LOW VOLTAGE DETECTOR

RN5VS SERIES

APPLICATION MANUAL

RICOH

ELECTRONIC DEVICES DIVISION

NO.EA-037-9701

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June 1995

RN5VS SERIES

APPLICATION MANUAL

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LOW VOLTAGE DETECTOR

RN5VS SERIES

OUTLINE

The RN5VS 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 RN5VS 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. Since the package for these ICs are SOT-23-5 (Mini-mold) package, high density mounting of the ICs on board is possible.

FEATURES

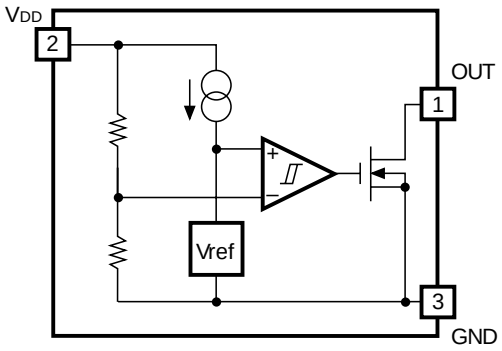
- Ultra-low Supply Current ·····TYP. 0.8μA (V_{DD}=1.5V)
- Broad Operating Voltage Range ····· 0.7V to 10.0V (Topt =25˚C)
- Detector Threshold·····Stepwise setting with a step of 0.1V in the range of 0.9V to 6.0V is possible (refer to Selection Guide).
- High Accuracy Detector Threshold·····±3.0%
- Low Temperature-Drift Coefficien of Detector Threshold·····TYP. ±100ppm/˚C
- Two Output Types·····Nch Open Drain and CMOS
- Packages·····SOT-23-5 (Mini-mold)

APPLICATIONS

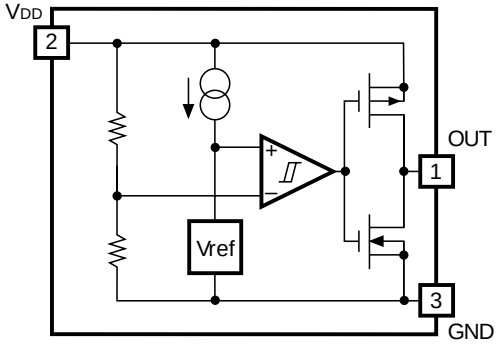
- CPU & Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-Up Circuit
- Power Failure Detector

BLOCK DIAGRAMS

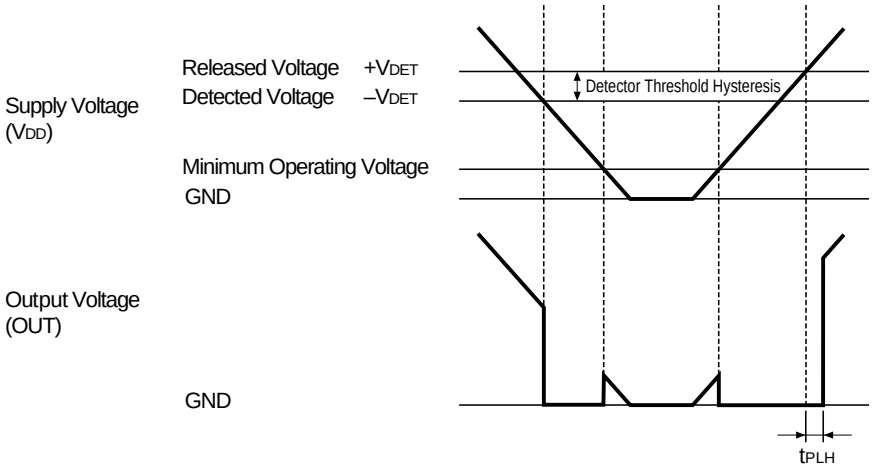
• **Nch Open Drain Output (RN5VS××A)**



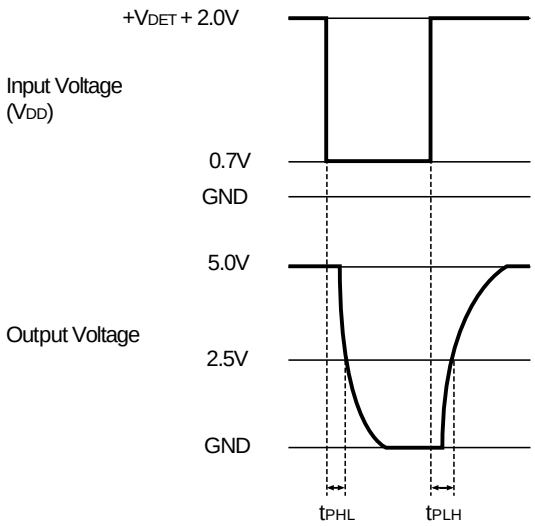
• **CMOS Output (RN5VS××C)**



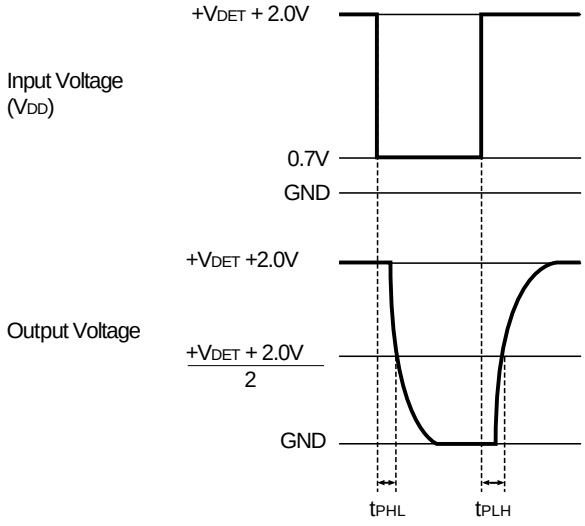
TIME CHART



DEFINITION OF OUTPUT DELAY TIME tplh



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 detector threshold, the output type, the packing type, and the taping type of RN5VS series can be designating at the user's request by specifying the part number as follows:

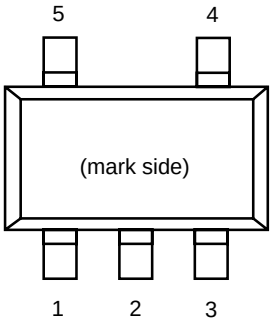
RN5VS××××–× → Part Number
↑ ↑↑ ↑
a b c d

Code	Contents
a	Setting Detector Threshold (–V_{DET}): Stepwise setting with a step of 0.1V in the range of 0.9V to 6.0V is possible.
b	Designation of Output Type: A: Nch Open Drain C: CMOS
c	Designation of Packing Type: A: Taping C: Antistatic bag for samples
d	Designation of Taping Type: Ex. TR, TL (refer to Taping Specifications, the standard direction is TR.)

For example, the product with Detector Threshold 3.5V, Output Type Nch Open Drain and Taping Type TR, is designated by Part Number RN5VS35AA-TR.

