Protection for Lithium-Ion Batteries (for double protection)
Monolithic IC MM3284 Series

Outline

This IC is a double protection IC for lithium battery of 1-cell to 4-cell. It detects the battery voltage for every cell. It includes a timer, eliminating an external capacitor for overcharge detection delay that is used for our conventional ICs, which allows programmable detection delay time.

Features

1. Overcharge detection voltage 4.0~4.5V Accuracy ±30mV (−40~85°C)
2. Current consumption (V_{CELL}=3.5V) 2.5µA typ.
3. Current consumption (V_{CELL}=2.5V) 2.0µA typ.
4. Maximum rating 28V
5. Operating voltage range: 2~24V
6. No external capacitance required for delay time
   (Delay time is determined by the internal circuit, ranging from 1s to 12s upon request)

Packages

SOT-26A
SSON-6A

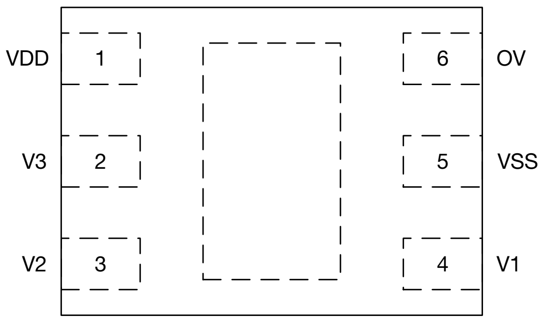
Applications

1. Laptop PCs
2. Battery powered device

Line-up

Model	Overcharge Detection Voltage	Overcharge Release Hysteresis Voltage	Overcharge Detection Dead Time
MM3284A	4.350±0.03V	200±60mV	1.2s typ.
MM3284B	4.350±0.03V	1000±300mV	1.2s typ.
MM3284C	4.350±0.03V	1000±300mV	10.0s typ.
MM3284E	4.450±0.03V	200±60mV	1.2s typ.
MM3284G	4.450±0.03V	1000±300mV	10.0s typ.
MM3284H	4.350±0.03V	1000±300mV	5.0s typ.
MM3284I	4.450±0.03V	1000±300mV	5.0s typ.
MM3284J	4.400±0.03V	1000±300mV	10.0s typ.

