

# One-cell li-ion/li-polymer battery protection IC

## MM3511 Series

### Outline

MM3511 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, Topr=+25°C)

#### 1. Range and accuracy of detection/release voltage

|                                            |                            |                                                   |
|--------------------------------------------|----------------------------|---------------------------------------------------|
| ●Overcharge detection voltage              | 3.6V to 5.0V, 5mV steps    | Accuracy±20mV<br>Accuracy±25mV (Topr=-5 to +60°C) |
| ●Overcharge release voltage                | 3.6V to 4.5V, 50mV steps   | Accuracy±30mV                                     |
| ●Overdischarge detection voltage           | 2.0V to 3.0V, 50mV steps   | Accuracy±35mV                                     |
| ●Overdischarge release voltage             | 2.0V to 3.5V, 50mV steps   | Accuracy±100mV                                    |
| ●Discharging overcurrent detection voltage | +50mV to +300mV, 5mV steps | Accuracy±10mV                                     |
| ●Charging overcurrent detection voltage    | -300mV to -50mV, 5mV steps | Accuracy±20mV                                     |
| ●Short detection voltage                   | 0.5V fixed                 | Accuracy±100mV                                    |

#### 2. Range of detection delay time

|                                               |                                                    |
|-----------------------------------------------|----------------------------------------------------|
| ●Overcharge detection delay time              | Selection from 143ms, 573ms, 1.0s, 1.2s            |
| ●Overdischarge detection delay time           | Selection from 20ms, 38ms, 64ms, 75ms, 96ms, 150ms |
| ●Discharging overcurrent detection delay time | Selection from 4.5ms, 8ms, 9ms, 12ms, 18ms         |
| ●Charging overcurrent detection delay time    | Selection from 4.5ms, 6ms, 8ms, 9ms, 16ms          |
| ●Short detection delay time                   | Selection from 250μs, 300μs, 400μs                 |

#### 3. 0V battery charge function

Selection from "Prohibition" or "Permission"

#### 4. Low current consumption

|                |                        |
|----------------|------------------------|
| ●Normal mode   | Typ. 3.0μA, Max. 5.5μA |
| ●Stand-by mode | Max. 0.1μA             |

#### 5. Absolute maximum ratings

|                        |                      |
|------------------------|----------------------|
| ●VDD pin               | VSS-0.3V to +12V     |
| ●COUT pin and V- pin   | VDD-28V to VDD+0.3V  |
| ●DOUT pin              | VSS-0.3V to VDD+0.3V |
| ●Storage temperature   | -55°C to +125°C      |
| ●Operation temperature | -40°C to +85°C       |

### Pin Assignment

| Top view          |        | Pin No. | Function                                                |
|-------------------|--------|---------|---------------------------------------------------------|
| SSON-6A / SSON-6J | SON-6C |         |                                                         |
|                   |        | 1       | Delay shorten terminal                                  |
|                   |        | 2       | Output of overcharge detection (Output type is CMOS)    |
|                   |        | 3       | Output of overdischarge detection (Output type is CMOS) |
|                   |        | 4       | VSS terminal (Connected to ground)                      |
|                   |        | 5       | VDD terminal (Connected to IC substraat)                |
|                   |        | 6       | Input terminal connected to charger negative voltage    |

# Selection Guide

(SSON-6A, SSON-6J ... 3,000pcs/Reel)(SON-6C ... 5,000pcs/Reel)

