



\* R3111E (TO-92) is the discontinued product as of

# RICOH

## R3111x SERIES

### LOW VOLTAGE DETECTOR

NO.EA-056-170428

### OUTLINE

The R3111x 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.

Three output types, Nch open drain "L" type, Nch open drain "H" type and CMOS type are available.

The R3111x Series are operable at a lower voltage than that for the Rx5VL series, and can be driven by a single battery.

Seven types of packages, TO-92, SOT-89, SOT-23-3, SOT-23-5, SC-82AB, SC-88A and SON1612-6 are available.

### FEATURES

- Supply Current ..... Typ. 0.8 $\mu$ A ( $-V_{DET}=1.5V, V_{DD}=-V_{DET}-0.1V$ )
- Operating Voltage Range..... 0.7V to 10.0V ( $T_a=25^{\circ}C$ )
- Detector Threshold Range..... 0.9V to 6.0V (0.1V steps)  
(For other voltages, please refer to MARK INFORMATIONS.)
- Detector Threshold Accuracy.....  $\pm 2.0\%$
- Temperature-Drift Coefficient of Detector Threshold ..... Typ.  $\pm 100ppm/^{\circ}C$
- Output Types..... Nch Open Drain "L", Nch Open Drain "H", and CMOS
- Packages ..... SON1612-6, SC-82AB, SC-88A, SOT-23-3, SOT-23-5, SOT-89, TO-92

### APPLICATIONS

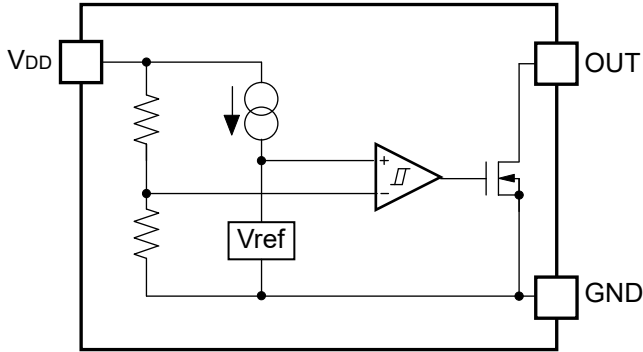
- CPU and Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-up Circuit
- Power Failure Detector

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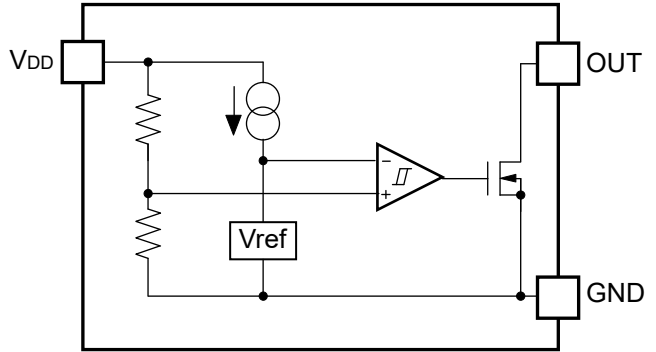
## R3111x

### BLOCK DIAGRAMS

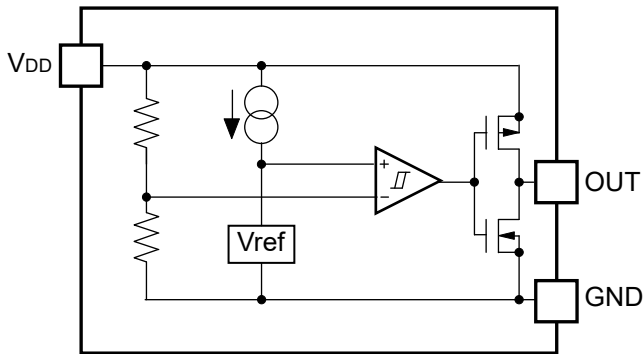
R3111xxxxA



R3111xxxxB



R3111xxxxC



## 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. The selection can be made with designating the part number as shown below;

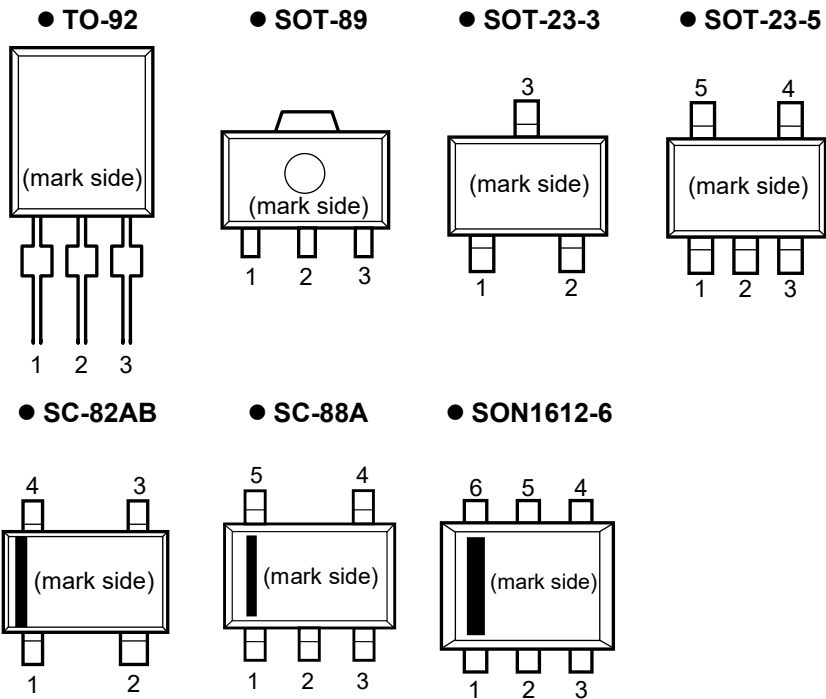
| Product Name      | Package   | Quantity per Reel | Pb Free | Halogen Free |
|-------------------|-----------|-------------------|---------|--------------|
| R3111Dxx1*-TR-FE  | SON1612-6 | 4,000 pcs         | Yes     | Yes          |
| R3111Qxx1*-TR-FE  | SC-82AB   | 3,000 pcs         | Yes     | Yes          |
| R3111Qxx2*-TR-FE  | SC-88A    | 3,000 pcs         | Yes     | Yes          |
| R3111Nxx1*-TR-FE  | SOT-23-5  | 3,000 pcs         | Yes     | Yes          |
| R3111Nxx2\$-TR-FE | SOT-23-3  | 3,000 pcs         | Yes     | Yes          |
| R3111Hxx1\$-T1-FE | SOT-89    | 1,000 pcs         | Yes     | Yes          |
| R3111Exx1\$-TZ-F  | TO-92     | 2,500 pcs         | Yes     | No           |

xx: The detector threshold can be designated in the range from 0.9V(09) to 6.0V(60) in 0.1V steps.  
(For other voltages, please refer to MARK INFORMATIONS.)

\* : Designation of Output Type  
(A) Nch Open Drain (Output "L" at Detection)  
(B) Nch Open Drain (Output "H" at Detection)  
(C) CMOS (Output "L" at Detection)

\$ : Designation of Output Type  
(A) Nch Open Drain (Output "L" at Detection)  
(C) CMOS (Output "L" at Detection)

## PIN CONFIGURATIONS



## PIN DESCRIPTIONS

### ● TO-92

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | V <sub>DD</sub> |
| 2       | GND             |
| 3       | OUT             |

### ● SOT-89

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2       | V <sub>DD</sub> |
| 3       | GND             |

### ● SOT-23-3

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2       | GND             |
| 3       | V <sub>DD</sub> |

### ● SOT-23-5

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2       | V <sub>DD</sub> |
| 3       | GND             |
| 4       | NC              |
| 5       | NC              |

### ● SC-82AB

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2       | V <sub>DD</sub> |
| 3       | NC              |
| 4       | GND             |

### ● SC-88A

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2*      | NC              |
| 3       | V <sub>DD</sub> |
| 4       | NC              |
| 5       | GND             |

### ● SON1612-6

| Pin No. | Symbol          |
|---------|-----------------|
| 1       | OUT             |
| 2       | V <sub>DD</sub> |
| 3       | GND             |
| 4       | NC              |
| 5       | V <sub>DD</sub> |
| 6       | NC              |

\* Pin No. 2 is connected to the bottom of the IC. It is recommended that the pin be connected to the V<sub>DD</sub> pin on the board, or otherwise be left floating so that there is no contact with other potentials.

**ABSOLUTE MAXIMUM RATINGS**

| 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    |
|           | Output Voltage (Nch)           | $V_{SS}-0.3$ to 12           |      |
| $I_{OUT}$ | Output Current                 | 70                           | mA   |
| $P_D$     | Power Dissipation (TO-92)*     | 300                          | mW   |
|           | Power Dissipation (SOT-89)*    | 900                          |      |
|           | Power Dissipation (SOT-23-3)*  | 420                          |      |
|           | Power Dissipation (SOT-23-5)*  | 420                          |      |
|           | Power Dissipation (SC-82AB)*   | 380                          |      |
|           | Power Dissipation (SC-88A)*    | 380                          |      |
|           | Power Dissipation (SON1612-6)* | 500                          |      |
| $T_a$     | Operating Temperature Range    | -40 to 85                    | °C   |
| $T_{stg}$ | 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.

## R3111x

# ELECTRICAL CHARACTERISTICS

### • R3111xxxxA

Ta=25°C

| Symbol                             | Item                                       | Conditions                              |                              | Min.                        | Typ.                        | Max.                        | Unit                    |
|------------------------------------|--|---|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------|
| $-V_{DET}$                         | Detector Threshold                         |   |                              | $-V_{DET}$<br>$\times 0.98$ |                             | $-V_{DET}$<br>$\times 1.02$ | V                       |
| $V_{HYS}$                          | Detector Threshold Hysteresis              |   |                              | $-V_{DET}$<br>$\times 0.03$ | $-V_{DET}$<br>$\times 0.05$ | $-V_{DET}$<br>$\times 0.07$ | V                       |
| $I_{SS}$                           | Supply Current                             | $0.9V \leq -V_{DET} < 2.0V$             | $V_{DD}=-V_{DET} -0.10V$     |                             | 0.8                         | 2.4                         | $\mu A$                 |
|                                    |  |   | $V_{DD}=-V_{DET} +2.0V$      |                             | 1.0                         | 3.0                         |                         |
|                                    |  | $2.0V \leq -V_{DET} < 3.0V$             | $V_{DD}=-V_{DET} -0.10V$     |                             | 0.9                         | 2.7                         |                         |
|                                    |  |   | $V_{DD}=-V_{DET} +2.0V$      |                             | 1.1                         | 3.3                         |                         |
|                                    |  | $3.0V \leq -V_{DET} < 4.0V$             | $V_{DD}=-V_{DET} -0.13V$     |                             | 1.0                         | 3.0                         |                         |
|                                    |  |   | $V_{DD}=-V_{DET} +2.0V$      |                             | 1.2                         | 3.6                         |                         |
|                                    |  | $4.0V \leq -V_{DET} < 5.0V$             | $V_{DD}=-V_{DET} -0.16V$     |                             | 1.1                         | 3.3                         |                         |
|                                    |  |   | $V_{DD}=-V_{DET} +2.0V$      |                             | 1.3                         | 3.9                         |                         |
| $5.0V \leq -V_{DET} \leq 6.0V$     | $V_{DD}=-V_{DET} -0.20V$                   |   | 1.2                          | 3.6                         |                             |                             |                         |
|                                    | $V_{DD}=-V_{DET} +2.0V$                    |   | 1.4                          | 4.2                         |                             |                             |                         |
| $V_{DDH}$                          | Maximum Operating Voltage                  |   |                              |                             |                             | 10                          | V                       |
| $V_{DDL}$                          | Minimum Operating Voltage*1                | Ta=25°C                                 |                              |                             | 0.55                        | 0.70                        | V                       |
|                                    |  | $-40^{\circ}C \leq Ta \leq 85^{\circ}C$ |                              |                             | 0.65                        | 0.80                        |                         |
| $I_{OUT}$                          | Output Current (Driver Output Pin)         | Nch                                     | $V_{DS}=0.05V, V_{DD}=0.70V$ |                             | 0.01                        | 0.05                        | $mA$                    |
|                                    |  |   | $0.9V \leq -V_{DET} < 1.1V$  | $V_{DS}=0.50V$              | 0.05                        | 0.5                         |                         |
|                                    |  |   |                              | $V_{DD}=0.85V$              |                             |                             |                         |
|                                    |  |   | $1.1V \leq -V_{DET} < 1.6V$  | $V_{DS}=0.50V$              | 0.2                         | 1.0                         |                         |
| $V_{DD}=1.00V$                     |  |   |                              |                             |                             |                             |                         |
| $1.6V \leq -V_{DET} \leq 6.0V$     | $V_{DS}=0.50V$                             | 1.0                                     | 2.0                          |                             |                             |                             |                         |
|                                    | $V_{DD}=1.50V$                             |   |                              |                             |                             |                             |                         |
| $t_{PLH}$                          | Output Delay Time*2                        |   |                              |                             |                             | 100                         | $\mu s$                 |
| $\frac{\Delta-V_{DET}}{\Delta Ta}$ | Detector Threshold Temperature Coefficient | $-40^{\circ}C \leq Ta \leq 85^{\circ}C$ |                              |                             | $\pm 100$                   |                             | $\frac{ppm}{^{\circ}C}$ |

\*1: Minimum operating voltage means the value of input voltage when output voltage maintains 0.1V or less. (In the case of the output pin is pulled up with a resistance of 470k $\Omega$  to 5.0V.)

\*2: The output pin is pulled up with a resistance of 470k $\Omega$  to 5.0V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7V to  $(+V_{DET}) + \square 2.0V$  and output voltage level becoming to 2.5V.

\* R3111E (TO-92) is the discontinued product as of April, 2017.

**R3111x**

● R3111xxxxB

Ta=25°C

| Symbol                              | Item                                       | Conditions                              |                                 | Min.                        | Typ.                        | Max.                        | Unit             |
|-------------------------------------|--|---|---------------------------------|-----------------------------|-----------------------------|-----------------------------|------------------|
| $-V_{DET}$                          | Detector Threshold                         |   |                                 | $-V_{DET}$<br>$\times 0.98$ |                             | $-V_{DET}$<br>$\times 1.02$ | V                |
| $V_{HYS}$                           | Detector Threshold Hysteresis              |   |                                 | $-V_{DET}$<br>$\times 0.03$ | $-V_{DET}$<br>$\times 0.05$ | $-V_{DET}$<br>$\times 0.07$ | V                |
| $I_{SS}$                            | Supply Current                             | $0.9V \leq -V_{DET} < 2.0V$             | $V_{DD} = -V_{DET} - 0.10V$     |                             | 0.8                         | 2.4                         | $\mu A$          |
|                                     |  |   | $V_{DD} = -V_{DET} + 2.0V$      |                             | 1.0                         | 3.0                         |                  |
|                                     |  | $2.0V \leq -V_{DET} < 3.0V$             | $V_{DD} = -V_{DET} - 0.10V$     |                             | 0.9                         | 2.7                         |                  |
|                                     |  |   | $V_{DD} = -V_{DET} + 2.0V$      |                             | 1.1                         | 3.3                         |                  |
|                                     |  | $3.0V \leq -V_{DET} < 4.0V$             | $V_{DD} = -V_{DET} - 0.13V$     |                             | 1.0                         | 3.0                         |                  |
|                                     |  |   | $V_{DD} = -V_{DET} + 2.0V$      |                             | 1.2                         | 3.6                         |                  |
|                                     |  | $4.0V \leq -V_{DET} < 5.0V$             | $V_{DD} = -V_{DET} - 0.16V$     |                             | 1.1                         | 3.3                         |                  |
|                                     |  |   | $V_{DD} = -V_{DET} + 2.0V$      |                             | 1.3                         | 3.9                         |                  |
| $5.0V \leq -V_{DET} \leq 6.0V$      | $V_{DD} = -V_{DET} - 0.20V$                |   | 1.2                             | 3.6                         |                             |                             |                  |
|                                     | $V_{DD} = -V_{DET} + 2.0V$                 |   | 1.4                             | 4.2                         |                             |                             |                  |
| $V_{DDH}$                           | Maximum Operating Voltage                  |   |                                 |                             |                             | 10                          | V                |
| $V_{DDL}$                           | Minimum Operating Voltage*1                | Ta=25°C                                 |                                 |                             | 0.55                        | 0.70                        | V                |
|                                     |  | $-40^{\circ}C \leq Ta \leq 85^{\circ}C$ |                                 |                             | 0.65                        | 0.80                        |                  |
| $I_{OUT}$                           | Output Current (Driver Output Pin)         | Nch                                     | $V_{DS} = 0.10V, V_{DD} = 6.5V$ | 2.5                         |                             |                             | mA               |
| $t_{PLH}$                           | Output Delay Time*2                        |   |                                 |                             |                             | 100                         | $\mu s$          |
| $\frac{\Delta -V_{DET}}{\Delta Ta}$ | Detector Threshold Temperature Coefficient | $-40^{\circ}C \leq Ta \leq 85^{\circ}C$ |                                 |                             | $\pm 100$                   |                             | ppm/ $^{\circ}C$ |

\*1: Minimum operating voltage means the value of input voltage when output voltage maintains 0.1V or less. (In the case of the output pin is pulled up with a resistance of 470k $\Omega$  to 5.0V.)

\*2: The output pin is pulled up with a resistance of 470k $\Omega$  to 5.0V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7V to  $(+V_{DET}) + \square 2.0V$  and output voltage level becoming to 2.5V.

