

# System Reset (with watchdog timer+battery back-up) Monolithic IC MM1106

## Outline

This IC combines the popular watchdog timer with a battery back-up, resulting in an IC that is easier to use. The watchdog timer has a built-in power ON reset function, and both the timer and the battery back-up section have low current consumption.

## Features

1. Low current consumption	270 $\mu$ A typ.
2. Watchdog timer	
Detection voltage	4.2V typ.
C <sub>T</sub> charging current	-0.24 $\mu$ A typ.
3. CS	
CS detection voltage	4.4V typ.
Output voltage low level	0.1V typ.
4. Battery back-up	
Power supply switching voltage	3.3V typ.
Input/output voltage difference (normal)	0.3V typ.
Input/output voltage difference (back-up)	0.3V typ.
Loss current (current consumption for back-up)	0.1 $\mu$ A typ.

## Package

SOP-14B (MM1106XF)  
DIP-14A (MM1106XD)

## Applications

1. Fax machines
2. Photocopiers
3. Air conditioners
4. Control equipment
5. Sequencers, etc.

## Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Power supply voltage	V <sub>CC</sub> max.	-0.3~+7	V
Voltage applied to input pin	V <sub>IN</sub>	-0.3~V <sub>CC</sub> +0.3 ( $\leq +7$ )	V
Voltage applied to output pin	V <sub>OUT</sub>	-0.3~V <sub>CC</sub> +0.3 ( $\leq +7$ )	V
V <sub>OUT</sub> output current 1	I <sub>L1</sub>	50	mA
V <sub>OUT</sub> output current 2	I <sub>L2</sub>	120	$\mu$ A
Allowable loss	P <sub>d</sub>	300	mW
Storage temperature	T <sub>STG</sub>	-40~+125	°C


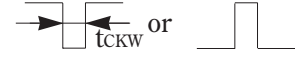

Note: I<sub>L1</sub> expresses output current value from main power supply (V<sub>CC</sub>) and I<sub>L2</sub> expresses output current value from battery (V<sub>BAT</sub>).

## Recommended Operating Conditions

Item	Symbol	Ratings	Units
Power supply voltage	V <sub>CC</sub>	+2.5~+6.5	V
RESET sink current	I <sub>OLR</sub>	0~1.0	mA
CS sink current	I <sub>OLC</sub>	0~500	μA
V <sub>OUT</sub> output current 1	I <sub>L1</sub>	0~30	mA
V <sub>OUT</sub> output current 2	I <sub>L2</sub>	0~80	μA
Clock input high level voltage	V <sub>CKH</sub>	2.0<	V
Clock input low level voltage	V <sub>CKL</sub>	<0.4	V
Clock monitoring time setting	T <sub>WD</sub>	1~1000	mS
Clock rise and fall times	T <sub>RCK</sub> , T <sub>FCK</sub>	<100	μS
Power supply voltage rise times	T <sub>RVCC</sub>	100<	μS
Power supply voltage fall times	T <sub>FVCC</sub>	50<	μS
TC pin capacitance	C <sub>T</sub>	0.0002~2	μF
Operating temperature	T <sub>OP</sub>	-25~+75	°C

## Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>CC</sub>=5.0V, V<sub>BAT</sub>=3.0V)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I <sub>CC</sub>	V <sub>CC</sub> =5.0V, I <sub>O</sub> =0μA		270	400	μA
RESET detection voltage	V <sub>SLR</sub>	V <sub>CC</sub> : Hi → Lo	4.00	4.20	4.40	V
Detection voltage temperature coefficient R	$\frac{\Delta V_{SR}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage R	V <sub>HYSR</sub>	V <sub>CC</sub> : Lo → Hi	0.05	0.10	0.20	V
CK input threshold	V <sub>TH</sub>		0.8	1.2	2	V
CK input current	I <sub>IH</sub>	V <sub>CK</sub> =5.0V		0	1	μA
	I <sub>IL</sub>	V <sub>CK</sub> =0V	-15	-7	-2	
Output voltage R H	V <sub>OHR</sub>	I <sub>RESET</sub> =-5μA	4.0	4.5		V
Output voltage R L	V <sub>OLR</sub>	I <sub>RESET</sub> =1.0mA		0.3	0.5	V
Output sync current R	I <sub>OLR</sub>	V <sub>CC</sub> =3.5V, V <sub>RESET</sub> =1V	1	2		mA
Output source current R	I <sub>OHR</sub>	V <sub>RESET</sub> =4.5V	8	15		μA
C <sub>T</sub> charge current	I <sub>CT1</sub>	V <sub>TC</sub> =0.7V during watchdog timer operation	-0.48	-0.24	-0.16	μA
	I <sub>CT2</sub>	V <sub>TC</sub> =0.7V during power ON reset operation	-0.48	-0.24	-0.16	
CS detection voltage	V <sub>SLC</sub>	V <sub>CC</sub> : Hi → Lo	4.20	4.40	4.60	V
Detection voltage temperature coefficient C	$\frac{\Delta V_{SC}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage C	V <sub>HYSC</sub>	V <sub>CC</sub> : Hi → Lo	0.05	0.10	0.20	V
Output voltage C H	V <sub>OHC</sub>	V <sub>CC</sub> =5.0V, I <sub>CS</sub> =1μA	4.50	4.65		V
Output voltage C L	V <sub>OLC</sub>	V <sub>CC</sub> =3.5V, I <sub>CS</sub> =1μA		0.1	0.4	V
Output sync current C	I <sub>OLC</sub>	V <sub>CC</sub> =3.5V, V <sub>CS</sub> =0.3μA	0.5	1.0		mA
Output source current C	I <sub>OHC</sub>	V <sub>CC</sub> =5.0V, V <sub>CS</sub> =4.5V	50	75		μA
Power supply switching voltage	V <sub>BB</sub>	V <sub>CC</sub> : Hi → Lo	3.15	3.30	3.45	V
Detection voltage temperature coefficient B	$\frac{\Delta V_{BB}}{\Delta T}$			±0.01	±0.05	%/°C
Hysteresis voltage B	V <sub>HYSB</sub>	V <sub>CC</sub> : Lo → Hi	0.05	0.10	0.20	V
I/O voltage difference 1 (normal)	V <sub>SAT1</sub>	V <sub>CC</sub> =5.0V, I <sub>O</sub> =-30mA		0.3	0.5	V
I/O voltage difference 2 (backup)	V <sub>SAT2</sub>	I <sub>O</sub> =-80μA, V <sub>BAT</sub> =3.0V		0.3	0.4	V

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Loss current	I <sub>LOSS</sub>	V <sub>CC</sub> =0V, I <sub>O</sub> =0μA, V <sub>BAT</sub> =3V			0.1	μA
Reverse current	I <sub>OREV</sub>	V <sub>CC</sub> =5.0V, I <sub>O</sub> =0μA, V <sub>BAT</sub> =0V			0.1	μA
External PNP transistor base-driving current	I <sub>BASE</sub>	V <sub>CC</sub> =5.0V, V <sub>OUT</sub> =4.2V, V <sub>TB</sub> =4.3V	2	5		mA
V <sub>CC</sub> input pulse width	T <sub>PI</sub>	V <sub>CC</sub> 	8			μS
CK input pulse width	T <sub>CKW</sub>	CK 	20			μS
CK input cycle	T <sub>CK</sub>	CK 	20			μS
Watchdog timer monitoring time *1	T <sub>WD</sub>	C <sub>T</sub> =0.02μF	50	100	150	mS
Watchdog timer reset time *2	T <sub>WR</sub>	C <sub>T</sub> =0.02μF	1	2	3	mS
Reset hold time for power supply rise *3	T <sub>PR</sub>	V <sub>CC</sub> : Lo→Hi (100μS), C <sub>T</sub> =0.02μF	50	100	150	mS
RESET delay time	T <sub>PD</sub>	V <sub>CC</sub> : Hi→Lo (50μS), C <sub>LR</sub> =15pF, R <sub>LR</sub> =22kΩ		10		μS
CS delay time	T <sub>PD</sub>	V <sub>CC</sub> : Hi→Lo (50μS), C <sub>LC</sub> =15pF		10		μS
RESET rise time	T <sub>RR</sub>	C <sub>LR</sub> =15pF, R <sub>LR</sub> =22kΩ		4		μS
RESET fall time	T <sub>FR</sub>	C <sub>LR</sub> =15pF, R <sub>LR</sub> =22kΩ		4		μS
CS rise time	T <sub>RC</sub>	C <sub>LC</sub> =15pF		4		μS
CS fall time	T <sub>FC</sub>	C <sub>LC</sub> =15pF		4		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<sub>CC</sub> exceeds detection voltage (V<sub>SHR</sub>) during power ON reset until reset release (RESET output high).
- \*4 Watchdog timer monitoring time (T<sub>WD</sub>), watchdog timer reset time (T<sub>WR</sub>) and reset hold time (T<sub>PR</sub>) during power supply rise can be changed by varying C<sub>T</sub> capacitance. The times are expressed by the following formulae.

