IC for CMOS System Reset
Monolithic IC PST35XX, 36XX Series

March 21, 2004

Outline

This system reset IC, developed using the CMOS process, has a built-in delay function. Ultra-low consumption current of 1.0μA (typ.). has been achieved through use of the CMOS process. Also, detection voltage is high-precision detection of ±2%. The small package MLF-4 (1.1×1.4×0.6mm) is used for space saving.

Features

1. Ultra-low current consumption	1.0μA typ. (V_{DD} = Vs + 1V)
2. High-precision detection voltage	±2%
3. Operating range	0.7 ~ 10V
4. Wide operating temperature range	-30 ~ +85°C
5. Detection voltage	0.9 ~ 6.0V (0.1V step)

6. Delay time can be easily set with an external component (capacitor).

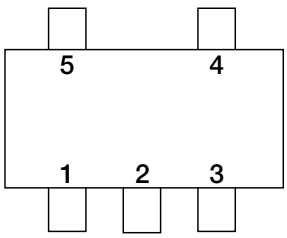
Packages

SOT-25A (PST35XXNR, PST36XXNR)
SC-82ABA, SC-82ABB (PST36XXUR, PST36XXUR)
SSON-4

Applications

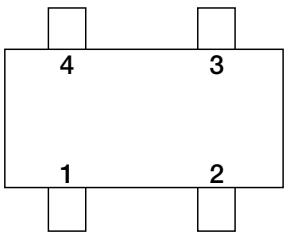
1. Reset circuits for microcomputers, CPUs and MPUs
2. Reset circuits for logic circuits
3. Battery voltage check circuits
4. Back-up power supply switching circuits
5. Level detection circuits
6. Delay time can be easily set with an external component (capacitor).

Pin Assignment



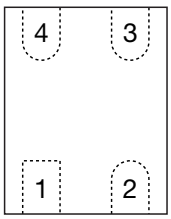
SOT-25A
(TOP VIEW)

1	OUT
2	V_{DD}
3	GND
4	NC
5	Cd



SC-82ABA
SC-82ABB
(TOP VIEW)

1	GND
2	V_{DD}
3	Cd
4	OUT

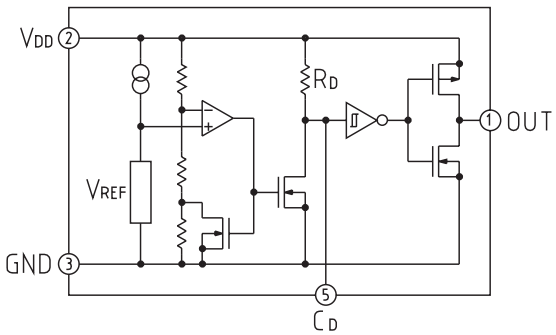


SSON-4
(TOP VIEW)

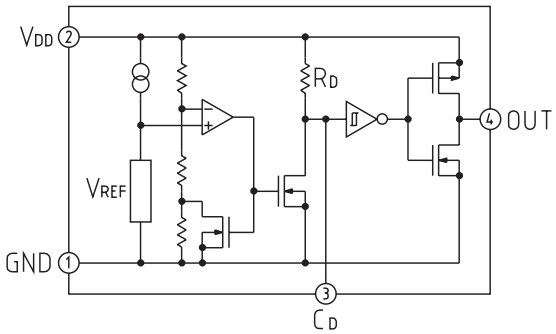
1	GND
2	OUT
3	Cd
4	V_{DD}

Equivalent Circuit Diagram

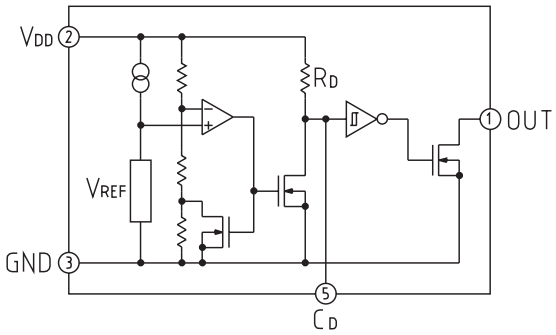
PST35XXNR (SOT-25A)



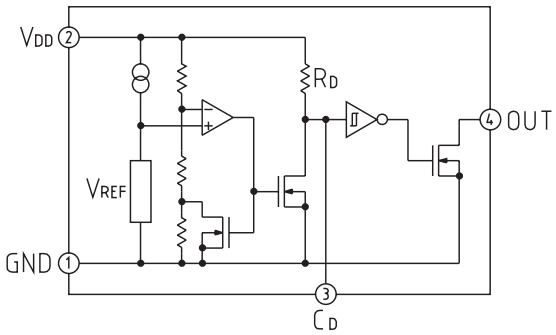
PST35XXUR (SC-82ABA/-82ABB)



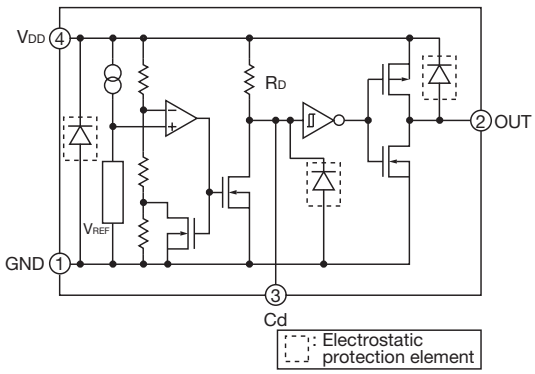
PST36XXNR (SOT-25A)



PST36XXUR (SC-82ABA/-82ABB)



PST35XXRX (SSON-4)



Pin Explanation

Pin No.	Pin Name	Function
1	GND	GND Pin
2	OUT	Reset Signal Output Pin
3	Cd	Capacitor Connect Pin with Delay
4	V_{DD}	V_{DD} Pin / Voltage Detect Pin

Recommended Operating Conditions

PST35XX UR/NR

Item	Symbol	Rating	Units
Operating temperature	T_{OPT}	–30~+85	℃
Power supply voltage	V_{DD}	+0.70~+10	V

PST36XX UR/NR

Item	Symbol	Rating	Units
Operating temperature	T_{OPT}	–30~+85	℃
Power supply voltage	V_{DD}	+0.70~+10	V

Absolute Maximum Ratings (Ta=25°C)

PST35XX UR/NR

Item	Symbol	Rating	Unit
Storage temperature	T_{STG}	–40~+125	°C
Operating temperature	T_{OPR}	–30~+85	°C
Power supply voltage	V_{DD} max.	+12	V
Output voltage	V_{OUT}	V_{SS}+0.3	V
Output current	I_{OUT}	70	mA
Allowable loss	Pd	150	mW
CD Pin Input Voltage	V_{CD}	V_{SS}-0.3~V_{DD}+0.3	V

PST36XX UR/NR

Item	Symbol	Rating	Unit
Storage temperature	T_{STG}	–40~+125	°C
Operating temperature	T_{OPR}	–30~+85	°C
Power supply voltage	V_{DD} max.	+12	V
Output voltage	V_{OUT}	V_{SS}–0.3~+12	V
Output current	I_{OUT}	70	mA
Allowable loss	Pd	150	mW
CD Pin Input Voltage	V_{CD}	V_{SS}-0.3~V_{DD}+0.3	V

Electrical Characteristics

(1) Detection Voltage Table Ta=25°C

Detection voltage	SOT-25A		SC-82AB	
	CMOS output	N-ch open drain	CMOS output	N-ch open drain
0.900 ± 2%	PST3509NR	PST3609NR	PST3509UR	PST3609UR
1.000 ± 2%	PST3510NR	PST3610NR	PST3510UR	PST3610UR
1.100 ± 2%	PST3511NR	PST3611NR	PST3511UR	PST3611UR
1.200 ± 2%	PST3512NR	PST3612NR	PST3512UR	PST3612UR
1.300 ± 2%	PST3513NR	PST3613NR	PST3513UR	PST3613UR
1.400 ± 2%	PST3514NR	PST3614NR	PST3514UR	PST3614UR
1.500 ± 2%	PST3515NR	PST3615NR	PST3515UR	PST3615UR
1.600 ± 2%	PST3516NR	PST3616NR	PST3516UR	PST3616UR
1.700 ± 2%	PST3517NR	PST3617NR	PST3517UR	PST3617UR
1.800 ± 2%	PST3518NR	PST3618NR	PST3518UR	PST3618UR
1.900 ± 2%	PST3519NR	PST3619NR	PST3519UR	PST3619UR
2.000 ± 2%	PST3520NR	PST3620NR	PST3520UR	PST3620UR
2.100 ± 2%	PST3521NR	PST3621NR	PST3521UR	PST3621UR
2.200 ± 2%	PST3522NR	PST3622NR	PST3522UR	PST3622UR
2.300 ± 2%	PST3523NR	PST3623NR	PST3523UR	PST3623UR
2.400 ± 2%	PST3524NR	PST3624NR	PST3524UR	PST3624UR
2.500 ± 2%	PST3525NR	PST3625NR	PST3525UR	PST3625UR
2.600 ± 2%	PST3526NR	PST3626NR	PST3526UR	PST3626UR
2.700 ± 2%	PST3527NR	PST3627NR	PST3527UR	PST3627UR
2.800 ± 2%	PST3528NR	PST3628NR	PST3528UR	PST3628UR
2.900 ± 2%	PST3529NR	PST3629NR	PST3529UR	PST3629UR
3.000 ± 2%	PST3530NR	PST3630NR	PST3530UR	PST3630UR
3.100 ± 2%	PST3531NR	PST3631NR	PST3531UR	PST3631UR
3.200 ± 2%	PST3532NR	PST3632NR	PST3532UR	PST3632UR
3.300 ± 2%	PST3533NR	PST3633NR	PST3533UR	PST3633UR
3.400 ± 2%	PST3534NR	PST3634NR	PST3534UR	PST3634UR
3.500 ± 2%	PST3535NR	PST3635NR	PST3535UR	PST3635UR
3.600 ± 2%	PST3536NR	PST3636NR	PST3536UR	PST3636UR
3.700 ± 2%	PST3537NR	PST3637NR	PST3537UR	PST3637UR
3.800 ± 2%	PST3538NR	PST3638NR	PST3538UR	PST3638UR
3.900 ± 2%	PST3539NR	PST3639NR	PST3539UR	PST3639UR
4.000 ± 2%	PST3540NR	PST3640NR	PST3540UR	PST3640UR
4.100 ± 2%	PST3541NR	PST3641NR	PST3541UR	PST3641UR
4.200 ± 2%	PST3542NR	PST3642NR	PST3542UR	PST3642UR
4.300 ± 2%	PST3543NR	PST3643NR	PST3543UR	PST3643UR
4.400 ± 2%	PST3544NR	PST3644NR	PST3544UR	PST3644UR
4.500 ± 2%	PST3545NR	PST3645NR	PST3545UR	PST3645UR
4.600 ± 2%	PST3546NR	PST3646NR	PST3546UR	PST3646UR
4.700 ± 2%	PST3547NR	PST3647NR	PST3547UR	PST3647UR
4.800 ± 2%	PST3548NR	PST3648NR	PST3548UR	PST3648UR
4.900 ± 2%	PST3549NR	PST3649NR	PST3549UR	PST3649UR
5.000 ± 2%	PST3550NR	PST3650NR	PST3550UR	PST3650UR
5.100 ± 2%	PST3551NR	PST3651NR	PST3551UR	PST3651UR
5.200 ± 2%	PST3552NR	PST3652NR	PST3552UR	PST3652UR
5.300 ± 2%	PST3553NR	PST3653NR	PST3553UR	PST3653UR
5.400 ± 2%	PST3554NR	PST3654NR	PST3554UR	PST3654UR
5.500 ± 2%	PST3555NR	PST3655NR	PST3555UR	PST3655UR
5.600 ± 2%	PST3556NR	PST3656NR	PST3556UR	PST3656UR
5.700 ± 2%	PST3557NR	PST3657NR	PST3557UR	PST3657UR
5.800 ± 2%	PST3558NR	PST3658NR	PST3558UR	PST3658UR
5.900 ± 2%	PST3559NR	PST3659NR	PST3559UR	PST3659UR
6.000 ± 2%	PST3560NR	PST3660NR	PST3560UR	PST3660UR