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## R3111x

### • R3111xxxxC

Ta=25°C

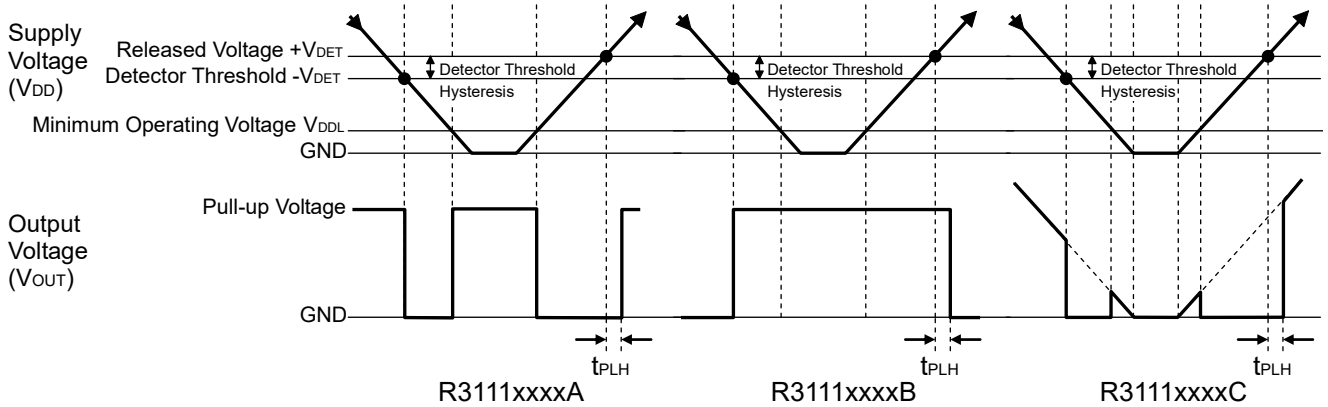
| Symbol                              | Item                                       | Conditions                            | Min.                             | Typ.                                 | Max.                   | Unit            |         |  |
|-------------------------------------|--|---------------------------------------|----------------------------------|--------------------------------------|------------------------|-----------------|---------|--|
| $-V_{DET}$                          | Detector Threshold                         |                                       | $-V_{DET} \times 0.98$           |                                      | $-V_{DET} \times 1.02$ | V               |         |  |
| $V_{HYS}$                           | Detector Threshold Hysteresis              |                                       | $-V_{DET} \times 0.03$           | $-V_{DET} \times 0.05$               | $-V_{DET} \times 0.07$ | V               |         |  |
| $I_{SS}$                            | Supply Current                             | $0.9V \leq -V_{DET} < 2.0V$           | $V_{DD} = -V_{DET} - 0.10V$      |                                      | 0.8                    | 2.4             | $\mu A$ |  |
|                                     |  |                                       | $V_{DD} = -V_{DET} + 2.0V$       |                                      | 1.0                    | 3.0             |         |  |
|                                     |  | $2.0V \leq -V_{DET} < 3.0V$           | $V_{DD} = -V_{DET} - 0.10V$      |                                      | 0.9                    | 2.7             |         |  |
|                                     |  |                                       | $V_{DD} = -V_{DET} + 2.0V$       |                                      | 1.1                    | 3.3             |         |  |
|                                     |  | $3.0V \leq -V_{DET} < 4.0V$           | $V_{DD} = -V_{DET} - 0.13V$      |                                      | 1.0                    | 3.0             |         |  |
|                                     |  |                                       | $V_{DD} = -V_{DET} + 2.0V$       |                                      | 1.2                    | 3.6             |         |  |
|                                     |  | $4.0V \leq -V_{DET} < 5.0V$           | $V_{DD} = -V_{DET} - 0.16V$      |                                      | 1.1                    | 3.3             |         |  |
|                                     |  |                                       | $V_{DD} = -V_{DET} + 2.0V$       |                                      | 1.3                    | 3.9             |         |  |
| $5.0V \leq -V_{DET} \leq 6.0V$      | $V_{DD} = -V_{DET} - 0.20V$                |                                       | 1.2                              | 3.6                                  |                        |                 |         |  |
|                                     | $V_{DD} = -V_{DET} + 2.0V$                 |                                       | 1.4                              | 4.2                                  |                        |                 |         |  |
| $V_{DDH}$                           | Maximum Operating Voltage                  |                                       |                                  |                                      | 10                     | V               |         |  |
| $V_{DDL}$                           | Minimum Operating Voltage*1                | Ta=25°C                               |                                  | 0.55                                 | 0.70                   | V               |         |  |
|                                     |  | $-40^\circ C \leq Ta \leq 85^\circ C$ |                                  | 0.65                                 | 0.80                   |                 |         |  |
| $I_{OUT}$                           | Output Current (Driver Output Pin)         | Nch                                   | $V_{DS} = 0.05V, V_{DD} = 0.70V$ | 0.01                                 | 0.05                   | $mA$            |         |  |
|                                     |  |                                       | $0.9V \leq -V_{DET} < 1.1V$      | $V_{DS} = 0.50V$<br>$V_{DD} = 0.85V$ | 0.05                   |                 | 0.5     |  |
|                                     |  |                                       | $1.1V \leq -V_{DET} < 1.6V$      | $V_{DS} = 0.50V$<br>$V_{DD} = 1.00V$ | 0.2                    |                 | 1.0     |  |
|                                     |  |                                       | $1.6V \leq -V_{DET} \leq 6.0V$   | $V_{DS} = 0.50V$<br>$V_{DD} = 1.50V$ | 1.0                    |                 | 2.0     |  |
|                                     |  | Pch                                   | $0.9V \leq -V_{DET} < 4.0V$      | $V_{DS} = -2.1V$<br>$V_{DD} = 4.5V$  | 1.0                    | 2.0             | $mA$    |  |
|                                     |  |                                       | $4.0V \leq -V_{DET} \leq 6.0V$   | $V_{DS} = -2.1V$<br>$V_{DD} = 8.0V$  | 1.5                    | 3.0             |         |  |
| $t_{PLH}$                           | Output Delay Time*2                        |                                       |                                  |                                      | 100                    | $\mu s$         |         |  |
| $\frac{\Delta -V_{DET}}{\Delta Ta}$ | Detector Threshold Temperature Coefficient | $-40^\circ C \leq Ta \leq 85^\circ C$ |                                  | $\pm 100$                            |                        | ppm/ $^\circ C$ |         |  |

\*1: Minimum operating voltage means the value of input voltage when output voltage maintains 0.1V or less.

\*2: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7V to  $(+V_{DET}) + \square 2.0V$  and output voltage level becoming to  $((+V_{DET}) + 2.0V) / 2$ .



## TIMING CHART



## DEFINITION OF OUTPUT DELAY TIME

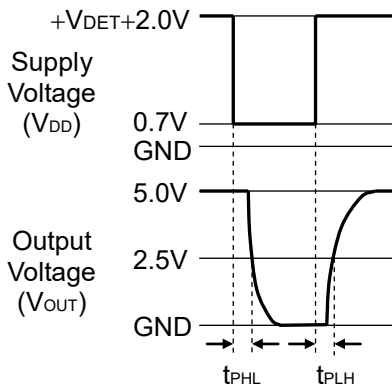
Output Delay Time ( $t_{PLH}$ ) is defined as follows:

1. In the case of Nch Open Drain Output:(R3111xxxxA/B)

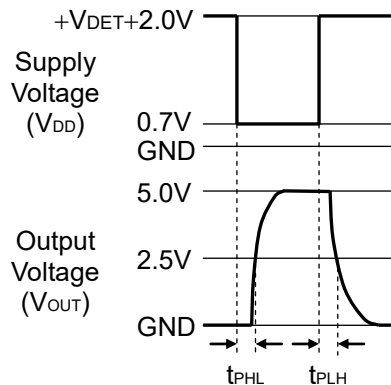
Under the condition of the output pin (OUT) is pulled up through a resistor of 470k $\Omega$  to 5V, the time interval between the rising edge of  $V_{DD}$  pulse from 0.7V to  $(+V_{DET})+2.0V$  and becoming of the output voltage to 2.5V.

2. In the case of CMOS Output:(R3111xxxxC)

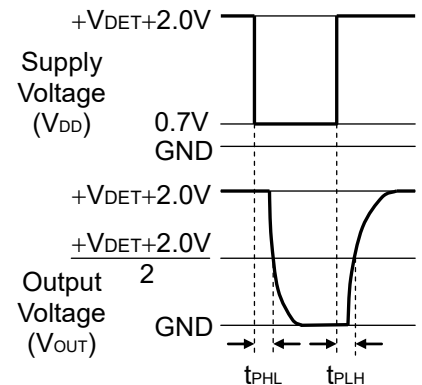
The time interval between the rising edge of  $V_{DD}$  pulse from 0.7V to  $(+V_{DET})+2.0V$  and becoming of the output voltage to  $((+V_{DET})+2.0V)/2$ .



Nch Open Drain Output  
(R3111xxxxA)



Nch Open Drain Output  
(R3111xxxxB)



CMOS Output  
(R3111xxxxC)

## R3111x

## ELECTRICAL CHARACTERISTICS BY DETECTOR THRESHOLD

## • R3111x09x to R3111x60x

| Part Number | Detector Threshold    |       |       | Detector Threshold Hysteresis |       |       | Supply Current 1                                    |      |      | Supply Current 2                                    |      |      |   |     |     |
|-------------|-----------------------|-------|-------|-------------------------------|-------|-------|---|------|------|---|------|------|---|-----|-----|
|             | -V <sub>DET</sub> [V] |       |       | V <sub>HYS</sub> [V]          |       |       | I <sub>SS1</sub> [μA]                               |      |      | I <sub>SS2</sub> [μA]                               |      |      |   |     |     |
|             | Min.                  | Typ.  | Max.  | Min.                          | Typ.  | Max.  | Condition   | Typ. | Max. | Condition   | Typ. | Max. |   |     |     |
| R3111x09xx  | 0.882                 | 0.900 | 0.918 | 0.027                         | 0.045 | 0.063 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.10V | 0.8  | 2.4  | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.10V | 0.9  | 2.7  |   |     |     |
| R3111x10xx  | 0.980                 | 1.000 | 1.020 | 0.030                         | 0.050 | 0.070 |   |      |      |   | 1.0  | 3.0  |   |     |     |
| R3111x11xx  | 1.078                 | 1.100 | 1.122 | 0.033                         | 0.055 | 0.077 |   |      |      |   | 0.9  | 2.7  | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.13V | 1.1 | 3.3 |
| R3111x12xx  | 1.176                 | 1.200 | 1.224 | 0.036                         | 0.060 | 0.084 |   |      |      |   |      |      |   |     |     |
| R3111x13xx  | 1.274                 | 1.300 | 1.326 | 0.039                         | 0.065 | 0.091 |   |      |      |   |      |      |   |     |     |
| R3111x14xx  | 1.372                 | 1.400 | 1.428 | 0.042                         | 0.070 | 0.098 |   |      |      |   |      |      |   |     |     |
| R3111x15xx  | 1.470                 | 1.500 | 1.530 | 0.045                         | 0.075 | 0.105 |   |      |      |   |      |      |   |     |     |
| R3111x16xx  | 1.568                 | 1.600 | 1.632 | 0.048                         | 0.080 | 0.112 |   |      |      |   |      |      |   |     |     |
| R3111x17xx  | 1.666                 | 1.700 | 1.734 | 0.051                         | 0.085 | 0.119 |   |      |      |   |      |      |   |     |     |
| R3111x18xx  | 1.764                 | 1.800 | 1.836 | 0.054                         | 0.090 | 0.126 |   |      |      |   |      |      |   |     |     |
| R3111x19xx  | 1.862                 | 1.900 | 1.938 | 0.057                         | 0.095 | 0.133 |   |      |      |   |      |      |   |     |     |
| R3111x20xx  | 1.960                 | 2.000 | 2.040 | 0.060                         | 0.100 | 0.140 |   |      |      |   |      |      |   |     |     |
| R3111x21xx  | 2.058                 | 2.100 | 2.142 | 0.063                         | 0.105 | 0.147 |   |      |      |   |      |      |   |     |     |
| R3111x22xx  | 2.156                 | 2.200 | 2.244 | 0.066                         | 0.110 | 0.154 |   |      |      |   |      |      |   |     |     |
| R3111x23xx  | 2.254                 | 2.300 | 2.346 | 0.069                         | 0.115 | 0.161 |   |      |      |   |      |      |   |     |     |
| R3111x24xx  | 2.352                 | 2.400 | 2.448 | 0.072                         | 0.120 | 0.168 |   |      |      |   |      |      |   |     |     |
| R3111x25xx  | 2.450                 | 2.500 | 2.550 | 0.075                         | 0.125 | 0.175 |   |      |      |   |      |      |   |     |     |
| R3111x26xx  | 2.548                 | 2.600 | 2.652 | 0.078                         | 0.130 | 0.182 |   |      |      |   |      |      |   |     |     |
| R3111x27xx  | 2.646                 | 2.700 | 2.754 | 0.081                         | 0.135 | 0.189 |   |      |      |   |      |      |   |     |     |
| R3111x28xx  | 2.744                 | 2.800 | 2.856 | 0.084                         | 0.140 | 0.196 |   |      |      |   |      |      |   |     |     |
| R3111x29xx  | 2.842                 | 2.900 | 2.958 | 0.087                         | 0.145 | 0.203 |   |      |      |   |      |      |   |     |     |
| R3111x30xx  | 2.940                 | 3.000 | 3.060 | 0.090                         | 0.150 | 0.210 |   |      |      |   |      |      |   |     |     |
| R3111x31xx  | 3.038                 | 3.100 | 3.162 | 0.093                         | 0.155 | 0.217 |   |      |      |   |      |      |   |     |     |
| R3111x32xx  | 3.136                 | 3.200 | 3.264 | 0.096                         | 0.160 | 0.224 |   |      |      |   |      |      |   |     |     |
| R3111x33xx  | 3.234                 | 3.300 | 3.366 | 0.099                         | 0.165 | 0.231 |   |      |      |   |      |      |   |     |     |
| R3111x34xx  | 3.332                 | 3.400 | 3.468 | 0.102                         | 0.170 | 0.238 |   |      |      |   |      |      |   |     |     |
| R3111x35xx  | 3.430                 | 3.500 | 3.570 | 0.105                         | 0.175 | 0.245 |   |      |      |   |      |      |   |     |     |
| R3111x36xx  | 3.528                 | 3.600 | 3.672 | 0.108                         | 0.180 | 0.252 |   |      |      |   |      |      |   |     |     |
| R3111x37xx  | 3.626                 | 3.700 | 3.774 | 0.111                         | 0.185 | 0.259 |   |      |      |   |      |      |   |     |     |
| R3111x38xx  | 3.724                 | 3.800 | 3.876 | 0.114                         | 0.190 | 0.266 |   |      |      |   |      |      |   |     |     |
| R3111x39xx  | 3.822                 | 3.900 | 3.978 | 0.117                         | 0.195 | 0.273 |   |      |      |   |      |      |   |     |     |
| R3111x40xx  | 3.920                 | 4.000 | 4.080 | 0.120                         | 0.200 | 0.280 |   |      |      |   |      |      |   |     |     |
| R3111x41xx  | 4.018                 | 4.100 | 4.182 | 0.123                         | 0.205 | 0.287 |   |      |      |   |      |      |   |     |     |
| R3111x42xx  | 4.116                 | 4.200 | 4.284 | 0.126                         | 0.210 | 0.294 |   |      |      |   |      |      |   |     |     |
| R3111x43xx  | 4.214                 | 4.300 | 4.386 | 0.129                         | 0.215 | 0.301 |   |      |      |   |      |      |   |     |     |
| R3111x44xx  | 4.312                 | 4.400 | 4.488 | 0.132                         | 0.220 | 0.308 |   |      |      |   |      |      |   |     |     |
| R3111x45xx  | 4.410                 | 4.500 | 4.590 | 0.135                         | 0.225 | 0.315 |   |      |      |   |      |      |   |     |     |
| R3111x46xx  | 4.508                 | 4.600 | 4.692 | 0.138                         | 0.230 | 0.322 |   |      |      |   |      |      |   |     |     |
| R3111x47xx  | 4.606                 | 4.700 | 4.794 | 0.141                         | 0.235 | 0.329 |   |      |      |   |      |      |   |     |     |
| R3111x48xx  | 4.704                 | 4.800 | 4.896 | 0.144                         | 0.240 | 0.336 |   |      |      |   |      |      |   |     |     |
| R3111x49xx  | 4.802                 | 4.900 | 4.998 | 0.147                         | 0.245 | 0.343 |   |      |      |   |      |      |   |     |     |
| R3111x50xx  | 4.900                 | 5.000 | 5.100 | 0.150                         | 0.250 | 0.350 |   |      |      |   |      |      |   |     |     |
| R3111x51xx  | 4.998                 | 5.100 | 5.202 | 0.153                         | 0.255 | 0.357 |   |      |      |   |      |      |   |     |     |
| R3111x52xx  | 5.096                 | 5.200 | 5.304 | 0.156                         | 0.260 | 0.364 |   |      |      |   |      |      |   |     |     |
| R3111x53xx  | 5.194                 | 5.300 | 5.406 | 0.159                         | 0.265 | 0.371 |   |      |      |   |      |      |   |     |     |
| R3111x54xx  | 5.292                 | 5.400 | 5.508 | 0.162                         | 0.270 | 0.378 |   |      |      |   |      |      |   |     |     |
| R3111x55xx  | 5.390                 | 5.500 | 5.610 | 0.165                         | 0.275 | 0.385 |   |      |      |   |      |      |   |     |     |
| R3111x56xx  | 5.488                 | 5.600 | 5.712 | 0.168                         | 0.280 | 0.392 |   |      |      |   |      |      |   |     |     |
| R3111x57xx  | 5.586                 | 5.700 | 5.814 | 0.171                         | 0.285 | 0.399 |   |      |      |   |      |      |   |     |     |
| R3111x58xx  | 5.684                 | 5.800 | 5.916 | 0.174                         | 0.290 | 0.406 |   |      |      |   |      |      |   |     |     |
| R3111x59xx  | 5.782                 | 5.900 | 6.018 | 0.177                         | 0.295 | 0.413 |   |      |      |   |      |      |   |     |     |
| R3111x60xx  | 5.880                 | 6.000 | 6.120 | 0.180                         | 0.300 | 0.420 |   |      |      |   |      |      |   |     |     |

\*1) In the case of CMOS output type; when the voltage is forced to V<sub>DD</sub> from 0.7V to (+V<sub>DET</sub>)+2.0V, time interval between the rising edge of V<sub>DD</sub> and the reaching point at ((+V<sub>DET</sub>)+2.0V)/2. In the case of Nch open drain output type : The output pin is pulled up to 5V through 470kΩ, and when the voltage is forced to V<sub>DD</sub> from 0.7V to (+V<sub>DET</sub>)+2.0V, time interval between the rising edge of V<sub>DD</sub> and the reaching point at ((+V<sub>DET</sub>)+2.0V)/2.

\*2) V<sub>DD</sub> 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 5V through 470kΩ resistor.

Condition 1: T<sub>a</sub>=25°C

Condition 2: -40°C ≤ T<sub>a</sub> ≤ 85°C

\* R3111E (TO-92) is the discontinued product as of April, 2017.

R3111x

| Output Current 1  |      |      | Output Current 2 *3              |                           |      | Output Delay Time     | Minimum Operating Voltage |  | Detector Threshold Temperature Coefficient       |                                     |      |
|---|------|------|----------------------------------|---------------------------|------|-----------------------|---------------------------|--|--|-------------------------------------|------|
| I <sub>OUT1</sub> [mA]  |      |      | I <sub>OUT2</sub> [mA]           |                           |      | t <sub>PLH</sub> [μs] | V <sub>DDL</sub> [V]      |  | Δ-V <sub>DET</sub> /ΔT <sub>a</sub> [ppm/°C]     |                                     |      |
| Condition   | Min. | Typ. | Condition                        | Min.                      | Typ. | Max.                  | Typ.                      | Max.   | Condition  | Typ.                                |      |
| <A/C version><br>Nch<br>V <sub>DS</sub> =0.05V<br>V <sub>DD</sub> =0.7V | 0.01 | 0.05 | V <sub>DD</sub> =<br>0.85V       | 0.05                      | 0.5  |                       |                           |  |  |                                     |      |
|   |      |      | V <sub>DD</sub> =<br>1.0V        | 0.2                       | 1.0  |                       |                           |  |  |                                     |      |
|   |      |      | Nch<br>V <sub>DS</sub> =<br>0.5V | V <sub>DD</sub> =<br>1.5V | 1.0  | 2.0                   | 100 *1                    | *2<br>Condition 1<br>0.55<br>Condition 2<br>0.65 | *2<br>Condition 1<br>0.70<br>Condition 2<br>0.80 | -40°C ≦<br>T <sub>a</sub><br>≦ 85°C | ±100 |
| <B version><br>Nch<br>V <sub>DS</sub> =0.10V<br>V <sub>DD</sub> =6.5V   | 2.5  | -    |                                  |                           |      |                       |                           |  |  |                                     |      |

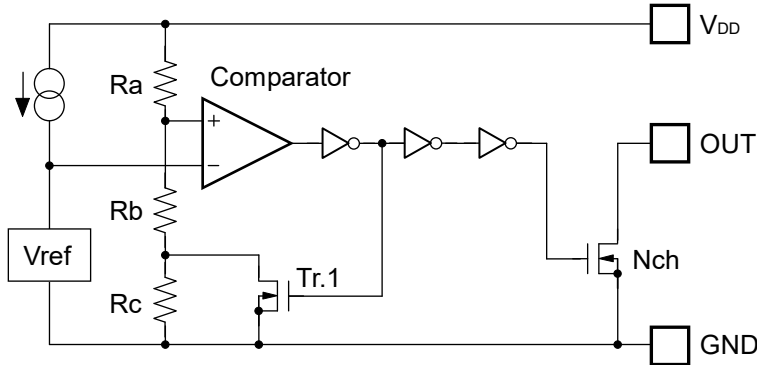
\*3) Only A/C versions.

