

# Lithium-Ion Battery Charge Control (1~3-serial cells) Monolithic IC MM1332

## Outline

This IC is a high-precision constant-voltage/constant-current power control IC for lithium-ion battery charge using a p-MOSFET as a power driver. It was developed for use with 1 to 3-cell chargers, and a constant current value can be set freely with an external resistor. It has a built-in amplifier for detecting low battery voltage. The lithium-ion battery charge function can be added to conventional chargers by using this IC.

## Series Table

Temperature conditions A: Ta=-25~75°C, B: Ta=-20~70°C, C: Ta=0~50°C, D: Ta=0~40°C

	Package				Output voltage (V)	Output voltage temperature conditions	Full charge detection voltage (mV)	Over voltage detection voltage (v)	Remarks *
	SOP-8C, 8E	VSOP-8A, 8B	TSOP-16A	TSOP-24A					
MM1332	AF				4.100±0.050	B			1cell
	BF				8.200±0.100	B			2cell
	CF				12.300±0.150	B			3cell
	DF				4.200±0.050	B			1cell
	EF				8.400±0.100	B			2cell
	FF				12.600±0.150	B			3cell
	GF				Variable				

## Features

- |  |   |
|--|---|
| 1. Output voltage (Ta=-20°C+~70°C)     | 3-Cell : 12.3V/12.6V±150mV<br>2-Cell : 8.2V/8.4V±100mV<br>1-Cell : 4.1V/4.2V±50mV |
| 2. Current consumption                 | 250µA typ.  |
| 3. Constant current output             | Set by external resistance  |
| Current limit (reference voltage)      | 0.1V=external resistance×current value  |
| 4. Low voltage detection function (LV) | 2.0V/cell   |

## Packages

SOP-8C, SOP-8E (MM1332□F)

\*The box represents the output (charge) voltage rank.

## Applications

1. For lithium-ion battery charge
2. High-precision output stabilized power supplies for various equipment

**Absolute Maximum Ratings** (Ta=25°C)

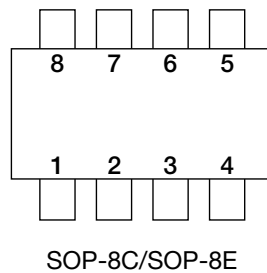
Item	Symbol	Rating	Units
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Operating temperature	T <sub>OPR</sub>	-20~+70	°C
Power supply voltage	V <sub>CC</sub> max.	-0.3~+18	V
Output voltage	V <sub>O</sub> max.	-0.3~V <sub>CC</sub>	V
SW input voltage	V <sub>SW</sub>	-0.3~V <sub>CC</sub> +0.3	V
Allowable power dissipation	P <sub>d</sub>	300	mW

**Electrical Characteristics** (Unless otherwise specified Ta=25°C, V<sub>CC</sub>=5V/CEL)

Item	Symbol	Measurement Conditions	Min	Typ.	Max.	Units
Operating power supply voltage range	V <sub>CC</sub>	Minimum value is during constant-current control	2.5	5	17.0	V
Current consumption 1	I <sub>CC1</sub>	V <sub>SW1</sub> =V <sub>SW2</sub> =OV (Charge : ON)		250		μA
Current consumption 2	I <sub>CC2</sub>	V <sub>SW1</sub> =V <sub>SW2</sub> =V <sub>CC</sub> (Charge : OFF)		2		μA
Output voltage	V <sub>O</sub>	Ta=-20~+70°C, MM1332A, B, C	4.05	4.10	4.15	V/sell
		Ta=-20~+70°C, MM1332D, E, F	4.15	4.20	4.25	
Current limits	V <sub>CL</sub>		90	100	110	mV
CEL-CS resistance	R <sub>CEL</sub>	MM1332A, B, C		820		kΩ/sell
		MM1332D, E, F		840		
SW1 input current	I <sub>SW1</sub>			20		μA
SW1 input voltage	V <sub>L1</sub>	Charge : ON	-0.3		2.0	V
	V <sub>H1</sub>	Charge : OFF	V <sub>CC</sub> -1.0		V <sub>CC</sub> +0.3	V
Low-voltage detection voltage	L <sub>V</sub>	A~F Rank	1.90	2.00	2.10	V/sell
		G Rank	2.00	2.15	2.30	
SW2 input current	I <sub>SW2</sub>			20		μA
SW2 input voltage	V <sub>L2</sub>	Low-voltage detection circuit : ON	-0.3		2.0	V
	V <sub>H2</sub>	Low-voltage detection circuit : OFF	V <sub>CC</sub> -1.0		V <sub>CC</sub> +0.3	V
Low voltage detection output leak current	I <sub>LV</sub>				0.2	μA
Low voltage detection output saturation voltage	V <sub>LV</sub>	I <sub>SINK</sub> =1mA		0.2	0.4	V

