0.8% LOW VOLTAGE DETECTOR

NO.EA-160-160226

OUTLINE

The R3114x series are CMOS-based voltage detector ICs with high detector threshold accuracy and ultra-low supply current, which can be operated at an extremely low voltage and is used for system reset as an example.

Each of these ICs consists of a voltage reference unit, a comparator, resistors for detector threshold setting, an output driver and a hysteresis circuit. The detector threshold is fixed with high accuracy internally and does not require any adjustment.

Two output types, Nch open drain type and CMOS type are available.

The R3114x series are operable at a lower voltage than that of the R3111x series, and can be driven by a single battery.

Three types of packages, SOT-23-5, SC-82AB, and DFN(PLP)1010-4 are available.

FEATURES

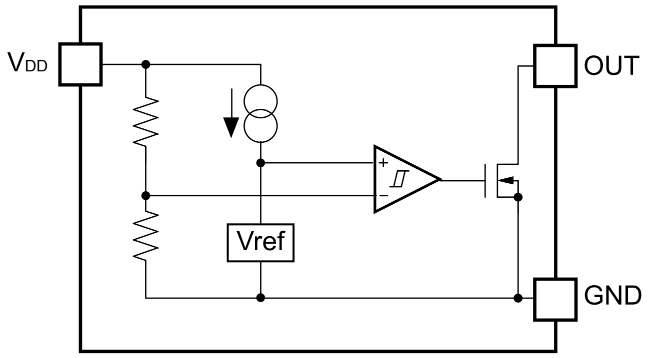
- Supply Current .... Typ. 0.35μA ($-V_{DET}=1.5V$, $V_{DD}=-V_{DET}+1V$)
- Operating Voltage Range.. 0.5V to 6.0V ($T_{opt}=25°C$)
- Detector Threshold Range.. 0.7V to 5.0V (0.1V steps)
  (For other voltages, please refer to MARK INFORMATIONS.)
- Detector Threshold Accuracy.. ±0.8% ($-V_{DET} \geq 1.5V$)
- Temperature-Drift Coefficient of Detector Threshold .... Typ. ±30ppm/°C
- Output Types... Nch Open Drain "L" and CMOS
- Packages .... DFN(PLP)1010-4, SC-82AB, SOT-23-5

APPLICATIONS

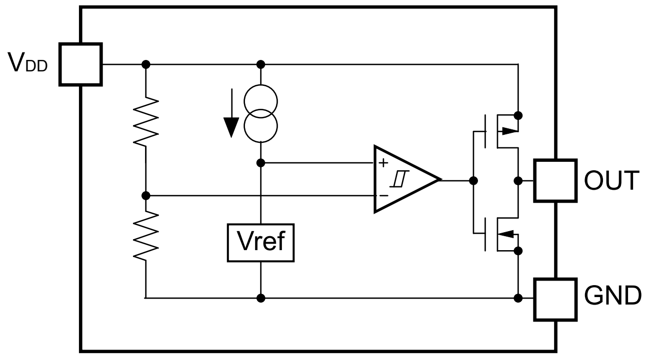
- CPU and Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-up Circuit
- Power Failure Detector

BLOCK DIAGRAMS

Nch Open Drain Output (R3114xxx1A)



CMOS Output (R3114xxx1C)



SELECTION GUIDE

The package type, the detector threshold, the output type and the taping type for the ICs can be selected at the users' request.

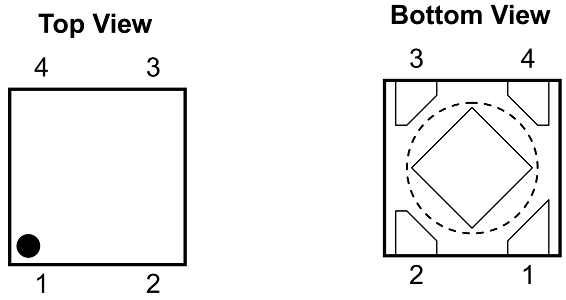
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R3114Kxx1∗-TR	DFN(PLP)1010-4	10,000 pcs	Yes	Yes
R3114Qxx1∗-TR-FE	SC-82AB	3,000 pcs	Yes	Yes
R3114Nxx1∗-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes

xx: The detector threshold can be designated in the range from 0.7V(07) to 5.0V(50) in 0.1V steps.
(For other voltages, please refer to MARK INFORMATIONS.)

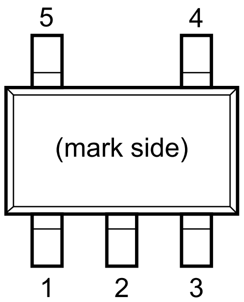
∗ : Designation of Output Type
(A) Nch Open Drain
(C) CMOS

PIN CONFIGURATIONS

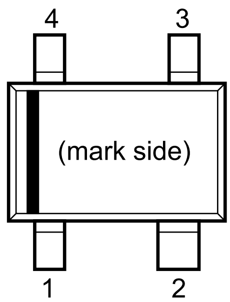
- **DFN(PLP)1010-4***



- **SOT-23-5**



- **SC-82AB**



PIN DESCRIPTIONS

- **DFN(PLP)1010-4***

Pin No.	Symbol	Description
1	OUT	Output Pin ("L" at detection)
2	NC	No Connection
3	GND	Ground Pin
4	V_{DD}	Input Pin

*) Tab is GND level. (They are connected to the reverse side of this IC.)
The tab is better to be connected to the GND, but leaving it open is also acceptable.

- **SOT-23-5**

Pin No.	Symbol	Description
1	OUT	Output Pin ("L" at detection)
2	V_{DD}	Input Pin
3	GND	Ground Pin
4	NC	No Connection
5	NC	No Connection

- **SC-82AB**

Pin No.	Symbol	Description
1	OUT	Output Pin ("L" at detection)
2	V_{DD}	Input Pin
3	NC	No Connection
4	GND	Ground Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{DD}	Supply Voltage	7.0	V
V_{OUT}	Output Voltage (Nch Open Drain Output)	V_{SS}–0.3 to 7.0	V
	Output Voltage (CMOS Output)	V_{SS}–0.3 to V_{DD}+0.3	
I_{OUT}	Output Current	20	mA
P_D	Power Dissipation (SOT-23-5)*	420	mW
	Power Dissipation (SC-82AB)*	380	
	Power Dissipation (DFN(PLP)1010-4)*	400	
Topt	Operating Temperature Range	–40 to 85	°C
Tstg	Storage Temperature Range	–55 to 125	°C

*) For Power Dissipation, please refer to PACKAGE INFORMATION.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.
The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

ELECTRICAL CHARACTERISTICS

- **R3114xxx1A/C** ☐ values indicate $-40°C \leq Topt \leq 85°C$, unless otherwise noted. Topt=25°C

Symbol	Item	Conditions			Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold	Topt=25°C	$1.5V < -V_{DET} \leq 5.0V$		$-V_{DET} \times 0.992$		$-V_{DET} \times 1.008$	V
			$0.7V \leq -V_{DET} \leq 1.5V$		-12		+12	mV
		$-40°C \leq Topt \leq 85°C$	$1.5V < -V_{DET} \leq 5.0V$		$-V_{DET} \times 0.985$		$-V_{DET} \times 1.015$	V
			$0.7V \leq -V_{DET} \leq 1.5V$		-22.5		+22.5	mV
V_{HYS}	Detector Threshold Hysteresis				$-V_{DET} \times 0.04$		$-V_{DET} \times 0.07$	V
I_{SS}	Supply Current	$V_{DD}=-V_{DET} -0.1V$	$0.7V \leq -V_{DET} < 1.6V$				1.40	µA
			$1.6V \leq -V_{DET} < 3.1V$				1.50	
			$3.1V \leq -V_{DET} < 4.1V$				1.60	
			$4.1V \leq -V_{DET} \leq 5.0V$				1.70	
		$V_{DD}=-V_{DET} +1.0V$	$0.7V \leq -V_{DET} < 1.6V$				1.20	
			$1.6V \leq -V_{DET} < 3.1V$				1.20	
			$3.1V \leq -V_{DET} < 4.1V$				1.30	
			$4.1V \leq -V_{DET} \leq 5.0V$				1.40	
V_{DDH}	Maximum Operating Voltage						6	V
V_{DDL}	Minimum Operating Voltage*1	Topt=25°C					0.50	V
		$-40°C \leq Topt \leq 85°C$					0.55	
I_{OUT}	Output Current (Driver Output Pin)	Nch	$V_{DD}=0.55V$, $V_{DS}=0.05V$		7			µA
			$0.7V \leq -V_{DET} < 1.1V$	$V_{DD}=0.6V$ $V_{DS}=0.5V$	0.02			mA
			$1.1V \leq -V_{DET} < 1.6V$	$V_{DD}=1.0V$ $V_{DS}=0.5V$	0.40			
			$1.6V \leq -V_{DET} < 3.1V$	$V_{DD}=1.5V$ $V_{DS}=0.5V$	1.00			
			$3.1V \leq -V_{DET} \leq 5.0V$	$V_{DD}=3.0V$ $V_{DS}=0.5V$	2.40			
		Pch*2	$0.7V \leq -V_{DET} < 4.0V$	$V_{DD}=4.5V$ $V_{DS}=-2.1V$	0.65			mA
			$4.0V \leq -V_{DET} \leq 5.0V$	$V_{DD}=6.0V$ $V_{DS}=-2.1V$	0.90			
I_{LEAK}	Nch Driver Leakage Current*3	$V_{DD}=6.0V$, $V_{DS}=7.0V$					80	nA
$\Delta -V_{DET}/\Delta Topt$	Detector Threshold Temperature Coefficient					±30		ppm/°C
t_{PLH}	Output Delay Time	$V_{DD}=0.55V$ to $-V_{DET}+2.0V$ or 6.0V				40		µs

