LOW VOLTAGE DETECTOR

R×5VT SERIES

APPLICATION MANUAL

RICOH

ELECTRONIC DEVICES DIVISION

NO.EA-026-9803

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June 1995

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OUTLINE

The R×5VT Series are voltage detector ICs with high detector threshold accuracy and ultra-low supply current by CMOS process, which can be operated at an extremely low voltage and is used, for instance, for system reset.

Each of these ICs consists of a voltage reference unit, a comparator, resistors for voltage detection, an output driver and a hysteresis circuit. The detector threshold is fixed with high accuracy.

The R×5VT Series are operable by a lower voltage than that for the R×5VL Series, and can be driven by a single battery.

Two output types, Nch open drain type and CMOS type, are available. Three types of packages, TO-92, SOT-89 (Mini-power Mold), SOT-23-5 (Mini-mold), are available.

FEATURES

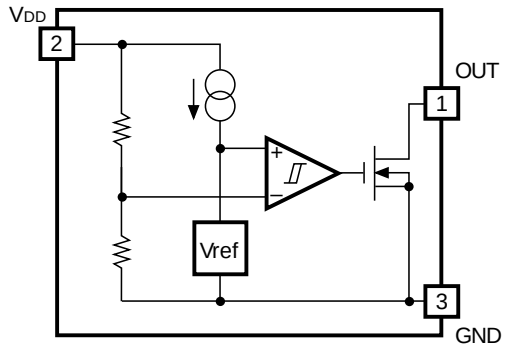
- Ultra-low Supply Current ·····TYP. 0.8μA (V_{DD}=1.5V)
- Broad Operating Voltage Range ····· 0.7V to 10.0V (Topt =25°C)
- Detector Threshold·····Stepwise setting with a step of 0.1V in the range of 0.9V to 6.0V is possible (refer to Selection Guide).
- High Accuracy Detector Threshold·····±2.5%
- Low Temperature-Drift Coefficien of Detector Threshold·····TYP. ±100ppm/°C
- Two Output Types·····Nch Open Drain and CMOS
- Three Types of Packages ·····TO-92, SOT-89 (Mini-power Mold), SOT-23-5 (Mini-mold)

APPLICATIONS

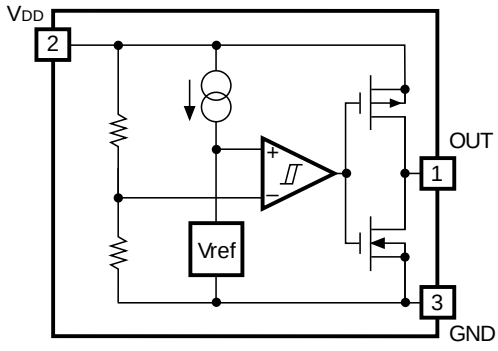
- CPU & Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-Up Circuit
- Power Failure Detector

BLOCK DIAGRAMS

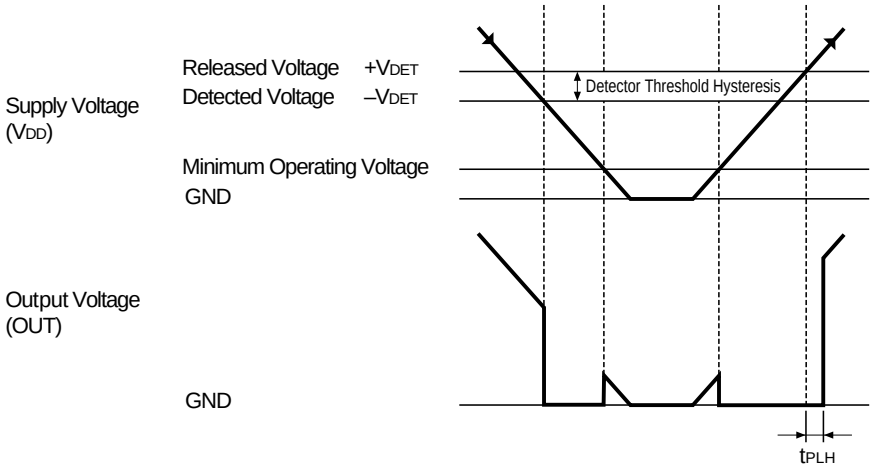
• **Nch Open Drain Output (R×5VT××A)**



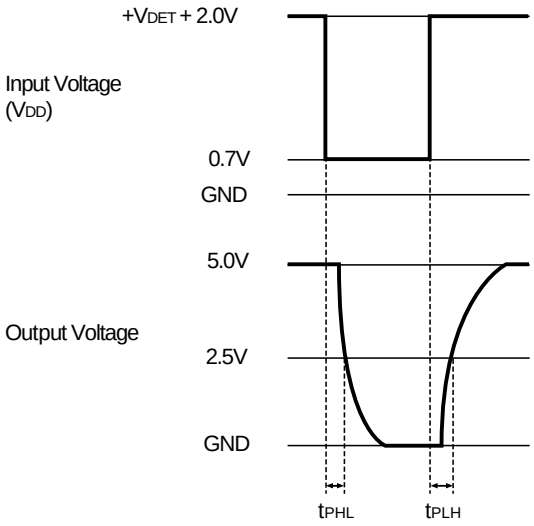
• **CMOS Output (R×5VT××C)**



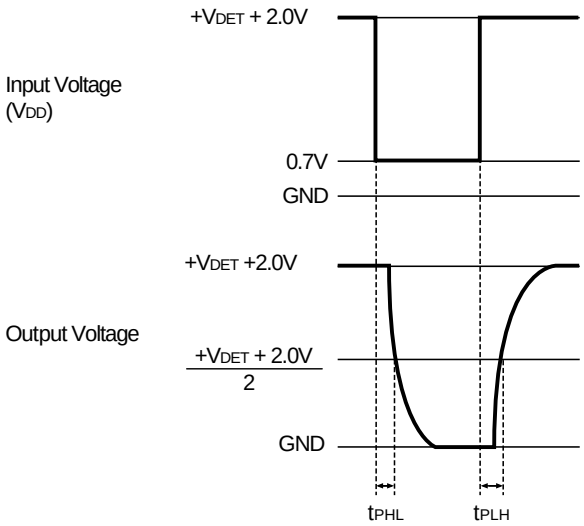
TIME CHART



DEFINITION OF OUTPUT DELAY TIME t_{PLH}



Nch Open Drain Output



CMOS Output

Output Delay Time t_{PLH} is defined as follows:

1. In the case of Nch Open Drain Output:

   When the time at which a pulse voltage which increases from 0.7V to +V_{DET}+2.0V is applied to V_{DD} is Time A, and the time at which the output voltage reaches 2.5V under the conditions that the output pin (OUT) is pulled up to 5V by a resistor of 470kΩ is Time B, the time period from Time A through Time B.

2. In the case of CMOS Output:

   When the time at which a pulse voltage which increases from 0.7V to +V_{DET}+2.0V is applied to V_{DD} is Time A, and the time at which the output voltage reaches the voltage of (+V_{DET}+2.0V)/2 is Time B, the time period from Time A through Time B.

SELECTION GUIDE

The package type, the detector threshold, the output type, the packing type, and the taping type of R×5VT series can be designating at the user's request by specifying the part number as follows:

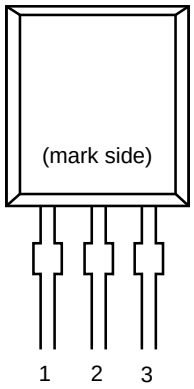
R×5VT×××-×× ←Part Number
↑ ↑ ↑↑ ↑
a b c d e

Code	Contents
a	Designation of Package Type: E: TO-92 H: SOT-89 (Mini-power Mold) N: SOT-23-5 (Mini-mold)
b	Setting Detector Threshold ($-V_{DET}$): Stepwise setting with a step of 0.1V in the range of 0.9V to 6.0V is possible.
c	Designation of Output Type: A: Nch Open Drain C: CMOS
d	Designation of Packing Type: A: Taping C: Antistatic bag for TO-92 and samples
e	Designation of Taping Type: Ex. TO-92: RF, RR, TZ SOT-89: T1, T2 SOT-23-5: TR, TL (refer to Taping Specifications) "TZ", "T1" and "TR" are prescribed as a standard

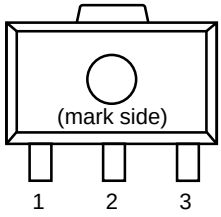
For example, the product with Package Type SOT-89, Detector Threshold 3.5V, Output Type Nch Open Drain and Taping Type T1, is designated by Part Number RH5VT35AA-T1.