- \* : MM1332 A : Output voltage 4.1V — for 1cell
- B : Output voltage 8.2V — for 2cell
- C : Output voltage 12.3V — for 3cell
- D : Output voltage 4.2V — for 1cell
- E : Output voltage 4.4V — for 2cell
- F : Output voltage 12.6V— for 3cell
- G : Output voltage available

## Pin Assignment Description



## Pin Description

Pin No.	Name	I/O	Description
1	SW1	Input	Charging ON/OFF control input pin. SW1=V <sub>CC</sub> : OFF, SW1=GND : ON Goes OFF when open as it is pulled up to V <sub>CC</sub> .
2	SW2	Input	Low voltage detection circuit ON/OFF control input pin. SW2=V <sub>CC</sub> : OFF, SW2=GND : ON Goes OFF when open as it is pulled up to V <sub>CC</sub> .
3	LV	Output	Low voltage detection circuit output pin. NPN-Tr open collector output; goes ON (low level) for low voltage.
4	GND		GND pin.
5	CS	Input	Current detection pin. Detects current when external resistor voltage drops and controls current. Reference voltage 0.1V=external resistance × current value
6	CEL	Input	Battery voltage input pin ★ Six types depending on rank : 4.1V, 8.2V, 12.3V, 4.2V, 8.4V, 12.6V, (TYP.)
7	EXT	Output	Constant voltage circuit output pin. Controls external P-MOS FET gate and charges constant voltage.
8	V <sub>CC</sub>		Power supply input pin.

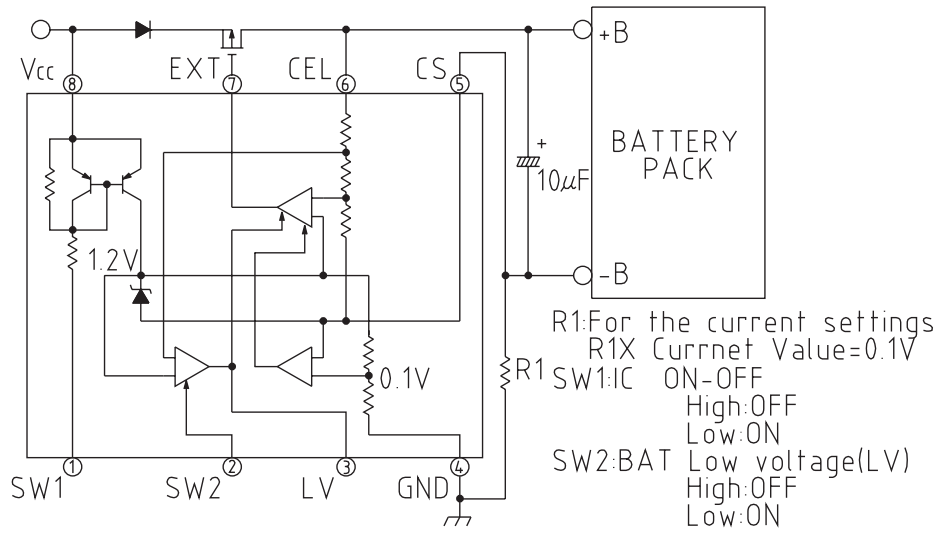
\*G : Constant voltage circuit input pin

External resistance ratio (R1 : R2) enables setting constant voltage circuit output voltage.

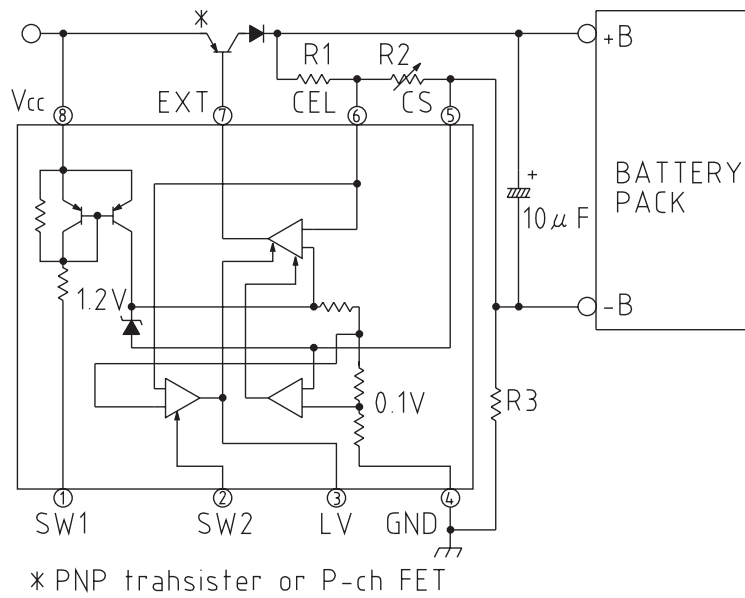
Low voltage detection voltage is set for one cell (4.1V or 4.2V).