| Product name | Package | Detection / Release voltage      |                                |                                    |                                   |                                               |                                            | 0V battery charge function | Delay time combination *1 |
|--------------|---------|----------------------------------|--------------------------------|------------------------------------|-----------------------------------|-----------------------------------------------|--------------------------------------------|----------------------------|---------------------------|
|              |         | Overcharge detection voltage [V] | Overcharge release voltage [V] | Overdischarge detection voltage[V] | Overdischarge release voltage [V] | Discharging overcurrent detection voltage [V] | Charging overcurrent detection voltage [V] |                            |                           |
|              |         | Vdet1                            | Vrel1                          | Vdet2                              | Vrel2                             | Vdet3                                         | Vdet4                                      |                            |                           |
| MM3511A16Y   | SON-6C  | 4.275                            | 4.175                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A26Y   | SON-6C  | 4.280                            | 4.080                          | 2.300                              | 2.300                             | 0.080                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A36Y   | SON-6C  | 4.280                            | 4.080                          | 2.300                              | 2.300                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A46Y   | SON-6C  | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.150                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A56Y   | SON-6C  | 4.280                            | 4.280                          | 2.800                              | 2.800                             | 0.050                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A66Y   | SON-6C  | 4.280                            | 4.280                          | 3.000                              | 3.000                             | 0.075                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A76Y   | SON-6C  | 4.275                            | 4.175                          | 2.300                              | 2.400                             | 0.050                                         | -0.100                                     | Permission                 | 1                         |
| MM3511A86Y   | SON-6C  | 4.300                            | 4.100                          | 2.300                              | 2.300                             | 0.130                                         | -0.100                                     | Permission                 | 1                         |
| MM3511AA6Y   | SON-6C  | 4.225                            | 4.025                          | 2.800                              | 2.800                             | 0.150                                         | -0.100                                     | Permission                 | 9                         |
| MM3511AB6Y   | SON-6C  | 4.225                            | 4.025                          | 3.000                              | 3.000                             | 0.060                                         | -0.060                                     | Permission                 | 9                         |
| MM3511B16Y   | SON-6C  | 3.900                            | 3.800                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511B26Y   | SON-6C  | 3.950                            | 3.850                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511B36Y   | SON-6C  | 4.000                            | 3.900                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511B46Y   | SON-6C  | 4.050                            | 3.950                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511B56Y   | SON-6C  | 4.100                            | 4.000                          | 2.300                              | 2.400                             | 0.100                                         | -0.100                                     | Permission                 | 1                         |
| MM3511C16Y   | SON-6C  | 4.280                            | 4.080                          | 2.300                              | 2.300                             | 0.100                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C26Y   | SON-6C  | 4.280                            | 4.080                          | 2.300                              | 2.300                             | 0.130                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C36Y   | SON-6C  | 4.280                            | 4.130                          | 2.600                              | 3.100                             | 0.150                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C46Y   | SON-6C  | 4.280                            | 4.130                          | 2.800                              | 3.100                             | 0.150                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C56Y   | SON-6C  | 4.200                            | 4.100                          | 2.800                              | 2.900                             | 0.150                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C66Y   | SON-6C  | 4.280                            | 4.130                          | 2.800                              | 3.100                             | 0.100                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C76Y   | SON-6C  | 4.280                            | 4.130                          | 2.800                              | 3.100                             | 0.050                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511C96Y   | SON-6C  | 4.280                            | 4.130                          | 2.800                              | 2.800                             | 0.150                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511CA6Y   | SON-6C  | 4.225                            | 4.025                          | 2.300                              | 2.300                             | 0.150                                         | -0.120                                     | Prohibition                | 1                         |
| MM3511CC6Y   | SON-6C  | 4.280                            | 4.130                          | 2.800                              | 3.100                             | 0.150                                         | -0.100                                     | Prohibition                | 1                         |
| MM3511E16Y   | SON-6C  | 4.325                            | 4.075                          | 2.500                              | 2.900                             | 0.150                                         | -0.100                                     | Permission                 | 2                         |
| MM3511G16Y   | SON-6C  | 4.350                            | 4.150                          | 2.300                              | 3.000                             | 0.200                                         | -0.100                                     | Permission                 | 3                         |
| MM3511H16Y   | SON-6C  | 4.280                            | 4.180                          | 2.300                              | 2.300                             | 0.120                                         | -0.100                                     | Permission                 | 4                         |
| MM3511H26Y   | SON-6C  | 4.275                            | 4.075                          | 2.800                              | 3.100                             | 0.100                                         | -0.100                                     | Permission                 | 4                         |
| MM3511H46Y   | SON-6C  | 4.275                            | 4.175                          | 2.400                              | 2.400                             | 0.120                                         | -0.100                                     | Permission                 | 4                         |
| MM3511H56Y   | SON-6C  | 4.280                            | 4.180                          | 2.300                              | 2.300                             | 0.090                                         | -0.075                                     | Permission                 | 4                         |
| MM3511K16Y   | SON-6C  | 4.275                            | 4.275                          | 2.300                              | 2.300                             | 0.100                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K26R   | SSON-6J | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.120                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K26Y   | SON-6C  | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.120                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K36R   | SSON-6A | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.130                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K36R   | SSON-6J | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.130                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K36Y   | SON-6C  | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.130                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K46R   | SSON-6J | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.150                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K46Y   | SON-6C  | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.150                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K56Y   | SON-6C  | 4.275                            | 4.275                          | 2.300                              | 2.300                             | 0.050                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K66R   | SSON-6J | 4.270                            | 4.070                          | 2.300                              | 2.300                             | 0.100                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K66Y   | SON-6C  | 4.270                            | 4.070                          | 2.300                              | 2.300                             | 0.100                                         | -0.100                                     | Permission                 | 5                         |
| MM3511K76Y   | SON-6C  | 4.275                            | 4.075                          | 2.300                              | 2.300                             | 0.130                                         | -0.130                                     | Permission                 | 5                         |
| MM3511K86R   | SSON-6J | 4.275                            | 4.075                          | 2.600                              | 2.600                             | 0.110                                         | -0.085                                     | Permission                 | 5                         |
| MM3511K86Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                              | 2.600                             | 0.110                                         | -0.085                                     | Permission                 | 5                         |
| MM3511K96Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                              | 2.600                             | 0.190                                         | -0.085                                     | Permission                 | 5                         |

• Any products mentioned in this catalog are subject to any modification in their appearance and others for improvements without prior notification.  
• The details listed here are not a guarantee of the individual products at the time of ordering. When using the products, you will be asked to check their specifications.