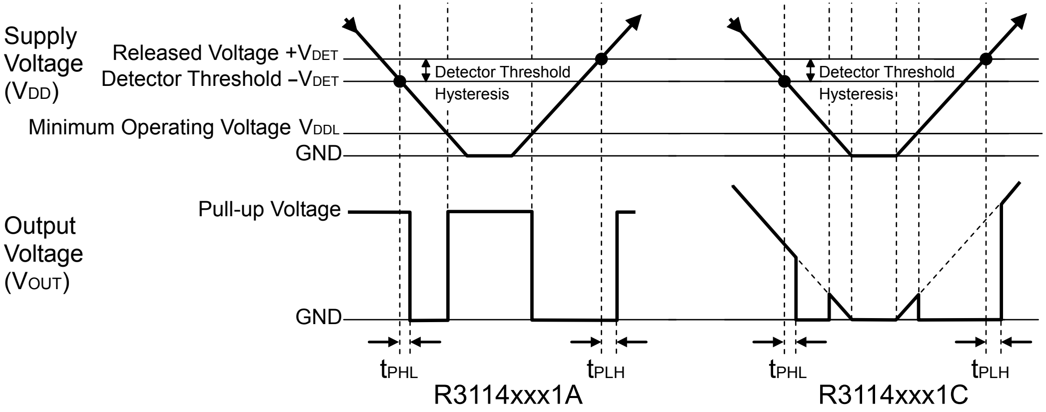
All of unit are tested and specified under load conditions such that Topt=25°C except for Detector Threshold Temperature Coefficient.

*1: Minimum operating voltage means the value of input voltage when output voltage maintains 0.1V or less.
(In case of Nch Open Drain Output type, the output pin is pulled up with a resistance of 470kΩ to 5.0V)

*2: In case of CMOS type

*3: In case of Nch Open Drain type

TIMING CHART

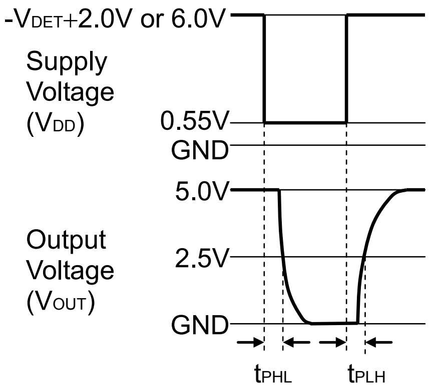


DEFINITION OF OUTPUT DELAY TIME

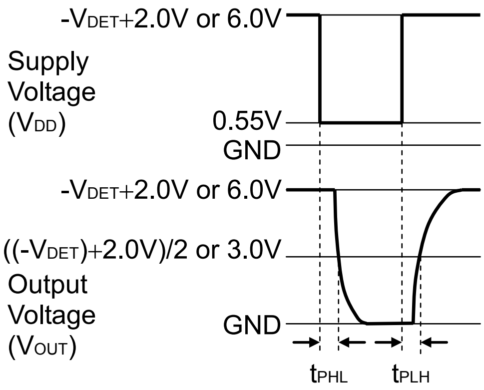
Output Delay Time (t_{PLH}) is defined as follows:

1. In the case of Nch Open Drain Output:
   Under the condition of the output pin (OUT) is pulled up through a resistor of 470kΩ to 5V, the time interval between the rising edge of V_{DD} pulse from 0.55V to ($-V_{DET}$)+2.0V or the time interval of 6.0V pulse voltage is supplied, the becoming of the output voltage to 2.5V.

2. In the case of CMOS Output:
   The time interval between the rising edge of V_{DD} pulse from 0.55V to ($-V_{DET}$)+2.0V or the time interval of 6.0V pulse voltage is supplied, the becoming of the output voltage to (($-V_{DET}$)+2.0V)/2 or 3.0V.



Nch Open Drain Output
(R3114xxx1A)



CMOS Output
(R3114xxx1C)

ELECTRICAL CHARACTERISTICS BY DETECTOR THRESHOLD

• R3114x071A/C to R3114x501A/C

Bold values are checked and guaranteed by design engineering at –40°C ≤ Topt ≤ 85°C, unless otherwise noted.

Topt=25°C

Part Number	Detector Threshold1		Detector Threshold2		Detector Threshold Hysteresis		Supply Current1		Supply Current2		Max. Op. Voltage	Min. Op. Voltage
	-VDET1 [V]		-VDET2 [V]		VHYS [V]		ISS1 [μA]		ISS2 [μA]		VDDH [V]	VDDL [V]
	Min.	Max.	Min.	Max.	Min.	Max.	Cond.	Max.	Cond.	Max.	Max.	Max.
R3114x071A/C	0.6880	0.7120	**0.6775**	**0.7225**	**0.028**	**0.049**	VDD= -VDET -0.1V	**1.400**	VDD= -VDET +1.0V	**1.200**	**6**	0.50 **0.55** *Note1
R3114x081A/C	0.7880	0.8120	**0.7775**	**0.8225**	**0.032**	**0.056**						
R3114x091A/C	0.8880	0.9120	**0.8775**	**0.9225**	**0.036**	**0.063**						
R3114x101A/C	0.9880	1.0120	**0.9775**	**1.0225**	**0.040**	**0.070**						
R3114x111A/C	1.0880	1.1120	**1.0775**	**1.1225**	**0.044**	**0.077**						
R3114x121A/C	1.1880	1.2120	**1.1775**	**1.2225**	**0.048**	**0.084**						
R3114x131A/C	1.2880	1.3120	**1.2775**	**1.3225**	**0.052**	**0.091**						
R3114x141A/C	1.3880	1.4120	**1.3775**	**1.4225**	**0.056**	**0.098**						
R3114x151A/C	1.4880	1.5120	**1.4775**	**1.5225**	**0.060**	**0.105**						
R3114x161A/C	1.5872	1.6128	**1.5760**	**1.6240**	**0.064**	**0.112**		**1.500**				
R3114x171A/C	1.6864	1.7136	**1.6745**	**1.7255**	**0.068**	**0.119**						
R3114x181A/C	1.7856	1.8144	**1.7730**	**1.8270**	**0.072**	**0.126**						
R3114x191A/C	1.8848	1.9152	**1.8715**	**1.9285**	**0.076**	**0.133**						
R3114x201A/C	1.9840	2.0160	**1.9700**	**2.0300**	**0.080**	**0.140**						
R3114x211A/C	2.0832	2.1168	**2.0685**	**2.1315**	**0.084**	**0.147**						
R3114x221A/C	2.1824	2.2176	**2.1670**	**2.2330**	**0.088**	**0.154**						
R3114x231A/C	2.2816	2.3184	**2.2655**	**2.3345**	**0.092**	**0.161**						
R3114x241A/C	2.3808	2.4192	**2.3640**	**2.4360**	**0.096**	**0.168**						
R3114x251A/C	2.4800	2.5200	**2.4625**	**2.5375**	**0.100**	**0.175**						
R3114x261A/C	2.5792	2.6208	**2.5610**	**2.6390**	**0.104**	**0.182**						
R3114x271A/C	2.6784	2.7216	**2.6595**	**2.7405**	**0.108**	**0.189**						
R3114x281A/C	2.7776	2.8224	**2.7580**	**2.8420**	**0.112**	**0.196**						
R3114x291A/C	2.8768	2.9232	**2.8565**	**2.9435**	**0.116**	**0.203**						
R3114x301A/C	2.9760	3.0240	**2.9550**	**3.0450**	**0.120**	**0.210**						
R3114x311A/C	3.0752	3.1248	**3.0535**	**3.1465**	**0.124**	**0.217**		**1.600**		**1.300**		
R3114x321A/C	3.1744	3.2256	**3.1520**	**3.2480**	**0.128**	**0.224**						
R3114x331A/C	3.2736	3.3264	**3.2505**	**3.3495**	**0.132**	**0.231**						
R3114x341A/C	3.3728	3.4272	**3.3490**	**3.4510**	**0.136**	**0.238**						
R3114x351A/C	3.4720	3.5280	**3.4475**	**3.5525**	**0.140**	**0.245**						
R3114x361A/C	3.5712	3.6288	**3.5460**	**3.6540**	**0.144**	**0.252**						
R3114x371A/C	3.6704	3.7296	**3.6445**	**3.7555**	**0.148**	**0.259**						
R3114x381A/C	3.7696	3.8304	**3.7430**	**3.8570**	**0.152**	**0.266**						
R3114x391A/C	3.8688	3.9312	**3.8415**	**3.9585**	**0.156**	**0.273**						
R3114x401A/C	3.9680	4.0320	**3.9400**	**4.0600**	**0.160**	**0.280**						
R3114x411A/C	4.0672	4.1328	**4.0385**	**4.1615**	**0.164**	**0.287**		**1.700**		**1.400**		
R3114x421A/C	4.1664	4.2336	**4.1370**	**4.2630**	**0.168**	**0.294**						
R3114x431A/C	4.2656	4.3344	**4.2355**	**4.3645**	**0.172**	**0.301**						
R3114x441A/C	4.3648	4.4352	**4.3340**	**4.4660**	**0.176**	**0.308**						
R3114x451A/C	4.4640	4.5360	**4.4325**	**4.5675**	**0.180**	**0.315**						
R3114x461A/C	4.5632	4.6368	**4.5310**	**4.6690**	**0.184**	**0.322**						
R3114x471A/C	4.6624	4.7376	**4.6295**	**4.7705**	**0.188**	**0.329**						
R3114x481A/C	4.7616	4.8384	**4.7280**	**4.8720**	**0.192**	**0.336**						
R3114x491A/C	4.8608	4.9392	**4.8265**	**4.9735**	**0.196**	**0.343**						
R3114x501A/C	4.9600	5.0400	**4.9250**	**5.0750**	**0.200**	**0.350**						

*Note1) VDD value when output voltage is equal or less than 0.1V. In the case of Nch Open Drain output type, the output pin is pulled up to 5.0V through 470kΩ resistor.

