

One-cell lithium-ion/lithium-polymer battery protection IC MM3280 Series

Outline

MM3280 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, short, charging overcurrent (optional), and over voltage charger (optional) 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, $T_{opr}=+25^{\circ}\text{C}$)

1. Range and accuracy of detection/release voltage

● Overcharge detection voltage	3.6V to 5.0V, 5mV steps	Accuracy \pm 20mV Accuracy \pm 25mV ($T_{opr}=-5$ to $+60^{\circ}\text{C}$)
● Overcharge release voltage	3.6V to 4.5V, 50mV steps	Accuracy \pm 30mV
● Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy \pm 35mV
● Overdischarge release voltage	2.0V to 3.5V, 50mV steps	Accuracy \pm 100mV
● Discharging overcurrent detection voltage	+50mV to +300mV, 5mV steps	Accuracy \pm 10mV
● Charging overcurrent detection voltage *	-300mV to -50mV, 5mV steps	Accuracy \pm 20mV
● Short detection voltage	Selection from 0.7V, 0.8V, 0.9V	Accuracy \pm 100mV
● Over voltage charger detection voltage *	VDD-8.0V fixed	Accuracy \pm 2.0V
● Over voltage charger release voltage *	VDD-7.3V fixed	Accuracy \pm 2.0V

2. Range of detection delay time

● Overcharge detection delay time	Selection from 0.25s, 1.0s, 1.2s, 4.5s
● Overdischarge detection delay time	Selection from 20ms, 24ms, 96ms, 125ms, 128ms, 144ms
● Discharging overcurrent detection delay time	Selection from 8ms, 12ms, 16ms, 20ms, 24ms, 48ms, 96ms, 160ms
● Charging overcurrent detection delay time	Selection from 4ms, 6ms, 8ms, 10ms, 12ms, 16ms, 96ms
● Short detection delay time	Selection from 200 μ s, 300 μ s, 400 μ s

3. 0V battery charge function

Selection from "Prohibition" or "Permission"

4. The overcharge detection delay timer reset time function (function for the pulse charge) is provided. *

5. Low current consumption

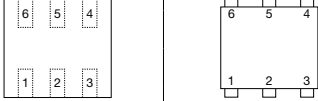
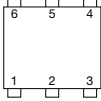
● Normal mode	Typ. 3.0 μ A, Max. 6.0 μ A
● Stand-by mode	Max. 0.1 μ A (For "Charger connection release" the overdischarge release condition.) Max. 0.5 μ A (For "Voltage release" the overdischarge release condition.)

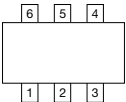
6. Absolute maximum ratings

● 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 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$
● Operation temperature	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

*Optional function

Pin Assignment

Top view		Pin No.				Symbol	Function
SSON-6E/6J/6M/6K	SON-6C	Ver1	Ver2	Ver3	Ver4		
		1	6	2	6	V-	Input terminal connected to charger negative voltage.
		2	1	1	2	COUT	Output of overcharge detection.
		3	3	3	3	DOUT	Output of overdischarge detection.
		4	4	4	4	VSS	VSS terminal. Connected to ground.
		5	5	5	5	VDD	VDD terminal. Connected to IC substrate.
		6	2	6	1	DS/NC	Delay shorten terminal.

Top view	Pin No.	Symbol	Function
SOT-26A/26B			
	1	DOUT	Output of overdischarge detection.
	2	V-	Input terminal connected to charger negative voltage.
	3	COUT	Output of overcharge detection.
	4	DS	Delay shorten terminal.
	5	VDD	VDD terminal. Connected to IC substrate.
	6	VSS	VSS terminal. Connected to ground.

