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### LOW VOLTAGE DETECTOR WITH BUILT-IN DELAY CIRCUIT

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NO.EA-209-160316

#### OUTLINE

R3134x Series are CMOS-based voltage detector ICs with built-in delay circuit, high detector threshold accuracy, and ultra low supply current, which can operate at low voltage.

These ICs can be used as system reset generators, and each of these ICs consists of a voltage reference, a comparator, resistors for setting voltage detector threshold, an output driver transistor, manual reset circuit, and an output delay generator.

Detector threshold is fixed internally with high accuracy and requires no adjustment. When a supply voltage crosses a setting detector threshold voltage from a high value to a lower value, this IC generates reset signal.

R3134x Series output "L" at its detect.

Since each of R3134x Series embeds an output delay generator, during a setting 240ms delay time, which is fixed in the IC, this IC keeps the reset condition after they are released. Released conditions will be kept for the delay time from when a supply voltage crosses a setting detector threshold voltage from a low value to a higher value, or from when the manual reset signal is released.

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

Since the packages for these ICs are DFN(PLP)1212-6, SOT-23-5, and SC-88A, high density mounting of the ICs on board is possible.

#### FEATURES

- Supply Current ..... Typ. 0.8 $\mu$ A (R3134x27Ex, V<sub>DD</sub>=3.0V)
- Operating Voltage Range ..... 0.75V to 6.0V (T<sub>opt</sub>=25°C)
- Detector Threshold Range ..... 1.0V to 5.0V (0.1V steps)  
Further, 2.32V, 2.63V, 2.93V, 3.08V, 4.38V, and 4.63V can be provided as standard.
- Detector Threshold Accuracy .....  $\pm$ 1.8%
- Temperature-Drift Coefficient of Detector Threshold ..... Typ.  $\pm$ 100ppm/°C
- Built-in Delay Time Circuit ..... Typ. 240ms
- Output Delay Time Accuracy .....  $\pm$ 15%
- Output Types ..... Nch Open Drain and CMOS
- Packages ..... DFN(PLP)1212-6, SC-88A, SOT-23-5

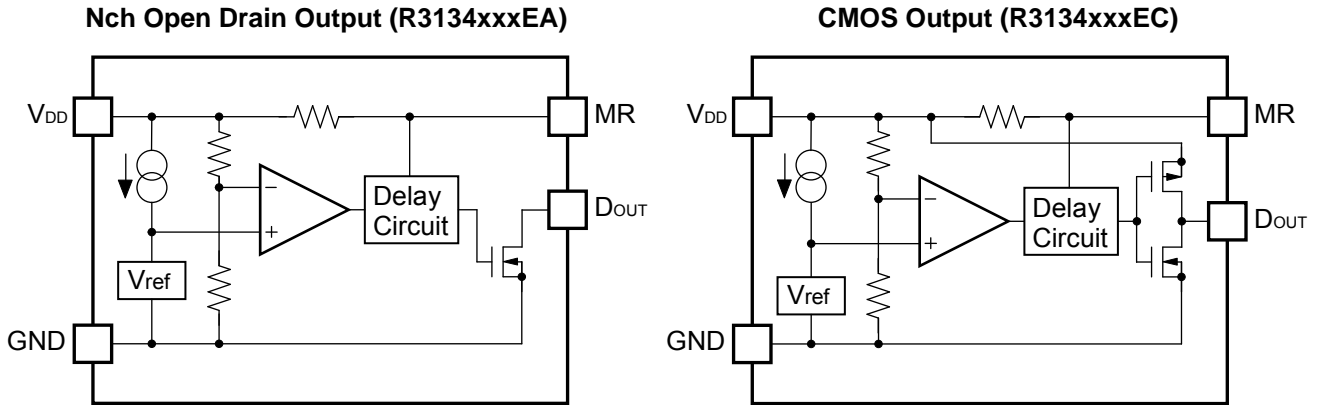
#### APPLICATIONS

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

\* R3134K (DFN(PLP)1212-6) and R3134Q (SC-88A) are the discontinued products as of March, 2016.