**RICOH**

**R3111x**

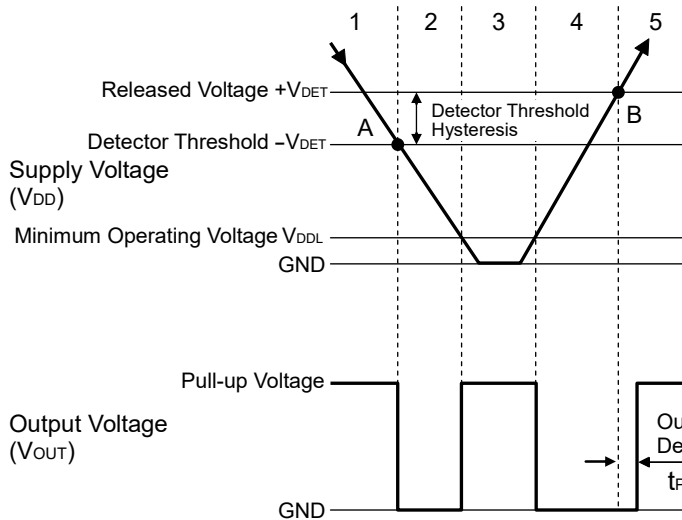
**OPERATION**

• **Operation of R3111xxxxA**



OUT pin should be pulled-up to V<sub>DD</sub> or an external voltage level.

**Block Diagram (R3111xxxxA)**



| Step                             | 1   | 2  | 3          | 4  | 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. Nch                   | OFF | ON | Indefinite | ON | OFF |

$$I \quad \frac{R_b+R_c}{R_a+R_b+R_c} \times V_{DD}$$

$$II \quad \frac{R_b}{R_a+R_b} \times V_{DD}$$

**Operation Diagram**

• **Explanation of operation**

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

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

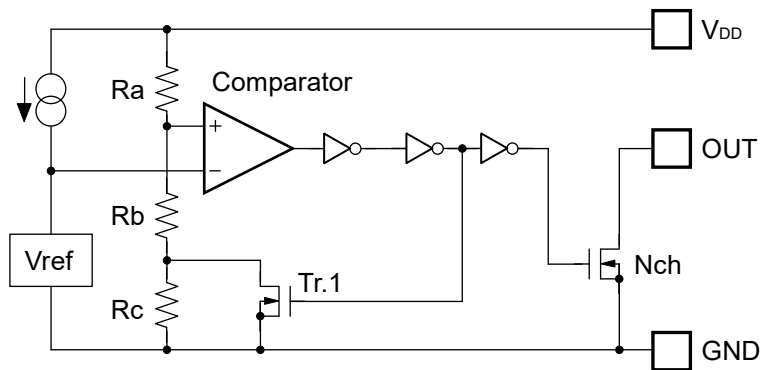
Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite. The output voltage is equal to the pull-up voltage.

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

Step 5. At Point "B",  $V_{ref} \leq V_{DD} \times R_b / (R_a+R_b)$  is true, as a result, the output of comparator is reversed from "L" to "H", then the output voltage is equal to the pull-up voltage. The voltage level of Point B means a released voltage ( $+V_{DET}$ ).

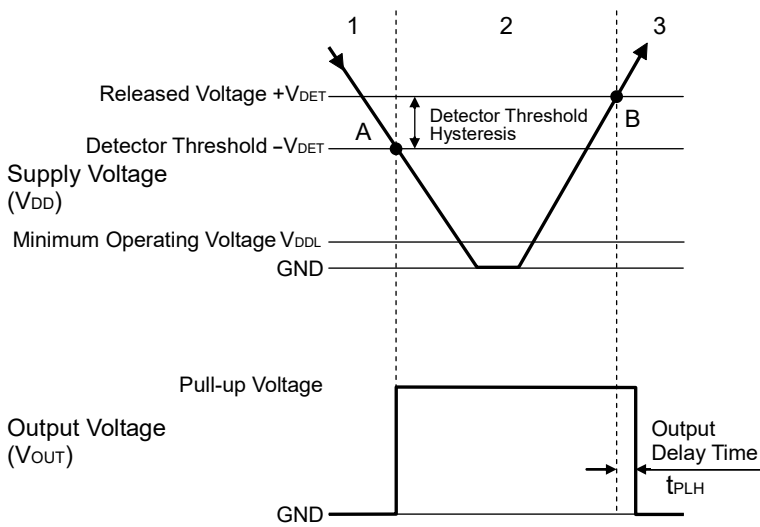
\*) The difference between a released voltage and a detector threshold voltage is a detector threshold hysteresis.

• Operation of R3111xxxxB



OUT pin should be pulled-up to V<sub>DD</sub> or an external voltage level.

Block Diagram (R3111xxxxB)



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

$$I \quad \frac{R_b+R_c}{R_a+R_b+R_c} \times V_{DD}$$

$$II \quad \frac{R_b}{R_a+R_b} \times V_{DD}$$

Operation Diagram

• Explanation of operation

Step 1. The output voltage is equal to the GND level.

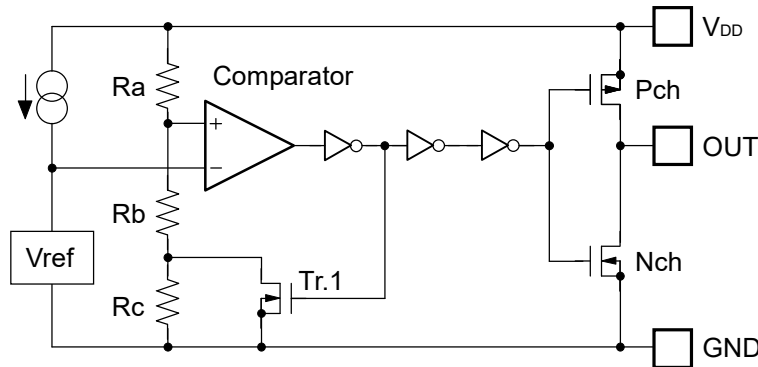
Step 2. At Point "A",  $V_{ref} \geq V_{DD} \times (R_b+R_c)/(R_a+R_b+R_c)$  is true, as a result, the output of comparator is reversed from "L" to "H", therefore the output voltage becomes the pull-up voltage. The voltage level of Point A means a detector threshold voltage ( $-V_{DET}$ ).

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

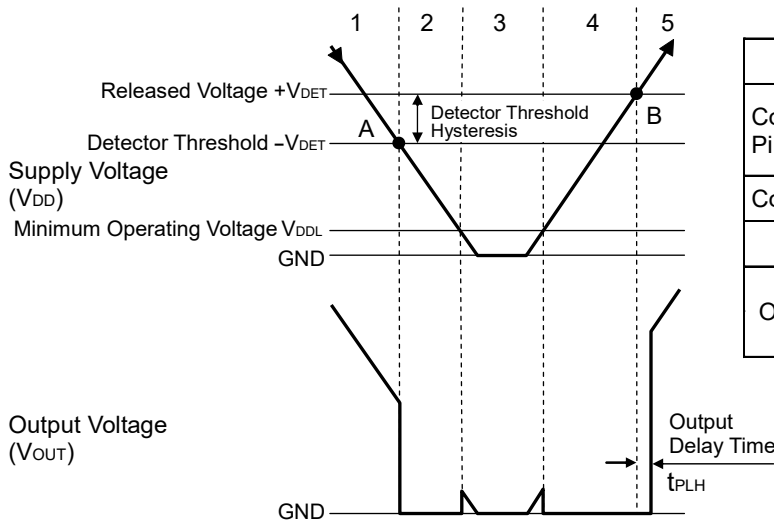
\*) The difference between a released voltage and a detector threshold voltage is a detector threshold hysteresis.

**R3111x**

• **Operation of R3111xxxxC**



**Block Diagram (R3111xxxxC)**



| Step                             | 1   | 2   | 3          | 4          | 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 |

$$I \quad \frac{R_b+R_c}{R_a+R_b+R_c} \times V_{DD}$$

$$II \quad \frac{R_b}{R_a+R_b} \times V_{DD}$$

**Operation Diagram**

• **Explanation of operation**

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

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

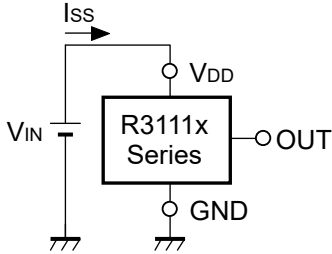
Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite.

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

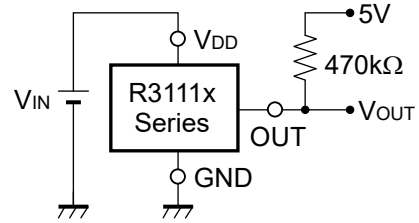
Step 5. At Point "B",  $V_{ref} \leq V_{DD} \times R_b/(R_a+R_b)$  is true, as a result, the output of comparator is reversed from "L" to "H", then the output voltage is equal to the supply voltage ( $V_{DD}$ ). The voltage level of Point B means a released voltage ( $+V_{DET}$ ).

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

## TEST CIRCUITS

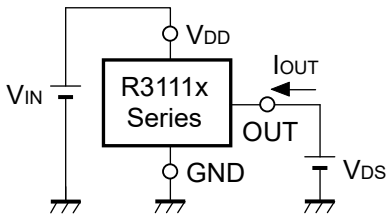


**Supply Current Test Circuit**

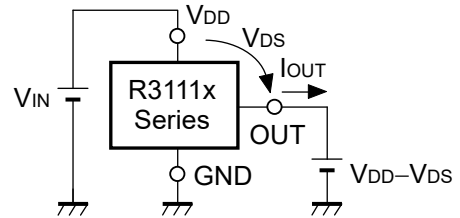


**Detector Threshold Test Circuit**

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

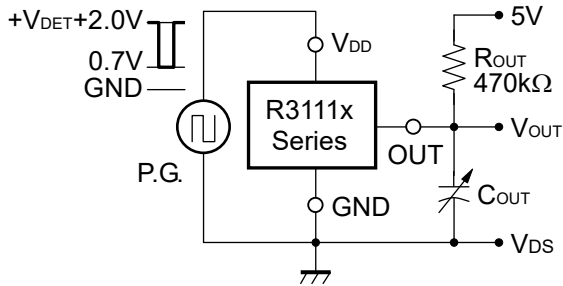


**Nch Driver Output Current Test Circuit**



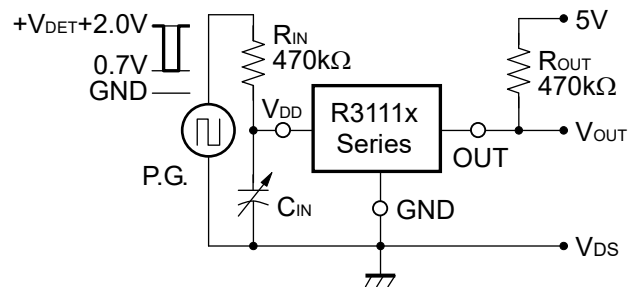
**Pch Driver Output Current Test Circuit**

\*Apply to CMOS Output type only



**Output Delay Time Test Circuit (1)**

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



**Output Delay Time Test Circuit (2)**

**R3111x**

● **Power Dissipation (SON1612-6)**

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

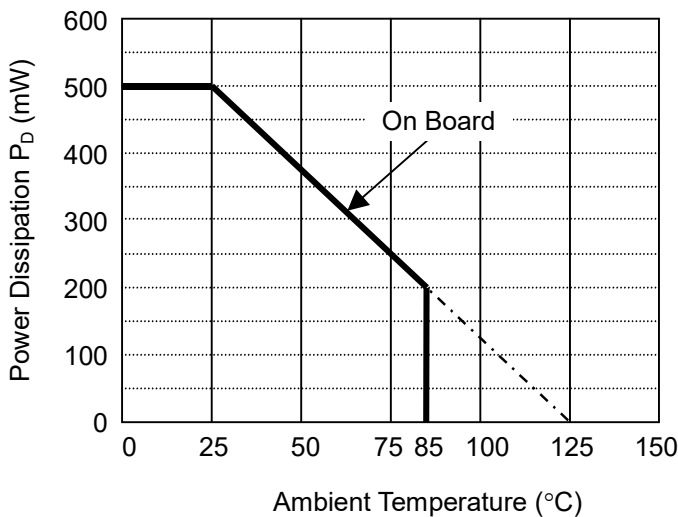
Measurement Conditions

|                  | <b>Standard Land Pattern</b>                  |
|------------------|---|
| Environment      | Mounting on Board (Wind velocity 0m/s)        |
| Board Material   | Glass cloth epoxy plastic (Double layers)     |
| Board Dimensions | 40mm × 40mm × 1.6mm                           |
| Copper Ratio     | Top side: Approx. 50%, Back side: Approx. 50% |
| Through - hole   | φ 0.5mm × 24pcs                               |

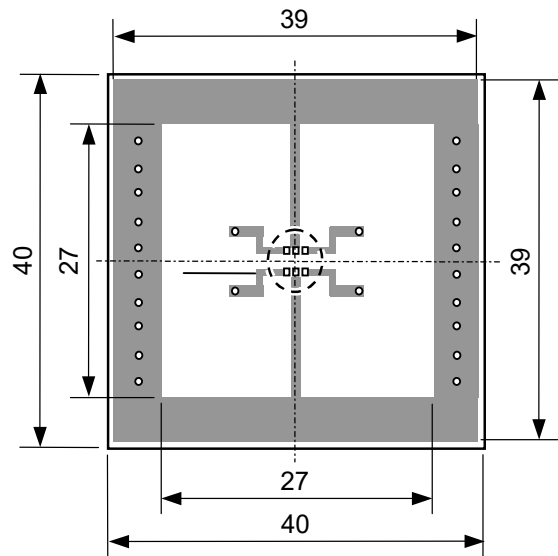
Measurement Results

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

|                    | <b>Standard Land Pattern</b>   |
|--------------------|--|
| Power Dissipation  | 500mW  |
| Thermal Resistance | $\theta_{ja} = (125-25^\circ\text{C}) / 0.5\text{W} = 200^\circ\text{C/W}$ |



**SON1612-6 Power Dissipation**

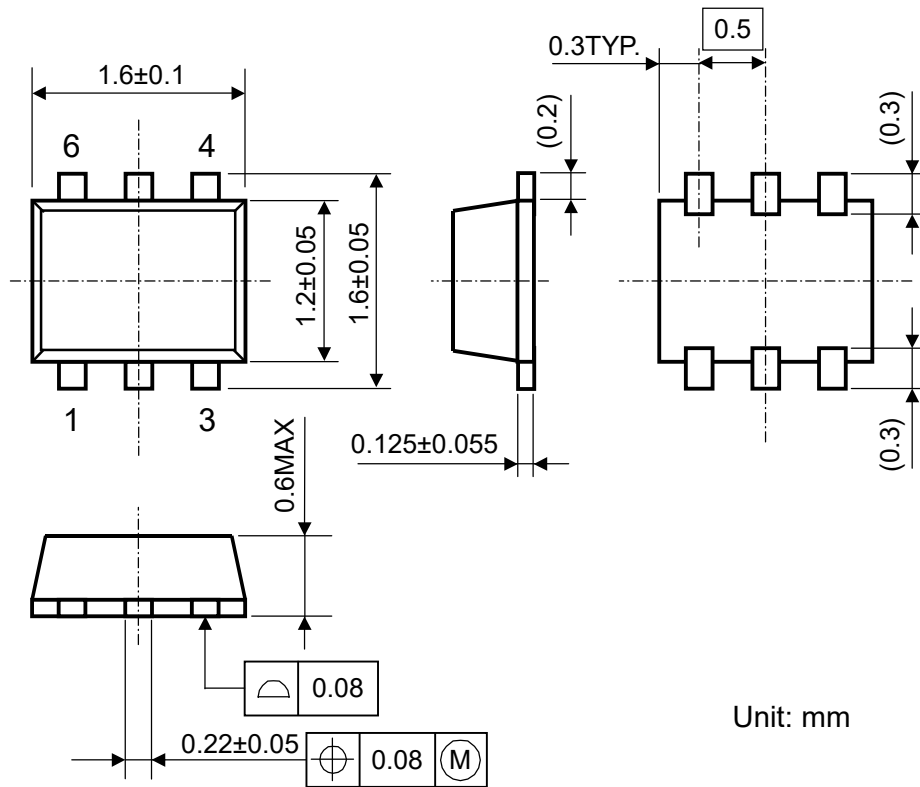


**Measurement Board Pattern**

○ IC Mount Area Unit : mm

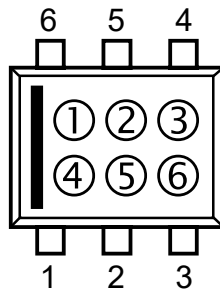


• Package Dimensions (SON1612-6)



• Mark Specification (SON1612-6)

- ①②③④ : Product Code ... **Refer to Mark Specification Table (SON1612-6).**
- ⑤⑥ : Lot No. .... Alphnumeric Serial Number



\* R3111E (TO-92) is the discontinued product as of April, 2017.