PIN CONFIGURATION

• **SOT-23-5**



PIN DESCRIPTION

• **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_D	Power Dissipation	150		mW
Topt	Operating Temperature Range	–40 to +85		˚C
Tstg	Storage Temperature Range	–55 to +125		˚C
Tsolder	Lead Temperature (Soldering)	260˚C,10s		

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

• RN5VS09A/C

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			0.873	0.900	0.927	V	
V_{HYS}	Detector Threshold Hysteresis			0.018	0.045	0.072	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
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚C			±100		ppm/˚C	

• RN5VS18A/C

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			1.746	1.800	1.854	V	
V_{HYS}	Detector Threshold Hysteresis			0.036	0.090	0.144	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
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚C			±100		ppm/˚C	

• **RN5VS27A/C**

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
−V_{DET}	Detector Threshold			2.619	2.700	2.781	V	
V_{HYS}	Detector Threshold Hysteresis			0.054	0.135	0.216	V	
I_{SS}	Supply Current	V_{DD}=2.60V			0.9	2.7	µA	
		V_{DD}=4.70V			1.1	3.3		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25˚C			0.55	0.70	V	Note 1
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚C			±100		ppm/˚C	

• **RN5VS36A/C**

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
−V_{DET}	Detector Threshold			3.492	3.600	3.708	V	
V_{HYS}	Detector Threshold Hysteresis			0.072	0.180	0.288	V	
I_{SS}	Supply Current	V_{DD}=3.47V			1.0	3.0	µA	
		V_{DD}=5.60V			1.2	3.6		
V_{DDH}	Maximum Operating Voltage					10	V	
V_{DDL}	Minimum Operating Voltage	Topt=25˚C			0.55	0.70	V	Note 1
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚C			±100		ppm/˚C	

• RN5VS45A/C

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			4.365	4.500	4.635	V	
V_{HYS}	Detector Threshold Hysteresis			0.090	0.225	0.360	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
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚C			±100		ppm/˚C	

• RN5VS54A/C

Topt=25˚C

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit	Note
$-V_{DET}$	Detector Threshold			5.238	5.400	5.562	V	
V_{HYS}	Detector Threshold Hysteresis			0.108	0.270	0.432	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
		−40˚C≤Topt≤85˚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	−40˚C≤Topt≤85˚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

• RN5VS09A/C to RN5VS39A/C

Part Number	Detector Threshold			Detector Threshold Hysteresis			Supply Current 1			Supply Current 2		
	–Vdet(V)			Vhys(V)			Iss(μA)			Iss(μA)		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
RN5VS09A/C	0.873	0.900	0.927	0.018	0.045	0.072	V_{DD}= (–V_{DET}) –0.10V	0.8	2.4	V_{DD}= (–V_{DET}) +2.0V	0.9	2.7
RN5VS10A/C	0.970	1.000	1.030	0.020	0.050	0.080					1.0	3.0
RN5VS11A/C	1.067	1.100	1.133	0.022	0.055	0.088						
RN5VS12A/C	1.164	1.200	1.236	0.024	0.060	0.096						
RN5VS13A/C	1.261	1.300	1.339	0.026	0.065	0.104						
RN5VS14A/C	1.358	1.400	1.442	0.028	0.070	0.112						
RN5VS15A/C	1.455	1.500	1.545	0.030	0.075	0.120						
RN5VS16A/C	1.552	1.600	1.648	0.032	0.080	0.128						
RN5VS17A/C	1.649	1.700	1.751	0.034	0.085	0.136						
RN5VS18A/C	1.746	1.800	1.854	0.036	0.090	0.144						
RN5VS19A/C	1.843	1.900	1.957	0.038	0.095	0.152						
RN5VS20A/C	1.940	2.000	2.060	0.040	0.100	0.160		0.9	2.7		1.1	3.3
RN5VS21A/C	2.037	2.100	2.163	0.042	0.105	0.168						
RN5VS22A/C	2.134	2.200	2.266	0.044	0.110	0.176						
RN5VS23A/C	2.231	2.300	2.369	0.046	0.115	0.184						
RN5VS24A/C	2.328	2.400	2.472	0.048	0.120	0.192						
RN5VS25A/C	2.425	2.500	2.575	0.050	0.125	0.200						
RN5VS26A/C	2.522	2.600	2.678	0.052	0.130	0.208						
RN5VS27A/C	2.619	2.700	2.781	0.054	0.135	0.216						
RN5VS28A/C	2.716	2.800	2.884	0.056	0.140	0.224						
RN5VS29A/C	2.813	2.900	2.987	0.058	0.145	0.232						
RN5VS30A/C	2.910	3.000	3.090	0.060	0.150	0.240	V_{DD}= (–V_{DET}) –0.13V	1.0	3.0		1.2	3.6
RN5VS31A/C	3.007	3.100	3.193	0.062	0.155	0.248						
RN5VS32A/C	3.104	3.200	3.296	0.064	0.160	0.256						
RN5VS33A/C	3.201	3.300	3.399	0.066	0.165	0.264						
RN5VS34A/C	3.298	3.400	3.502	0.068	0.170	0.272						
RN5VS35A/C	3.395	3.500	3.605	0.070	0.175	0.280						
RN5VS36A/C	3.492	3.600	3.708	0.072	0.180	0.288						
RN5VS37A/C	3.589	3.700	3.811	0.074	0.185	0.296						
RN5VS38A/C	3.686	3.800	3.914	0.076	0.190	0.304						
RN5VS39A/C	3.783	3.900	4.017	0.078	0.195	0.312						

(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 :–40°C ≤Topt ≤ 85°C

Topt=25˚C

Output Current 1			Output Current 2				Output Current 3			Output Delay Time	Minimum Operating Voltage		Detector Threshold Tempco.	
Iout(mA)			Iout(mA)				Iout(mA)			tplh(µs)	Vddl(V)		Δ–Vdet/ΔTopt (ppm/˚C)	
Conditions	MIN.	TYP.	Conditions		MIN.	TYP.	Conditions	MIN.	TYP.	MAX.	TYP.	MAX.	Conditions	TYP.
Nch				V_{DD}= 0.85V	0.05	0.50	Pch				Note 2	Note 2		
				V_{DD}= 1.0V	0.2	1.0								
V_{DS}= 0.05V	0.01	0.05	V_{DS}= 0.50V	V_{DD}= 1.5V	1.0	2.0	V_{DS}= –2.1V	1.0	2.0	Note 1 100	Condition 1 0.55	Condition 1 0.70	–40˚C≤ Topt ≤85˚C	±100
V_{DD}= 0.7V							V_{DD}= 4.5V				Condition 2 0.65	Condition 2 0.80		

