CMOS System Reset
Monolithic IC PST31XX~34XX Series

Outline

This IC is a system reset IC developed using the CMOS process. Super low consumption current of 0.25μA typ. has been achieved through use of the CMOS process. Also, detection voltage is high precision detection of ±2%.

Features

(1) Super low consumption current	0.25μA typ. (when V_{DD} = Vs + 1V)
(2) High precision detection voltage	±2%
(3) Hysteresis characteristic	5% typ.
(4) Operating range	0.95 ~ 10V
(5) Wide operating temperature range	-30 ~ +85°C
(6) Detection voltage	2 ~ 6V (0.1V step)

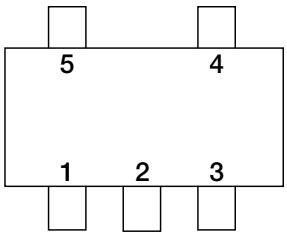
Package

SOT-25 (PST31XX, PST32XX)
SC-82AB (PST33XX, PST34XX)

Applications

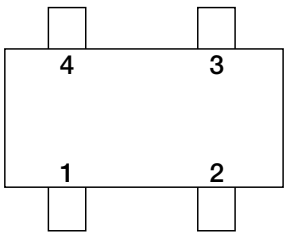
(1) Microcomputer, CPU, MPU reset circuits
(2) Logic circuit reset circuits
(3) Battery voltage check circuits
(4) Back-up circuit switching circuits
(5) Level detection circuits

Pin Assignment



1	V_{OUT}
2	V_{DD}
3	V_{SS}
4	NC
5	

SOT-25
(TOP VIEW)

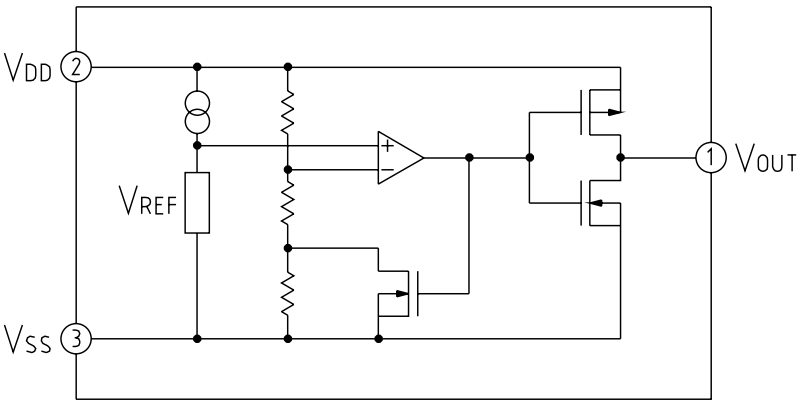


1	V_{OUT}
2	V_{DD}
3	NC
4	V_{SS}

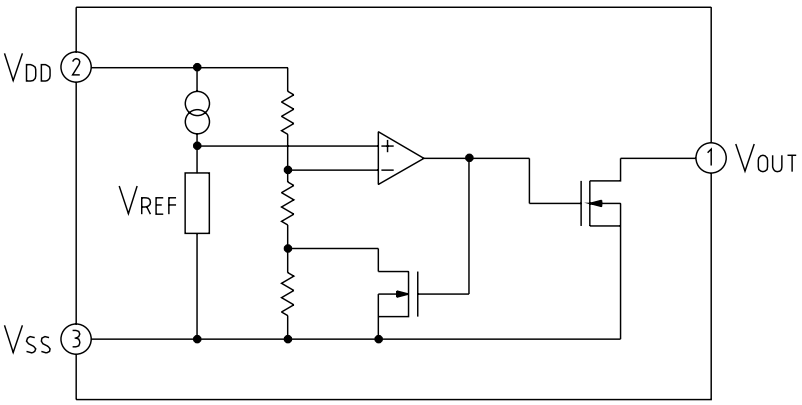
SC-82AB
(TOP VIEW)