Detection voltage measurement conditions: V_{DD} = 9V→0V, measurement circuit 1

Electrical Characteristics (Except where noted otherwise, Ta=25°C)

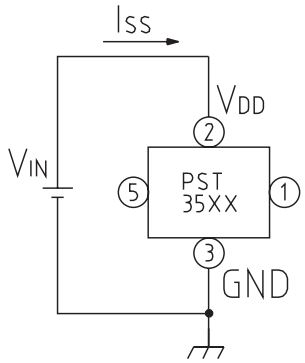
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Hysteresis voltage	V_{HYS}		Vs×0.03	Vs×0.05	Vs×0.07	V
Detection voltage temperature coefficient	Vs/⊿T	−30°C ≦ T_{OPT} ≦ 85°C		±0.01		%/°C
Consumption current 1	I_{SS1}	V_{DD}= (−V_{DET}) −0.13V		4	8	µA
Consumption current 2	I_{SS2}	V_{DD}= (−V_{DET}) +2.0V		1.2	3.6	µA
Output voltage 1	I_{OUT1}	Nch: V_{DS}=0.05V, V_{DD}=0.7V	0.01	0.05		mA
Output voltage 2	I_{OUT2}	V_{DD}=1.5V, Nch:V_{DS}=0.5V, V_{DD}=1.5V	1.0	2.0		mA
Output voltage 3	I_{OUT3}	V_{DD}=4.5V, Pch: V_{DS}=−2.1V	1.0	2.0		mA
Delay terminal threshold voltage	V_{TCD}	V_{DD}= (−V_{DET}) × 1.1V	V_{DD}×0.4	V_{DD}×0.5	V_{DD}×0.6	V
Delay terminal output current 1	I_{CD1}	V_{DS}=0.1V, V_{DD}=0.7V	2	30		µA
Delay terminal output current 2	I_{CD2}	V_{DS}=0.5V, V_{DD}=1.5V	200	800		µA
Minimum operating voltage 1	V_{DDL1}	V_{OUT} ≦ 0.1V, T_{OPT}=25°C		0.55	0.70	V
Minimum operating voltage 2	V_{DDL2}	V_{OUT} ≦ 0.1V, −30°C ≦ T_{OPT} ≦ 85°C		0.65	0.80	V
Delay circuit resistance	R_D		0.5	1.0	2.0	MΩ
Leak current	I_{LEAK}	V_{DD}=10V, V_{CD}=10V, V_{DS}=10V			0.1	µA

Note: Output current is only CMOS output (PST3530NR).

Measuring Circuit

PST35XXNR

(1)



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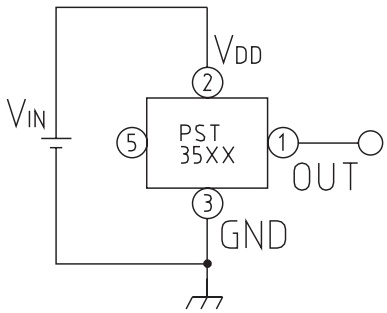

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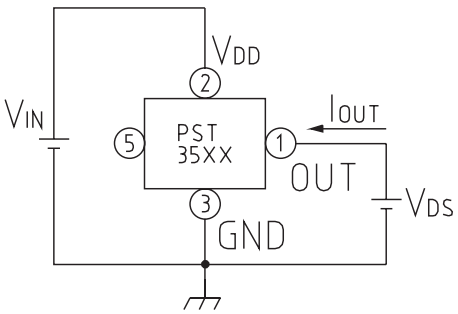

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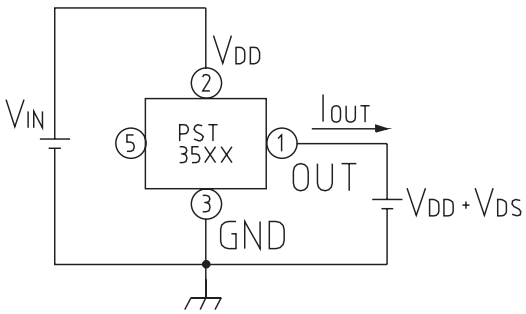

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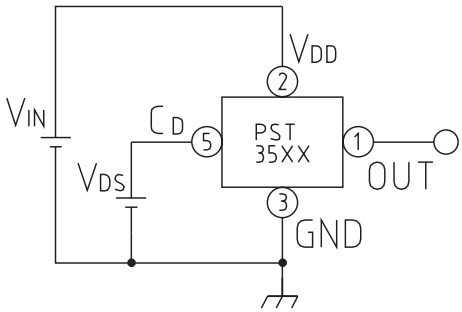

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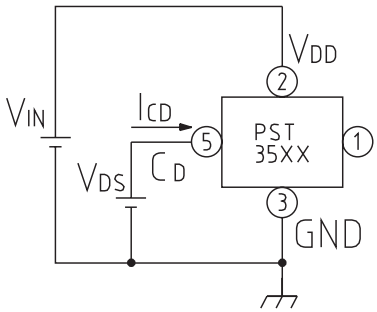

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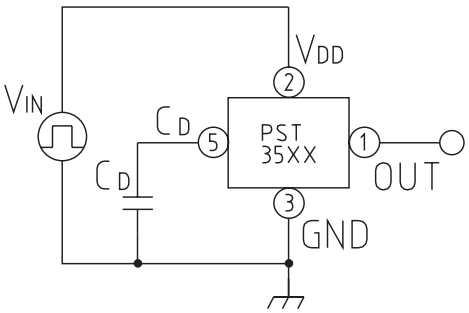
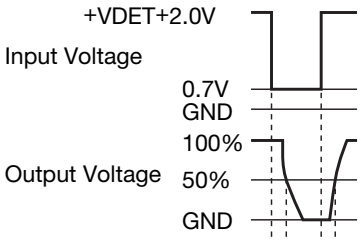
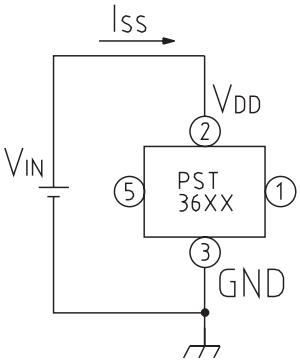




Delay Time Current

PST36XXNR

(1)



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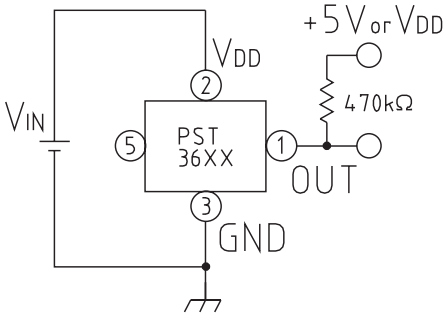

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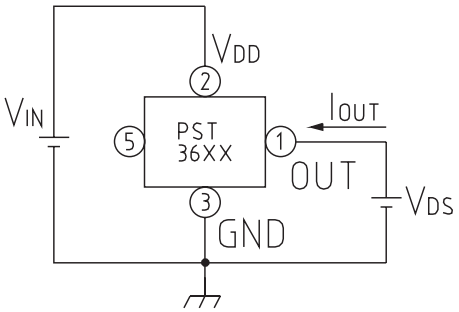

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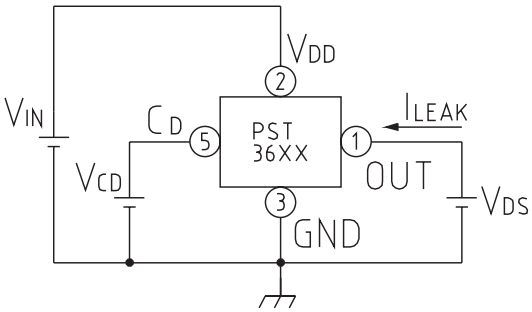

