

## Low VD with Individual SENSE Pin and Delay Function for Automotive Applications

NO.EC-242-140130

### OUTLINE

The R3118x is a CMOS-based voltage detector IC with individual sense pin, high detector threshold accuracy and delay time, 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 the IC consists of a voltage reference unit, a hysteresis comparator, resistors net for detector threshold setting, an output driver transistor, and a delay circuit.

$V_{DD}$  supply pin for the IC and voltage supervisory sense pin are individual, therefore the output pin can keep "L" level even if the sense pin voltage is going down to 0V, or there is no indefinite range for the sense pin.

Since a delay circuit is built-in, by connecting an external capacitor, any output delay time can be set. In the R3118x series, detector released delay time can be set, and detector delay time is not influenced by the external capacitor for the delay time.

The detector threshold is fixed with high accuracy internally and does not require any adjustment.

The tolerance of the detector threshold is  $\pm 22.5\text{mV}$  ( $-V_{DET\_S} < 1.6\text{V}$ ) or  $\pm 1.5\%$  ( $-V_{DET\_S} \geq 1.6\text{V}$ ).

Minimum detector threshold voltage is 0.6V, ultra low voltage detector threshold can be set.

Output delay time for the detector release can be set with high accuracy. The tolerance of the IC side is  $\pm 30\%$ .

Two output types, Nch open drain type and CMOS type are available. If the sense pin voltage becomes to equal or lower than the detector threshold voltage, the output voltage becomes "L", and if the sense pin voltage becomes to released voltage, the output voltage becomes "H" after the set delay time.

The R3118x supports SOT-23-5 package.

### FEATURES\*

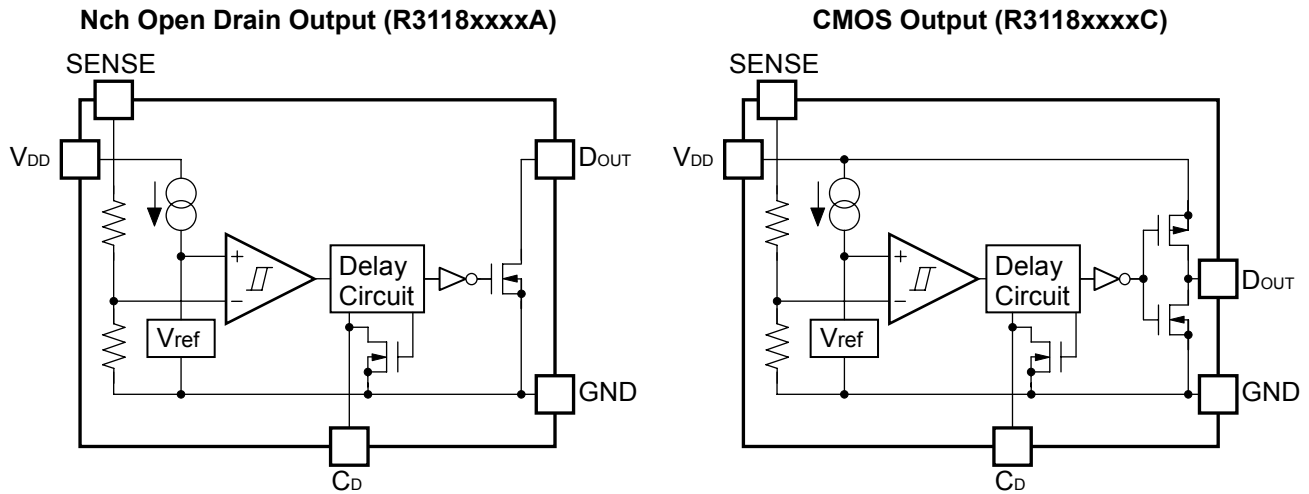
- Operating Voltage Range (Maximum Rating) ..... 1.0V to 6.0V (7.0V)
- Supply Current ..... Typ.  $0.4\mu\text{A}$  ( $V_{SENSE} \geq +V_{DET}$ ,  $V_{DD}=6\text{V}$ )  
Consumption current through SENSE pin is not included.
- Detector Threshold Range ..... 0.6V to 5.0V (0.1V steps)  
For other voltages, refer to *MARK INFORMATIONS*.
- Accuracy Detector Threshold .....  $\pm 1.5\%$  ( $-V_{DET\_S} \geq 1.6\text{V}$ ),  $\pm 22.5\text{mV}$  ( $-V_{DET\_S} < 1.6\text{V}$ )
- Temperature-Drift Coefficient of Detector Threshold ..... Typ.  $\pm 30\text{ppm}/^\circ\text{C}$
- Accuracy Detector Released .....  $\pm 30\%$
- Temperature-Drift Coefficient of Detector Released ..... Typ.  $\pm 0.16\text{ppm}/^\circ\text{C}$
- Output Types ..... Nch Open Drain and CMOS
- Packages ..... SOT-23-5

\*  $T_a=25^\circ\text{C}$ , unless otherwise noted.

### APPLICATIONS

- Power source for car accessories including car audio equipment, car navigation system, and ETC system.

## BLOCK DIAGRAMS



## SELECTION GUIDE

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

| Product Name     | Package  | Quantity per Reel | Pb Free | Halogen Free |
|------------------|----------|-------------------|---------|--------------|
| R3118Nxx1*-TR-#E | SOT-23-5 | 3,000 pcs         | Yes     | Yes          |

xx: The detector threshold can be designated in the range from 0.6V(06) to 5.0V(50) in 0.1V steps.  
For other voltages, please refer to *MARK INFORMATIONS*.

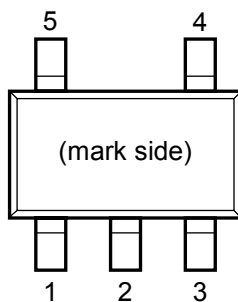
\* : Designation of Output Type  
(A) Nch Open Drain  
(C) CMOS

# : Specify Automotive Class Code

|   | Operating Temperature Range | Guaranteed Specs Temperature Range | Screening        |
|---|-----------------------------|------------------------------------|------------------|
| A | -40°C to 85°C               | 25°C                               | High temperature |

## PIN DESCRIPTIONS

### • SOT-23-5



### • SOT-23-5

| Pin No. | Symbol           | Description   |
|---------|------------------|---|
| 1       | D <sub>OUT</sub> | Output Pin ("L" at detection)                         |
| 2       | V <sub>DD</sub>  | Input Pin   |
| 3       | GND              | Ground Pin  |
| 4       | C <sub>D</sub>   | Pin for External Capacitor (for setting output delay) |
| 5       | SENSE            | Voltage Detector Voltage Sense Pin                    |

**ABSOLUTE MAXIMUM RATINGS**

| Symbol             | Item                                       | Rating                       | Unit |
|--------------------|--|------------------------------|------|
| V <sub>DD</sub>    | Supply Voltage                             | -0.3 to 7.0                  | V    |
| V <sub>SENSE</sub> | SENSE Pin Voltage                          | -0.3 to 7.0                  | V    |
| V <sub>DOUT</sub>  | Output Voltage (Nch Open Drain Output)     | -0.3 to 7.0                  | V    |
|                    | Output Voltage (CMOS Output)               | -0.3 to V <sub>DD</sub> +0.3 |      |
| I <sub>DOUT</sub>  | Output Current Nch Driver (Sink Current)   | 20                           | mA   |
|                    | Output Current Pch Driver (Source Current) | -5                           |      |
| P <sub>D</sub>     | Power Dissipation (SOT-23-5) *             | 420                          | mW   |
| T <sub>j</sub>     | Junction Temperature Range                 | -40 to 125                   | °C   |
| T <sub>stg</sub>   | 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 are not assured.

**RECOMMENDED OPERATING RATINGS**

| Symbol          | Item                        | Rating     | Unit |
|-----------------|-----------------------------|------------|------|
| V <sub>DD</sub> | Supply Voltage              | 1.0 to 6.0 | V    |
| T <sub>a</sub>  | Operating Temperature Range | -40 to 85  | °C   |

**RECOMMENDED OPERATING RATINGS**

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

## ELECTRICAL CHARACTERISTICS

### • R3118xxxxA/C

□ values indicate  $-40^{\circ}\text{C} \leq \text{Ta} \leq 85^{\circ}\text{C}$ ,  $-V_{\text{DET\_S}}$  means set detector threshold,  $V_{\text{DD}}=1\text{V}$  to  $6\text{V}$ , unless otherwise noted.

### • R3118xxxA/C

(Ta=25°C)