Block Diagram

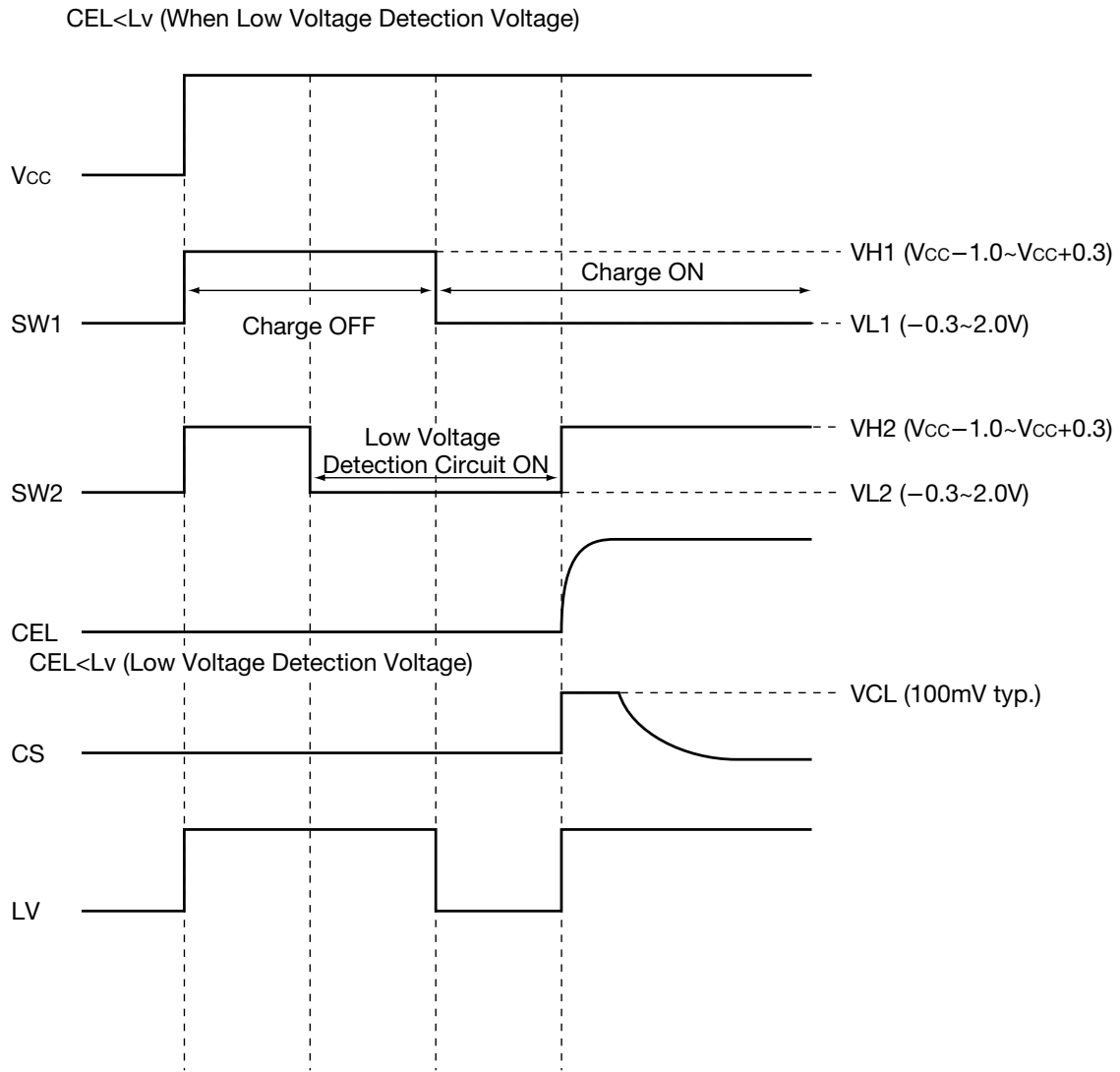
MM1332A, B, C, D, E, F,



MM1332G



Timing Chart



With LV pulled up to Vcc by a resistance