

## Voltage Monitor IC for Li-ion Cell Balance

# MM3513 Series

### Description

The MM3513 series are voltage monitor ICs for rechargeable Lithium-ion or Lithium-polymer batteries, using a high voltage CMOS process. Each Lithium-ion or Lithium-polymer battery can be balanced. Each of these ICs is composed of voltage detectors, reference voltage sources, an oscillator, a counter circuit and logical circuits.

### Features

(Unless otherwise specified, Ta=25 degC)

|                                    |                                                                   |          |
|------------------------------------|-------------------------------------------------------------------|----------|
| •Detection voltage                 | Range                                                             | Accuracy |
| Detection voltage                  | 3.5V to 4.5V, 5mV steps                                           | +/-20mV  |
| Hysteresis voltage                 | 0V to 0.4V, 50mV steps                                            |          |
|                                    | However, "Detection voltage-Hysteresis voltage<3.5V" is disabled. |          |
| •Current consumption at Ta=25 degC |                                                                   |          |
| Normal mode                        | 1.5uA typ. 3.0uA max.                                             |          |
| Standby mode                       | 0.5uA max.                                                        |          |

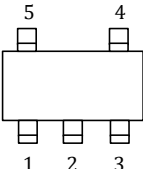
### Applications

- Lithium-ion rechargeable battery pack
- Lithium polymer rechargeable battery pack

### Package type

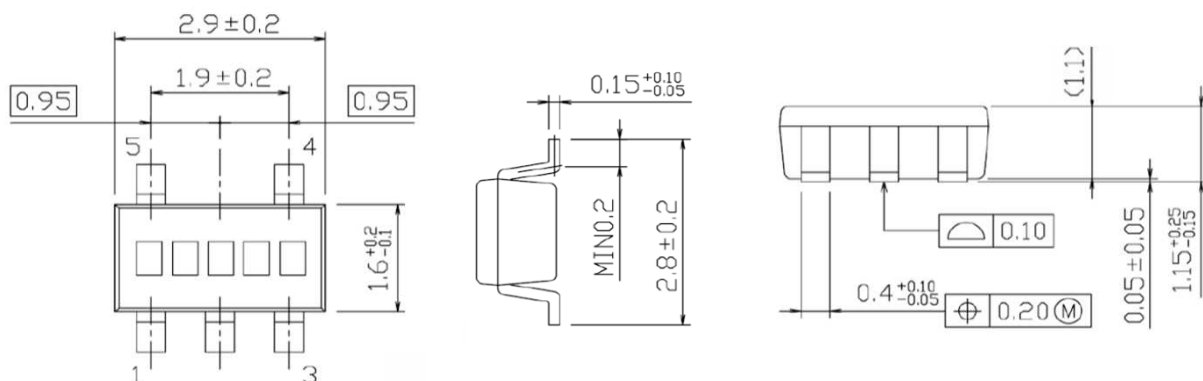
- SOT-25A 2.80 × 2.90 × 1.15 [mm]

### Package and pin configuration

| SON-6F                                                                              | Pin No. | Symbol | Function                                         |
|-------------------------------------------------------------------------------------|---------|--------|--------------------------------------------------|
|  | 1       | NC     | No connection                                    |
|                                                                                     | 2       | VDD    | VDD terminal. Connected to IC substraat          |
|                                                                                     | 3       | VSS    | VSS terminal. Connected to ground                |
|                                                                                     | 4       | DS     | Delay shorten terminal                           |
|                                                                                     | 5       | OUT    | Output of detecting voltage. Output type is CMOS |

### Package dimensions

- SOT-25A



**Absolute maximum ratings**

| Parameter           | Symbol | Rating             | Unit |
|---------------------|--------|--------------------|------|
| Supply voltage      | VDD    | -0.3 to 12         | V    |
| DS terminal         | VDS    | VSS-0.3 to VDD+0.3 | V    |
| OUT terminal        | VOUT   | VSS-0.3 to VDD+0.3 | V    |
| Storage temperature | Tstg   | -55 to +125        | degC |