Selection Guide

(SOT26A/SOT-26B, SSON-6E, SSON-6J, SSON-6K ... 3,000pcs/Reel)(SON-6C ... 5,000pcs/Reel)

Product name	Package	Pin No.	Model No.	Optional function				Detection / Release voltage							Detection delay time				
				0V battery charge function	Charging overcurrent detection	Over voltage charger detection	Overcharge detection delay timer reset time	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time
		V	V	V	V	V	V	V	V	V	s	ms	ms	ms	us				
MM3280A01RRE	SSON6J	1	A1	○	○	○	○	4.300	4.100	2.300	2.300	0.105	-0.100	0.9	4.500	125	12	16	400
MM3280A01YRE	SON6C	1	A1	○	○	○	○	4.300	4.100	2.300	2.300	0.105	-0.100	0.9	4.500	125	12	16	400
MM3280B04RRE	SSON6J	2	B4	×	○	○	○	4.445	4.245	2.300	2.300	0.060	-0.070	0.9	4.500	96	12	8	400
MM3280B05RRE	SSON6J	2	B5	×	○	○	○	4.445	4.245	2.300	2.300	0.050	-0.070	0.3	4.500	96	160	8	400
MM3280B07RRE	SSON6J	2	BA	×	○	○	○	4.445	4.245	2.300	2.300	0.055	-0.060	0.3	1.000	96	12	10	300
MM3280C01RRE	SSON6K	3	C1	○	○	○	×	4.225	4.025	2.800	2.800	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C01NRH	SOT26A/B	3	81C	○	○	○	×	4.225	4.025	2.800	2.800	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C04RRE	SSON6K	3	C4	○	○	○	×	4.275	4.175	2.300	2.300	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C05RRE	SSON6K	3	C5	○	○	○	×	4.375	4.275	2.300	2.300	0.200	-0.150	0.9	1.000	96	12	6	400
MM3280D01NRH	SOT25A	-	80D	○	○	×	×	4.275	4.075	2.800	3.100	0.100	-0.100	0.9	0.250	144	16	8	400
MM3280E01YRE	SON6C	1	E1	○	○	×	×	4.275	4.275	2.300	2.300	0.100	-0.100	0.9	1.000	20	6	8	400
MM3280EA1YRE	SON6C	4	GR	○	○	×	×	4.275	4.075	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA2RRE	SSON6J	4	7R	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA3YRE	SON6C	4	GS	○	○	×	×	4.415	4.215	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EA4YRE	SON6C	4	GV	○	○	×	×	4.425	4.225	3.000	3.200	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA5YRE	SON6C	4	GX	○	○	×	×	4.425	4.225	2.800	3.000	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA6YRE	SON6C	4	GY	○	○	×	×	4.420	4.220	2.500	2.900	0.050	-0.040	0.3	1.024	64	12	8	300
MM3280EA9YRE	SON-6C	4	KC	○	○	×	×	4.425	4.225	2.500	2.800	0.130	-0.100	0.5	1.024	32	8	8	250
MM3280EAAYRE	SON-6C	4	KH	○	○	×	×	4.425	4.225	2.500	2.900	0.200	-0.150	0.5	1.024	96	12	10	300
MM3280EAFYRE	SON-6C	4	KP	○	○	×	×	4.475	4.275	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EAGYRE	SON-6C	4	KR	○	○	×	×	4.475	4.275	2.500	2.900	0.080	-0.080	0.3	1.024	96	12	8	300
MM3280EAHYRE	SON-6C	4	KS	○	○	×	×	4.475	4.275	2.500	2.900	0.050	-0.050	0.3	1.024	96	12	8	300
MM3280EB1RRE	SSON6J	4	7S	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EB2YRE	SON6C	4	GT	×	○	×	×	4.415	4.215	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EB3YRE	SON6C	4	GU	×	○	×	×	4.450	4.250	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EB4YRE	SON6C	4	GZ	×	○	×	×	4.420	4.220	2.500	2.900	0.050	-0.040	0.3	1.024	64	12	8	300
MM3280EB5YRE	SON6C	4	GP	×	○	×	×	4.475	4.275	2.500	2.900	0.130	-0.100	0.3	1.024	96	12	8	300
MM3280EB6YRE	SON6C	4	GK	×	○	×	×	4.475	4.275	2.500	2.900	0.150	-0.125	0.4	1.024	64	8	8	250