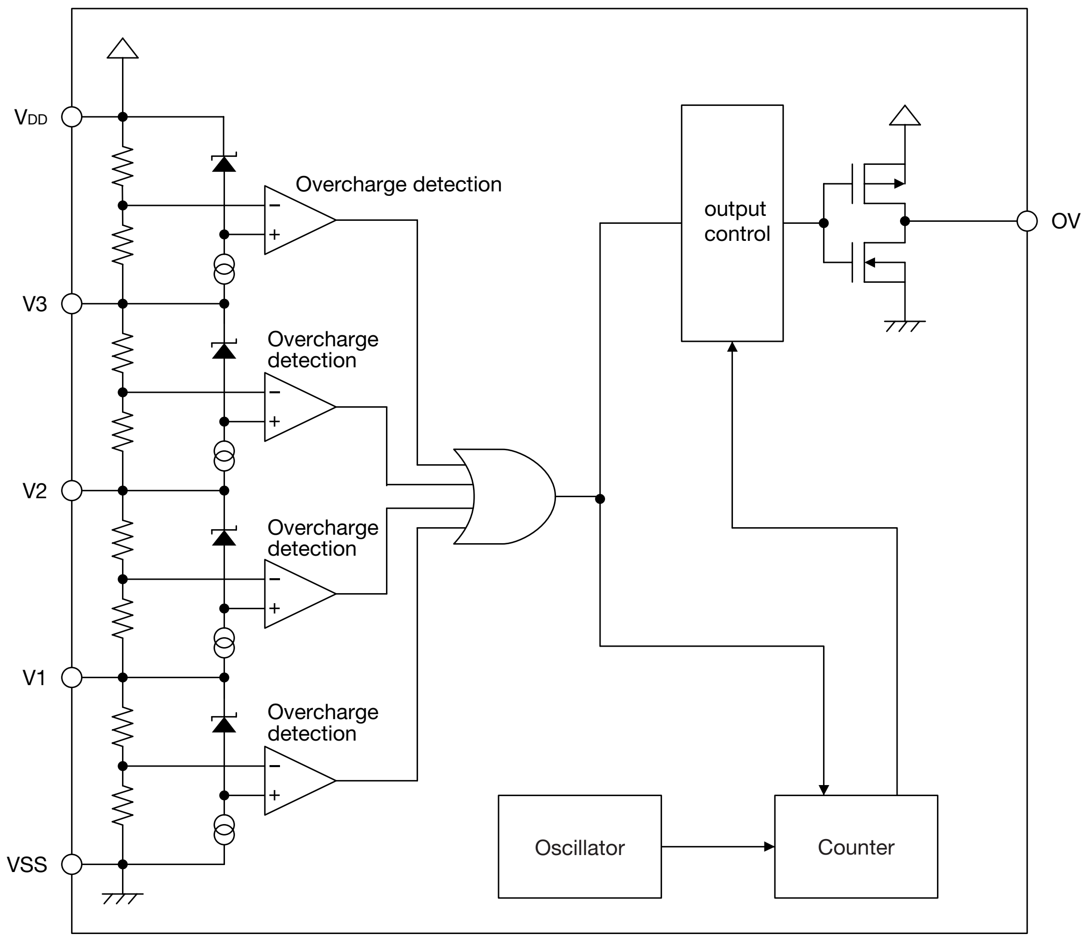
Pin Assignment



SSON-6A
(TOP VIEW)

1	VDD
2	V3
3	V2
4	V1
5	VSS
6	OV

Block Diagram



Pin Description

Pin No.	Pin name	Input/Output	Functions
1	VDD	INPUT	The input terminal of the power supply for IC and of the positive voltage for V4 cell.
2	V3	INPUT	The input terminal of the positive voltage for V3 cell and of the negative voltage for V4 cell.
3	V2	INPUT	The input terminal of the positive voltage for V2 cell and of the negative voltage for V3 cell.
4	V1	INPUT	The input terminal of the positive voltage for V1 cell and of the negative voltage for V2 cell.
5	VSS	INPUT	The input terminal of the ground of IC and of the negative voltage for V1 cell.
6	OV	OUTPUT	The output terminal of over-charge detection. Output type is CMOS. · Normal mode : "Low" · Overcharge mode : "High"

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Unit
Storage temperature range	T_{STG}	–5~+125	°C
Operating temperature range	T_{OPR}	–40~+110	°C
Supply voltage	$V_{DDmax.}$	VSS–0.3~VSS+28	V
OV pin input voltage	$V_{Omax.}$	VSS–0.3~VDD+0.3	V
Allowable loss	Pd	150	mW

Recommended Operating Conditions (Ta=25°C)

Item	Symbol	Ratings	Unit
Operating temperature range	T_{OPR}	–40~+110	°C
Operating voltage range	V_{OPR}	VSS+2.0~VSS+24	V

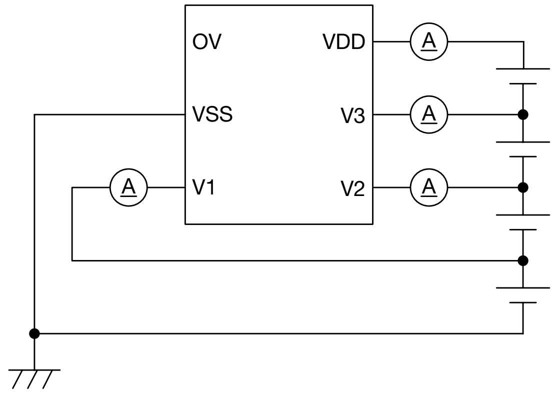
Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{CELL}=3.5V)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit	Measuring Circuit
Consumption current 1	I_{DD1}	V_{CELL}=3.5V, I_{OUT}=0mA		2.5	5	μA	A
Consumption current 2	I_{DD2}	V_{CELL}=2.3V, I_{OUT}=0mA		2	4	μA	A
V3 pin input current	I_{V3}	V_{CELL}=3.5V	–300		300	nA	A
V2 pin input current	I_{V2}	V_{CELL}=3.5V	–300		300	nA	A
V1 pin input current	I_{V1}	V_{CELL}=3.5V	–300		300	nA	A
Overcharge detection voltage	$V_{CELL}U$	Ta=0~+50°C ⋆1 V_{CELL}=3.5V→4.5V	4.320	4.350	4.380	V	B
Overcharge detection voltage	$V_{CELL}U$	Ta=–40~+85°C ⋆1 V_{CELL}=3.5V→4.5V	4.300	4.350	4.400	V	B
Overcharge detection voltage	$V_{CELL}U$	Ta=–40~+110°C ⋆1 V_{CELL}=3.5V→4.5V	4.270	4.350	4.430	V	B
Overcharge release voltage	$V_{CELL}O$	V_{CELL}=4.5V→3.5V	$V_{CELL}U$ 1.2V	$V_{CELL}U$ 1.0V	$V_{CELL}U$ 0.8V	V	B
Overcharge detection dead time	t_{OV}	V_{CELL}=3.5V→4.5V	7.0	10.0	13.0	s	B
OV pin source current	$I_{SO}O_V$	V_{CELL}>$V_{CELL}U$ V_{OV}=V_{IN}–0.5V	20			μA	C
OV pin sink current	$I_{SI}O_V$	V_{OV}=0.5V Ta=–40~110°C ⋆1	20			μA	C
OV pin output voltage H	$V_{TH}O_VH$	V_{CELL}>$V_{CELL}U$ V_{IN}–V_{OV} I_{SO}=20μA			0.5	V	D
OV pin output voltage L	$V_{TH}O_VL$	V_{OV}–V_{SS} I_{SO}=–20μA Ta=–40~110°C ⋆1			0.5	V	D
Voltage of delay time shortening	V_{DS}	V_{CELL}=6V→8V	6.0	7.0	8.0	V	B

