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System Reset (with built-in watchdog timer) Monolithic IC MM1035

Outline

This IC functions in a variety of CPU systems and other logic systems to generate a reset signal and reset the system accurately during momentary interruption or lowering of power supply voltage.
 It also has a built-in watchdog timer for operation diagnosis. This prevents the system from running wild by generating an intermittent reset pulse during system mis-operation.

Features

1. Built-in watchdog timer
2. Low minimum operating voltage $V_{CC}=0.8V$ typ.
3. Both positive and negative logic reset output can be extracted
4. Accurate detection of drop in power supply voltage
5. Detection voltage has hysteresis
6. Few external parts 1 capacitor

Package

DIP-8A (MM1035XD)
 SOP-8A (MM1035XF)

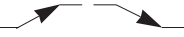
Applications

Microcomputers

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Units
Storage temperature	T_{STG}	-40~+125	°C
Operating temperature	T_{OPR}	-20~+70	°C
Power supply voltage	V_{CC} max.	-0.3~+10	V
Voltage applied to VS & CK pins	V_{VS} & V_{CK}	-0.3~+10	V
Voltage applied to RESET, RESET pin	V_{OH}	-0.3~+10	V
Allowable loss	P_d	400	mW

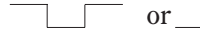
(Except where noted otherwise, $T_a=25^\circ\text{C}$, $V_{CC}=5\text{V}$, measurement circuit 1)

Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I _{CC}	1	During watchdog timer operation		0.7	1.0	mA
Detection voltage	V _{SL}	1	V _S =OPEN, V _{CC} 	4.05	4.20	4.35	V
	V _{SH}	1	V _S =OPEN, V _{CC} 	4.15	4.30	4.45	
Detection voltage temperature coefficient	V _S /ΔT	1			±0.01		%/°C
Hysteresis voltage	V _{HYS}	1	V _{SH} -V _{SL} , V _{CC} 	50	100	150	mV
CK input threshold	V _{TH}	1		0.8	1.2	2	V
CK input current	I _{IH}	1	V _{CK} =5V		0	1	μA
	I _{IL}	1	V _{CK} =0V	-20	-10	-3	
Output voltage (High)	V _{OH1}	1	I _{RESET} = -5μA, V _S =OPEN	4.5	4.8		V
	V _{OH2}	1	I _{RESET} = -5μA, V _S =0V	4.5	4.8		
Output voltage (Low)	V _{OL1}	1	I _{RESET} = 3mA, V _S =0V		0.2	0.4	V
	V _{OL2}	1	I _{RESET} = 10mA, V _S =0V		0.3	0.5	
	V _{OL3}	1	I _{RESET} = 0.5mA, V _S =OPEN		0.2	0.4	
	V _{OL4}	1	I _{RESET} = 1mA, V _S =OPEN		0.3	0.5	
Output sink current	I _{OL1}	1	V _{RESET} = 1.0V, V _S =0V	10	16		mA
	I _{OL2}	1	V _{RESET} = 1.0V, V _S =OPEN	1	2		
C _T charge current	I _{CT1}	1	V _{TC} = 1.0V during watchdog timer operation	-8	-12	-24	μA
	I _{CT2}	1	V _{TV} = 1.0V during power on reset operation	-0.8	-1.2	-2.4	μA
Minimum operating power supply voltage to ensure $\overline{\text{RESET}}$	V _{CC1}	1	V _{RESET} = 0.4V I _{RESET} = 0.2mA		0.8	1.0	V
Minimum operating power supply voltage to ensure $\overline{\text{RESET}}$	V _{CC2}	1	I _{RESET} = V _{CC} - 0.1V R _{I2} (between Pin 2 and GND) = 1MΩ		0.8	1.0	V

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Electrical Characteristics 2 (AC)

(Except where noted otherwise, Ta=25°C, Vcc=5V, measurement circuit 2)

Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Units
Vcc input pulse width	T _{PI}	2	V _{CC} 	8			μS
CK input pulse width	T _{CKW}	2	CK  or 	3			μS
CK input cycle	T _{CK}	2		20			μS
Watchdog timer monitoring time *1	T _{WD}	2	C _T =0.1μF	5	10	15	mS
Reset time for watchdog timer *2	T _{WR}	2	C _T =0.1μF	1	2	3	mS
Reset hold time for power supply rise *3	T _{PR}	2	C _T =0.1μF, V _{CC} 	50	100	150	mS
Output delay time from Vcc *4	T _{PD1}	2	RESET pin R _{L1} =2.2kΩ, C _{L1} =100pF		2	10	μS
	T _{PD2}	2	RESET pin R _{L2} =10kΩ, C _{L2} =20pF		3	10	
Output rise time *5	t _{r1}	2	RESET pin R _{L1} =2.2kΩ, C _{L1} =100pF		1.0	1.5	μS
	t _{r2}	2	RESET pin R _{L2} =10kΩ, C _{L2} =20pF		1.0	1.5	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_{SH}) during power on reset, until RESET output goes high (reset release).
- *4: Output delay time is the time from when power supply voltage drops below detection voltage (V_{SL}), until RESET output goes low (reset status).
- *5: Voltage range when measuring output rise and fall is 10~90%.
- *6: 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. The recommended range for C_T is 0.001~10μF.

$$T_{PR} \text{ (mS)} \approx 1000 \times C_T \text{ (}\mu\text{F)}$$

$$T_{WD} \text{ (mS)} \approx 100 \times C_T \text{ (}\mu\text{F)}$$

$$T_{WR} \text{ (mS)} \approx 20 \times C_T \text{ (}\mu\text{F)}$$

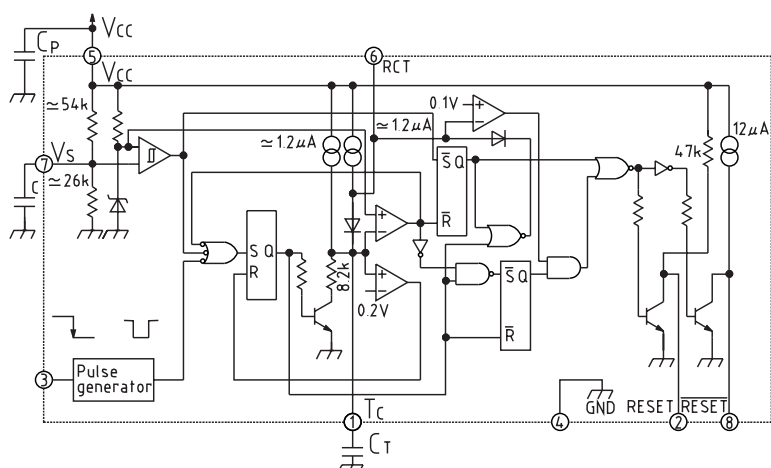
Example : When C_T=0.1μF

$$T_{PR} \approx 100\text{mS}$$

$$T_{WD} \approx 10\text{mS}$$

$$T_{WR} \approx 2\text{mS}$$

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 Block Diagram

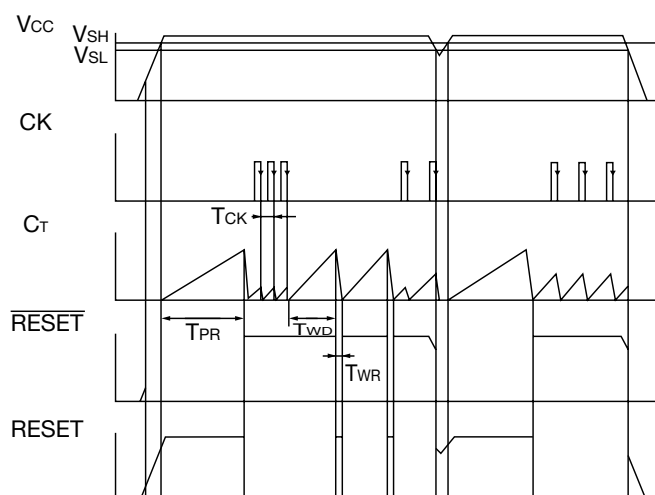


Note 1: $C_P = 0.1\mu F$ approx.

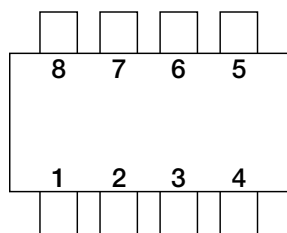
Note 2: $C \approx 1000pF$.

Note 3: The watchdog timer can be stopped by connecting the RCT pin to GND.
 (Then it functions as a voltage detection circuit.)