| Symbol             | Item                               | Conditions   | Min.   | Typ.                                 | Max.                                 | Unit                                 |    |
|--------------------|------------------------------------|--|--|--------------------------------------|--------------------------------------|--------------------------------------|----|
| $-V_{\text{DET}}$  | Detector Threshold                 | $-V_{\text{DET\_S}} < 1.6\text{V}$   | Ta=25°C  | $-V_{\text{DET\_S}}$<br>-0.0225      | $-V_{\text{DET\_S}}$                 | $-V_{\text{DET\_S}}$<br>+0.0225      | V  |
|                    |                                    |  | $-40^{\circ}\text{C} \leq \text{Ta} \leq 85^{\circ}\text{C}$ | □<br>$-V_{\text{DET\_S}}$<br>-0.0375 | $-V_{\text{DET\_S}}$                 | □<br>$-V_{\text{DET\_S}}$<br>+0.0375 |    |
|                    |                                    | $-V_{\text{DET\_S}} \geq 1.6\text{V}$  | Ta=25°C  | $-V_{\text{DET\_S}}$<br>× 0.985      | $-V_{\text{DET\_S}}$                 | $-V_{\text{DET\_S}}$<br>× 1.015      |    |
|                    |                                    |  | $-40^{\circ}\text{C} \leq \text{Ta} \leq 85^{\circ}\text{C}$ | □<br>$-V_{\text{DET\_S}}$<br>× 0.975 | $-V_{\text{DET\_S}}$                 | □<br>$-V_{\text{DET\_S}}$<br>× 1.025 |    |
| $V_{\text{HYS}}$   | Detector threshold Hysteresis      | Ta=25°C  | $-V_{\text{DET\_S}}$<br>× 0.040                              | $-V_{\text{DET\_S}}$<br>× 0.055      | $-V_{\text{DET\_S}}$<br>× 0.070      | V                                    |    |
|                    |                                    | $-40^{\circ}\text{C} \leq \text{Ta} \leq 85^{\circ}\text{C}$                           | □<br>$-V_{\text{DET\_S}}$<br>× 0.035                         | $-V_{\text{DET\_S}}$<br>× 0.055      | □<br>$-V_{\text{DET\_S}}$<br>× 0.075 |                                      |    |
| Symbol             | Item                               | Conditions   | Min.   | Typ.                                 | Max.                                 | Unit                                 |    |
| $I_{\text{SS}}$    | Supply Current *1                  | $V_{\text{SENSE}}=0\text{V}$ , $V_{\text{DD}}=6\text{V}$                               |  | 0.480                                | □<br>1.450                           | μA                                   |    |
|                    |                                    | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=6\text{V}$                               |  | 0.400                                | □<br>1.200                           |                                      |    |
| $R_{\text{SENSE}}$ | Sense Resistor                     | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=6\text{V}$                               | □<br>9   | 34                                   | □<br>58                              | MΩ                                   |    |
| $I_{\text{DOUT}}$  | Output Current (Driver Output Pin) | Nch<br>$V_{\text{SENSE}}=0\text{V}$  | $V_{\text{DD}}=1\text{V}$ , $V_{\text{DOUT}}=0.1\text{V}$    | □<br>0.150                           |                                      |                                      | mA |
|                    |                                    |  | $V_{\text{DD}}=3\text{V}$ , $V_{\text{DOUT}}=0.1\text{V}$    | □<br>0.550                           |                                      |                                      |    |
|                    |                                    |  | $V_{\text{DD}}=5\text{V}$ , $V_{\text{DOUT}}=0.1\text{V}$    | □<br>0.850                           |                                      |                                      |    |
|                    |                                    |  | $V_{\text{DD}}=1\text{V}$ , $V_{\text{DOUT}}=0.4\text{V}$    | □<br>0.400                           |                                      |                                      |    |
|                    |                                    |  | $V_{\text{DD}}=3\text{V}$ , $V_{\text{DOUT}}=0.4\text{V}$    | □<br>2.100                           |                                      |                                      |    |
|                    |                                    |  | $V_{\text{DD}}=5\text{V}$ , $V_{\text{DOUT}}=0.4\text{V}$    | □<br>3.300                           |                                      |                                      |    |
|                    |                                    | Pch*2<br>$V_{\text{SENSE}}=6\text{V}$  | $V_{\text{DD}}=1\text{V}$ , $V_{\text{DOUT}}=0.9\text{V}$    | □<br>6                               |                                      |                                      | μA |
|                    |                                    |  | $V_{\text{DD}}=3\text{V}$ , $V_{\text{DOUT}}=2.9\text{V}$    | □<br>30                              |                                      |                                      |    |
|                    |                                    |  | $V_{\text{DD}}=5\text{V}$ , $V_{\text{DOUT}}=4.9\text{V}$    | □<br>45                              |                                      |                                      |    |
| $I_{\text{LEAK}}$  | Nch Driver Leakage Current *3      | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=6\text{V}$ , $V_{\text{DOUT}}=6\text{V}$ |  |                                      | □<br>80                              | nA                                   |    |
| $R_{\text{DIS}}$   | Cd pin Discharge Tr. On Resistance | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=1\text{V}$ , $V_{\text{CD}}=0.4\text{V}$ | □<br>2.200   |                                      | □<br>6.200                           | kΩ                                   |    |
|                    |                                    | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=3\text{V}$ , $V_{\text{CD}}=0.4\text{V}$ | □<br>0.400   |                                      | □<br>1.250                           |                                      |    |
|                    |                                    | $V_{\text{SENSE}}=6\text{V}$ , $V_{\text{DD}}=5\text{V}$ , $V_{\text{CD}}=0.4\text{V}$ | □<br>0.250   |                                      | □<br>0.800                           |                                      |    |
| $t_{\text{reset}}$ | Detect Output Delay Time *4        | Ta=25°C  |  | 80                                   |                                      | μs                                   |    |
| $t_{\text{delay}}$ | Release Output Delay Time *5       | Ta=25°C  | 70   | 100                                  | 130                                  | ms                                   |    |
|                    |                                    | $-40^{\circ}\text{C} \leq \text{Ta} \leq 85^{\circ}\text{C}$                           | □<br>65  | 100                                  | □<br>145                             |                                      |    |

All of unit are tested and specified under load conditions such that  $T_j \approx \text{Ta} = 25^{\circ}\text{C}$  except for Detector Output Delay Time and Release Output Delay Time.

\*1 Consumption current through SENSE pin is not included.

\*<sup>2</sup> In case of CMOS type

\*<sup>3</sup> In case of Nch Open Drain type

\*<sup>4</sup> In the case of CMOS output type: In the case that a 0.022 $\mu$ F capacitor is connected to the C<sub>D</sub> pin, the time interval from forcing pulsive voltage between -V<sub>DET\_SX</sub>1.155V and -V<sub>DET\_SX</sub>0.9 to SENSE pin, to when the output voltage of the D<sub>OUT</sub> pin will reach from "H" to V<sub>DD</sub>/2.

In the case of Nch Open drain output type: In the case that a 0.022 $\mu$ F capacitor is connected to the C<sub>D</sub> pin and the D<sub>OUT</sub> pin is pulled up to 5V with 470k $\Omega$ , the time interval from forcing pulsive voltage between -V<sub>DET\_SX</sub>1.155V and -V<sub>DET\_SX</sub>0.9V to SENSE pin, to when the output voltage reaches from "H" to 2.5V.

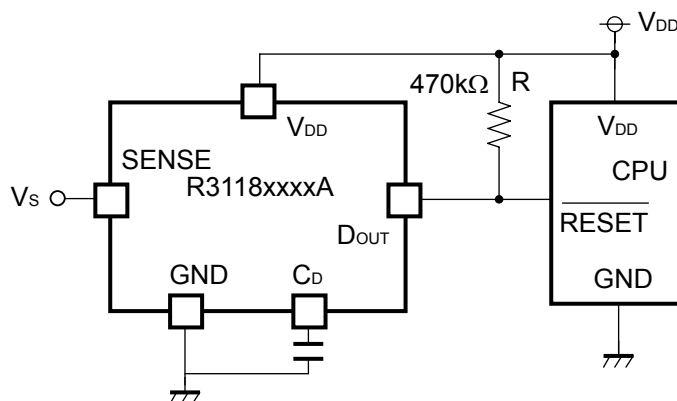
\*<sup>5</sup> In the case of CMOS output type: In the case that a 0.022 $\mu$ F capacitor is connected to the C<sub>D</sub> pin, the time interval from forcing pulsive voltage between -V<sub>DET\_SX</sub>0.9 and -V<sub>DET\_SX</sub>1.155V to SENSE pin, to when the output voltage of the D<sub>OUT</sub> pin will reach from "L" to V<sub>DD</sub>/2.

In the case of Nch Open drain output type: In the case that a 0.022 $\mu$ F capacitor is connected to the C<sub>D</sub> pin and the D<sub>OUT</sub> pin is pulled up to 5V with 470k $\Omega$ , the time interval from forcing pulsive voltage between -V<sub>DET\_SX</sub>0.9V and -V<sub>DET\_SX</sub>1.155V to SENSE pin, to when the output voltage reaches from "L" to 2.5V.

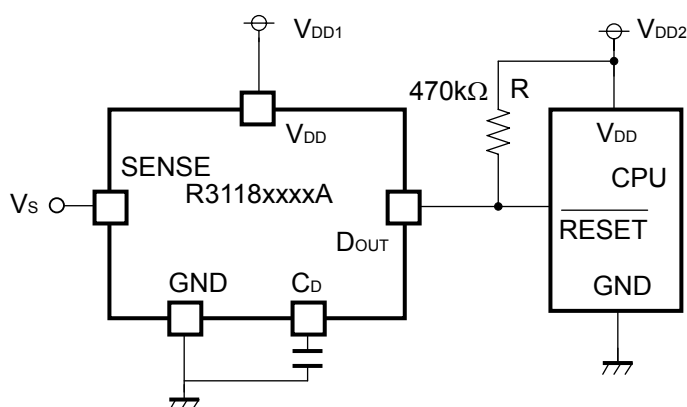
## TYPICAL APPLICATION

- R3118xxxxA CPU Reset Circuit (Nch Open Drain Output)

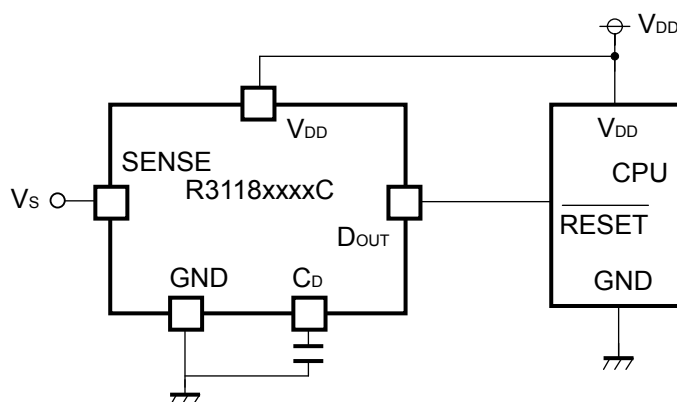
(1)  $V_{DD}$  pin Voltage to R3118xxxxA is equal to  $V_{DD}$  pin Voltage to CPU



(2)  $V_{DD}$  pin Voltage to R3118xxxxA is unequal to  $V_{DD}$  pin Voltage to CPU



- R3118xxxxC CPU Reset Circuit (CMOS Output)



## 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\*<sup>1</sup>, 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 100kΩ or less as a guide, and connect C<sub>IN</sub> of 0.1μF 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 result, make sure that the cross conduction current has no problem.

