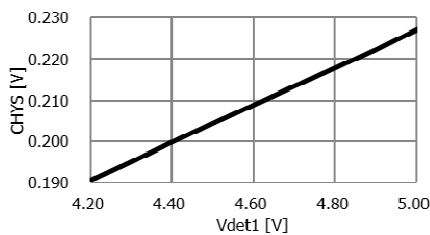
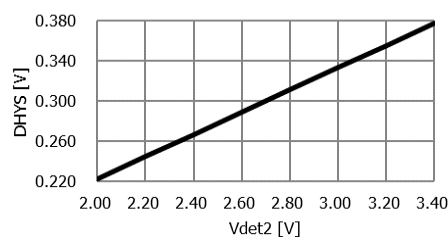
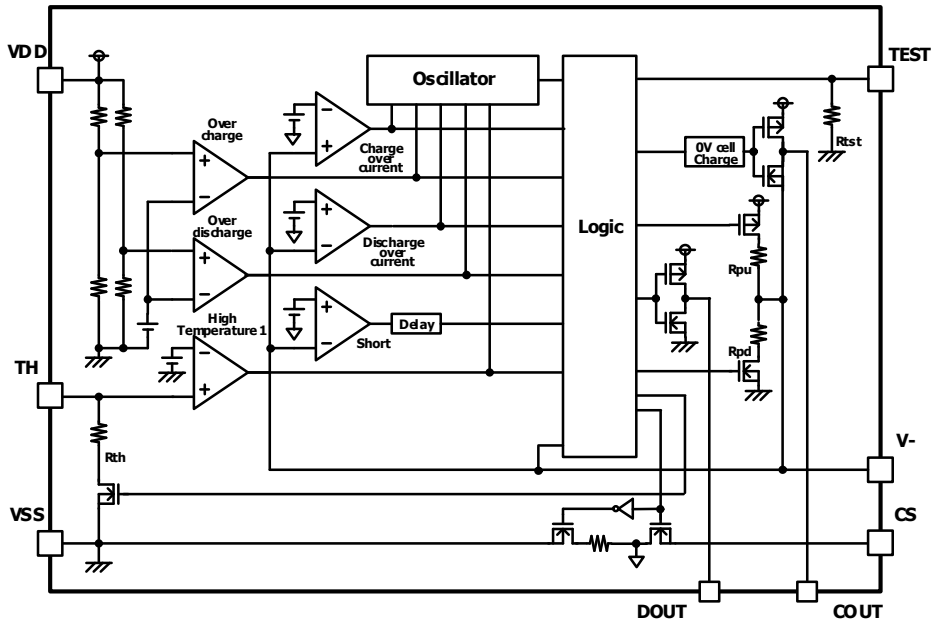


fig2. Overdischarge hysteresis





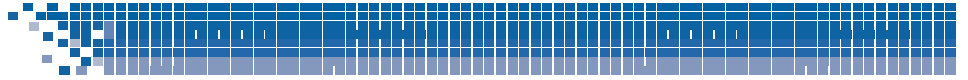
Block Diagram



Package and pin configuration

WLCSP-8C / WLCSP-8D / WLCSP-8G	Pin No.	Symbol	Function
	A1	V-	Negative charger voltage input terminal
	B1	VDD	Positive power supply voltage input terminal
	C1	TEST	Test terminal
	D1	VSS	Negative power supply voltage input terminal
	A2	COUT	Charge FET control terminal
	B2	CS	Current level input terminal
	C2	TH	NTC Thermistor input terminal
	D2	DOUT	Discharge FET control terminal

