

Reset IC

PST893R/PST894R Series

Overview

This IC is a System Reset IC that detect turn-off or the power flicker in power supply of CPU or logic systems. The IC has the delay time pin by an external capacitor and manual reset sense pin. The manual reset function can reset for system at any time. Therefore the IC is suitable for some applications of forced reset or test function.

Features

- Low current consumption
- Manual reset function

Main specifications

- | | |
|---------------------------------|--|
| ■ Absolute maximum rating | : -0.3V ~ 6.5V |
| ■ Operating voltage | : 0.7V ~ 6.0V |
| ■ Operating ambient temperature | : -40℃ ~ 85℃ |
| ■ Detection voltage | : 0.8V ~ 5.2V (0.1V step) |
| ■ Detection voltage accuracy | : ±1% |
| ■ Hysteresis voltage | : Typ. VTH×0.05 |
| ■ Consumption current | : Typ. 0.35uA |
| ■ Output type | : PST893R: CMOS
PST894R: Open drain |
| ■ Output Logic | : Active L |
| ■ Delay Resistance | : Typ. 1MΩ |

Packages

- SOT-25A

Application

- Reset circuits for microcomputers, CPUs and MPUs
- Reset circuits for logic circuits
- Battery voltage check circuits
- Back-up power supply switching circuits
- Level detection circuits



Model Name

P

S

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X

X

X

X

X

X

X

Series name

(A)

(B)

(C)

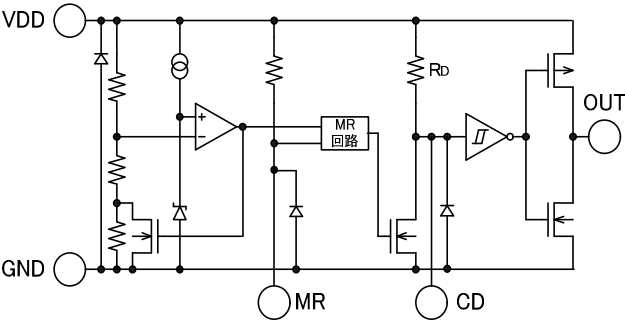
(D)

(E)

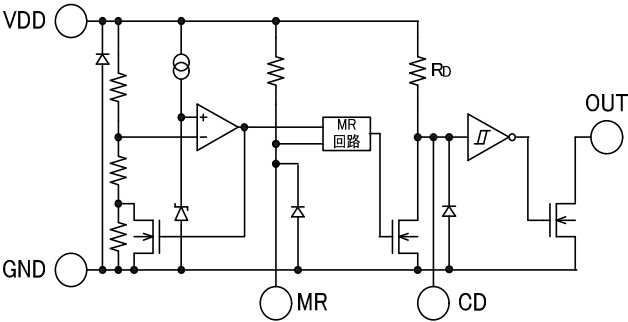
(A)	Output type	3	CMOS
		4	Open drain
(B)	Function option	R	Manual reset
(C)	Reset detection voltage	080	Specify the detection voltage with a three-digit number. Detection voltage is 0.80V to 5.20V (0.10V steps.)
		?	
		520	
(D)	Package	N	SOT-25A
(E)	Packing specifications	R	R housing (SOT-25A)

Block Diagram

- PST893R (CMOS output)

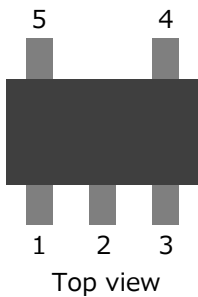


- PST894R (Open drain output)



Pin Configuration

■ SOT-25A



Pin No.	Pin name	Function
1	OUT	Output pin
2	VDD	Power supply input pin
3	GND	Ground pin
4	CD	Delay pin with external capacitor
5	MR	Manual reset pin

Absolute Maximum Ratings

Item		Symbol	Min.	Max.	Unit
Supply voltage		VDD	-0.3	6.5	V
CD pin voltage		VCD	-0.3	VDD+0.3	V
MR pin voltage		VMR	-0.3	VDD+0.3	V
Output voltage	PST893R	VOUT	-0.3	VDD+0.3	V
	PST894R		-0.3	6.5	V
Output current		IOUT	0	20	mA
Storage temperature		Tstg	-55	125	°C

Recommended Operating Conditions

Item		Symbol	Min.	Max.	Unit
Operating Ambient temperature		Topr	-40	85	°C
Operating voltage		Vop	0.7	6.0	V



