

Detection of Lithium Ion Battery Overcharging Monolithic IC MM1373

Outline

This IC detects overcharging of lithium ion batteries. It is designed for use with three or four battery cells, and detects battery voltages for each cell. An overcharge detection delay time can be set using an external capacitor. The overcharge detection signal output is open-collector, and goes low when overcharging is detected.

Features

- | | | |
|---|-----------------|---------------------|
| 1. Consumption current | $V_{CEL}=3.8V$ | 3.0 μ A typ. |
| 2. Consumption current | $V_{CEL}=2.3V$ | 0.3 μ A typ. |
| 3. Input current between cell pins | $V_{CEL}=3.8V$ | $\pm 0.3\mu$ A max. |
| 4. Overcharge detection voltage | A type | 4.35V \pm 50mV |
| 5. Overcharge detection delay time | $C_T=0.22\mu$ F | 1.5S typ. |
| 6. Detection voltage can be changed to accommodate customer needs | | |

Package

SOP-8C
SOP-8E

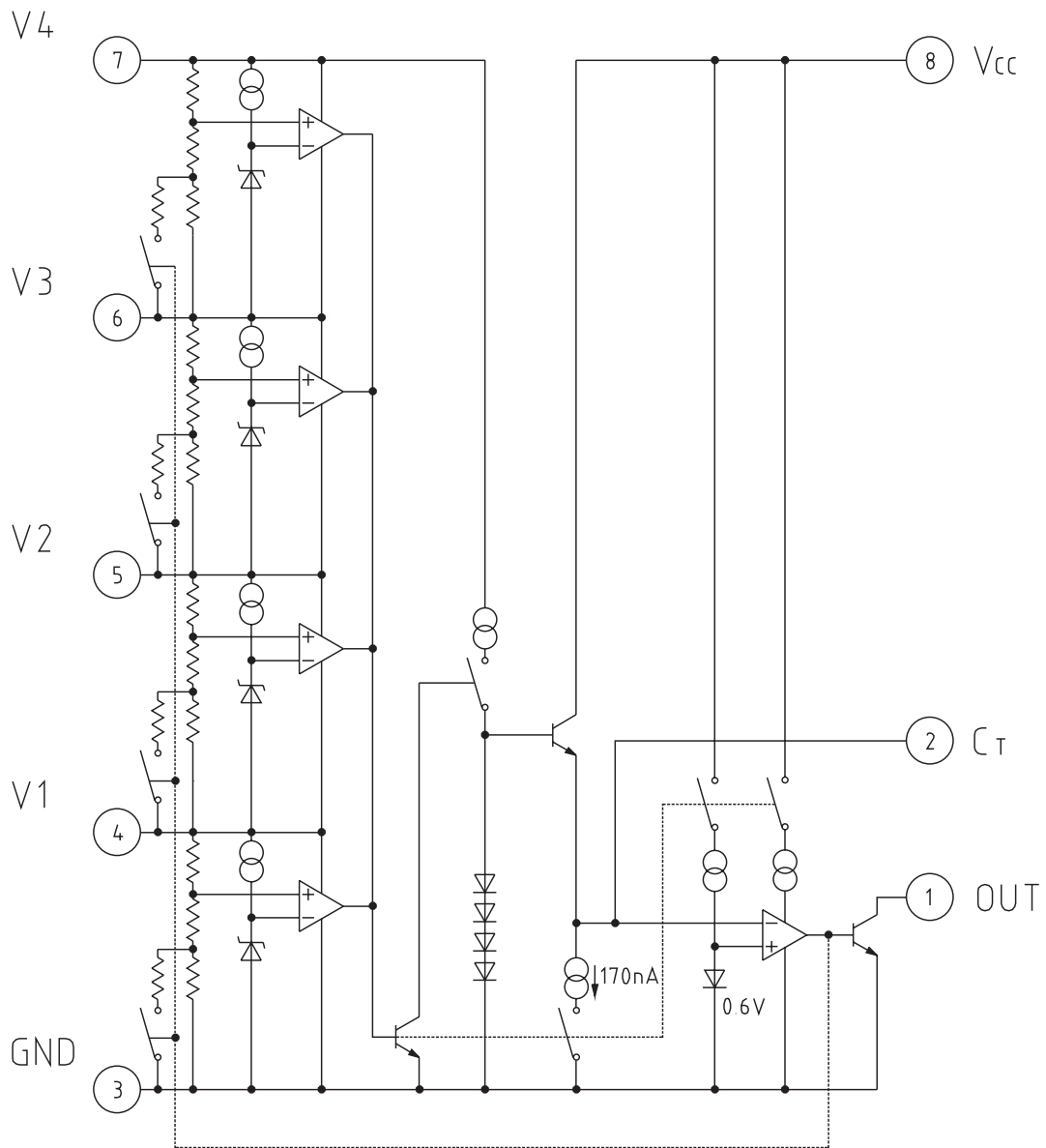
Applications

1. For secondary protection of lithium ion battery packs