PIN CONFIGURATION

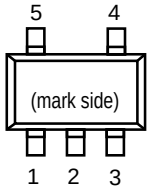
• TO-92



• SOT-89



• SOT-23-5



PIN DESCRIPTION

• TO-92

Pin No.	Symbol
1	OUT
2	V_{DD}
3	GND

• SOT-89

Pin No.	Symbol
1	OUT
2	V_{DD}
3	GND

• SOT-23-5

Pin No.	Symbol
1	OUT
2	V_{DD}
3	GND
4	NC
5	NC

ABSOLUTE MAXIMUM RATINGS

Topt=25˚C

Symbol	Item	Rating		Unit
V_{DD}	Supply Voltage	12		V
V_{OUT}	Output Voltage	CMOS	V_{SS}–0.3 to V_{DD}+0.3	V
		Nch	V_{SS}–0.3 to 12	
I_{OUT}	Output Current	70		mA
P_{D1}	Power Dissipation 1 (NOTE1)	300		mW
P_{D2}	Power Dissipation 2 (NOTE2)	150		mW
Topt	Operating Temperature Range	–30 to +80		˚C
Tstg	Storage Temperature Range	–55 to +125		˚C
Tsolder	Lead Temperature (Soldering)	260˚C,10s		

(NOTE 1) applied to SOT-89 and TO-92
(NOTE 2) applied to SOT-23-5

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum ratings are threshold limit values that must not be exceeded even for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits.

ELECTRICAL CHARACTERISTICS

• R5VT09A/C

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			0.878	0.900	0.922	V	
V_{HYS}	Detector Threshold Hysteresis			0.027	0.045	0.063	V	
I_{SS}	Supply Current	V_{DD}=0.80V			0.8	2.4	µA	
		V_{DD}=2.90V			0.9	2.7		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		−30°C≤Topt≤80°C			0.65	0.80		
I_{OUT}	Output Current	Nch	V_{DS}=0.05V,V_{DD}=0.70V	0.01	0.05		mA	
			V_{DS}=0.50V,V_{DD}=0.85V	0.05	0.50			
		Pch V_{DS}=−2.1V,V_{DD}=4.5V		1.0	2.0		mA	
t_{PLH}	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	−30°C≤Topt≤80°C			±100		ppm/°C	

• R5VT18A/C

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			1.755	1.800	1.845	V	
V_{HYS}	Detector Threshold Hysteresis			0.054	0.090	0.126	V	
I_{SS}	Supply Current	V_{DD}=1.70V			0.8	2.4	µA	
		V_{DD}=3.80V			1.0	3.0		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		−30°C≤Topt≤80°C			0.65	0.80		
I_{OUT}	Output Current	Nch	V_{DS}=0.05V,V_{DD}=0.70V	0.01	0.05		mA	
			V_{DS}=0.50V,V_{DD}=1.50V	1.00	2.00			
		Pch V_{DS}=−2.1V,V_{DD}=4.5V		1.0	2.0		mA	
t_{PLH}	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	−30°C≤Topt≤80°C			±100		ppm/°C	

• R×5VT27A/C

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
−VDET	Detector Threshold			2.633	2.700	2.767	V	
VHYS	Detector Threshold Hysteresis			0.081	0.135	0.189	V	
ISS	Supply Current	VDD=2.60V			0.9	2.7	µA	
		VDD=4.70V			1.1	3.3		
VDDH	Maximum Operating Voltage					10	V	
VDDL	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		−30°C≤Topt≤80°C			0.65	0.80		
IOUT	Output Current	Nch	VDS=0.05V,VDD=0.70V	0.01	0.05		mA	
			VDS=0.50V,VDD=1.50V	1.00	2.00			
		Pch VDS=−2.1V,VDD=4.5V		1.0	2.0		mA	
tPLH	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	−30°C≤Topt≤80°C			±100		ppm/°C	

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
−VDET	Detector Threshold			3.510	3.600	3.690	V	
VHYS	Detector Threshold Hysteresis			0.108	0.180	0.252	V	
ISS	Supply Current	VDD=3.47V			1.0	3.0	µA	
		VDD=5.60V			1.2	3.6		
VDDH	Maximum Operating Voltage					10	V	
VDDL	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		−30°C≤Topt≤80°C			0.65	0.80		
IOUT	Output Current	Nch	VDS=0.05V,VDD=0.70V	0.01	0.05		mA	
			VDS=0.50V,VDD=1.50V	1.00	2.00			
		Pch VDS=−2.1V,VDD=4.5V		1.0	2.0		mA	
tPLH	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	−30°C≤Topt≤80°C			±100		ppm/°C	

• R5VT45A/C

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
–V_{DET}	Detector Threshold			4.388	4.500	4.612	V	
V_{HYS}	Detector Threshold Hysteresis			0.135	0.225	0.315	V	
I_{SS}	Supply Current	V_{DD}=4.34V			1.1	3.3	µA	
		V_{DD}=6.50V			1.3	3.9		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		–30°C≤Topt≤80°C			0.65	0.80		
I_{OUT}	Output Current	Nch	V_{DS}=0.05V,V_{DD}=0.70V	0.01	0.05		mA	
			V_{DS}=0.50V,V_{DD}=1.50V	1.00	2.00			
		Pch V_{DS}=–2.1V,V_{DD}=8.0V		1.5	3.0		mA	
t_{PLH}	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	–30°C≤Topt≤80°C			±100		ppm/°C	

• R5VT54A/C

Topt=25°C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
–V_{DET}	Detector Threshold			5.265	5.400	5.535	V	
V_{HYS}	Detector Threshold Hysteresis			0.162	0.270	0.378	V	
I_{SS}	Supply Current	V_{DD}=5.20V			1.2	3.6	µA	
		V_{DD}=7.40V			1.4	4.2		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25°C			0.55	0.70	V	Note 1
		–30°C≤Topt≤80°C			0.65	0.80		
I_{OUT}	Output Current	Nch	V_{DS}=0.05V,V_{DD}=0.70V	0.01	0.05		mA	
			V_{DS}=0.50V,V_{DD}=1.50V	1.00	2.00			
		Pch V_{DS}=–2.1V,V_{DD}=8.0V		1.5	3.0		mA	
t_{PLH}	Output Delay Time					100	µs	Note 2
$\frac{\Delta -V_{DET}}{\Delta Topt}$	Detector Threshold Temperature Coefficient	–30°C≤Topt≤80°C			±100		ppm/°C	

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470kΩ, and the pull-up voltage is set at 5.0V.

(Note 2) Refer to the previously defined "Output Delay Time t_{PLH}".

ELECTRICAL CHARACTEISTICS BY DETECTOR THRESHOLD

• R×5VT09A/C to R×5VT39A/C

Part Number	Detector Threshold			Detector Threshold Hysteresis			Supply Current 1			Supply Current 2		
	$-V_{DET}$(V)			V_{HYS}(V)			Iss(μA)			Iss(μA)		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
R×5VT09A/C	0.878	0.900	0.922	0.027	0.045	0.063	V_{DD}= ($-V_{DET}$) −0.10V	0.8	2.4	V_{DD}= ($-V_{DET}$) +2.0V	0.9	2.7
R×5VT10A/C	0.975	1.000	1.025	0.030	0.050	0.070					1.0	3.0
R×5VT11A/C	1.073	1.100	1.127	0.033	0.055	0.077						
R×5VT12A/C	1.170	1.200	1.230	0.036	0.060	0.084						
R×5VT13A/C	1.268	1.300	1.332	0.039	0.065	0.091						
R×5VT14A/C	1.365	1.400	1.435	0.042	0.070	0.098						
R×5VT15A/C	1.463	1.500	1.537	0.045	0.075	0.105						
R×5VT16A/C	1.560	1.600	1.640	0.048	0.080	0.112						
R×5VT17A/C	1.658	1.700	1.742	0.051	0.085	0.119						
R×5VT18A/C	1.755	1.800	1.845	0.054	0.090	0.126						
R×5VT19A/C	1.853	1.900	1.947	0.057	0.095	0.133						
R×5VT20A/C	1.950	2.000	2.050	0.060	0.100	0.140		0.9	2.7		1.1	3.3
R×5VT21A/C	2.048	2.100	2.152	0.063	0.105	0.147						
R×5VT22A/C	2.145	2.200	2.255	0.066	0.110	0.154						
R×5VT23A/C	2.243	2.300	2.357	0.069	0.115	0.161						
R×5VT24A/C	2.340	2.400	2.460	0.072	0.120	0.168						
R×5VT25A/C	2.438	2.500	2.562	0.075	0.125	0.175						
R×5VT26A/C	2.535	2.600	2.665	0.078	0.130	0.182						
R×5VT27A/C	2.633	2.700	2.767	0.081	0.135	0.189						
R×5VT28A/C	2.730	2.800	2.870	0.084	0.140	0.196						
R×5VT29A/C	2.828	2.900	2.972	0.087	0.145	0.203						
R×5VT30A/C	2.925	3.000	3.075	0.090	0.150	0.210	V_{DD}= ($-V_{DET}$) −0.13V	1.0	3.0		1.2	3.6
R×5VT31A/C	3.023	3.100	3.177	0.093	0.155	0.217						
R×5VT32A/C	3.120	3.200	3.280	0.096	0.160	0.224						
R×5VT33A/C	3.218	3.300	3.382	0.099	0.165	0.231						
R×5VT34A/C	3.315	3.400	3.485	0.102	0.170	0.238						
R×5VT35A/C	3.413	3.500	3.587	0.105	0.175	0.245						
R×5VT36A/C	3.510	3.600	3.690	0.108	0.180	0.252						
R×5VT37A/C	3.608	3.700	3.792	0.111	0.185	0.259						
R×5VT38A/C	3.705	3.800	3.895	0.114	0.190	0.266						

(Note 1) Refer to the previously defined “Output Delay Time t_{PLH}”.