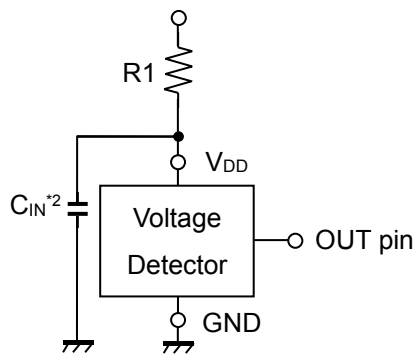


Figure A

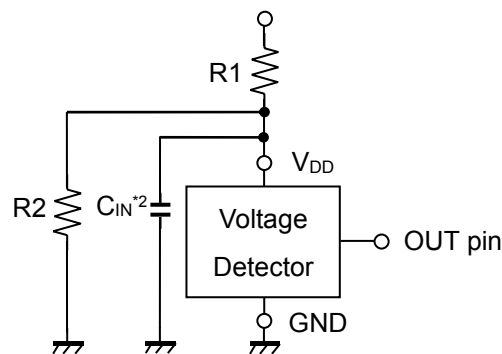


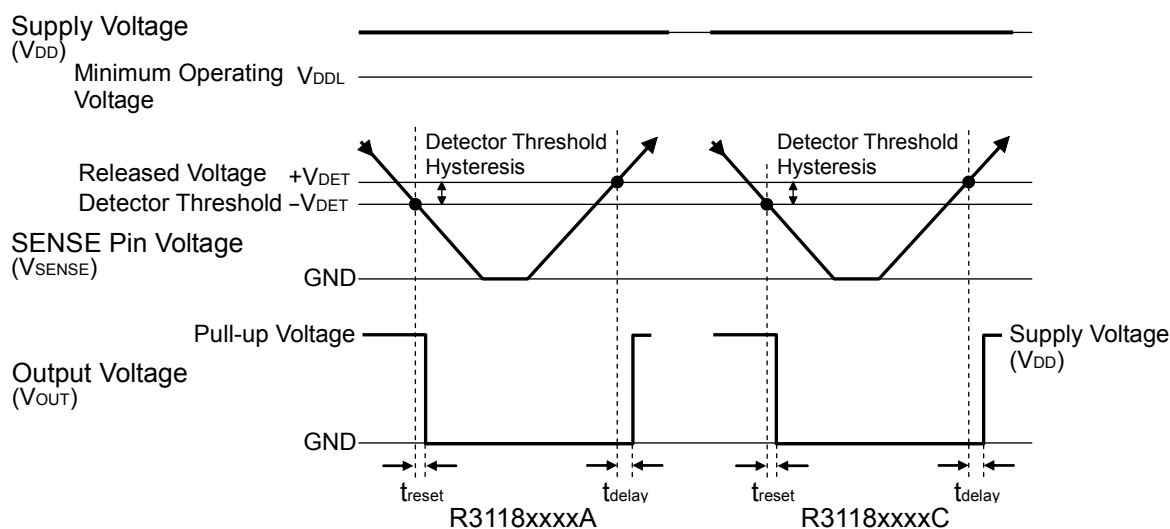
Figure B

\*<sup>1</sup> In the CMOS output type, a charging current for OUT pin is included.

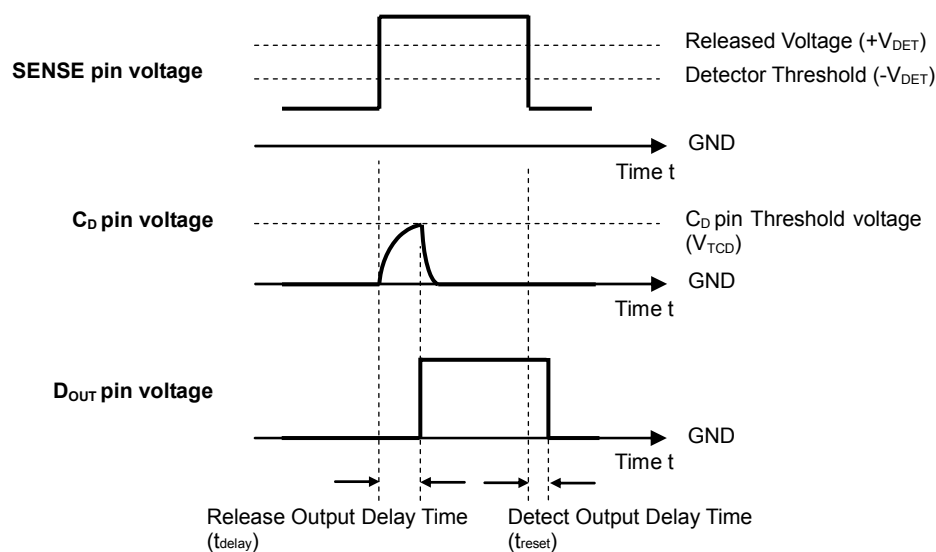
\*<sup>2</sup> Note the bias dependence of capacitors.



## TIMING CHART



## DESCRIPTION OF OUTPUT DELAY OPERATION



**Output Delay Operation Diagram**

A higher voltage than the released voltage is forced to the SENSE pin, charge to the capacitor connected to  $C_D$  pin is started, then the  $C_D$  pin voltage increases. Until  $C_D$  pin voltage reaches to  $C_D$  pin threshold voltage, the output of  $D_{OUT}$  pin voltage keeps "L", then when  $C_D$  pin voltage is higher than  $C_D$  pin threshold voltage, the  $D_{OUT}$  pin voltage changes from "L" to "H". The released output delay time means the time interval from when the released voltage threshold or more voltage level is forced to SENSE pin to when  $D_{OUT}$  voltage changes from "L" to "H".

When the voltage of  $D_{OUT}$  pin reverses from "L" to "H", the discharge of the external capacitor connected to  $C_D$  pin starts. Therefore, the time interval from when the voltage lower than the detector threshold is forced to SENSE pin, to when the output voltage reverses from "H" to "L", or detector output delay time is constant and independent from the external capacitance value.

- \*1. After the D<sub>OUT</sub> pin voltage reverses from "L" to "H", if a voltage lower than the detector threshold is forced to SENSE pin before the capacitor connected to C<sub>D</sub> pin is discharged, delay time will increase. The time interval (t<sub>DIS</sub>) from when the capacitor connected to C<sub>D</sub> pin is discharged completely to when the capacitor is charged to a certain C<sub>D</sub> pin voltage (described as V<sub>CD</sub> herein) can be calculated by power supply voltage (V<sub>DD</sub>), external capacitance (C<sub>D</sub>), on resistance of the C<sub>D</sub> pin discharge transistor (R<sub>DIS</sub>) as in the next formula:

$$t_{DIS} = -R_{DIS} \times C_D \times \ln(V_{CD}/V_{DD} \times 0.45)$$

- \*2. During the released delay operation, only a small current will charge the external capacitor connected to C<sub>D</sub> pin. If the leakage current between C<sub>D</sub> pin and GND is large, the released delay time may increase or the detector may not be released.
- \*3. During the released delay operation, if the V<sub>DD</sub> pin voltage varies, the released output delay time will be also shift.

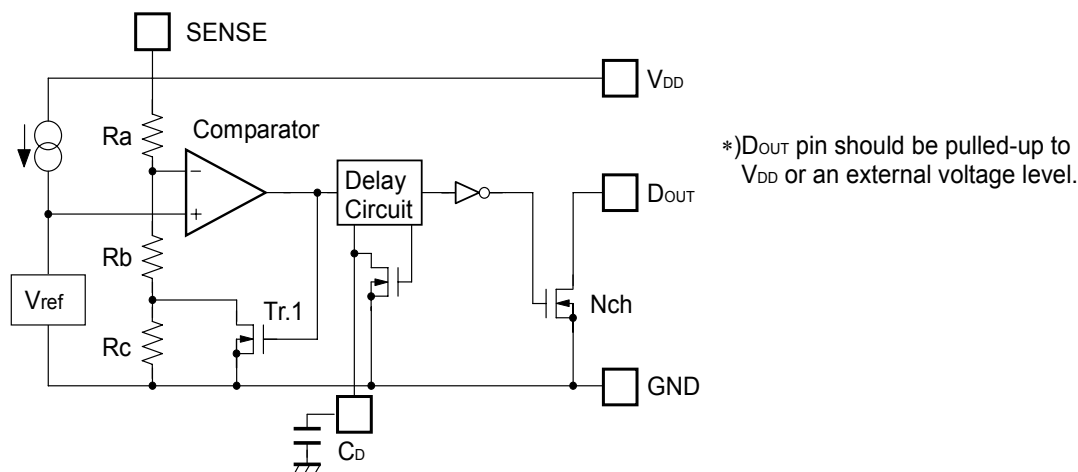
#### ● How To Calculate Released Output Delay Time

The release output delay time (t<sub>delay</sub>) can be calculated as in the next formula with an external capacitance value (C<sub>D</sub>):

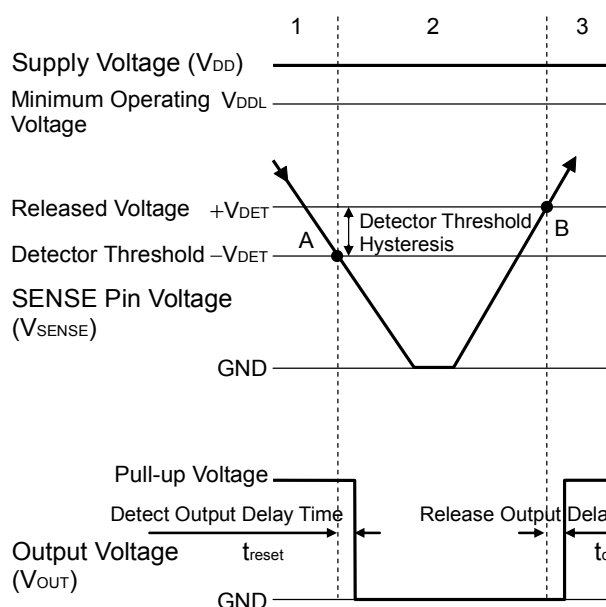
$$t_{delay}(s) = 4.545 \times 10^6 \times C_D(F)$$

## OPERATION

### • R3118xxxxA



Block diagram with an external capacitor (R3118xxxxA)



| Step                             | 1   | 2  | 3   |
|----------------------------------|-----|----|-----|
| Comparator (-) Pin Input Voltage | I   | II | I   |
| Comparator Output                | L   | H  | L   |
| Tr.1                             | OFF | ON | OFF |
| Output Tr. Nch                   | OFF | ON | OFF |

$$I \quad \frac{Rb+Rc}{Ra+Rb+Rc} \times V_{SENSE}$$

$$II \quad \frac{Rb}{Ra+Rb} \times V_{SENSE}$$

Operation Diagram

### • Explanation

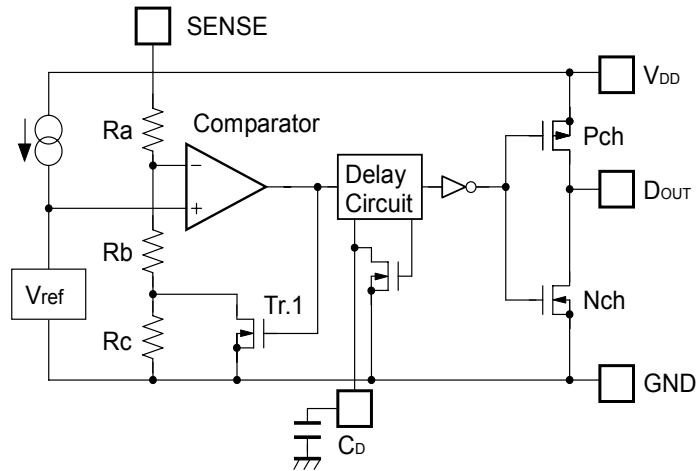
Step 1. The output voltage is equal to the pull-up voltage.

Step 2. At Point "A",  $V_{ref} \leq V_{SENSE} \times (Rb+Rc)/(Ra+Rb+Rc)$  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 ( $-V_{DET}$ ). (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 GND level.)