## R3134x

### BLOCK DIAGRAMS



### SELECTION GUIDE

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

| Product Name        | Package        | Quantity per Reel | Pb Free | Halogen Free |
|---------------------|----------------|-------------------|---------|--------------|
| R3134KxxE*(y)-TR    | DFN(PLP)1212-6 | 5,000 pcs         | Yes     | Yes          |
| R3134QxxE*(y)-TR-FE | SC-88A         | 3,000 pcs         | Yes     | Yes          |
| R3134NxxE*(y)-TR-FE | SOT-23-5       | 3,000 pcs         | Yes     | Yes          |

xx: The detector threshold can be designated in the range from 1.0V(10) to 5.0V(50) in 0.1V steps.

y: If the detector threshold includes the 3rd digit, indicate the digit of 0.01V.

(Example) If the detector threshold is 2.63V, R3134x26E\*3-TR-x

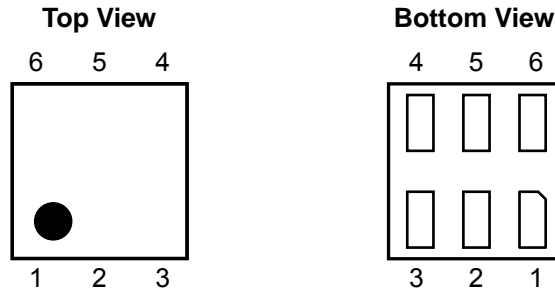
\* : Designation of Output Type

(A) Nch Open Drain

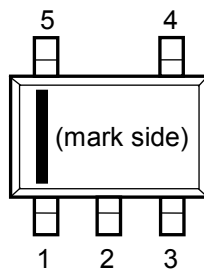
(C) CMOS

## PIN CONFIGURATIONS

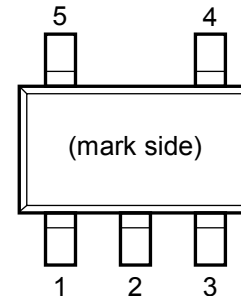
### • DFN(PLP)1212-6



### • SC-88A



### • SOT-23-5



## PIN DESCRIPTIONS

### • DFN(PLP)1212-6

| Pin No. | Symbol           | Description                      |
|---------|------------------|----------------------------------|
| 1       | V <sub>DD</sub>  | Input Pin                        |
| 2       | NC               | No Connection                    |
| 3       | GND              | Ground Pin                       |
| 4       | D <sub>OUT</sub> | Output Pin<br>("L" at detection) |
| 5       | NC               | No Connection                    |
| 6       | MR               | Manual Reset Input Pin*          |

### • SC-88A

| Pin No. | Symbol           | Description                      |
|---------|------------------|----------------------------------|
| 1       | V <sub>DD</sub>  | Input Pin                        |
| 2       | GND              | Ground Pin                       |
| 3       | MR               | Manual Reset Input Pin*          |
| 4       | D <sub>OUT</sub> | Output Pin<br>("L" at detection) |
| 5       | NC               | No Connection                    |

### • SOT-23-5

| Pin No. | Symbol           | Description                      |
|---------|------------------|----------------------------------|
| 1       | D <sub>OUT</sub> | Output Pin<br>("L" at detection) |
| 2       | V <sub>DD</sub>  | Input Pin                        |
| 3       | GND              | Ground Pin                       |
| 4       | MR               | Manual Reset Input Pin*          |
| 5       | NC               | No Connection                    |

\*) MR pin is active at "L" input. Pulled up via 1M $\Omega$  (Typ.). If MR pin is not necessary, open this node, or connect it to V<sub>DD</sub>.

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## R3134x

### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Item                                   | Rating                       | Unit |
|-----------|--|------------------------------|------|
| $V_{DD}$  | Supply Voltage                         | 6.5                          | V    |
| $V_{OUT}$ | Output Voltage (Nch Open Drain Output) | $V_{SS}-0.3$ to 6.5          | V    |
|           | Output Voltage (CMOS Output)           | $V_{SS}-0.3$ to $V_{DD}+0.3$ |      |
| $V_{MR}$  | Input Voltage                          | $V_{SS}-0.3$ to $V_{DD}+0.3$ | V    |
| $I_{OUT}$ | Output Current                         | 20                           | mA   |
| $P_D$     | Power Dissipation (DFN(PLP)1212-6)*    | 400                          | mW   |
|           | Power Dissipation (SC-88A)*            | 380                          |      |
|           | Power Dissipation (SOT-23-5)*          | 420                          |      |
| $T_{opt}$ | 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.