(Note 2) Refer to the previously defined “Minimum Operating Voltage”.
Condition 1:Topt =25˚C
Condition 2:–30˚C ≤Topt ≤ 80˚C

Topt=25°C

Output Current 1			Output Current 2				Output Current 3			Output Delay Time	Minimum Operating Voltage		Detector Threshold Tempco.	
I_{OUT}(mA)			I_{OUT}(mA)				I_{OUT}(mA)			t_{PLH}(µs)	V_{DDL}(V)		Δ–V_{DET}/ΔTopt (ppm/°C)	
Conditions	MIN.	TYP.	Conditions		MIN.	TYP.	Conditions	MIN.	TYP.	MAX.	TYP.	MAX.	Conditions	TYP.
Nch V_{DS}= 0.05V V_{DD}= 0.7V	0.01	0.05	V_{DS}= 0.50V	V_{DD}= 0.85V	0.05	0.50	Pch V_{DS}= –2.1V V_{DD}= 4.5V	1.0	2.0	Note 1 100	Note 2 Condition 1 0.55 Condition 2 0.65	Note 2 Condition 1 0.70 Condition 2 0.80	–30°C≤ Topt ≤80°C	±100
				V_{DD}= 1.0V	0.2	1.0								
				V_{DD}= 1.5V	1.0	2.0								

• R×5VT40A/C to R×5VT60A/C

Part Number	Detector Threshold			Detector Threshold Hysteresis			Supply Current 1			Supply Current 2		
	–V_{DET}(V)			V_{HYS}(V)			Iss(µA)			Iss(µA)		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
R×5VT40A/C	3.900	4.000	4.100	0.120	0.200	0.280	V_{DD}= (–V_{DET}) –0.16V	1.1	3.3	V_{DD}= (–V_{DET}) +2.0V	1.3	3.9
R×5VT41A/C	3.998	4.100	4.202	0.123	0.205	0.287						
R×5VT42A/C	4.095	4.200	4.305	0.126	0.210	0.294						
R×5VT43A/C	4.193	4.300	4.407	0.129	0.215	0.301						
R×5VT44A/C	4.290	4.400	4.510	0.132	0.220	0.308						
R×5VT45A/C	4.388	4.500	4.612	0.135	0.225	0.315						
R×5VT46A/C	4.485	4.600	4.715	0.138	0.230	0.322						
R×5VT47A/C	4.583	4.700	4.817	0.141	0.235	0.329						
R×5VT48A/C	4.680	4.800	4.920	0.144	0.240	0.336						
R×5VT49A/C	4.778	4.900	5.022	0.147	0.245	0.343						
R×5VT50A/C	4.875	5.000	5.125	0.150	0.250	0.350	V_{DD}= (–V_{DET}) –0.20V	1.2	3.6		1.4	4.2
R×5VT51A/C	4.973	5.100	5.277	0.153	0.255	0.357						
R×5VT52A/C	5.070	5.200	5.330	0.156	0.260	0.364						
R×5VT53A/C	5.168	5.300	5.432	0.159	0.265	0.371						
R×5VT54A/C	5.265	5.400	5.535	0.162	0.270	0.378						
R×5VT55A/C	5.363	5.500	5.637	0.165	0.275	0.385						
R×5VT56A/C	5.460	5.600	5.740	0.168	0.280	0.392						
R×5VT57A/C	5.558	5.700	5.842	0.171	0.285	0.399						
R×5VT58A/C	5.655	5.800	5.945	0.174	0.290	0.406						
R×5VT59A/C	5.753	5.900	6.047	0.177	0.295	0.413						

(Note 1) Refer to the previously defined “Output Delay Time t_{PLH}”.
(Note 2) Refer to the previously defined “Minimum Operating Voltage”.
Condition 1:Topt =25°C
Condition 2:–30°C ≤Topt ≤ 80°C

Topt=25°C

Output Current 1			Output Current 2				Output Current 3			Output Delay Time	Minimum Operating Voltage		Detector Threshold Tempco.	
I_{OUT}(mA)			I_{OUT}(mA)				I_{OUT}(mA)			t_{PLH}(µs)	V_{DDL}(V)		$\Delta-V_{DET}/\Delta Topt$ (ppm/°C)	
Conditions	MIN.	TYP.	Conditions		MIN.	TYP.	Conditions	MIN.	TYP.	MAX.	TYP.	MAX.	Conditions	TYP.
Nch							Pch				Note 2	Note 2		
V_{DS}= 0.05V	0.01	0.05	V_{DS}= 0.50V	V_{DD}= 1.5V	1.0	2.0	V_{DS}= –2.1V	1.5	3.0	Note 1 100	Condition 1 0.55	Condition 1 0.70	-30°C≤ Topt ≤80°C	±100
V_{DD}= 0.7V							V_{DD}= 8.0V				Condition 2 0.65	Condition 2 0.80		

OPERATION

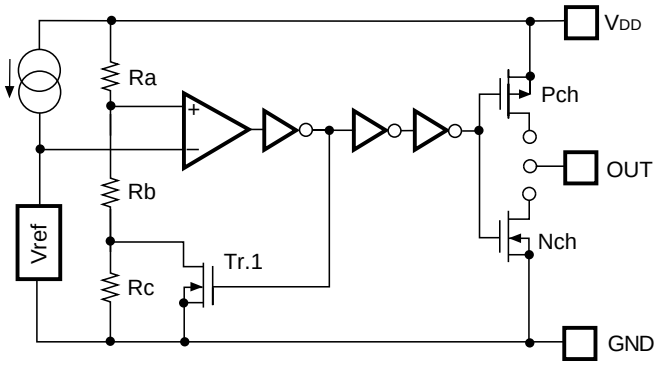


FIG. 1 Block Diagram

- In R5VTxxA, Nch Tr. drain is connected to OUT pin.
- In R5VTxxC, Nch Tr. drain and Pch Tr. drain are connected to OUT pin.

Operation Diagram

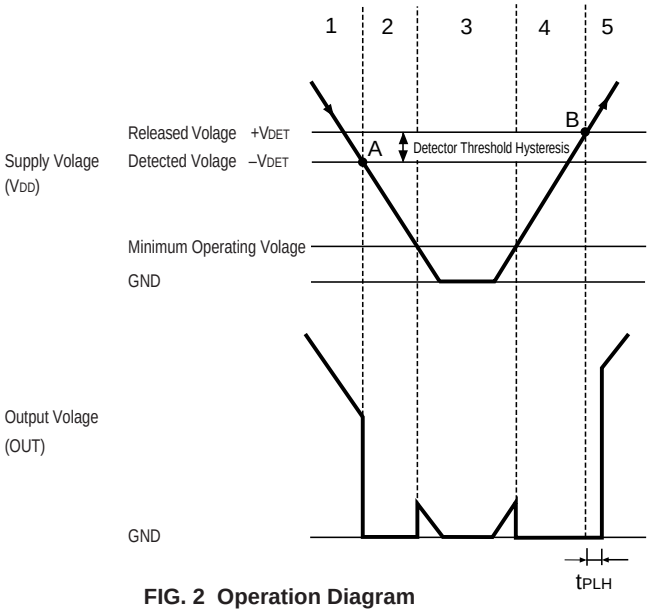


FIG. 2 Operation Diagram

Step		Step 1	Step 2	Step 3	Step 4	Step 5
Comparator(+) Pin Input Voltage		I	II	II	II	I
Comparator Output		H	L	Indefinite	L	H
Tr. 1		OFF	ON	Indefinite	ON	OFF
Output Tr.	Pch	ON	OFF	Indefinite	OFF	ON
	Nch	OFF	ON	Indefinite	ON	OFF

I. $\dfrac{Rb + Rc}{Ra + Rb + Rc} \cdot V_{DD}$

II. $\dfrac{Rb}{Ra + Rb} \cdot V_{DD}$

Step 1. Output Voltage is equal to Power Source Voltage (V_{DD}).

