



3cells Li-ion/polymer battery protection IC

MM3783 series

Outline

The MM3783 series are protection IC using high voltage CMOS process for overcharge, overdischarge, overcurrent, and temperature protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, short and 3 thresholds temperature protection NTC thermistor of the rechargeable 3cells Lithium-ion or Lithium-polymer battery can be detected. The internal circuit of IC is composed by the voltage detector, the reference voltage source, delay time control circuit and the logical circuit, etc. Low cost and small size configuration can be achieved when MM3783 series is combined with our existing product MM3474 series and used for the applications of 6 cells or more.

Features

(Unless otherwise specified, Ta=25°C)

1) Range and accuracy of detection/release voltage

• Overcharge detection voltage	3.6V to 4.5V, 5mV steps	Accuracy±25mV (Ta=0~50°C)
• Overcharge release voltage	3.4V to 4.5V, 50mV steps	Accuracy±50mV
• Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±80mV
• Overdischarge release voltage	2.0V to 3.5V, 50mV steps	Accuracy±100mV
• Discharging overcurrent detection voltage1	+30mV to +300mV, 5mV steps	Accuracy±15%
• Discharging overcurrent detection voltage2	2 or 4 times of VDET3-1	Accuracy±20%
• Short detection voltage	4 or 8 times of VDET3-1	Accuracy±30%
• Charging overcurrent detection voltage	-300mV to -20mV, 5mV step	Accuracy±15%
• Temperature protection detection temperature	-25°C to 75°C , 5°C step	Accuracy±3°C

2) Range of detection delay time

• Overcharge detection delay time	Setting by capacitor of COV
• Overdischarge detection delay time	Setting by capacitor of CUV
• Discharging overcurrent detection delay time1	Setting by capacitor of CDOC
• Discharging overcurrent detection delay time2	1/10 to 10times of tVDET3-1
• Short detection delay time	200us fixed
• Charging overcurrent detection delay time	Setting by capacitor of CCOC
• Temperature protection detection delay time	Setting by capacitor of CTH

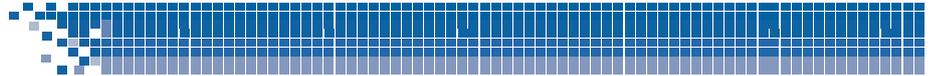
3) 0V battery charge function

Selection from "Prohibition" or "Permission"

4) Low current consumption

• Consumption current1 (VDD), Vcell=4.3V	Typ. 22.0uA Max. 34.0uA
• Consumption current2 (VDD), Vcell=3.5V	Typ. 20.0uA Max. 26.0uA
• Consumption current3 (VDD), Vcell=2.0V	Typ. 1.5uA, Max. 3.0uA

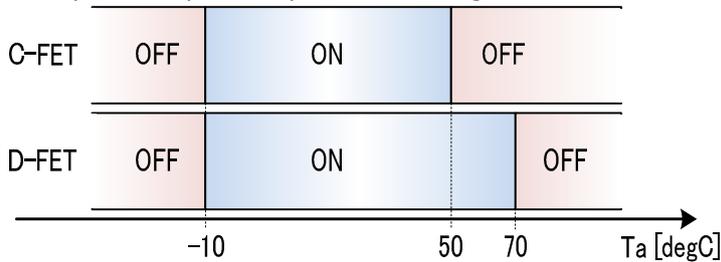




5) Temperature protection function

Temperature protection thresholds can be setting 3 value (two thresholds of high temperature, one threshold of low temperature) by using a NTC thermistor.

- Example of temperature protection setting



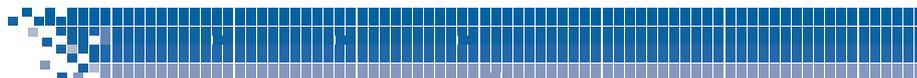
High temp protection	: Charge control	Detect: +50°C±3°C, Release: +40°C±3°C
	: Discharge control	Detect: +70°C±3°C, Release: +60°C±3°C
Low temp protection	: Charge/Discharge control	Detect: -10°C±3°C, Release: 0°C±3°C

6) Package type

- TSOP-16B 5.00 × 6.40 × 1.10 [mm]

Pin explanations

TSOP-16B	Pin No.	Symbol	Function
<p>TOP VIEW</p>	1	OV	Charge control output pin. Output type is CMOS.
	2	V-	Negative voltage of charger and load input pin.
	3	DCHG	Discharge control output pin. Output type is CMOS.
	4	COV	This pin is delay time setting of overcharge detection and overcharge release.
	5	CUV	This pin is delay time setting of overdischarge detection and overdischarge release.
	6	CDOC	This pin is delay time setting of discharging overcurrent detection and discharging overcurrent release.
	7	CCOC	This pin is delay time setting of charging overcurrent detection and charging overcurrent release.
	8	CTH	This pin is delay time setting of temperature protection detection and temperature protection release.
	9	CS	Input of overcurrent detection.
	10	TH	Temperature detection pin.
	11	REG	The regulator output pin for a thermo sense resistor drive.
	12	VSS_CS	Common pin of overcurrent detection circuit.
	13	VSS	The input pin of the negative voltage of V1 cell. The input pin of the ground of IC.
	14	V1	The input pin of the positive voltage of V1 cell, and the negative voltage of V2 cell.
	15	V2	The input pin of the positive voltage of V2 cell, and the negative voltage of V3 cell.
	16	VDD	The input pin of the power supply of IC, and the positive voltage of V3 cell.