Electrical Characteristics

(Ta=25°C, unless otherwise specified) *Note1

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Test circuit
Reset voltage *Note1	VTH	VDD=H→L Upper lineTa=25°C Lower lineTa=-40°C~85°C	0.8V	0.780 0.776	0.800 -	0.820 0.824	V	①
			0.9V	0.880 0.873	0.900 -	0.920 0.927		
			1.0V	0.980 0.970	1.000 -	1.020 1.030		
			1.1V	1.080 1.067	1.100 -	1.120 1.133		
			1.2V	1.180 1.164	1.200 -	1.220 1.236		
			1.3V	1.280 1.261	1.300 -	1.320 1.339		
			1.4V	1.380 1.358	1.400 -	1.420 1.442		
			1.5V	1.480 1.455	1.500 -	1.520 1.545		
			1.6V	1.580 1.552	1.600 -	1.620 1.648		
			1.7V	1.680 1.649	1.700 -	1.720 1.751		
			1.8V	1.780 1.746	1.800 -	1.820 1.854		
			1.9V	1.880 1.843	1.900 -	1.920 1.957		
			2.0V	1.980 1.940	2.000 -	2.020 2.060		
			2.1V	2.079 2.037	2.100 -	2.121 2.163		
			2.2V	2.178 2.134	2.200 -	2.222 2.266		
			2.3V	2.277 2.231	2.300 -	2.323 2.369		
			2.4V	2.376 2.328	2.400 -	2.424 2.472		
			2.5V	2.475 2.425	2.500 -	2.525 2.575		
			2.6V	2.574 2.522	2.600 -	2.626 2.678		
			2.7V	2.673 2.619	2.700 -	2.727 2.781		
			2.8V	2.772 2.716	2.800 -	2.828 2.884		
			2.9V	2.871 2.813	2.900 -	2.929 2.987		
			3.0V	2.970 2.910	3.000 -	3.030 3.090		

Electrical Characteristics

(Ta=25°C, unless otherwise specified) *Note1

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Test circuit
Reset voltage *Note1	VTH	VDD=H→L Upper line Ta=25°C Lower line Ta=-40°C~85°C	3.1V	3.069 3.007	3.100 -	3.131 3.193	V	①
			3.2V	3.168 3.104	3.200 -	3.232 3.296		
			3.3V	3.267 3.201	3.300 -	3.333 3.399		
			3.4V	3.366 3.298	3.400 -	3.434 3.502		
			3.5V	3.465 3.395	3.500 -	3.535 3.605		
			3.6V	3.564 3.492	3.600 -	3.636 3.708		
			3.7V	3.663 3.589	3.700 -	3.737 3.811		
			3.8V	3.762 3.686	3.800 -	3.838 3.914		
			3.9V	3.861 3.783	3.900 -	3.939 4.017		
			4.0V	3.960 3.880	4.000 -	4.040 4.120		
			4.1V	4.059 3.977	4.100 -	4.141 4.223		
			4.2V	4.158 4.074	4.200 -	4.242 4.326		
			4.3V	4.257 4.171	4.300 -	4.343 4.429		
			4.4V	4.356 4.268	4.400 -	4.444 4.532		
			4.5V	4.455 4.365	4.500 -	4.545 4.635		
			4.6V	4.554 4.462	4.600 -	4.646 4.738		
			4.7V	4.653 4.559	4.700 -	4.747 4.841		
			4.8V	4.752 4.656	4.800 -	4.848 4.944		
			4.9V	4.851 4.753	4.900 -	4.949 5.047		
			5.0V	4.950 4.850	5.000 -	5.050 5.150		
			5.1V	5.049 4.947	5.100 -	5.151 5.253		
			5.2V	5.148 5.044	5.200 -	5.252 5.356		

Electrical Characteristics

(Ta=25°C, unless otherwise specified) *Note1

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Test circuit
Hysteresis voltage	ΔV_{TH}	VDD=L→H	0.8V	0.024	0.040	0.064	V	①
			0.9V	0.027	0.045	0.072		
			1.0V	0.030	0.050	0.080		
			1.1V	0.033	0.055	0.088		
			1.2V	0.360	0.600	0.960		
			1.3V	0.039	0.065	0.104		
			1.4V	0.042	0.070	0.112		
			1.5V	0.045	0.075	0.120		
			1.6V	0.048	0.080	0.128		
			1.7V	0.051	0.085	0.136		
			1.8V	0.054	0.090	0.144		
			1.9V	0.057	0.095	0.152		
			2.0V	0.060	0.100	0.160		
			2.1V	0.063	0.105	0.168		
			2.2V	0.066	0.110	0.176		
			2.3V	0.069	0.115	0.184		
			2.4V	0.072	0.120	0.192		
			2.5V	0.075	0.125	0.200		
			2.6V	0.078	0.130	0.208		
			2.7V	0.081	0.135	0.216		
			2.8V	0.084	0.140	0.224		
			2.9V	0.087	0.145	0.232		
			3.0V	0.090	0.150	0.240		
			3.1V	0.093	0.155	0.248		
			3.2V	0.096	0.160	0.256		
			3.3V	0.099	0.165	0.264		
			3.4V	0.102	0.170	0.272		
			3.5V	0.105	0.175	0.280		
			3.6V	0.108	0.180	0.288		
			3.7V	0.111	0.185	0.296		
			3.8V	0.114	0.190	0.304		
			3.9V	0.117	0.195	0.312		
			4.0V	0.120	0.200	0.320		
4.1V	0.123	0.205	0.328					
4.2V	0.126	0.210	0.336					
4.3V	0.129	0.215	0.344					
4.4V	0.132	0.220	0.352					
4.5V	0.135	0.225	0.360					
4.6V	0.138	0.230	0.368					
4.7V	0.141	0.235	0.376					
4.8V	0.144	0.240	0.384					
4.9V	0.147	0.245	0.392					
5.0V	0.150	0.250	0.400					
5.1V	0.153	0.255	0.408					
5.2V	0.156	0.260	0.416					