• RN5VS40A/C to RN5VS60A/C

Part Number	Detector Threshold			Detector Threshold Hysteresis			Supply Current 1			Supply Current 2		
	–Vdet(V)			Vhys(V)			Iss(µA)			Iss(µA)		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
RN5VS40A/C	3.880	4.000	4.120	0.080	0.200	0.320						
RN5VS41A/C	3.977	4.100	4.223	0.082	0.205	0.328						
RN5VS42A/C	4.074	4.200	4.326	0.084	0.210	0.336						
RN5VS43A/C	4.171	4.300	4.429	0.086	0.215	0.344	V_{DD}=					
RN5VS44A/C	4.268	4.400	4.532	0.088	0.220	0.352	($-V_{DET}$)	1.1	3.3		1.3	3.9
RN5VS45A/C	4.365	4.500	4.635	0.090	0.225	0.360	–0.16V					
RN5VS46A/C	4.462	4.600	4.738	0.092	0.230	0.368						
RN5VS47A/C	4.559	4.700	4.841	0.094	0.235	0.376						
RN5VS48A/C	4.656	4.800	4.944	0.096	0.240	0.384				V_{DD}=		
RN5VS49A/C	4.753	4.900	5.047	0.098	0.245	0.392				($-V_{DET}$)		
RN5VS50A/C	4.850	5.000	5.150	0.100	0.250	0.400				+2.0V		
RN5VS51A/C	4.947	5.100	5.253	0.102	0.255	0.408						
RN5VS52A/C	5.044	5.200	5.356	0.104	0.260	0.416						
RN5VS53A/C	5.141	5.300	5.459	0.106	0.265	0.424	V_{DD}=					
RN5VS54A/C	5.238	5.400	5.562	0.108	0.270	0.432	($-V_{DET}$)	1.2	3.6		1.4	4.2
RN5VS55A/C	5.335	5.500	5.665	0.110	0.275	0.440	–0.20V					
RN5VS56A/C	5.432	5.600	5.768	0.112	0.280	0.448						
RN5VS57A/C	5.529	5.700	5.871	0.114	0.285	0.456						
RN5VS58A/C	5.626	5.800	5.974	0.116	0.290	0.464						
RN5VS59A/C	5.723	5.900	6.077	0.118	0.295	0.472						
RN5VS60A/C	5.820	6.000	6.180	0.120	0.300	0.480						

(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 :–40°C ≤Topt ≤ 85°C

Topt=25˚C

Output Current 1			Output Current 2				Output Current 3			Output Delay Time	Minimum Operating Voltage		Detector Threshold Tempco.	
Iout(mA)			Iout(mA)				Iout(mA)			tplh(µs)	Vddl(V)		Δ–Vdet/ΔTopt (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	–40˚C≤ Topt ≤85˚C	±100
V_{DD}= 0.7V							V_{DD}= 8.0V				Condition 2 0.65	Condition 2 0.80		

OPERATION

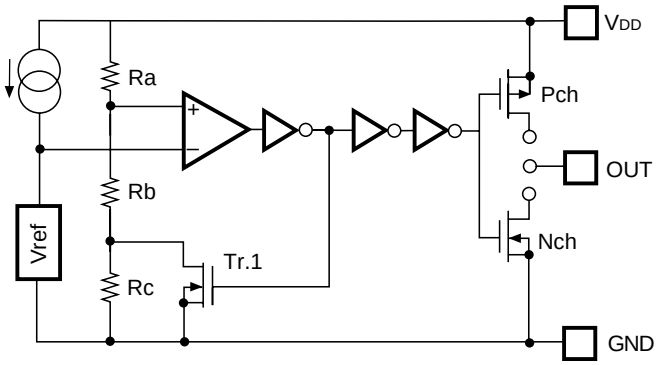


FIG. 1 Block Diagram

- In RN5VS××A, Nch Tr. drain is connected to OUT pin.
- In RN5VS××C, Nch Tr. drain and Pch Tr. drain are connected to OUT pin.

Operation Diagram

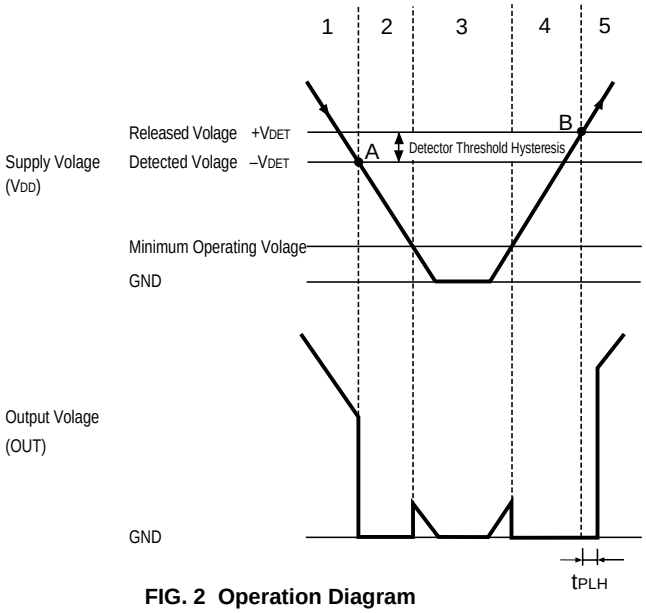


FIG. 2 Operation Diagram

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

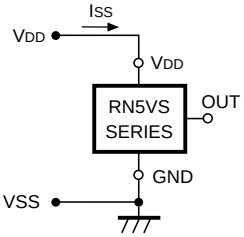


FIG. 3 Supply Current Test Circuit

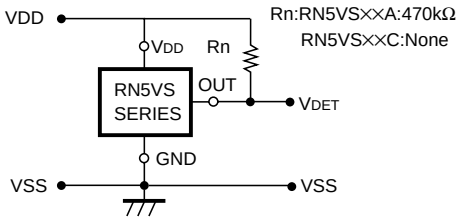


FIG. 4 Detector Threshold Test Circuit

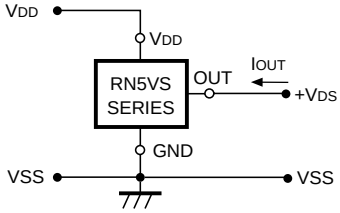


FIG. 5 Nch Driver Output Current Test Circuit

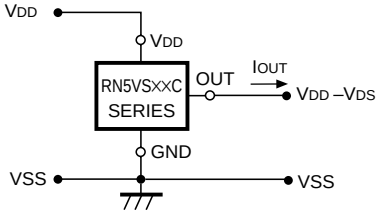


FIG. 6 Pch Driver Output Current Test Circuit

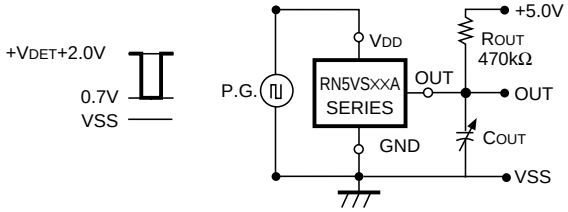


FIG. 7 Output Delay Time Test Circuit (1)