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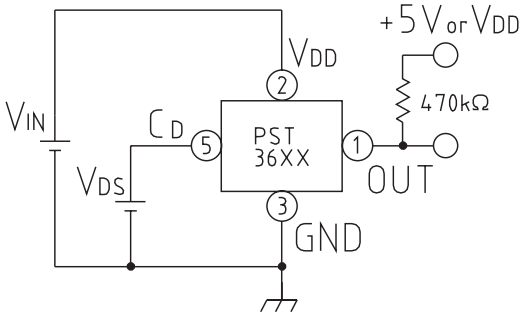

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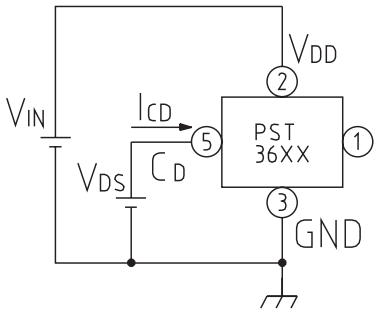

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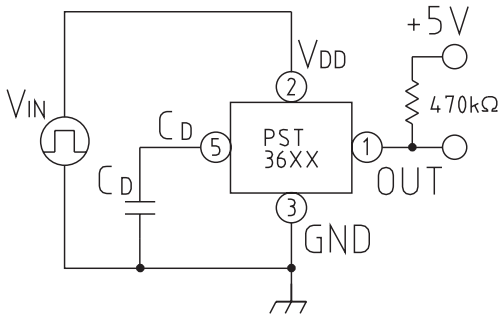
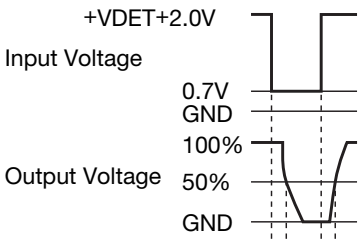
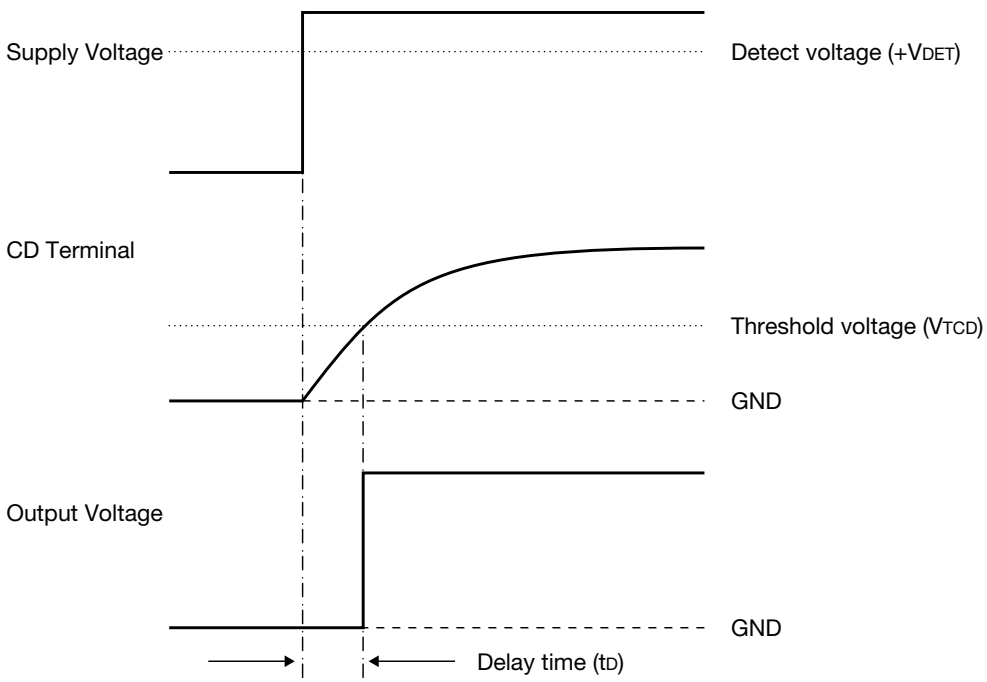


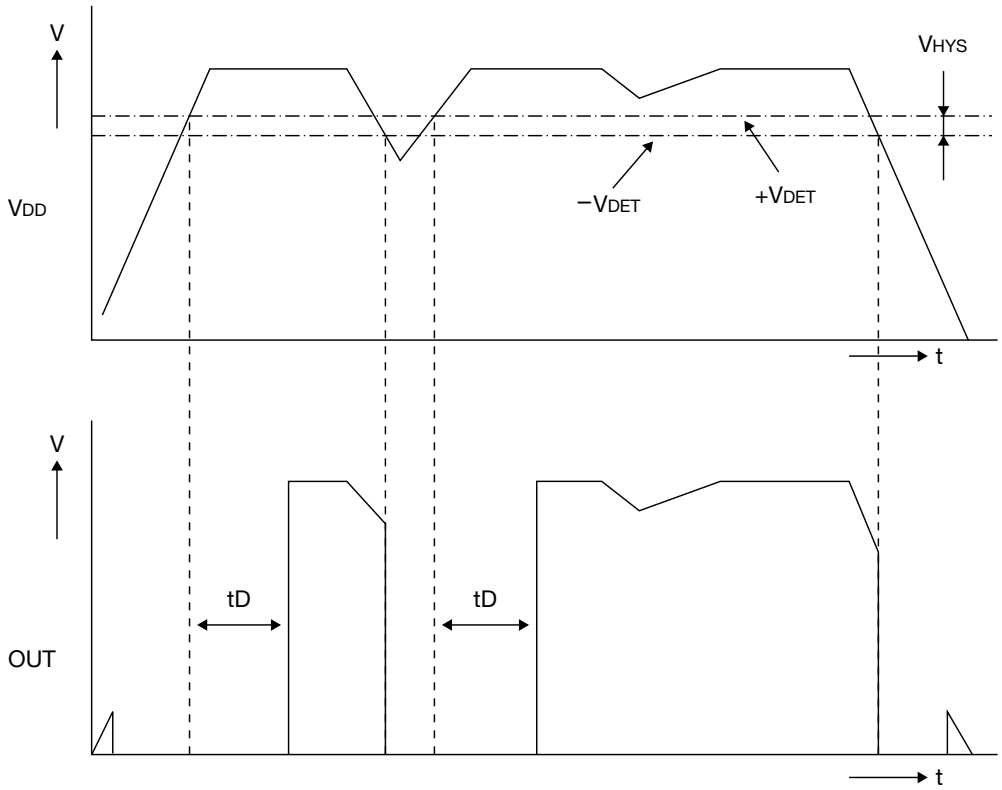


Delay Time Current

Timing Chart

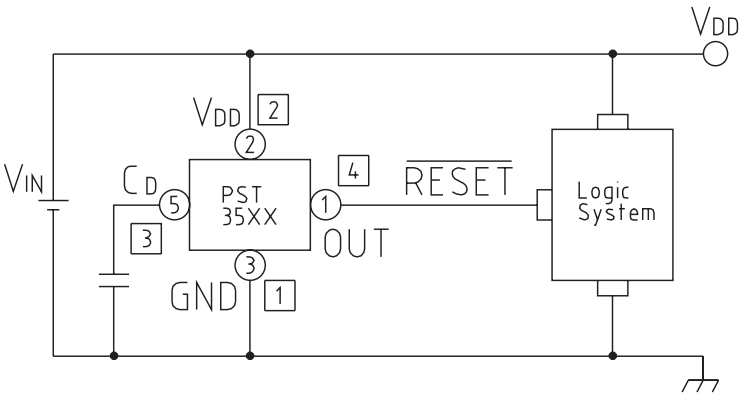


Delay Time (tD) $tD \fallingdotseq 0.69 \times R_D \times C_D$ (F) (s) R_D: C_D Pin Resistance C_D: Capacitor



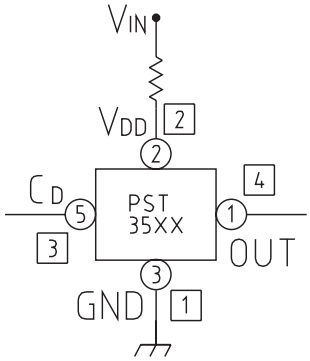
Application Circuits

PST35XX UR/NR



Please be advised that Mitsumi Electric Co., Ltd. is not liable for any accidents or damage caused as a result of the use of this circuit.

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 Electric Co., Ltd. shall not be liable for any such problem, nor grant a license therefor.



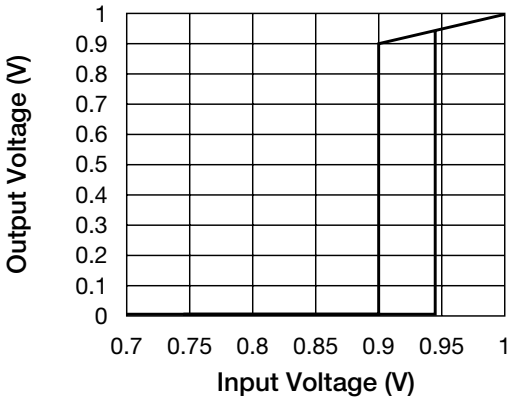
Pin position

- ○ **SOT-25A**
- □ **SC-82AB**

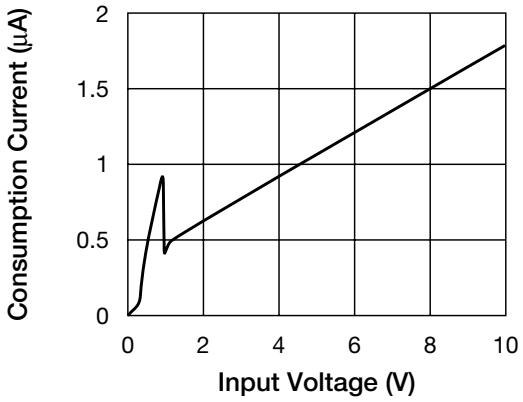
Please note that there is any possibility of circuit oscillation when resistance put in the line V_{IN}.