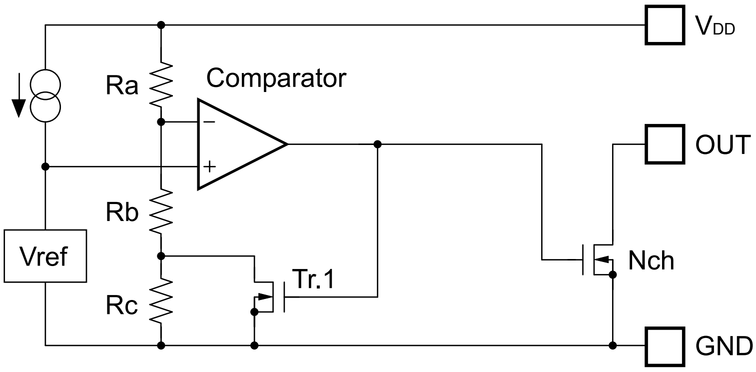
<table>
<tr><th colspan="2">Nch Driver Output Current1</th><th colspan="2">Nch Driver Output Current2</th><th colspan="2">Pch Driver Output Current</th><th colspan="2">Nch Driver Leakage Current</th><th>Detector Threshold Temperature Coefficient</th><th colspan="2">Output Delay Time</th></tr>
<tr><th colspan="2">I_{OUT1} [μA]</th><th colspan="2">I_{OUT2} [mA]</th><th colspan="2">I_{OUT3} [mA]</th><th colspan="2">I_{LEAK} [nA]</th><th>Δ-V_{DET}/ΔT_{opt} [ppm/°C]</th><th colspan="2">t_{PLH} [μs]</th></tr>
<tr><th>Cond.</th><th>Min.</th><th>Cond.</th><th>Min.</th><th>Cond.</th><th>Min.</th><th>Cond.</th><th>Max.</th><th>Typ.</th><th>Cond.</th><th>Typ.</th></tr>
<tr><td rowspan="6">V_{DD}=0.55V
V_{DS}=0.05V</td><td rowspan="6">7</td><td>V_{DD}=0.6V
V_{DS}=0.5V</td><td>0.020</td><td rowspan="4">V_{DD}=4.5V
V_{DS}=-2.1V</td><td rowspan="4">0.650</td><td rowspan="6">V_{DD}=6.0V
V_{DS}=7.0V</td><td rowspan="6">80</td><td rowspan="6">±30</td><td rowspan="5">V_{DD}=0.55V
↓
-V_{DET}+2.0V
*Note2</td><td rowspan="6">40</td></tr>
<tr><td>V_{DD}=1.0V
V_{DS}=0.5V</td><td>0.400</td></tr>
<tr><td>V_{DD}=1.5V
V_{DS}=0.5V</td><td>1.000</td></tr>
<tr><td rowspan="3">V_{DD}=3.0V
V_{DS}=0.5V</td><td rowspan="3">2.400</td></tr>
<tr><td rowspan="2">V_{DD}=6.0V
V_{DS}=-2.1V</td><td rowspan="2">0.900</td></tr>
<tr><td>V_{DD}=0.55V
↓
6.0V
*Note2</td></tr>
</table>

*Note2) 1. In the case of CMOS output type:
When the voltage is forced from 0.55V to (-V_{DET})+2.0V or a 6.0V pulse voltage is added to V_{DD}, time interval that the output voltage reaches ((-V_{DET})+2.0V)/2 or a 3.0V.

2. In the case of Nch Open Drain output type:
The output pin is pulled up to 5.0V through 470kΩ, and when the voltage is forced from 0.55V to (-V_{DET})+2.0V or a 6.0V pulse voltage is added to V_{DD}, time interval that the output voltage reaches 2.5V.

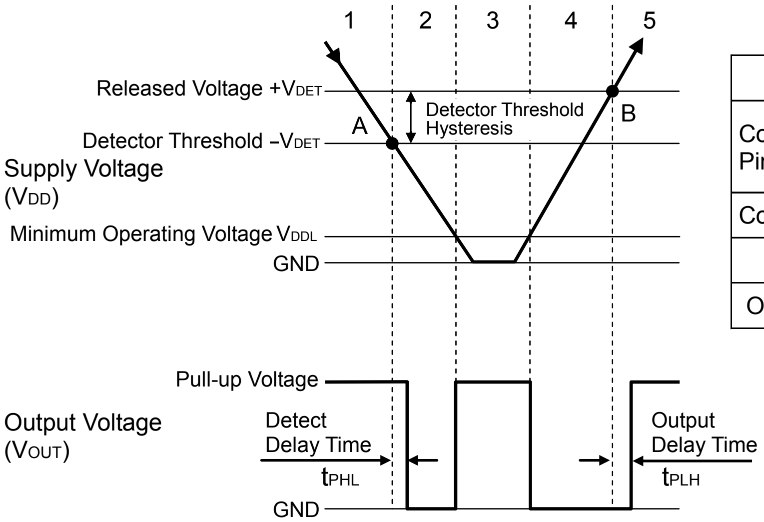
OPERATION

• Operation of R3114xxx1A



OUT pin should be pulled-up to V_{DD} or an external voltage level.

Block Diagram (R3114xxx1A)



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

I $\quad \dfrac{Rb+Rc}{Ra+Rb+Rc} \times V_{DD}$

II $\quad \dfrac{Rb}{Ra+Rb} \times V_{DD}$

Operation Diagram

• Explanation of operation

Step 1. The output voltage is equal to the pull-up voltage.

Step 2. At Point "A", Vref ≧ V_{DD}×(Rb+Rc)/(Ra+Rb+Rc) is true, as a result, the output of comparator is reversed from "L" to "H", therefore the output voltage becomes the GND level. The voltage level of Point A means a detector threshold voltage ($-V_{DET}$).

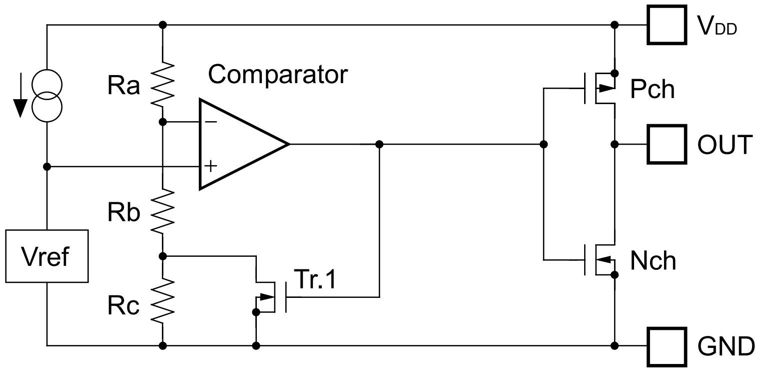
Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite. The output voltage is equal to the pull-up voltage.

Step 4. The output voltage is equal to the GND level.

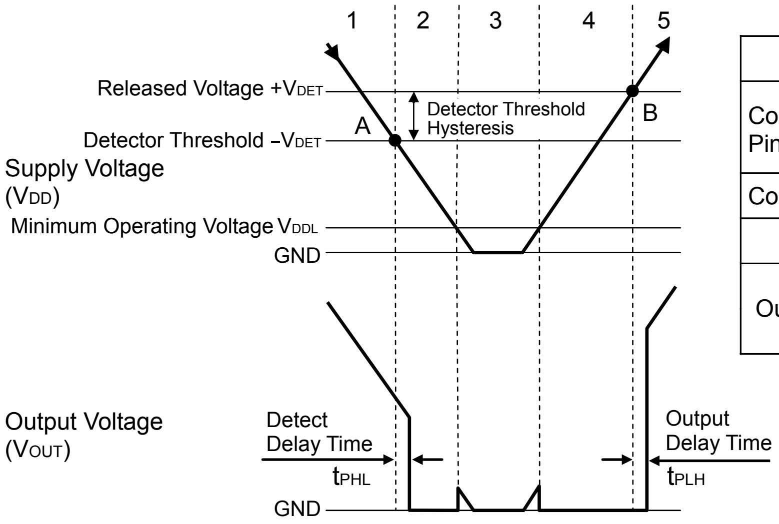
Step 5. At Point "B", Vref ≦ V_{DD}×Rb/(Ra+Rb) is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the pull-up voltage. The voltage level of Point B means a released voltage ($+V_{DET}$).

∗) The difference between a released voltage and a detector threshold voltage is a detector threshold hysteresis.

• Operation of R3114xxx1C



Block Diagram (R3114xxx1C)



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

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

II $\dfrac{Rb}{Ra+Rb} \times V_{DD}$

Operation Diagram

• Explanation of operation

Step 1. The output voltage is equal to the supply voltage (V_{DD}).

