

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 μ A typ.
2. Watchdog timer	
Detection voltage	4.2V typ.
C _T charging current	-0.24 μ 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 μ 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 _{CC} max.	-0.3~+7	V
Voltage applied to input pin	V _{IN}	-0.3~V _{CC} +0.3 ($\leq +7$)	V
Voltage applied to output pin	V _{OUT}	-0.3~V _{CC} +0.3 ($\leq +7$)	V
V _{OUT} output current 1	I _{L1}	50	mA
V _{OUT} output current 2	I _{L2}	120	μ A
Allowable loss	P _d	300	mW
Storage temperature	T _{STG}	-40~+125	°C

Note: I_{L1} expresses output current value from main power supply (V_{CC}) and I_{L2} expresses output current value from battery (V_{BAT}).


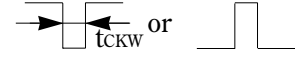
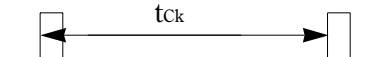
Recommended Operating Conditions

Item	Symbol	Ratings	Units
Power supply voltage	V _{CC}	+2.5~+6.5	V
RESET sink current	I _{OLR}	0~1.0	mA
CS sink current	I _{OLC}	0~500	μA
V _{OUT} output current 1	I _{L1}	0~30	mA
V _{OUT} output current 2	I _{L2}	0~80	μA
Clock input high level voltage	V _{CKH}	2.0<	V
Clock input low level voltage	V _{CKL}	<0.4	V
Clock monitoring time setting	T _{WD}	1~1000	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	0.0002~2	μF
Operating temperature	T _{OP}	-25~+75	°C

Electrical Characteristics

(Typical model MM1106X) (Except where noted otherwise, T_a=25°C, V_{CC}=5.0V, V_{BAT}=3.0V)
 (Except where noted otherwise, resistance unit is Ω)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I _{CC}	V _{CC} =5.0V, I _o =0μA		270	400	μA
RESET detection voltage	V _{SLR}	V _{CC} : 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 _{HYSR}	V _{CC} : Lo → Hi	0.05	0.10	0.20	V
CK input threshold	V _{TH}		0.8	1.2	2	V
CK input current	I _{IH}	V _{CK} =5.0V		0	1	μA
	I _{IL}	V _{CK} =0V	-15	-7	-2	
Output voltage R H	V _{OHR}	I _{RESET} =-5μA	4.0	4.5		V
Output voltage R L	V _{OLR}	I _{RESET} =1.0mA		0.3	0.5	V
Output sync current R	I _{OLR}	V _{CC} =3.5V, V _{RESET} =1V	1	2		mA
Output source current R	I _{OHR}	V _{RESET} =4.5V	8	15		μA
C _T charge current	I _{CT1}	V _{TC} =0.7V during watchdog timer operation	-0.48	-0.24	-0.16	μA
	I _{CT2}	V _{TC} =0.7V during power ON reset operation	-0.48	-0.24	-0.16	
CS detection voltage	V _{SLC}	V _{CC} : 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 _{HYSC}	V _{CC} : Hi → Lo	0.05	0.10	0.20	V
Output voltage C H	V _{OHC}	V _{CC} =5.0V, I _{CS} =1μA	4.50	4.65		V
Output voltage C L	V _{OLC}	V _{CC} =3.5V, I _{CS} =1μA		0.1	0.4	V
Output sync current C	I _{OLC}	V _{CC} =3.5V, V _{CS} =0.3μA	0.5	1.0		mA
Output source current C	I _{OHC}	V _{CC} =5.0V, V _{CS} =4.5V	50	75		μA
Power supply switching voltage	V _{BB}	V _{CC} : 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 _{HYSB}	V _{CC} : Lo → Hi	0.05	0.10	0.20	V
I/O voltage difference 1 (normal)	V _{SAT1}	V _{CC} =5.0V, I _o =-30mA		0.3	0.5	V
I/O voltage difference 2 (backup)	V _{SAT2}	I _o =-80μA, V _{BAT} =3.0V		0.3	0.4	V