Equivalent Circuit Diagram

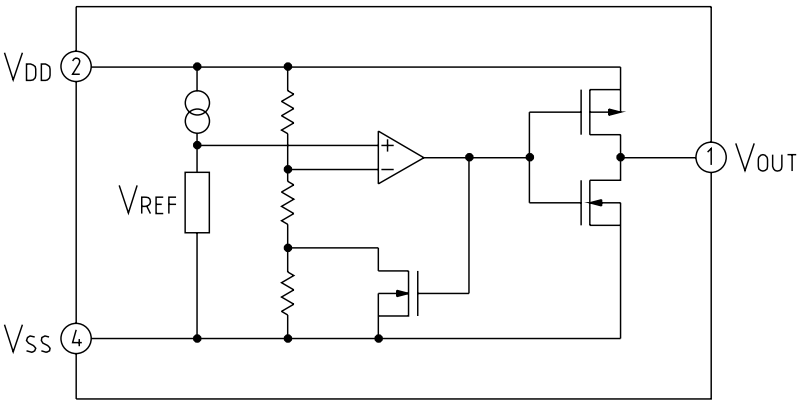
PST31XX



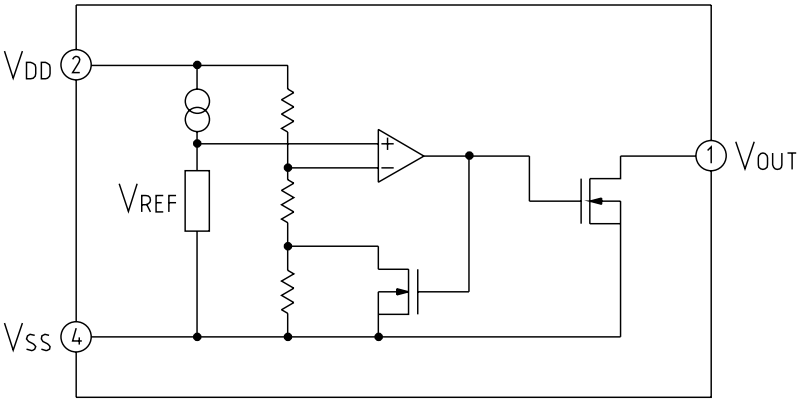
PST32XX



PST33XX



PST34XX



Absolute Maximum Ratings (Ta=25°C)

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}	50	mA
Allowable loss	Pd	150	mW

Electrical Characteristics

(1) Detection Voltage Table Ta=25°C

Detection voltage	SOT-25		SC-82	
	CMOS output	N-ch open drain	CMOS output	N-ch open drain
2.0V±2%	PST3120	PST3220	PST3320	PST3420
2.1V±2%	PST3121	PST3221	PST3321	PST3421
2.2V±2%	PST3122	PST3222	PST3322	PST3422
2.3V±2%	PST3123	PST3223	PST3323	PST3423
2.4V±2%	PST3124	PST3224	PST3324	PST3424
2.5V±2%	PST3125	PST3225	PST3325	PST3425
2.6V±2%	PST3126	PST3226	PST3326	PST3426
2.7V±2%	PST3127	PST3227	PST3327	PST3427
2.8V±2%	PST3128	PST3228	PST3328	PST3428
2.9V±2%	PST3129	PST3229	PST3329	PST3429
3.0V±2%	PST3130	PST3230	PST3330	PST3430
3.1V±2%	PST3131	PST3231	PST3331	PST3431
3.2V±2%	PST3132	PST3232	PST3332	PST3432
3.3V±2%	PST3133	PST3233	PST3333	PST3433
3.4V±2%	PST3134	PST3234	PST3334	PST3434
3.5V±2%	PST3135	PST3235	PST3335	PST3435
3.6V±2%	PST3136	PST3236	PST3336	PST3436
3.7V±2%	PST3137	PST3237	PST3337	PST3437
3.8V±2%	PST3138	PST3238	PST3338	PST3438
3.9V±2%	PST3139	PST3239	PST3339	PST3439
4.0V±2%	PST3140	PST3240	PST3340	PST3440
4.1V±2%	PST3141	PST3241	PST3341	PST3441
4.2V±2%	PST3142	PST3242	PST3342	PST3442
4.3V±2%	PST3143	PST3243	PST3343	PST3443
4.4V±2%	PST3144	PST3244	PST3344	PST3444
4.5V±2%	PST3145	PST3245	PST3345	PST3445
4.6V±2%	PST3146	PST3246	PST3346	PST3446
4.7V±2%	PST3147	PST3247	PST3347	PST3447
4.8V±2%	PST3148	PST3248	PST3348	PST3448
4.9V±2%	PST3149	PST3249	PST3349	PST3449
5.0V±2%	PST3150	PST3250	PST3350	PST3450
5.1V±2%	PST3151	PST3251	PST3351	PST3451
5.2V±2%	PST3152	PST3252	PST3352	PST3452
5.3V±2%	PST3153	PST3253	PST3353	PST3453
5.4V±2%	PST3154	PST3254	PST3354	PST3454
5.5V±2%	PST3155	PST3255	PST3355	PST3455
5.6V±2%	PST3156	PST3256	PST3356	PST3456
5.7V±2%	PST3157	PST3257	PST3357	PST3457
5.8V±2%	PST3158	PST3258	PST3358	PST3458
5.9V±2%	PST3159	PST3259	PST3359	PST3459
6.0V±2%	PST3160	PST3260	PST3360	PST3460