Timing Chart



Pin Assignment



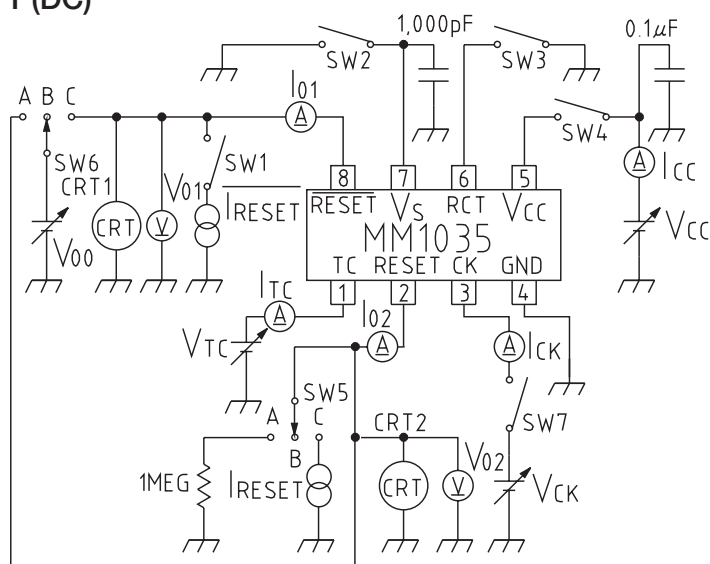
1	Tc
2	RESET
3	CK
4	GND
5	Vcc
6	RCT
7	Vs
8	RESET

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 Pin Description

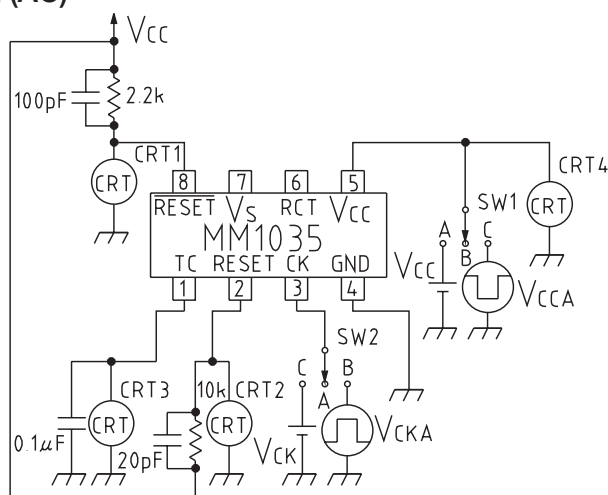
Pin No.	Pin Name	Function
1	T _C	T _{WD} , T _{WR} , T _{PR} variable pins. (T _{WD} , T _{WR} and T _{PR} times are determined by the external capacitor.)
2	RESET	Reset output pin (High output)
3	CK	Clock input pin (inputs clock from logic system)
4	GND	Reset output pin (High output)
5	V _{CC}	4.2V detection voltage
6	RCT	Watchdog timer stop pin Operation modes: Operation→ OPEN, Stop→ connect to GND
7	V _S	Detection voltage variable pin Variation modes : Lower → pull up resistance, Raise → pull down
8	RESET	Reset output pin (Low output)

Measuring Circuit

■ Measuring Circuit 1 (DC)



■ Measuring Circuit 2 (AC)



