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

MM3725/MM3726 series

Outline

The MM3725/MM3726 series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, and short protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected. Each of these IC composed of four voltage detectors, short detection circuit, reference voltage sources, oscillator, counter circuit and logical circuits.

Features

(Unless otherwise specified,Ta=25℃)

1) Range and accuracy of detection/release voltage

・Overcharge detection voltage	3.6V to 5.0V, 5mV steps	Accuracy±20mV
・Overcharge release voltage	Vdet1-0.2V to Vdet1, 5mV steps	Accuracy±30mV
・Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±35mV
・Overdischarge release voltage	2.0V to 3.0V, 50mV steps	Accuracy+50 / -35mV (In case Vdet2=Vrel2) Accuracy+90 / -65mV (In case Vdet2≠Vrel2)
・Discharging overcurrent detection voltage	+20mV to +300mV, 1mV steps	Accuracy±5mV
・Charging overcurrent detection voltage	-300mV to -20mV, 1mV steps	Accuracy±5mV
・Short detection voltage	+70mV to +350mV, 1mV steps	Accuracy±8%
・0V battery charge inhibition battery voltage	1.3V to 1.8V, 0.1V steps	Accuracy±100mV
	0.9V	Accuracy±300mV

2) Range of detection delay time

・Overcharge detection delay time	Selection from 256ms to 4.6s
・Overdischarge detection delay time	Selection from 8ms to 256ms
・Discharging overcurrent detection delay time	Selection from 8ms to 256ms
・Charging overcurrent detection delay time	Selection from 6ms to 64ms
・Short detection delay time	Selection from 250us to 400us

3) 0V battery charge function — Selection from "Prohibition" or "Permission"

4) Low current consumption

・Normal mode	Typ. 3.0uA, Max. 6.0uA
・Stand-by mode	Max. 0.1uA (In case Overdischarge latch function Enable.)
	Max. 0.6uA (In case Overdischarge latch function Disable.)

5) Package type

・SSON-6J	1.40 × 1.40 × 0.55 [mm]
・SON-6C	1.60 × 2.00 × 0.55 [mm]

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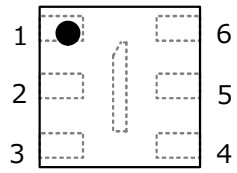
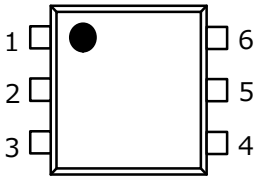
Pin explanations

SSON-6J/6M	Pin No.	Symbol	Function
	1	NC	No connection
	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	V-	Charger negative voltage input terminal

SON-6C	Pin No.	Symbol	Function
	1	NC	No connection
	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	V-	Charger negative voltage input 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
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

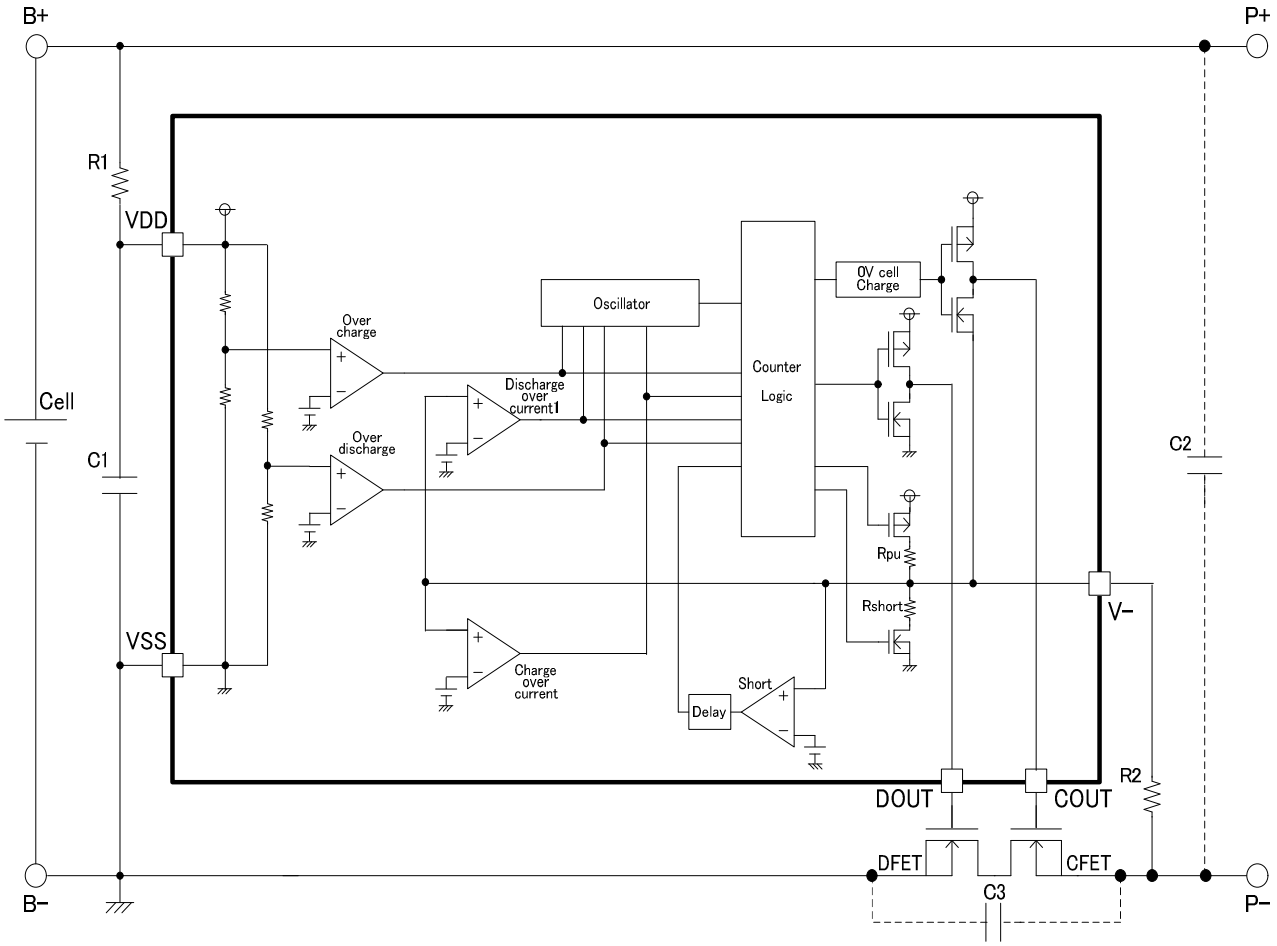
Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	Topr	-40	85	℃
Operating voltage	Vop	1.5	5.5	V

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	-	3.0	6.0	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℃	Typ-0.025		Typ+0.025	
Overcharge release voltage	Vrel1	Vdet1≠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	Vdet2=Vrel2	Typ-0.035	Vrel2	Typ+0.050	V
		Vdet2≠Vrel2	Typ-0.065	Vrel2	Typ+0.090	V
Discharging overcurrent detection voltage	Vdet3		Typ-0.005	Vdet3	Typ+0.005	V
Charging overcurrent detection voltage	Vdet4		Typ-0.005	Vdet4	Typ+0.005	V
Short detection voltag	Vshort		Typ*0.92	Vshort	Typ*1.08	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	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*0.7	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	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.