Step 2. When Input Voltage to Comparator reaches the state of $V_{ref} \geq V_{DD} \cdot (Rb+Rc)/(Ra+Rb+Rc)$ at Point A (Detected Voltage $-V_{DET}$), the output of Comparator is reserved, so that Output Voltage becomes GND.

Step 3. In the case of CMOS Output, Output Voltage becomes unstable when Supply Voltage (V_{DD}) is smaller than Minimum Operating Voltage. In the case of Nch Open Drain Output, a pulled-up voltage is output.

Step 4. Output Voltage becomes equal to GND.

Step 5. When Input Voltage to Comparator reaches the state of $V_{ref} \leq V_{DD} \cdot (Rb)/(Ra+ Rb)$ at Point B (Released Voltage $+V_{DET}$), the output of Comparator is reversed, so that Output Voltage becomes equal to Supply Voltage (V_{DD}).

TEST CIRCUITS

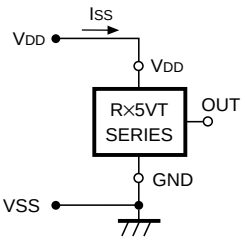


FIG. 3 Supply Current Test Circuit

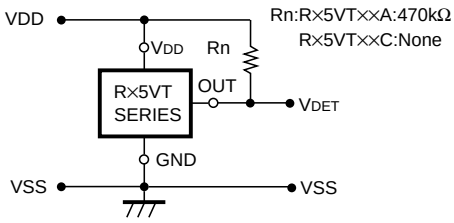


FIG. 4 Detector Threshold Test Circuit

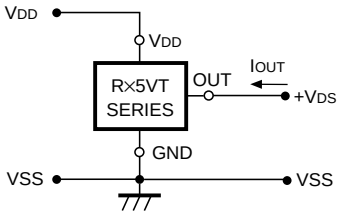


FIG. 5 Nch Driver Output Current Test Circuit

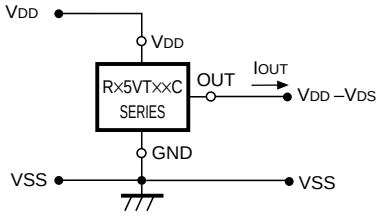


FIG. 6 Pch Driver Output Current Test Circuit

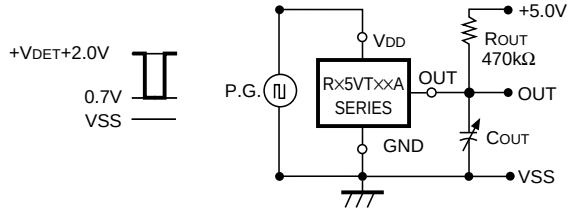


FIG. 7 Output Delay Time Test Circuit (1)

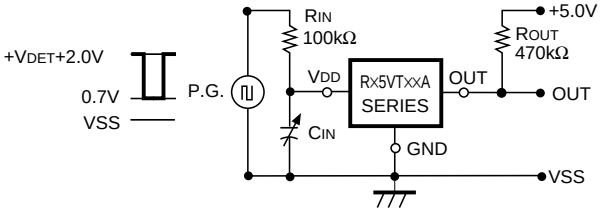
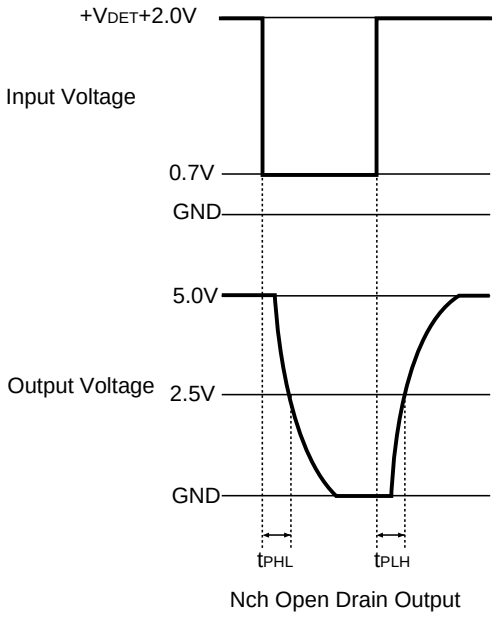
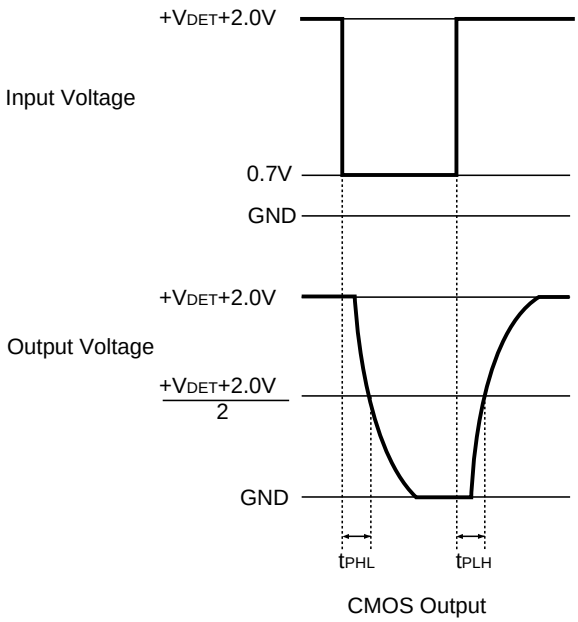


FIG. 8 Output Delay Time Test Circuit (2)

In Output Delay Time Test Circuits (1) and (2) in FIG. 7 and FIG. 8, their respective Output Voltage Fall Times (t_{PHL}) and Rise Times (t_{PLH}) are defined as shown below.