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Measuring Circuit 1

SW Table 6-1-2. SW&Power Supply Table 1

Item	Symbol	SW1	SW2	SW3	SW4	SW5	SW6	SW7	V _{CC}	V _{CK}	V _{CT}	I _{RESET}	I _{RESET}	VM, IM	Notes
Consumption current	I _{CC}	OFF	OFF	OFF	ON	B	B	ON	5V	5V	0V	-	-	I _{CC}	
Detection voltage	V _{SL}	OFF	OFF	ON	ON	B	B	ON	5V→0V	3V	3V	-	-	V _{o1} , CRT1	
	V _{SH}	OFF	OFF	ON	ON	B	B	ON	4V→5V	3V	3V	-	-	V _{o1} , CRT1	
CK input threshold	V _{TH}	OFF	OFF	OFF	ON	B	B	ON	5V	0V→3V	1V	-	-	I _{CK}	
CK input current	I _{IH}	OFF	OFF	OFF	ON	B	B	ON	5V	5V	0V	-	-	I _{CK}	
	I _{IL}	OFF	OFF	OFF	ON	B	B	ON	5V	0V	0V	-	-	I _{CK}	
Output voltage (High)	V _{OH1}	ON	OFF	ON	ON	B	B	ON	5V	5V	3V	-5μA	-	V _{o1}	
	V _{OH2}	OFF	ON	ON	ON	C	B	ON	5V	5V	3V	-	-5μA	V _{o2}	
Output voltage (Low)	V _{OL1}	ON	ON	ON	ON	B	B	ON	5V	5V	3V	3mA	-	V _{o1}	
	V _{OL2}	ON	ON	ON	ON	B	B	ON	5V	5V	3V	10mA	-	V _{o1}	
	V _{OL3}	OFF	OFF	ON	ON	C	B	ON	5V	5V	3V	-	0.5mA	V _{o2}	
	V _{OL4}	OFF	OFF	ON	ON	C	B	ON	5V	5V	3V	-	1mA	V _{o2}	
Output sink current	I _{OL1}	OFF	ON	ON	ON	B	C	ON	5V	5V	3V	-	-	I _{o1}	V _{oo} =1V
	I _{OL2}	OFF	OFF	ON	ON	B	A	ON	5V	5V	3V	-	-	I _{o2}	V _{oo} =1V
C _T charge current 1	I _{TC1}	OFF	OFF	OFF	ON	B	B	OFF	5V	-	1V	-	-	I _{TC}	
C _T charge current 2	I _{TC2}	OFF	OFF	ON	ON	B	B	OFF	5V	-	1V	-	-	I _{TC}	
Minimum operating power supply voltage to ensure reset	V _{CCL1}	ON	OFF	ON	ON	B	B	ON	0V→2V	0V	0V		-	V _{o1} , V _{CC}	
Minimum operating power supply voltage to ensure reset	V _{CCL2}	OFF	ON	ON	ON	A	B	ON	0V→2V	0V	0V	-	-	V _{o2} , V _{CC}	

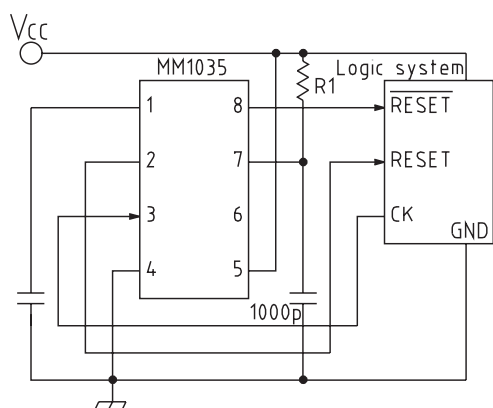
Measuring Circuit 2

SW Table 6-2-2. SW&Power Supply Table 2

Item	Symbol	SW1	SW2	V _{CCA}	V _{CC}	V _{CKA}	V _{CK}	CRT	Notes
V _{CC} input pulse width	T _{PI}	C	B	5V --- 4V ---	-	1.4V --- 0V ---	-	CRT1,2,3	T ₁ =8μS
CK input pulse width	T _{CKW}	A	B		5V	1.4V --- 0V ---	-	CRT1,2,3	T ₂ =3μS
CK input cycle	T _{CK}	A	B		5V	1.4V --- 0V ---	-	CRT1,2,3	T ₃ =20μS
Watchdog timer monitoring time	T _{WD}	A	A		5V		5V	CRT1,2,3	
Reset time for watchdog timer	T _{WR}	A	A		5V		5V	CRT1,2,3	
Reset hold time for power supply rise	T _{PR}	B→A	A		5V		5V	CRT1,2,3	
Output delay time from V _{CC}	T _{PD1}	C	A	5V --- 0V ---	-		0V	CRT1,3	
	T _{PD2}	C	A	5V --- 0V ---	-		0V	CRT2,3	
Output rise time	T _{R1}	A	A		5V		5V	CRT1	
	T _{R2}	A	A		5V		5V	CRT2	
Output fall time	T _{P1}	A	A		5V		5V	CRT1	
	T _{P2}	A	A		5V		5V	CRT2	