Characteristics (For products with PST3509 detection voltage 0.9V typ. CMOS output)

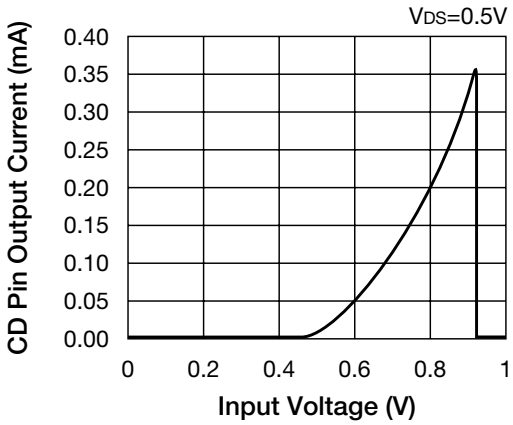
Output voltage vs input voltage



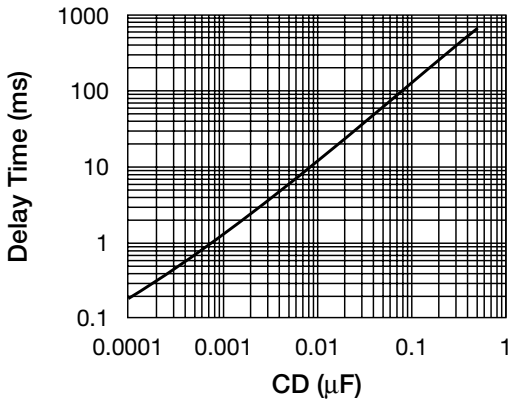
Consumption current vs input voltage



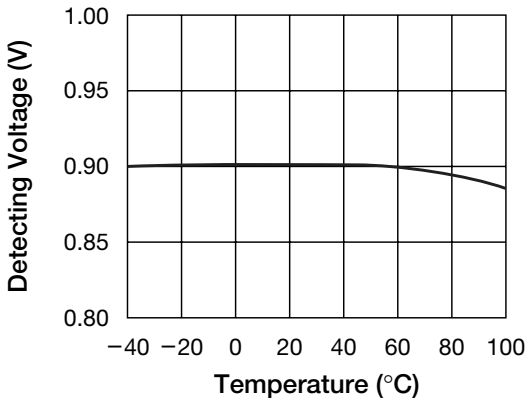
CD Pin output current vs input voltage



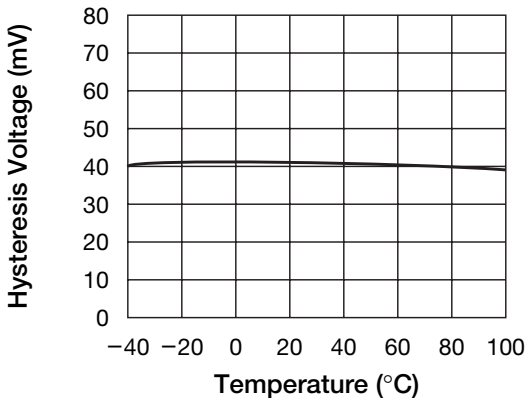
Delay time vs CD



Detecting voltage vs temperature

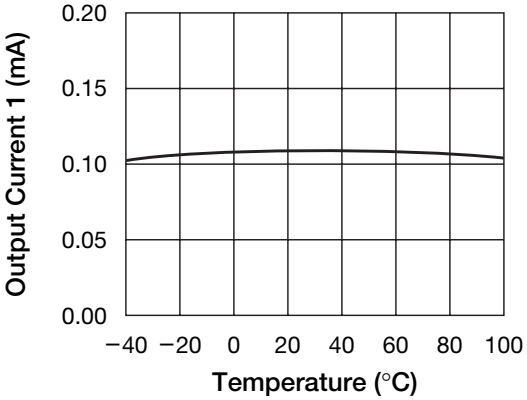


Hysteresis voltage vs temperature

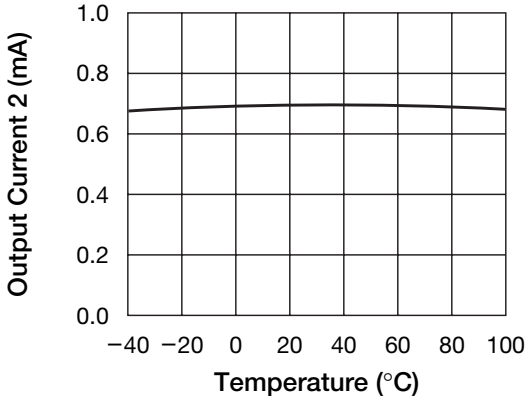


Note: These are typical characteristics.

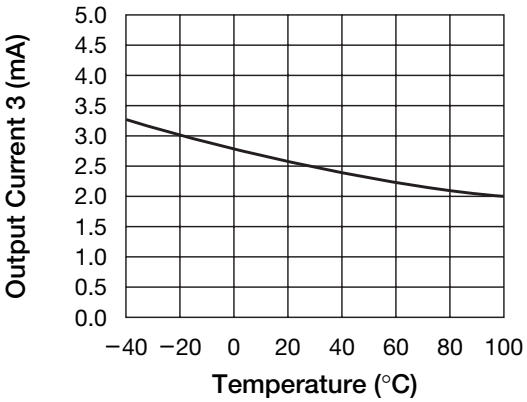
Output current 1 vs temperature



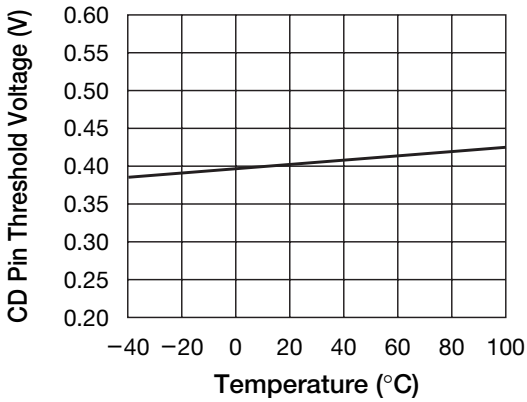
Output current 2 vs temperature



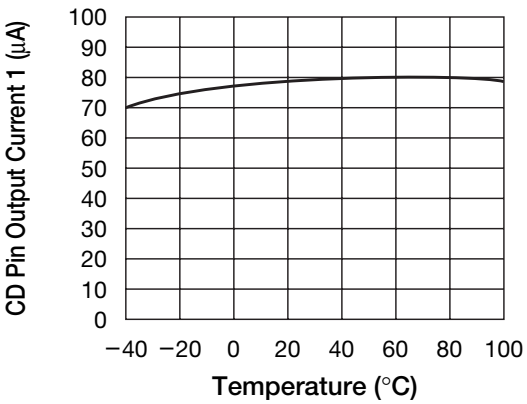
Output current 3 vs temperature



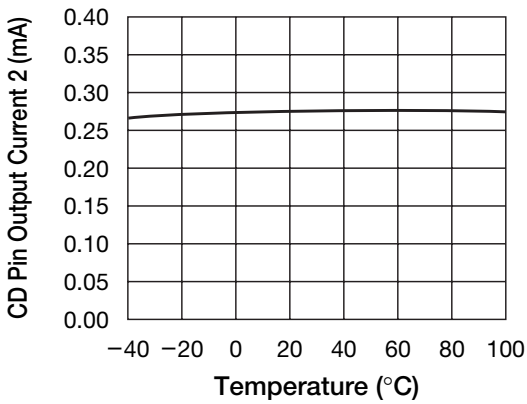
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



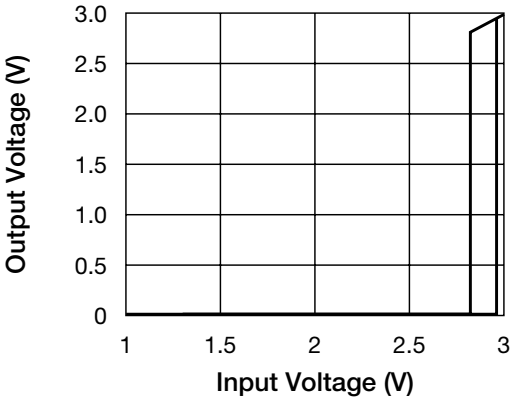
CD Pin output current 2 vs temperature



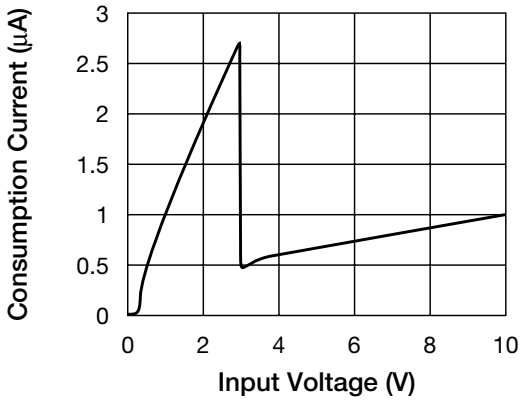
Note: These are typical characteristics.