Electrical Characteristics

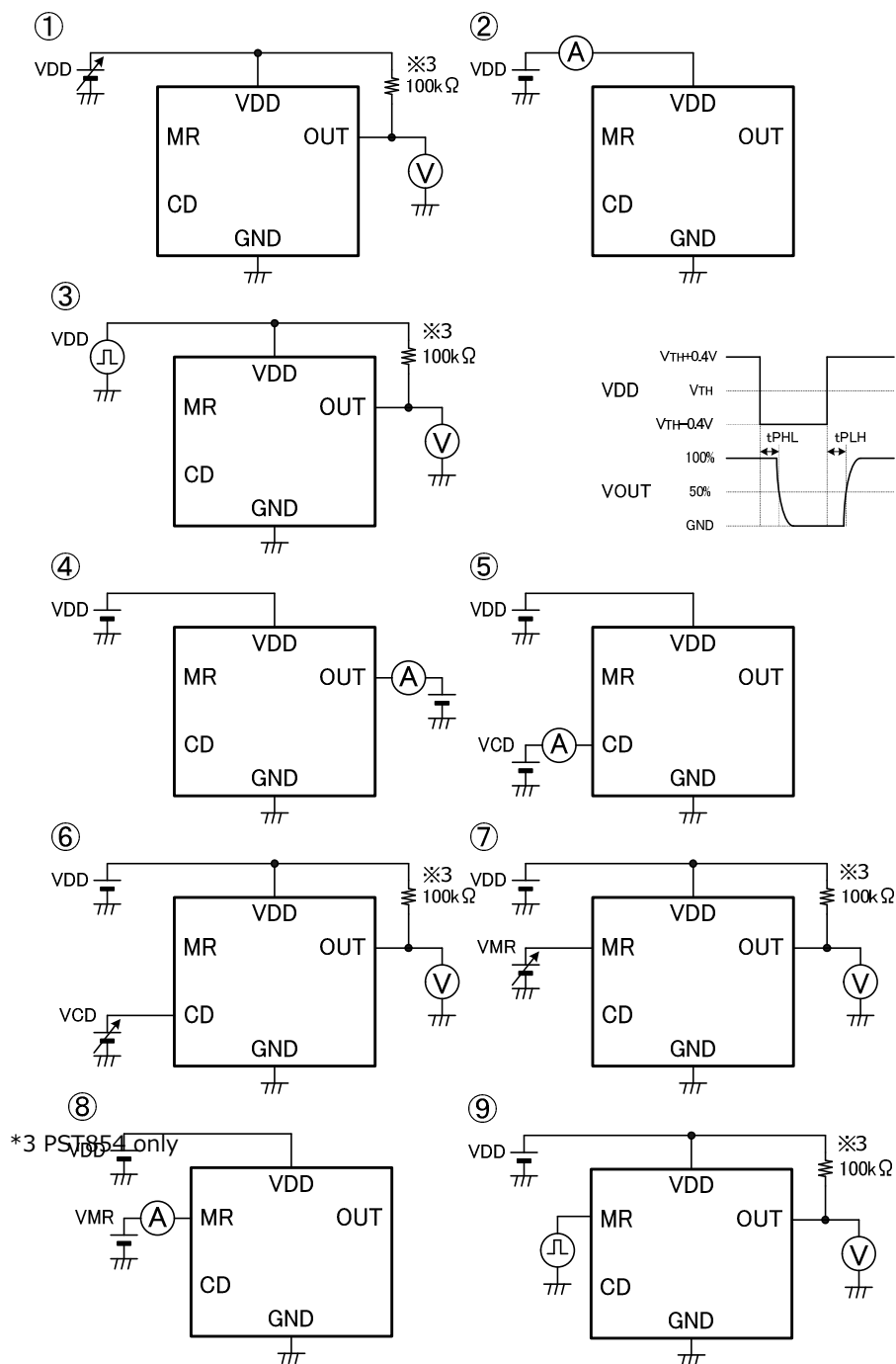
(Ta=25°C, unless otherwise specified) *Note1

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Test circuit
Consumption current	IDD	VDD=VTH+1V	0.8V~5.2V	-	0.35	1.0	uA	②
Reset threshold temperature coefficient *Note2	$\Delta V_{TH}/^{\circ}C$	Ta=-40℃~+85℃	0.8V~5.2V	-	±100	-	ppm/℃	①
"L" Transfer delay time *Note2	tPHL	VDD=VTH+0.4V→VTH-0.4V	1.2V~5.2V	2	15	100	us	③
"H" Transfer delay time *Note2	tPLH	VDD=VTH-0.4V→VTH+0.4V	1.2V~5.2V	2	15	100	us	③
"L" Output current	IOL1	VDD=0.7V, VDS=0.05V	0.8V~5.2V	0.01	0.10	—	mA	④
	IOL2	VDD=1.2V, VDS=0.5V	1.3V~5.2V	0.23	2.00	—		
	IOL3	VDD=2.4V, VDS=0.5V	2.5V~5.2V	1.60	8.00	—		
	IOL4	VDD=3.6V, VDS=0.5V	3.7V~5.2V	3.20	12.0	—		
"H" Output current	IOH1	VDD=4.8V, VDS=0.5V PST893R only	0.8V~4.7V	0.36	0.62	-	mA	④
	IOH2	VDD=6.0V, VDS=0.5V PST893R only	0.8V~5.2V	0.46	0.75	-		
Output leakage current	Ileak	VDD=6V, VOUT=6V PST854R only	0.8V~5.2V	-	-	0.1	uA	④
Delay resistance	RCD	VDD=VTH+1V VCD=0V	0.8V~5.2V	0.5	1.0	2.0	MΩ	⑤
CD pin threshold voltage	VTCD	VDD=VTH×1.1 VCD=0V→VDD	0.8V~5.2V	VDD×0.3	VDD×0.5	VDD×0.7	V	⑥
CD pin output current 1	ICD1	VDD=0.7V VCD=0.1V	0.8V~5.2V	2	30	-	uA	⑤
CD pin output current 2	ICD2	VDD=0.8V VCD=0.5V	0.8V~1.0V	20	80	-	uA	⑤
		VDD=1.0V VCD=0.5V	1.1V~1.5V	50	150	-	uA	⑤
		VDD=1.5V VCD=0.5V	1.6V~5.2V	200	400	-	uA	⑤
MR pin input voltage H	VMR_H	VDD=VTH+1V	0.8V~5.2V	VDD-0.3	-	VDD×0.7	V	⑦
MR pin input voltage L	VMR_L	VDD=VTH+1V	0.8V~5.2V	0	-	0.3	V	⑦
MR pin input resistance	RMR	VDD=VTH+1V VMR=0V	0.8V~5.2V	0.5	1.0	2.0	MΩ	⑧
MR pin input pulse wide *Note2	tMR	VDD=VTH+1V	0.8V~5.2V	500	-	-	us	⑨

