

System Reset (with built-in watchdog timer) Monolithic IC MM1135, MM1136

Outline

These ICs were developed to drive low voltage batteries, and have 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 3.4V \pm 3%
 2. Power supply voltage detection 3.2V \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 (MM1135XF, MM1136XF)

Applications

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

Series Table

Model	V _{SLB}	V _{SLR}	T _{PR}	T _{WD}	T _{WR}
MM1135	3.4V	3.2V	100ms	10ms	2ms
MM1136			100ms	100ms	2ms

*C_T=0.02 μ F

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

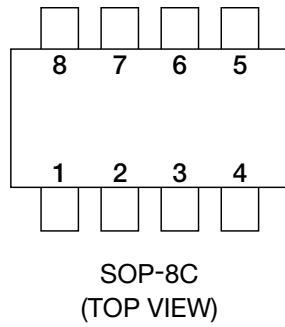
T_{WD} : Timer monitoring time

T_{WR} : Reset time

V_{SLB} : Battery check detection voltage

V_{SLR} : Reset detection voltage

Pin Assignment

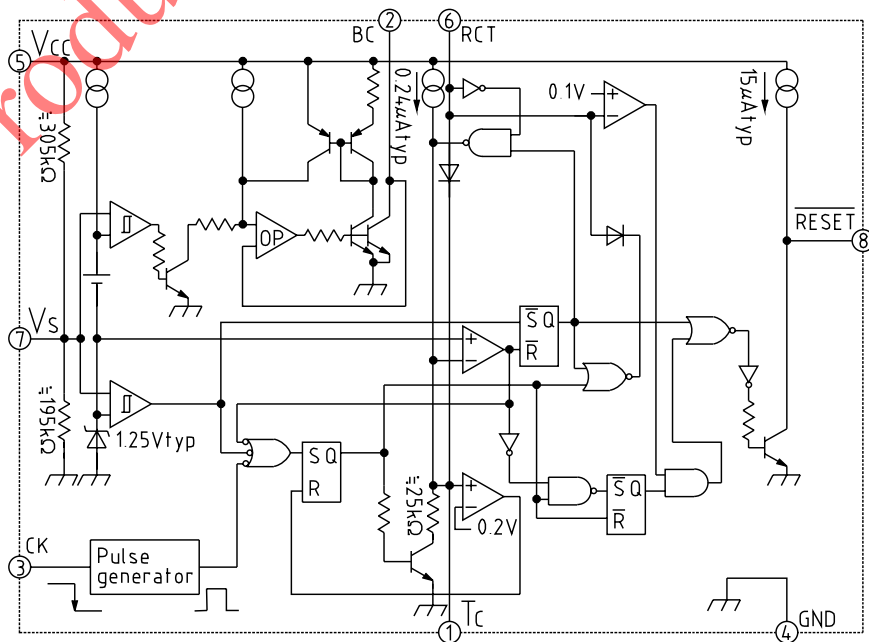


1	TC
2	BC
R E S E T)	
3	CK
4	GND
5	V _{cc}
6	RCT
7	V _s

Pin Description

Pin No.	Pin name	Function
1	TC	T _{WD} , T _{WR} , T _{PR} time setting pins.
2	BC (R E S E T)	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	R E S E T	Reset output pin (low output)

Block Diagram



Absolute Maximum Ratings

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	450	mW
Storage temperature	T _{STG}	-40~+125	°C

Recommended Operating Conditions

Item	Symbol	Rating	Units
Power supply voltage	V _{CC}	+2.5~+6.5	V
R E S E T sync current	I _{OLR}	0~1.5	mA
BC sync current	I _{OLC}	0~1.5	mA
Clock input high level voltage	V _{CKH}	1.4<	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	0.002~2	μF
Operating temperature	T _{OP}	-25~+75	°C

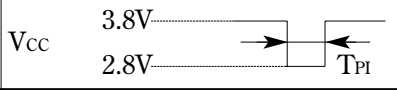
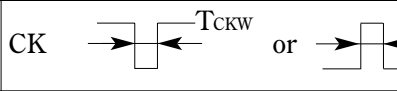
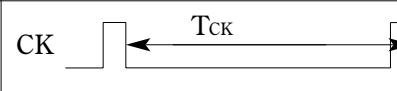
Products to be discontinued

Electrical Characteristics

(Typical model MM1136X) (Except where noted otherwise, Ta=25°C, Vcc=3.8V)
(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 _{SLR}	V _{CC} : High→Low R _{CT} : GND, V _{TC} =OPEN	3.10	3.20	3.30	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 R _{CT} : GND, V _{TC} =OPEN	25	50	100	mV
BC detection voltage	V _{SLB}	V _{CC} : High→ Low, R _{LB} =10k	3.30	3.40	3.50	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} =10k	25	50	100	mV
Detection voltage difference	ΔV_{SL}	$\Delta V_{SL}=V_{SLB}-V_{SLR}$	0.18	0.20	0.22	V
CK input threshold	V _{TH}		0.8	1.2	2	V
CK input current	I _{IH}	V _{CK} =3.8V		0	1	μA
	I _{IL}	V _{CK} =0.0V	-15	-6	-2	
Output voltage RH	V _{OHR}	I _{RESET} = -5μA	3.0	3.4		V
Output voltage BH	V _{OHB}	R _{LB} =10k	3.2	3.6		V
Output voltage RL	V _{OLR}	I _{RESET} = 1mA, V _{CC} =3.0V		0.3	0.5	V
Output voltage BL	V _{OLB}	I _{BC} =5mA, V _{CC} =3.0V		0.3	0.5	V
Output sync current R	I _{OLR}	V _{RESET} = 0.5V, V _{CC} =3.0V	1	2		mA
Output sync current B	I _{OLB}	V _{BC} =0.5V, V _{CC} =3.0V	5	10		mA
Output source current R	I _{OHR}	V _{RESET} = 3.4V	8	15		μA
C _T charge current	I _{CT1}	V _{TC} =1.0V during watchdog timer operation	-0.48	-0.24	-0.16	μA
	I _{CT2}	V _{TC} =1.0V during power ON reset operation	-0.48	-0.24	-0.16	μA
Minimum operating power supply voltage to ensure RESET	V _{CC}	V _{RESET} = 0.4V I _{RESET} = 0.1mA		0.8	1.0	V