## R3111x

### • Marking Specification Table (SON1612-6)

| R3111Dxx1A  |             | R3111Dxx1C  |             | R3111Dxx1B  |             |
|-------------|-------------|-------------|-------------|-------------|-------------|
| Part Number | ①②③④        | Part Number | ①②③④        | Part Number | ①②③④        |
| R3111D091A  | <b>A09A</b> | R3111D091C  | <b>A09C</b> | R3111D091B  | <b>A09B</b> |
| R3111D101A  | <b>A10A</b> | R3111D101C  | <b>A10C</b> | R3111D101B  | <b>A10B</b> |
| R3111D111A  | <b>A11A</b> | R3111D111C  | <b>A11C</b> | R3111D111B  | <b>A11B</b> |
| R3111D121A  | <b>A12A</b> | R3111D121C  | <b>A12C</b> | R3111D121B  | <b>A12B</b> |
| R3111D131A  | <b>A13A</b> | R3111D131C  | <b>A13C</b> | R3111D131B  | <b>A13B</b> |
| R3111D141A  | <b>A14A</b> | R3111D141C  | <b>A14C</b> | R3111D141B  | <b>A14B</b> |
| R3111D151A  | <b>A15A</b> | R3111D151C  | <b>A15C</b> | R3111D151B  | <b>A15B</b> |
| R3111D161A  | <b>A16A</b> | R3111D161C  | <b>A16C</b> | R3111D161B  | <b>A16B</b> |
| R3111D171A  | <b>A17A</b> | R3111D171C  | <b>A17C</b> | R3111D171B  | <b>A17B</b> |
| R3111D181A  | <b>A18A</b> | R3111D181C  | <b>A18C</b> | R3111D181B  | <b>A18B</b> |
| R3111D191A  | <b>A19A</b> | R3111D191C  | <b>A19C</b> | R3111D191B  | <b>A19B</b> |
| R3111D201A  | <b>A20A</b> | R3111D201C  | <b>A20C</b> | R3111D201B  | <b>A20B</b> |
| R3111D211A  | <b>A21A</b> | R3111D211C  | <b>A21C</b> | R3111D211B  | <b>A21B</b> |
| R3111D221A  | <b>A22A</b> | R3111D221C  | <b>A22C</b> | R3111D221B  | <b>A22B</b> |
| R3111D231A  | <b>A23A</b> | R3111D231C  | <b>A23C</b> | R3111D231B  | <b>A23B</b> |
| R3111D241A  | <b>A24A</b> | R3111D241C  | <b>A24C</b> | R3111D241B  | <b>A24B</b> |
| R3111D251A  | <b>A25A</b> | R3111D251C  | <b>A25C</b> | R3111D251B  | <b>A25B</b> |
| R3111D261A  | <b>A26A</b> | R3111D261C  | <b>A26C</b> | R3111D261B  | <b>A26B</b> |
| R3111D271A  | <b>A27A</b> | R3111D271C  | <b>A27C</b> | R3111D271B  | <b>A27B</b> |
| R3111D281A  | <b>A28A</b> | R3111D281C  | <b>A28C</b> | R3111D281B  | <b>A28B</b> |
| R3111D291A  | <b>A29A</b> | R3111D291C  | <b>A29C</b> | R3111D291B  | <b>A29B</b> |
| R3111D301A  | <b>A30A</b> | R3111D301C  | <b>A30C</b> | R3111D301B  | <b>A30B</b> |
| R3111D311A  | <b>A31A</b> | R3111D311C  | <b>A31C</b> | R3111D311B  | <b>A31B</b> |
| R3111D321A  | <b>A32A</b> | R3111D321C  | <b>A32C</b> | R3111D321B  | <b>A32B</b> |
| R3111D331A  | <b>A33A</b> | R3111D331C  | <b>A33C</b> | R3111D331B  | <b>A33B</b> |
| R3111D341A  | <b>A34A</b> | R3111D341C  | <b>A34C</b> | R3111D341B  | <b>A34B</b> |
| R3111D351A  | <b>A35A</b> | R3111D351C  | <b>A35C</b> | R3111D351B  | <b>A35B</b> |
| R3111D361A  | <b>A36A</b> | R3111D361C  | <b>A36C</b> | R3111D361B  | <b>A36B</b> |
| R3111D371A  | <b>A37A</b> | R3111D371C  | <b>A37C</b> | R3111D371B  | <b>A37B</b> |
| R3111D381A  | <b>A38A</b> | R3111D381C  | <b>A38C</b> | R3111D381B  | <b>A38B</b> |
| R3111D391A  | <b>A39A</b> | R3111D391C  | <b>A39C</b> | R3111D391B  | <b>A39B</b> |
| R3111D401A  | <b>A40A</b> | R3111D401C  | <b>A40C</b> | R3111D401B  | <b>A40B</b> |
| R3111D411A  | <b>A41A</b> | R3111D411C  | <b>A41C</b> | R3111D411B  | <b>A41B</b> |
| R3111D421A  | <b>A42A</b> | R3111D421C  | <b>A42C</b> | R3111D421B  | <b>A42B</b> |
| R3111D431A  | <b>A43A</b> | R3111D431C  | <b>A43C</b> | R3111D431B  | <b>A43B</b> |
| R3111D441A  | <b>A44A</b> | R3111D441C  | <b>A44C</b> | R3111D441B  | <b>A44B</b> |
| R3111D451A  | <b>A45A</b> | R3111D451C  | <b>A45C</b> | R3111D451B  | <b>A45B</b> |
| R3111D461A  | <b>A46A</b> | R3111D461C  | <b>A46C</b> | R3111D461B  | <b>A46B</b> |
| R3111D471A  | <b>A47A</b> | R3111D471C  | <b>A47C</b> | R3111D471B  | <b>A47B</b> |
| R3111D481A  | <b>A48A</b> | R3111D481C  | <b>A48C</b> | R3111D481B  | <b>A48B</b> |
| R3111D491A  | <b>A49A</b> | R3111D491C  | <b>A49C</b> | R3111D491B  | <b>A49B</b> |
| R3111D501A  | <b>A50A</b> | R3111D501C  | <b>A50C</b> | R3111D501B  | <b>A50B</b> |
| R3111D511A  | <b>A51A</b> | R3111D511C  | <b>A51C</b> | R3111D511B  | <b>A51B</b> |
| R3111D521A  | <b>A52A</b> | R3111D521C  | <b>A52C</b> | R3111D521B  | <b>A52B</b> |
| R3111D531A  | <b>A53A</b> | R3111D531C  | <b>A53C</b> | R3111D531B  | <b>A53B</b> |
| R3111D541A  | <b>A54A</b> | R3111D541C  | <b>A54C</b> | R3111D541B  | <b>A54B</b> |
| R3111D551A  | <b>A55A</b> | R3111D551C  | <b>A55C</b> | R3111D551B  | <b>A55B</b> |
| R3111D561A  | <b>A56A</b> | R3111D561C  | <b>A56C</b> | R3111D561B  | <b>A56B</b> |
| R3111D571A  | <b>A57A</b> | R3111D571C  | <b>A57C</b> | R3111D571B  | <b>A57B</b> |
| R3111D581A  | <b>A58A</b> | R3111D581C  | <b>A58C</b> | R3111D581B  | <b>A58B</b> |
| R3111D591A  | <b>A59A</b> | R3111D591C  | <b>A59C</b> | R3111D591B  | <b>A59B</b> |
| R3111D601A  | <b>A60A</b> | R3111D601C  | <b>A60C</b> | R3111D601B  | <b>A60B</b> |

● **Power Dissipation (SC-82AB)**

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

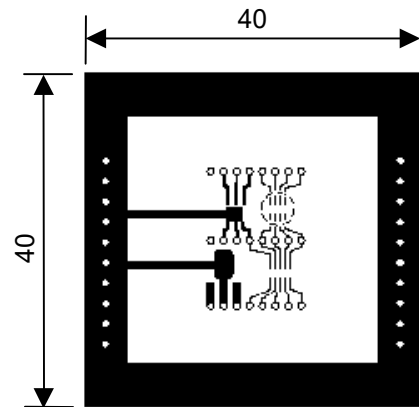
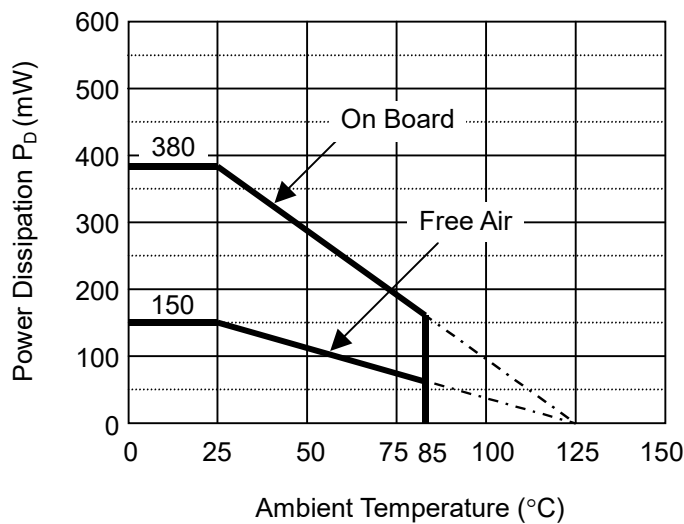
Measurement Conditions

|                  | Standard Land Pattern                         |
|------------------|---|
| Environment      | Mounting on Board (Wind velocity=0m/s)        |
| Board Material   | Glass cloth epoxy plastic (Double Layers)     |
| Board Dimensions | 40mm × 40mm × 1.6mm                           |
| Copper Ratio     | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-hole     | φ0.5mm × 44pcs                                |

Measurement Result

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

|                    | Standard Land Pattern   | Free Air                 |
|--------------------|---|--------------------------|
| Power Dissipation  | 380mW   | 150mW                    |
| Thermal Resistance | $\theta_{ja}=(125-25^{\circ}\text{C})/0.38\text{W}=263^{\circ}\text{C/W}$ | 667 $^{\circ}\text{C/W}$ |

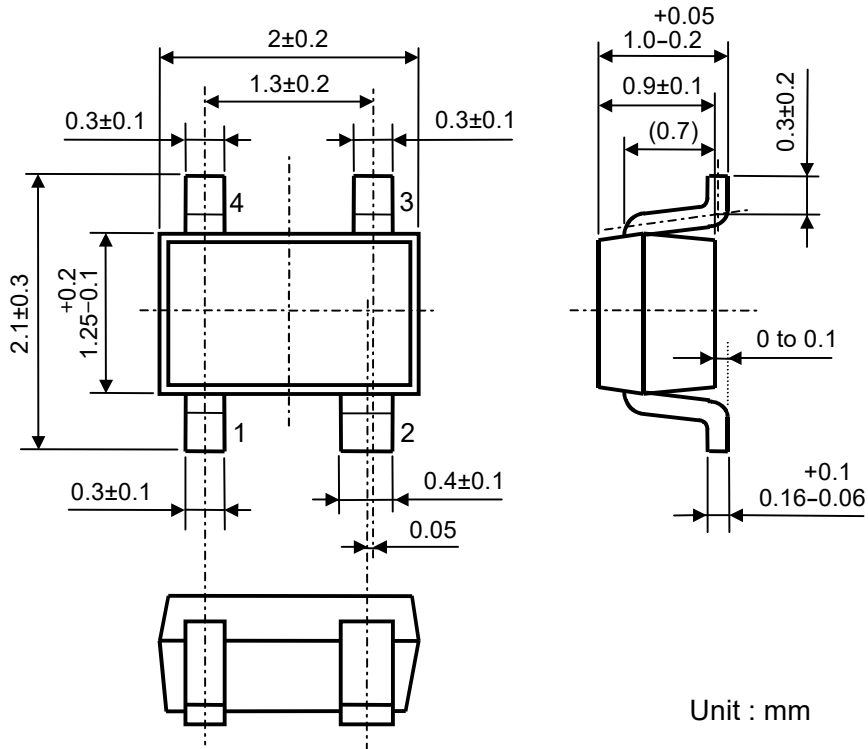


Measurement Board Pattern

○ IC Mount Area (Unit : mm)

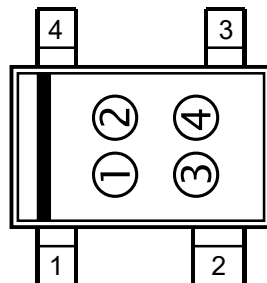
**R3111x**

• **Package Dimensions (SC-82AB)**



• **Mark Specification (SC-82AB)**

- ①② : Product Code ... **Refer to Mark Specification Table (SC-82AB).**
- ③④ : Lot No. .... Alphanumeric Serial Number



• Marking Specification Table (SC-82AB)

| R3111Qxx1A  |    | R3111Qxx1C  |    | R3111Qxx1B  |    |
|-------------|----|-------------|----|-------------|----|
| Part Number | ①② | Part Number | ①② | Part Number | ①② |
| R3111Q091A  | K9 | R3111Q091C  | T9 | R3111Q091B  | 09 |
| R3111Q101A  | L0 | R3111Q101C  | U0 | R3111Q101B  | 10 |
| R3111Q111A  | L1 | R3111Q111C  | U1 | R3111Q111B  | 11 |
| R3111Q121A  | L2 | R3111Q121C  | U2 | R3111Q121B  | 12 |
| R3111Q131A  | L3 | R3111Q131C  | U3 | R3111Q131B  | 13 |
| R3111Q141A  | L4 | R3111Q141C  | U4 | R3111Q141B  | 14 |
| R3111Q151A  | L5 | R3111Q151C  | U5 | R3111Q151B  | 15 |
| R3111Q161A  | L6 | R3111Q161C  | U6 | R3111Q161B  | 16 |
| R3111Q171A  | L7 | R3111Q171C  | U7 | R3111Q171B  | 17 |
| R3111Q181A  | L8 | R3111Q181C  | U8 | R3111Q181B  | 18 |
| R3111Q191A  | L9 | R3111Q191C  | U9 | R3111Q191B  | 19 |
| R3111Q201A  | M0 | R3111Q201C  | V0 | R3111Q201B  | 20 |
| R3111Q211A  | M1 | R3111Q211C  | V1 | R3111Q211B  | 21 |
| R3111Q221A  | M2 | R3111Q221C  | V2 | R3111Q221B  | 22 |
| R3111Q231A  | M3 | R3111Q231C  | V3 | R3111Q231B  | 23 |
| R3111Q241A  | M4 | R3111Q241C  | V4 | R3111Q241B  | 24 |
| R3111Q251A  | M5 | R3111Q251C  | V5 | R3111Q251B  | 25 |
| R3111Q261A  | M6 | R3111Q261C  | V6 | R3111Q261B  | 26 |
| R3111Q271A  | M7 | R3111Q271C  | V7 | R3111Q271B  | 27 |
| R3111Q281A  | M8 | R3111Q281C  | V8 | R3111Q281B  | 28 |
| R3111Q291A  | M9 | R3111Q291C  | V9 | R3111Q291B  | 29 |
| R3111Q301A  | N0 | R3111Q301C  | W0 | R3111Q301B  | 30 |
| R3111Q311A  | N1 | R3111Q311C  | W1 | R3111Q311B  | 31 |
| R3111Q321A  | N2 | R3111Q321C  | W2 | R3111Q321B  | 32 |
| R3111Q331A  | N3 | R3111Q331C  | W3 | R3111Q331B  | 33 |
| R3111Q341A  | N4 | R3111Q341C  | W4 | R3111Q341B  | 34 |
| R3111Q351A  | N5 | R3111Q351C  | W5 | R3111Q351B  | 35 |
| R3111Q361A  | N6 | R3111Q361C  | W6 | R3111Q361B  | 36 |
| R3111Q371A  | N7 | R3111Q371C  | W7 | R3111Q371B  | 37 |
| R3111Q381A  | N8 | R3111Q381C  | W8 | R3111Q381B  | 38 |
| R3111Q391A  | N9 | R3111Q391C  | W9 | R3111Q391B  | 39 |
| R3111Q401A  | P0 | R3111Q401C  | X0 | R3111Q401B  | 40 |
| R3111Q411A  | P1 | R3111Q411C  | X1 | R3111Q411B  | 41 |
| R3111Q421A  | P2 | R3111Q421C  | X2 | R3111Q421B  | 42 |
| R3111Q431A  | P3 | R3111Q431C  | X3 | R3111Q431B  | 43 |
| R3111Q441A  | P4 | R3111Q441C  | X4 | R3111Q441B  | 44 |
| R3111Q451A  | P5 | R3111Q451C  | X5 | R3111Q451B  | 45 |
| R3111Q461A  | P6 | R3111Q461C  | X6 | R3111Q461B  | 46 |
| R3111Q471A  | P7 | R3111Q471C  | X7 | R3111Q471B  | 47 |
| R3111Q481A  | P8 | R3111Q481C  | X8 | R3111Q481B  | 48 |
| R3111Q491A  | P9 | R3111Q491C  | X9 | R3111Q491B  | 49 |
| R3111Q501A  | R0 | R3111Q501C  | Y0 | R3111Q501B  | 50 |
| R3111Q511A  | R1 | R3111Q511C  | Y1 | R3111Q511B  | 51 |
| R3111Q521A  | R2 | R3111Q521C  | Y2 | R3111Q521B  | 52 |
| R3111Q531A  | R3 | R3111Q531C  | Y3 | R3111Q531B  | 53 |
| R3111Q541A  | R4 | R3111Q541C  | Y4 | R3111Q541B  | 54 |
| R3111Q551A  | R5 | R3111Q551C  | Y5 | R3111Q551B  | 55 |
| R3111Q561A  | R6 | R3111Q561C  | Y6 | R3111Q561B  | 56 |
| R3111Q571A  | R7 | R3111Q571C  | Y7 | R3111Q571B  | 57 |
| R3111Q581A  | R8 | R3111Q581C  | Y8 | R3111Q581B  | 58 |
| R3111Q591A  | R9 | R3111Q591C  | Y9 | R3111Q591B  | 59 |
| R3111Q601A  | S0 | R3111Q601C  | Z0 | R3111Q601B  | 60 |

## R3111x

### • Power Dissipation (SC-88A)

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

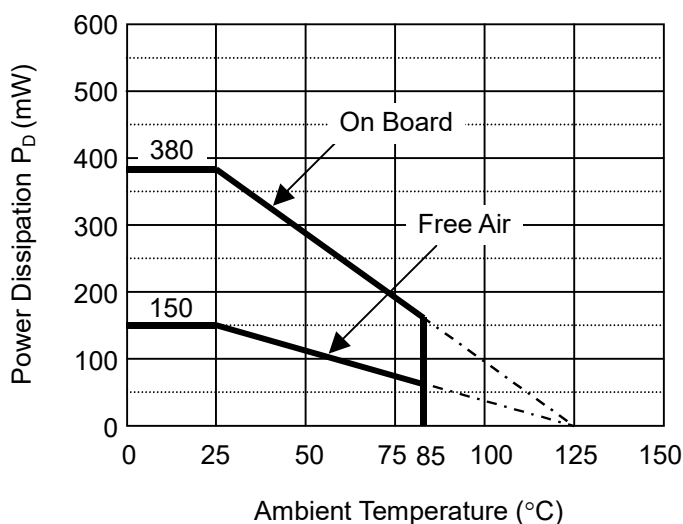
#### Measurement Conditions

|                  | Standard Land Pattern                         |
|------------------|---|
| Environment      | Mounting on Board (Wind velocity=0m/s)        |
| Board Material   | Glass cloth epoxy plastic (Double Layers)     |
| Board Dimensions | 40mm × 40mm × 1.6mm                           |
| Copper Ratio     | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-hole     | φ0.5mm × 44pcs                                |

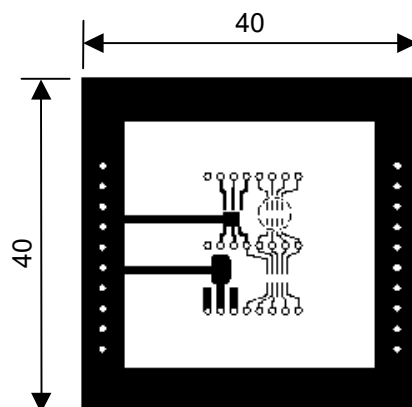
#### Measurement Result

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

|                    | Standard Land Pattern  | Free Air   |
|--------------------|--|--|
| Power Dissipation  | 380mW  | 150mW  |
| Thermal Resistance | $\theta_{ja}=(125-25^\circ\text{C})/0.38\text{W}=263^\circ\text{C}/\text{W}$ | $\theta_{ja}=(125-25^\circ\text{C})/0.15\text{W}=667^\circ\text{C}/\text{W}$ |
|                    | $\theta_{jc}=75^\circ\text{C}/\text{W}$                                      | -  |



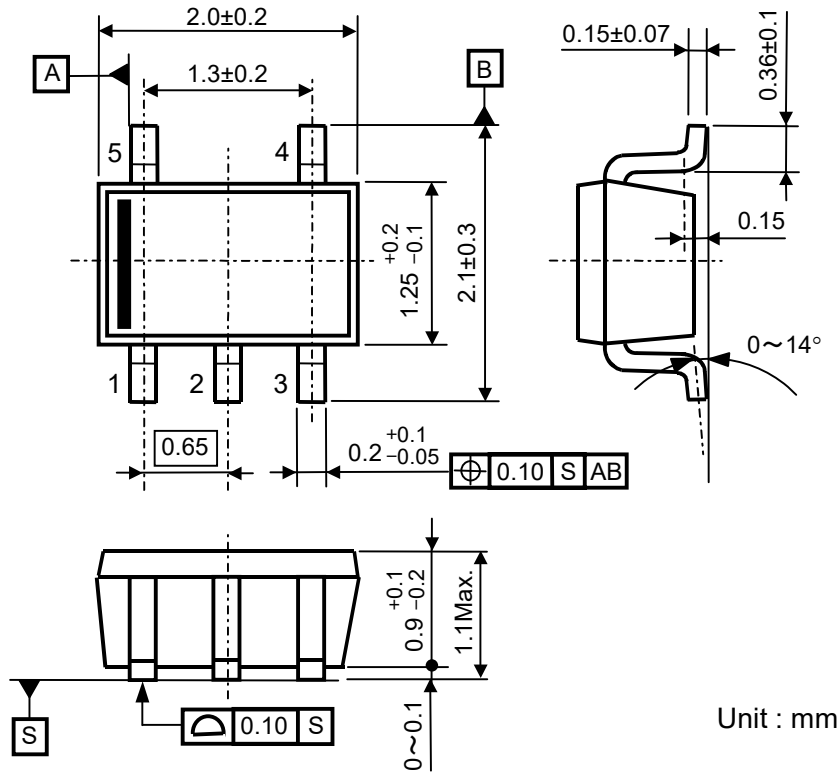
Power Dissipation



Measurement Board Pattern

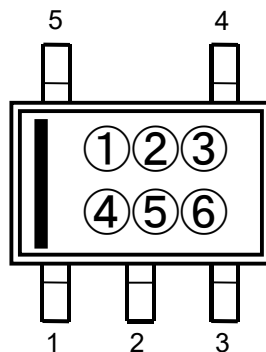
○ IC Mount Area (Unit : mm)

● Package Dimensions (SC-88A)



● Mark Specification (SC-88A)

- ①②③④ : Product Code ... **Refer to Mark Specification Table (SC-88A).**
- ⑤⑥ : Lot No. .... Alphnumeric Serial Number



\* R3111E (TO-92) is the discontinued product as of April, 2017.