Nch Open Drain Output

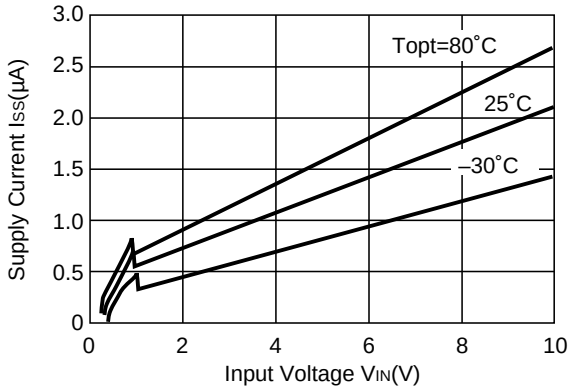


CMOS Output

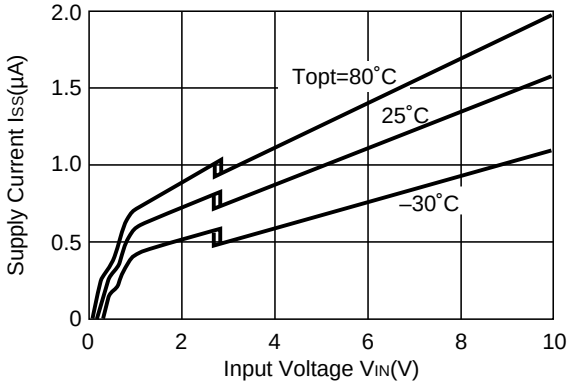
TYPICAL CHARACTERISTICS

1) Supply Current vs. Input Voltage

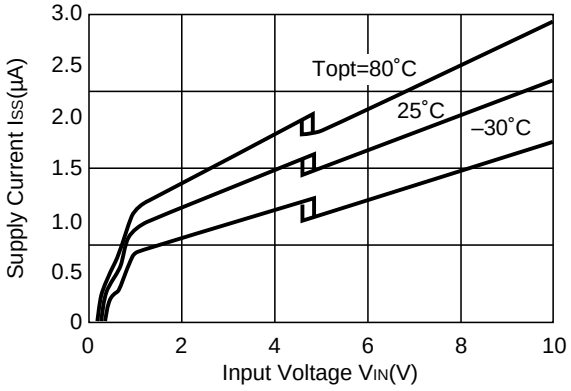
R×5VT09C



R×5VT27C

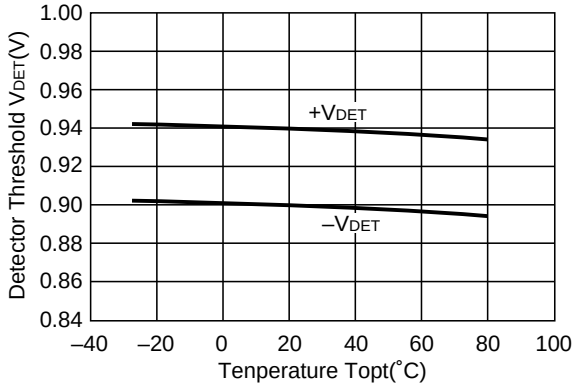


R×5VT45C

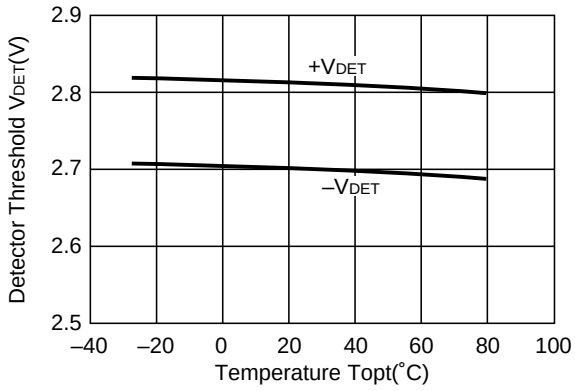


2) Detector Threshold vs. Temperature

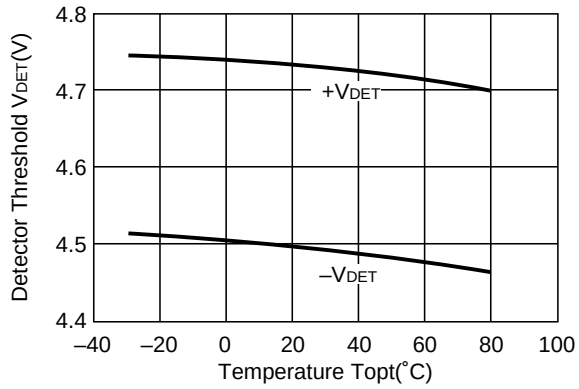
R×5VT09C



R×5VT27C

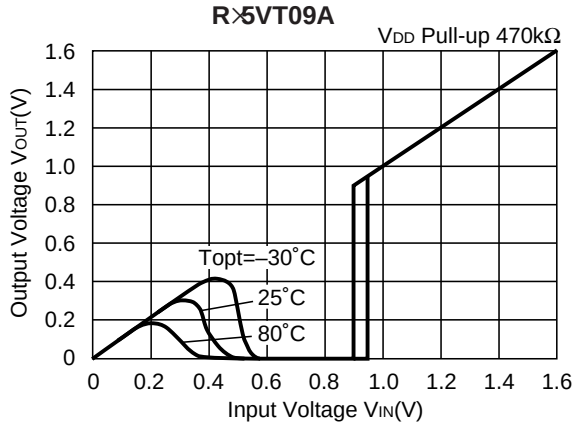


R×5VT45C

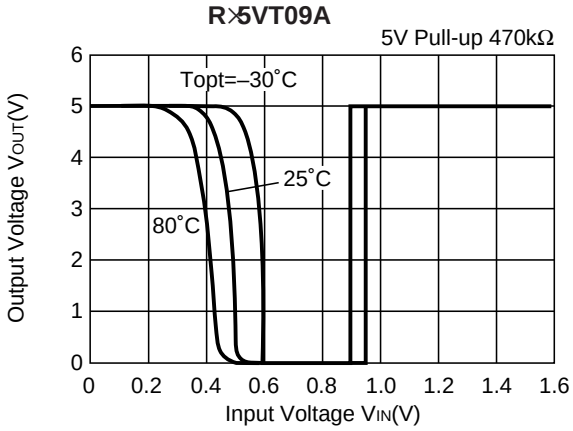


3) Output Voltage vs. Input Voltage

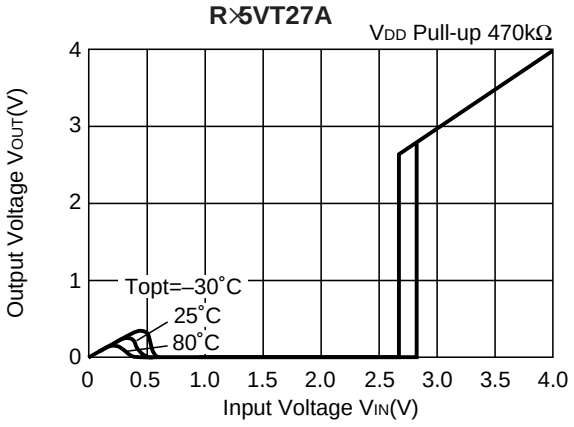
R×5VT09A



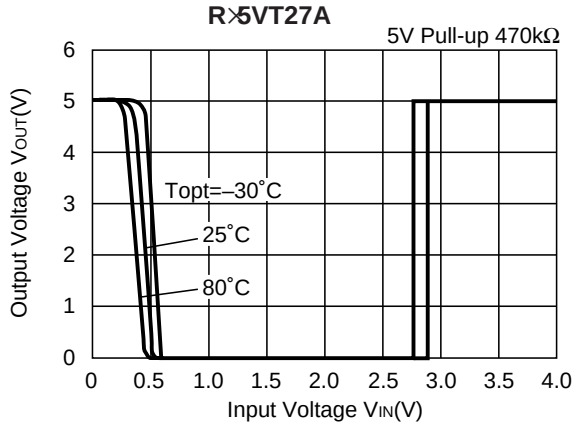
R×5VT09A



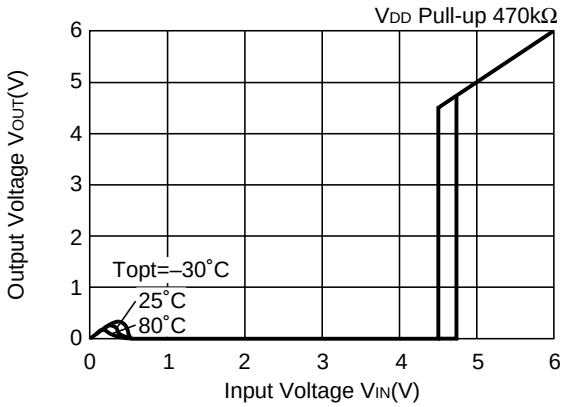
R×5VT27A



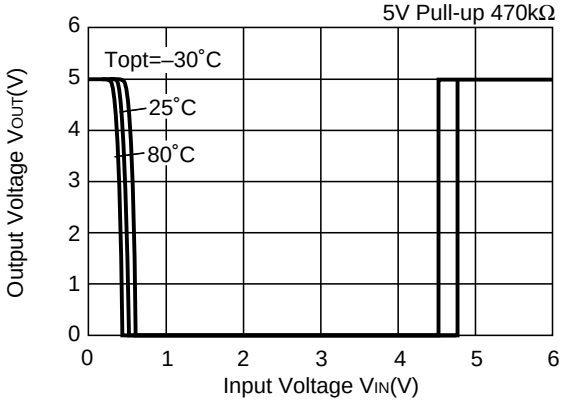
R×5VT27A



R5VT45A

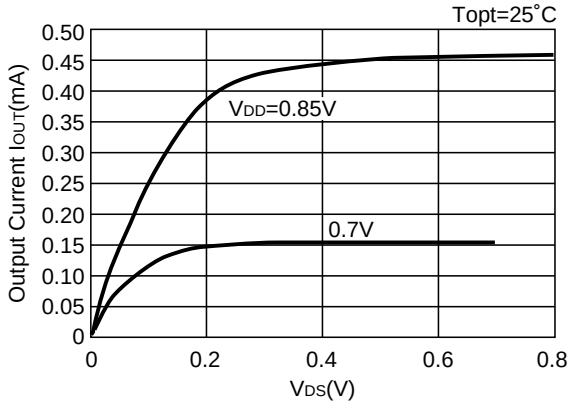


R5VT45A

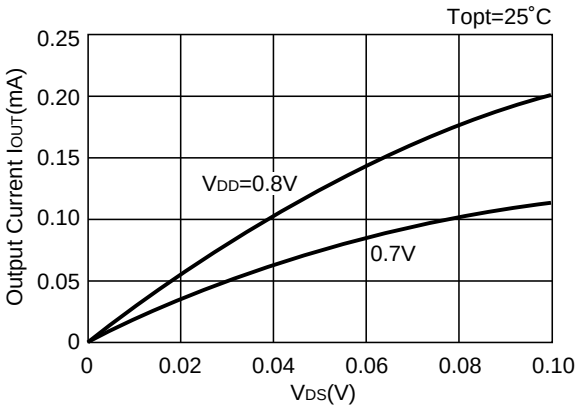


4) Nch Driver Output Current vs. VDS

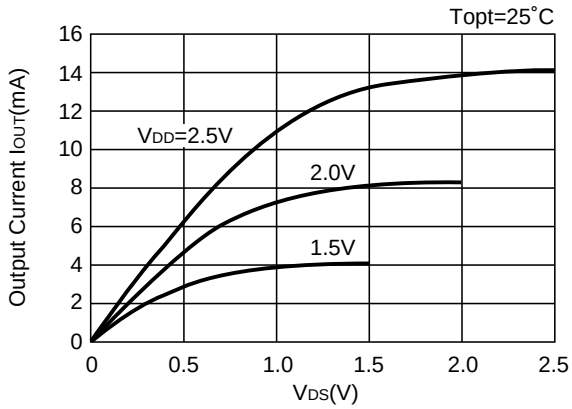
R5VT09C



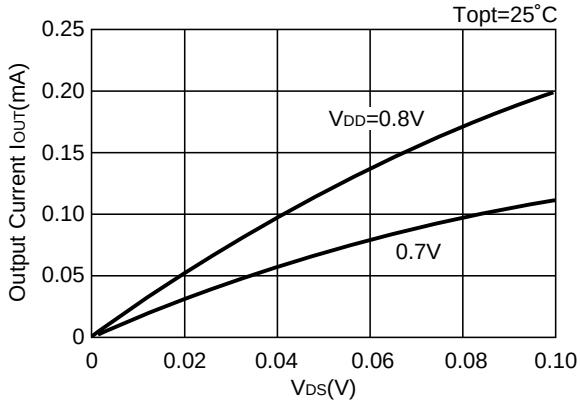
R5VT09C



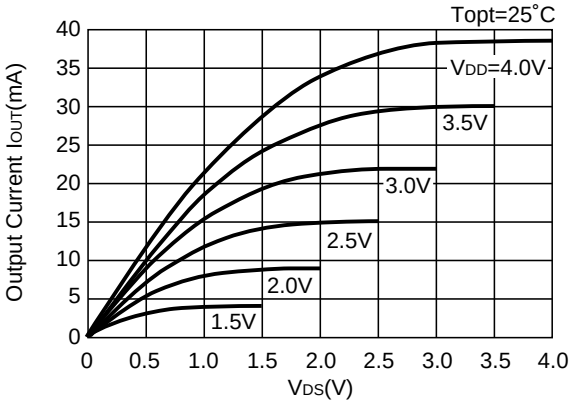
R5VT27C