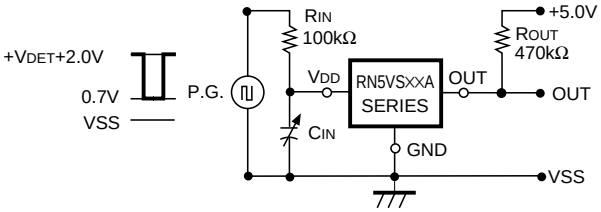
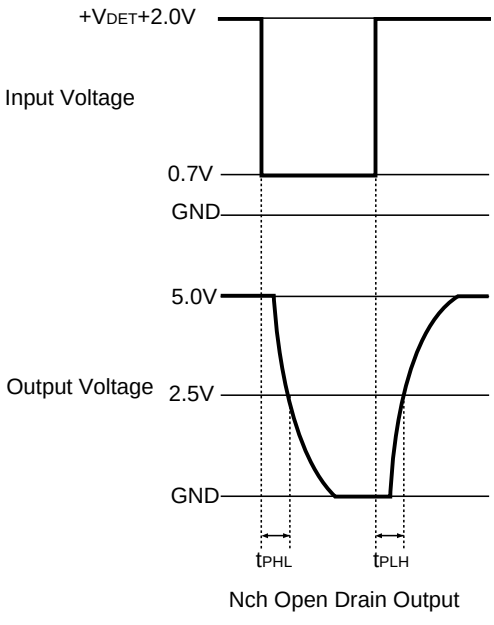
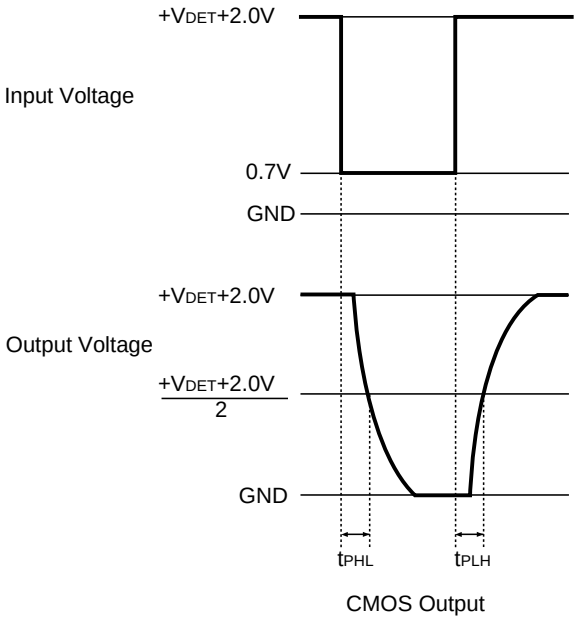


FIG. 8 Output Delay Time Test Circuit (2)