Step 2. At Point "A", Vref $\geqq V_{DD} \times (Rb+Rc)/(Ra+Rb+Rc)$ is true, as a result, the output of comparator is reversed from "L" to "H", therefore the output voltage becomes the GND level. The voltage level of Point A means a detector threshold voltage ($-V_{DET}$).

Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite.

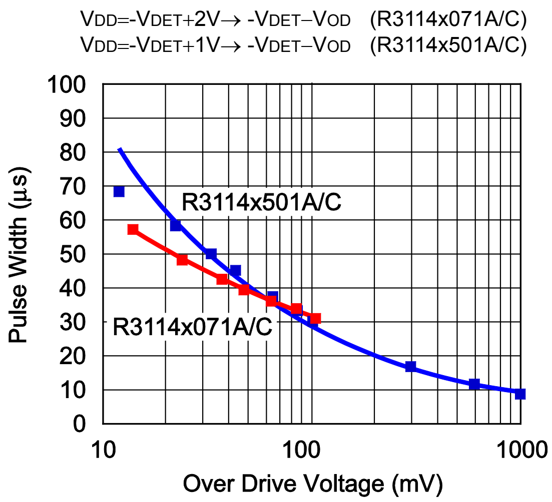
Step 4. The output voltage is equal to the GND level.

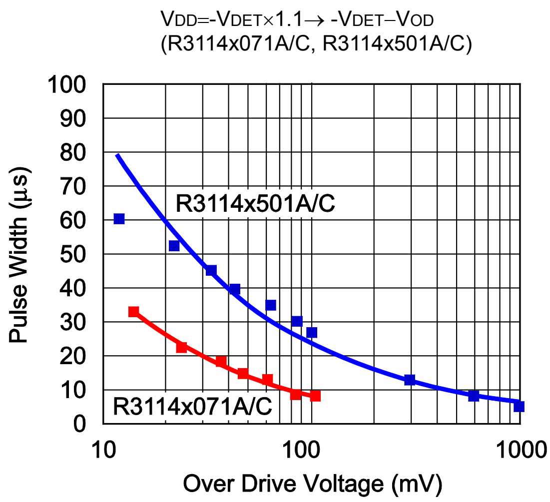
Step 5. At Point "B", Vref $\leqq V_{DD} \times Rb/(Ra+Rb)$ is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the supply voltage (V_{DD}). The voltage level of Point B means a released voltage ($+V_{DET}$).

∗) The difference between a released voltage and a detector threshold voltage is a detector threshold hysteresis.

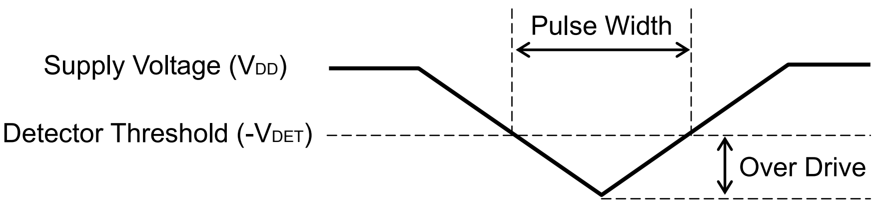
Detector Operation vs. glitch input voltage to the VDD pin

When the R3114x is at released, if the pulse voltage which the detector threshold or lower voltage, the graph below means that the relation between pulse width and the amplitude of the swing to keep the released state for the R3114x.





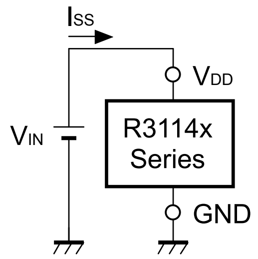
∗VOD: Over Drive Voltage



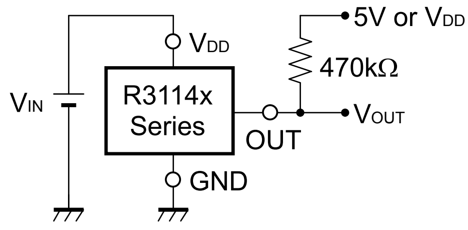
VDD Input Waveform

This graph shows the maximum pulse conditions to keep the released voltage. If the pulse with larger amplitude or wider width than the graph above, is input to VDD pin, the reset signal may be output.

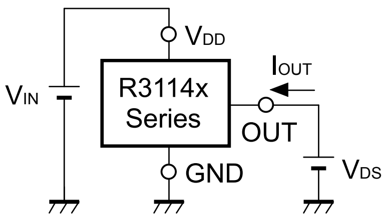
TEST CIRCUITS



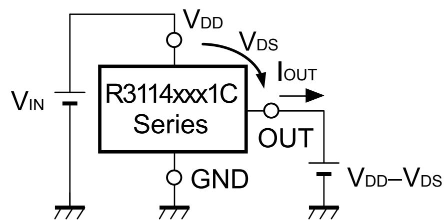
Supply Current Test Circuit



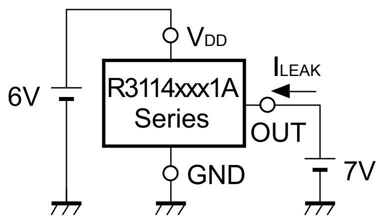
Detector Threshold Test Circuit
(Pull-up circuit is not necessary for CMOS Output type.)



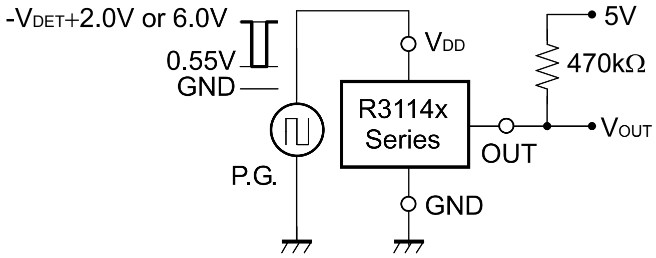
Nch Driver Output Current Test Circuit



Pch Driver Output Current Test Circuit
∗Apply to CMOS Output type only



Nch Driver Leakage Current Test Circuit
∗Apply to Nch Driver Output type only



Output Delay Time Test Circuit
(Pull-up circuit is not necessary for CMOS Output type.)

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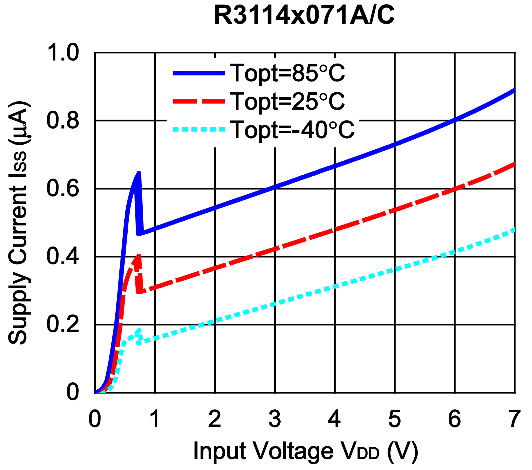
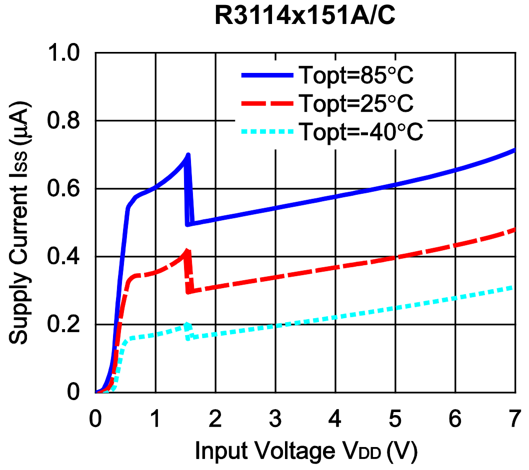
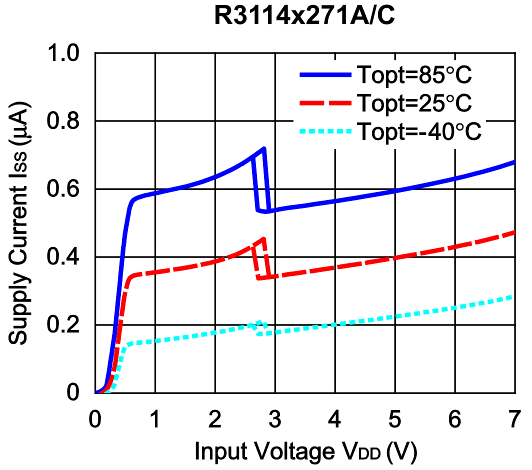
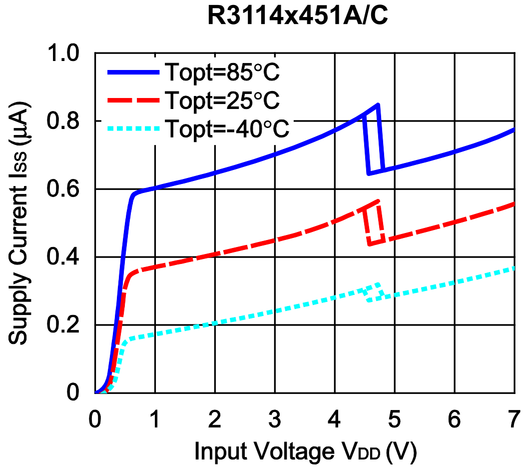
TYPICAL CHARACTERISTICS