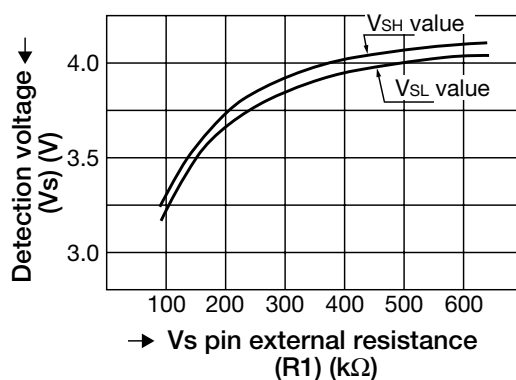
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Detection Voltage Variation 1 (lowering detection voltage)

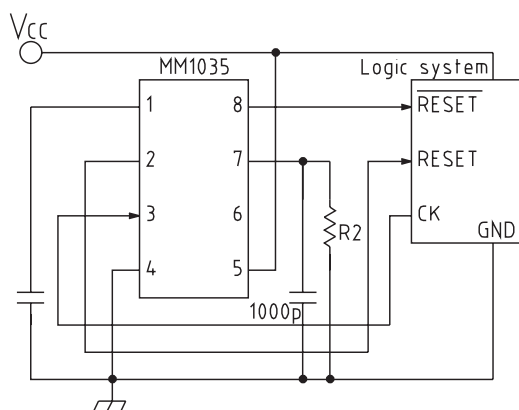


Detection voltage can be changed by connecting resistor R1 externally to MM1035 Vs pin. Determine R1 according to graph 1 when changing Vs.

Graph 1. Detection voltage change using MM1035 external resistor

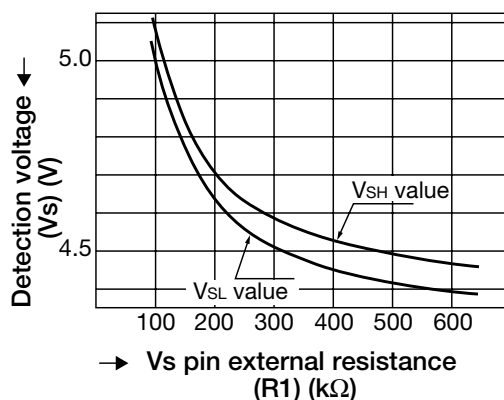


Detection Voltage Variation 2 (raising detection voltage)



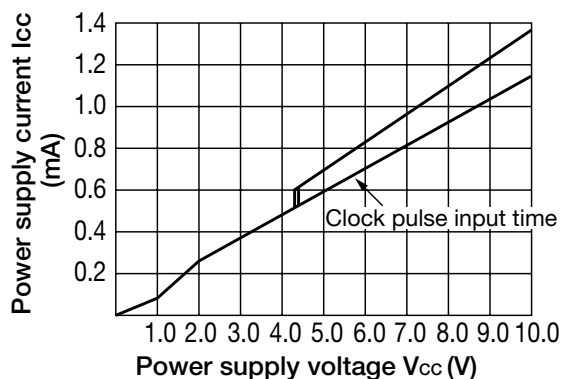
Detection voltage can be changed by connecting resistor R2 externally to MM1035 Vs pin. Determine R2 according to graph 2 when changing Vs.

Graph 2. Detection voltage change using MM1035 external resistor

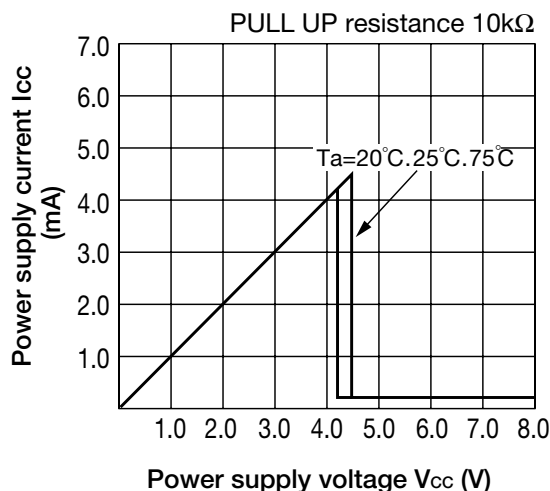


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Characteristics

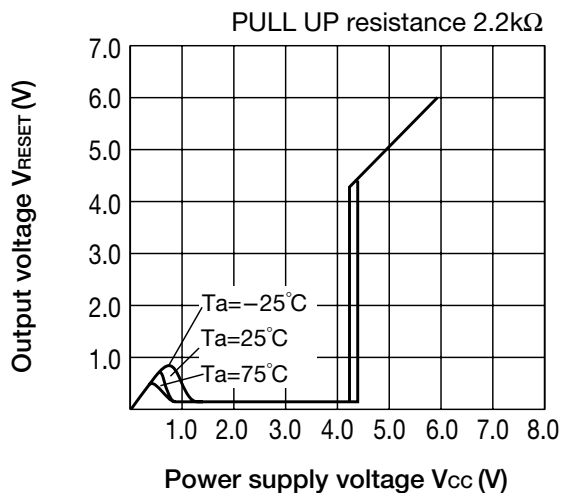
Power supply current-Power supply voltage