Example : when C<sub>T</sub>=0.02μF

$$T_{PR} \text{ (mS)} \cong 5000 \times C_T \text{ (}\mu\text{F)} \quad T_{PR} \cong 100\text{mS}$$

$$T_{WD} \text{ (mS)} \cong 5000 \times C_T \text{ (}\mu\text{F)} \quad T_{WD} \cong 100\text{mS}$$

$$T_{WR} \text{ (mS)} \cong 100 \times C_T \text{ (}\mu\text{F)} \quad T_{WR} \cong 2\text{mS}$$

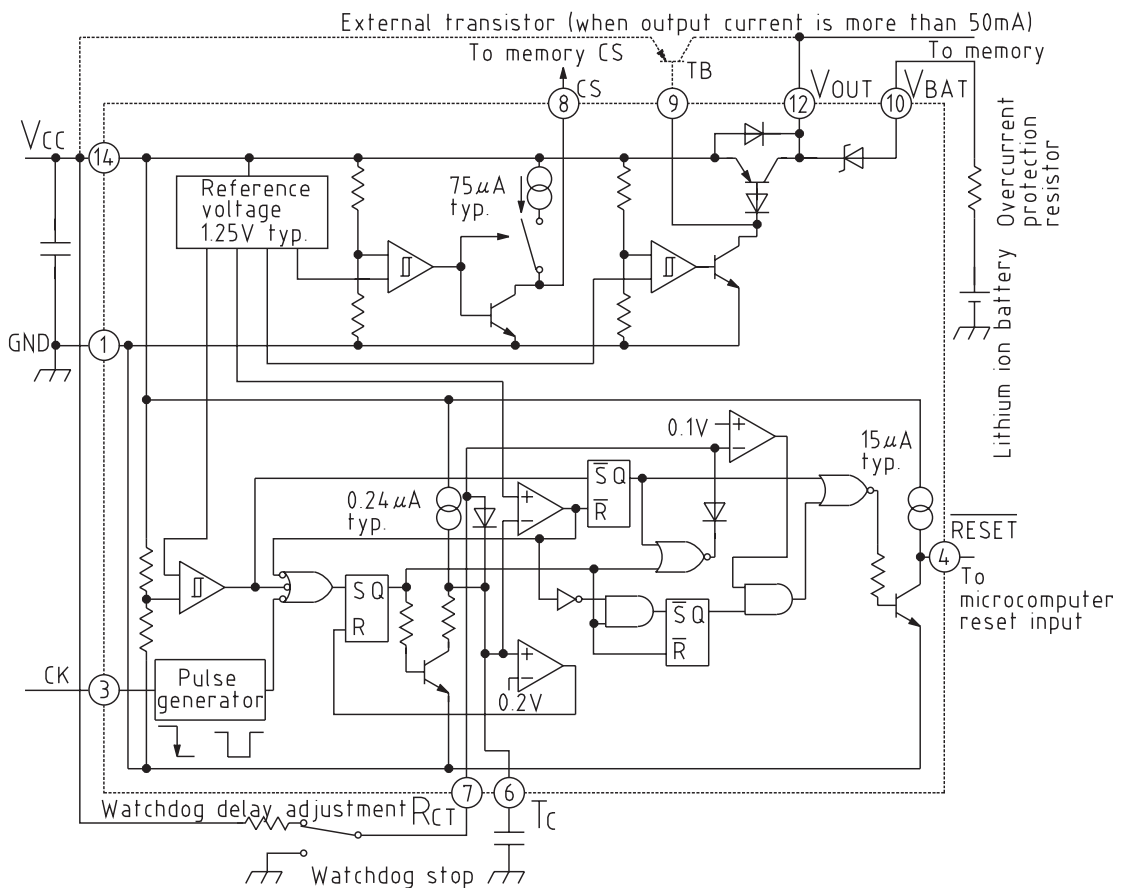
- \*5 The voltage range when measuring output rise and fall time is 10~90%.
- \*6 The IC can be made to operate only as a reset IC with delay during V<sub>CC</sub> rise by connecting the RCT pin to GND.
- \*7 V<sub>CC</sub> rise time should be 100μS or more, and fall time should be 50μS or more.

Pin Description

Pin No.	Pin name	Function
1	GND	Ground
2	N.C	NON CONNECT
3	CK	Clock input
4	RESET	Reset output
5	N.C	NON CONNECT
6	TC	Capacitor for setting power ON delay and timer monitoring times
7	RCT	Watchdog timer stop (when connected to GND); timer time adjustment
8	CS	Chip select output
9	TB	External power transistor drive pin
10	V <sub>BAT</sub>	Back-up power supply input
11	N.C	NON CONNECT
12	V <sub>OUT</sub>	Back-up voltage output
13	N.C	NON CONNECT
14	V <sub>CC</sub>	Main power supply

Note : Connect external transistor when output current is more than 50mA.

Block Diagram



Timing Chart