1) Supply Current vs. Input Voltage

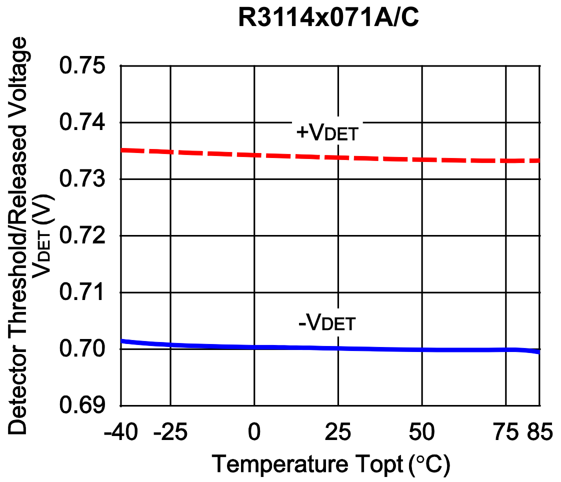


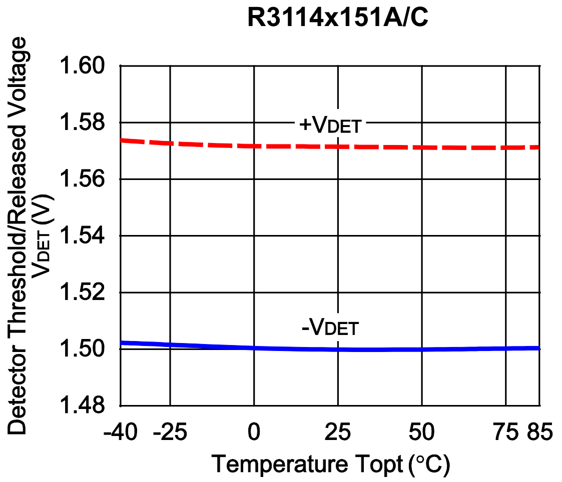




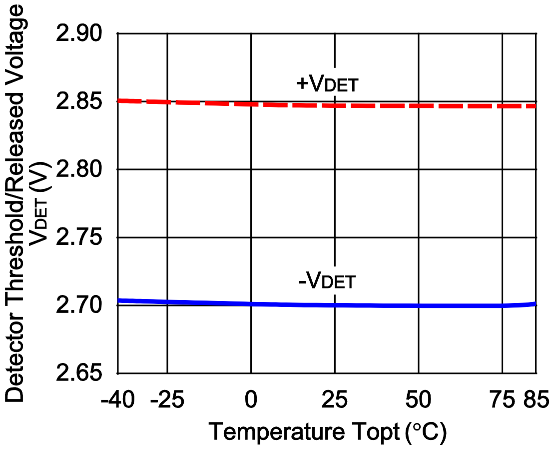


2) Detector Threshold vs. Temperature

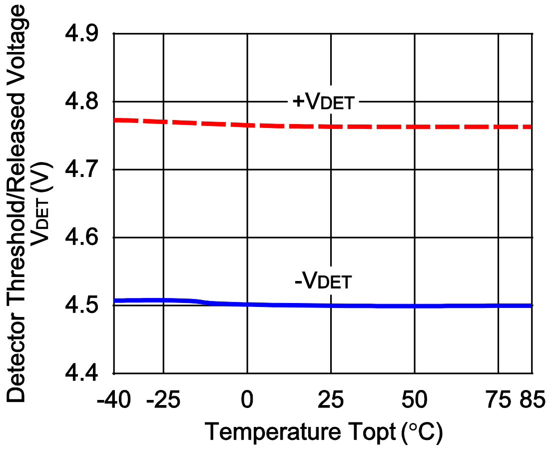




R3114x271A/C

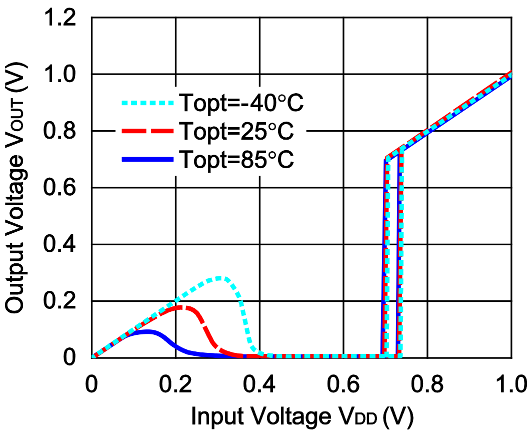


R3114x451A/C

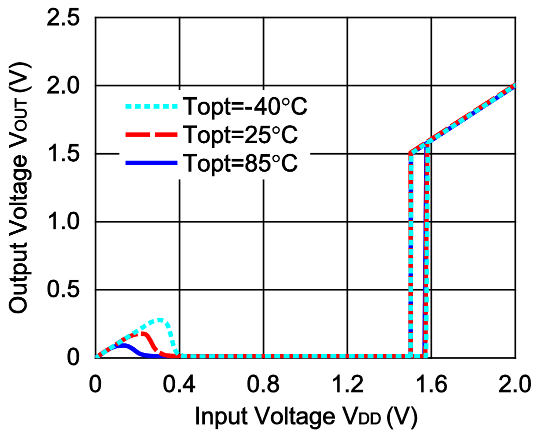


3) Output Voltage vs. Input Voltage

R3114x071C



R3114x151C



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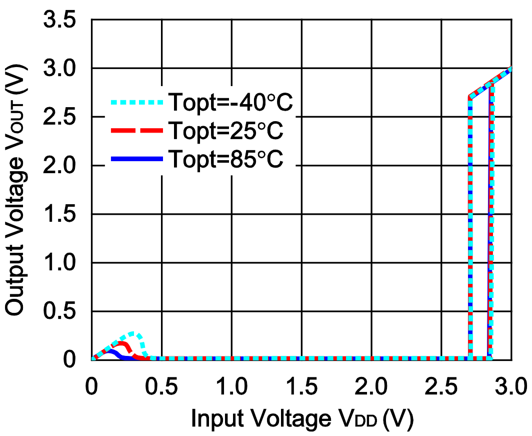

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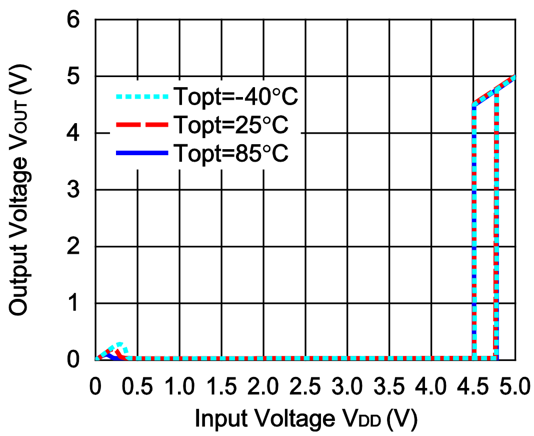

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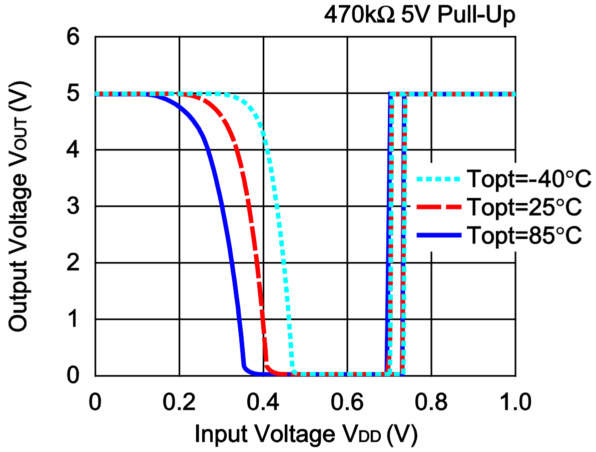

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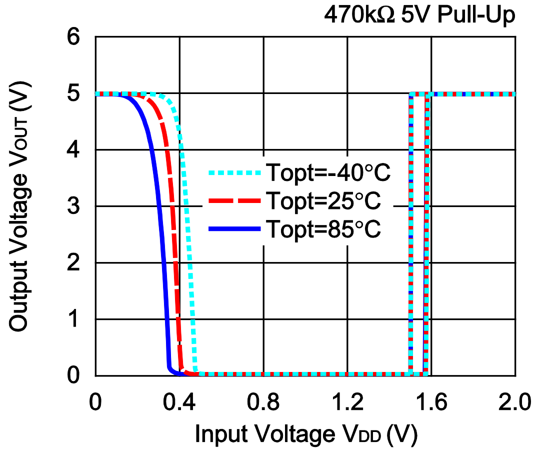

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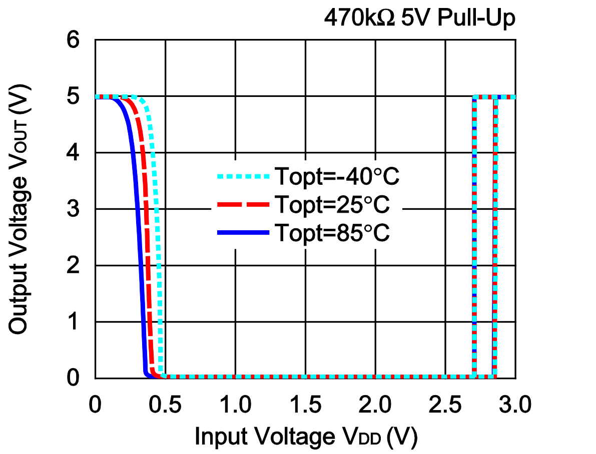