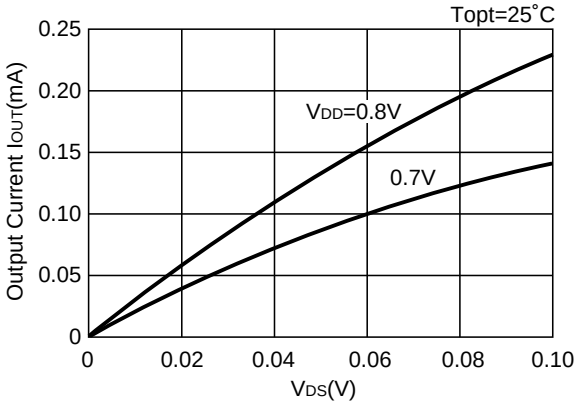
R5VT27C



R×5VT45C

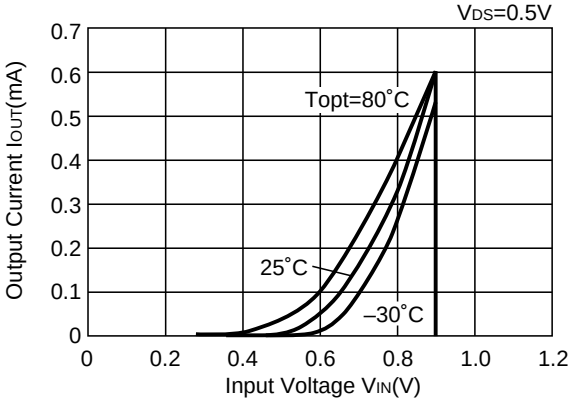


R×5VT45C

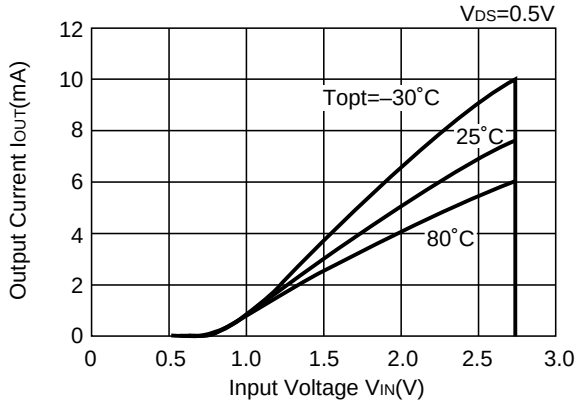


5) Nch Driver Output Current vs. Input Voltage

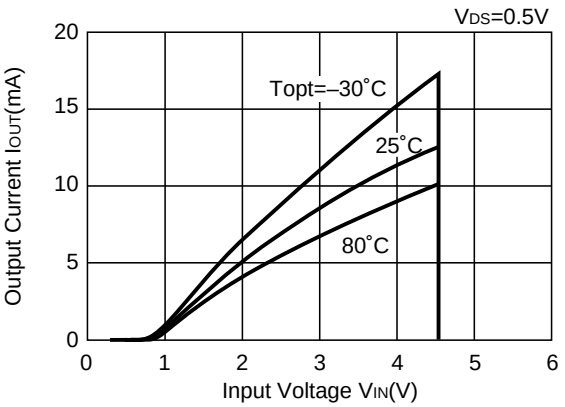
R×5VT09C



R×5VT27C

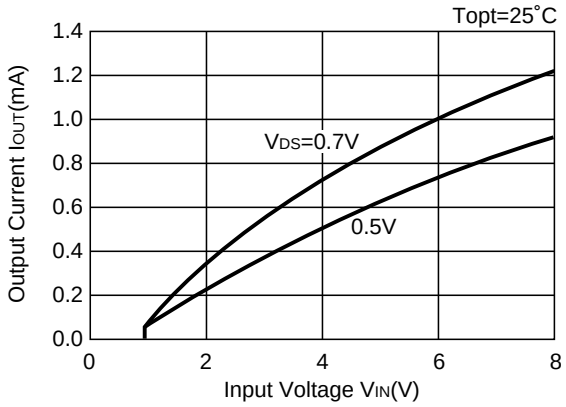


R×5VT45C

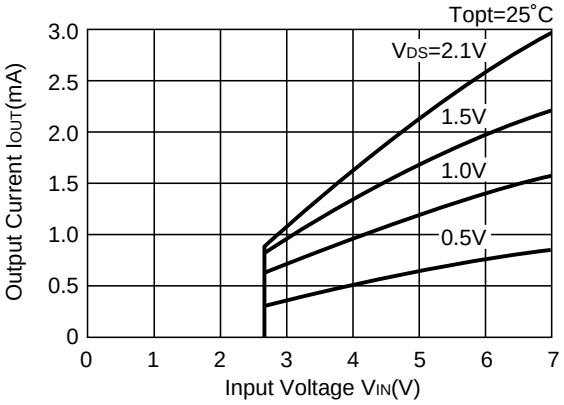


6) Pch Driver Output Current vs. Input Voltage

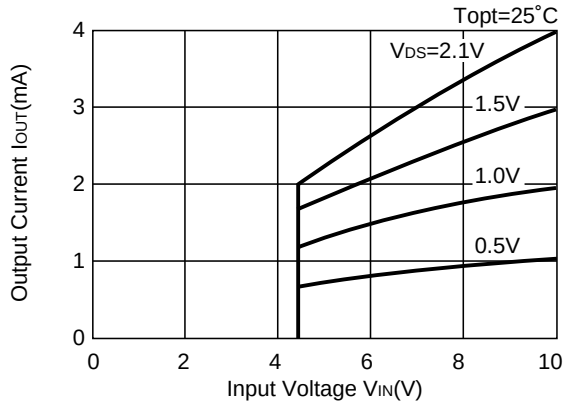
R×5VT09C



R×5VT27C

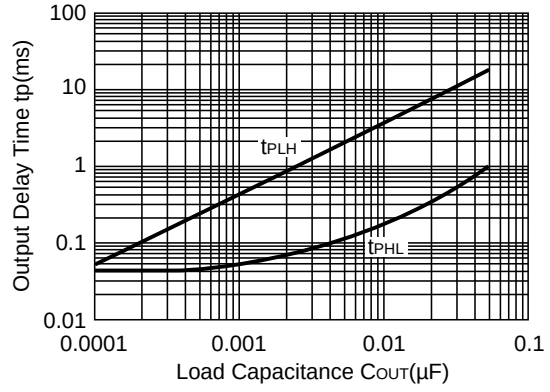


R×5VT45C

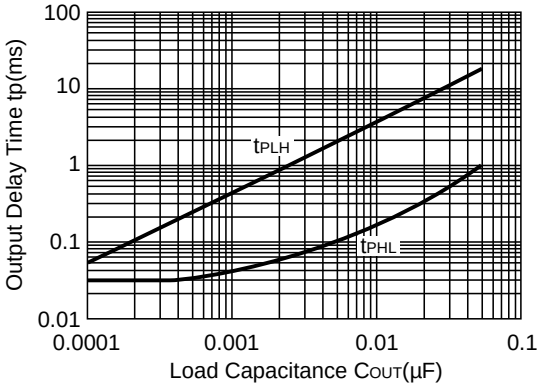


7) Output Delay Time vs. Load Capacitance

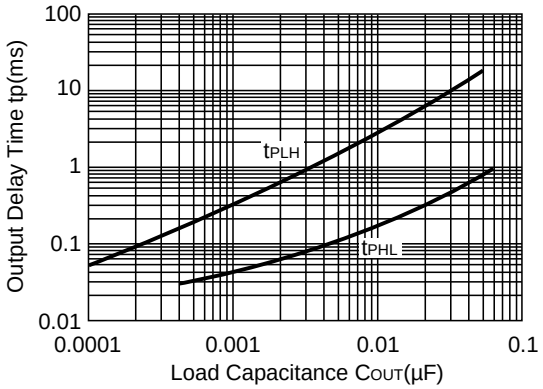
R×5VT09A



R×5VT27A

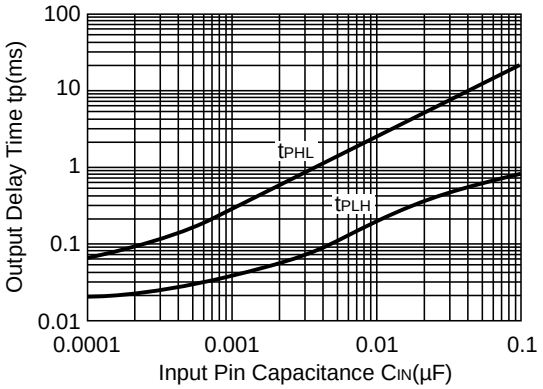


R×5VT45A

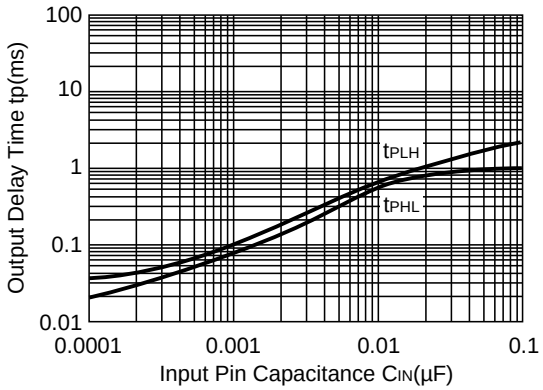


8) Output Delay Time vs. Input Pin Capacitance

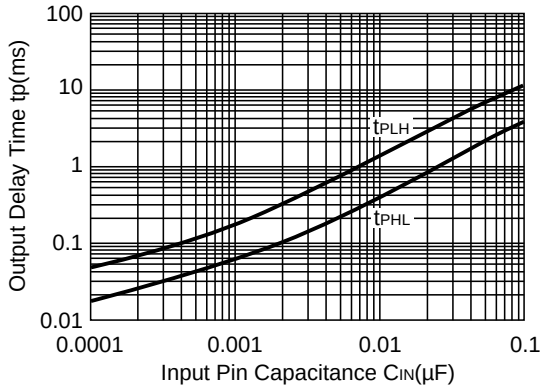
R×5VT09A



R×5VT27A



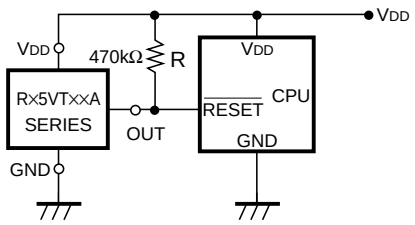
R×5VT45A



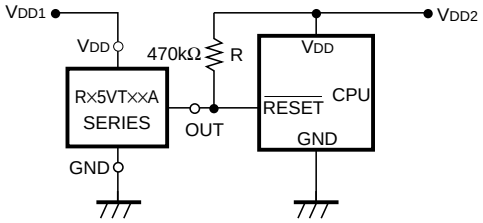
TYPICAL APPLICATIONS

• R×5VT××A CPU Reset Circuit (Nch Open Drain Output)

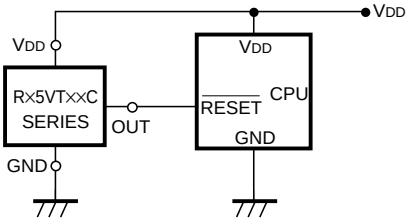