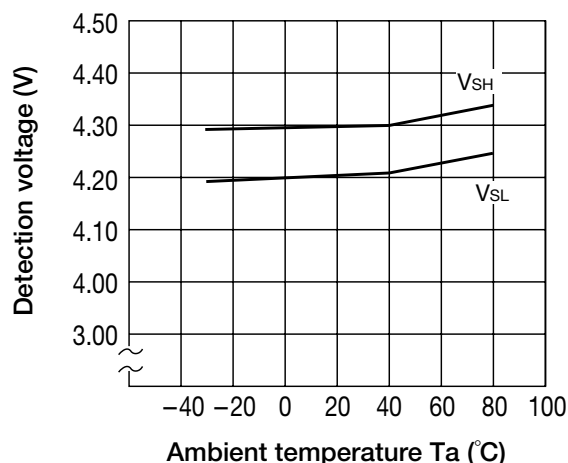
Output voltage-Power supply voltage (RESET pin)



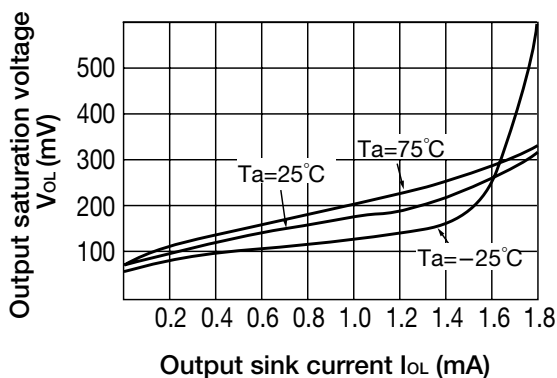
Output voltage-Power supply voltage (RESET pin)



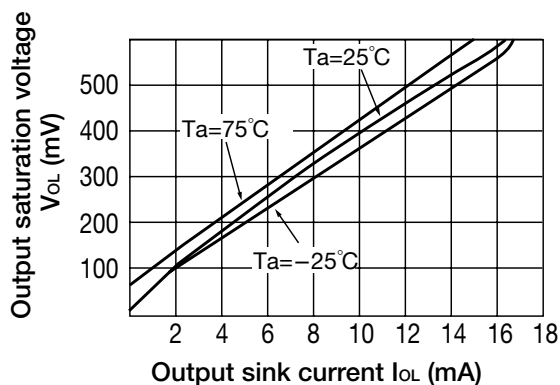
Detection voltage (V_{SL} , V_{SH}) temperature (RESET, $\overline{RESET}$ pins)



Output saturation voltage-Output sink current (RESET pin)

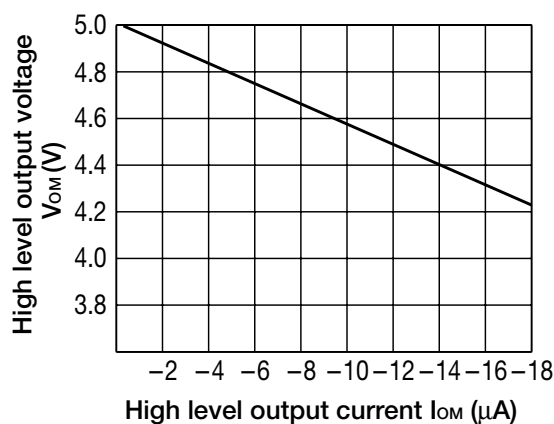


Output saturation voltage-Output sink current (RESET pin)