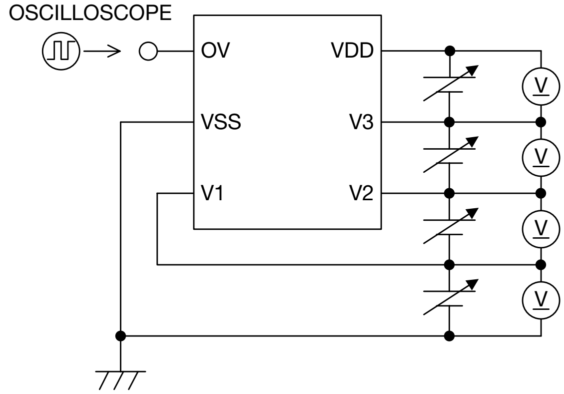
Note1: ⋆1 Guaranteed value

Measuring Circuit

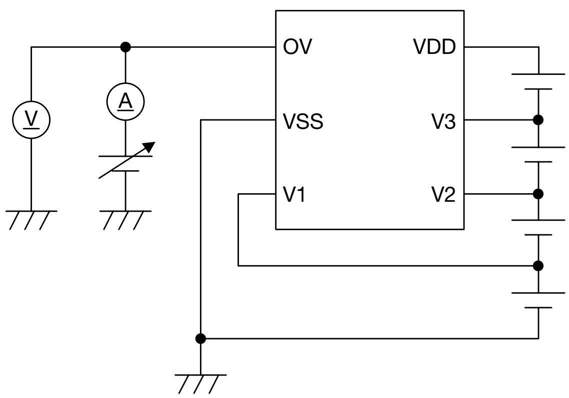
A.



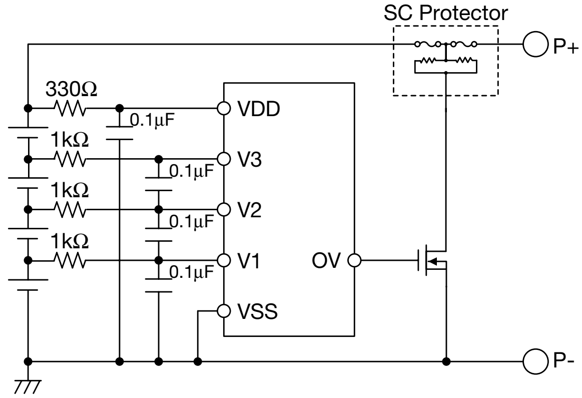
B.



