

# 1cell Li-ion/Li-polymer battery protection IC

## MM3722 Series

### Outline

MM3722 series are Li-ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). In the One-cell battery pack, on resistance of the FET SW has been used for over-current/short-current detection. MM3722 realize over-current/short-current protection with high accuracy and with no temperature dependence by using a chip resistor.

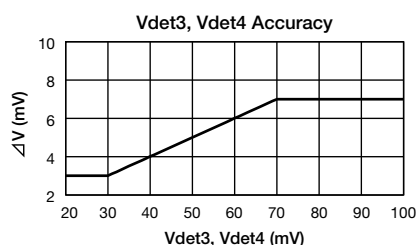
### Features

(Unless otherwise specified, Topr=+25°C)

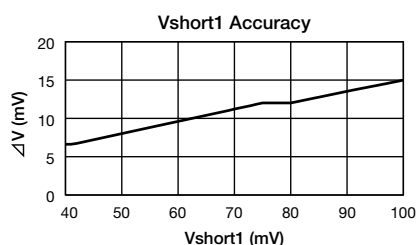
#### (1) Range and accuracy of detection voltage

|                                               |                               |                                                                                    |
|-----------------------------------------------|-------------------------------|------------------------------------------------------------------------------------|
| ●Overcharge detection voltage                 | 3.6V to 5.0V, 5mV step        | Accuracy±20mV<br>Accuracy±25mV (Topr=-20 to +60°C)                                 |
| ●Overcharge release voltage                   | Vdet1-0.2V to Vdet1, 5mV step | Accuracy±30mV                                                                      |
| ●Overdischarge detection voltage              | 2.0V to 3.0V, 50mV step       | Accuracy±35mV                                                                      |
| ●Overdischarge release voltage                | 2.0V to 3.0V, 50mV step       | Accuracy+65/-35mV (In case Vdet2=Vrel2)<br>Accuracy+90/-65mV (In case Vdet2≠Vrel2) |
| ●Discharging overcurrent detection voltage    | 20mV to 150mV, 1mV step       | Accuracy±Δ (Note1)                                                                 |
| ●Charging overcurrent detection voltage       | -150mV to -20mV, 1mV step     | Accuracy±Δ (Note1)                                                                 |
| ●Short detection voltage1                     | 40mV to 250mV, 1mV step       | Accuracy±Δ (Note2)                                                                 |
| ●Short detection voltage2                     | VDD-0.9V                      | Accuracy±300mV                                                                     |
| ●0V battery charge inhibition battery voltage | 1.3V to 1.8V / 0.1V step      | Accuracy±100mV                                                                     |
|                                               | 0.9V                          | Accuracy±300mV                                                                     |

Note1 : Current detection voltage Accuracy



Note2 : Short detection voltage1 Accuracy



#### (2) Delay time setting

|                                               |                |
|-----------------------------------------------|----------------|
| ●Overcharge detection delay time              | 256ms to 4.6s  |
| ●Overdischarge detection delay time           | 8ms to 256ms   |
| ●Discharging overcurrent detection delay time | 8ms to 256ms   |
| ●Charging overcurrent detection delay time    | 6ms to 64ms    |
| ●Short detection delay time                   | 250μs to 400μs |

#### (3) Current consumption

|                |                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------|
| ●Normal mode   | Typ. 3.0μA, Max. 6.0μA                                                                                                |
| ●Stand-by mode | Max. 0.1μA (In case Overdischarge latch function Enable)<br>Max. 0.6μA (In case Overdischarge latch function Disable) |

#### (4) 0V battery Charge function

Selectable "Permission" or "Inhibition"

#### (5) Absolute maximum ratings

|                        |                      |
|------------------------|----------------------|
| ●VDD pin               | VSS-0.3V to +12V     |
| ●COUT pin and V- pin   | VDD-28V to VDD+0.3V  |
| ●DOOUT pin and CS 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-6J  | SON-6C |         |                                              |
|          |        | 1       | Negative power supply voltage input terminal |
|          |        | 2       | Positive power supply voltage input terminal |
|          |        | 3       | Current detection terminal                   |
|          |        | 4       | Charger negative voltage input terminal      |
|          |        | 5       | Charge FET control terminal                  |
|          |        | 6       | Discharge FET control terminal               |