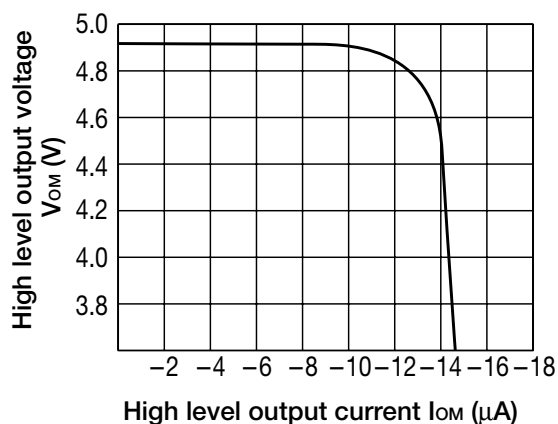


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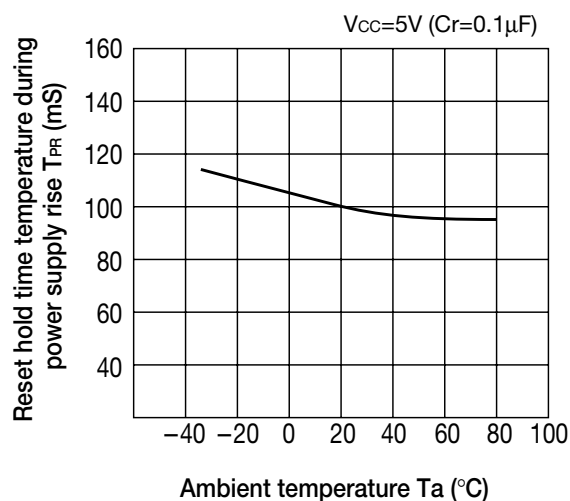
■ High level output voltage-High level output current (RESET pin)



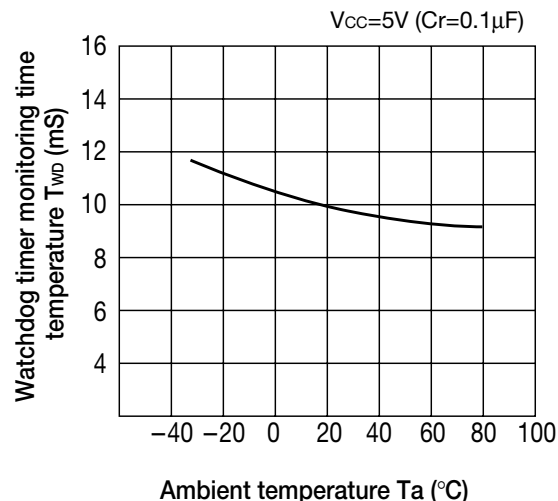
■ High level output voltage - High level output current (RESET pin)



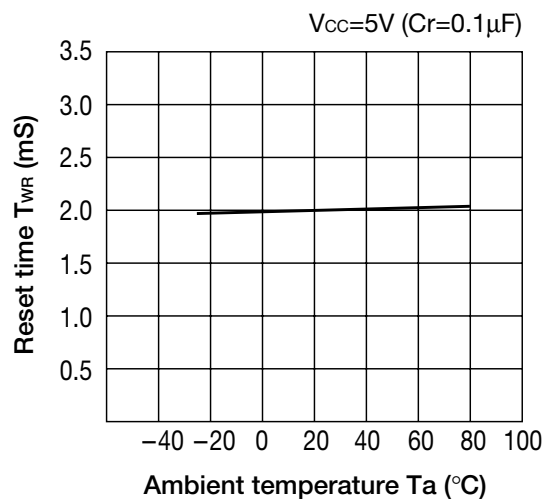
■ Reset hold time temperature during power supply rise



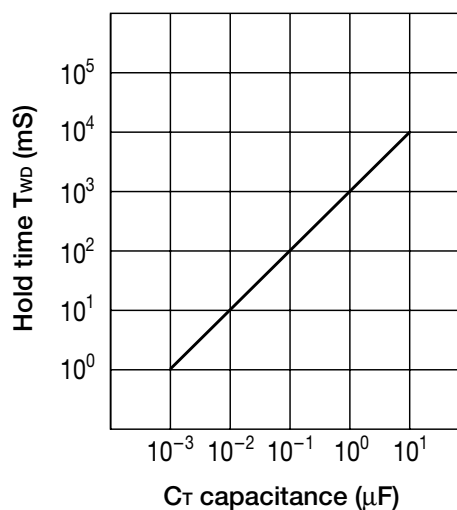
■ Watchdog timer monitoring time temperature



■ Reset time temperature (for watchdog timer)



■ C_T value for reset hold time during power supply rise



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