Product is to be discontinued

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}	C _T =0.02μF	50	100	150	ms
RESET delay time	t _{PDR}	V _{CC} : High → Low, R _{LR} =10k, C _{LR} =15pF		10		μs
BC delay time	t _{PDB}	V _{CC} : High → Low, R _{LB} =4.7k, C _{LB} =15pF		10		μs
RESET rise time	t _{RR}	R _{LR} =10k, C _{LR} =15pF		10		μs
RESET fall time	t _{FR}	R _{LR} =10k, C _{LR} =15pF		2		μs
BC rise time	t _{RB}	R _{LB} =4.7k, C _{LB} =15pF		10		μs
BC fall time	t _{FB}	R _{LB} =4.7k, 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.

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

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

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

Example : When C_T=0.02μF

$$T_{PR} \cong 100\text{ms}$$

$$T_{WD} \cong 100\text{ms}$$

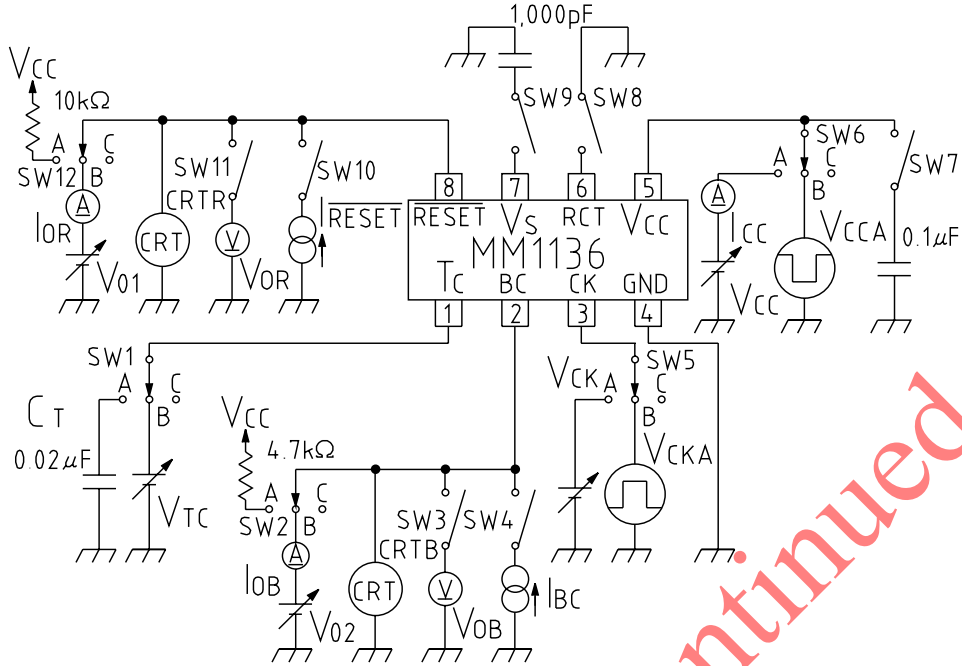
$$T_{WR} \cong 2\text{ms}$$

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

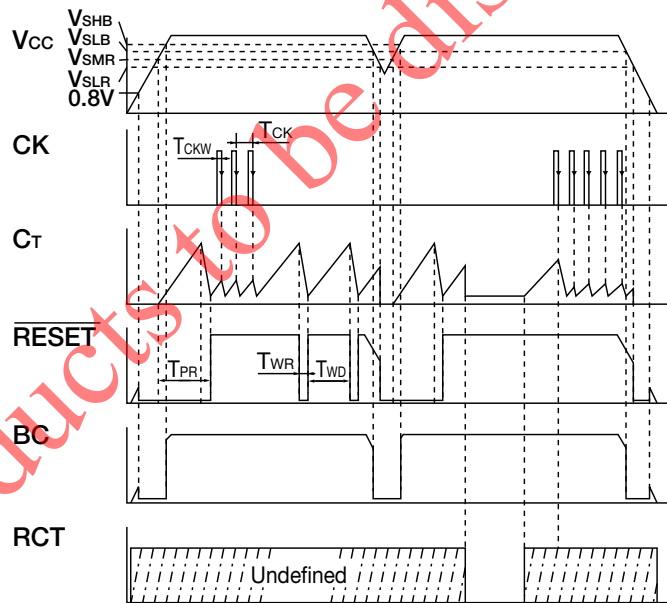
*6 The voltage range when measuring output rise and fall time is 10~90%.

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

Measuring Circuit



Timing Chart



Basic Circuit Diagram