*Note1: The IC is only tested at Ta=25°C in final test. It is guaranteed by design except Ta=25°C.

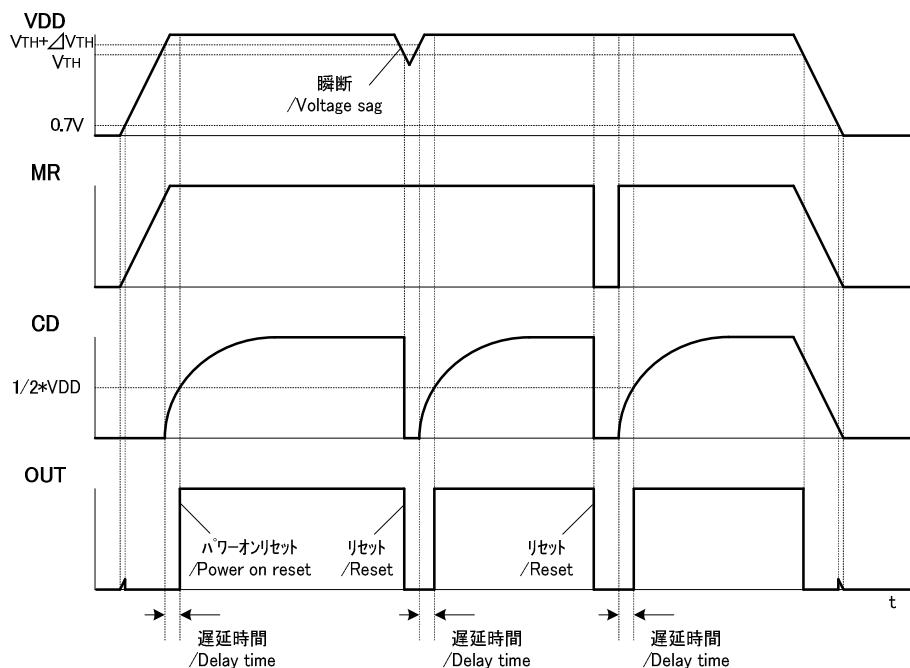
*Note2: The parameter is guaranteed by design.

Test Circuit



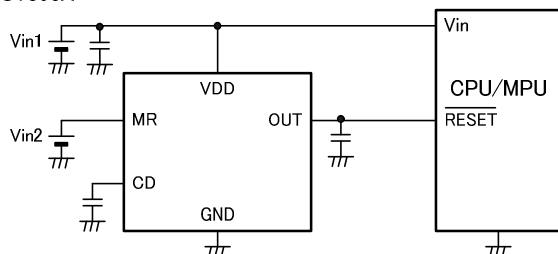
Timing Chart

- PST894R (Open drain output)

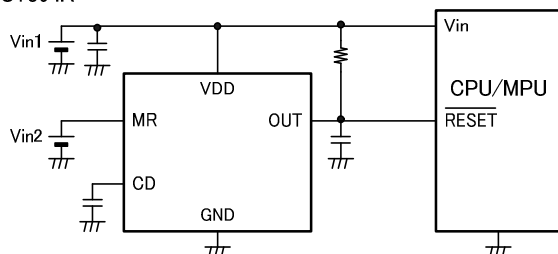


Application Circuit

- PST893R



- PST894R



- The typical application circuit is not guaranteed for a set applications. It has to test sufficiently in a set applications.

In the event a problem which may affect industrial property or any other rights of us or a third party

- is encountered during the use of information described in these circuit, Mitsumi shall not be liable for any such problem, nor grant a license therefore.

Application notes

Reset voltage

In case of $VDD=H \rightarrow L$, the reset voltage is the detected voltage at $OUT=H \rightarrow L$.

Release voltage

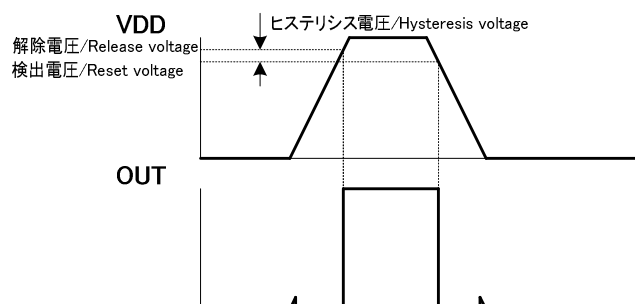
In case of $VDD=L \rightarrow H$, the release voltage is the detected voltage at $OUT=L \rightarrow H$.