Characteristics (For products with PST3528 detection voltage 2.8V typ. CMOS output)

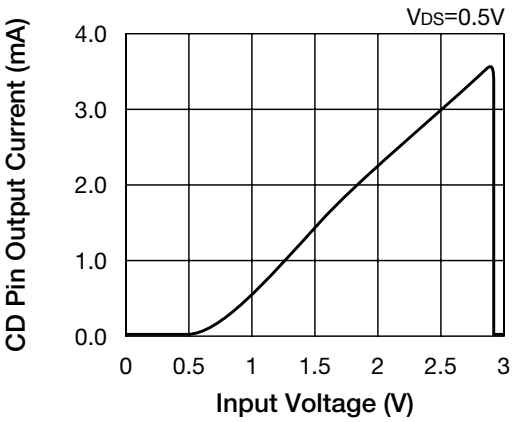
Output voltage vs input voltage



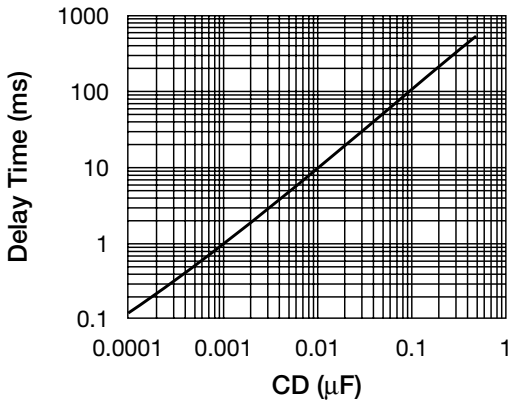
Consumption current vs input voltage



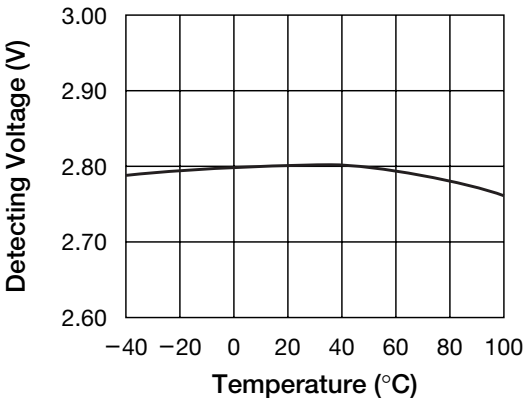
CD pin output current vs input voltage



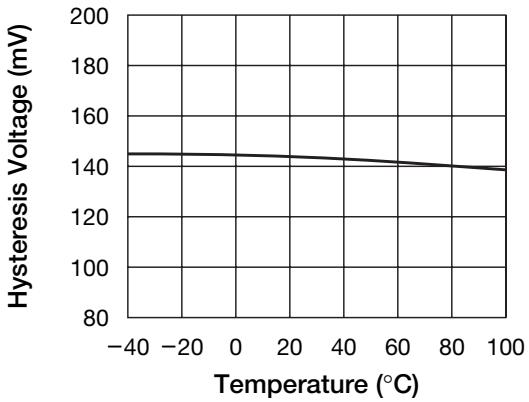
Delay time vs CD



Detecting voltage vs temperature

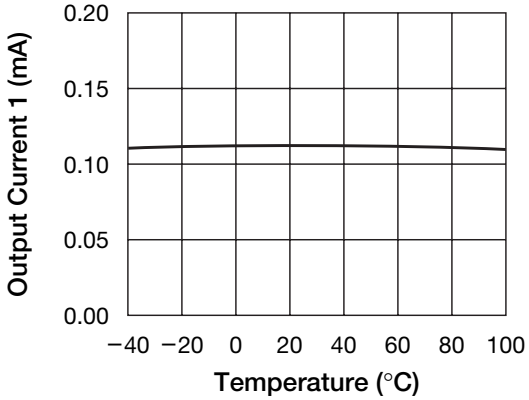


Hysteresis voltage vs temperature

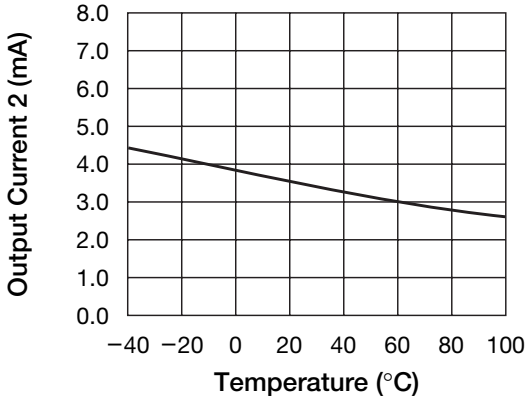


Note: These are typical characteristics.

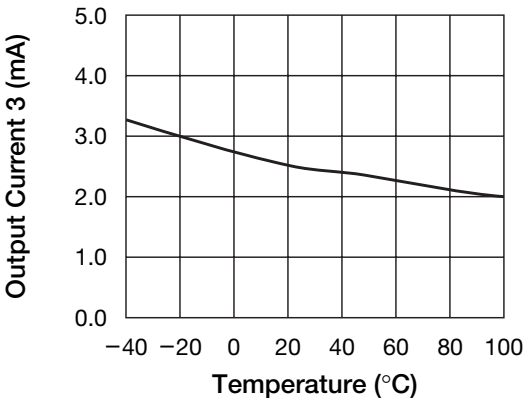
Output current 1 vs temperature



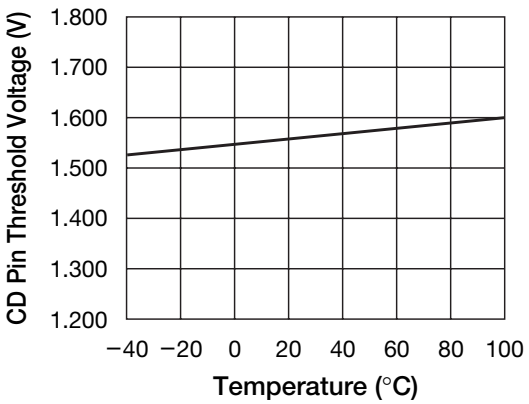
Output current 2 vs temperature



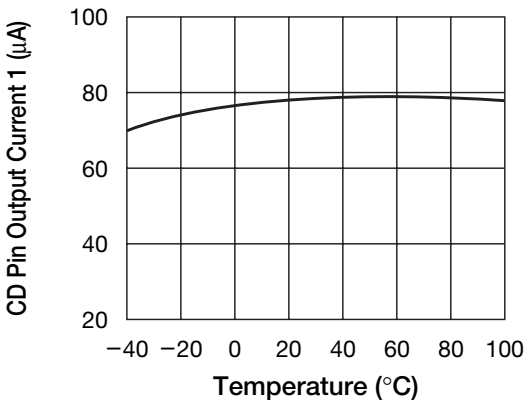
Output current 3 vs temperature



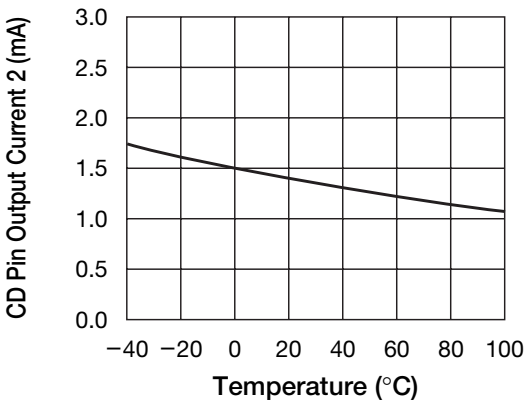
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



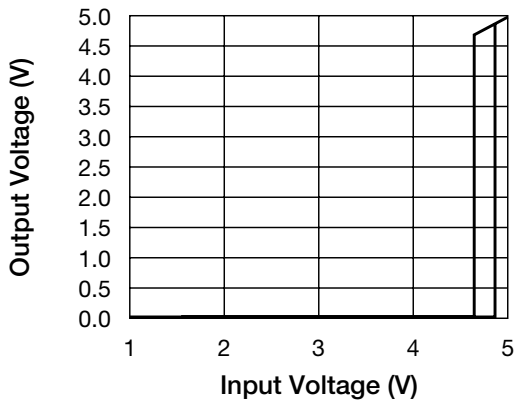
CD Pin output current 2 vs temperature



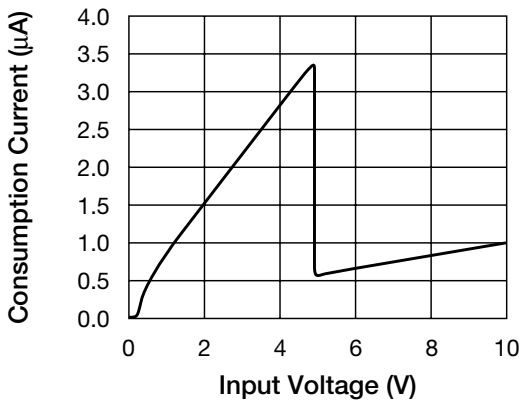
Note: These are typical characteristics.

Characteristics (For products with PST3546 detection voltage 4.6V typ. CMOS output)