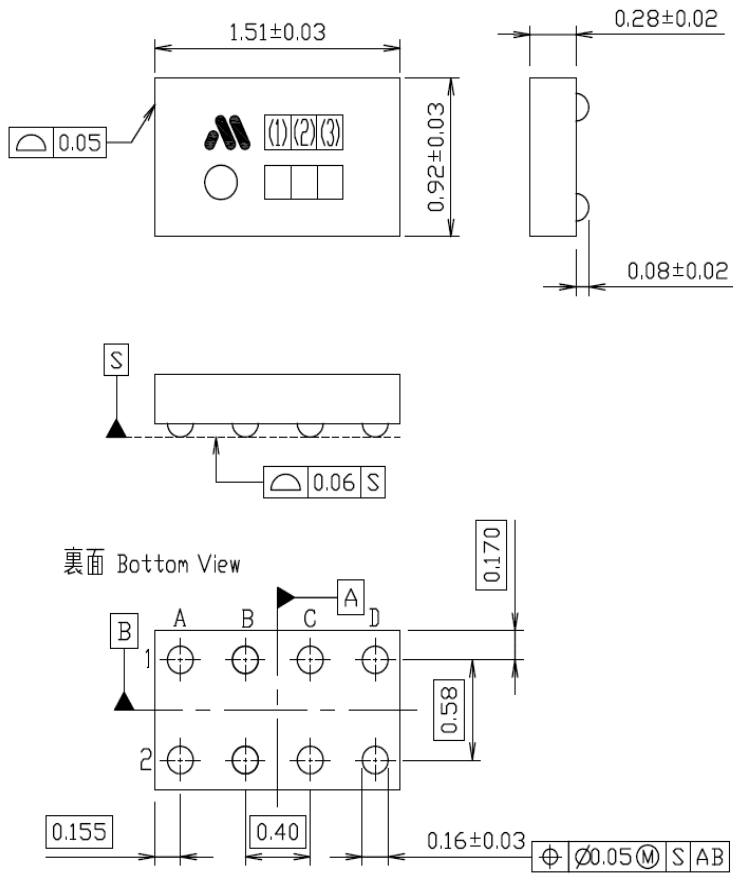




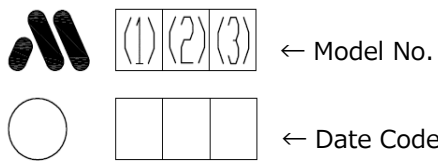
Package dimensions

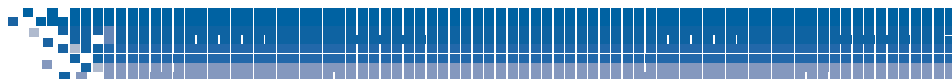
Unit:mm

WLCSP-8C / WLCSP-8D / WLCSP-8G



Marking Contents





Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	VDD	-0.3 to 12	V
V- terminal voltage	V-	VDD-28 to VDD+0.3	V
COUT terminal voltage	VCOUT	VDD-28 to VDD+0.3	V
DOUT terminal voltage	VDOUT	VSS-0.3 to VDD+0.3	V
CS terminal voltage	VCS	VDD-28 to VDD+0.3	V
TH terminal voltage	VTH	VSS-0.3 to VDD+0.3	V
TEST terminal voltage	VTEST	VSS-0.3 to VDD+0.3	V
Storage temperature	Tstg	-55 to +125	degC

Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Operating ambient temperature	ToPr	-40 to +85	degC
Operating voltage	Vop	1.5 to 5.5	V

Electrical characteristics

(Unless otherwise specified, Ta=25 degC)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	Idd	VDD=4.0V, VCS=V-=0V *1 TH pin : Open	-	3.5	6.0	kohm
TH terminal current	Ith	Rntc= 470kohm +/-1% 4250k +/-1%	-	0.7	1.2	uA
Current consumption at standby	Is	VDD=1.5V VCS=V-=VDD or open *1	-	-	40	nA
V- pin pull-up resistance	Rpu	VDD=1.8V VCS=V-=0V	500	1,000	2,000	kohm
TH terminal resistance	Rth	VDD=3.6V, VCS=V-=0V TH=1.0V	80	160.0	320	kohm
TEST terminal resistance	Rtst	VDD=3.6V, VCS=V-=0V TEST=1.0V	-	25	-	kohm
COUT output resistance L	RcoL	VDD=5.0V VCS=V-=0V, COUT=0.1V *2	-	5.0	20.0	kohm
COUT output resistance H	RcoH	VDD=4.0V VCS=V-=0V, COUT=3.9V *2	-	5.0	20.0	kohm
DOUT output resistance L	RdoL	VDD=1.8V VCS=V-=0V, DOUT=0.1V *2	-	5.0	20.0	kohm
DOUT output resistance H	RdoH	VDD=4.0V VCS=V-=0V, DOUT=3.9V *2	-	5.0	20.0	kohm

*1 Ta=-40 - 25 degC

*2 Ta=-40 - 85 degC





Electrical characteristics

(Unless otherwise specified, Ta=25 degC)