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

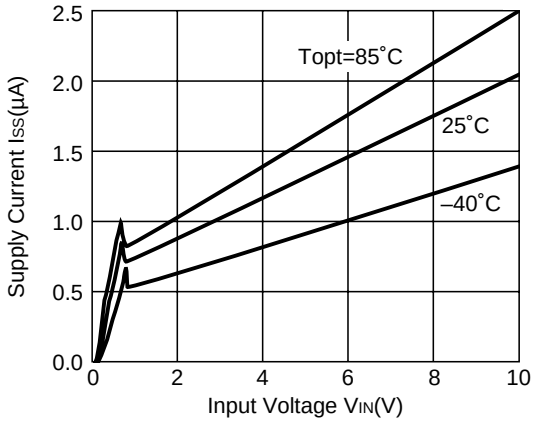


CMOS Output

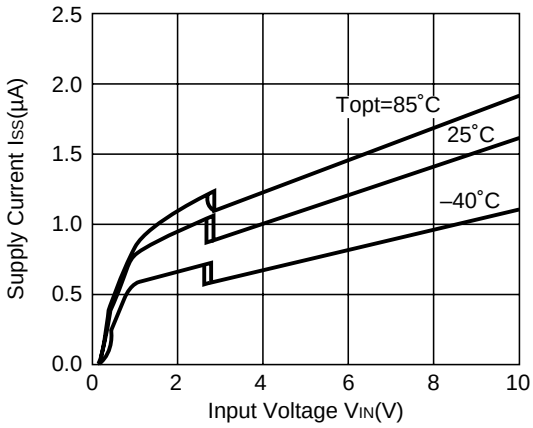
TYPICAL CHARACTERISTICS

1) Supply Current vs. Input Voltage

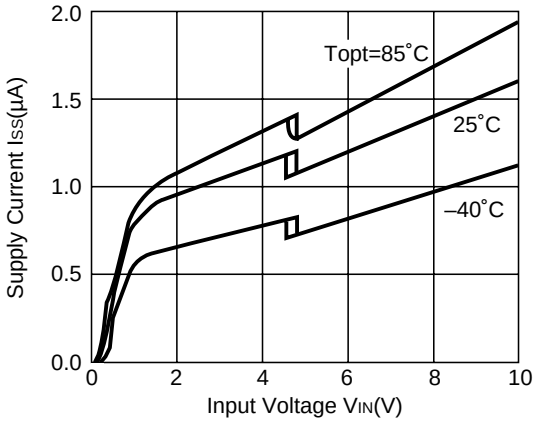
RN5VS09C



RN5VS27C

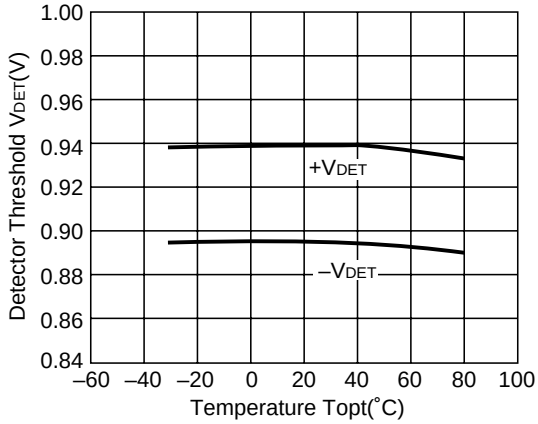


RN5VS45C

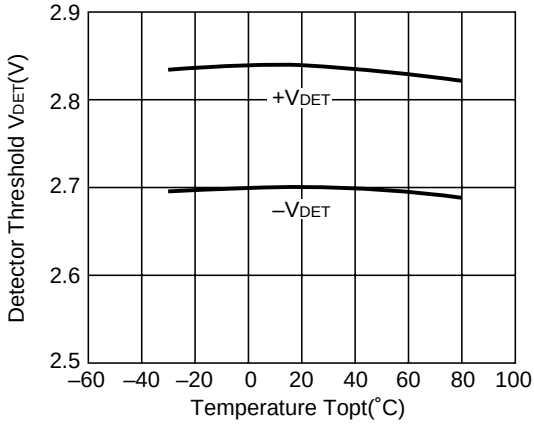


2) Detector Threshold vs. Temperature

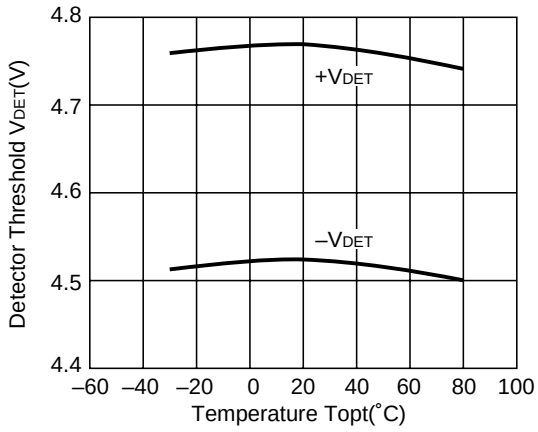
RN5VS09C



RN5VS27C

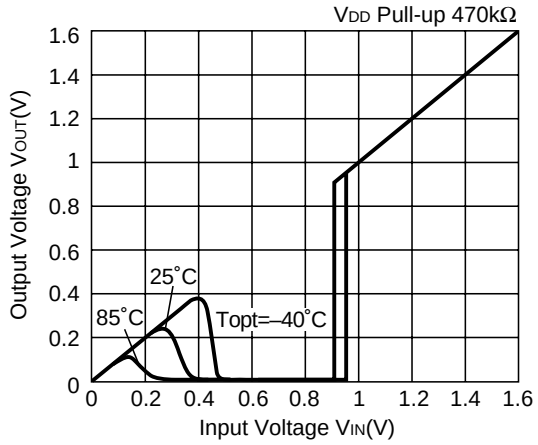


RN5VS45C

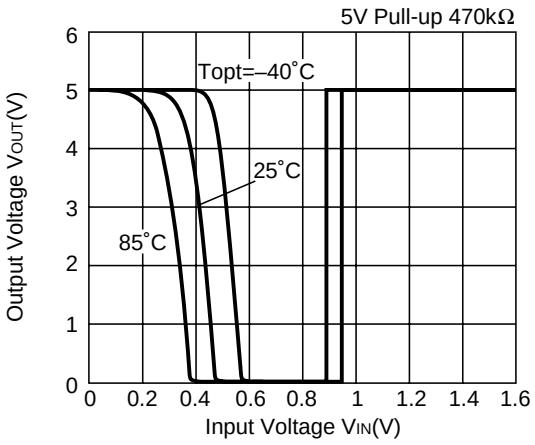


3) Output Voltage vs. Input Voltage

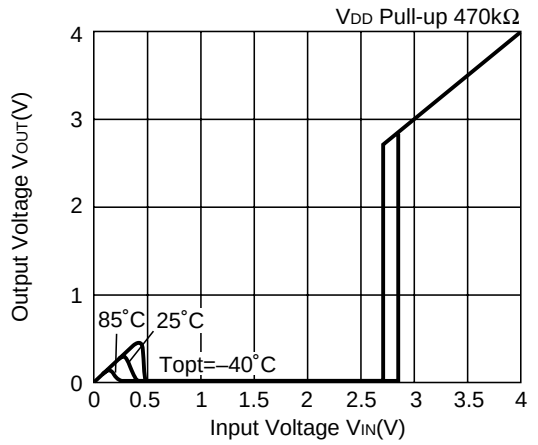
RN5VS09A



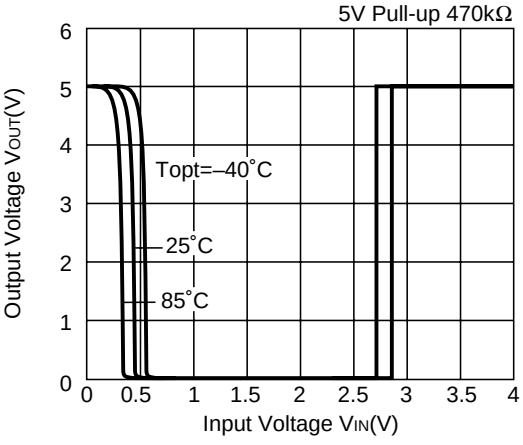
RN5VS09A



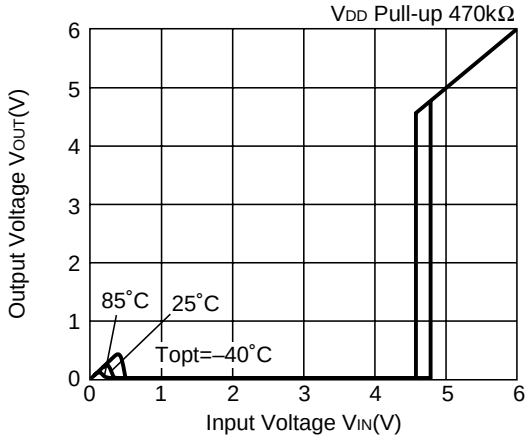
RN5VS27A



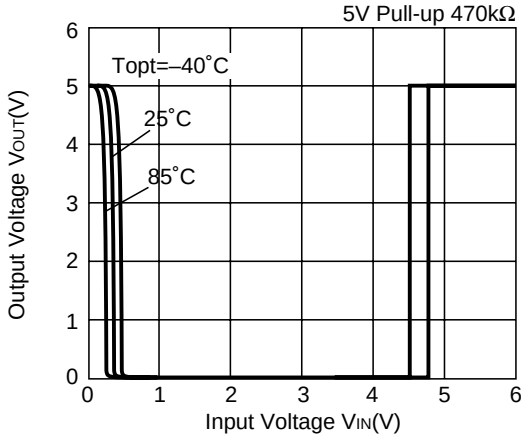
RN5VS27A



RN5VS45A

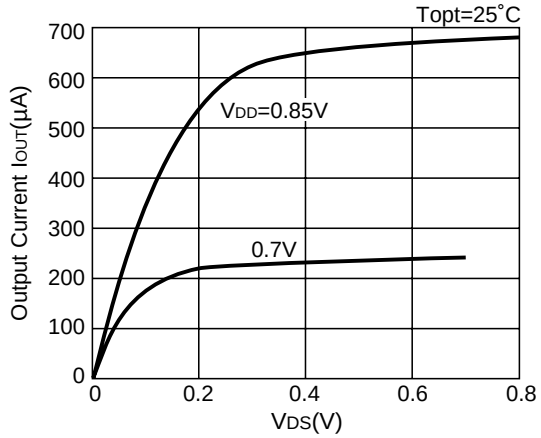


RN5VS45A

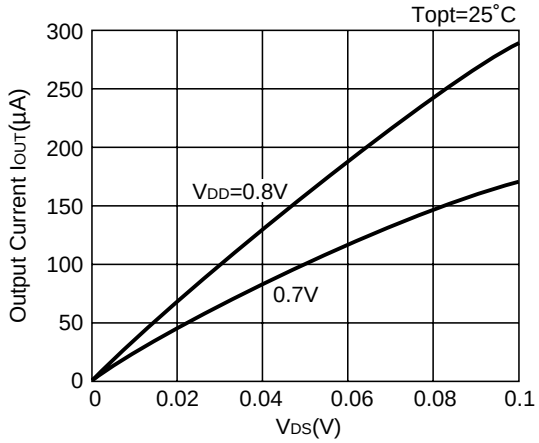


4) Nch Driver Output Current vs. V_{DS}

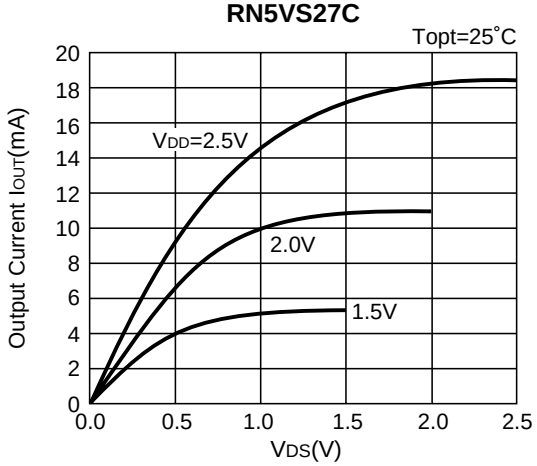
RN5VS09C



RN5VS09C



RN5VS27C



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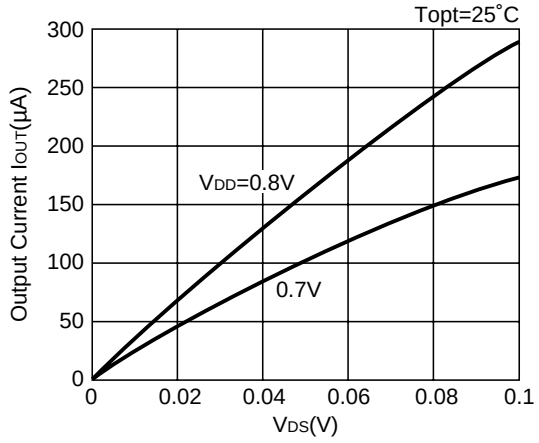