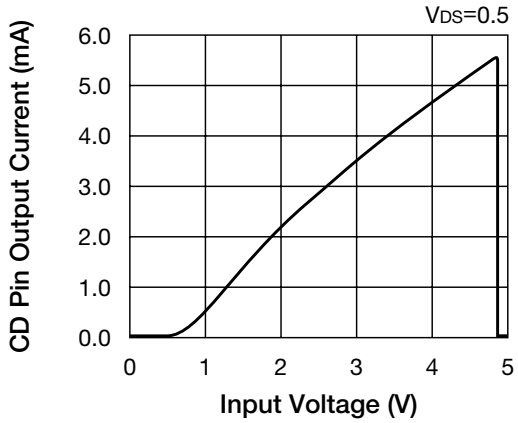
Output voltage vs input voltage



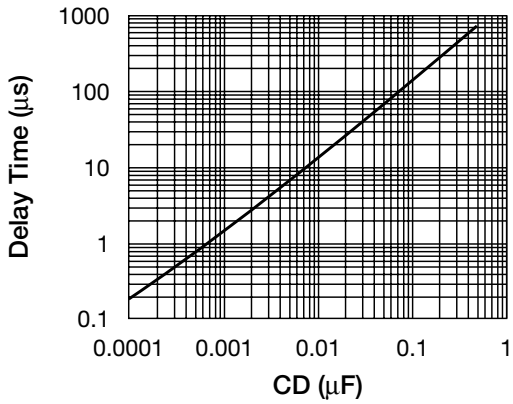
Consumption current vs input voltage



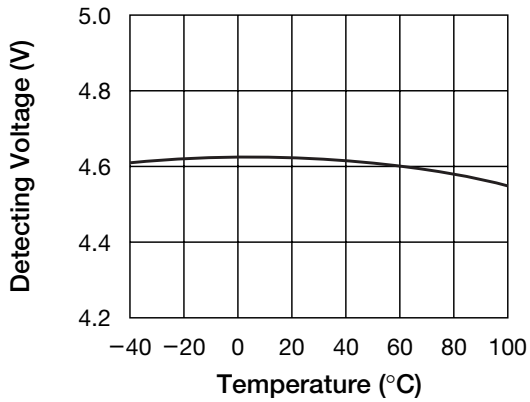
CD Pin output current vs input voltage



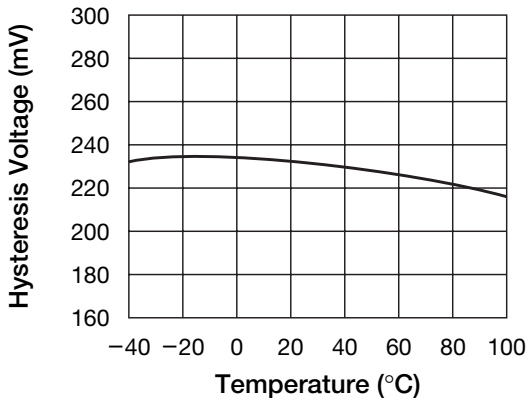
Delay time vs CD



Detecting voltage vs temperature

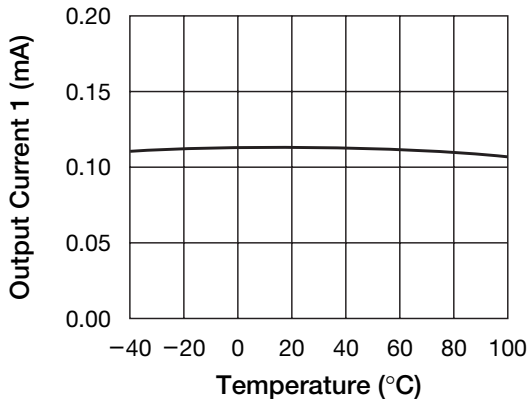


Hysteresis voltage vs temperature

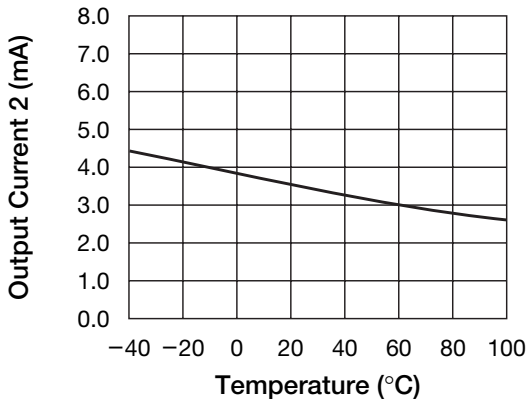


Note: These are typical characteristics.

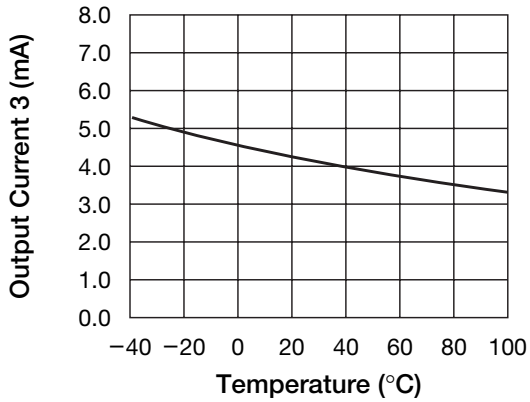
Output current 1 vs temperature



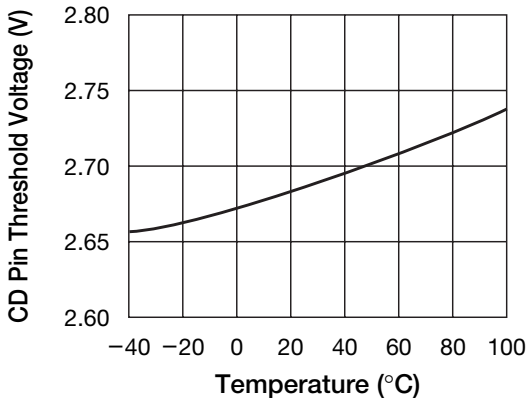
Output current 2 vs temperature



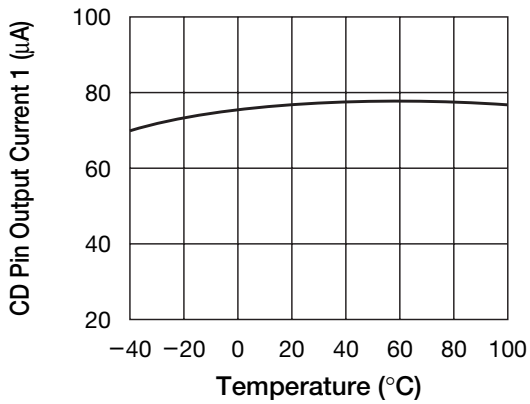
Output current 3 vs temperature



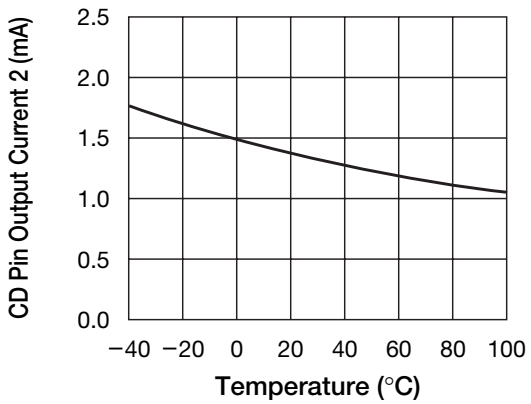
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



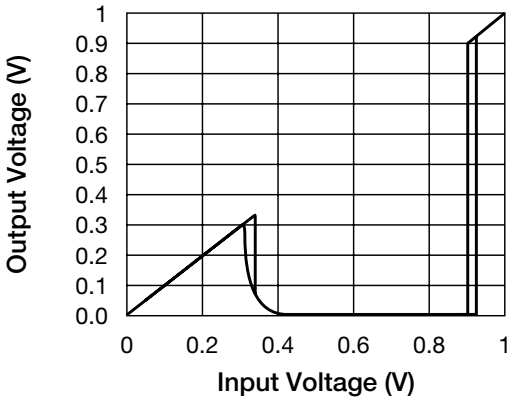
CD Pin output current 2 vs temperature



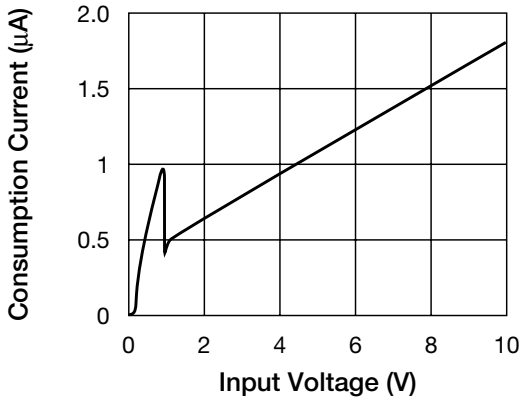
Note: These are typical characteristics.

Characteristics (For products with PST3609 detection voltage 0.9V typ. N-ch open drain)

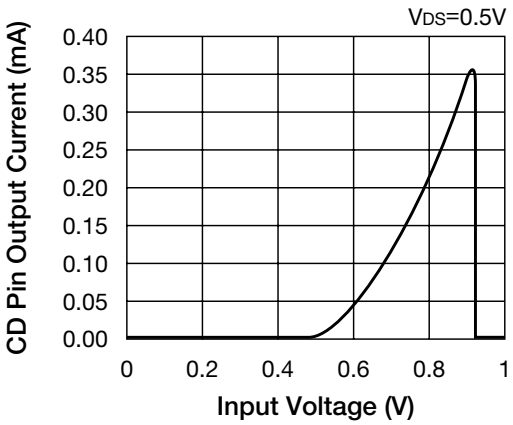
Output voltage vs input voltage



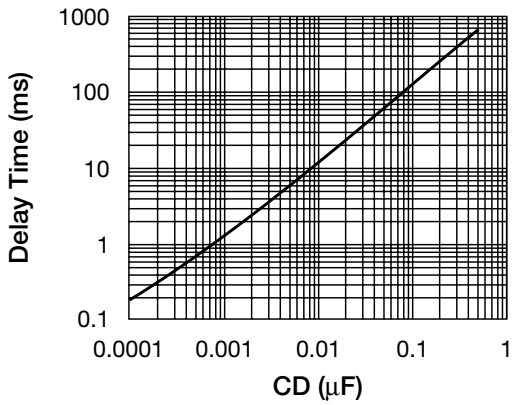
Consumption current vs input voltage



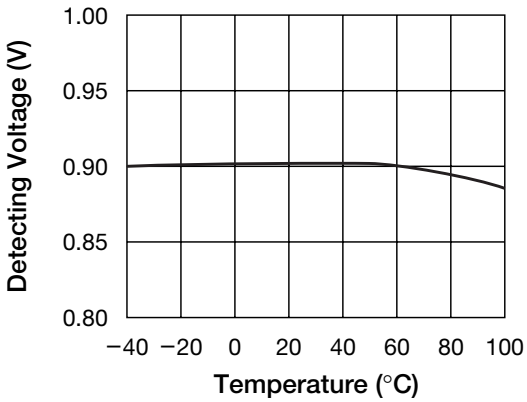
CD Pin output current vs input voltage



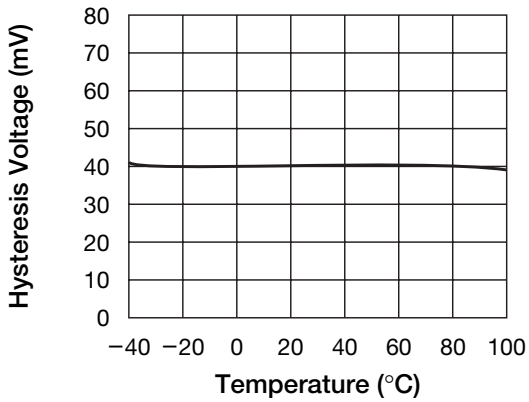
Delay time vs CD



Detecting voltage vs temperature

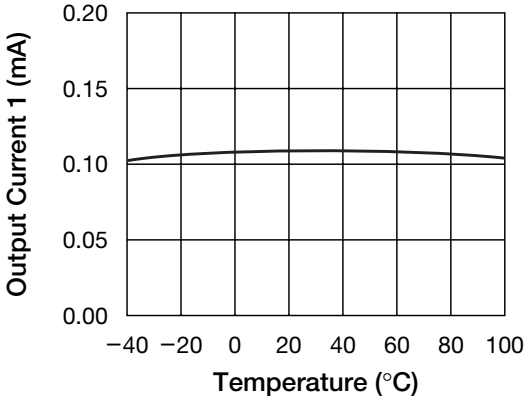


Hysteresis voltage vs temperature

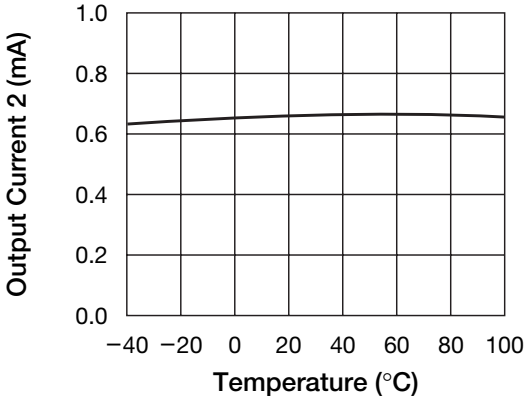


Note: These are typical characteristics.