(1)Input Voltage to R×5VT××A is the same as the input voltage to CPU.



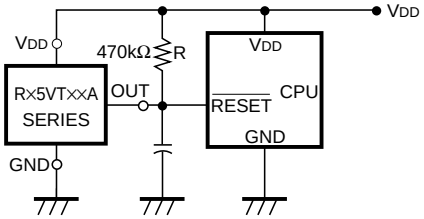
(2) Input Voltage to R×5VT××A is different from the input voltage to CPU.



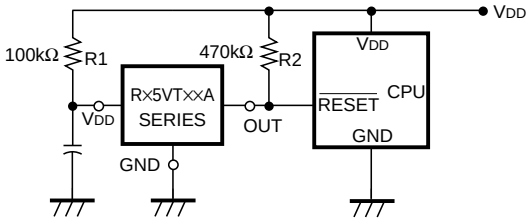
• R×5VT××C CPU Reset Circuit (CMOS Output)



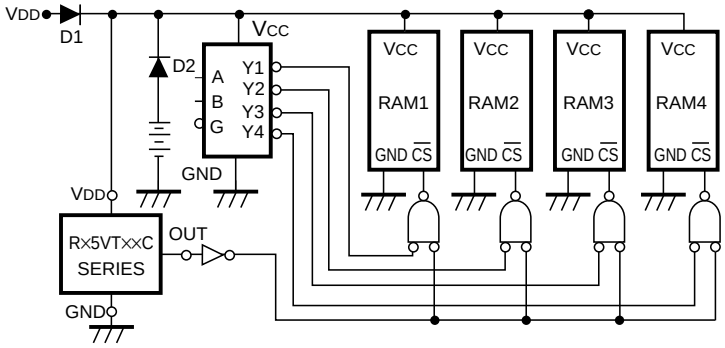
• R×5VT××A Output delay Time Circuit 1



• R×5VT××A Output delay Time Circuit 2

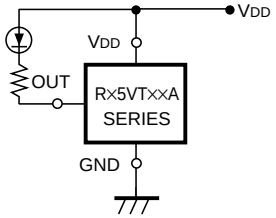


• Memory Back-up Circuit



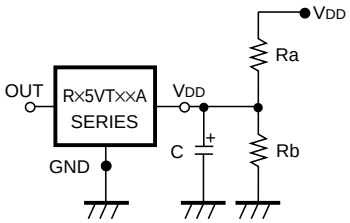
• **Voltage Level Indicator Circuit (lighted when the power runs out)**

(Nch Open Drain Output)



• **Detector Threshold Changing Circuit**

(Nch Open Drain Output)



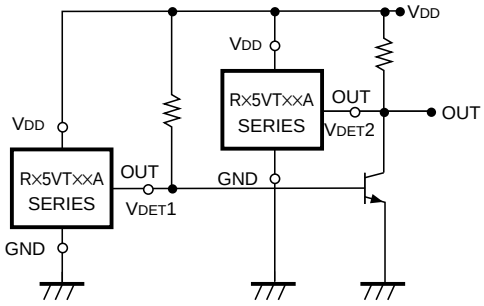
$$\text{Changed Detector Threshold} = \frac{Ra + Rb}{Rb} \cdot (-V_{DET})$$

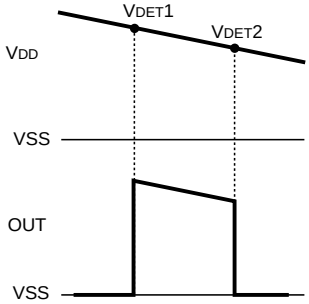
$$\text{Hysteresis Voltage} = \frac{Ra + Rb}{Rb} \cdot V_{HYS}$$

(Note) Please note that when the value of Ra becomes excessively large, the detector threshold detected may differ from the value calculated by use of the above formula.