## R3111x

### • Marking Specification Table (SC-88A)

| R3111Qxx2A  |      | R3111Qxx2C  |      | R3111Qxx2B  |      |
|-------------|------|-------------|------|-------------|------|
| Part Number | ①②③④ | Part Number | ①②③④ | Part Number | ①②③④ |
| R3111Q092A  | U009 | R3111Q092C  | V009 | R3111Q092B  | W009 |
| R3111Q102A  | U010 | R3111Q102C  | V010 | R3111Q102B  | W010 |
| R3111Q112A  | U011 | R3111Q112C  | V011 | R3111Q112B  | W011 |
| R3111Q122A  | U012 | R3111Q122C  | V012 | R3111Q122B  | W012 |
| R3111Q132A  | U013 | R3111Q132C  | V013 | R3111Q132B  | W013 |
| R3111Q142A  | U014 | R3111Q142C  | V014 | R3111Q142B  | W014 |
| R3111Q152A  | U015 | R3111Q152C  | V015 | R3111Q152B  | W015 |
| R3111Q162A  | U016 | R3111Q162C  | V016 | R3111Q162B  | W016 |
| R3111Q172A  | U017 | R3111Q172C  | V017 | R3111Q172B  | W017 |
| R3111Q182A  | U018 | R3111Q182C  | V018 | R3111Q182B  | W018 |
| R3111Q192A  | U019 | R3111Q192C  | V019 | R3111Q192B  | W019 |
| R3111Q202A  | U020 | R3111Q202C  | V020 | R3111Q202B  | W020 |
| R3111Q212A  | U021 | R3111Q212C  | V021 | R3111Q212B  | W021 |
| R3111Q222A  | U022 | R3111Q222C  | V022 | R3111Q222B  | W022 |
| R3111Q232A  | U023 | R3111Q232C  | V023 | R3111Q232B  | W023 |
| R3111Q242A  | U024 | R3111Q242C  | V024 | R3111Q242B  | W024 |
| R3111Q252A  | U025 | R3111Q252C  | V025 | R3111Q252B  | W025 |
| R3111Q262A  | U026 | R3111Q262C  | V026 | R3111Q262B  | W026 |
| R3111Q272A  | U027 | R3111Q272C  | V027 | R3111Q272B  | W027 |
| R3111Q282A  | U028 | R3111Q282C  | V028 | R3111Q282B  | W028 |
| R3111Q292A  | U029 | R3111Q292C  | V029 | R3111Q292B  | W029 |
| R3111Q302A  | U030 | R3111Q302C  | V030 | R3111Q302B  | W030 |
| R3111Q312A  | U031 | R3111Q312C  | V031 | R3111Q312B  | W031 |
| R3111Q322A  | U032 | R3111Q322C  | V032 | R3111Q322B  | W032 |
| R3111Q332A  | U033 | R3111Q332C  | V033 | R3111Q332B  | W033 |
| R3111Q342A  | U034 | R3111Q342C  | V034 | R3111Q342B  | W034 |
| R3111Q352A  | U035 | R3111Q352C  | V035 | R3111Q352B  | W035 |
| R3111Q362A  | U036 | R3111Q362C  | V036 | R3111Q362B  | W036 |
| R3111Q372A  | U037 | R3111Q372C  | V037 | R3111Q372B  | W037 |
| R3111Q382A  | U038 | R3111Q382C  | V038 | R3111Q382B  | W038 |
| R3111Q392A  | U039 | R3111Q392C  | V039 | R3111Q392B  | W039 |
| R3111Q402A  | U040 | R3111Q402C  | V040 | R3111Q402B  | W040 |
| R3111Q412A  | U041 | R3111Q412C  | V041 | R3111Q412B  | W041 |
| R3111Q422A  | U042 | R3111Q422C  | V042 | R3111Q422B  | W042 |
| R3111Q432A  | U043 | R3111Q432C  | V043 | R3111Q432B  | W043 |
| R3111Q442A  | U044 | R3111Q442C  | V044 | R3111Q442B  | W044 |
| R3111Q452A  | U045 | R3111Q452C  | V045 | R3111Q452B  | W045 |
| R3111Q462A  | U046 | R3111Q462C  | V046 | R3111Q462B  | W046 |
| R3111Q472A  | U047 | R3111Q472C  | V047 | R3111Q472B  | W047 |
| R3111Q482A  | U048 | R3111Q482C  | V048 | R3111Q482B  | W048 |
| R3111Q492A  | U049 | R3111Q492C  | V049 | R3111Q492B  | W049 |
| R3111Q502A  | U050 | R3111Q502C  | V050 | R3111Q502B  | W050 |
| R3111Q512A  | U051 | R3111Q512C  | V051 | R3111Q512B  | W051 |
| R3111Q522A  | U052 | R3111Q522C  | V052 | R3111Q522B  | W052 |
| R3111Q532A  | U053 | R3111Q532C  | V053 | R3111Q532B  | W053 |
| R3111Q542A  | U054 | R3111Q542C  | V054 | R3111Q542B  | W054 |
| R3111Q552A  | U055 | R3111Q552C  | V055 | R3111Q552B  | W055 |
| R3111Q562A  | U056 | R3111Q562C  | V056 | R3111Q562B  | W056 |
| R3111Q572A  | U057 | R3111Q572C  | V057 | R3111Q572B  | W057 |
| R3111Q582A  | U058 | R3111Q582C  | V058 | R3111Q582B  | W058 |
| R3111Q592A  | U059 | R3111Q592C  | V059 | R3111Q592B  | W059 |
| R3111Q602A  | U060 | R3111Q602C  | V060 | R3111Q602B  | W060 |
| R3111Q222A5 | U001 |             |      |             |      |



● **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.)

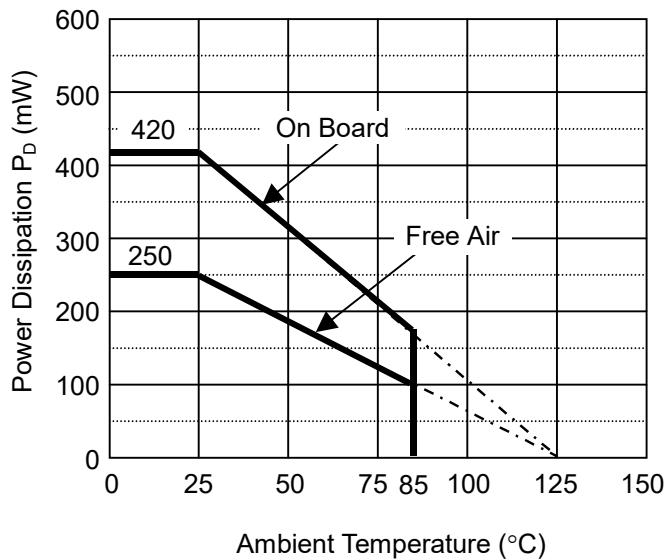
Measurement Conditions

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

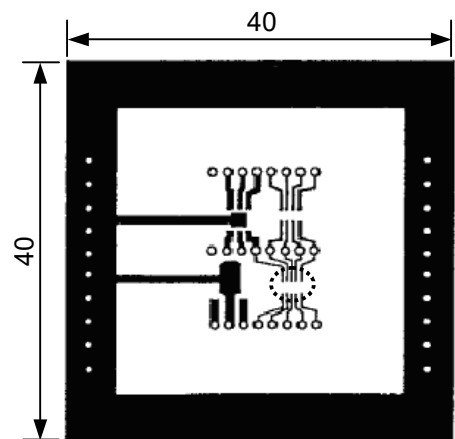
Measurement Result

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

|                    | 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 $^\circ\text{C/W}$ |



**Power Dissipation**

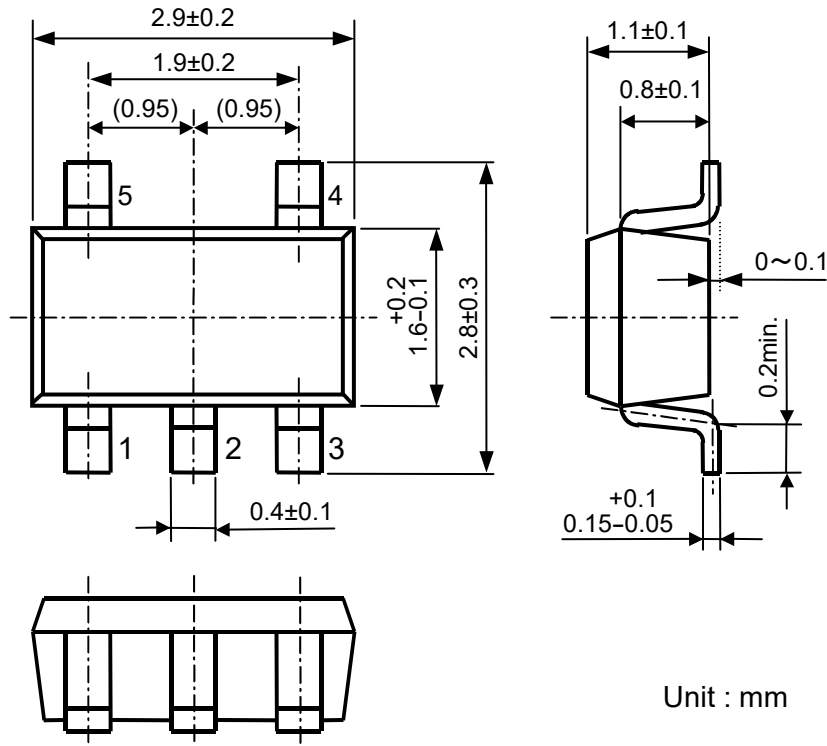


**Measurement Board Pattern**

○ IC Mount Area (Unit: mm)

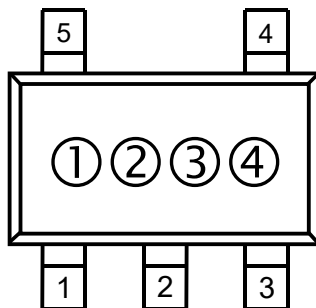
**R3111x**

• **Package Dimensions (SOT-23-5)**



• **Mark Specification (SOT-23-5)**

- ①② : Product Code ... **Refer to Mark Specification Table (SOT-23-5).**
- ③④ : Lot No. .... Alphabetic Serial Number



## ● Marking Specification Table (SOT-23-5)

| R3111Nxx1A  |    | R3111Nxx1C  |    | R3111Nxx1B  |    |
|-------------|----|-------------|----|-------------|----|
| Part Number | ①② | Part Number | ①② | Part Number | ①② |
| R3111N091A  | 9A | R3111N091C  | 9H | R3111N091B  | D1 |
| R3111N101A  | 0B | R3111N101C  | 0J | R3111N101B  | D2 |
| R3111N111A  | 1B | R3111N111C  | 1J | R3111N111B  | D3 |
| R3111N121A  | 2B | R3111N121C  | 2J | R3111N121B  | D4 |
| R3111N131A  | 3B | R3111N131C  | 3J | R3111N131B  | D5 |
| R3111N141A  | 4B | R3111N141C  | 4J | R3111N141B  | D6 |
| R3111N151A  | 5B | R3111N151C  | 5J | R3111N151B  | D7 |
| R3111N161A  | 6B | R3111N161C  | 6J | R3111N161B  | D8 |
| R3111N171A  | 7B | R3111N171C  | 7J | R3111N171B  | D9 |
| R3111N181A  | 8B | R3111N181C  | 8J | R3111N181B  | J1 |
| R3111N191A  | 9B | R3111N191C  | 9J | R3111N191B  | J2 |
| R3111N201A  | 0C | R3111N201C  | 0K | R3111N201B  | J3 |
| R3111N211A  | 1C | R3111N211C  | 1K | R3111N211B  | J4 |
| R3111N221A  | 2C | R3111N221C  | 2K | R3111N221B  | J5 |
| R3111N231A  | 3C | R3111N231C  | 3K | R3111N231B  | J6 |
| R3111N241A  | 4C | R3111N241C  | 4K | R3111N241B  | J7 |
| R3111N251A  | 5C | R3111N251C  | 5K | R3111N251B  | EB |
| R3111N261A  | 6C | R3111N261C  | 6K | R3111N261B  | EC |
| R3111N271A  | 7C | R3111N271C  | 7K | R3111N271B  | ED |
| R3111N281A  | 8C | R3111N281C  | 8K | R3111N281B  | EE |
| R3111N291A  | 9C | R3111N291C  | 9K | R3111N291B  | EF |
| R3111N301A  | 0D | R3111N301C  | 0L | R3111N301B  | EG |
| R3111N311A  | 1D | R3111N311C  | 1L | R3111N311B  | EH |
| R3111N321A  | 2D | R3111N321C  | 2L | R3111N321B  | EJ |
| R3111N331A  | 3D | R3111N331C  | 3L | R3111N331B  | EK |
| R3111N341A  | 4D | R3111N341C  | 4L | R3111N341B  | KB |
| R3111N351A  | 5D | R3111N351C  | 5L | R3111N351B  | KC |
| R3111N361A  | 6D | R3111N361C  | 6L | R3111N361B  | KD |
| R3111N371A  | 7D | R3111N371C  | 7L | R3111N371B  | KE |
| R3111N381A  | 8D | R3111N381C  | 8L | R3111N381B  | KF |
| R3111N391A  | 9D | R3111N391C  | 9L | R3111N391B  | KG |
| R3111N401A  | 0E | R3111N401C  | 0M | R3111N401B  | KH |
| R3111N411A  | 1E | R3111N411C  | 1M | R3111N411B  | KJ |
| R3111N421A  | 2E | R3111N421C  | 2M | R3111N421B  | KK |
| R3111N431A  | 3E | R3111N431C  | 3M | R3111N431B  | QB |
| R3111N441A  | 4E | R3111N441C  | 4M | R3111N441B  | QC |
| R3111N451A  | 5E | R3111N451C  | 5M | R3111N451B  | QD |
| R3111N461A  | 6E | R3111N461C  | 6M | R3111N461B  | QE |
| R3111N471A  | 7E | R3111N471C  | 7M | R3111N471B  | QF |
| R3111N481A  | 8E | R3111N481C  | 8M | R3111N481B  | QG |
| R3111N491A  | 9E | R3111N491C  | 9M | R3111N491B  | QH |
| R3111N501A  | 0F | R3111N501C  | 0N | R3111N501B  | QJ |
| R3111N511A  | 1F | R3111N511C  | 1N | R3111N511B  | QK |
| R3111N521A  | 2F | R3111N521C  | 2N | R3111N521B  | VB |
| R3111N531A  | 3F | R3111N531C  | 3N | R3111N531B  | VC |
| R3111N541A  | 4F | R3111N541C  | 4N | R3111N541B  | VD |
| R3111N551A  | 5F | R3111N551C  | 5N | R3111N551B  | VE |
| R3111N561A  | 6F | R3111N561C  | 6N | R3111N561B  | VF |
| R3111N571A  | 7F | R3111N571C  | 7N | R3111N571B  | VG |
| R3111N581A  | 8F | R3111N581C  | 8N | R3111N581B  | VH |
| R3111N591A  | 9F | R3111N591C  | 9N | R3111N591B  | VJ |
| R3111N601A  | 0G | R3111N601C  | 0P | R3111N601B  | VK |

**R3111x**

• **Power Dissipation (SOT-23-3)**

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-23-3) is substitution of SOT-23-6.)