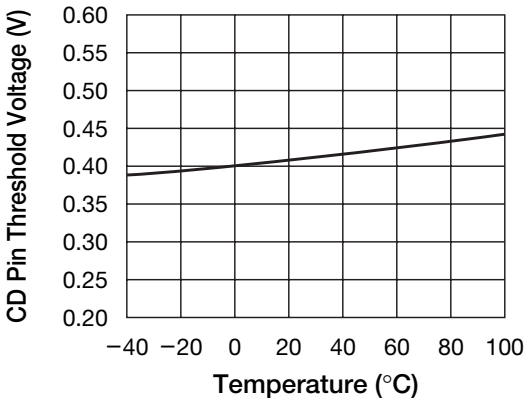
Output current 1 vs temperature



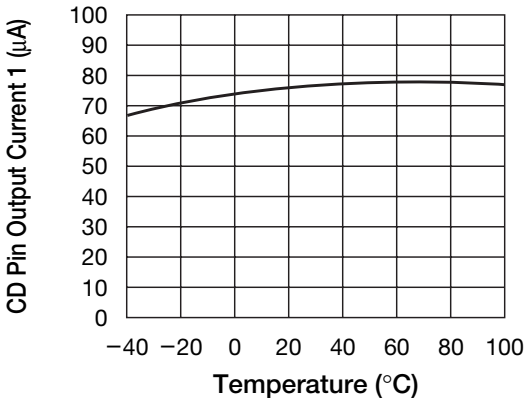
Output current 2 vs temperature



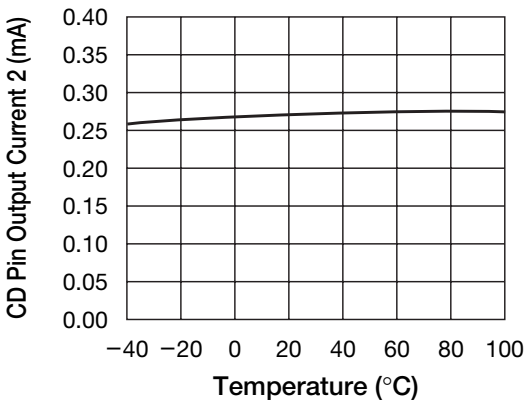
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



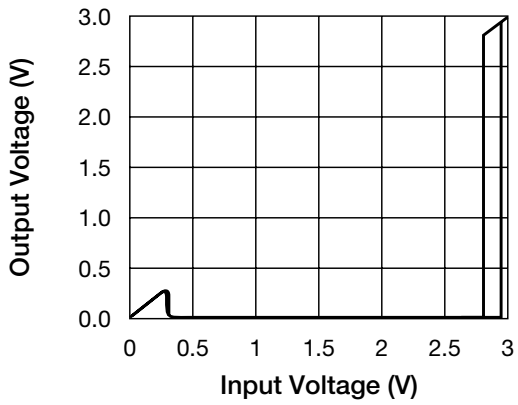
CD Pin output current 2 vs temperature



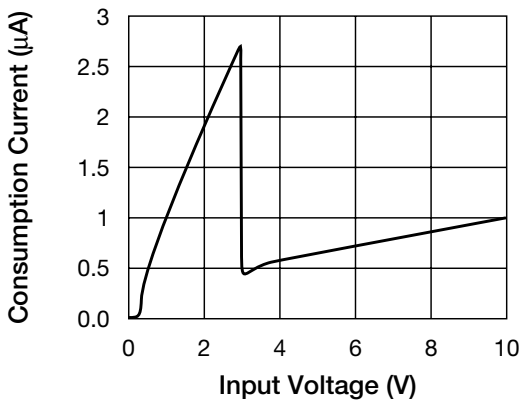
Note: These are typical characteristics.

Characteristics (For products with PST3628 detection voltage 2.8V typ. N-ch open drain)

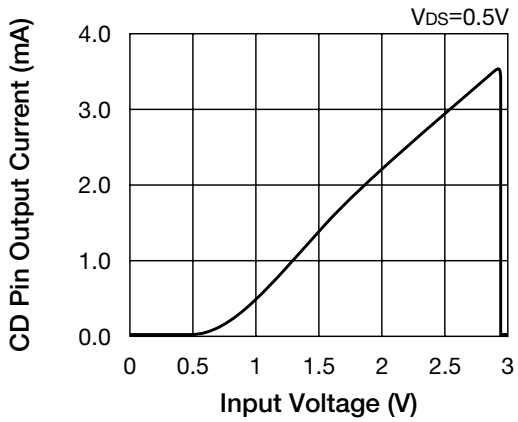
Output voltage vs input voltage



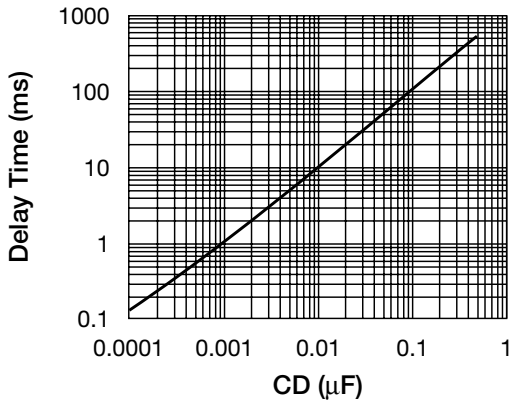
Consumption current vs input voltage



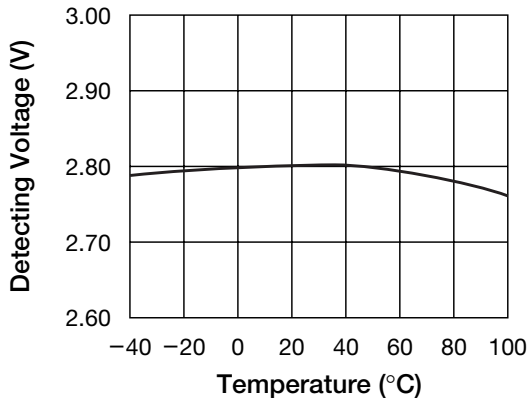
CD Pin output current vs input voltage



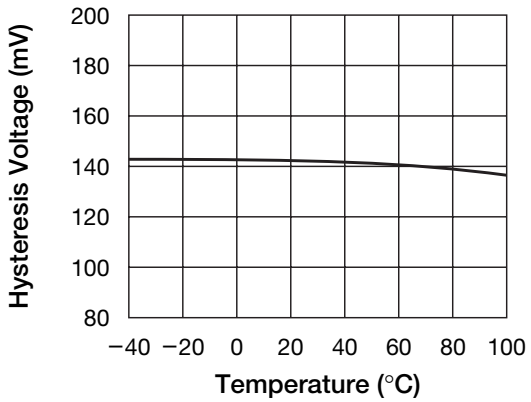
Delay time vs CD



Detecting voltage vs temperature

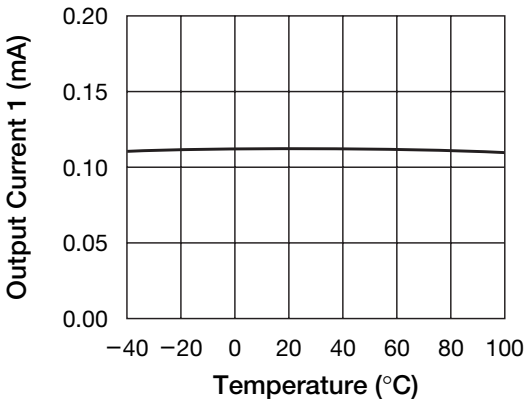


Hysteresis voltage vs temperature

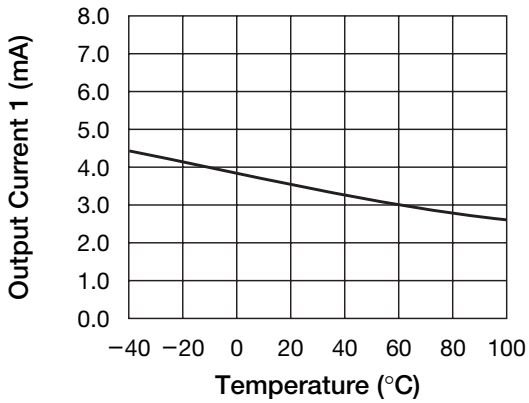


Note: These are typical characteristics.