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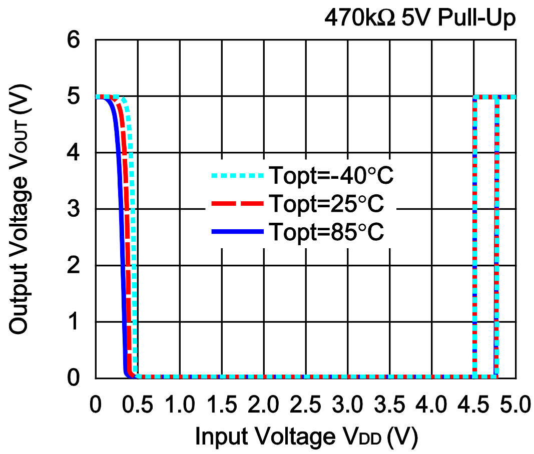
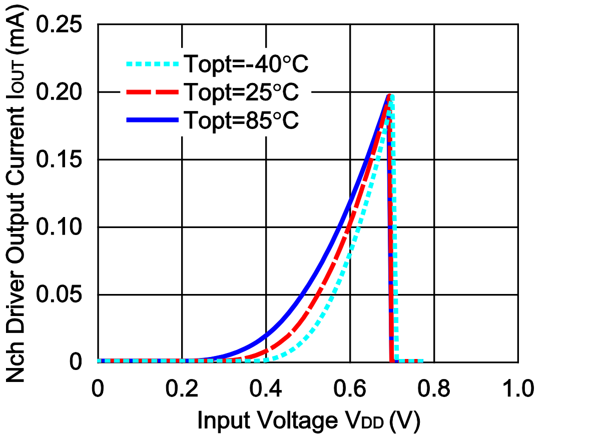
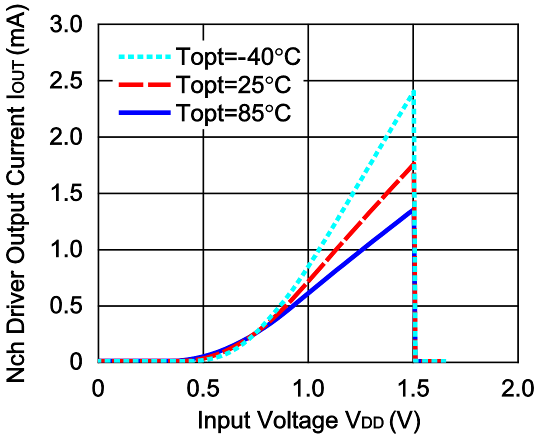


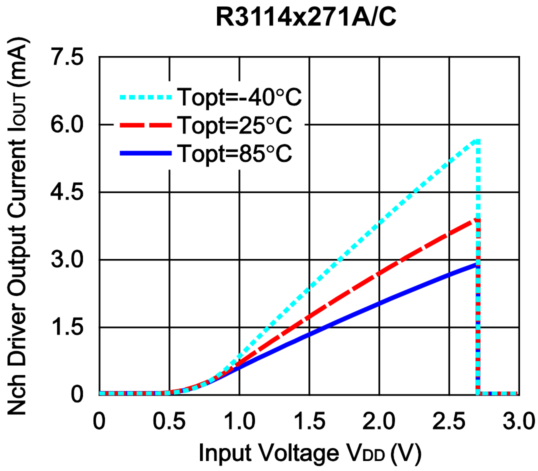
4) Nch Driver Output Current vs. Input Voltage (VDS=0.5V)

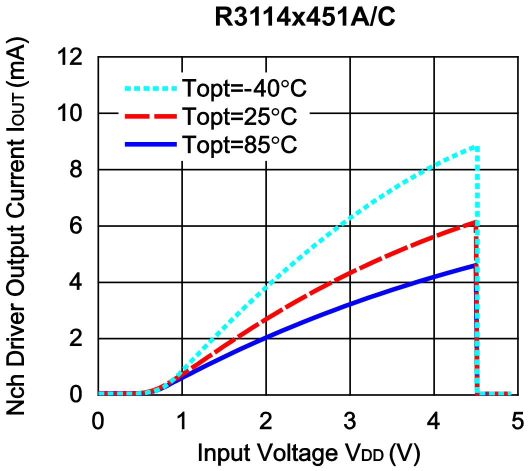
R3114x071A/C



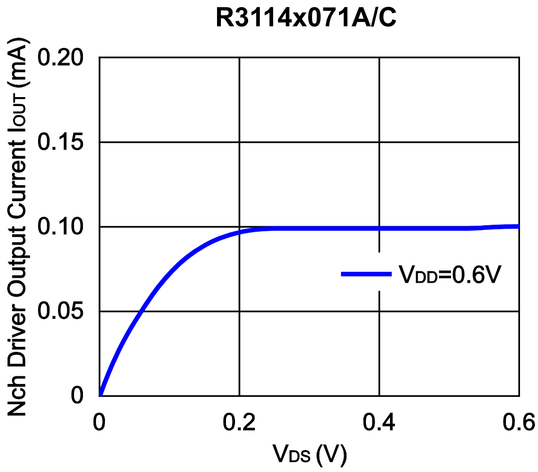
R3114x151A/C

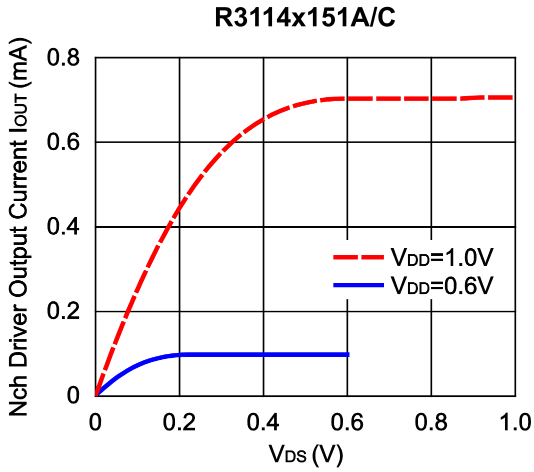


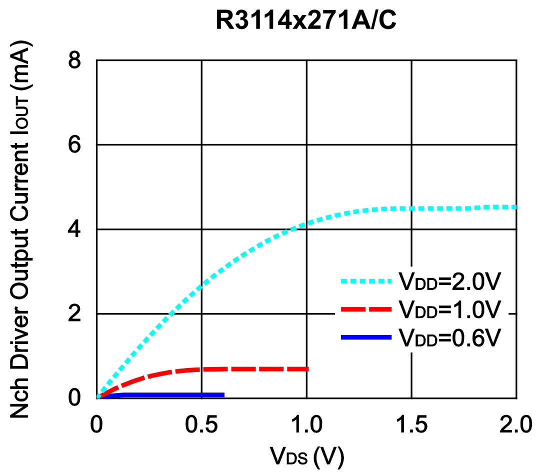


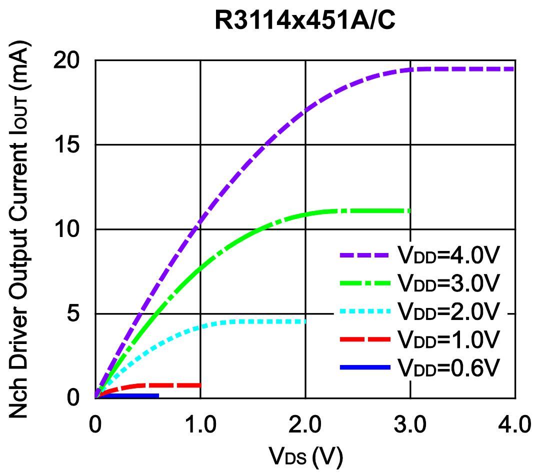


5) Nch Driver Output Current vs. V_{DS}



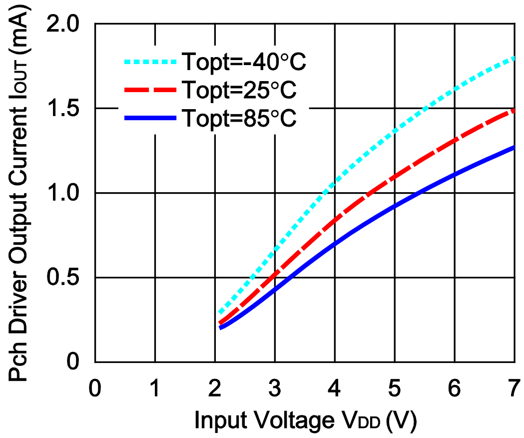




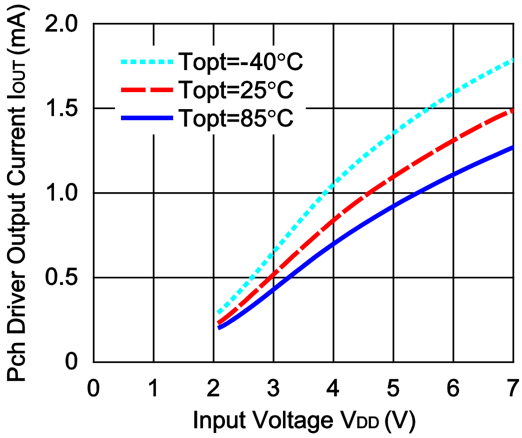


6) Pch Driver Output Current vs. Input Voltage (VDS=−2.1V)