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

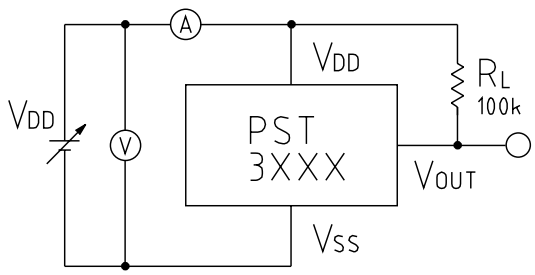
Electrical Characteristics (Except where noted otherwise, Ta=25°C)

Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Unit
Hysteresis voltage	⊿Vs	1	V_{DD}=0V→Vs+1V→0V	Vs×0.03	Vs×0.05	Vs×0.08	V
Detection voltage temperature coefficient	Vs/⊿T	1	Ta=–30~+85°C		±0.01		%/°C
Consumption current	I_{CC}	1	V_{DD}=Vs+1V ＊1		0.25	1	µA
N-ch output current 1		2	V_{DD}=1.2V, Nch : V_{DS}=0.5V	0.23	0.5		mA
Leak current when OFF	I_{OH}	3	V_{DD}=V_{DS}=10V			0.1	µA
N-ch output current 2		2	V_{DD}=2.4V, Nch : V_{DS}=0.5V,Vs>2.5V ＊1	1.6	3.7		mA
N-ch output current 3		2	V_{DD}=3.6V, Nch : V_{DS}=0.5V,Vs>3.7V ＊1	3.2	7.0		mA
P-ch output current 1 ＊2		3	V_{DD}=4.8V, Pch : V_{DS}=0.5V,Vs<4.7V ＊1	0.36	0.62		mA
P-ch output current 2 ＊2		3	V_{DD}=6.0V, Pch : V_{DS}=0.5V,Vs<5.9V ＊1	0.46	0.75		mA

Notes: ＊1 Vs is detection voltage
＊2 Only for CMOS output products
＊3 Open drain output products only.

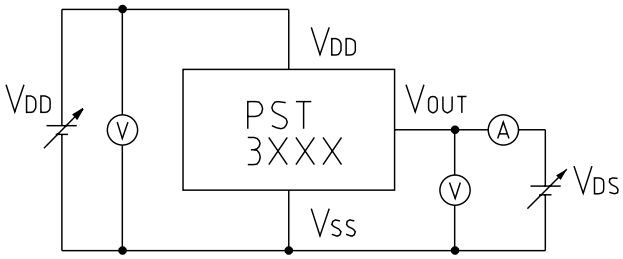
Measuring Circuit

Measuring Circuit 1

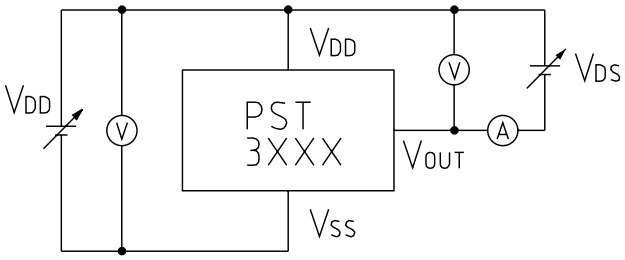


R_L is not needed for CMOS output.