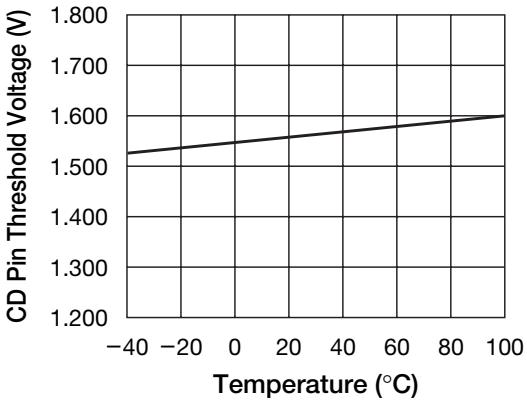
Output current 1 vs temperature



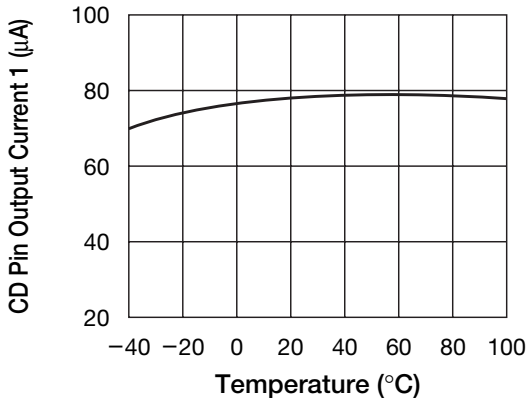
Output current 2 vs temperature



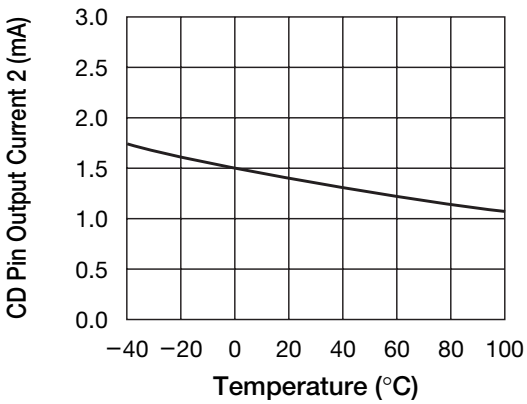
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



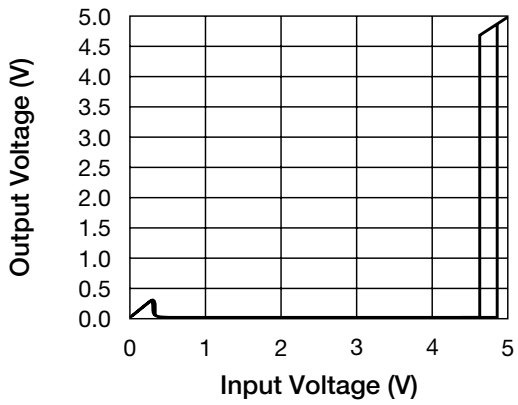
CD Pin output current 2 vs temperature



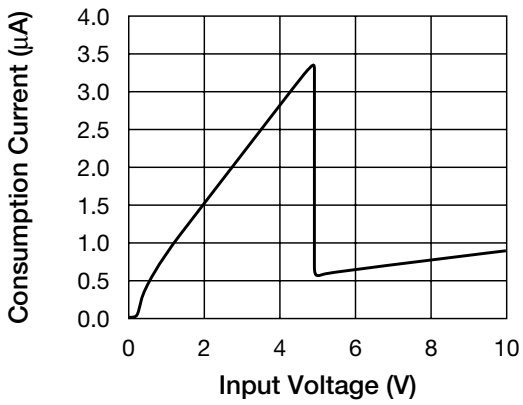
Note: These are typical characteristics.

Characteristics (For products with PST3646 detection voltage 4.6V typ. N-ch open drain)

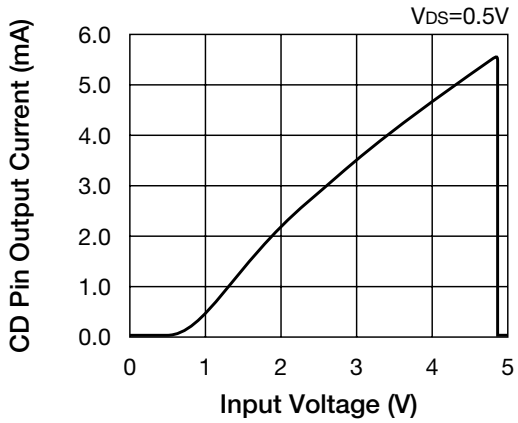
Output voltage vs input voltage



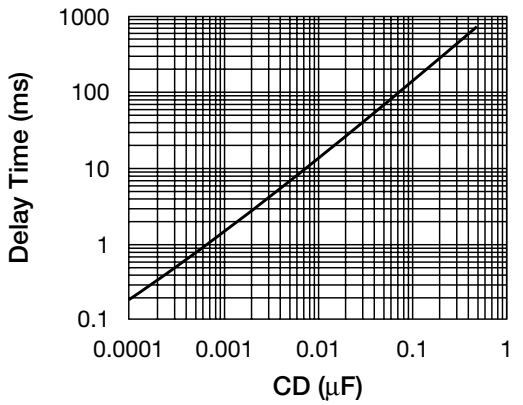
Consumption current vs input voltage



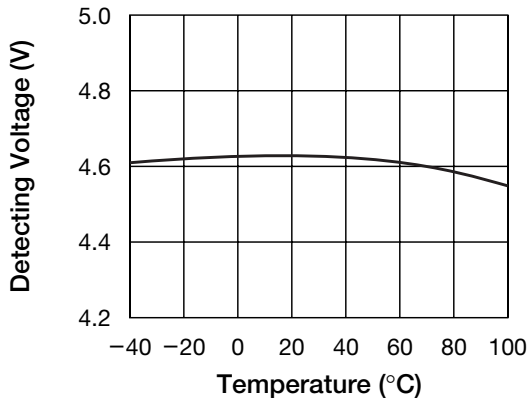
CD Pin output current vs input voltage



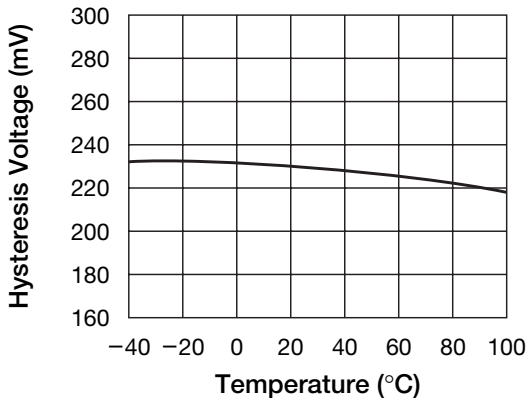
Delay time vs CD



Detecting voltage vs temperature

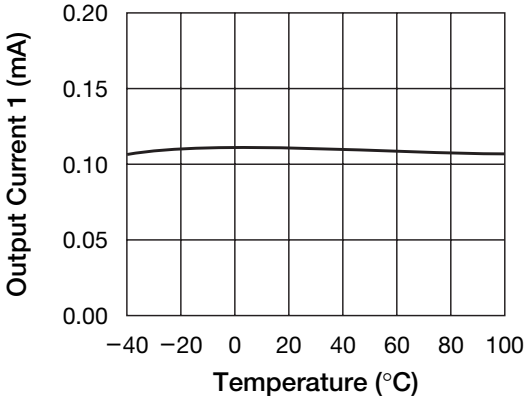


Hysteresis voltage vs temperature

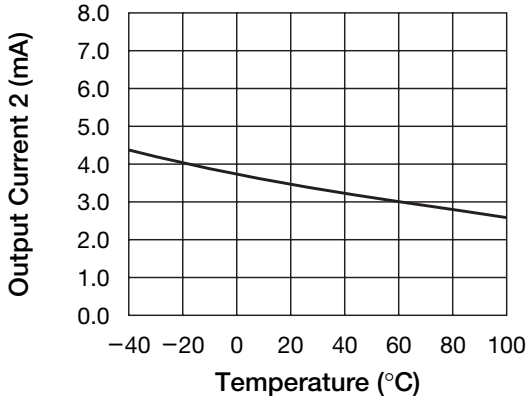


Note: These are typical characteristics.

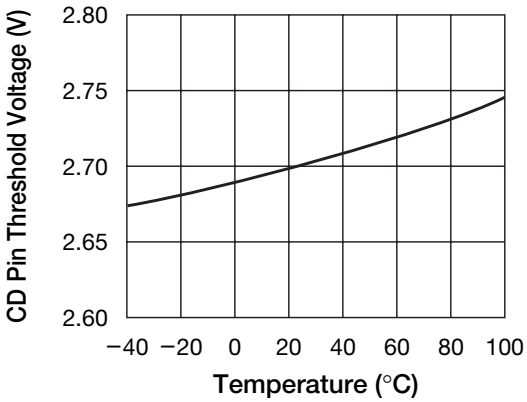
Output current 1 vs temperature



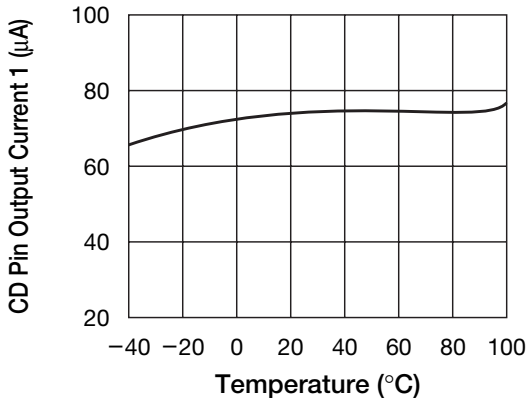
Output current 2 vs temperature



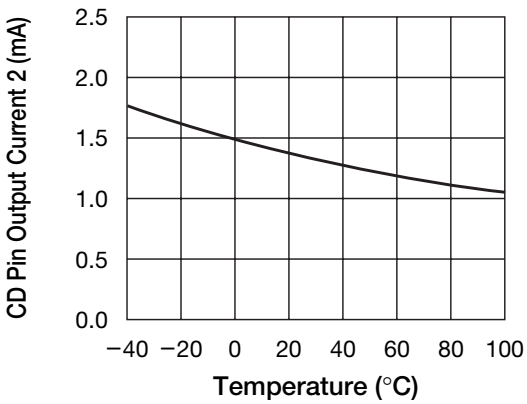
CD Pin threshold voltage vs temperature



CD Pin output current 1 vs temperature



CD Pin output current 2 vs temperature



Note: These are typical characteristics.