MM3280EG1RRE	SSON6J	4	7T	×	○	×	×	4.475	4.375	2.000	2.000	0.075	-0.075	0.5	0.576	144	4.25	4	300
MM3280F02RRE	SSON6J	1	F2	○	×	○	×	4.300	4.100	2.300	2.300	0.130	-	0.9	1.000	24	12	-	400
MM3280G01RRE	SSON6J	1	G1	×	×	○	×	4.280	4.100	2.300	2.300	0.050	-	0.9	1.000	24	12	-	400
MM3280G02RRE	SSON6J	1	G2	×	×	○	×	4.280	4.100	2.800	2.800	0.050	-	0.9	1.000	24	12	-	400
MM3280H01NRH	SOT26A/B	-	81H	○	×	○	×	4.275	4.175	3.000	3.200	0.150	-	0.9	1.000	125	12	-	400
MM3280H02NRH	SOT26A/B	-	82H	○	×	○	×	4.280	4.100	2.300	2.500	0.150	-	0.9	1.000	24	12	-	400
MM3280H03NRH	SOT26A/B	-	83H	○	×	○	×	4.215	4.115	2.800	2.900	0.150	-	0.9	1.000	24	12	-	400
MM3280H04NRH	SOT26A/B	-	84H	○	×	○	×	3.800	3.600	2.300	2.500	0.100	-	0.9	1.000	125	12	-	400
MM3280I01NRH	SOT26A/B	-	81I	○	×	○	×	4.250	4.050	2.500	3.000	0.150	-	0.9	1.000	24	12	-	400
MM3280I02NRH	SOT26A/B	-	82I	○	×	○	×	4.250	4.050	2.500	3.000	0.100	-	0.9	1.000	24	12	-	400
MM3280J01NRH	SOT26A/B	-	81J	○	○	×	×	4.250	4.050	2.500	3.000	0.200	-0.100	0.8	1.000	20	12	8	300
MM3280J03NRH	SOT26A/B	-	83J	○	○	×	×	3.800	3.600	2.000	2.380	0.100	-0.100	0.8	1.000	96	20	12	300
MM3280J04NRH	SOT26A/B	-	84J	○	○	×	×	4.275	4.215	3.000	3.200	0.150	-0.100	0.8	1.000	96	20	12	300
MM3280J05NRH	SOT26A/B	-	85J	○	○	×	×	4.250	4.190	2.800	3.000	0.150	-0.100	0.8	1.000	96	20	12	300
MM3280J07NRH	SOT26A/B	-	87J	○	○	×	×	4.250	4.190	2.500	3.000	0.100	-0.100	0.7	1.000	96	20	12	300
MM3280J12NRH	SOT26A/B	-	8CJ	○	○	×	×	4.280	4.100	2.300	2.500	0.200	-0.200	0.8	1.000	20	12	8	300
MM3280J16NRH	SOT26A/B	-	8EJ	○	○	×	×	4.280	4.230	2.500	3.000	0.100	-0.100	0.7	1.000	96	20	12	300
MM3280JA1YRE	SON6C	4	J1	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JB1NRH	SOT26A/B	-	8B1	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JB2NRH	SOT26A/B	-	8B2	○	○	×	×	4.350	4.150	2.500	2.900	0.200	-0.100	0.7	1.000	96	12	10	300
MM3280JB3NRH	SOT26A/B	-	8B3	○	○	×	×	4.375	4.275	2.800	3.000	0.170	-0.150	0.7	1.000	96	12	10	300
MM3280JB5NRH	SOT26A/B	-	8B5	○	○	×	×	4.400	4.300	2.800	3.000	0.150	-0.150	0.7	1.000	96	12	10	300
MM3280JB7NRH	SOT26A/B	-	8B7	○	○	×	×	4.425	4.225	2.500	2.900	0.160	-0.160	0.7	1.000	96	12	10	300
MM3280JC1YRE	SON6C	4	JC	○	○	×	×	4.380	4.180	2.600	3.000	0.180	-0.130	0.9	1.000	96	12	10	300
MM3280JC2YRE	SON6C	4	C2	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JD2YRE	SON6C	4	DB	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JD4YRE	SON6C	4	DD	×	○	×	×	4.425	4.225	2.300	2.650	0.170	-0.130	0.7	1.000	96	12	10	300
MM3280JF1YRE	SON6C	4	AF	○	○	×	×	4.425	4.225	2.500	2.500	0.100	-0.100	0.5	1.000	96	12	10	300
MM3280JF2YRE	SON6C	4	BF	○	○	×	×	4.425	4.225	2.500	2.500	0.150	-0.100	0.5	1.000	96	12	10	300
MM3280JF3NRH	SOT-25A	-	80J	○	○	×	×	4.280	4.080	2.800	2.800	0.150	-0.100	0.5	0.250	144	18	10	300
MM3280JH1YRE	SON6C	4	AH	○	○	×	×	4.415	4.215	2.500	2.900	0.045	-0.045	0.3	1.000	96	12	10	300
MM3280JH1RRE	SSON6J	4	JB	○	○	×	×	4.415	4.215	2.500	2.900	0.045	-0.045	0.3	1.000	96	12	10	300
MM3280JH2YRE	SON6C	4	BH	○	○	×	×	4.415	4.215	2.500	2.900	0.080	-0.080	0.3	1.000	96	12	10	300

