

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 ($\approx 0.2\text{V}$). 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

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

Package

SOP-8C (MM1142XF)

Applications

- 2V cordless telephones
- Portable communication equipment
- 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

$\star C_T=0.02\mu\text{F}$

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

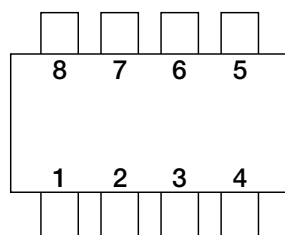
T_{WD} : Timer monitoring time

T_{WR} : Reset time

V_{SLB} : Battery check detection voltage

V_{SLR} : Reset detection voltage

Pin Assignment



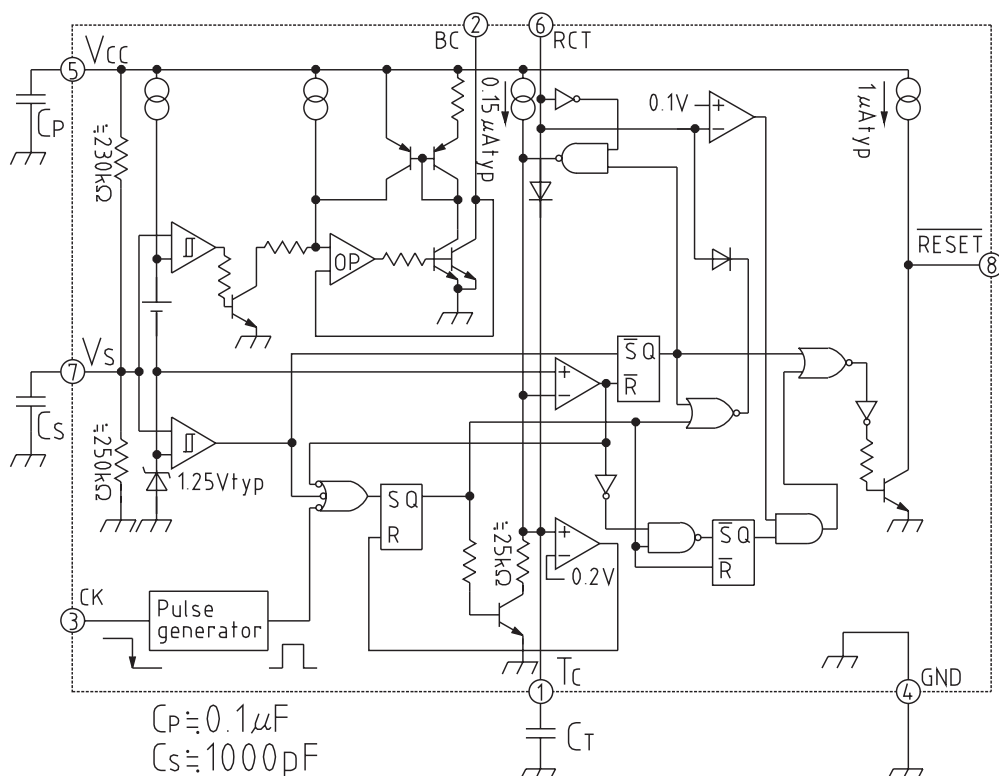
SOP-8C

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 modes 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)

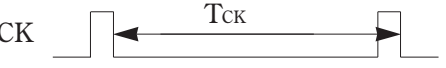
Item	Symbol	Rating	Units
Power supply voltage	V _{CC} max.	-0.3~+7	V
Voltage applied to input pin	V _{IN}	-0.3~V _{CC} +0.3 (≤ +7)	V
Voltage applied to output pin	V _{OUT}	-0.3~V _{CC} +0.3 (≤ +7)	V
Allowable loss	P _d	300	mW
Storage temperature	T _{STG}	-40~+125	°C

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 _{RCK} , t _{FCK}	<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)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I _{CC}	No load		200	280	μA
RESET detection voltage	V _{SLR}	V _{CC} : High→Low, RCT : 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 _{HYSR}	V _{CC} : Low→High, RCT=GND, V _{TC} =OPEN	25	50	100	mV
BC detection voltage	V _{SLB}	V _{CC} : High→Low, R _{LB} =10kΩ		2.20	±3%	V
Detection voltage temperature coefficient B	$\frac{\Delta V_{SB}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage B	V _{HYSB}	V _{CC} : Low→High, R _{LB} =10kΩ	25	50	100	mV
Detection voltage difference	ΔV _{SL}	ΔV _{SL} =V _{SLB} -V _{SLR}	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 _{OHR}	I _{RESET} =-1μA	2.0	2.2		V
Output voltage BH	V _{OHB}	R _{LB} =10kΩ	2.0	2.2		V
Output voltage RL	V _{OLR}	I _{RESET} =500μA, V _{CC} =1.8V		0.3	0.5	V
Output voltage BL	V _{OLB}	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 _{OHR}	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}		20			μS
CK input pulse width	T _{CKW}		10			μS
CK input cycle	T _{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} =100kΩ, C _{LR} =15pF		10		μS
BC delay time	t _{PDB}	V _{CC} : High → Low, R _{LB} =10kΩ, C _{LB} =15pF		10		μS
RESET rise time	t _{RR}	R _{LR} =100kΩ, C _{LR} =15pF		10		μS
RESET fall time	t _{FR}	R _{LR} =100kΩ, C _{LR} =15pF		2		μS
BC rise time	t _{RB}	R _{LB} =10kΩ, C _{LB} =15pF		10		μS
BC fall time	t _{FB}	R _{LB} =10kΩ, 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 (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.

Timing Chart