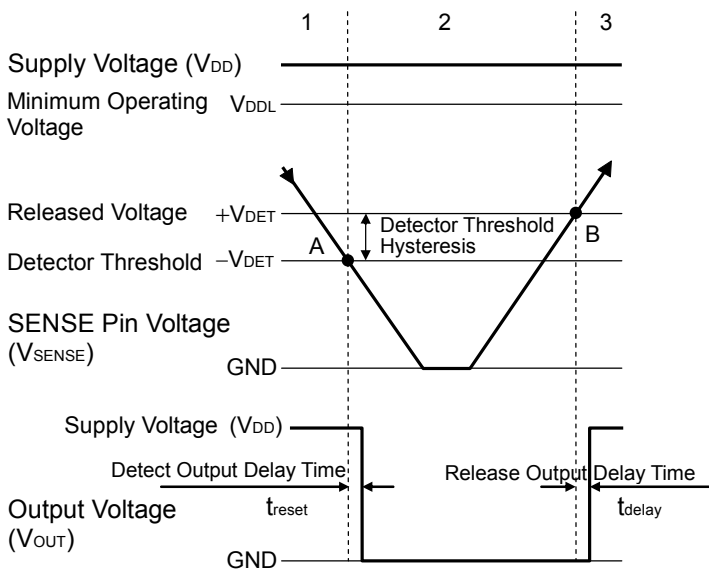
Step 3. At Point "B",  $V_{ref} \leq V_{SENSE} \times Rb/(Ra+Rb)$  is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the pull-up voltage. The voltage level of Point B means a released voltage ( $+V_{DET}$ ).

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

• R3118xxxxC



Block diagram with an external capacitor (R3118xxxxC)



| Step                             | 1   | 2   | 3   |     |
|----------------------------------|-----|-----|-----|-----|
| Comparator (-) Pin Input Voltage | I   | II  | I   |     |
| Comparator Output                | L   | H   | L   |     |
| Tr.1                             | OFF | ON  | OFF |     |
| Output Tr.                       | Pch | ON  | OFF | ON  |
|                                  | Nch | OFF | ON  | OFF |

$$I \quad \frac{Rb+Rc}{Ra+Rb+Rc} \times V_{SENSE}$$

$$II \quad \frac{Rb}{Ra+Rb} \times V_{SENSE}$$

Operation Diagram

• Explanation

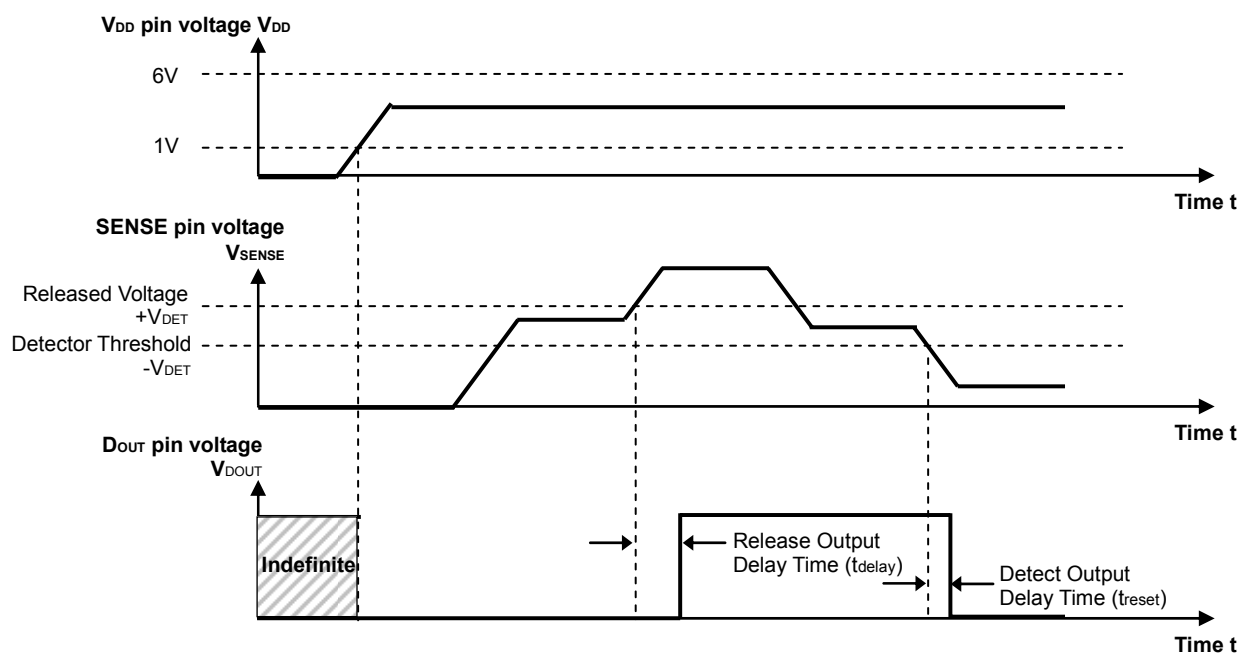
Step 1. The output voltage is equal to the supply voltage ( $V_{DD}$ ).

Step 2. At Point "A",  $V_{ref} \geq V_{SENSE} \times (Rb+Rc) / (Ra+Rb+Rc)$  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 ( $-V_{DET}$ ). (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 GND level.)

Step 3. At Point "B",  $V_{ref} \leq V_{SENSE} \times Rb / (Ra+Rb)$  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 ( $+V_{DET}$ ).

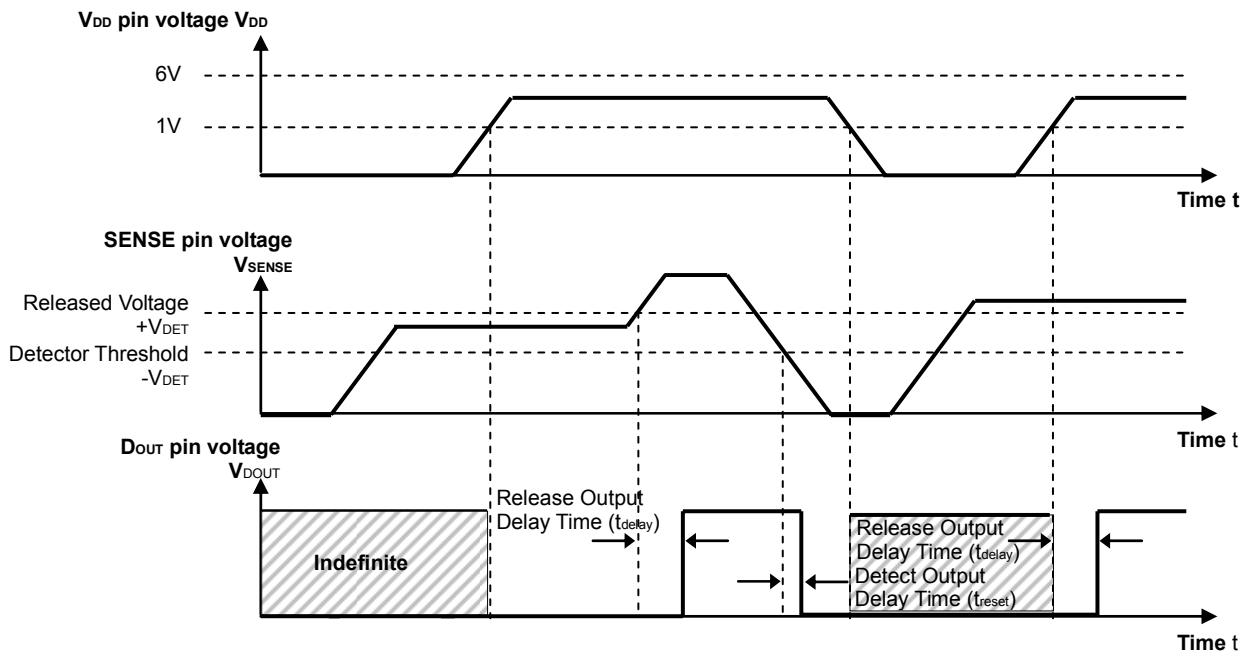
\*) The difference between a released voltage and a detector threshold voltage is a detector threshold hysteresis.

- In the case of the SENSE pin voltage is forced after the V<sub>DD</sub> pin voltage is forced.



If a voltage is applied to SENSE pin after a power (in the range from 1V to 6V) is applied to V<sub>DD</sub> pin, D<sub>OUT</sub> pin becomes "L" when the SENSE pin voltage is less than released voltage +V<sub>DET</sub>, and D<sub>OUT</sub> pin becomes "H" when the SENSE pin voltage is equal or more than the released voltage +V<sub>DET</sub>.

- In the case of the  $V_{DD}$  pin voltage is forced after the SENSE pin voltage is forced.



In the case of the SENSE pin voltage is less than released voltage  $+V_{DET}$ , when the  $V_{DD}$  pin voltage becomes to 1V or more, "L" output of  $D_{OUT}$  is determined. In case of the SENSE pin voltage is equal or more than the released voltage  $+V_{DET}$ , when the  $V_{DD}$  pin voltage becomes to 1V or more, "H" output of  $D_{OUT}$  is determined.

\* If the turn on speed of the supply voltage of the  $V_{DD}$  pin up to 1V is slower than the 1V/s, connect 0.001 $\mu$ F or more capacitor to  $C_D$  pin, otherwise, the output of  $D_{OUT}$  pin may indefinite.