*1 0V battery charge function ○ : Permission × : Prohibition
 *2 Optional functions ○ : Provided × : Not provided

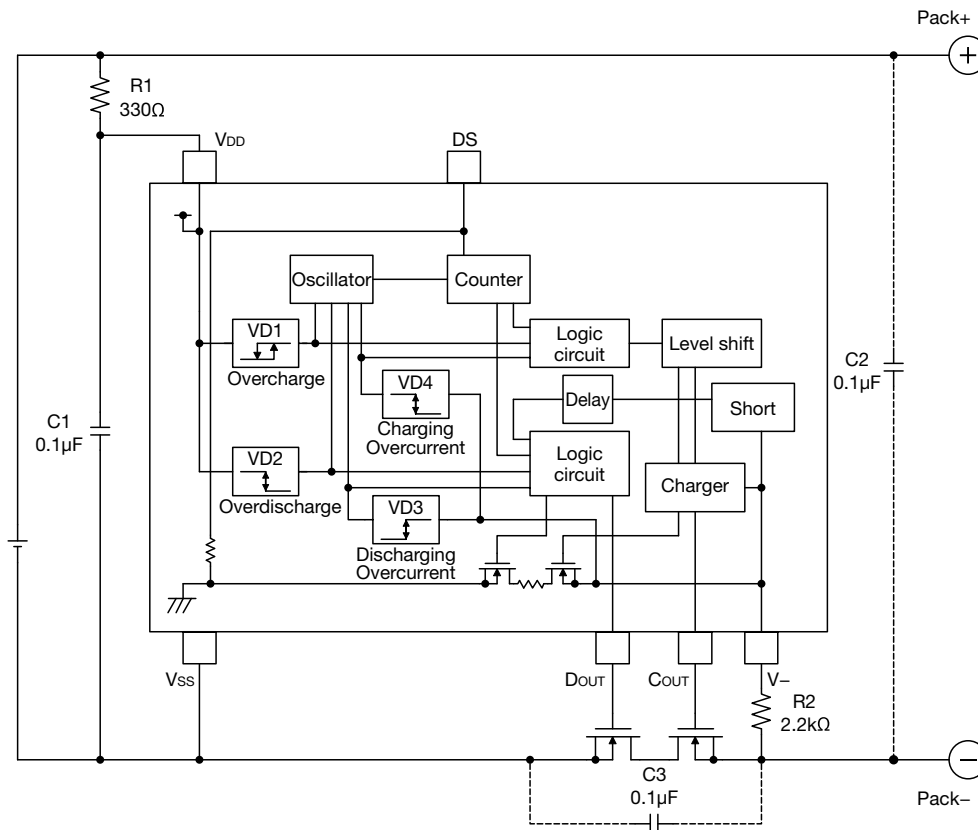
Please inquire to us, if you request a rank other than the above.