## Product Line up

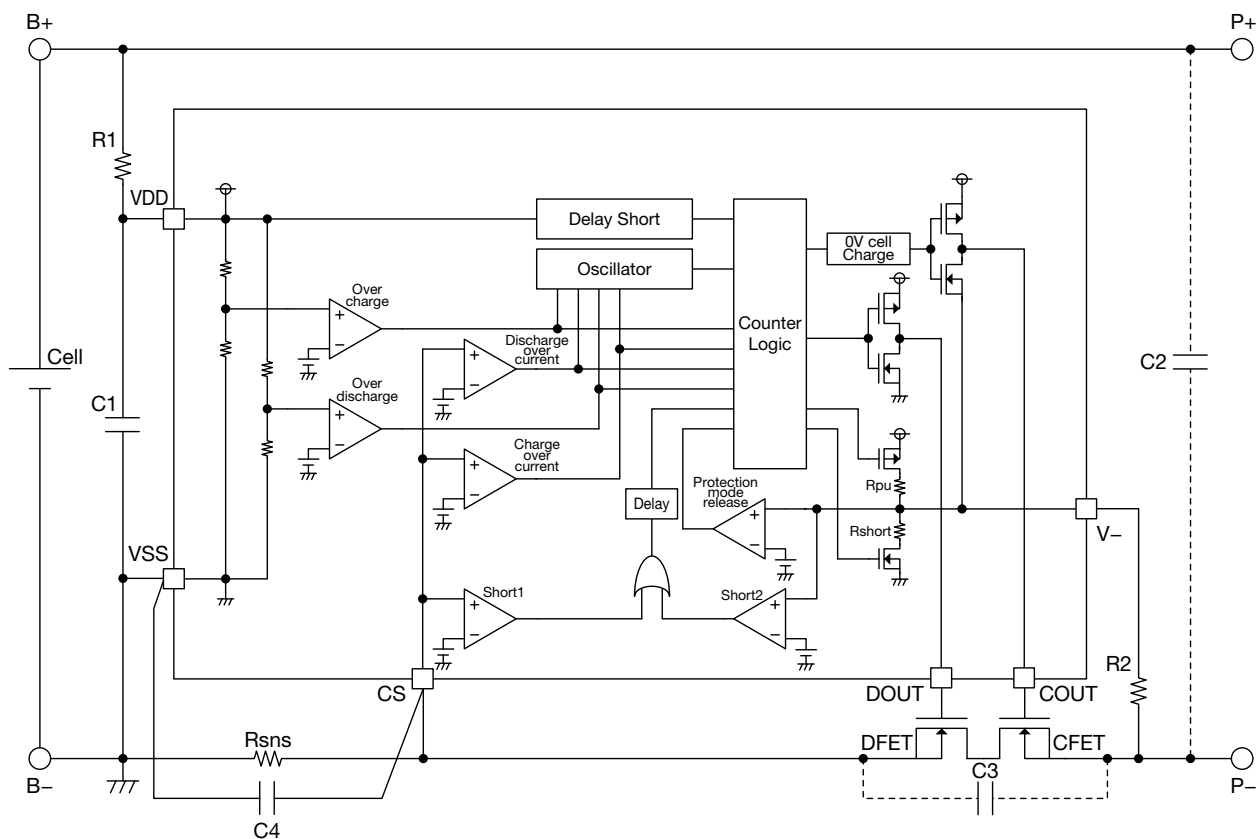
| Product name | Package | 0V charge prohibition voltage | Protection mode latch function |               |                       | Hys-Cancel |               | Discharging overcurrent release range extended function. | Overcharge detection voltage [V] | Overcharge detection voltage [V] | Overdischarge detection voltage [V] | Overdischarge detection voltage [V] | Discharging overcurrent detection voltage [V] | Charging overcurrent detection voltage [V] | Short detection voltage [V] | Delay time (Note2) |
|--------------|---------|-------------------------------|--------------------------------|---------------|-----------------------|------------|---------------|----------------------------------------------------------|----------------------------------|----------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------|--------------------------------------------|-----------------------------|--------------------|
|              |         |                               | Overcharge                     | Overdischarge | Discharge overcurrent | Overcharge | Overdischarge |                                                          | Vdet1                            | Vrel1                            | Vdet2                               | Vrel2                               | Vdet3                                         | Vdet4                                      | Vshort                      |                    |
|              |         |                               |                                |               |                       |            |               |                                                          | V                                | V                                | V                                   | V                                   | V                                             | V                                          | V                           |                    |
|              |         |                               |                                |               |                       |            |               |                                                          |                                  |                                  |                                     |                                     |                                               |                                            |                             |                    |
| MM3722AJ1YRE | SON-6C  | Permission                    | Disable                        | Disable       | Disable               | Enable     | Enable        | Yes (VDD-0.9V)                                           | 4.425                            | 4.225                            | 2.500                               | 2.900                               | 0.036                                         | -0.020                                     | 0.060                       | B                  |
| MM3722AJ4RRE | SSON-6J | Permission                    | Disable                        | Disable       | Disable               | Enable     | Enable        | Yes (VDD-0.9V)                                           | 4.470                            | 4.270                            | 2.500                               | 2.900                               | 0.049                                         | -0.031                                     | 0.160                       | C                  |
| MM3722AM1RRE | SSON-6J | 0.9                           | Disable                        | Disable       | Disable               | Enable     | Enable        | Yes (VDD-0.9V)                                           | 4.475                            | 4.275                            | 2.500                               | 2.900                               | 0.032                                         | -0.020                                     | 0.060                       | B                  |
| MM3722KF1RRE | SSON-6J | 0.9                           | Enable                         | Enable        | Disable               |            |               | Yes (1.0V)                                               | 4.280                            | 4.280                            | 2.400                               | 2.400                               | 0.032                                         | -0.030                                     | 0.180                       | A                  |
| MM3722KF2RRE | SSON-6J | 0.9                           | Enable                         | Enable        | Disable               |            |               | Yes (1.0V)                                               | 4.425                            | 4.425                            | 2.400                               | 2.400                               | 0.034                                         | -0.022                                     | 0.180                       | A                  |
| MM3722KF3RRE | SSON-6J | 0.9                           | Enable                         | Enable        | Disable               |            |               | Yes (1.0V)                                               | 4.425                            | 4.425                            | 2.800                               | 2.800                               | 0.040                                         | -0.030                                     | 0.180                       | A                  |
| MM3722KF4RRE | SSON-6J | 1.5                           | Enable                         | Enable        | Disable               |            |               | Yes (1.0V)                                               | 4.425                            | 4.425                            | 2.600                               | 2.600                               | 0.040                                         | -0.030                                     | 0.180                       | A                  |