Parameter	Symbol	Note	Min.	Typ.	Max.	Unit
Overcharge detection voltage	Vdet1	Ta=25°C	-0.010	Vdet1	+0.010	V
		Ta=0 - 50°C	-0.010		+0.010	
Overcharge release voltage	Vrel1	*3	-0.020	Vrel1	+0.010	V
		*4	-0.030		+0.030	
Overdischarge detection voltage	Vdet2		-0.035	Vdet2	+0.035	V
Overdischarge release voltage	Vrel2	*5	-0.035	Vrel2	+0.035	V
		*6	-0.070		+0.070	
Discharging overcurrent detection voltage	Vdet3		-2.0	Vdet3	+2.0	mV
Charging overcurrent detection voltage	Vdet4		-3.0	Vdet4	+3.0	mV
Short detection voltage1	Vshort1		-3.0	Vshort1	+3.0	mV
Short detection voltage2	Vshort2		VDD-1.3	VDD-0.9	VDD-0.5	V
0V battery charge permission charger voltage	Vst		-	-	1.2	V
0V battery charge inhibition battery voltage	Vst		-0.05	Vst	+0.05	V
Overvoltage charger detection voltage	VhiChg		-2.00	VhiChg	+2.00	V
Overcurrent release threshold voltage	VrelC		-0.15	VrelC	+0.15	V
Abnormal temperature detection 1	Tdet1		-3.0	Tdet1	+3.0	degC
Abnormal temperature detection resistance 1	RTdet1			RTdet1		kohm
Abnormal temperature release 1	Trel1		-5.0	Trel1	+5.0	degC
Abnormal temperature release resistance 1	RTrel1			RTrel1		kohm
Overcharge detection delay time	tVdet1		-20%	tVdet1	+20%	ms
Overdischarge detection delay time	tVdet2		-20%	tVdet2	+20%	ms
Discharging overcurrent detection delay time	tVdet3		-20%	tVdet3	+20%	ms
Charging overcurrent detection delay time	tVdet4		-20%	tVdet4	+20%	ms
Short detection delay time	tshort		-30%	tshort	+30%	us
Abnormal temperature detection delay time	tTdet		-20%	tTdet	+20%	ms

*3 Overcharge latch function enable.

*4 Overcharge latch function disable.

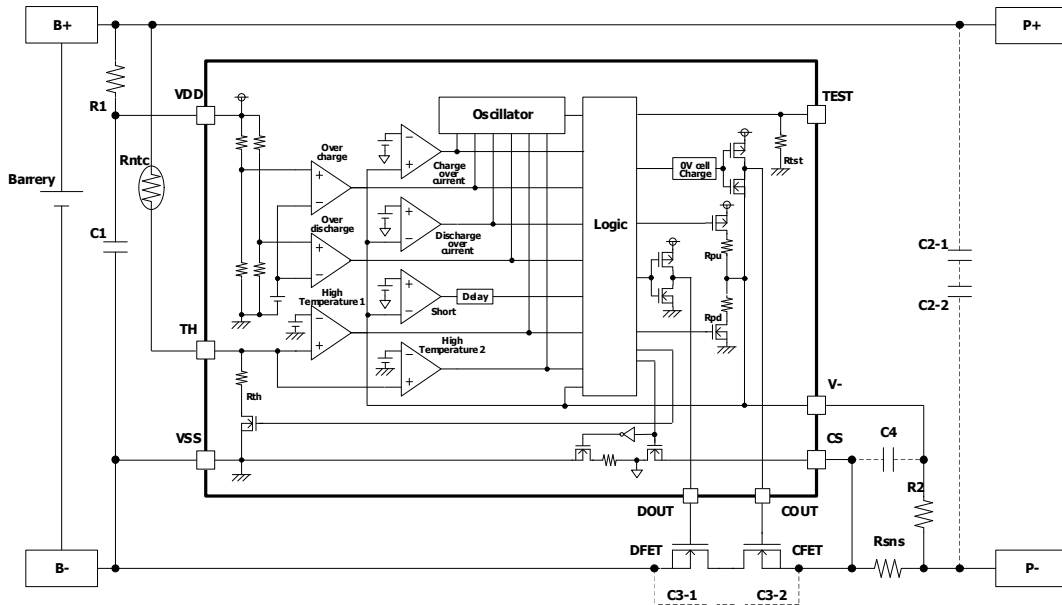
*5 Overdischarge no hysteresis latch function enable.

*6 Overdischarge hysteresis latch function enable.





Typical application circuit



Unit:ohm ,F

Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	100	300	1k	For voltage fluctuation, ESD Protection
R2	Resistor	100	300	2.2k	Current limit for charger reverse connection
Rsns	Resistor	-	-	-	Current sensing
Rntc	NTC Thermistor	R25	470k, 220k, 100k		Temperature sensing R25: Typ +/-1%, B(25/50): Typ. +/-1%
		B (25/50)	-	-	
C1	Capacitor	0.01u	0.1u	1.0u	For voltage fluctuation
C2	Capacitor	-	0.1u	-	For exogenous noise
C3	Capacitor	-	0.1u	-	For exogenous noise
C4	Capacitor	-	0.1u	-	For exogenous noise
DFET	Nch MOS FET	-	-	-	Charge and discharge control
CFET					

*The above application circuit and constant value do not guarantee proper operation.

*Please evaluate thoroughly by actual application to set up constants.