(Release voltage = Reset voltage + Hysteresis voltage)

Hysteresis voltage

The hysteresis voltage prevents a malfunction from power supply noise.

(Hysteresis voltage = Release voltage - Reset voltage)



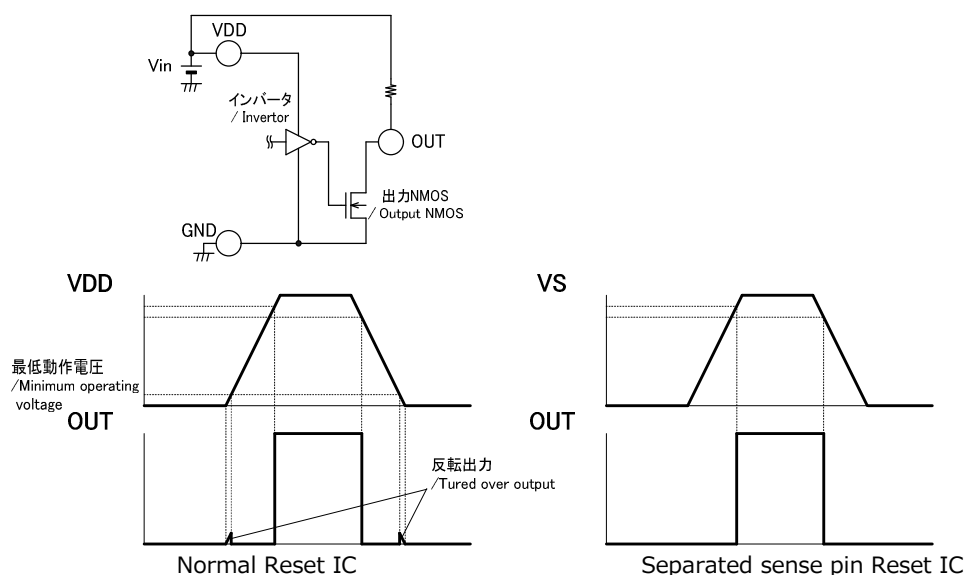
VDD pin Minimum operating voltage

VDD pin is a detected pin and an internal power supply circuit.

When VDD is less than minimum operating voltage, the output NMOS is failed the bias voltage of gate.

Therefore NMOS turn off, and OUT voltage turn over from low to high.

If the minimum operating voltage can not be admitted, it is recommended to use a separated sense pin reset IC.



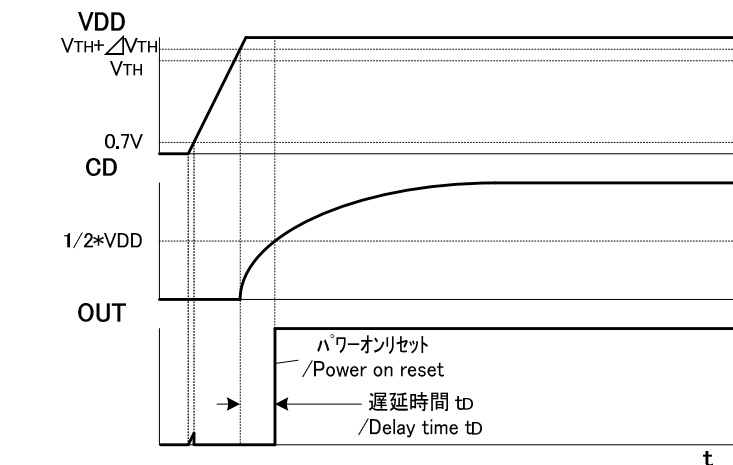
Application notes

Delay time

The delay circuit is connected with an external capacitor to CD pin.

The delay time is decided on time constant by an internal resistance and an external capacitor.

Power-on-reset (VS=L→H) is released, after an input voltage turned on stable voltage.



Delay Time

$$tD = 0.69 \times CD \times RD \text{ [s]}$$

C_D : External capacitor [F]

R_D : Delay resistance [Ω]

The charging time formula of the CR time constant, is a case of " $V_{CD} = 0.5 \times VDD$ ".

$$tD = -CD \times RD \times \ln(1 - V_{CD}/VDD)$$

V_{CD} : CD threshold voltage [V]

CD pin

CD pin is high impedance for a delay resistance or constant current circuit.

It is necessary to take care for dew condensation or PCB or capacitor leakage.

Long delay time

When a high delay capacitor is used, the release delay time can be long.

But a delay time occurs in reset operation by discharge time of capacitor.

A set is recommended to design considering the delay time.

MR pin

MR pin can be manual reset at any timing.

When MR switches H→L, OUT switches H→L. When MR switches L→H, OUT switch H→L after delay time.

If MR pin is not used, it has to be connected with VDD pin.

Application notes

CMOS output

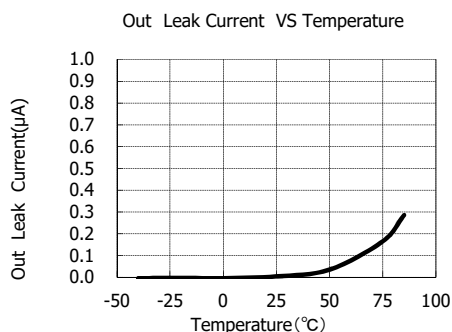
CMOS output is inverter output between VDD and GND. It is not necessary to connect a pull-up resistance.