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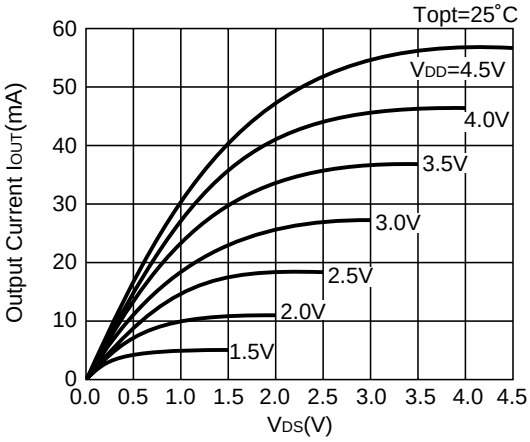
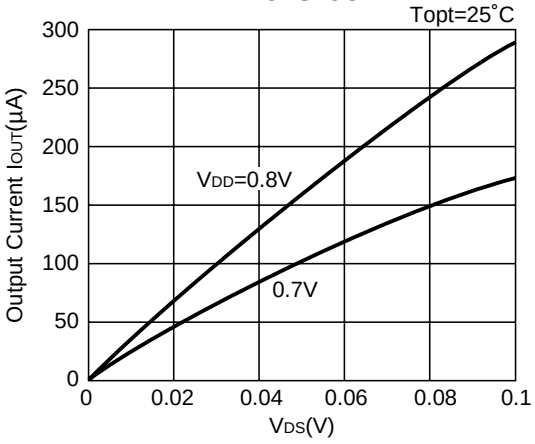
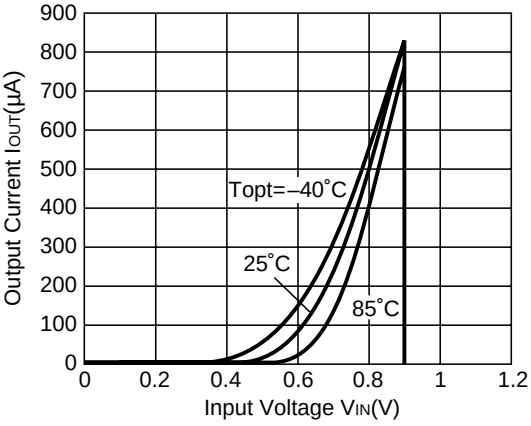