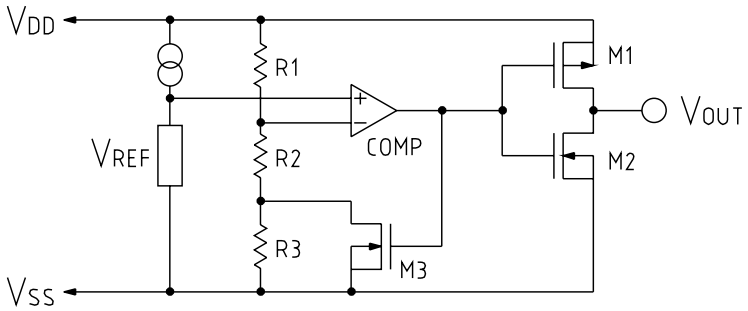
Measuring Circuit 2



Measuring Circuit 3



Description of Operation



(1) V_{DD} > VS, V_{OUT}: H (M1: ON, M2, M3: OFF)
When V_{DD} is gradually lowered from the above state, detection voltage is as follows.
Detection voltage: (R1 + R2 + R3) / (R2 + R3) × VREF

(2) V_{DD} < VS, V_{OUT}: L (M1: OFF, M2, M3: ON)
When V_{DD} is gradually raised from the above state, release voltage is as follows.
Release voltage = (R1 + R2) / (R2) × VREF

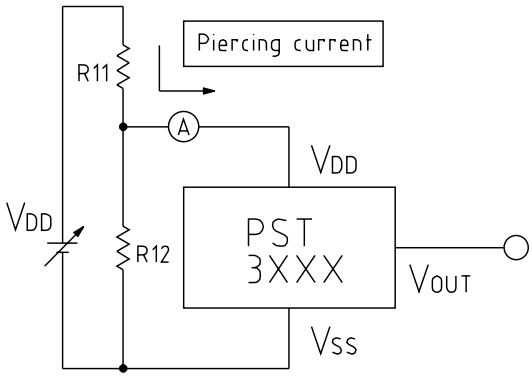
(3) Hysteresis voltage = (release voltage) - (detection voltage).

(4) When V_{DD} drops and goes below the minimum operating voltage, output is undefined; when output is pulled up, output becomes V_{DD}.

(5) VREF and detection resistors
1) The reference voltage source (VREF) for this IC is 0.8V typ. This gives excellent low power consumption and temperature characteristics.
2) The high resistance process is used for resistors R1, R2 and R3 to achieve low consumption current for the IC.

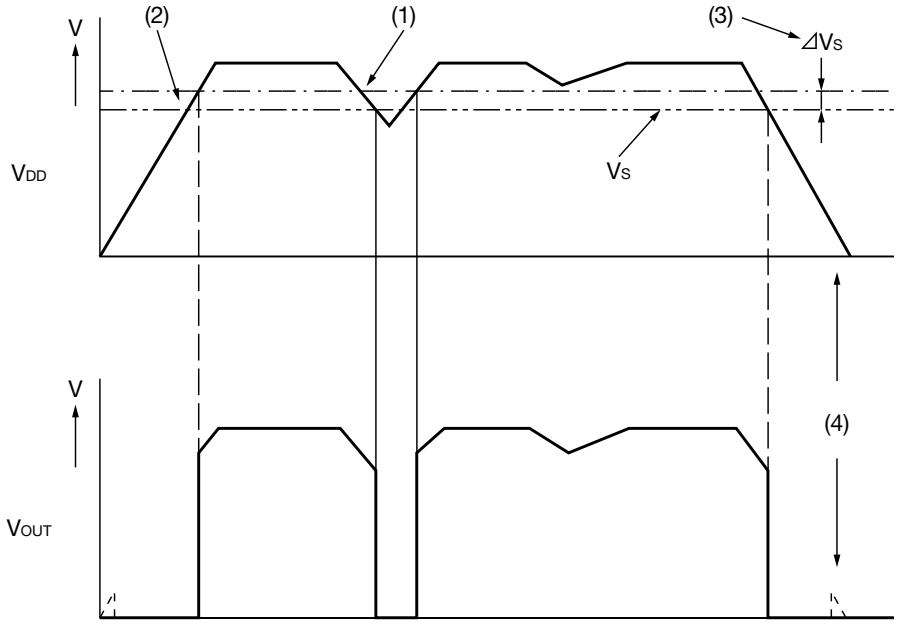
(6) Through current flows momentarily for detection and release. When using high V_{DD} pin impedance, the through current may cause oscillation.

(Example) Detection voltage changed by external settings



* The IC input voltage fluctuates due to the through current × R11 voltage drop, and an oscillation state where detection and release are repeated may occur.
* With CMOS output types, do not use as shown in the diagram at left.