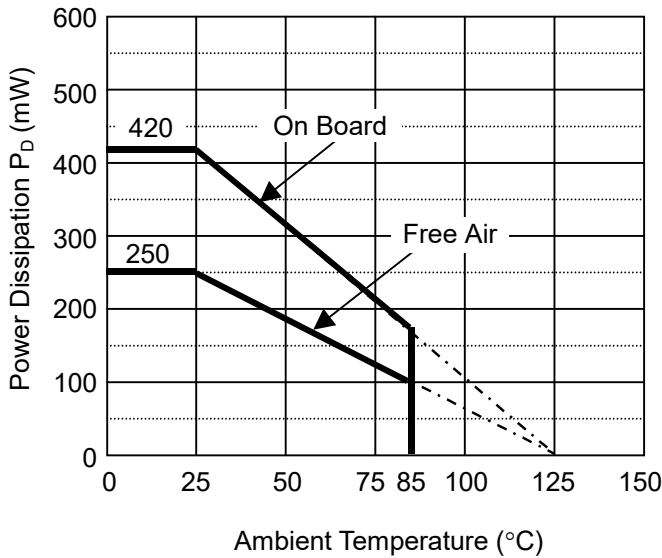
Measurement Conditions

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

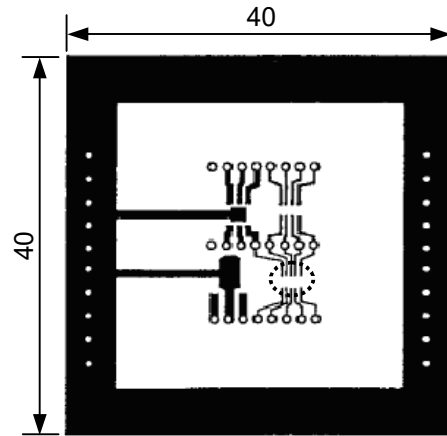
Measurement Result

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

|                    | 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 $^{\circ}\text{C/W}$ |



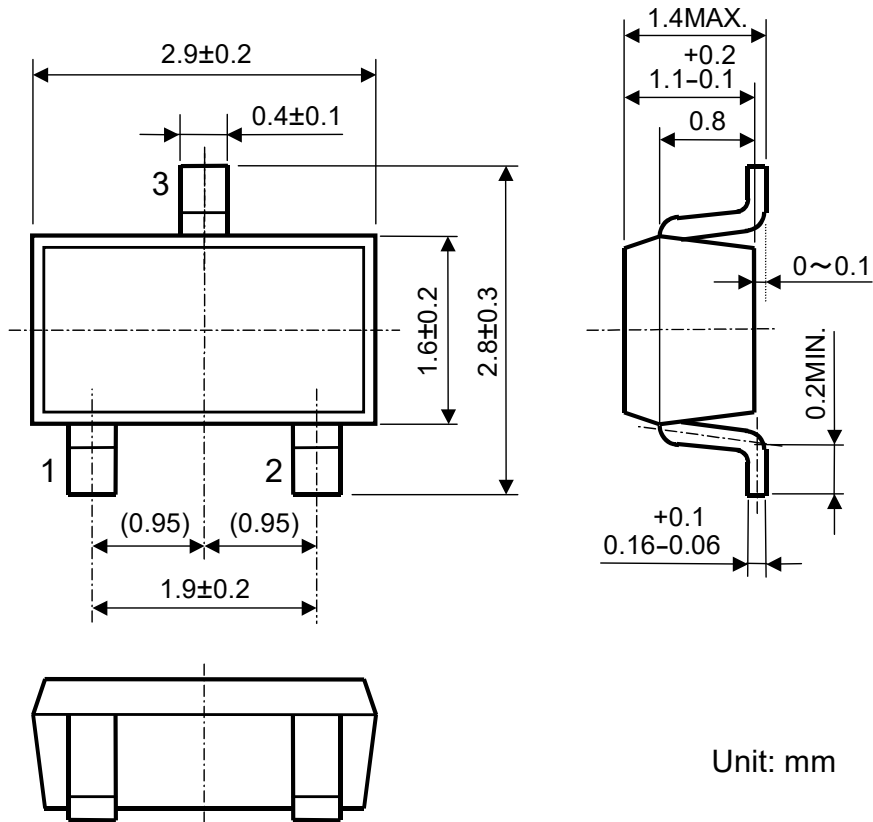
**Power Dissipation**



**Measurement Board Pattern**

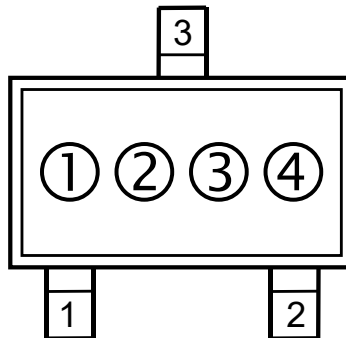
○ IC Mount Area (Unit: mm)

• Package Dimensions (SOT-23-3)



• Mark Specification (SOT-23-3)

- ①② : Product Code ... Refer to Mark Specification Table (SOT-23-3).
- ③④ : Lot No. .... Alphnumeric Serial Number



\* R3111E (TO-92) is the discontinued product as of April, 2017.

## R3111x

### • Marking Specification Table (SOT-23-3)

| R3111Nxx2A  |           | R3111Nxx2C  |           |
|-------------|-----------|-------------|-----------|
| Part Number | ①②        | Part Number | ①②        |
| R3111N092A  | <b>A9</b> | R3111N092C  | <b>H9</b> |
| R3111N102A  | <b>B0</b> | R3111N102C  | <b>J0</b> |
| R3111N112A  | <b>B1</b> | R3111N112C  | <b>J1</b> |
| R3111N122A  | <b>B2</b> | R3111N122C  | <b>J2</b> |
| R3111N132A  | <b>B3</b> | R3111N132C  | <b>J3</b> |
| R3111N142A  | <b>B4</b> | R3111N142C  | <b>J4</b> |
| R3111N152A  | <b>B5</b> | R3111N152C  | <b>J5</b> |
| R3111N162A  | <b>B6</b> | R3111N162C  | <b>J6</b> |
| R3111N172A  | <b>B7</b> | R3111N172C  | <b>J7</b> |
| R3111N182A  | <b>B8</b> | R3111N182C  | <b>J8</b> |
| R3111N192A  | <b>B9</b> | R3111N192C  | <b>J9</b> |
| R3111N202A  | <b>C0</b> | R3111N202C  | <b>K0</b> |
| R3111N212A  | <b>C1</b> | R3111N212C  | <b>K1</b> |
| R3111N222A  | <b>C2</b> | R3111N222C  | <b>K2</b> |
| R3111N232A  | <b>C3</b> | R3111N232C  | <b>K3</b> |
| R3111N242A  | <b>C4</b> | R3111N242C  | <b>K4</b> |
| R3111N252A  | <b>C5</b> | R3111N252C  | <b>K5</b> |
| R3111N262A  | <b>C6</b> | R3111N262C  | <b>K6</b> |
| R3111N272A  | <b>C7</b> | R3111N272C  | <b>K7</b> |
| R3111N282A  | <b>C8</b> | R3111N282C  | <b>K8</b> |
| R3111N292A  | <b>C9</b> | R3111N292C  | <b>K9</b> |
| R3111N302A  | <b>D0</b> | R3111N302C  | <b>L0</b> |
| R3111N312A  | <b>D1</b> | R3111N312C  | <b>L1</b> |
| R3111N322A  | <b>D2</b> | R3111N322C  | <b>L2</b> |
| R3111N332A  | <b>D3</b> | R3111N332C  | <b>L3</b> |
| R3111N342A  | <b>D4</b> | R3111N342C  | <b>L4</b> |
| R3111N352A  | <b>D5</b> | R3111N352C  | <b>L5</b> |
| R3111N362A  | <b>D6</b> | R3111N362C  | <b>L6</b> |
| R3111N372A  | <b>D7</b> | R3111N372C  | <b>L7</b> |
| R3111N382A  | <b>D8</b> | R3111N382C  | <b>L8</b> |
| R3111N392A  | <b>D9</b> | R3111N392C  | <b>L9</b> |
| R3111N402A  | <b>E0</b> | R3111N402C  | <b>M0</b> |
| R3111N412A  | <b>E1</b> | R3111N412C  | <b>M1</b> |
| R3111N422A  | <b>E2</b> | R3111N422C  | <b>M2</b> |
| R3111N432A  | <b>E3</b> | R3111N432C  | <b>M3</b> |
| R3111N442A  | <b>E4</b> | R3111N442C  | <b>M4</b> |
| R3111N452A  | <b>E5</b> | R3111N452C  | <b>M5</b> |
| R3111N462A  | <b>E6</b> | R3111N462C  | <b>M6</b> |
| R3111N472A  | <b>E7</b> | R3111N472C  | <b>M7</b> |
| R3111N482A  | <b>E8</b> | R3111N482C  | <b>M8</b> |
| R3111N492A  | <b>E9</b> | R3111N492C  | <b>M9</b> |
| R3111N502A  | <b>F0</b> | R3111N502C  | <b>N0</b> |
| R3111N512A  | <b>F1</b> | R3111N512C  | <b>N1</b> |
| R3111N522A  | <b>F2</b> | R3111N522C  | <b>N2</b> |
| R3111N532A  | <b>F3</b> | R3111N532C  | <b>N3</b> |
| R3111N542A  | <b>F4</b> | R3111N542C  | <b>N4</b> |
| R3111N552A  | <b>F5</b> | R3111N552C  | <b>N5</b> |
| R3111N562A  | <b>F6</b> | R3111N562C  | <b>N6</b> |
| R3111N572A  | <b>F7</b> | R3111N572C  | <b>N7</b> |
| R3111N582A  | <b>F8</b> | R3111N582C  | <b>N8</b> |
| R3111N592A  | <b>F9</b> | R3111N592C  | <b>N9</b> |
| R3111N602A  | <b>G0</b> | R3111N602C  | <b>P0</b> |

● **Power Dissipation (SOT-89-3)**

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

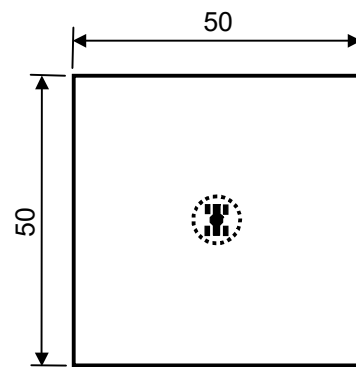
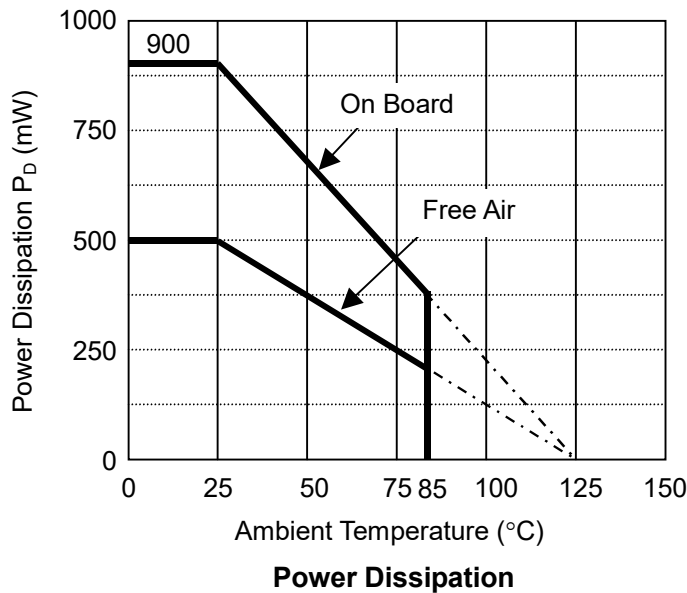
Measurement Conditions

|                  | Standard Land Pattern                                |
|------------------|--|
| Environment      | Mounting on Board (Wind velocity=0m/s)               |
| Board Material   | Glass cloth epoxy plastic (Double sided)             |
| Board Dimensions | 50mm × 50mm × 1.6mm                                  |
| Copper Ratio     | Top side : Approx. 10% ,<br>Back side : Approx. 100% |
| Through-hole     | -  |

Measurement Result

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

|                    | Standard Land Pattern  | Free Air |
|--------------------|--|----------|
| Power Dissipation  | 900mW  | 500mW    |
| Thermal Resistance | $\theta_{ja} = (125-25^\circ\text{C})/0.9\text{W} = 111^\circ\text{C/W}$ | 200°C/W  |

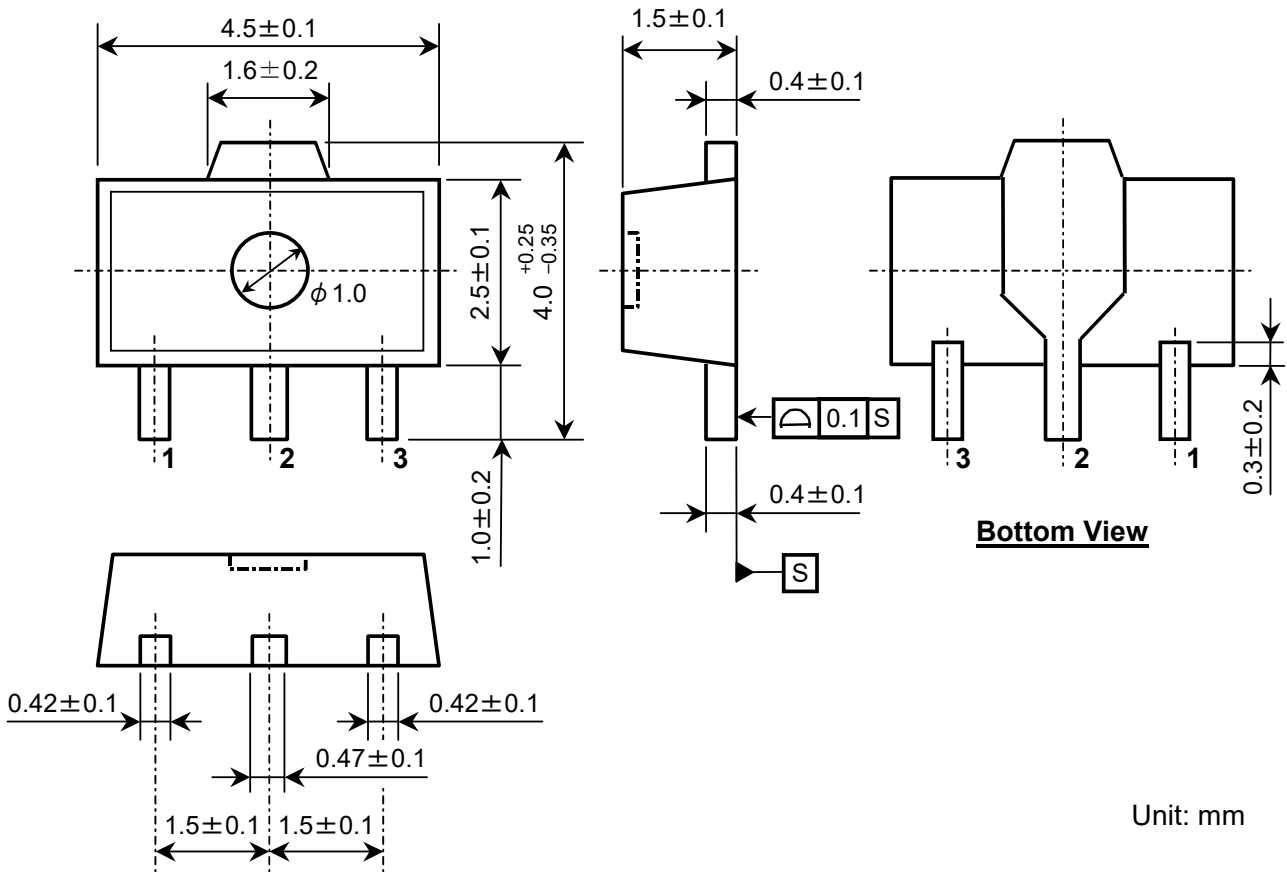


Measurement Board Pattern

○ IC Mount Area Unit : mm

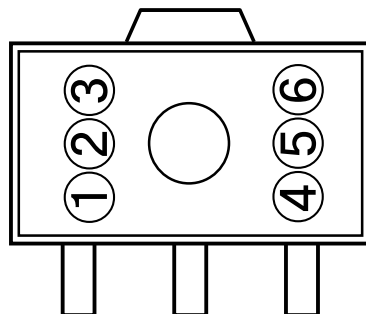
**R3111x**

• **Package Dimensions (SOT-89-3)**



• **Mark Specification (SOT-89-3)**

- ①②③④ : Product Code ... **Refer to Mark Specification Table (SOT-89-3).**
- ⑤⑥ : Lot No. .... Alphabetic Serial Number





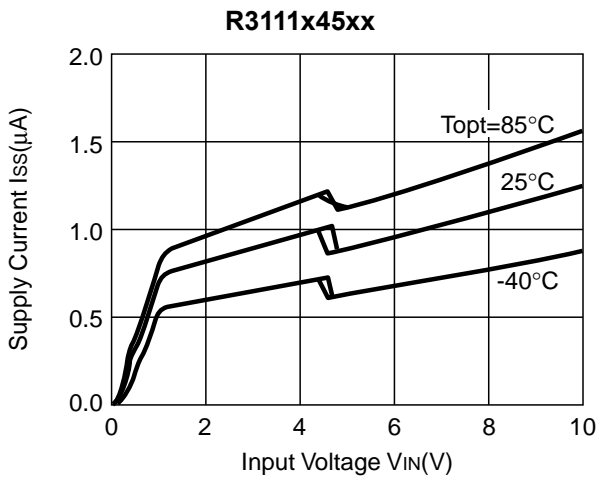
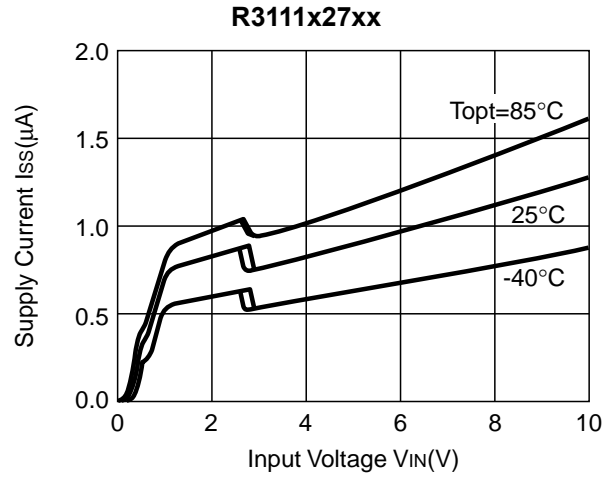
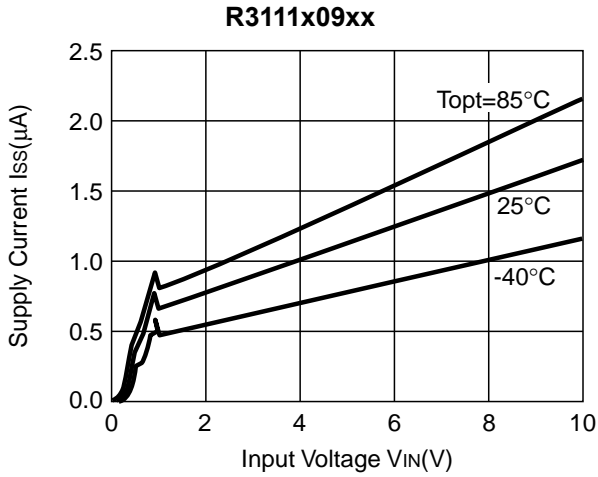
● Marking Specification Table (SOT-89-3)