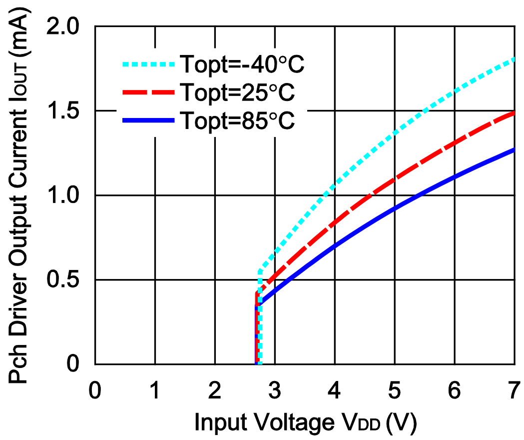
R3114x071C



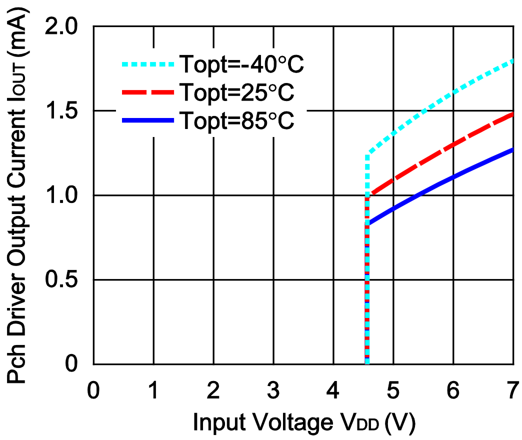
R3114x151C



R3114x271C

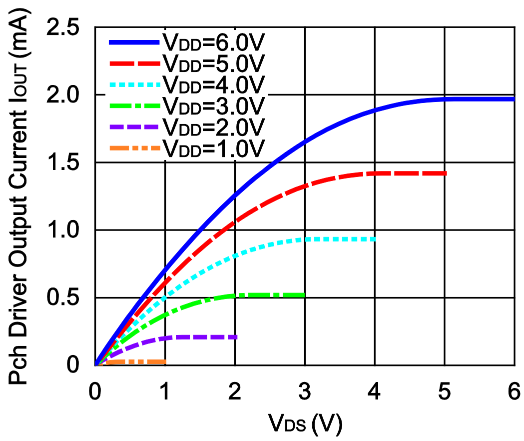


R3114x451C

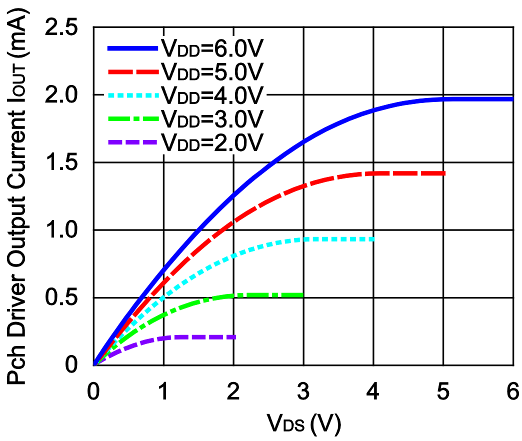


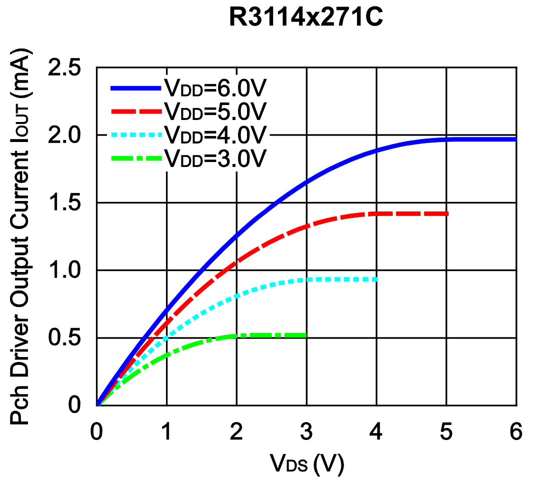
7) Pch Driver Output Current vs. VDS

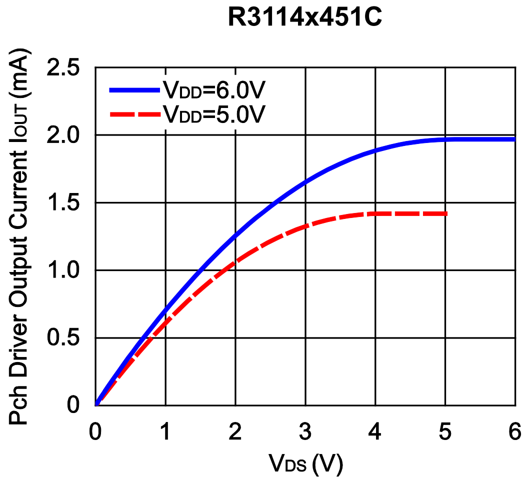
R3114x071C



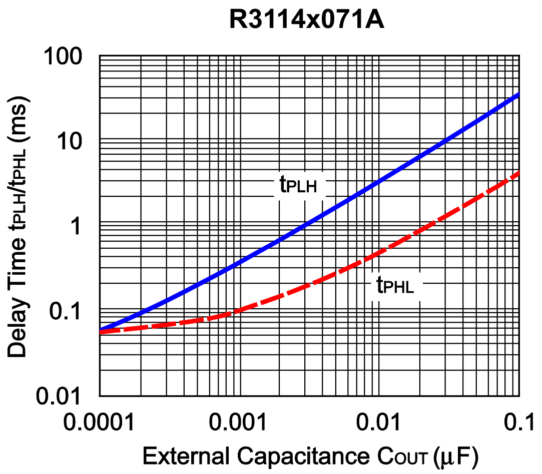
R3114x151C

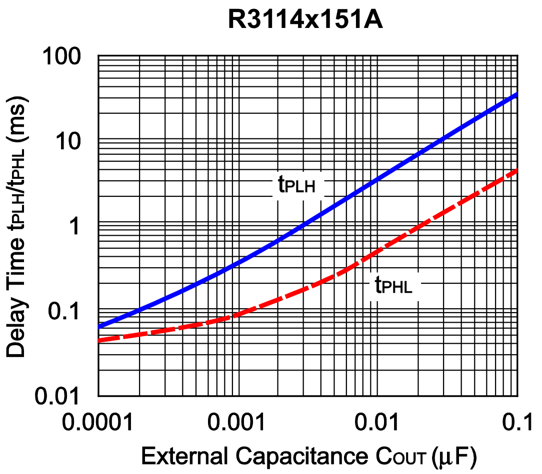


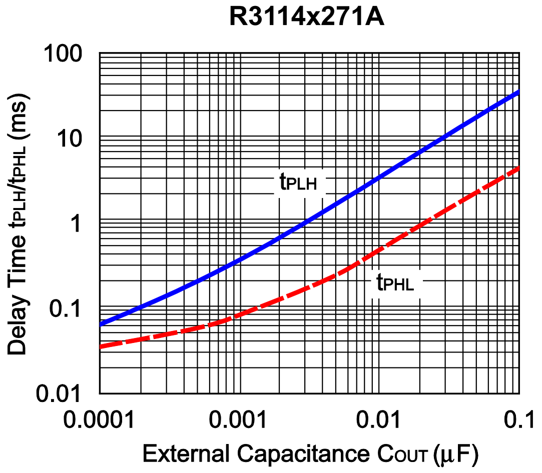


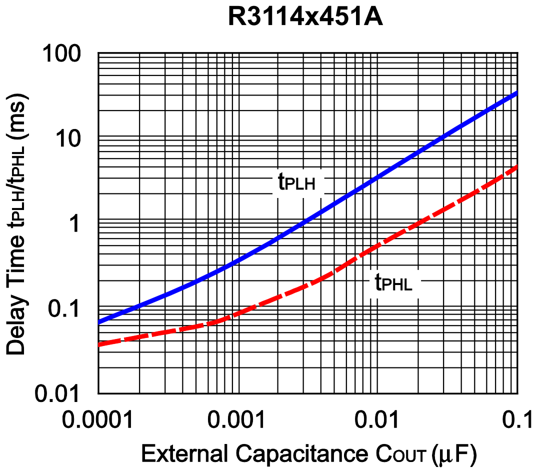


8) Output Delay Time vs. External Capacitance





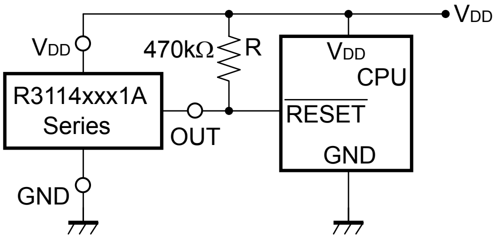




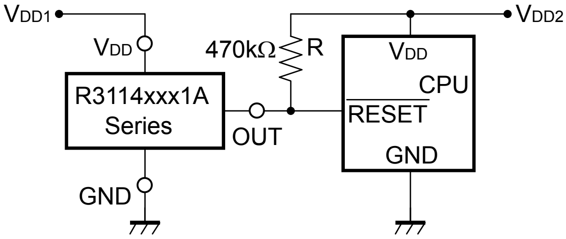
TYPICAL APPLICATION

- **R3114xxx1A CPU Reset Circuit 1 (Nch Open Drain Output)**

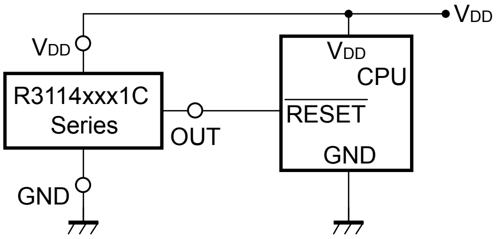
Case1. Input Voltage to R3114xxx1A is equal to Input Voltage to CPU