RN5VS45C

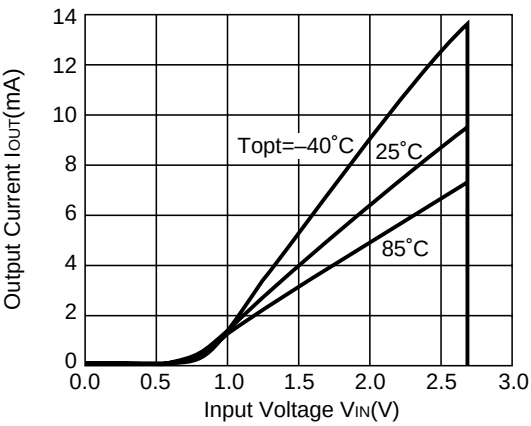


5) Nch Driver Output Current vs. Input Voltage

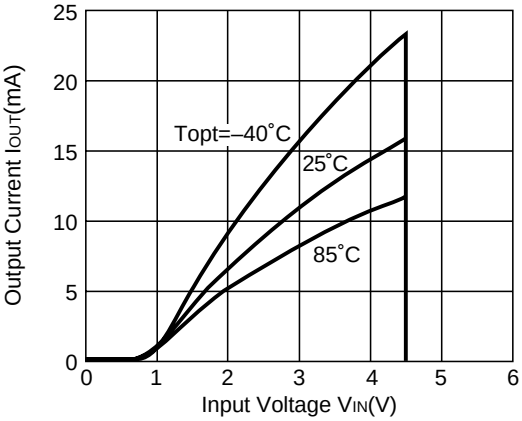
RN5VS09C



RN5VS27C

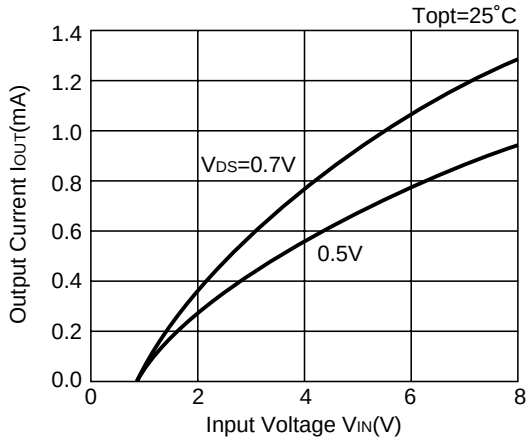


RN5VS45C

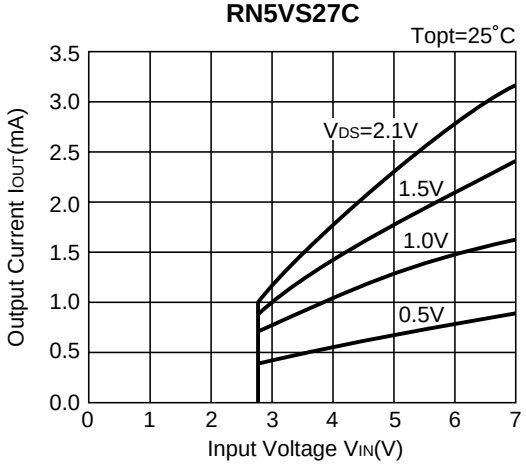


6) Pch Driver Output Current vs. Input Voltage

RN5VS09C



RN5VS27C



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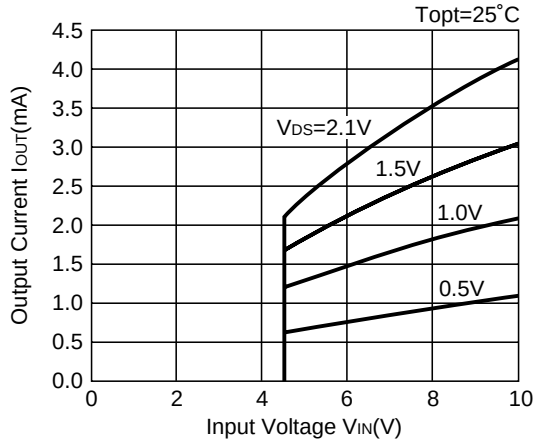
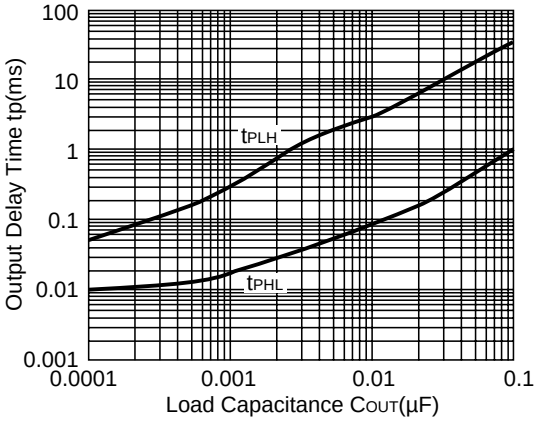
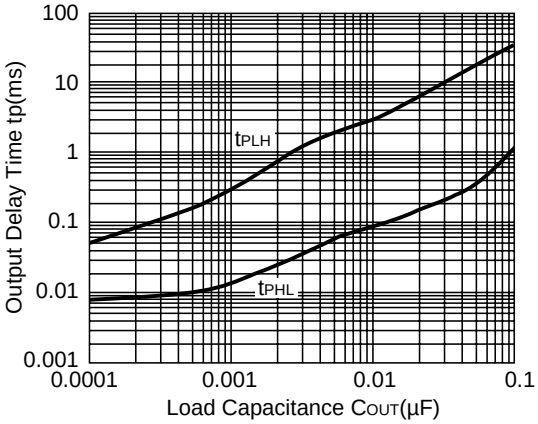


7) Output Delay Time vs. Load Capacitance

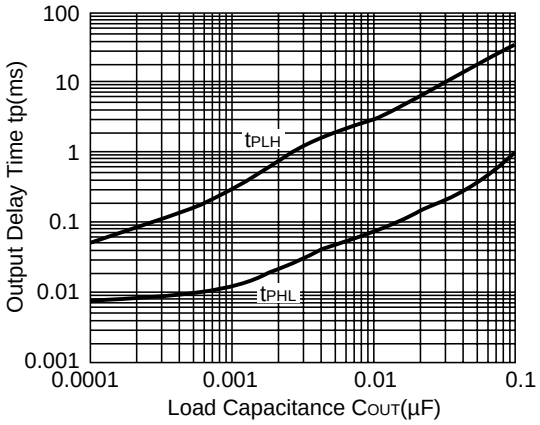
RN5VS09A



RN5VS27A

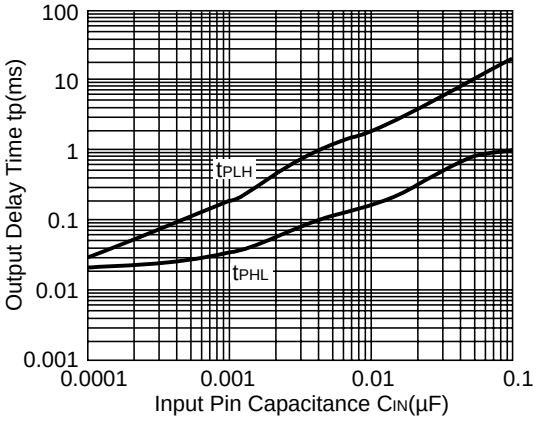


RN5VS45A

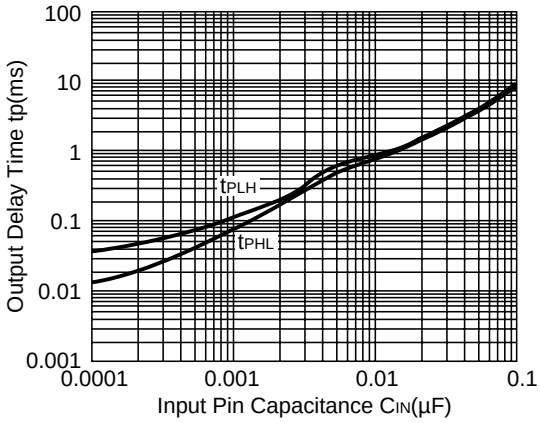


8) Output Delay Time vs. Input Pin Capacitance

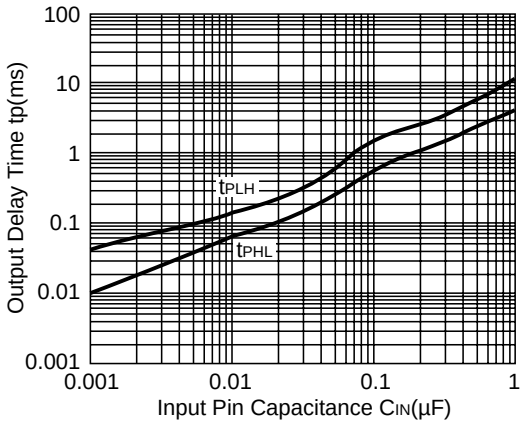
RN5VS09A



RN5VS27A



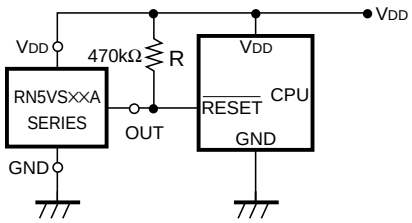
RN5VS45A



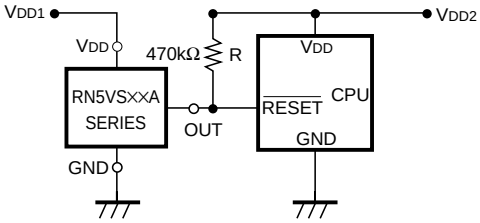
TYPICAL APPLICATIONS

• RN5VS××A CPU Reset Circuit (Nch Open Drain Output)

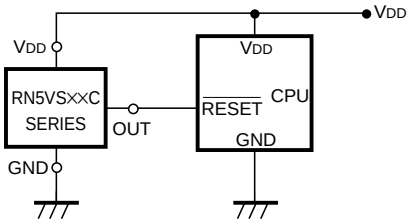
(1) Input Voltage to RN5VS××A is the same as the input voltage to CPU.



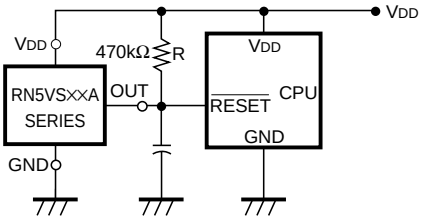
(2) Input Voltage to RN5VS××A is different from the input voltage to CPU.