Open drain output

Open drain output is certainly connected with an external pull-up resistance.

The pull-up resistance can be supplied for any voltage and more than VDD voltage.

At high temperature, please pay attention to the leak current for open drain NMOS, it happens output voltage is up to leak current.



Oscillation

When a series resistance R_A is connected with VDD, it is possible to occur an oscillation at threshold voltage.

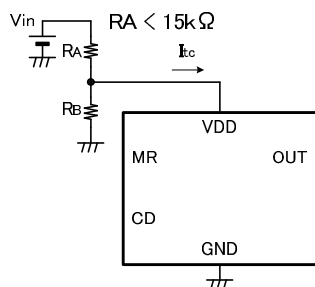
It is occurred by voltage drops of a through current I_{tc} at threshold and a series resistance R_A .

To prevent it, R_A has to be set less than $15k\Omega$.

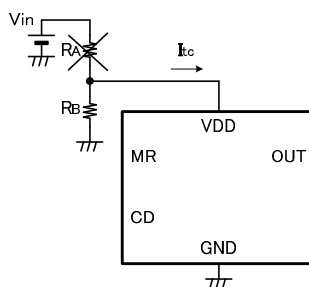
In CMOS output, since it may oscillate, please do not put resistance R_A .

Open drain output

• $R_A < 15k\Omega$

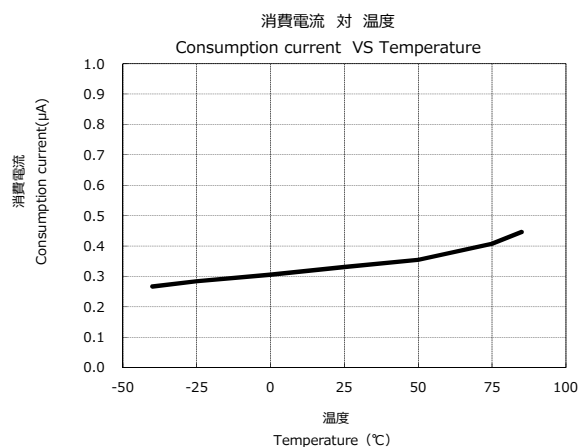
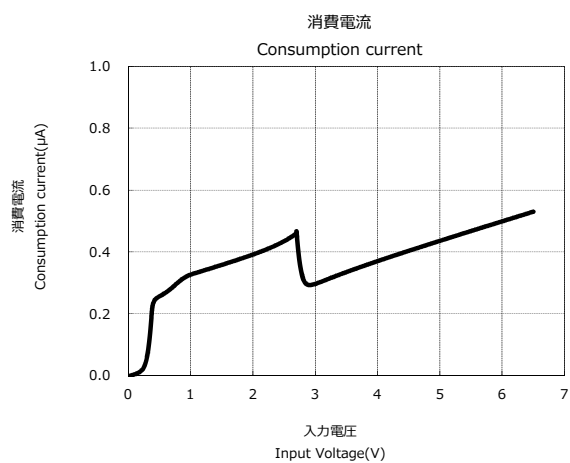
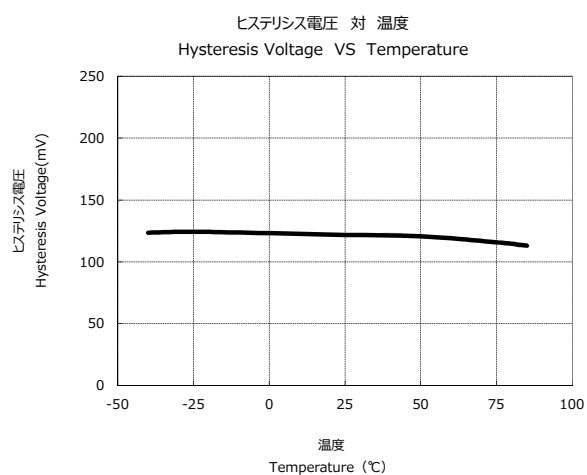
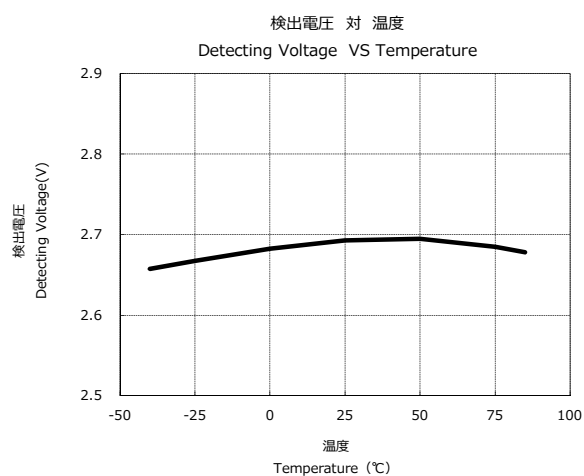
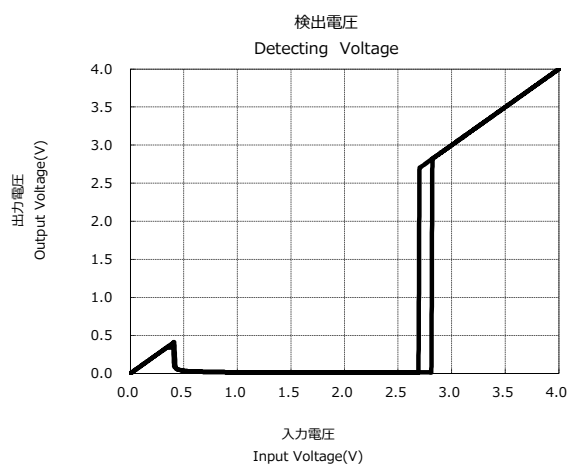


