

System Reset (with built-in watchdog timer) Monolithic IC MM1142

Outline

This IC was developed to drive low voltage batteries, and has a watchdog timer with built-in microcomputer reset voltage detection circuit and low battery detection circuit.

A single reference voltage is used for low battery voltage detection and microcomputer reset voltage detection, so detection voltage difference is uniform ($\approx 0.2V$). Further, there is a built-in watchdog timer for operation diagnosis, which prevents the system from running wild by generating an intermittent reset pulse during system mis-operation.

Features

1. Accurate voltage drop detection voltage
 1. Low battery detection 2.2V \pm 3%
 2. Power supply voltage detection 2.0V \pm 3%
 3. Detection voltage error 0.2V \pm 20mV 1-2
 4. Hysteresis both 50mV typ.
2. Watchdog function stop pin (can be made to function only as reset IC during V_{CC} rise)
3. Low current consumption 150 μ A typ.

Package

SOP-8C (MM1142XF)

Applications

1. 2V cordless telephones
2. Portable communication equipment
3. Various types of small, handy equipment

Series Table

Model	V _{SLB}	V _{SLR}	T _{PR}	T _{WD}	T _{WR}
MM1142	2.2V	2.0V	100ms	100ms	2ms

*C_T=0.02 μ F

T_{PR} : Reset hold time during V_{CC} rise

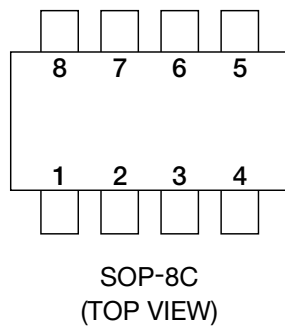
T_{WD} : Timer monitoring time

T_{WR} : Reset time

V_{SLB}: Battery check detection voltage

V_{SLR}: Reset detection voltage

Pin Assignment

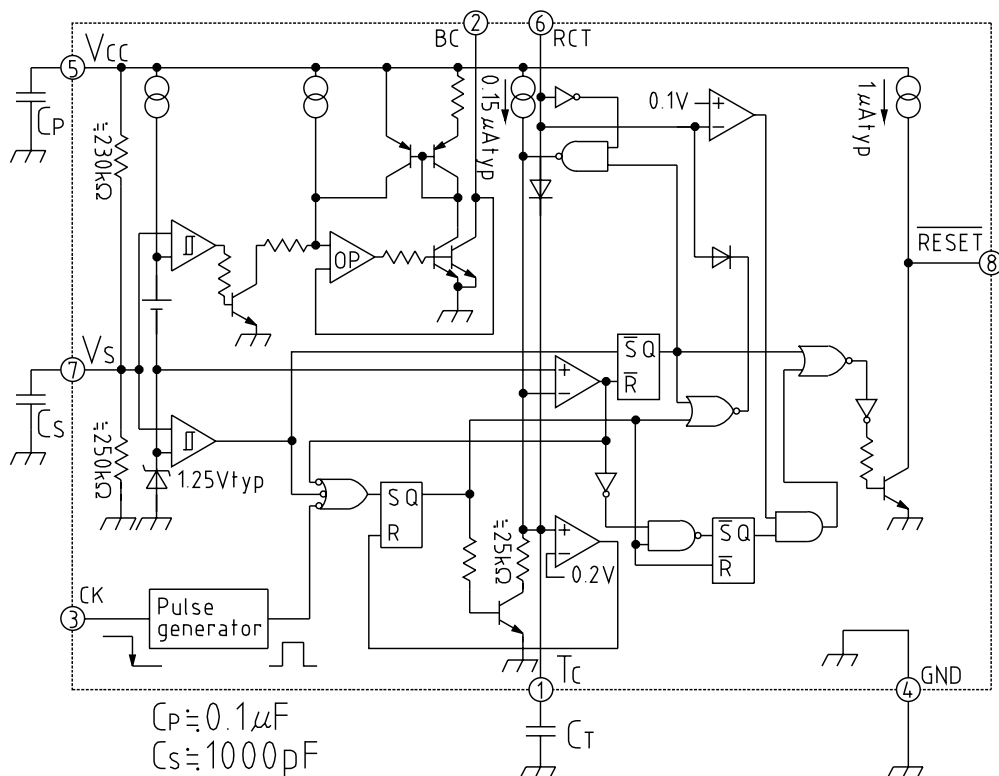


1	TC