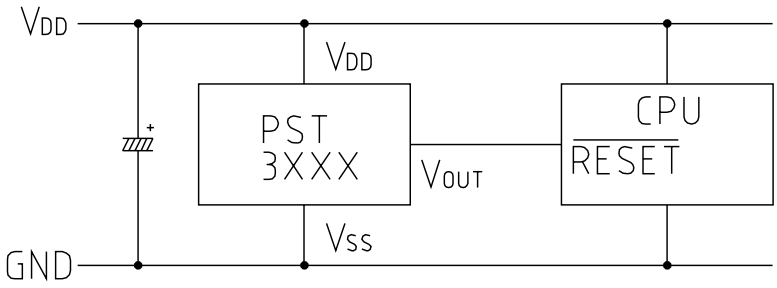
Timing Chart



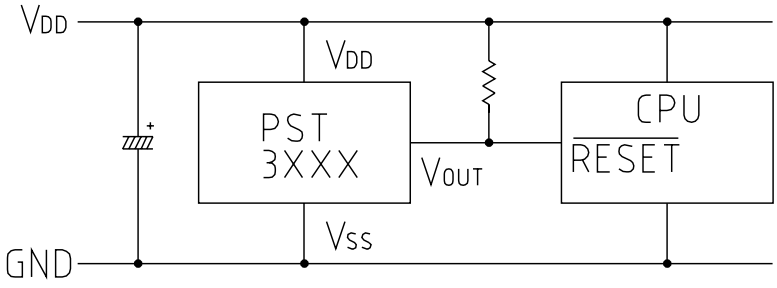
(1) ~ (4) in the above diagram correspond to the Description of Operation.
Vs detection voltage
⊿Vs hysteresis voltage

Application Circuits

Normal reset circuit



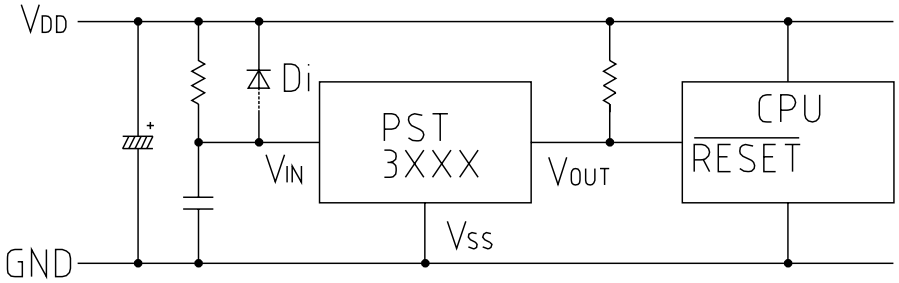
PST31XX, PST33XX (CMOS output products)



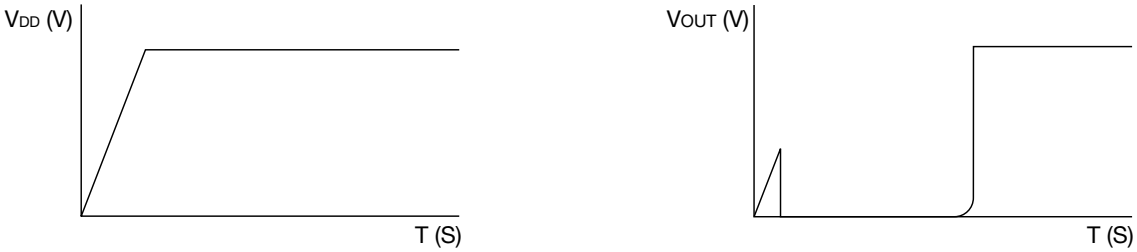
PST32XX, PST34XX (N-ch open drain output products)

Power ON reset circuit

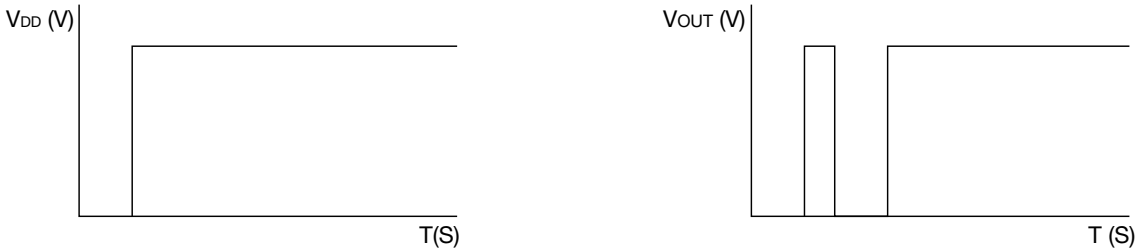
A power ON reset circuit can be configured on PST32XX, PST34XX (N-ch open drain output products).