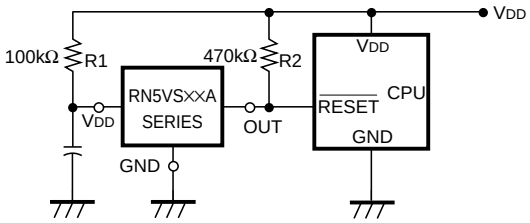
• RN5VS××C CPU Reset Circuit (CMOS Output)



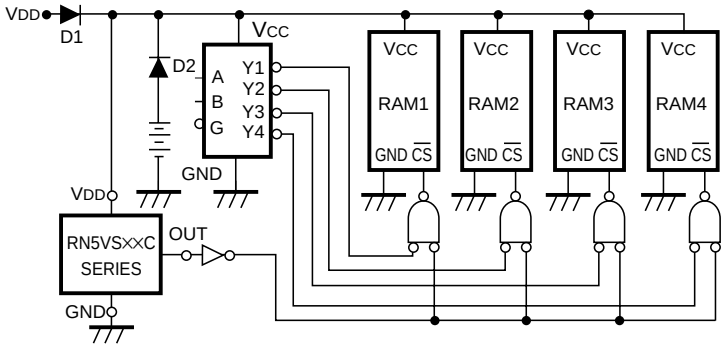
• RN5VS××A Output delay Time Circuit 1



• RN5VS××A Output delay Time Circuit 2

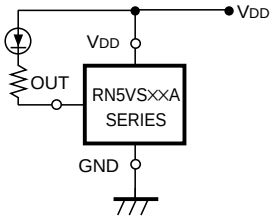


• Memory Back-up Circuit



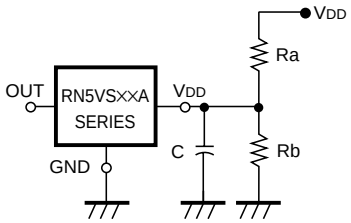
• **Voltage Level Indicator Circuit (lighted when the power runs out)**

(Nch Open Drain Output)



• **Detector Threshold Changing Circuit**

(Nch Open Drain Output)



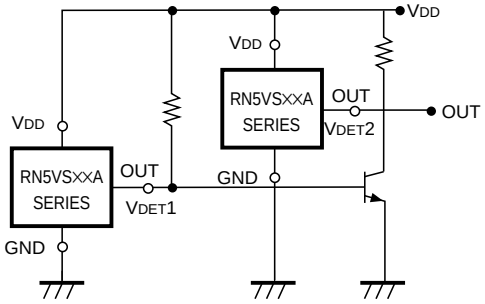
$$\text{Changed Detector Threshold} = \frac{Ra + Rb}{Rb} \cdot (-V_{DET})$$

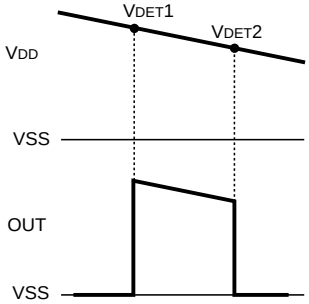
$$\text{Hysteresis Voltage} = \frac{Ra + Rb}{Rb} \cdot V_{HYS}$$

(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.

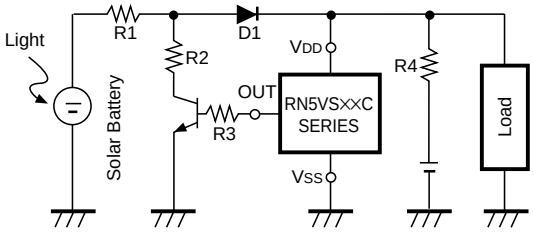
• **Window Comparator Circuit**

(Nch Open Drain Output)





• **Excessive Charge Preventing Circuit**



APPLICATION HINTS

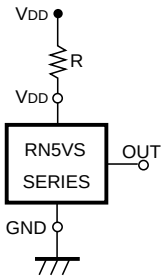


FIG.9

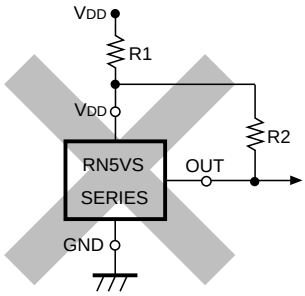
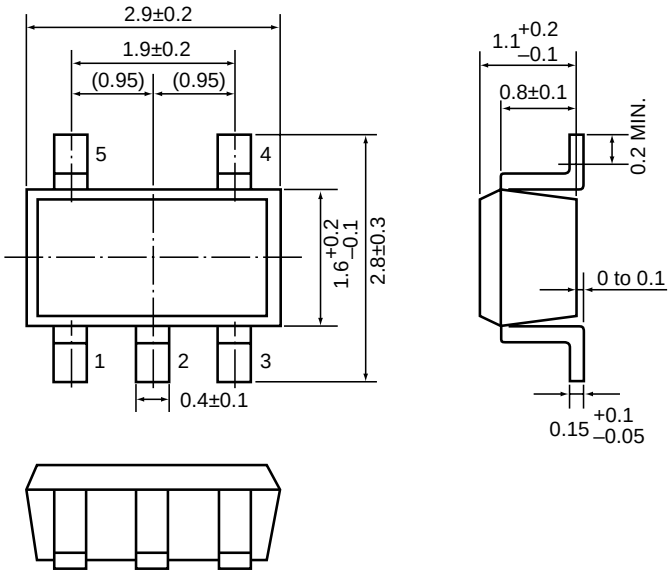


FIG.10

1. When RN5VS××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 V_{DD} and RN5VS V_{DD} Pin.When RN5VS××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 RN5VS××C (CMOS Output) and RN5VS××A (Nch Open Drain Output).

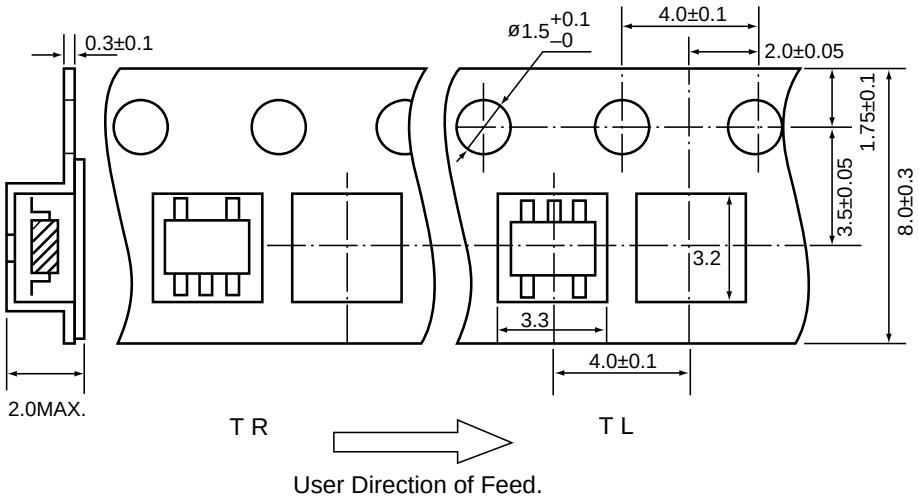
PACKAGE DIMENSIONS (Unit: mm)

• **SOT-23-5**



TAPING SPECIFICATIONS (Unit: mm)

• **SOT-23-5**



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