2	BC(RESET)
3	CK
4	GND
5	V _{CC}
6	RCT
7	V _S
8	RESET

Pin Description

Pin No.	Pin name	Function
1	TC	T _{WD} , T _{WR} , T _{PR} time setting pins.
2	BC(RESET)	Battery check output pin (RESET low level output) for 3.4V
3	CK	Clock input pin
4	GND	GND pin
5	V _{CC}	Power supply voltage input pin
6	RCT	Watchdog timer stop pin Operation → OPEN, Stop → connect to GND
7	V _S	Detection voltage fine adjustment pin
8	RESET	Reset output pin (low output)

Block Diagram



Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Units
Power supply voltage	V _{CC} max.	-0.3~+7	V
Voltage applied to input pin	V _{IN}	-0.3~V _{CC} +0.3 (≦ +7)	V
Voltage applied to output pin	V _{OUT}	-0.3~V _{CC} +0.3 (≦ +7)	V
Allowable loss	P _d	300	mW
Storage temperature	T _{STG}	-40~+125	°C

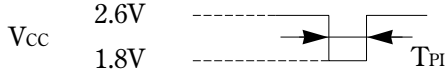
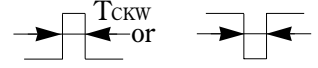
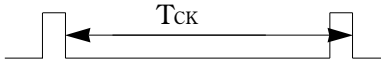
Recommended Operating Conditions

Item	Symbol	Rating	Units
Power supply voltage	V _{CC}	+1.9~+6.5	V
RESET sync current	I _{OLR}	0~500	μA
BC sync current	I _{OLC}	0~5.0	mA
Clock input high level voltage	V _{CKH}	1.0<	V
Clock input low level voltage	V _{CKL}	<0.2	V
Clock monitoring time setting	T _{WD}	1~10000	ms
Clock rise and fall times	t _{TRCK} , t _{TFCK}	<100	μs
Power supply voltage rise times	t _{RVCC}	100<	μs
Power supply voltage fall times	t _{FVCC}	50<	μs
TC pin capacitance	C _T	0.0022~2.2	μF
Operating temperature	T _{OP}	-20~+70	°C

Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{CC}=2.6V)