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Loss current	I _{LOSS}	V _{CC} =0V, I _O =0μA, V _{BAT} =3V			0.1	μA
Reverse current	I _{OREV}	V _{CC} =5.0V, I _O =0μA, V _{BAT} =0V			0.1	μA
External PNP transistor base-driving current	I _{BASE}	V _{CC} =5.0V, V _{OUT} =4.2V, V _{TB} =4.3V	2	5		mA
V _{CC} input pulse width	T _{PI}	V _{CC} 	8			μs
CK input pulse width	T _{CKW}	CK 	3			μs
CK input cycle	T _{CK}	CK 	20			μs
Watchdog timer monitoring time *1	T _{WD}	C _T =0.02μF	50	100	150	ms
Watchdog timer reset time *2	T _{WR}	C _T =0.02μF	1	2	3	ms
Reset hold time for power supply rise *3	T _{PR}	V _{CC} : Lo→Hi (100μs), C _T =0.02μF	50	100	150	ms
RESET delay time	T _{PDR}	V _{CC} : Hi→Lo (50μs), C _{LR} =15pF, R _{LR} =22k		10		μs
CS delay time	T _{PCD}	V _{CC} : Hi→Lo (50μs), C _{LC} =15pF		10		μs
RESET rise time	T _{RR}	C _{LR} =15pF, R _{LR} =22k		4		μs
RESET fall time	T _{FR}	C _{LR} =15pF, R _{LR} =22k		4		μs
CS rise time	T _{RC}	C _{LC} =15pF		4		μs
CS fall time	T _{FC}	C _{LC} =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_{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=0.02μF

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

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

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

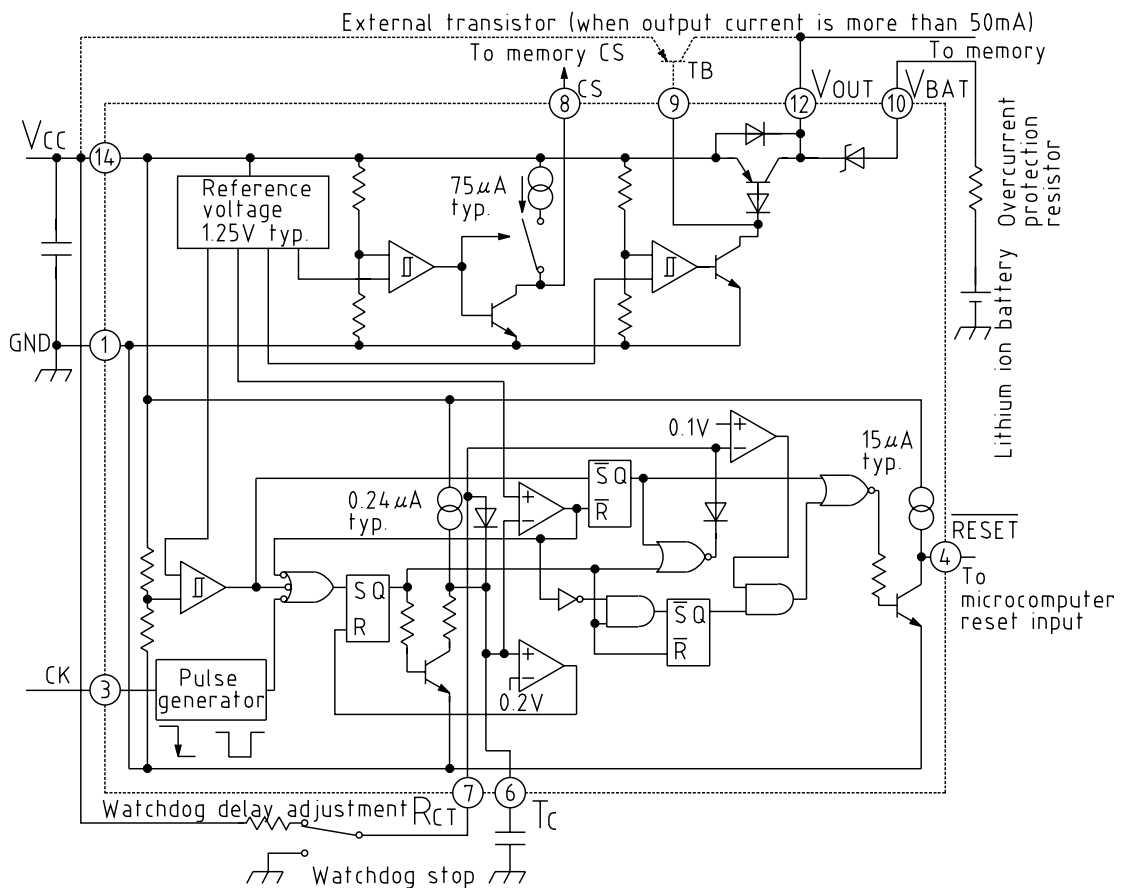
- *5 The voltage range when measuring output rise and fall time is 10~90%.
- *6 The IC can be made to operate only as a reset IC with delay during V_{CC} rise by connecting the RCT pin to GND.
- *7 V_{CC} rise time should be 100μs or more, and fall time should be 50μs or more.

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 _{BAT}	Back-up power supply input
11	N.C	NON CONNECT
12	V _{OUT}	Back-up voltage output
13	N.C	NON CONNECT
14	V _{CC}	Main power supply

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

Block Diagram



Timing Chart