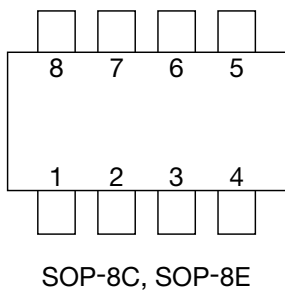
Overcharge Detection ICs

MM1373	Detection voltage	Hysteresis
Rank A	4.350V	250mV
Rank B	4.250V	250mV
Rank C	4.225V	None
Rank D	4.130V	None
Rank E	4.450V	100mV

Block Diagram



Pin Assignment



1	OUT
2	C _T
3	GND
4	V1
5	V2
6	V3
7	V4
8	V _{cc}

Pin Description

Pin no.	Pin name	Function	Internal equivalent circuit diagram
1	OUT	Reset output pin	
2	C _T	Delay capacitance pin	
4	V1	Cell 1 power supply	
5	V2	Cell 2 power supply	
6	V3	Cell 3 power supply	
7	V4	Cell 4 power supply	
8	V _{CC}		
3	GND		

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
V _{CC} input voltage	V _{CC}	-0.3~24	V
V4 input voltage *1	V4		
V3 input voltage *1	V3		
V2 input voltage *1	V2		
V1 input voltage *1	V1		
C _T pin voltage *2	V _{CT}	-0.3~24	V
V _{OUT} pin voltage	V _{OUT}	-0.3~24	V
Allowable loss	Pd	300	mW
Operating temperature	T _{OPR}	-20~+80	°C
Storage temperature	T _{STG}	-40~+125	°C

*1 $V_{CC} \geq V4 \geq V3 \geq V2 \geq V1 \geq -0.3$

*2: A current no greater than 100µA should be passed through pin Ct.