duct name	Package	Pin No.	Model No.	Optional function				Detection / Release voltage							Detection delay time				
				0V battery charge function	Charging overcurrent detection	Over voltage charger detection	Overcharge detection delay timer reset time	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time
				*1	*2			Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort
								V	V	V	V	V	V	V	s	ms	ms	ms	us
MM3280JH2RRE	SSON6J	4	JC	○	○	×	×	4.415	4.215	2.500	2.900	0.080	-0.080	0.3	1.000	96	12	10	300
MM3280JH3YRE	SON-6C	4	CH	○	○	×	×	4.425	4.200	2.300	2.800	0.100	-0.060	0.3	1.000	96	12	10	300
MM3280JH4YRE	SON-6C	4	DH	○	○	×	×	4.425	4.200	2.300	2.800	0.055	-0.060	0.25	1.000	96	12	10	300
MM3280JH5YRE	SON-6C	4	EH	○	○	×	×	4.470	4.270	2.500	2.900	0.130	-0.130	0.4	1.000	96	12	10	300
MM3280JH6NRH	SOT-26A/B	-	8B8	○	○	×	×	4.375	4.275	2.800	3.000	0.200	-0.150	0.6	1.000	96	12	10	300
MM3280JH7NRH	SOT-26A/B	-	8B9	○	○	×	×	4.425	4.325	2.800	3.000	0.200	-0.150	0.6	1.000	96	12	10	300
MM3280JH8NRH	SOT-26A/B	-	8BA	○	○	×	×	4.280	4.080	2.800	3.000	0.150	-0.150	0.5	1.200	144	9	8	320
MM3280JL1YRE	SON-6C	4	L0	×	○	×	×	4.400	4.200	2.900	2.900	0.100	-0.100	0.4	1.000	96	12	10	300
MM3280JL2YRE	SON-6C	4	L1	×	○	×	×	4.425	4.225	2.500	2.500	0.180	-0.125	0.5	1.000	32	8	8	250
MM3280JM1YRE	SON-6C	4	M0	×	○	×	×	4.400	4.200	2.900	2.900	0.100	-0.100	0.4	1.000	96	12	10	300
MM3280N01YRE	SON6C	1	N1	○	○	×	×	4.280	4.180	2.300	2.300	0.160	-0.160	0.9	1.000	96	20	16	400
MM3280P09RRE	SSON6J	2	P9	×	○	×	×	4.280	4.180	2.700	2.700	0.065	-0.075	0.9	1.000	96	20	18	400
MM3280P10RRE	SSON6J	2	P0	×	○	×	×	4.280	4.100	2.300	2.300	0.170	-0.170	0.9	1.000	24	12	4	400
MM3280P12RRE	SSON6E	2	P2	○	○	×	×	4.280	4.100	2.300	2.300	0.150	-0.220	0.9	1.000	24	12	4	400
MM3280P16RRE	SSON6J	2	PA	×	○	×	×	4.280	4.100	2.300	2.300	0.160	-0.150	0.9	1.000	24	12	4	400
MM3280P17RRE	SSON6J	2	PB	×	○	×	×	4.280	4.100	2.300	2.300	0.120	-0.120	0.9	1.000	24	12	4	400
MM3280P18RRE	SSON6J	2	PD	○	○	×	×	4.420	4.240	3.000	3.000	0.150	-0.220	0.9	1.000	24	12	4	400
MM3280P20RRE	SSON6J	2	PC	×	○	×	×	4.280	4.100	2.300	2.300	0.200	-0.120	0.9	1.000	24	12	4	400
MM3280P21RRE	SSON6J	2	PF	×	○	×	×	4.430	4.190	2.300	2.300	0.240	-0.250	0.9	1.000	24	12	4	400