CMOS output



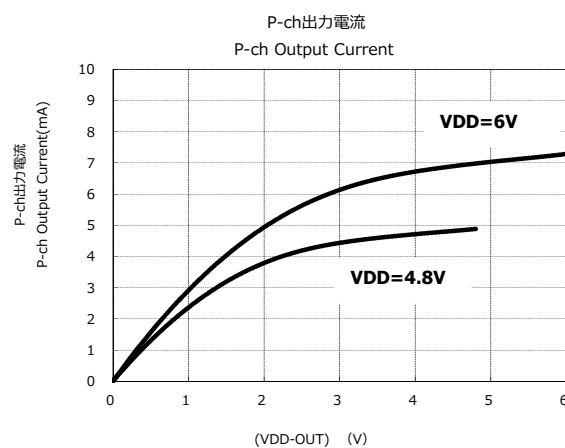
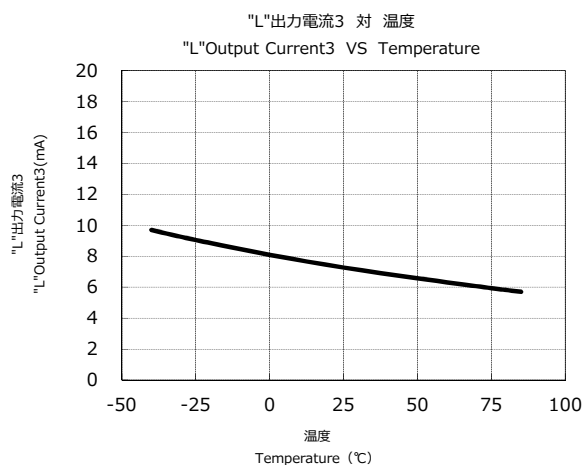
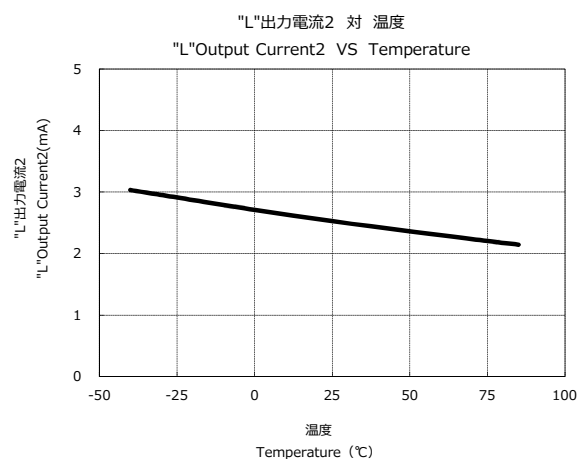
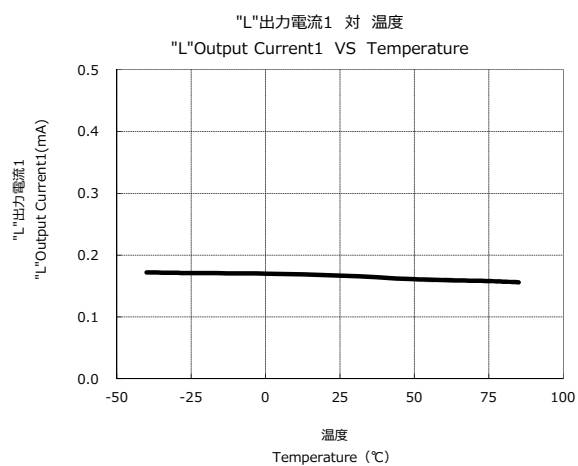
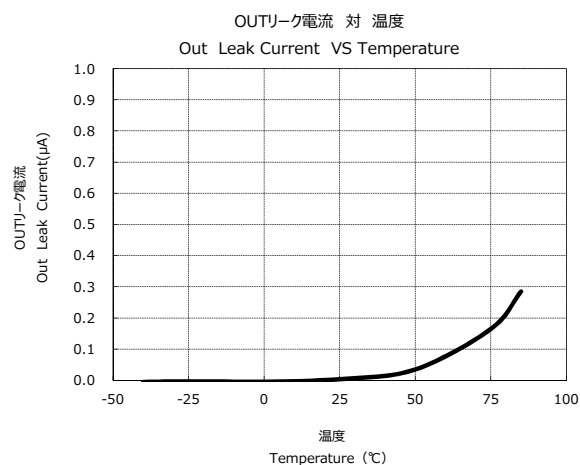
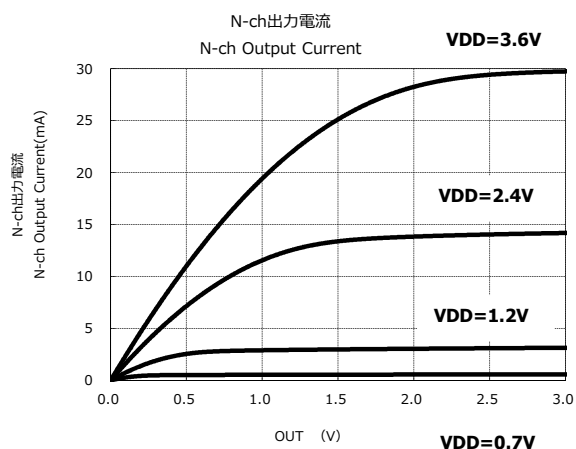
Typical Performance Characteristics (PST894R270)