(Except where noted otherwise, resistance unit is Ω)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I _{CC}	No load		200	280	μA
RESET detection voltage	V _{S_{LR}}	V _{CC} : High→Low, R _{CT} : GND, V _{TC} =OPEN		2.00	±3%	V
Detection voltage temperature coefficient R	$\frac{\Delta V_{SR}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage R	V _{H_{YSR}}	V _{CC} : Low→High, R _{CT} =GND, V _{TC} =OPEN	25	50	100	mV
BC detection voltage	V _{S_{LB}}	V _{CC} : High→Low, R _{LB} =10k		2.20	±3%	V
Detection voltage temperature coefficient B	$\frac{\Delta V_{SB}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage B	V _{H_{YSB}}	V _{CC} : Low→High, R _{LB} =10k	25	50	100	mV
Detection voltage difference	ΔV_{SL}	$\Delta V_{SL}=V_{SLB-VSLR$	0.175	0.200	0.225	V
CK input threshold	V _{TH}		0.4	0.6	1.2	V
CK input current	I _{IH}	V _{CK} =2.6V		0	1	μA
	I _{IL}	V _{CK} =0.0V	-15	-6	-2	
Output voltage RH	V _{O_{HR}}	I _{RESET} =-1μA	2.0	2.2		V
Output voltage BH	V _{O_{HB}}	R _{LB} =10k	2.0	2.2		V
Output voltage RL	V _{O_{LR}}	I _{RESET} =500μA, V _{CC} =1.8V		0.3	0.5	V
Output voltage BL	V _{O_{LB}}	I _{BC} =5mA, V _{CC} =1.8V		0.3	0.5	V
Output sync current R	I _{OLR}	V _{RESET} =0.5V, V _{CC} =1.8V	500	700		μA
Output sync current B	I _{OLB}	V _{BC} =0.5V, V _{CC} =1.8V	5	7		mA
Output source current R	I _{O_{HR}}	V _{RESET} =2.0V	2	4		μA
C _T charge current	I _{CT1}	V _{TC} =0.5V during watchdog timer operation	-0.300	-0.150	-0.075	μA
	I _{CT2}	V _{TC} =0.5V during power ON reset operation	-0.300	-0.150	-0.075	
Minimum operating power supply voltage to ensure RESET	V _{CCL}	V _{RESET} =0.4V, I _{RESET} =0.05mA		0.8	1.0	V

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
V _{CC} input pulse width	T _{PI}	V _{CC} 	20			μs
CK input pulse width	T _{CKW}	CK 	10			μs
CK input cycle	T _{CK}	CK 	50			μs
Watchdog timer monitoring time *1	T _{WD}	C _T =0.022μF	50	100	150	ms
Watchdog timer reset time *2	T _{WR}	C _T =0.022μF	1	2	3	ms
Reset hold time for power supply rise *3	T _{PR}	C _T =0.022μF	50	100	150	ms
RESET delay time	t _{PDR}	V _{CC} : High → Low, R _{LR} =100k, C _{LR} =15pF		10		μs
BC delay time	t _{PDB}	V _{CC} : High → Low, R _{LB} =10k, C _{LB} =15pF		10		μs
RESET rise time	t _{RR}	R _{LR} =100k, C _{LR} =15pF		10		μs
RESET fall time	t _{FR}	R _{LR} =100k, C _{LR} =15pF		2		μs
BC rise time	t _{RB}	R _{LB} =10k, C _{LB} =15pF		10		μs
BC fall time	t _{FB}	R _{LB} =10k, C _{LB} =15pF		2		μs

Notes:

*1 Monitoring time is the time from the last pulse (negative edge) of the timer clear clock pulse until reset pulse output.

In other words, reset output is output if a clock pulse is not input during this time.

*2 Reset time means reset pulse width. However, this does not apply to power ON reset.

*3 Reset hold time is the time from when V_{CC} exceeds detection voltage (V_{SHR}) during power ON reset until reset release ($\overline{\text{RESET}}$ output high).

*4 Watchdog timer monitoring time (T_{WD}), watchdog timer reset time (T_{WR}) and reset hold time (T_{PR}) during power supply rise can be changed by varying C_T capacitance. The times are expressed by the following formulae.

Example : When C_T=0.22F

$$T_{PR} \text{ (ms)} \approx 4500 \times C_T \text{ (}\mu\text{F)} \quad T_{PR} \approx 100\text{ms}$$

$$T_{WD} \text{ (ms)} \approx 4500 \times C_T \text{ (}\mu\text{F)} \quad T_{WD} \approx 100\text{ms}$$

$$T_{WR} \text{ (ms)} \approx 90 \times C_T \text{ (}\mu\text{F)} \quad T_{WR} \approx 2\text{ms}$$

*5 T_{WD} can be varied by placing a resistor (1MΩ or more) between the RCT pin and V_{CC}.

*6 The voltage range when measuring output rise and fall time is 10~90%.

*7 V_{CC} rise time should be 100μs or more, and fall time should be 50μs or more.