## PACKAGE INFORMATION

### Power Dissipation (SOT-23-5)

Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

(Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

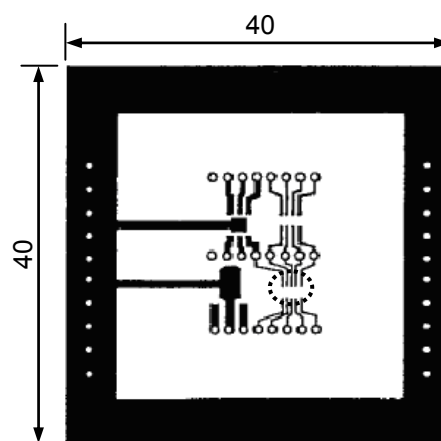
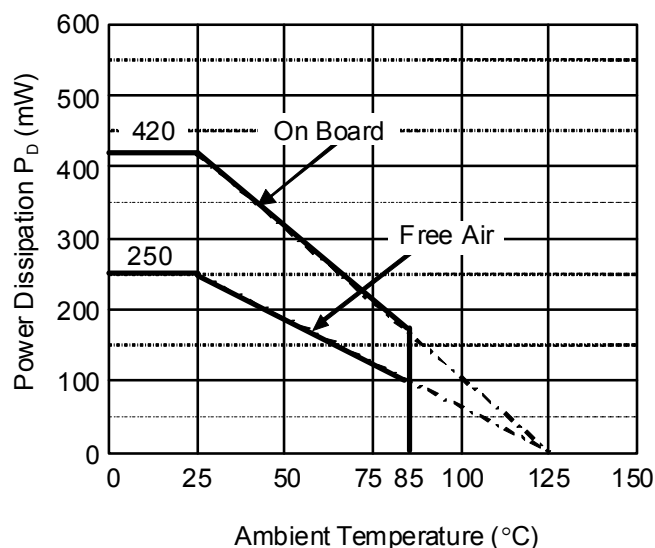
#### Measurement Conditions

|                  | Standard Test Land Pattern                    |
|------------------|---|
| Environment      | Mounting on Board (Wind velocity=0m/s)        |
| Board Material   | Glass cloth epoxy plastic (Double sided)      |
| Board Dimensions | 40mm x 40mm x 1.6mm                           |
| Copper Ratio     | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-holes    | $\phi$ 0.5mm x 44pcs                          |


#### Measurement Result

( $T_a=25^\circ\text{C}$ ,  $T_{j\text{max}}=125^\circ\text{C}$ )

|                    | Standard Land Pattern   | Free Air               |
|--------------------|---|------------------------|
| Power Dissipation  | 420mW   | 250mW                  |
| Thermal Resistance | $\theta_{ja} = (125-25^\circ\text{C})/0.42\text{W} = 238^\circ\text{C/W}$ | 400 $^\circ\text{C/W}$ |

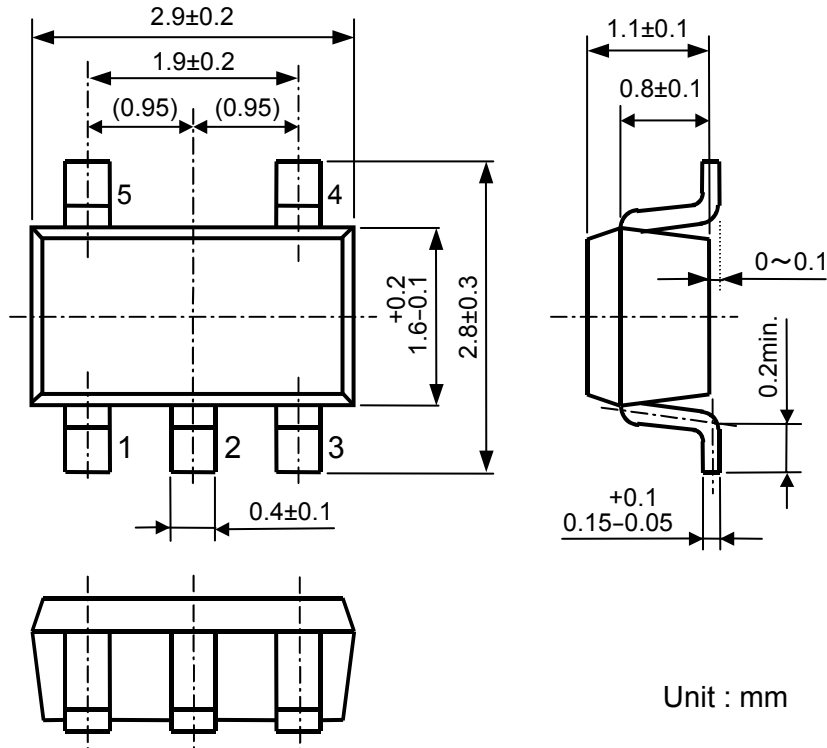


Measurement Board Pattern

 IC Mount Area (Unit: mm)

#### Power Dissipation

Package Dimensions (SOT-23-5)

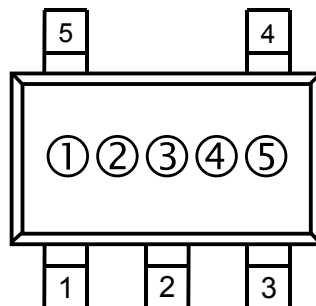


SOT-23-5 Package Dimensions

Mark Specifications (SOT-23-5)

①②③: Product Code ... **Refer to "Mark Specification Table"**

④⑤: Lot Number ... Alphanumeric Serial Number



SOT-23-5 Mark Specifications



## R3118N Mark Specification Table (SOT-23-5)

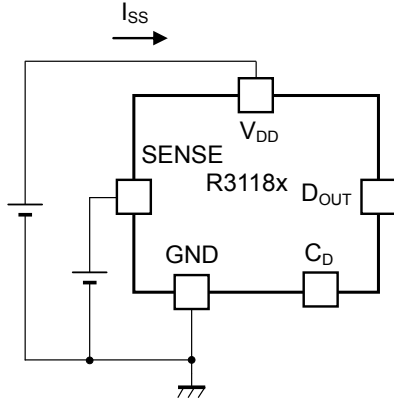
## R3118Nxx1A

| Product Name | ①②③ | V <sub>SET</sub> |
|--------------|-----|------------------|
| R3118N061A   | SAA | 0.6V             |
| R3118N071A   | SAB | 0.7V             |
| R3118N081A   | SAC | 0.8V             |
| R3118N091A   | SAD | 0.9V             |
| R3118N101A   | SAE | 1.0V             |
| R3118N111A   | SAF | 1.1V             |
| R3118N121A   | SAG | 1.2V             |
| R3118N131A   | SAH | 1.3V             |
| R3118N141A   | SAJ | 1.4V             |
| R3118N151A   | SAK | 1.5V             |
| R3118N161A   | SAL | 1.6V             |
| R3118N171A   | SAM | 1.7V             |
| R3118N181A   | SAN | 1.8V             |
| R3118N191A   | SAP | 1.9V             |
| R3118N201A   | SAQ | 2.0V             |
| R3118N211A   | SAR | 2.1V             |
| R3118N221A   | SAS | 2.2V             |
| R3118N231A   | SAT | 2.3V             |
| R3118N241A   | SAU | 2.4V             |
| R3118N251A   | SAV | 2.5V             |
| R3118N261A   | SAW | 2.6V             |
| R3118N271A   | SAX | 2.7V             |
| R3118N281A   | SAY | 2.8V             |
| R3118N291A   | SAZ | 2.9V             |
| R3118N301A   | TAA | 3.0V             |
| R3118N311A   | TAB | 3.1V             |
| R3118N321A   | TAC | 3.2V             |
| R3118N331A   | TAD | 3.3V             |
| R3118N341A   | TAE | 3.4V             |
| R3118N351A   | TAF | 3.5V             |
| R3118N361A   | TAG | 3.6V             |
| R3118N371A   | TAH | 3.7V             |
| R3118N381A   | TAJ | 3.8V             |
| R3118N391A   | TAK | 3.9V             |
| R3118N401A   | TAL | 4.0V             |
| R3118N411A   | TAM | 4.1V             |
| R3118N421A   | TAN | 4.2V             |
| R3118N431A   | TAP | 4.3V             |
| R3118N441A   | TAQ | 4.4V             |
| R3118N451A   | TAR | 4.5V             |
| R3118N461A   | TAS | 4.6V             |
| R3118N471A   | TAT | 4.7V             |
| R3118N481A   | TAU | 4.8V             |
| R3118N491A   | TAV | 4.9V             |
| R3118N501A   | TAW | 5.0V             |

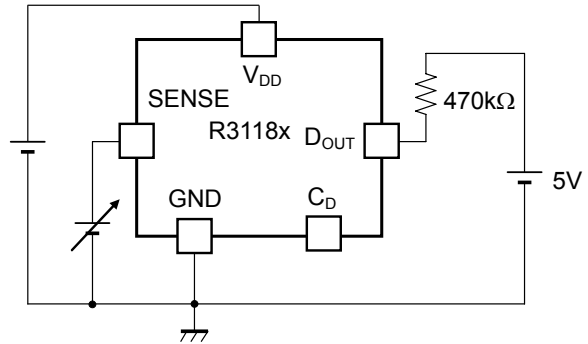
## R3118Nxx1C

| Product Name | ①②③ | V <sub>SET</sub> |
|--------------|-----|------------------|
| R3118N061C   | SBA | 0.6V             |
| R3118N071C   | SBB | 0.7V             |
| R3118N081C   | SBC | 0.8V             |
| R3118N091C   | SBD | 0.9V             |
| R3118N101C   | SBE | 1.0V             |
| R3118N111C   | SBF | 1.1V             |
| R3118N121C   | SBG | 1.2V             |
| R3118N131C   | SBH | 1.3V             |
| R3118N141C   | SBJ | 1.4V             |
| R3118N151C   | SBK | 1.5V             |
| R3118N161C   | SBL | 1.6V             |
| R3118N171C   | SBM | 1.7V             |
| R3118N181C   | SBN | 1.8V             |
| R3118N191C   | SBP | 1.9V             |
| R3118N201C   | SBQ | 2.0V             |
| R3118N211C   | SBR | 2.1V             |
| R3118N221C   | SBS | 2.2V             |
| R3118N231C   | SBT | 2.3V             |
| R3118N241C   | SBU | 2.4V             |
| R3118N251C   | SBV | 2.5V             |
| R3118N261C   | SBW | 2.6V             |
| R3118N271C   | SBX | 2.7V             |
| R3118N281C   | SBY | 2.8V             |
| R3118N291C   | SBZ | 2.9V             |
| R3118N301C   | TBA | 3.0V             |
| R3118N311C   | TBB | 3.1V             |
| R3118N321C   | TBC | 3.2V             |
| R3118N331C   | TBD | 3.3V             |
| R3118N341C   | TBE | 3.4V             |
| R3118N351C   | TBF | 3.5V             |
| R3118N361C   | TBG | 3.6V             |
| R3118N371C   | TBH | 3.7V             |
| R3118N381C   | TBJ | 3.8V             |
| R3118N391C   | TBK | 3.9V             |
| R3118N401C   | TBL | 4.0V             |
| R3118N411C   | TBM | 4.1V             |
| R3118N421C   | TBN | 4.2V             |
| R3118N431C   | TBP | 4.3V             |
| R3118N441C   | TBQ | 4.4V             |
| R3118N451C   | TBR | 4.5V             |
| R3118N461C   | TBS | 4.6V             |
| R3118N471C   | TBT | 4.7V             |
| R3118N481C   | TBU | 4.8V             |
| R3118N491C   | TBV | 4.9V             |
| R3118N501C   | TBW | 5.0V             |

TEST CIRCUITS

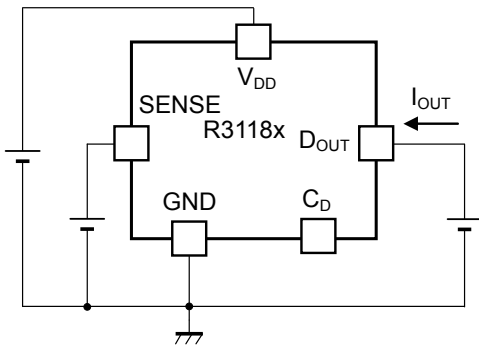


Supply Current Test Circuit

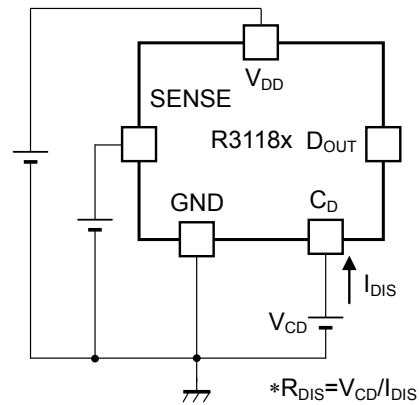


Detector Threshold Test Circuit

(Pull-up circuit is not necessary for CMOS Output type.)

