

For lithium ion battery protection (for double protection) 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 NPN open-collector, and goes low when overcharging is detected. MM1451 is available for 1 ~ 3 cells. Overcharge detection signal output is PNP output, and output goes high during detection.

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

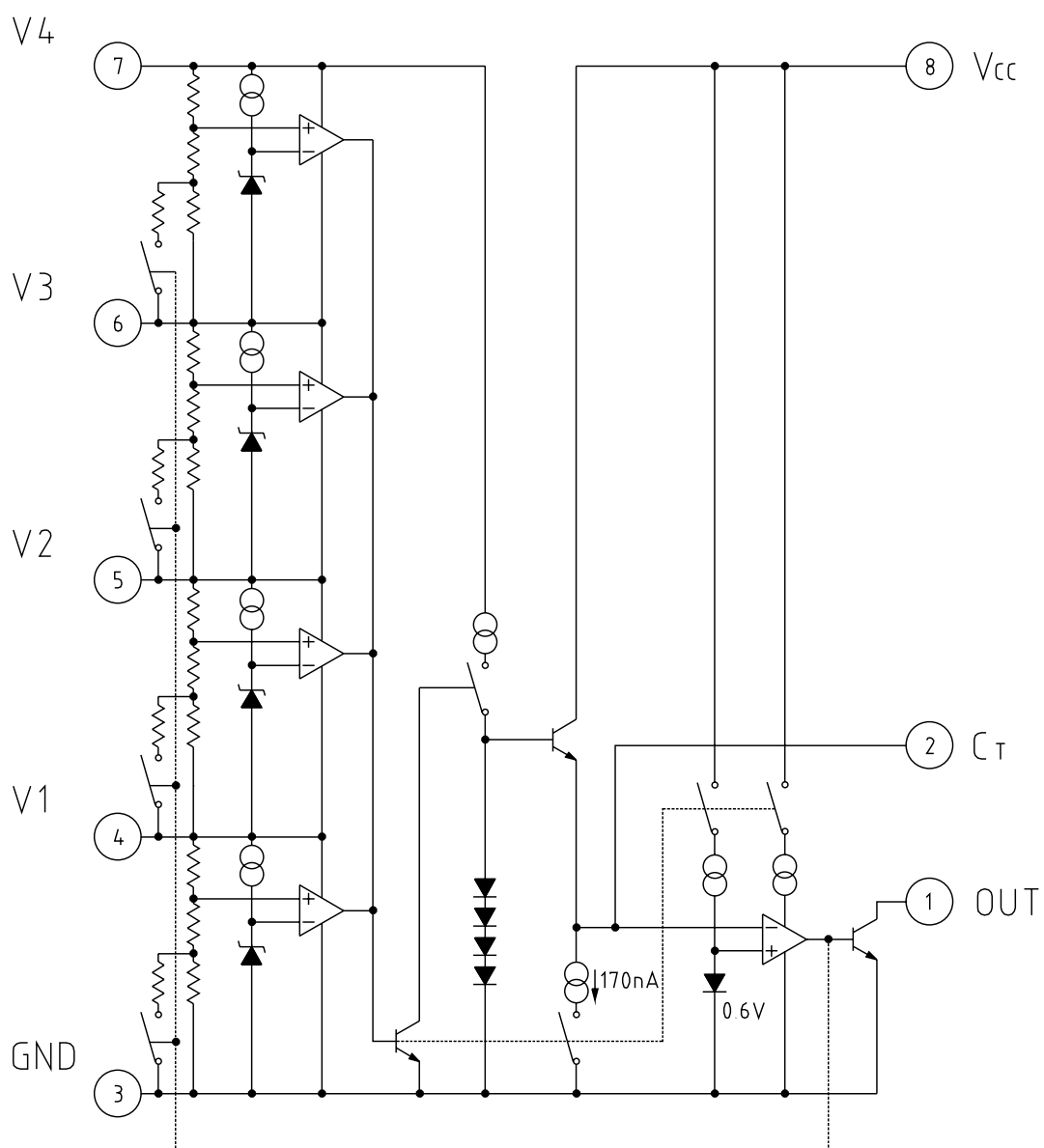
Applications

- For 3 ~ 4 cell lithium ion batteries, for double protection.

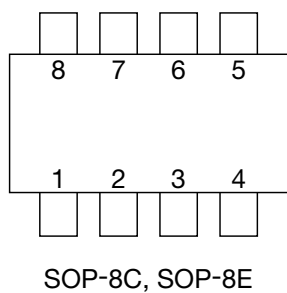
Overcharge Detection ICs

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

Block Diagram

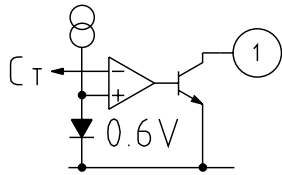
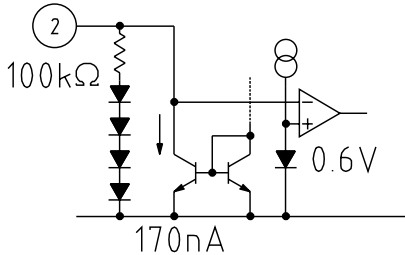
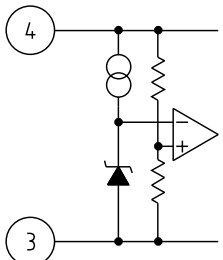
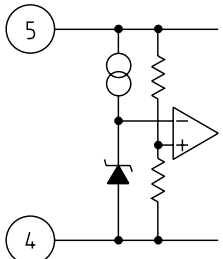
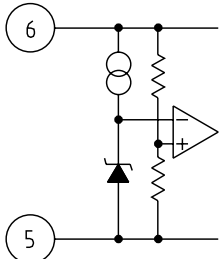
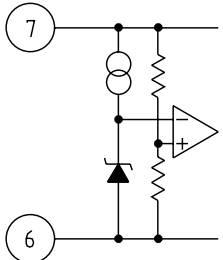