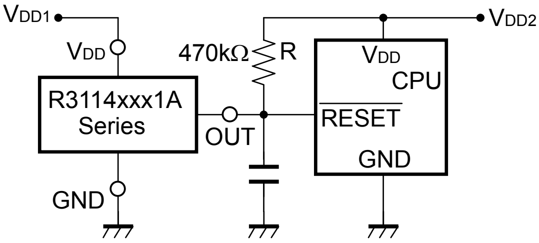
Case2. Input Voltage to R3114xxx1A is unequal to Input Voltage to CPU



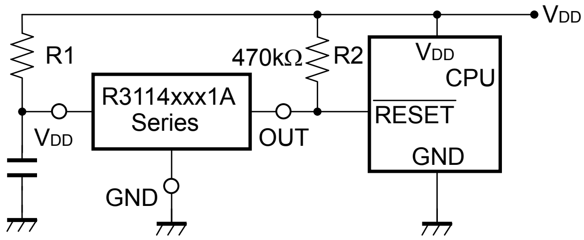
- **R3114xxx1C CPU Reset Circuit (CMOS Output)**



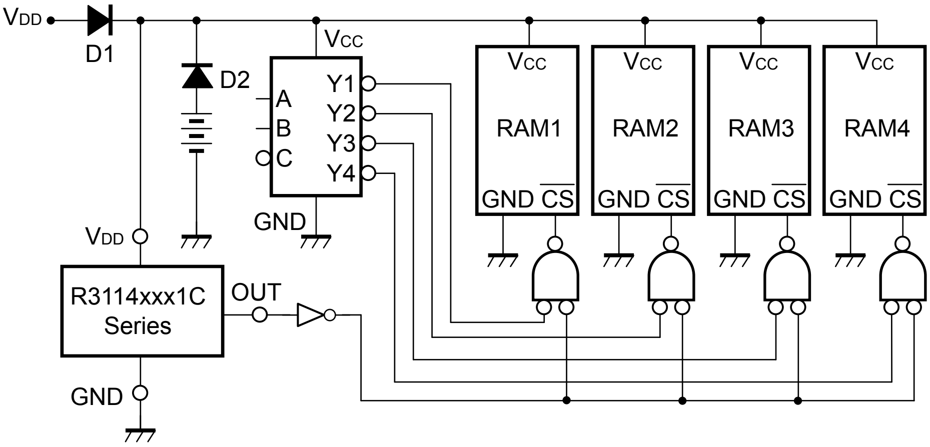
- **R3114xxx1A Output Delay Time Circuit 1 (Nch Open Drain Output)**



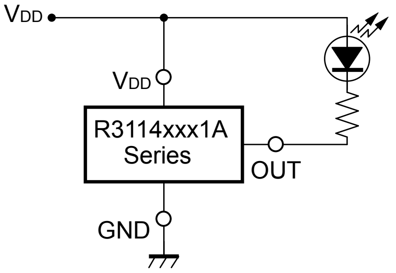
- **R3114xxx1A Output Delay Time Circuit 2 (Nch Open Drain Output)**



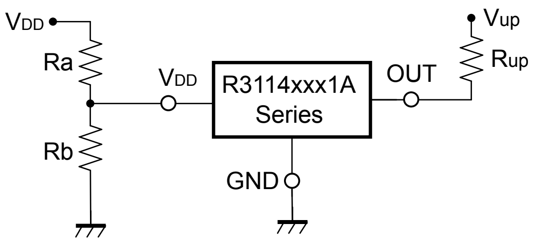
- **Memory Back-up Circuit**



• Voltage level Indicator Circuit (lighted when the power runs out) (Nch Open Drain Output)



• Detector Threshold Adjustable Circuit 1 (Nch Open Drain Output)

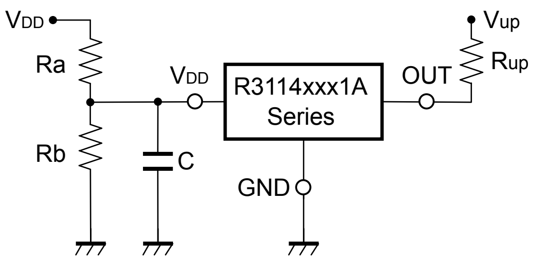


Adjustable Detector Threshold$=(-V_{DET})\times(Ra+Rb)/Rb$

Hysteresis Voltage$=(V_{HYS})\times(Ra+Rb)/Rb$

∗1) To prevent oscillation, set Ra ≤ 1kΩ, Rb ≤ 100Ω.
∗2) If the value of Ra is set excessively large, voltage drop may occur caused by the supply current of IC itself, and detector threshold and hysteresis voltage may vary.
∗3) If V_{up} and V_{DD} are connected, the voltage dropdown caused by R_{up}, may cause difference in the hysteresis voltage.

• Detector Threshold Adjustable Circuit 2 (Nch Open Drain Output)

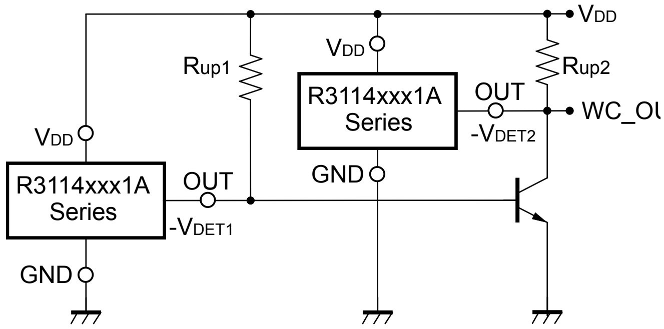


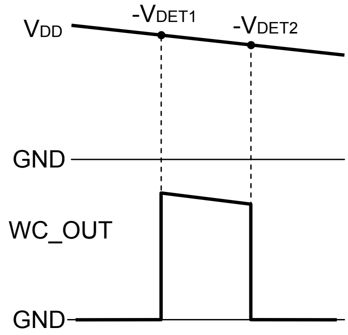
Adjustable Detector Threshold$=(-V_{DET})\times(Ra+Rb)/Rb$

Hysteresis Voltage$=(V_{HYS})\times(Ra+Rb)/Rb$

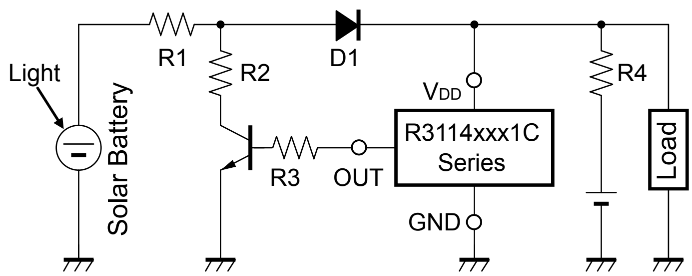
∗1) To prevent oscillation, set Ra ≤ 100kΩ, C ≥ ≤ 0.01μF.
∗2) If the value of Ra is set excessively large, voltage drop may occur caused by the supply current of IC itself, and detector threshold and hysteresis voltage may vary.
∗3) If V_{up} and V_{DD} are connected, the voltage dropdown caused by R_{up}, may cause difference in the hysteresis voltage.
∗4) If the value of Ra, Rb and C are set excessively large, the delay of the start-up may become too long.

- **Window Comparator Circuit (Nch Open Drain Output)**





- **Over-charge Preventing Circuit**



TECHNICAL NOTES

When connecting resistors to the device's input pin

When connecting a resistor (R1) to an input of this device, the input voltage decreases by [Device's Consumption Current] x [Resistance Value] only. And, the cross conduction current*1, which occurs when changing from the detecting state to the release state, is decreased the input voltage by [Cross Conduction Current] x [Resistance Value] only. And then, this device will enter the re-detecting state if the input voltage reduction is larger than the difference between the detector voltage and the released voltage.

When the input resistance value is large and the VDD is gone up at mildly in the vicinity of the released voltage, repeating the above operation may result in the occurrence of output.

As shown in Figure A/B, set R1 to become 100 kΩ or less as a guide, and connect C_{IN} of 0.1 μF and more to between the input pin and GND. Besides, make evaluations including temperature properties under the actual usage condition, with using the evaluation board like this way. As a result, make sure that the cross conduction current has no problem.

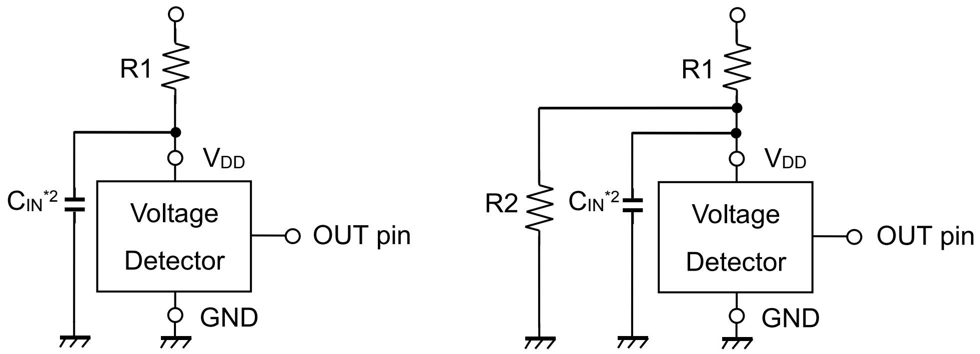


Figure A Figure B

*1 In the CMOS output type, a charging current for OUT pin is included.
*2 Note the bias dependence of capacitors.

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Halogen Free

Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.
Ricoh has been providing RoHS compliant products since April 1, 2006 and Halogen-free products since April 1, 2012.

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