MM3280P22RRE	SSON6J	2	PE	×	○	×	×	4.420	4.240	2.300	2.300	0.210	-0.220	0.9	1.000	24	12	4	400
MM3280P23RRE	SSON6J	2	PE	○	○	×	×	4.430	4.250	2.300	2.300	0.120	-0.120	0.9	1.000	24	12	4	400
MM3280P25RRE	SSON6J	2	PK	×	○	×	×	4.280	4.100	2.300	2.300	0.160	-0.100	0.9	1.000	128	24	4	400
MM3280P26RRE	SSON6J	2	PL	×	○	×	×	4.420	4.240	2.300	2.300	0.170	-0.170	0.9	1.000	24	12	4	400
MM3280PA1RRE	SSON6J	2	PH	×	○	×	×	4.420	4.420	2.300	2.300	0.115	-0.130	0.9	1.000	24	12	4	400
MM3280PA6RRE	SSON6J	2	PN	○	○	×	×	4.370	4.370	2.300	2.300	0.140	-0.130	0.5	1.000	24	12	4	400
MM3280PA7RRE	SSON-6J	2	PR	×	○	×	×	4.430	4.430	2.800	2.800	0.080	-0.080	0.5	1.000	24	12	4	400
MM3280PA9RRE	SSON-6J/6M	2	PS	×	○	×	×	4.280	4.280	2.700	2.700	0.070	-0.090	0.5	1.000	24	12	4	400
MM3280S01NRH	SOT26A/B	-	81S	○	×	○	×	4.280	4.080	3.000	3.000	0.080	-	0.9	1.200	144	8	-	400
MM3280S02RRE	SSON6J	1	S2	○	×	○	×	4.300	4.100	3.000	3.000	0.250	-	0.9	1.200	144	8	-	400
MM3280T01NRH	SOT26A/B	-	81T	×	○	×	×	4.280	4.280	2.800	2.800	0.050	-0.100	0.9	1.000	20	6	8	200
MM3280T02RRE	SSON6J	1	T2	×	○	×	×	4.280	4.280	2.800	2.800	0.050	-0.100	0.9	1.000	20	6	8	200
MM3280T03NRH	SOT26A/B	-	83T	×	○	×	×	3.670	3.670	2.050	2.050	0.050	-0.060	0.4	1.000	96	96	96	400
MM3280W01NRH	SOT26A/B	-	812	○	○	○	×	4.280	4.280	2.300	2.500	0.150	-0.150	0.9	1.000	24	12	8	400
MM3280W06NRH	SOT26A/B	-	862	×	○	○	×	4.325	4.325	2.500	2.900	0.150	-0.150	0.7	1.000	24	12	8	400
MM3280W07NRH	SOT26A/B	-	872	○	○	○	×	4.350	4.350	2.300	2.500	0.150	-0.150	0.7	1.000	24	12	8	400

*1 0V battery charge function ○ : Permission × : Prohibition
 *2 Optional functions ○ : Provided × : Not provided

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

Application Circuit



R1 and C1 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R1 is enlarged, and the value of R1 is adjusted to 1kΩ or less. Moreover, adjust the value of C1 to 0.01μF or more to do the stability operation, please.

R1 and R2 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R2 may cause a power consumption will be over rating of power dissipation, therefore the 'R1+R2' should be more than 1kΩ. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10kΩ or less, please.

C2 and C3 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.