| R3111Hxx1A  |             | R3111Hxx1C  |             |
|-------------|-------------|-------------|-------------|
| Part Number | ①②③④        | Part Number | ①②③④        |
| R3111H091A  | <b>A09A</b> | R3111H091C  | <b>A09C</b> |
| R3111H101A  | <b>A10A</b> | R3111H101C  | <b>A10C</b> |
| R3111H111A  | <b>A11A</b> | R3111H111C  | <b>A11C</b> |
| R3111H121A  | <b>A12A</b> | R3111H121C  | <b>A12C</b> |
| R3111H131A  | <b>A13A</b> | R3111H131C  | <b>A13C</b> |
| R3111H141A  | <b>A14A</b> | R3111H141C  | <b>A14C</b> |
| R3111H151A  | <b>A15A</b> | R3111H151C  | <b>A15C</b> |
| R3111H161A  | <b>A16A</b> | R3111H161C  | <b>A16C</b> |
| R3111H171A  | <b>A17A</b> | R3111H171C  | <b>A17C</b> |
| R3111H181A  | <b>A18A</b> | R3111H181C  | <b>A18C</b> |
| R3111H191A  | <b>A19A</b> | R3111H191C  | <b>A19C</b> |
| R3111H201A  | <b>A20A</b> | R3111H201C  | <b>A20C</b> |
| R3111H211A  | <b>A21A</b> | R3111H211C  | <b>A21C</b> |
| R3111H221A  | <b>A22A</b> | R3111H221C  | <b>A22C</b> |
| R3111H231A  | <b>A23A</b> | R3111H231C  | <b>A23C</b> |
| R3111H241A  | <b>A24A</b> | R3111H241C  | <b>A24C</b> |
| R3111H251A  | <b>A25A</b> | R3111H251C  | <b>A25C</b> |
| R3111H261A  | <b>A26A</b> | R3111H261C  | <b>A26C</b> |
| R3111H271A  | <b>A27A</b> | R3111H271C  | <b>A27C</b> |
| R3111H281A  | <b>A28A</b> | R3111H281C  | <b>A28C</b> |
| R3111H291A  | <b>A29A</b> | R3111H291C  | <b>A29C</b> |
| R3111H301A  | <b>A30A</b> | R3111H301C  | <b>A30C</b> |
| R3111H311A  | <b>A31A</b> | R3111H311C  | <b>A31C</b> |
| R3111H321A  | <b>A32A</b> | R3111H321C  | <b>A32C</b> |
| R3111H331A  | <b>A33A</b> | R3111H331C  | <b>A33C</b> |
| R3111H341A  | <b>A34A</b> | R3111H341C  | <b>A34C</b> |
| R3111H351A  | <b>A35A</b> | R3111H351C  | <b>A35C</b> |
| R3111H361A  | <b>A36A</b> | R3111H361C  | <b>A36C</b> |
| R3111H371A  | <b>A37A</b> | R3111H371C  | <b>A37C</b> |
| R3111H381A  | <b>A38A</b> | R3111H381C  | <b>A38C</b> |
| R3111H391A  | <b>A39A</b> | R3111H391C  | <b>A39C</b> |
| R3111H401A  | <b>A40A</b> | R3111H401C  | <b>A40C</b> |
| R3111H411A  | <b>A41A</b> | R3111H411C  | <b>A41C</b> |
| R3111H421A  | <b>A42A</b> | R3111H421C  | <b>A42C</b> |
| R3111H431A  | <b>A43A</b> | R3111H431C  | <b>A43C</b> |
| R3111H441A  | <b>A44A</b> | R3111H441C  | <b>A44C</b> |
| R3111H451A  | <b>A45A</b> | R3111H451C  | <b>A45C</b> |
| R3111H461A  | <b>A46A</b> | R3111H461C  | <b>A46C</b> |
| R3111H471A  | <b>A47A</b> | R3111H471C  | <b>A47C</b> |
| R3111H481A  | <b>A48A</b> | R3111H481C  | <b>A48C</b> |
| R3111H491A  | <b>A49A</b> | R3111H491C  | <b>A49C</b> |
| R3111H501A  | <b>A50A</b> | R3111H501C  | <b>A50C</b> |
| R3111H511A  | <b>A51A</b> | R3111H511C  | <b>A51C</b> |
| R3111H521A  | <b>A52A</b> | R3111H521C  | <b>A52C</b> |
| R3111H531A  | <b>A53A</b> | R3111H531C  | <b>A53C</b> |
| R3111H541A  | <b>A54A</b> | R3111H541C  | <b>A54C</b> |
| R3111H551A  | <b>A55A</b> | R3111H551C  | <b>A55C</b> |
| R3111H561A  | <b>A56A</b> | R3111H561C  | <b>A56C</b> |
| R3111H571A  | <b>A57A</b> | R3111H571C  | <b>A57C</b> |
| R3111H581A  | <b>A58A</b> | R3111H581C  | <b>A58C</b> |
| R3111H591A  | <b>A59A</b> | R3111H591C  | <b>A59C</b> |
| R3111H601A  | <b>A60A</b> | R3111H601C  | <b>A60C</b> |

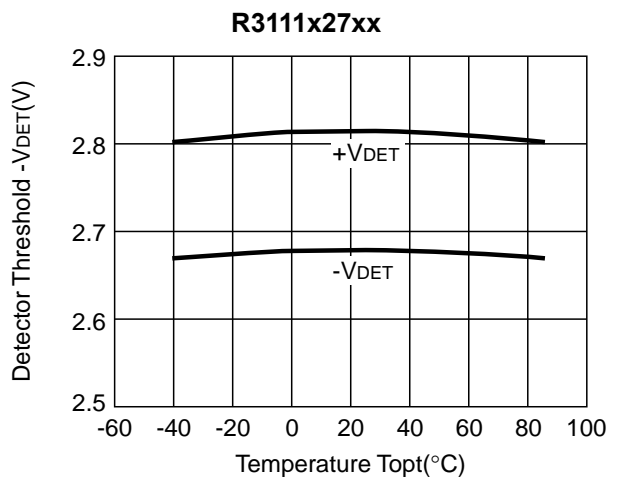
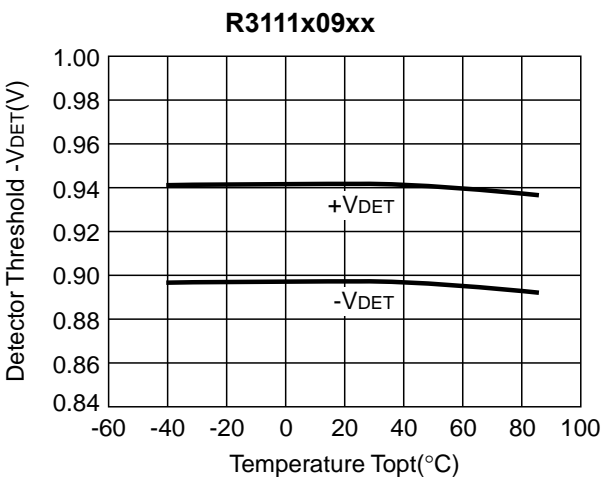
**R3111x**

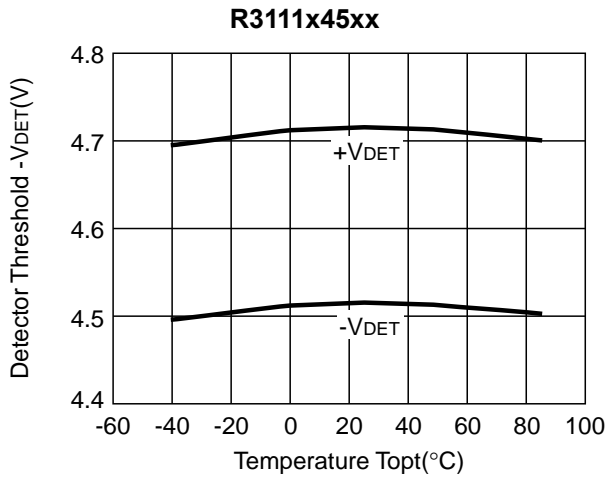
**TYPICAL CHARACTERISTICS**

**1) Supply Current vs. Input Voltage**

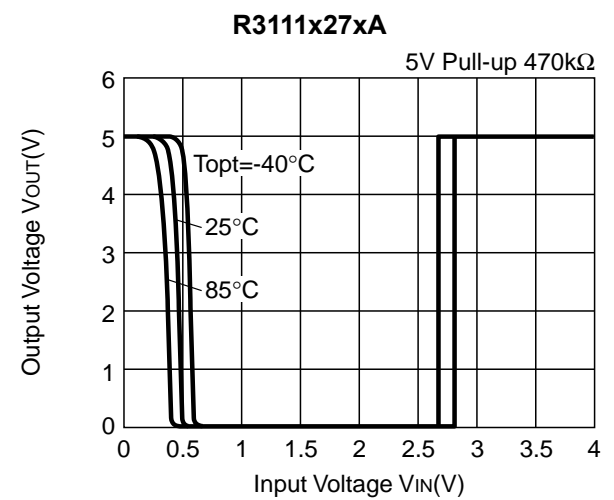
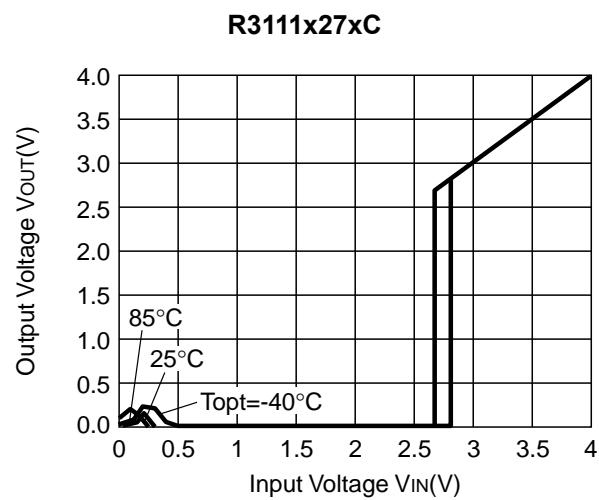
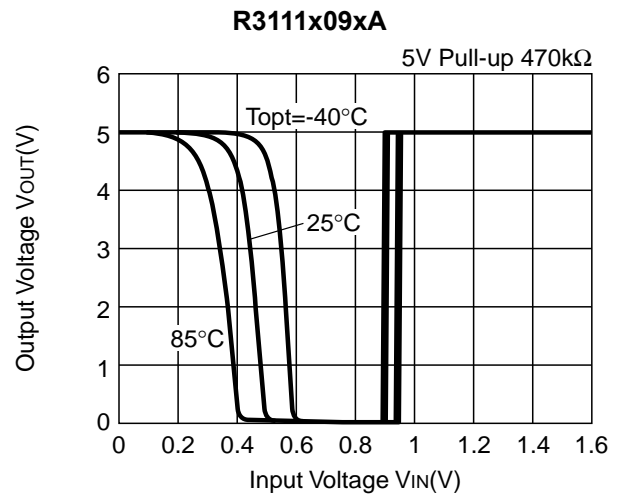
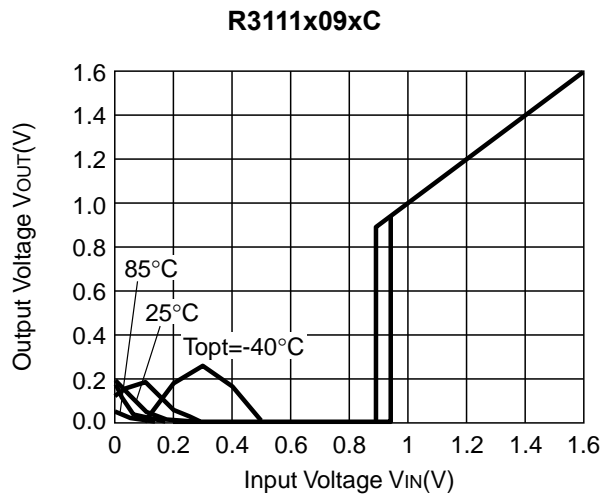


**2) Detector Threshold Hysteresis vs. Temperature**

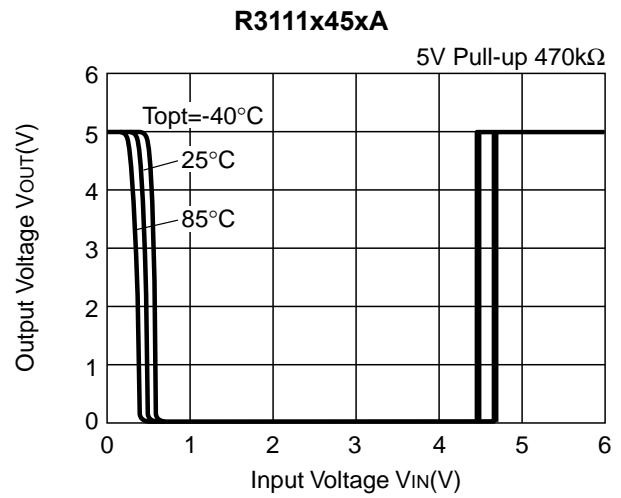
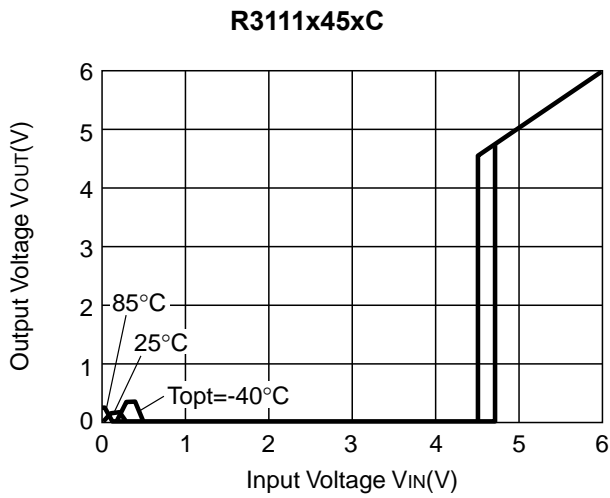




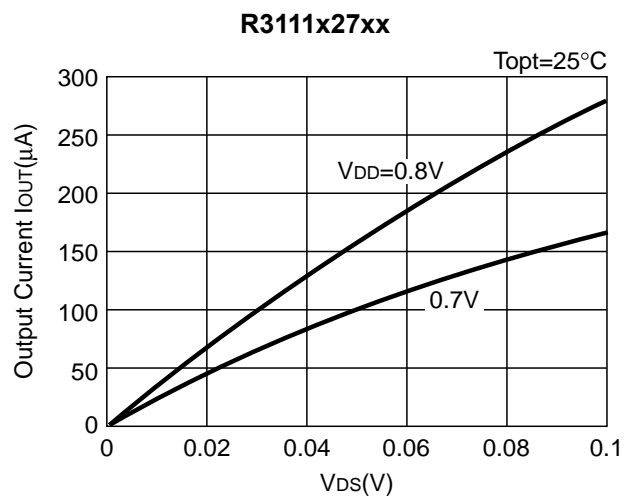
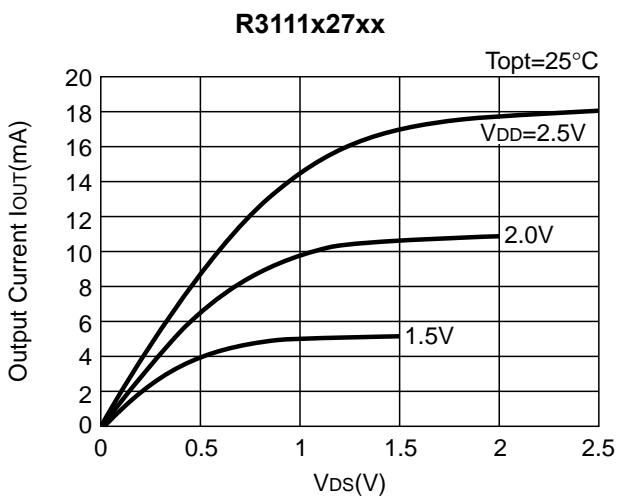
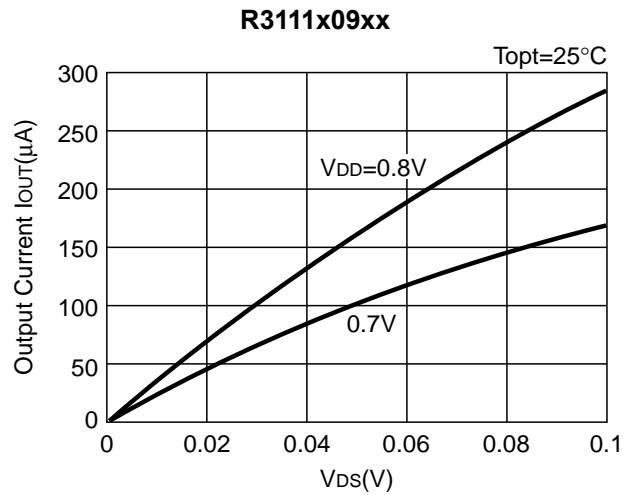
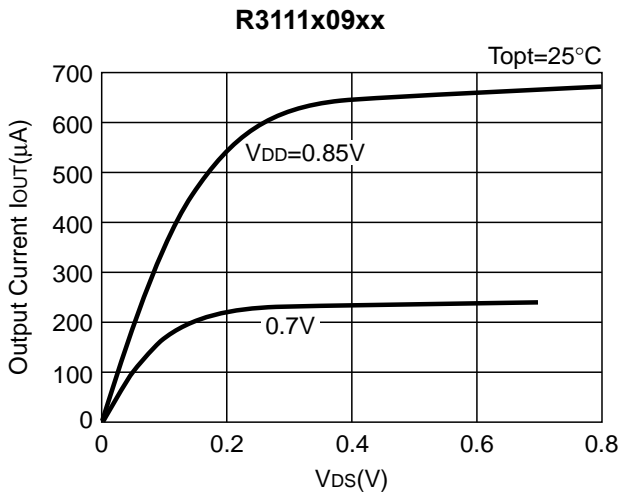
### 3) Output Voltage vs. Input Voltage



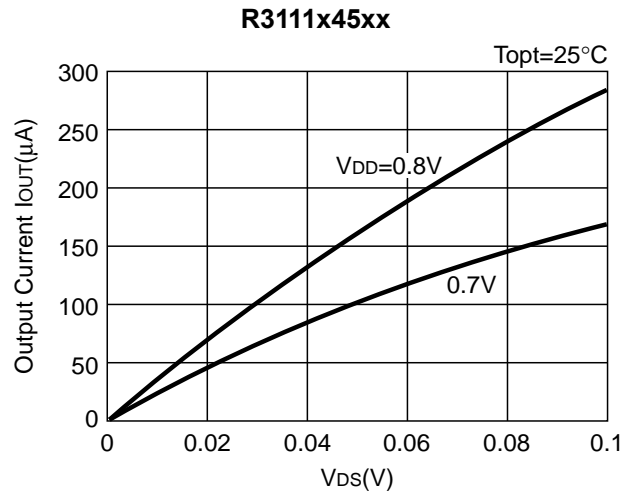
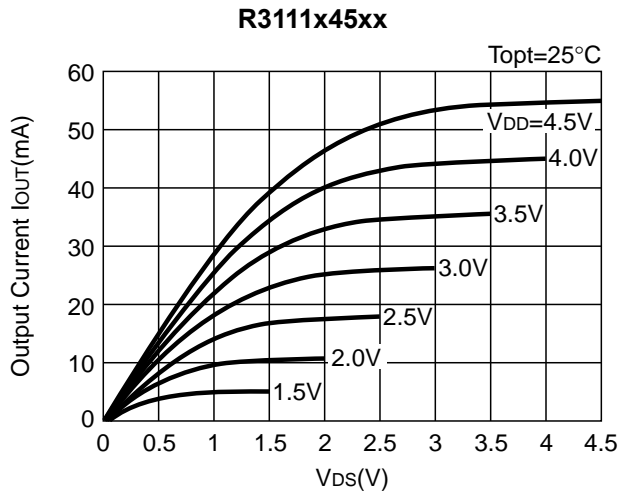
**R3111x**



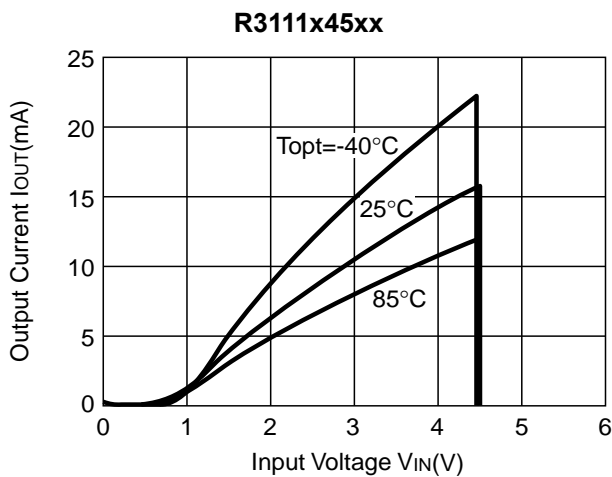
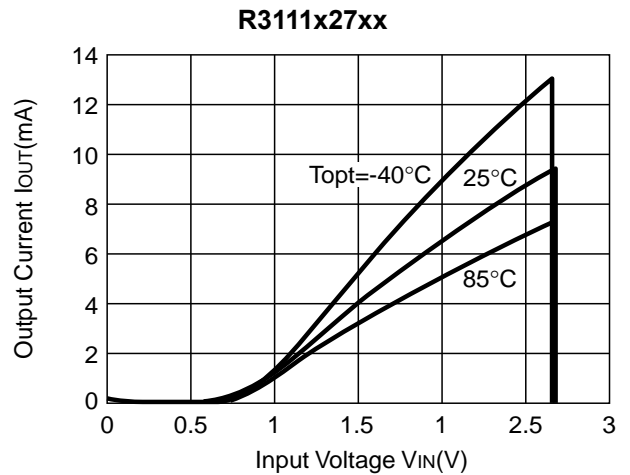
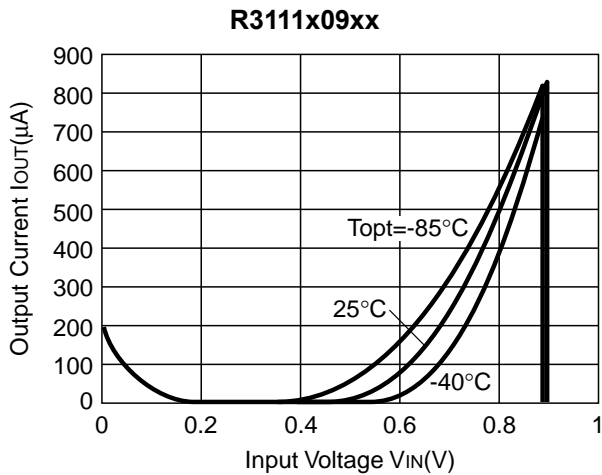
**4) Nch Driver Output Current vs.  $V_{DS}$**



\* R3111E (TO-92) is the discontinued product as of April, 2017.