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
VDD pin supply voltage	V _{VDD_MAX}	VSS-0.3	VSS+21.0	V
Voltage between the input terminals of voltage of battery	V _{cell_MAX}	-0.3	10.0	V
V- pin supply voltage	V _{V-_MAX}	VDD-30	VDD+0.3	V
OV pin supply voltage	V _{OV_MAX}	VDD-30	VDD+0.3	V
DCHG pin supply voltage	V _{DCHG_MAX}	VSS-0.3	VDD+0.3	V
Storage temperature	T _{STG}	-55	125	°C

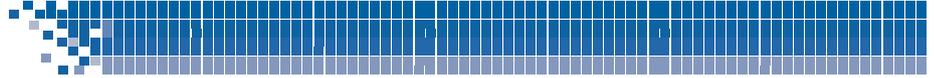
Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	T _{OPR}	-30	80	°C
Operating voltage	V _{OPR}	VSS+3.5	VSS+18.0	V

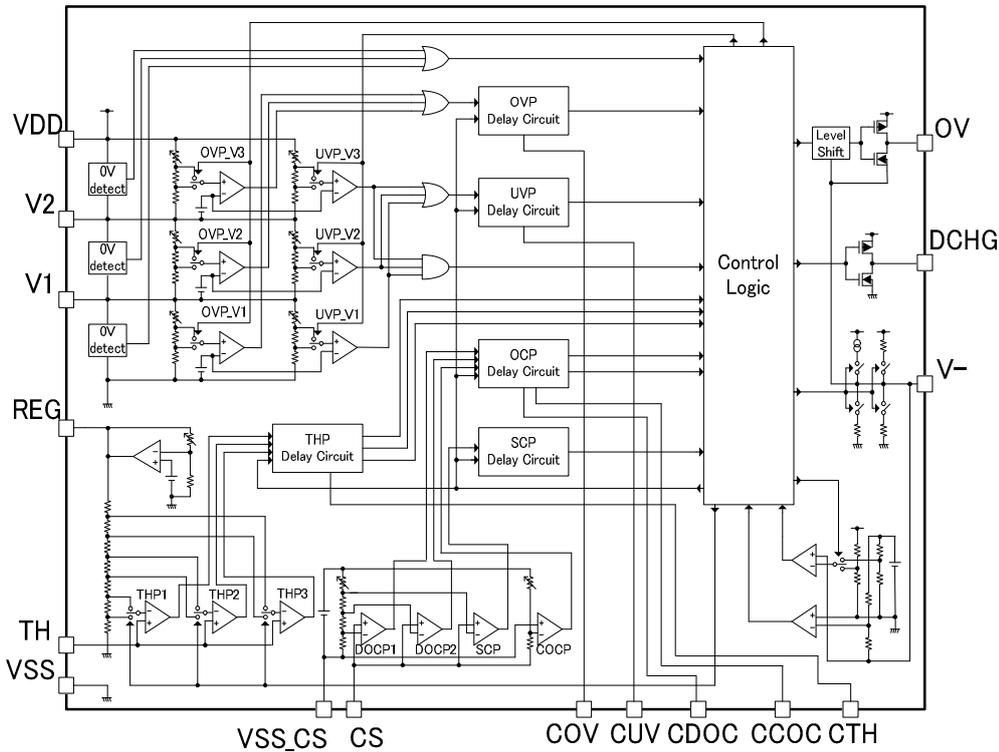
Electrical characteristics

(特記なき場合、Ta=25°C)