PST32XX, PST34XX (N-ch open drain output products)



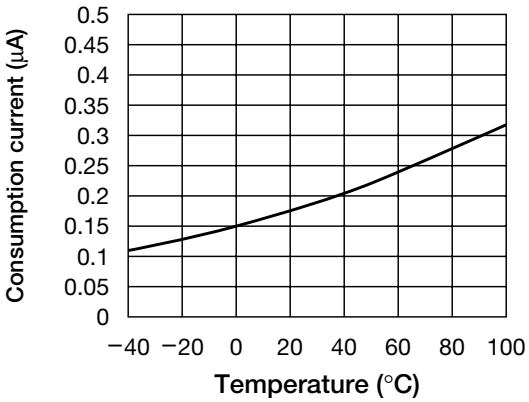
If there is a problem with delay in fall time, insert a Di.



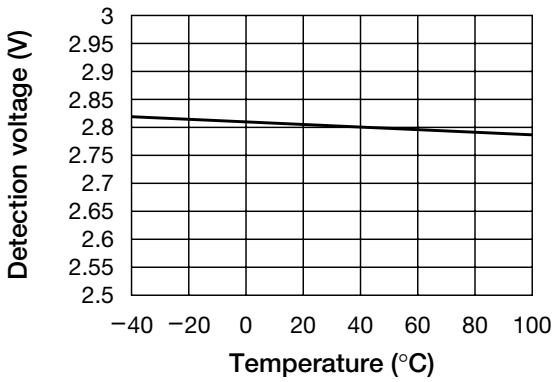
If power supply rises suddenly, output may go "H" momentarily when below minimum operating voltage (0.95V), as shown in the above diagram.

Characteristics (For products with PST3128 detection voltage 2.8V typ.)

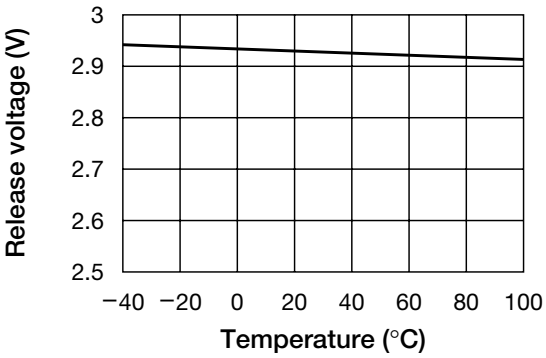
Consumption current (V_{DD} = 3.8V) temperature