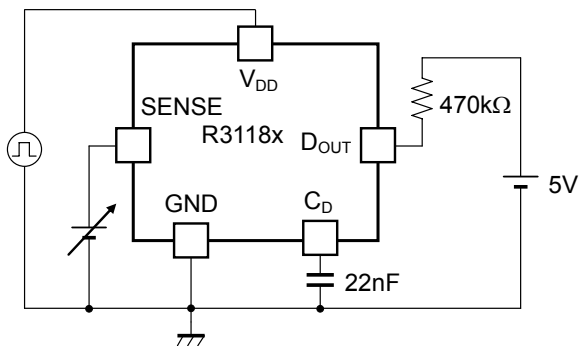


Nch/Pch Driver Output Current Test Circuit



\* $R_{DIS} = V_{CD} / I_{DIS}$

C<sub>D</sub> pin Discharge Transistor On resistance Test Circuit



Detect output delay time/Release output delay time Test Circuit

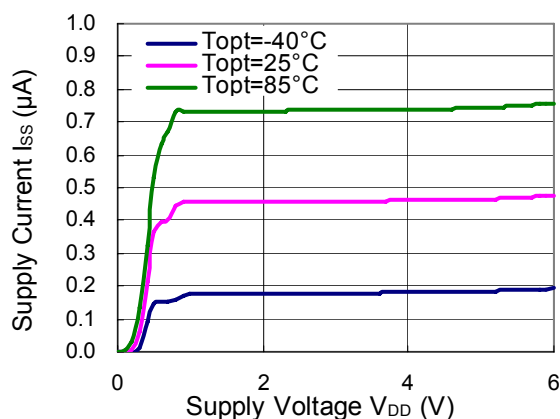
(Pull-up circuit is not necessary for CMOS Output type.)

## TYPICAL CHARACTERISTICS

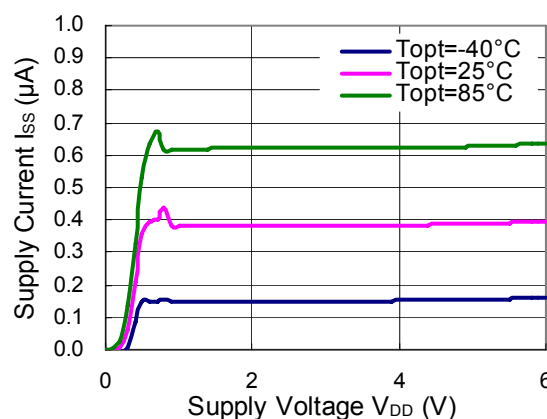
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

### 1) Supply Current vs. Supply Voltage

R3118xxxxA/C ( $V_{SENSE}=0V$ )

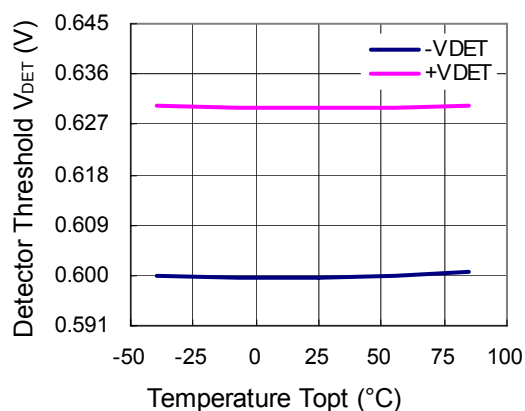


R3118xxxxA/C ( $V_{SENSE}=6V$ )

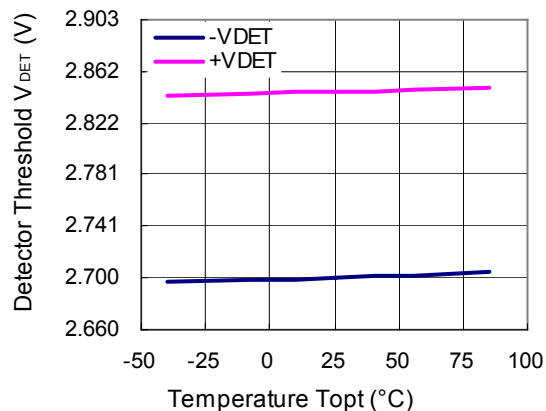


### 2) Detector Threshold vs. Temperature

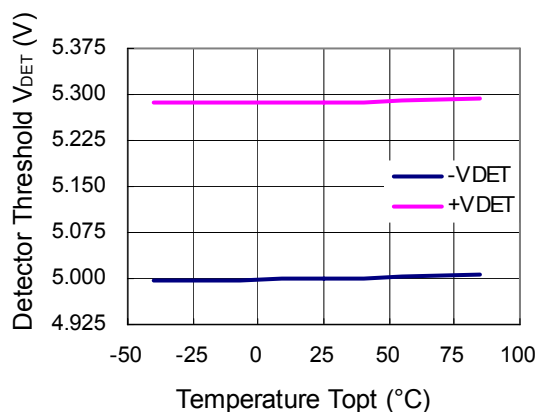
R3118x06xA/C ( $V_{DD}=5.3V$ )



R3118x27xA/C ( $V_{DD}=5.3V$ )

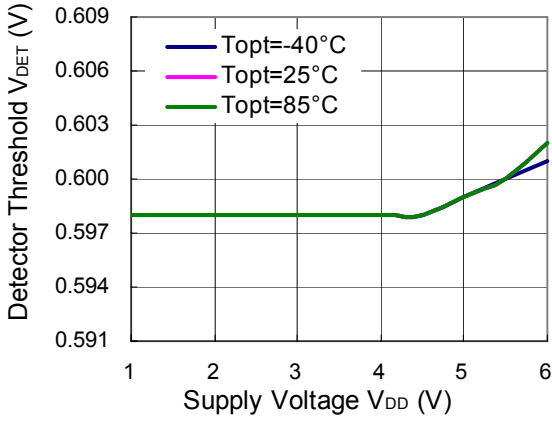


R3118x50xA/C ( $V_{DD}=5.3V$ )

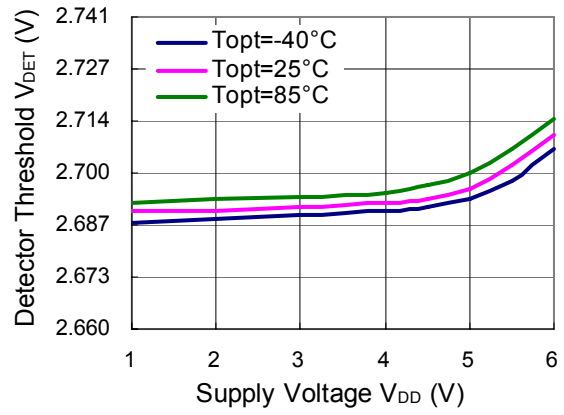


3) Detector Threshold vs. Supply Voltage

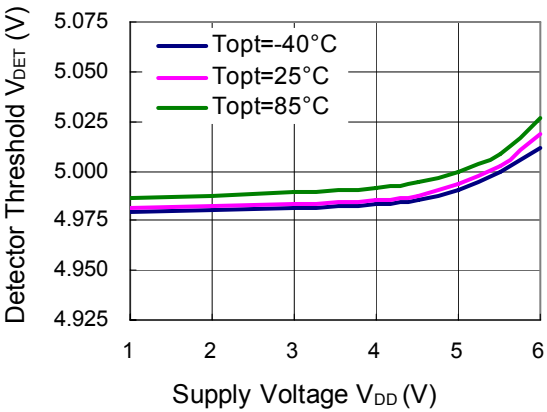
R3118x06xA/C



R3118x27xA/C

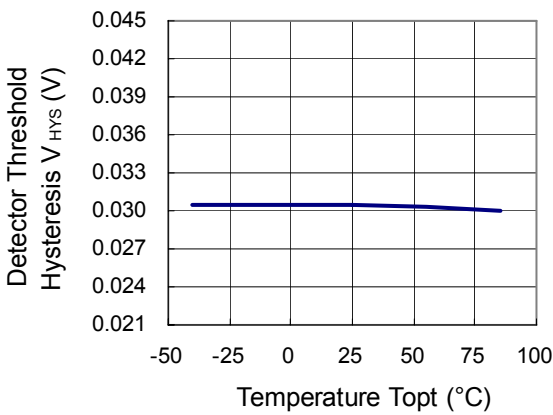


R3118x50xA/C

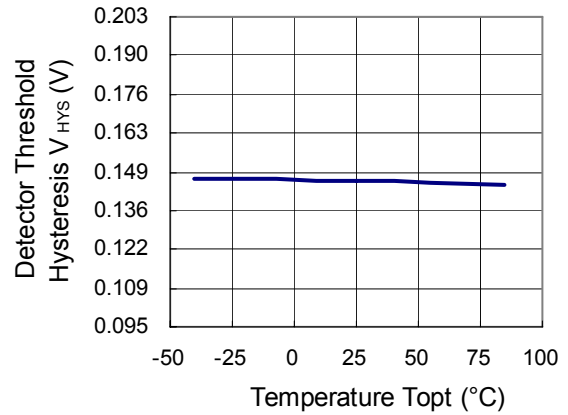


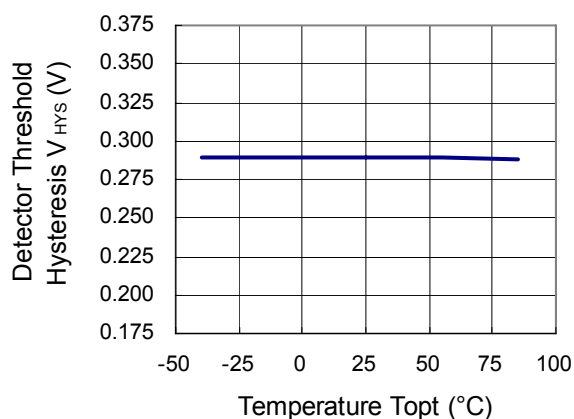
4) Hysteresis vs. Temperature

R3118x06xA/C (V<sub>DD</sub>=5.3V)