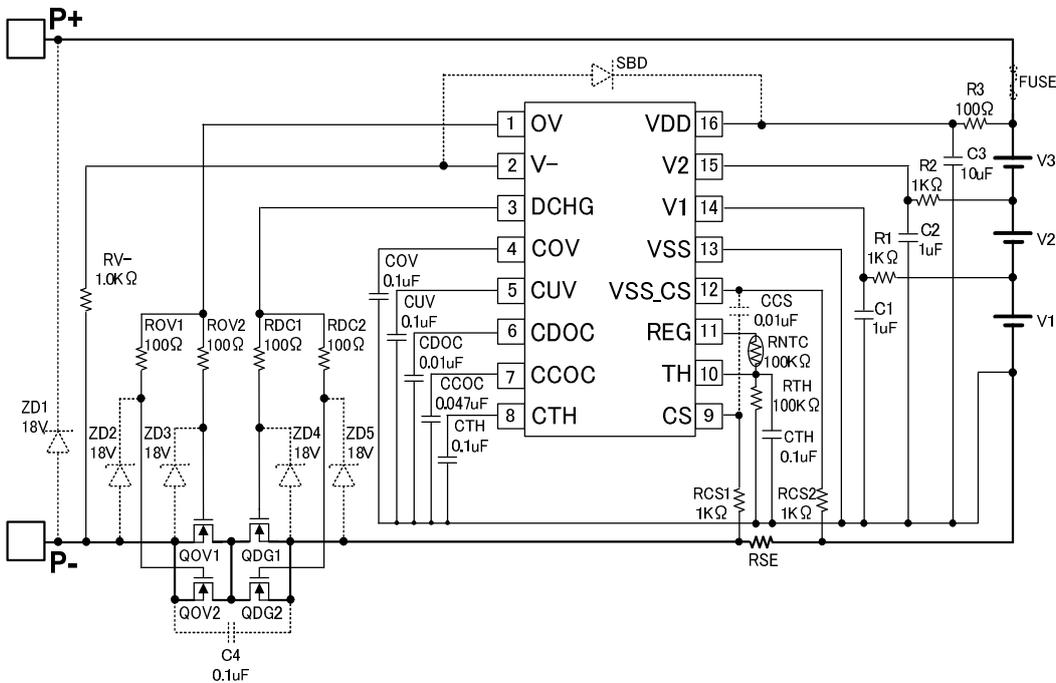
Parameter	Symbol	Note	Min	Typ	Max	Unit
Current consumption						
Current consumption1 (VDD)	I _{DD1}	Vcell=4.3V	-	22.0	34.0	uA
Current consumption2 (VDD)	I _{DD2}	Vcell=3.5V	-	20.0	26.0	uA
Current consumption3 (VDD)	I _{DD3}	Vcell=2.0V, V-=VSS	-	1.5	3.0	uA
Detection / Release voltage and Temperature protection						
Maximum forbidden voltage for 0V charging	V _{CELL0V}	"Prohibition" function	0.6	0.9	1.2	V
Minimum operating voltage for 0V charging	V _{st}	"Permission" function	-	-	1.2	V
Overcharge detection voltage	V _{DET1}	Ta=0~50°C	Typ-0.025	V _{DET1}	Typ+0.025	V
Overcharge release voltage	V _{REL1}		Typ-0.050	V _{REL1}	Typ+0.050	V
Overdischarge detection voltage	V _{DET2}		Typ-0.080	V _{DET2}	Typ+0.080	V
Overdischarge release voltage	V _{REL2}		Typ-0.100	V _{REL2}	Typ+0.100	V
Discharging overcurrent detection voltage 1	V _{DET3-1}		Typ-15%	V _{DET3-1}	Typ+15%	V
Discharging overcurrent detection voltage 2	V _{DET3-2}		Typ-20%	V _{DET3-2}	Typ+20%	V
Short detection voltage	V _{SHORT}		Typ-30%	V _{SHORT}	Typ+30%	V
Charging overcurrent detection voltage	V _{DET4}		Typ-15%	V _{DET4}	Typ+15%	V
Temperature protection detection temperature1	T _{THD1}		Typ-3°C	T _{THD1}	Typ+3°C	°C
Temperature protection release temperature1	T _{THR1}		Typ-3°C	T _{THR1}	Typ+3°C	°C
Temperature protection detection temperature2	T _{THD2}		Typ-3°C	T _{THD2}	Typ+3°C	°C
Temperature protection release temperature2	T _{THR2}		Typ-3°C	T _{THR2}	Typ+3°C	°C
Temperature protection detection temperature3	T _{THD3}		Typ-3°C	T _{THD3}	Typ+3°C	°C
Temperature protection release temperature3	T _{THR3}		Typ-3°C	T _{THR3}	Typ+3°C	°C
Detection voltage delay time						
Overcharge detection delay time	t _{VDET1}		Typ-50%	t _{VDET1}	Typ+50%	s
Overdischarge detection delay time	t _{VDET2}		Typ-50%	t _{VDET2}	Typ+50%	s
Discharging overcurrent detection delay time 1	t _{VDET3-1}		Typ-50%	t _{VDET3-1}	Typ+50%	ms
Discharging overcurrent detection delay time 2	t _{VDET3-2}		Typ-50%	t _{VDET3-2}	Typ+50%	ms
Short detection delay time	t _{SHORT}		100	200	400	us
Charging overcurrent detection delay time	t _{VDET4}		Typ-50%	t _{VDET4}	Typ+50%	ms
Temperature protection detection delay time	t _{VDET5}		Typ-50%	t _{VDET5}	Typ+50%	s



Block diagram



Typical application circuit



※ This circuits are typical examples provided for reference purposes, so in actual applications, the circuit constants, conditions and operations should be thoroughly studied. Mitsumi Electric Co., Ltd. Assumes no responsibility for any trouble or damage as a result of the use of these circuits.