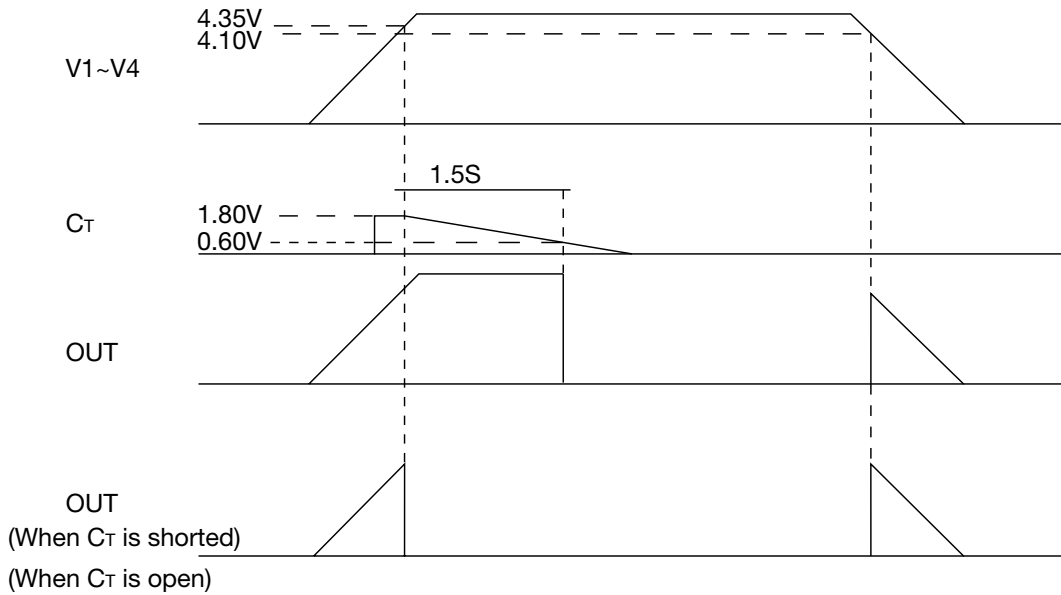
Recommended Operating Conditions

Item	Symbol	Ratings	Units
Input voltage between cells 1	V _{op1}	2.0~4.35	V
V _{CC} input voltage	V _{op2}	4.0~18	V

Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{CEL}=V4-V3=V3-V2=V2-V1=V1-GND, V_{CC}=4XV_{CEL})

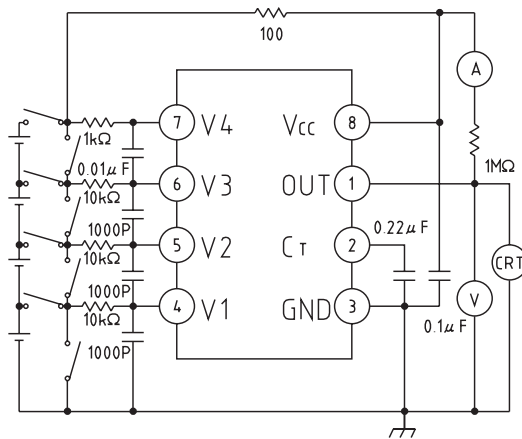
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current 1	I1	V _{CEL} =3.8V		3.0	6.0	µA
Consumption current 2	I2	V _{CEL} =2.3V		0.3	0.5	µA
Pin I/O current between cells	I3	V _{CEL} =3.8V (V4, V3, V2, V1 side)		±0.0	±0.3	µA
Overcharge detection voltage	V _s	V _{CEL} =L→H, Ta=-20~+70°C	4.30	4.35	4.40	V
Hysteresis voltage	HSY	V _{CEL} =L→H→L	0.20	0.25	0.30	V
Overcharge detection delay time	T _{PLH}	C _T =0.22µF	1.0	1.5	2.0	S
Output voltage L	V _{OL}	I _L =100µA			0.4	V
Output leakage current	I _{LEAK}	V _{CEL} =3.8V, V _{OUT} =24V			0.1	µA

Timing Chart



Note : When pin Ct is shorted or left open, the output goes low when overcharging is detected.

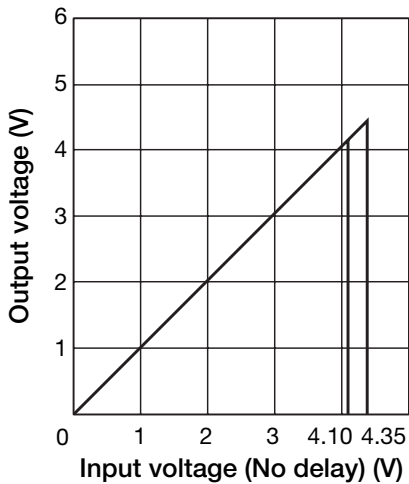
Application Circuits



Note : By shorting each cell, two-, three- and four-cell series can be accommodated. A V4 cell should always be connected. If the V4 cell is shorted, the chip may not function correctly.

Characteristics

Detection voltage



Output delay time