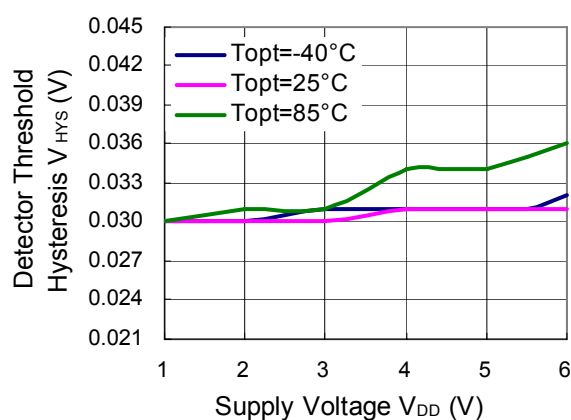
R3118x27xA/C (V<sub>DD</sub>=5.3V)



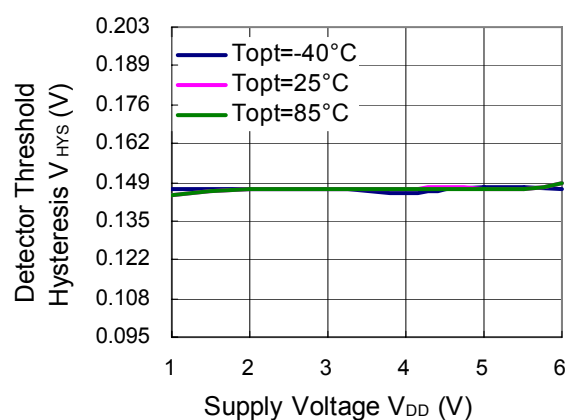
R3118x50xA/C ( $V_{DD}=5.3V$ )

### 5) Hysteresis vs. Supply Voltage

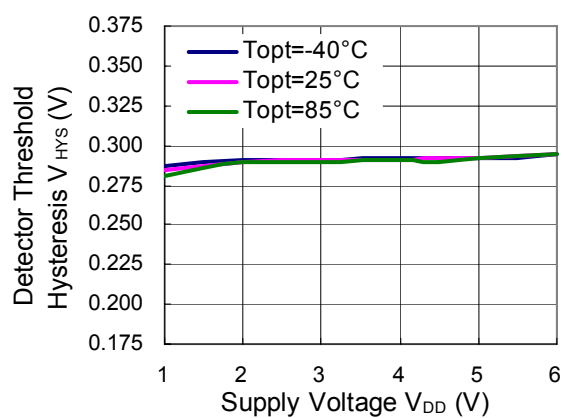
R3118x06xA/C



R3118x27xA/C



R3118x50xA/C

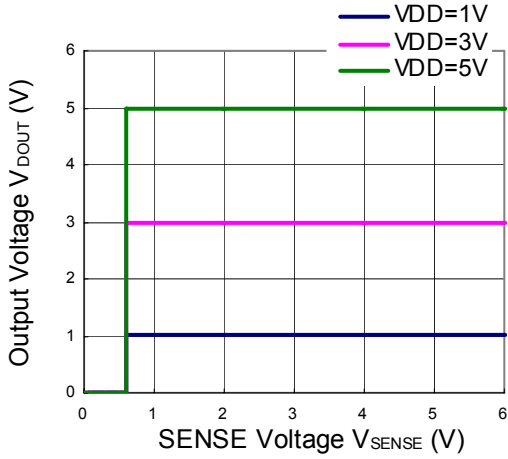


**R3118N**

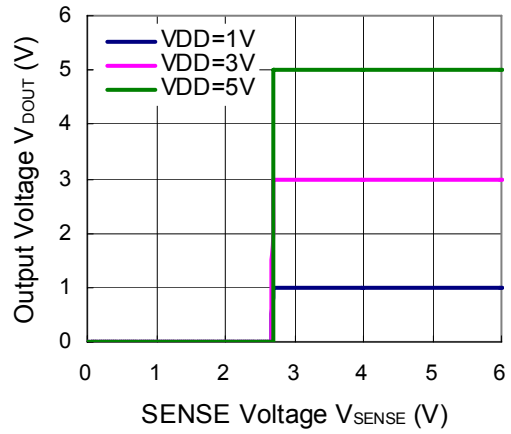
NO.EC-242-140130

**6) Output Voltage vs. SENSE Voltage** (Dout pin is pulled up to V<sub>DD</sub> pin via 470kΩ.)

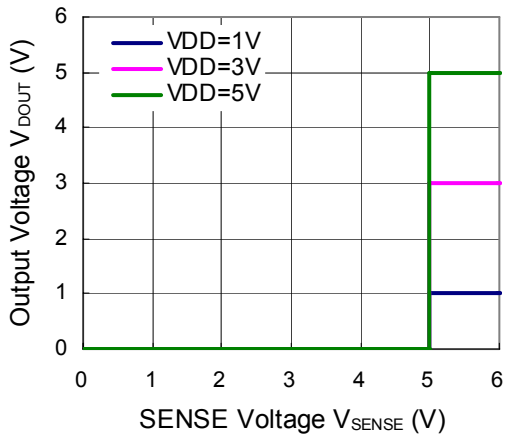
**R3118x06xA/C**



**R3118x27xA/C**

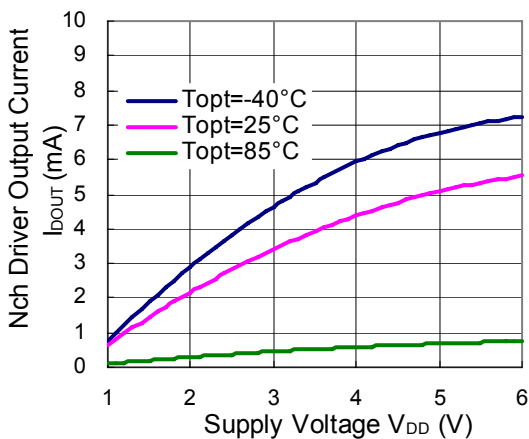


**R3118x50xA/C**



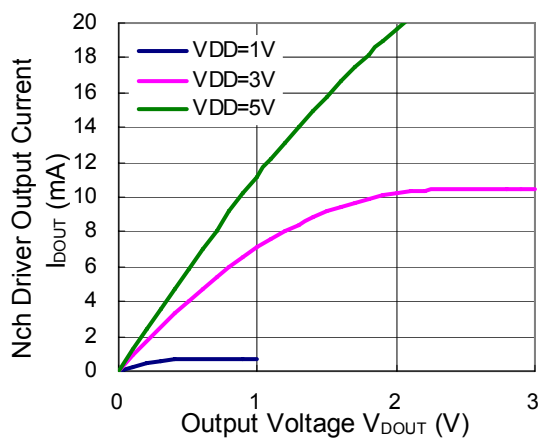
**7) Nch Driver Output Current vs. Supply Voltage**

**R3118xxxxA/C (V<sub>DOUT</sub>=0.4V)**



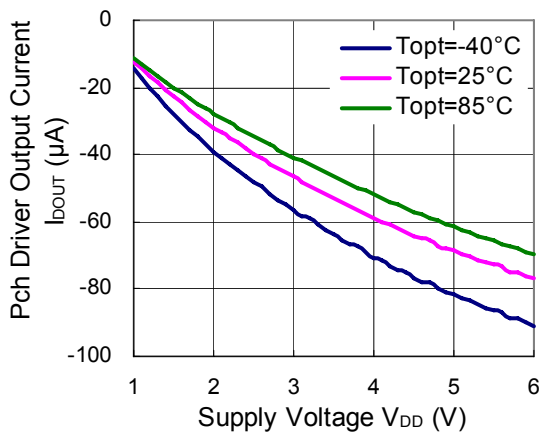
**8) Nch Driver Output Current vs. Output Voltage**

**R3118xxxxA/C**



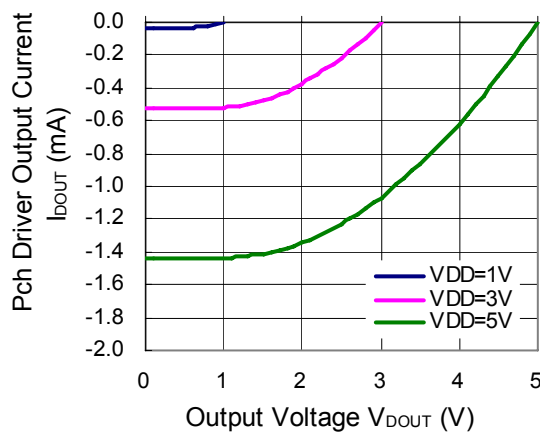
9) Pch Driver Output Current vs. Supply Voltage

R3118xxxxA/C ( $V_{DOUT}=V_{DD}-0.1V$ )



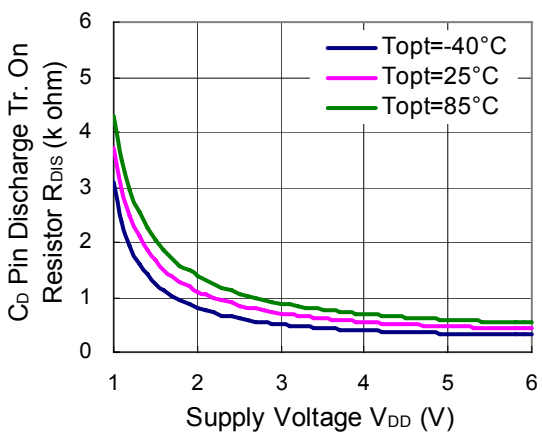
10) Pch Driver Output current vs. Output voltage

R3118xxxxA/C



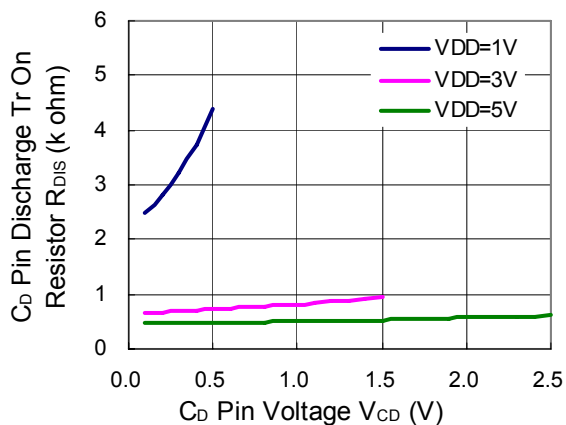
11) C<sub>D</sub> pin Discharge Tr. On Resistance vs. Supply Voltage

R3118xxxxA/C ( $V_{CD}=0.4V$ )