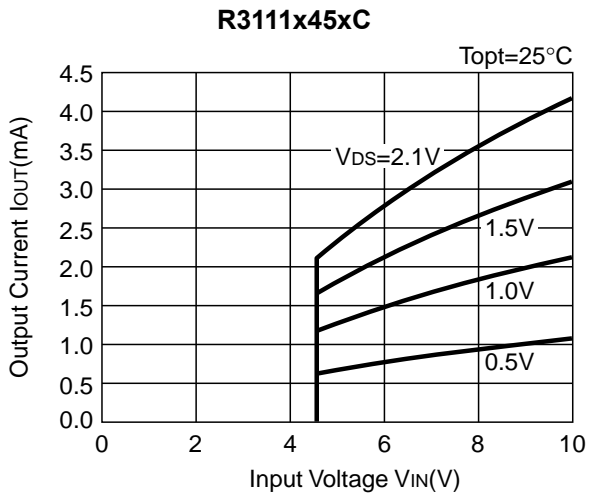
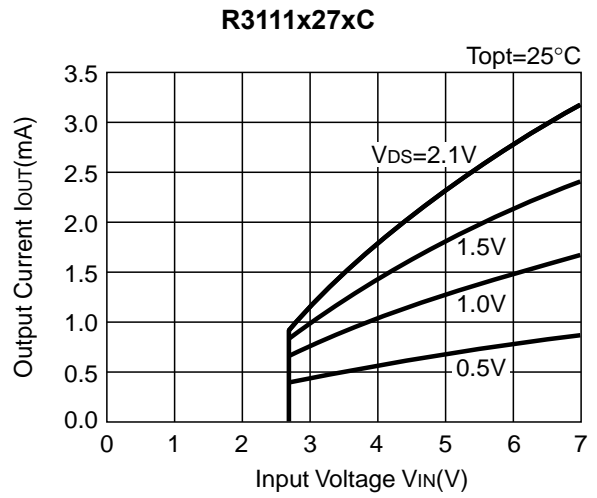
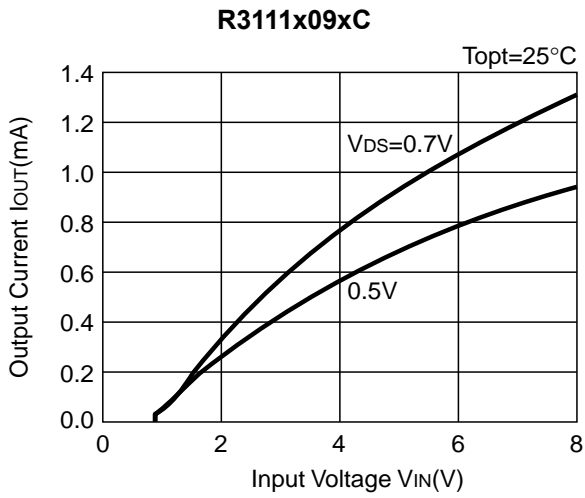


5) Nch Driver Output Current vs. Input Voltage

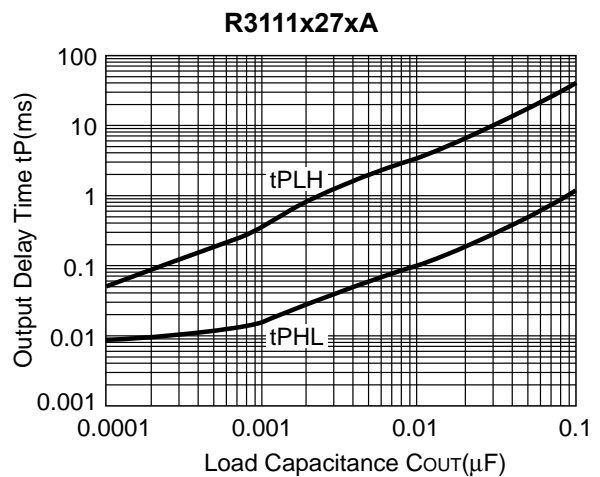
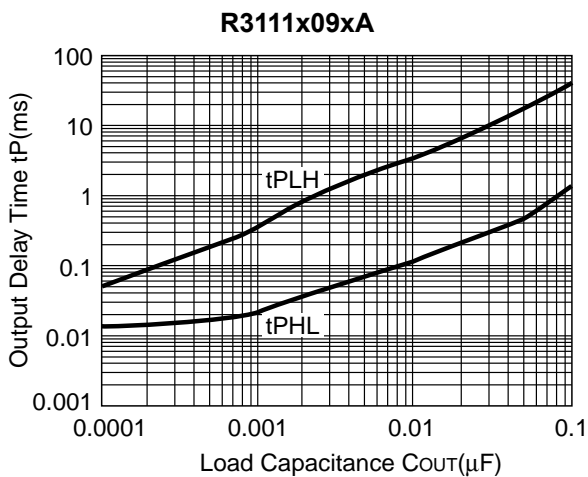


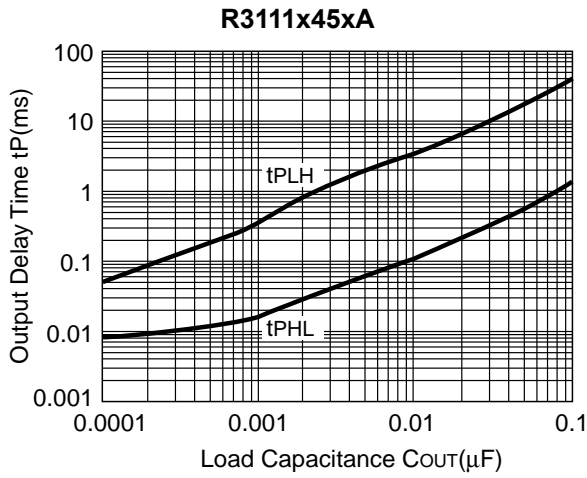
**R3111x**

**6) Pch Driver Output Current vs. Input Voltage**

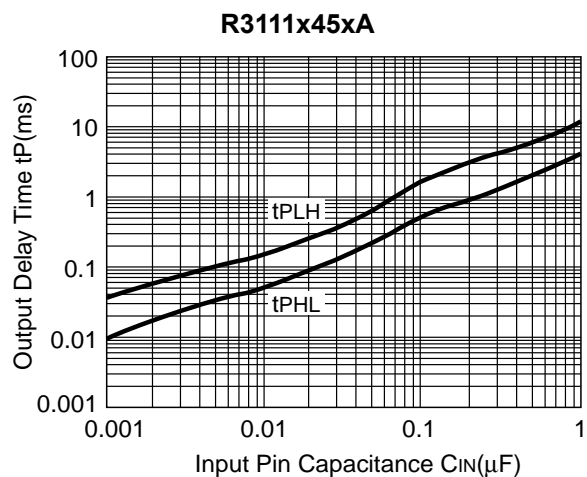
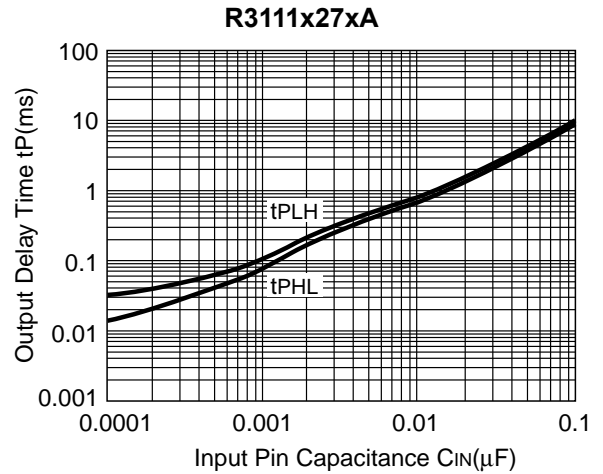
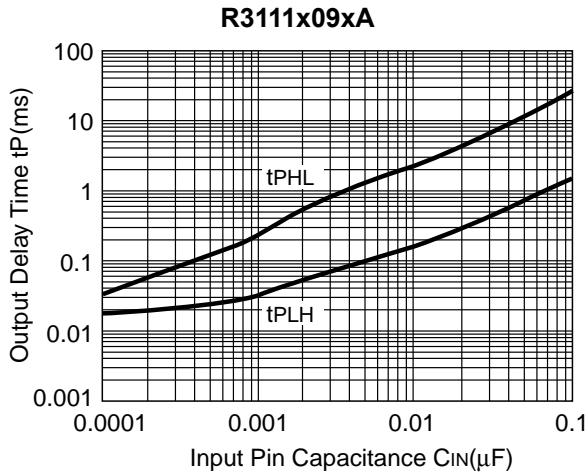


**7) Output Delay Time vs. Load Capacitance (Ta=25°C)**





**8) Output Delay Time vs. Input Pin Capacitance**

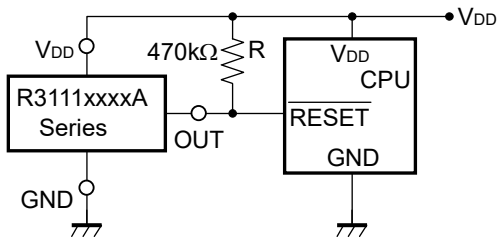


## R3111x

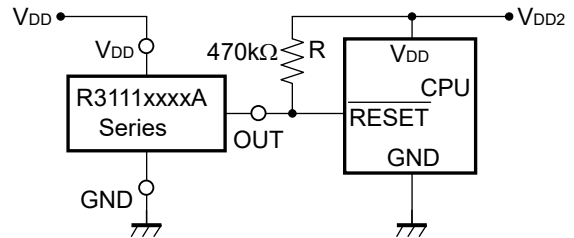
### TYPICAL APPLICATION

#### • R3111xxxxA CPU Reset Circuit (Nch Open Drain Output)

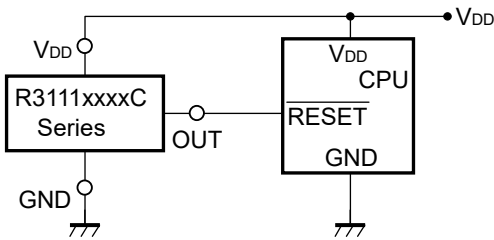
Case 1. Input Voltage to R3111xxxxA is equal to Input Voltage to CPU



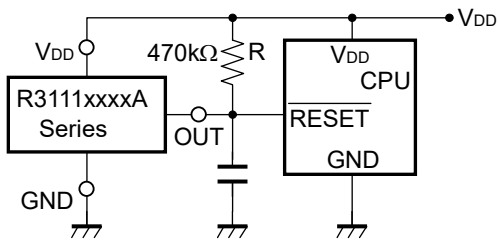
Case 2. Input Voltage to R3111xxxxA is unequal to Input Voltage to CPU



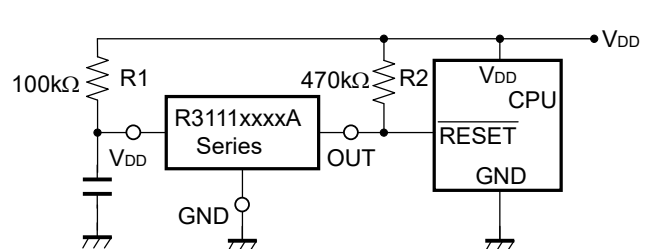
#### • R3111xxxxC CPU Reset Circuit (CMOS Output)



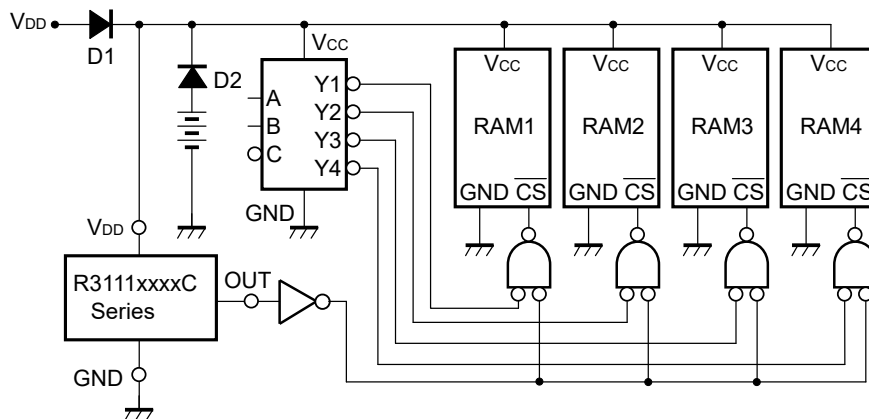
#### • R3111xxxxA Output Delay Time Circuit 1 (Nch Open Drain Output)



#### • R3111xxxxA Output Delay Time Circuit 2 (Nch Open Drain Output)

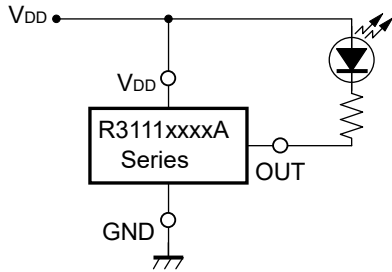


#### • Memory Back-up Circuit

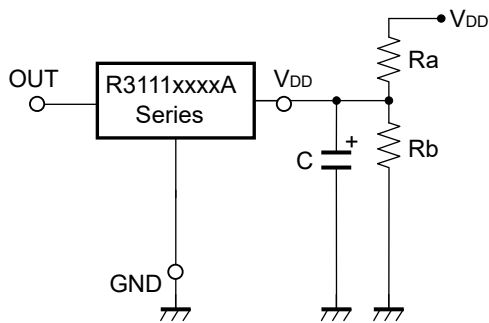




• **Voltage level Indicator Circuit (lighted when the power runs out)  
(Nch Open Drain Output)**



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

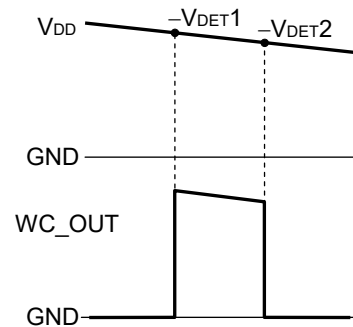
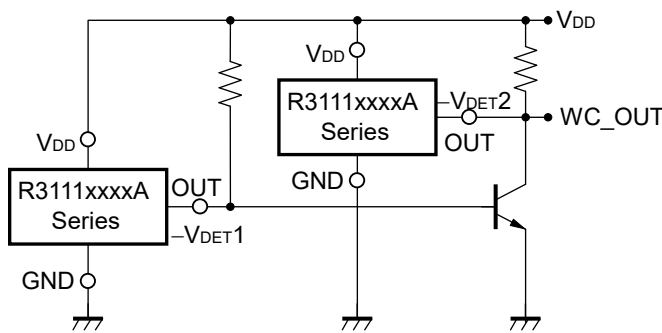


Adjusted Detector Threshold  
 $= (-V_{DET}) \times (R_a + R_b) / R_b$

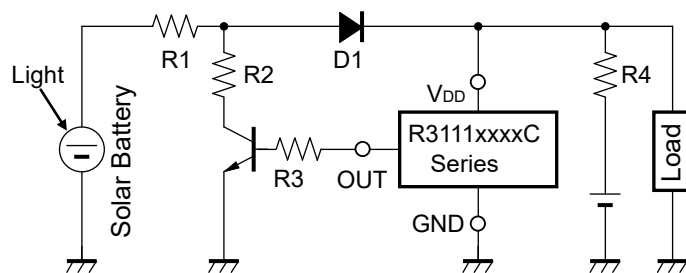
Hysteresis Voltage  
 $= (V_{HYS}) \times (R_a + R_b) / R_b$

\*) If the value of Ra is set excessively large, voltage drop may occur caused by the supply current of IC itself, and detector threshold may vary.

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



• **Over-charge Preventing Circuit**



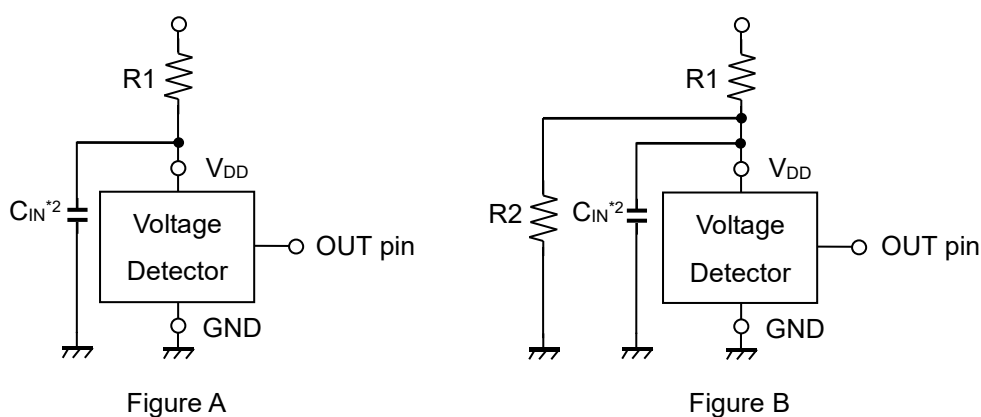
## TECHNICAL NOTES

### 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\*<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 100 kΩ or less as a guide, and connect C<sub>IN</sub> 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.



\*<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.