(Ta=25°C, unless otherwise specified)



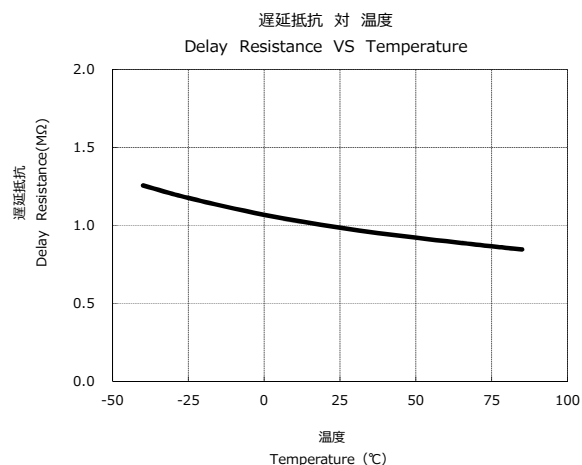
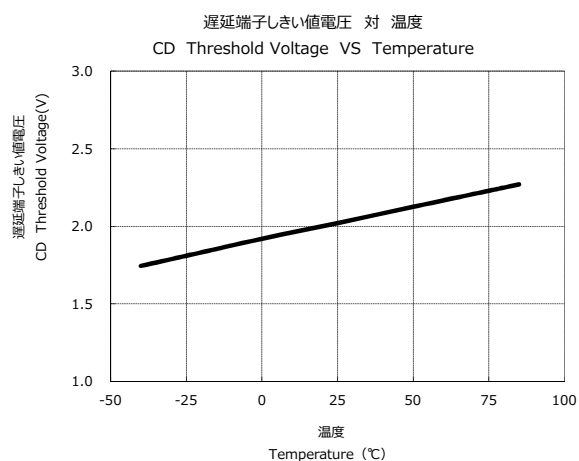
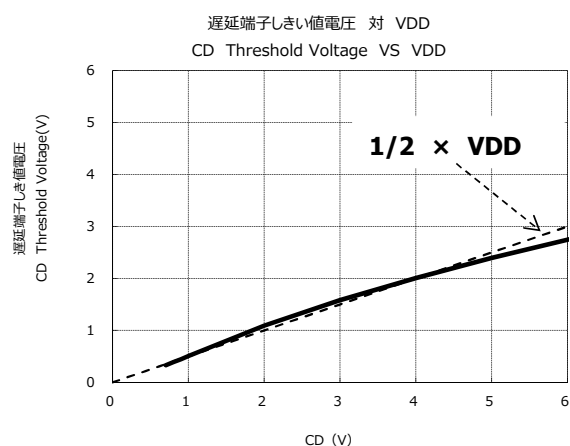
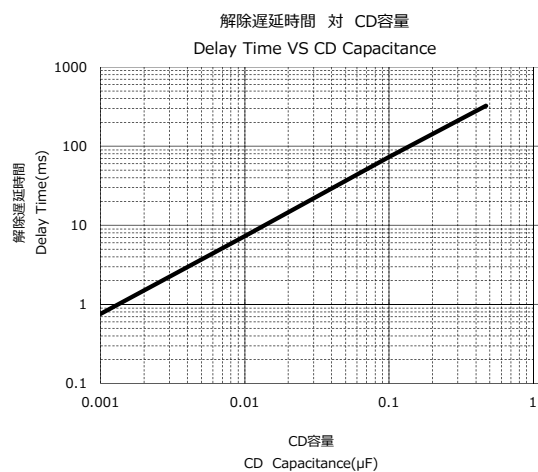
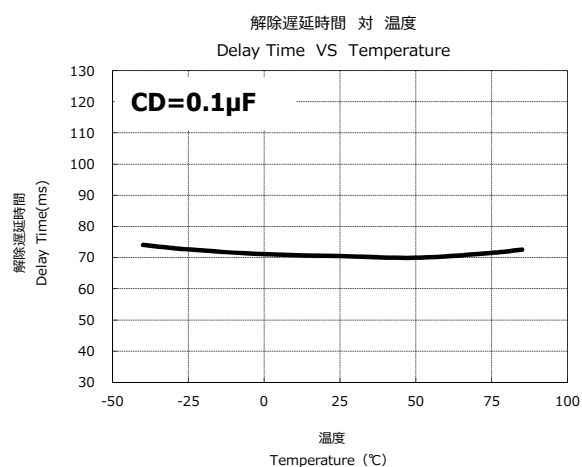
Typical Performance Characteristics (PST894R270)

(特記なき場合 Ta=25℃)



特性例 (PST894R270)

(特記なき場合 Ta=25℃)



特性例 (PST894R270)

(特記なき場合 Ta=25℃)