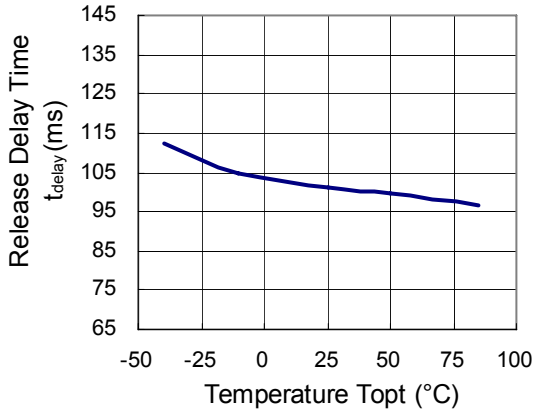
12) C<sub>D</sub> pin Discharge Transistor On Resistance vs. C<sub>D</sub> pin voltage

R3118xxxxA/C



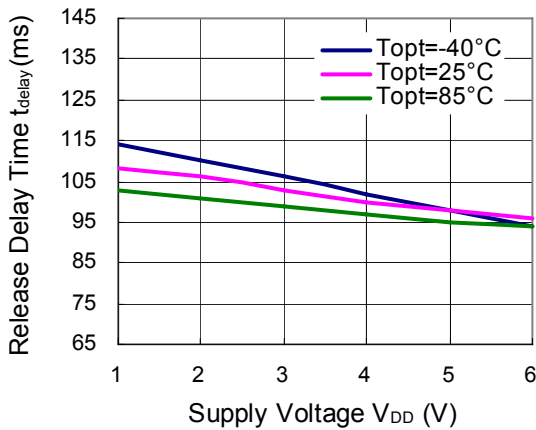
13) Release Output Delay Time vs. Temperature

R3118xxxxA/C ( $V_{DD}=4V$ ,  $C_D=0.022\mu F$ )



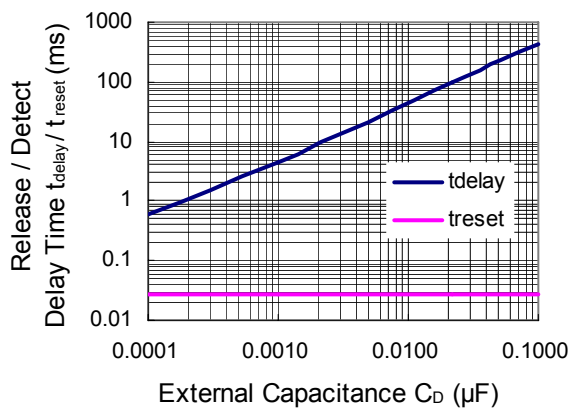
14) Release Output Delay Time vs. Supply Voltage

R3118xxxxA/C ( $C_D=0.022\mu F$ )



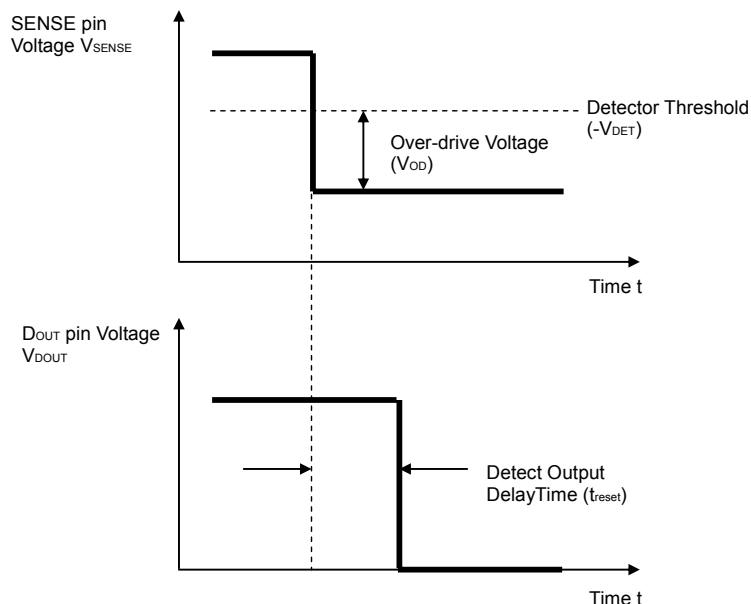
15) Detect Output Delay Time/Release Output Delay Time vs.  $C_D$  pin External Capacitance

R3118xxxxA/C ( $V_{DD}=4V$ )

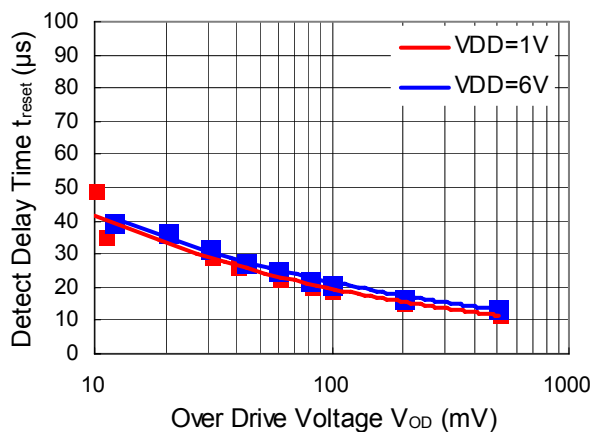




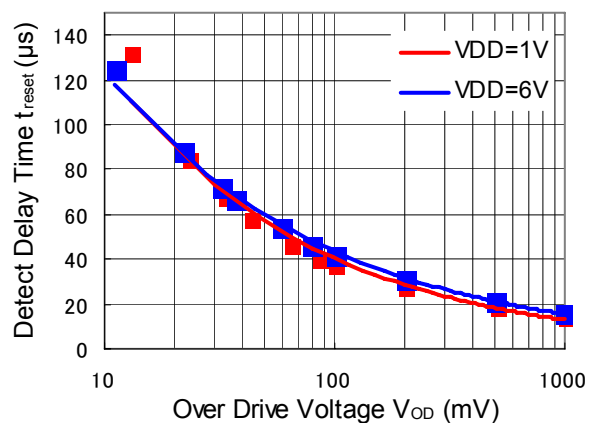
16) Detect Output Delay time vs. Over-drive Voltage



R3118x06xA/C ( $C_D=none$ )

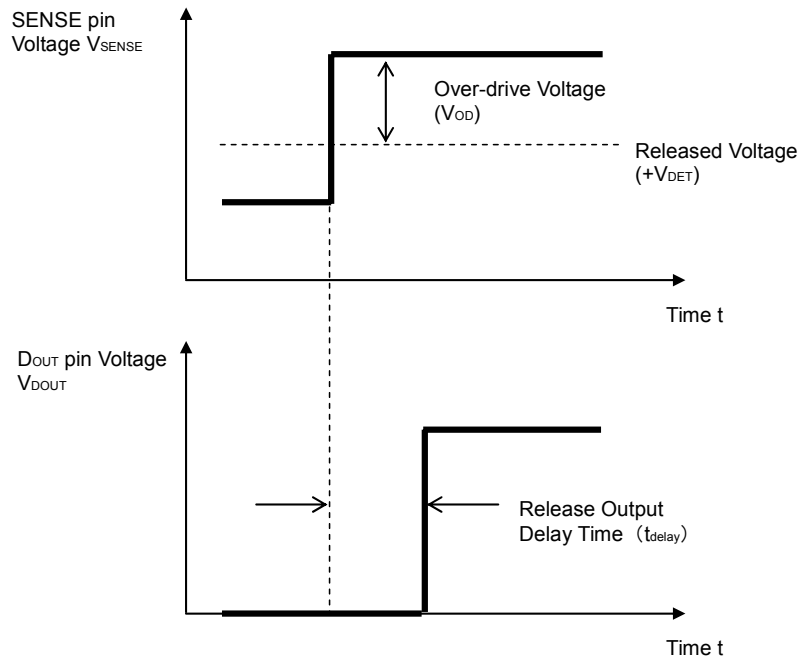


R3118x50xA/C ( $C_D=none$ )

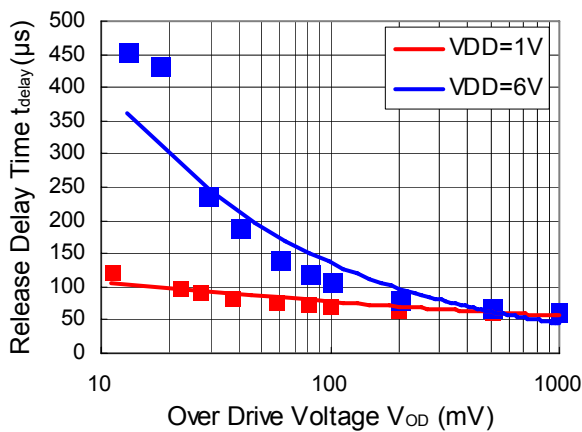


The pulse shorter than the detect output delay time cannot be detected, and "L" does not output from D\_OUT pin.

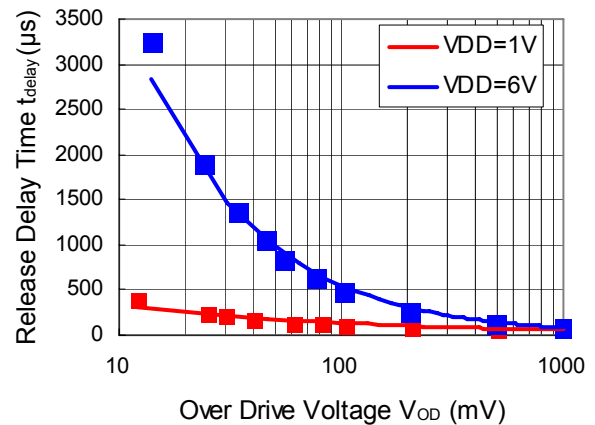
17) Release Output Delay time vs. Over-drive Voltage



R3118x06xA/C ( $C_D$ =none)



R3118x50xA/C ( $C_D$ =none)



· If the pulse is shorter than the output release delay time, the R3118 cannot be released and "H" does not output from  $D_{OUT}$  pin.

· If the attachment capacitor for  $C_D$  pin for setting a delay time is too small and the difference between the released voltage threshold and the actual released voltage is too small or the slope for rising voltage of the SENSE pin is too slow, the output delay time tolerance will be worse.

Ex. Attachment capacitor=0.0001 $\mu$ F, Released voltage threshold=4.725V, Actual released voltage=4.75V In this case, the calculated delay time=0.4545ms, however, over-drive voltage is only 25mV. Therefore, the actual delay time will be approximately 2.4545ms. If the attachment capacitor=0.001 $\mu$ F and other conditions are same as above, the calculated delay time=4.545ms, and the actual delay time will be approximately 6.545ms. If the attachment capacitor=0.01 $\mu$ F and other conditions are same as above, the calculated delay time=45.45ms, and the actual delay time will be approximately 47.45ms.



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**RICOH ELECTRONIC DEVICES CO., LTD.**

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Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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