Note2 : Delay time

|   | tVdet1 [s] | tVrel1 [ms] | tVdet2 [ms] | tVrel2 [ms] | tVdet3 [ms] | tVrel3 [ms] | tVdet4 [ms] | tVrel4 [ms] | tshort [μs] |
|---|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| A | 1.000      | 8.00        | 20.00       | 1.00        | 12.00       | 1.00        | 16.00       | 1.00        | 250         |
| B | 1.024      | 16.00       | 96.00       | 1.00        | 12.00       | 1.00        | 10.00       | 1.00        | 300         |
| C | 1.024      | 16.00       | 125.00      | 1.00        | 16.00       | 1.00        | 8.00        | 1.00        | 250         |

Please inquire to us, if you need another spec.

## Application Circuit



| Symbol       | Part        | Min.         | Typ.          | Max.         | Purpose                                      |
|--------------|-------------|--------------|---------------|--------------|----------------------------------------------|
| R1           | Resistor    |              | 100           | 1k $\Omega$  | For voltage fluctuation, For ESD             |
| C1           | Capacitor   | 0.01 $\mu$ F | 0.1 $\mu$ F   | 1.0 $\mu$ F  | For voltage fluctuation                      |
| R2           | Resistor    |              | 1.0k $\Omega$ | 10k $\Omega$ | Current limit for charger reverse connection |
| C2           | Capacitor   |              | 0.1 $\mu$ F   |              | For exogenous noise                          |
| C3           | Capacitor   |              | 0.1 $\mu$ F   |              | For exogenous noise                          |
| Rsns         | Resistor    |              |               | 20m $\Omega$ | Current detection resistance                 |
| C4           | Capacitor   |              | 0.1 $\mu$ F   |              | For exogenous noise                          |
| DFET<br>CFET | Nch MOS FET |              |               |              | Charge and discharge control                 |

This typical application circuit and constant value do not guarantee proper operation.  
 Please evaluate thoroughly by actual application to set up constants.