## Selection Guide

(SSON-6A, SSON-6J ... 3,000pcs/Reel)(SON-6C ... 5,000pcs/Reel)

| Product name | Package | Detection / Release voltage      |                                |                                     |                                   |                                               |                                            | 0V battery charge function | Delay time combination<br>*1 |
|--------------|---------|----------------------------------|--------------------------------|-------------------------------------|-----------------------------------|-----------------------------------------------|--------------------------------------------|----------------------------|------------------------------|
|              |         | Overcharge detection voltage [V] | Overcharge release voltage [V] | Overdischarge detection voltage [V] | Overdischarge release voltage [V] | Discharging overcurrent detection voltage [V] | Charging overcurrent detection voltage [V] |                            |                              |
|              |         | Vdet1                            | Vrel1                          | Vdet2                               | Vrel2                             | Vdet3                                         | Vdet4                                      |                            |                              |
| MM3511L16R   | SSON-6J | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.100                                         | -0.085                                     | Permission                 | 5                            |
| MM3511L16Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.100                                         | -0.085                                     | Permission                 | 5                            |
| MM3511L36R   | SSON-6J | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.180                                         | -0.120                                     | Permission                 | 5                            |
| MM3511L36Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.180                                         | -0.120                                     | Permission                 | 5                            |
| MM3511L56Y   | SON-6C  | 4.350                            | 4.150                          | 2.300                               | 2.300                             | 0.130                                         | -0.100                                     | Permission                 | 5                            |
| MM3511L66Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.150                                         | -0.100                                     | Permission                 | 5                            |
| MM3511L76Y   | SON-6C  | 4.275                            | 4.275                          | 2.300                               | 2.300                             | 0.125                                         | -0.100                                     | Permission                 | 5                            |
| MM3511L86Y   | SON-6C  | 4.275                            | 4.075                          | 2.600                               | 2.600                             | 0.100                                         | -0.080                                     | Prohibition                | 5                            |
| MM3511L96Y   | SON-6C  | 4.275                            | 4.275                          | 2.600                               | 2.600                             | 0.100                                         | -0.080                                     | Prohibition                | 5                            |
| MM3511LA6Y   | SON-6C  | 4.375                            | 4.375                          | 3.000                               | 3.000                             | 0.150                                         | -0.150                                     | Prohibition                | 5                            |
| MM3511M16RR  | SSON-6A | 4.275                            | 4.275                          | 2.500                               | 2.500                             | 0.160                                         | -0.100                                     | Prohibition                | 1                            |
| MM3511M16RL  | SSON-6A | 4.275                            | 4.275                          | 2.500                               | 2.500                             | 0.160                                         | -0.100                                     | Prohibition                | 1                            |
| MM3511M16YR  | SON-6C  | 4.275                            | 4.275                          | 2.500                               | 2.500                             | 0.160                                         | -0.100                                     | Prohibition                | 1                            |
| MM3511M16YL  | SON-6C  | 4.275                            | 4.275                          | 2.500                               | 2.500                             | 0.160                                         | -0.100                                     | Prohibition                | 1                            |
| MM3511N16Y   | SON-6C  | 4.280                            | 4.080                          | 2.400                               | 2.400                             | 0.050                                         | -0.100                                     | Prohibition                | 11                           |
| MM3511P16Y   | SON-6C  | 4.225                            | 4.125                          | 2.000                               | 2.000                             | 0.200                                         | -0.100                                     | Prohibition                | 7                            |
| MM3511W16Y   | SON-6C  | 4.225                            | 4.025                          | 2.500                               | 2.900                             | 0.150                                         | -0.150                                     | Permission                 | 8                            |
| MM3511W26Y   | SON-6C  | 4.375                            | 4.175                          | 2.400                               | 2.800                             | 0.145                                         | -0.145                                     | Permission                 | 6                            |
| MM3511WA6Y   | SON-6C  | 4.390                            | 4.190                          | 2.500                               | 2.500                             | 0.130                                         | -0.125                                     | Prohibition                | 10                           |
| MM3511WB6Y   | SON-6C  | 4.390                            | 4.190                          | 2.500                               | 2.500                             | 0.200                                         | -0.125                                     | Prohibition                | 10                           |

### \* Delay time combination

|                                                |        | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    |
|------------------------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Overcharge detection delay time                | tVdet1 | 1.2s  | 1.2s  | 143ms | 1.2s  | 1.2s  | 1.0s  | 573ms | 1.0s  | 1.2s  | 1.0s  | 1.2s  |
| Overdischarge detection delay time             | tVdet2 | 150ms | 150ms | 38ms  | 150ms | 38ms  | 20ms  | 150ms | 96ms  | 75ms  | 64ms  | 150ms |
| Discharging overcurrent detection delay time   | tVdet3 | 9ms   | 9ms   | 18ms  | 18ms  | 9ms   | 12ms  | 4.5ms | 12ms  | 9ms   | 8ms   | 4.5ms |
| Charging overcurrent detection delay time [ms] | tVdet4 | 9ms   | 9ms   | 9ms   | 9ms   | 9ms   | 16ms  | 4.5ms | 6ms   | 9ms   | 8ms   | 9ms   |
| Short detection delay time                     | tshort | 300us | 400us | 300us | 300us | 300us | 400us | 300us | 400us | 300us | 250us | 300us |

Please inquire to us, if you request a rank other than the above.