**Recommend operating conditions**

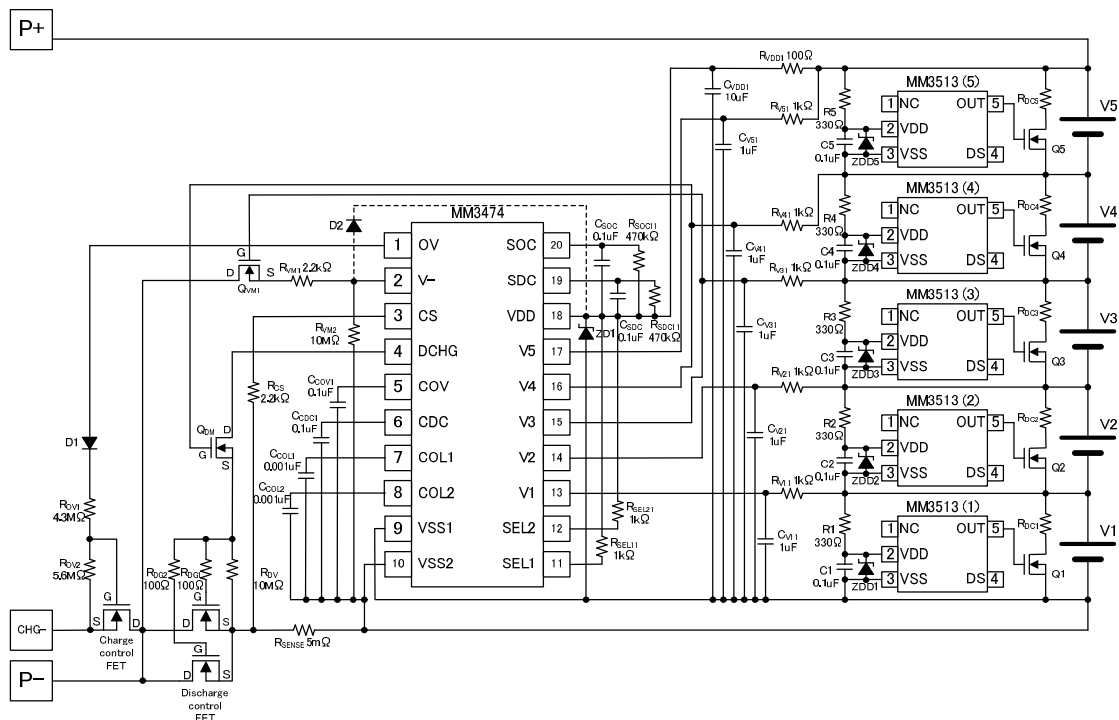
| Parameter                     | Symbol | Rating     | Unit |
|-------------------------------|--------|------------|------|
| Operating ambient temperature | Topr   | -40 to +85 | degC |
| Operating voltage             | Vop    | 1.5 to 5.5 | V    |

**Electrical characteristics**

| Parameter                        | Symbol | Conditions          | Min.      | Typ.   | Max.      | Unit |
|----------------------------------|--------|---------------------|-----------|--------|-----------|------|
| Input voltage and Output voltage |        |                     |           |        |           |      |
| Operating input voltage          | VDD1   | VDD-VSS             | 1.5       | -      | 5.5       | V    |
| Standby mode change voltage      | Vsta   |                     | 2.9       | 3.0    | 3.1       | V    |
| OUT pin Nch ON voltage           | Vol    | Iol=30uA, VDD=3.4V  | -         | 0.4    | 0.5       | V    |
| OUT pin Pch ON voltage           | Voh    | Ioh=-30uA, VDD=4.5V | 3.9       | 4.3    | -         | V    |
| Current consumption              |        |                     |           |        |           |      |
| Current consumption              | Idd    | VDD=3.4V            | -         | 1.5    | 3.0       | uA   |
| Current consumption at stand-by  | Is     | VDD=2.0V            | -         | 0.2    | 0.5       | uA   |
| Detection voltage                |        |                     |           |        |           |      |
| Detection voltage                | Vdet   | Ta=+25degC          | Typ-0.020 | Vdet1  | Typ+0.020 | V    |
|                                  |        | Ta=-5~+60drgC       | Typ-0.025 |        | Typ+0.025 |      |
| Detection delay time             |        |                     |           |        |           |      |
| Detection delay time             | tVdet  | VDD=3.4V→4.6V       | Typ*0.8   | tVdet1 | Typ*1.2   | s    |

## Typical application circuit

5cell typical application



## Application hints

- Resistors R1 to R5 and capacitors C1 to C5 stabilize a supply voltage ripple. However, if the resistors R1 to R5 are increased, the detection voltage raises due to through-current in the IC. Therefore, adjust the value to 1k ohm or less. Moreover, the capacitors C1 to C5 should be 0.01uF or more to ensure stable operation.
- For resistors RDC1 to RDC5, the value of bypass current is determined.

## Lineup

| Product name<br>(MM3513) | Detection voltage | Hysteresis voltage | Detection delay time | Release delay time |
|--------------------------|-------------------|--------------------|----------------------|--------------------|
|                          | V                 | V                  | sec                  | ms                 |
| A01NRH                   | 4.150             | 0.010              | 0.25                 | 8.0                |
| B01NRH                   | 3.750             | 0.010              | 0.25                 | 8.0                |
| C01NRH                   | 4.200             | 0.010              | 0.25                 | 8.0                |
| D01NRH                   | 3.600             | 0.010              | 0.25                 | 8.0                |
| D02NRH                   | 3.600             | 0.100              | 0.25                 | 8.0                |
| F01NRH                   | 3.650             | 0.010              | 0.25                 | 8.0                |
| H01NRH                   | 4.175             | 0.010              | 0.25                 | 8.0                |
| J01NRH                   | 3.475             | 0.010              | 0.25                 | 8.0                |
| K01NRH                   | 4.180             | 0.010              | 0.25                 | 4000.0             |
| L01NRH                   | 4.175             | 0.000              | 0.25                 | 4000.0             |
| R01NRH                   | 4.210             | 0.010              | 0.25                 | 8.0                |

## NOTES

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- No responsibility is assumed by us for any consequence resulting from any wrong or improper use or operation, etc. of this product.

### 【ATTENTION】

- This product is designed and manufactured with the intention of normal use in general electronics. No special circumstance as described below is considered for the use of it when it is designed. With this reason, any use and storage under the circumstances below may affect the performance of this product. Prior confirmation of performance and reliability is requested to customers.
  - Environment with strong static electricity or electromagnetic wave
  - Environment with high temperature or high humidity where dew condensation may occur
- This product is not designed to withstand radioactivity, and must avoid using in a radioactive environment.
- This specification is written in Japanese and English. The English text is faithfully translated into the Japanese. However, if any question arises, Japanese text shall prevail.