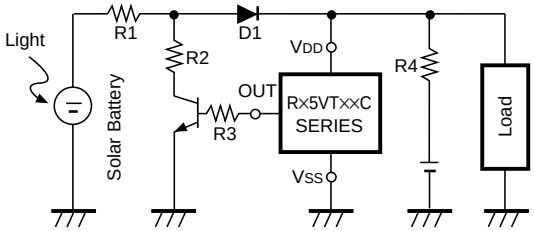
• **Window Comparator Circuit**

(Nch Open Drain Output)





• **Excessive Charge Preventing Circuit**



APPLICATION HINTS

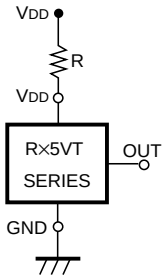


FIG.9

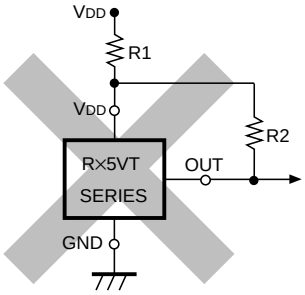
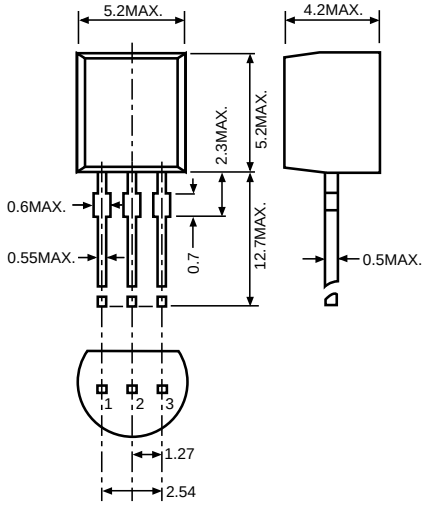


FIG.10

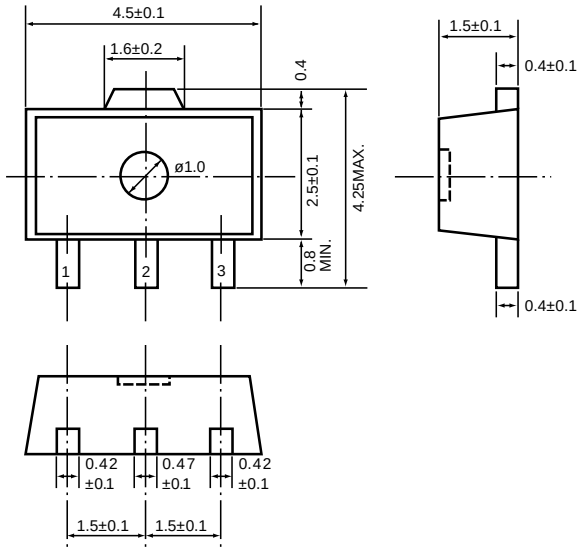
1. When R×5VT××C (CMOS Output) is used in FIG. 9, this IC may oscillate by the through-type current at the detection when impedance is connected between Power Source VDD and R×5VT VDD Pin. When R×5VT××A (Nch Open Drain Output) is used in FIG. 9, and R becomes excessively large, Detector Threshold may be varied because of the voltage drop of the supply current in the IC itself.
2. The connection as shown in FIG. 10 may cause the oscillation in both R×5VT××C (CMOS Output) and R×5VT××A (Nch Open Drain Output).

PACKAGE DIMENSIONS (Unit: mm)

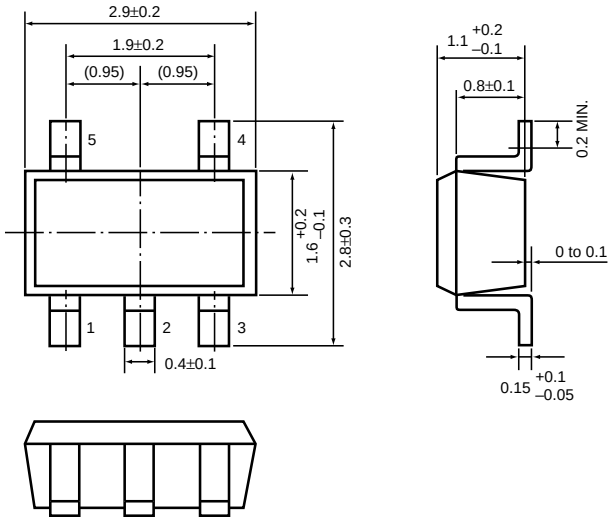
• **TO-92**



• **SOT-89**

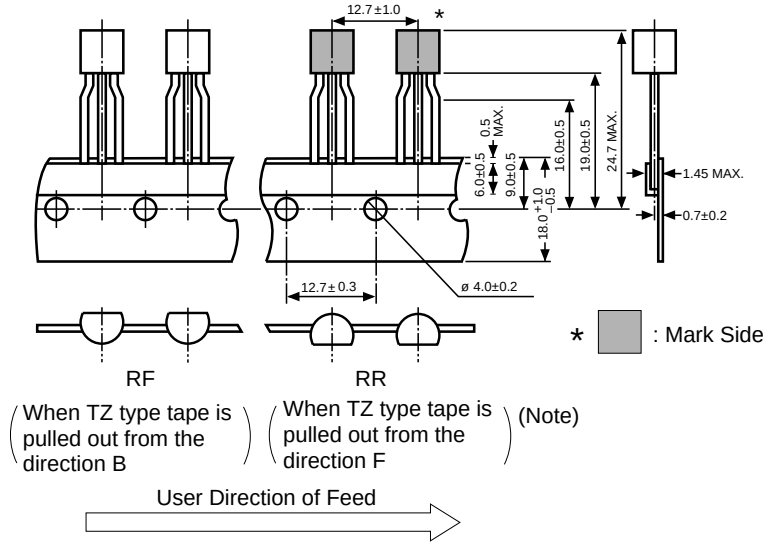


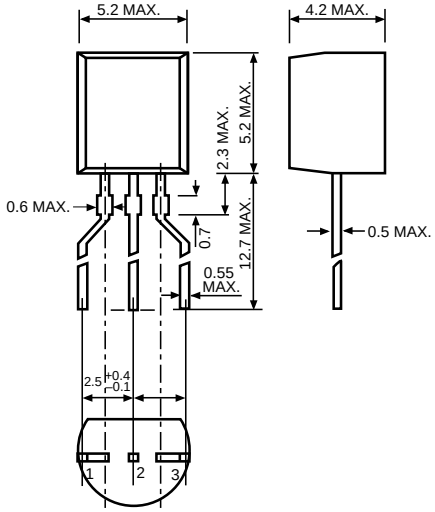
• **SOT-23-5**



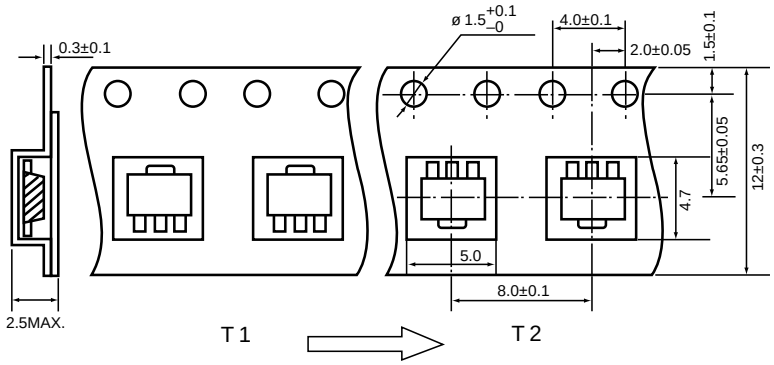
TAPING SPECIFICATIONS (Unit: mm)

• **TO-92**





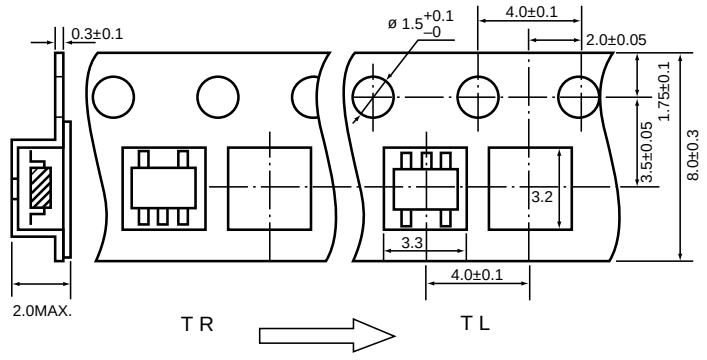
• **SOT-89**



(Note) When taping is conducted, the pins of TO-92 are subjected to a particular forming.

(Note) TZ type tape is not in the form of a reel, but is packed in a zigzag state in a box.Therefore, the tape can be used as either an RF type tape or an RR type tape,depending upon the pulling out direction (B or F).

• **SOT-23-5**



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