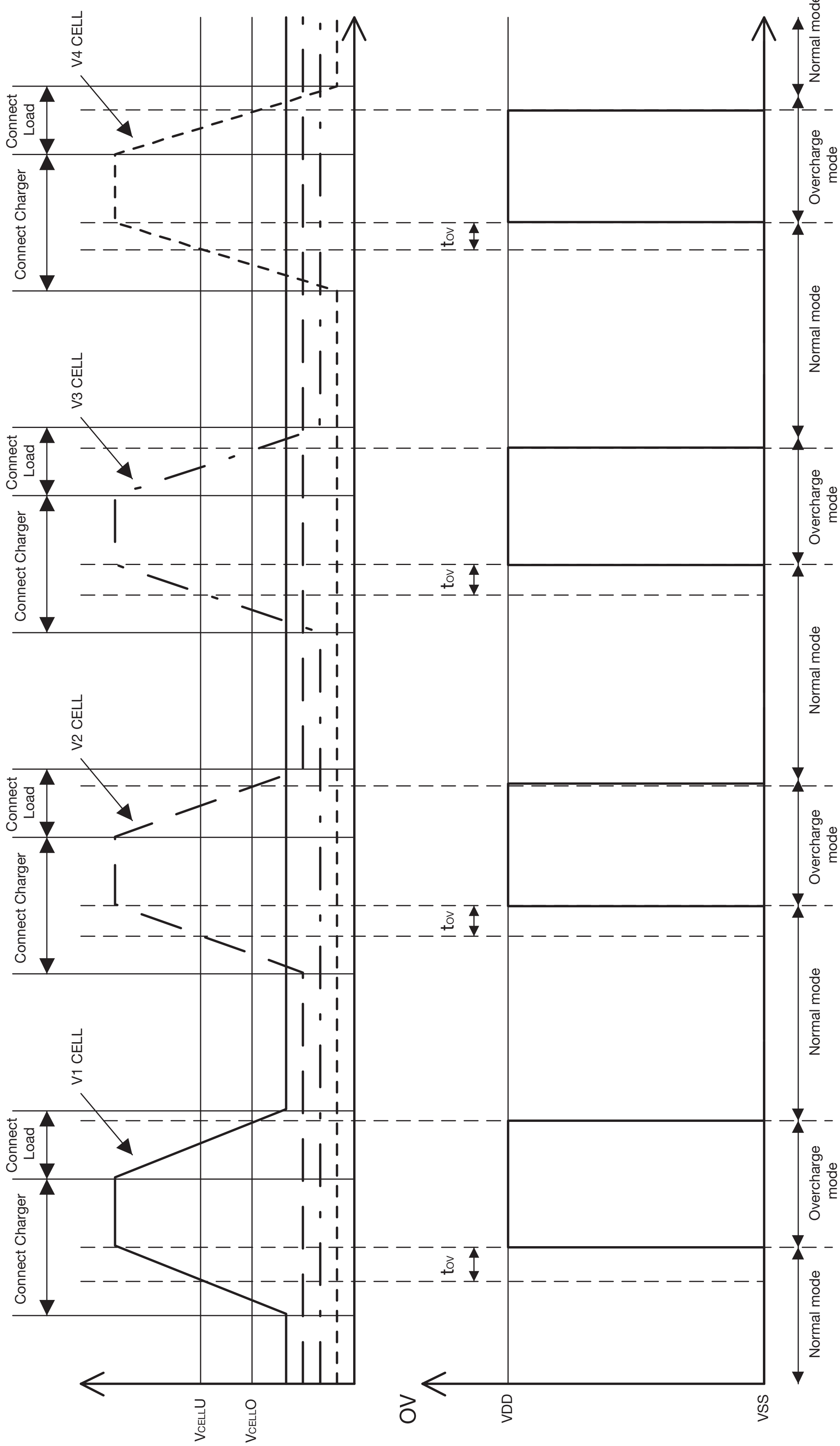
C.



D.

