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 (≒ 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±3%
    2. Power supply voltage detection 2.0V±3%
    3. Detection voltage error 0.2V±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 150μA typ.

Package

SOP-8C (MM1142XF)

Applications

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

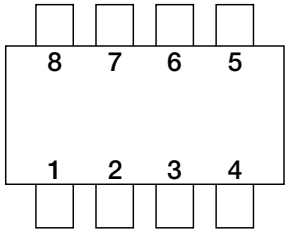
Series Table

Model	V_{SLB}	V_{SLR}	T_{PR}	T_{WD}	T_{WR}
MM1142	2.2V	2.0V	100mS	100mS	2mS

∗C_T=0.02μF

T_{PR} : Reset hold time during Vcc rise
T_{WD} : Timer monitoring time
T_{WR} : Reset time
V_{SLB}: Battery check detection voltage
V_{SLR}: Reset detection voltage

Pin Assignment



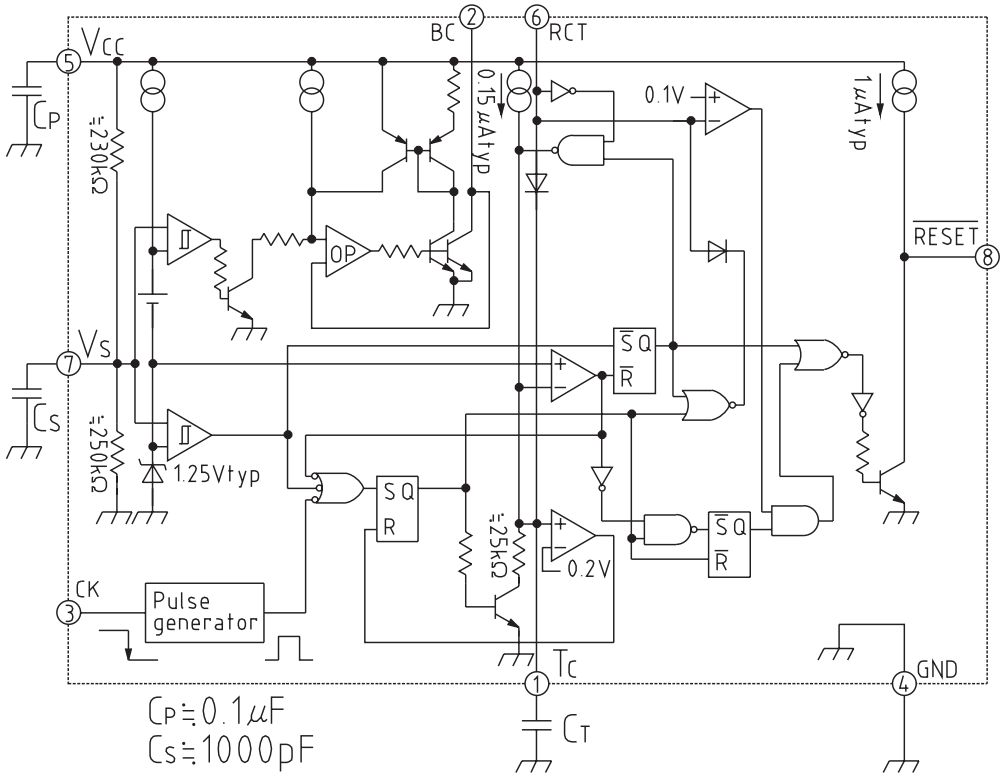
SOP-8C

1	TC
2	BC ($\overline{\text{RESET}}$)
3	CK
4	GND
5	V_{CC}
6	RCT
7	V_S
8	$\overline{\text{RESET}}$

Pin Description

Pin No.	Pin name	Function
1	TC	T_{WD}, T_{WR}, T_{PR} time setting pins.
2	BC ($\overline{\text{RESET}}$)	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	$\overline{\text{RESET}}$	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	Pd	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
$\overline{\text{RESET}}$ 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
$\overline{\text{RESET}}$ 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}	$\Delta V_{SL}=V_{SLB}-V_{SLR}$	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}	$I_{\overline{RESET}}$=−1µA	2.0	2.2		V
Output voltage BH	V_{OHB}	R_{LB}=10kΩ	2.0	2.2		V
Output voltage RL	V_{OLR}	$I_{\overline{RESET}}$=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}	$V_{\overline{RESET}}$=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}	$V_{\overline{RESET}}$=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 $\overline{\text{RESET}}$	V_{CCL}	$V_{\overline{RESET}}$=0.4V, $I_{\overline{RESET}}$=0.05mA		0.8	1.0	V

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
V_{CC} input pulse width	T_{PI}	V_{CC} 2.6V / 1.8V, T_{PI}	20			µS
CK input pulse width	T_{CKW}	CK, T_{CKW} or	10			µS
CK input cycle	T_{CK}	CK, 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
$\overline{RESET}$ 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
$\overline{RESET}$ rise time	t_{RR}	R_{LR}=100kΩ, C_{LR}=15pF		10		µS
$\overline{RESET}$ 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 ($\overline{RESET}$ 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

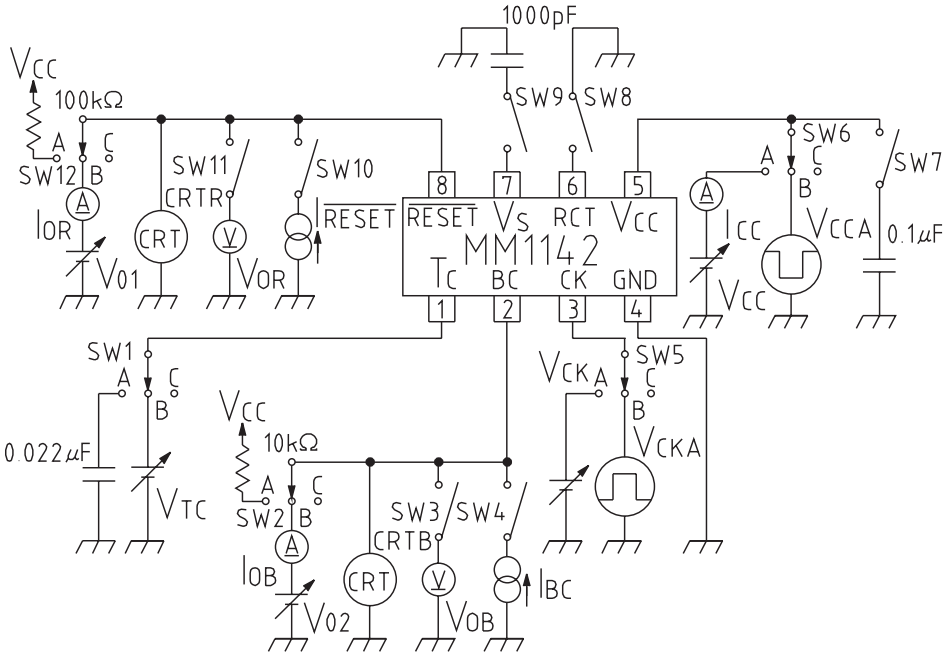
T_{PR} (mS) ≃ 4500×C_T (µF) T_{PR} ≃ 100mS
T_{WD} (mS) ≃ 4500×C_T (µF) T_{WD} ≃ 100mS
T_{WR} (mS) ≃ 90×C_T (µF) T_{WR} ≃ 2mS

*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.

Measuring Circuit



Timing Chart