Pin Assignment



| | |
|---|-----|
| 1 | OUT |
| 2 | CT |
| 3 | GND |
| 4 | V1 |
| 5 | V2 |
| 6 | V3 |
| 7 | V4 |
| 8 | VCC |

Pin Description

| Pin no. | Pin name | Function | Internal equivalent circuit diagram |
|---------|-----------------|-----------------------|---|
| 1 | OUT | Reset output pin |  |
| 2 | C _T | Delay capacitance pin |  |
| 3 | GND | Ground 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} | | |

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

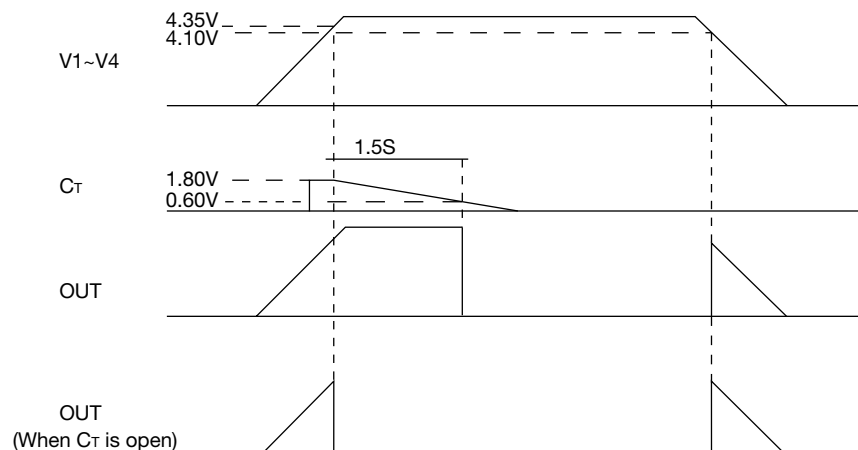
| Item | Symbol | Ratings | Units |
|-------------------------------|------------------|----------|-------|
| Input voltage between cells 1 | V _{op1} | 2.0~4.35 | V |
| V _{CC} input voltage | V _{op2} | 4.0~18 | V |

Electrical Characteristics

(Except where noted otherwise, Ta=25°C, V_{CEL}=V4-V3=V3-V2=V2-V1=V1-GND, V_{CC}=4 × V_{CEL}) Models listed MM1373AF

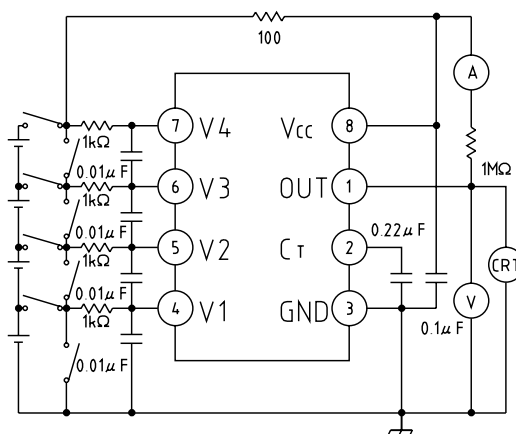
| Item | Symbol | Measurement conditions | Min. | Typ. | Max. | Units |
|---------------------------------|-------------------|---|------|------|------|-------|
| Consumption current 1 | I1 | V _{CEL} =3.8V | | 3.0 | 6.0 | μA |
| Consumption current 2 | I2 | V _{CEL} =2.3V | | 0.3 | 0.5 | μA |
| Pin 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



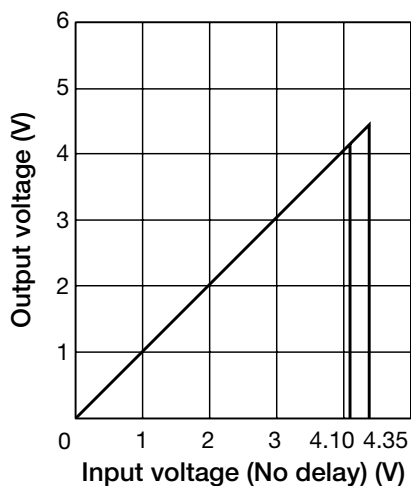
Note 1: By shorting each cell, two-, three- and four-cell series can be accommodated. A V4 cell should always be connected. If the V4 cell is shorted, the chip may not function correctly.

Note 2: The input resistance for each cell should be 1kΩ or lower. Also, please select the appropriate value for the external capacitor according to the usage environment.

Note 3: Connect in the following order when connecting the battery: GND → V4 and VCC → V2 → V1 or V3.

Characteristics

Detection voltage



Output delay time