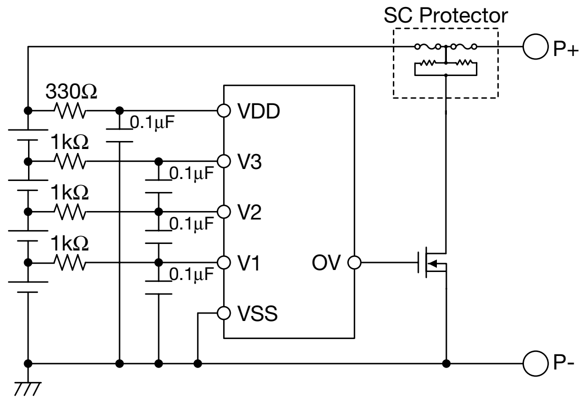


Timing Chart

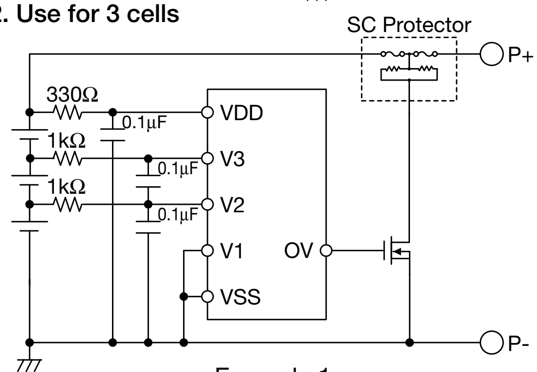


Application Circuit

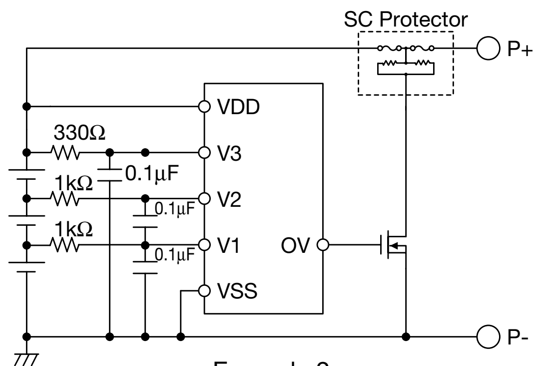
1. Use for 4 cells



2. Use for 3 cells

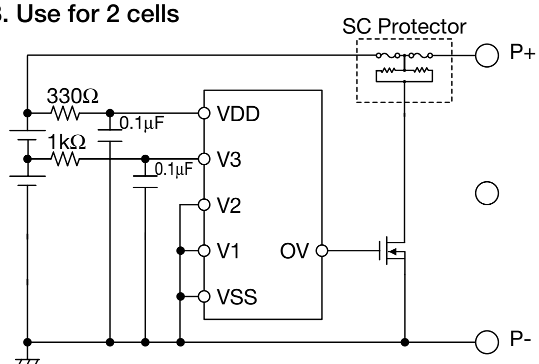


Example 1

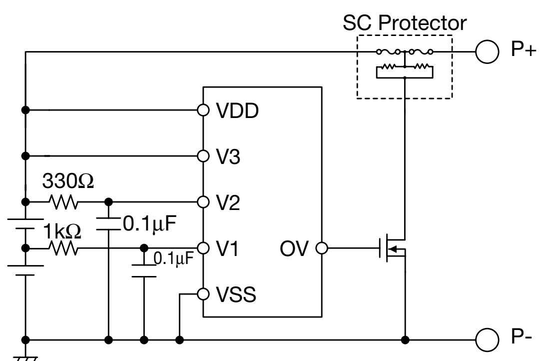


Example 2

3. Use for 2 cells

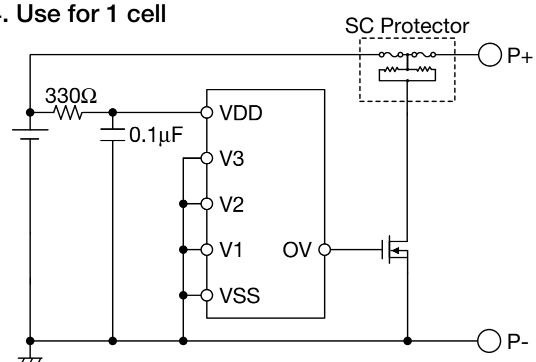


Example 1

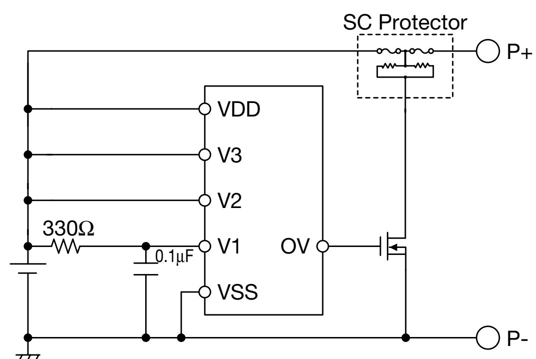


Example 2

4. Use for 1 cell



Example 1



Example 2

When the battery is connected, 0V and VSS are short-circuited by the jumper, and we recommend the method of removing the jumper that is short-circuited of 0V and VSS when the connection of all cells is completed.

* The fixed number is reference value.