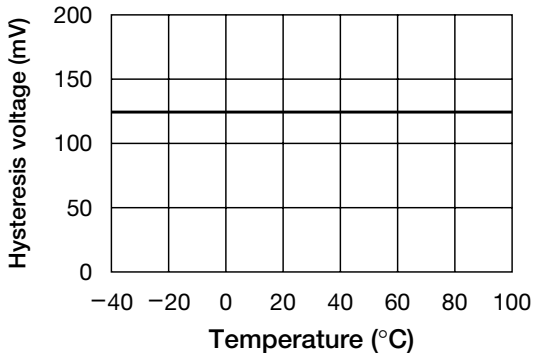
Detection voltage temperature



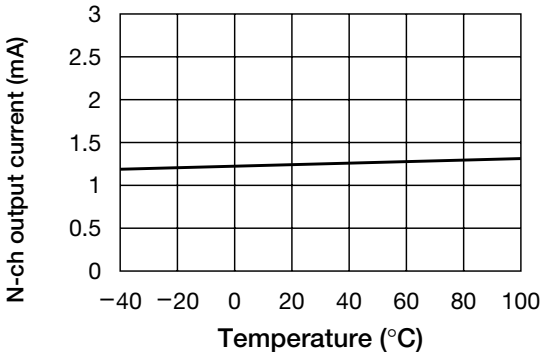
Release voltage temperature



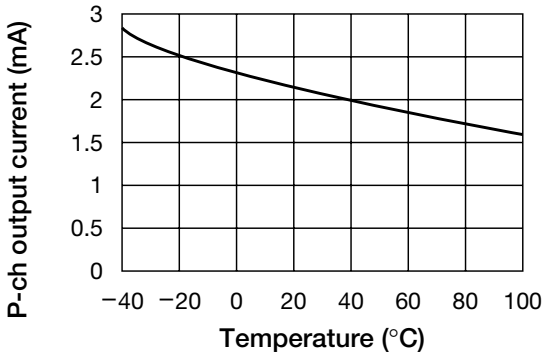
Hysteresis voltage temperature



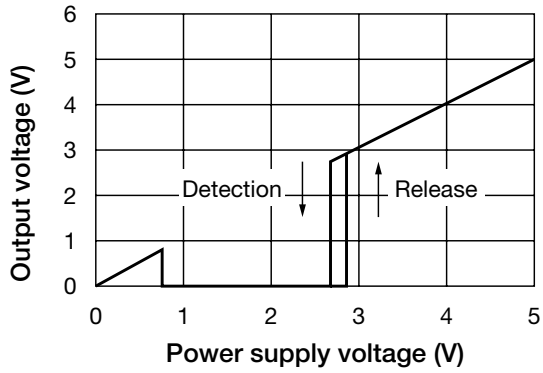
N-ch output current temperature (V_{DS} = 0.5V)



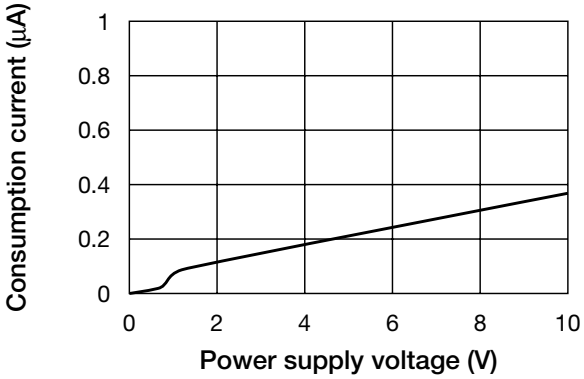
P-ch output current temperature (V_{DS} = 0.5V)



Output voltage power supply voltage

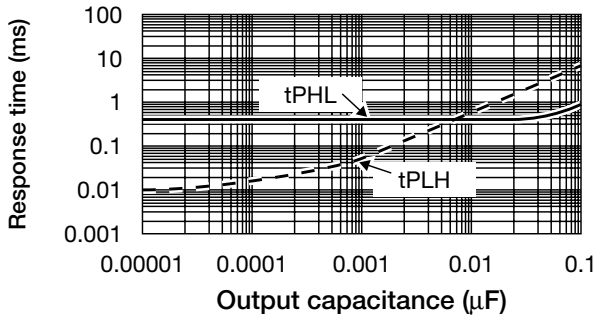


Consumption current power supply voltage

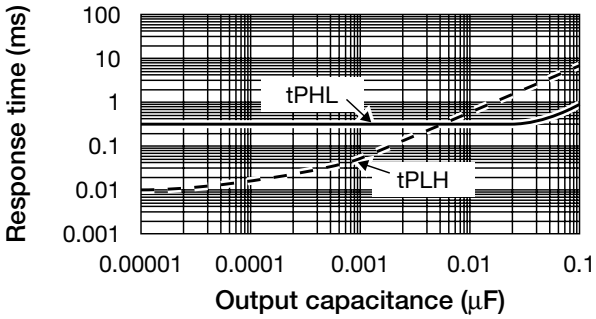


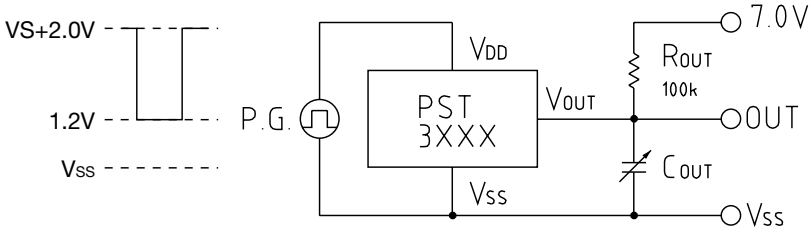
Transfer delay time characteristics (N-ch open drain output products)

PST3428 response characteristics



PST3446 response characteristics





Transfer delay time measurement circuit