## ELECTRICAL CHARACTERISTICS

### • R3134x

The specification in  is checked and guaranteed by design engineering at  $-40^{\circ}\text{C} \leq T_{\text{opt}} \leq 85^{\circ}\text{C}$ .

$T_{\text{opt}}=25^{\circ}\text{C}$

| Symbol  | Item                                       | Conditions  | Min.                                    | Typ.      | Max.                          | Unit                                  |               |
|---|--|---|---|-----------|-------------------------------|---------------------------------------|---------------|
| $V_{\text{DET}}$                                      | Detector Threshold                         |   | $V_{\text{DET}} \times 0.982$           |           | $V_{\text{DET}} \times 1.018$ | V                                     |               |
| $I_{\text{SS1}}$                                      | Supply Current1                            | $V_{\text{DD}}=V_{\text{DET}}-0.1\text{V}$ , $I_{\text{OUT}}=0\text{A}$ |   |           | 2.0                           | $\mu\text{A}$                         |               |
| $I_{\text{SS2}}$                                      | Supply Current2                            | $V_{\text{DD}}=V_{\text{DET}}+0.1\text{V}$ , $I_{\text{OUT}}=0\text{A}$ |   |           | 2.0                           | $\mu\text{A}$                         |               |
| $I_{\text{SS3}}$                                      | Supply Current3                            | $V_{\text{DD}}=6\text{V}$ ,<br>$I_{\text{OUT}}=0\text{A}$               | $V_{\text{DET}} < 1.6\text{V}$          |           |                               | 3.6                                   | $\mu\text{A}$ |
|   |  |   | $1.6 \leq V_{\text{DET}} < 2.7\text{V}$ |           |                               | 3.0                                   |               |
|   |  |   | $2.7\text{V} \leq V_{\text{DET}}$       |           |                               | 2.5                                   |               |
| $V_{\text{DD}}$                                       | Operating Voltage                          | $T_{\text{opt}}=25^{\circ}\text{C}$                                     | 0.75                                    |           | 6.00                          | V                                     |               |
|   |  | $-40^{\circ}\text{C} \leq T_{\text{opt}} \leq 85^{\circ}\text{C}$       | <input type="checkbox"/> 0.85           |           | <input type="checkbox"/> 6.00 |                                       |               |
| $V_{\text{OH}}$                                       | "H" Output Voltage                         | Refer to the following table  |   |           |                               |                                       |               |
| $V_{\text{OL}}$                                       | "L" Output Voltage                         | Refer to the following table  |   |           |                               |                                       |               |
| $V_{\text{IH}}$                                       | MR pin "H" Input Voltage                   | $V_{\text{DD}} \geq V_{\text{DET}}+0.1\text{V}$                         | $0.75 \times V_{\text{DD}}$             |           |                               | V                                     |               |
| $V_{\text{IL}}$                                       | MR pin "L" Input Voltage                   | $V_{\text{DD}} \geq V_{\text{DET}}+0.1\text{V}$                         |   |           | $0.2 \times V_{\text{DD}}$    | V                                     |               |
| $R_{\text{MR}}$                                       | MR pin pull-up Resistance                  | $T_{\text{opt}}=25^{\circ}\text{C}$                                     | 0.5                                     | 1.0       | 4.0                           | $\text{M}\Omega$                      |               |
| $\frac{\Delta V_{\text{DET}}}{\Delta T_{\text{opt}}}$ | Detector Threshold Temperature Coefficient | $-40^{\circ}\text{C} \leq T_{\text{opt}} \leq 85^{\circ}\text{C}$       |   | $\pm 100$ |                               | $\frac{\text{ppm}}{^{\circ}\text{C}}$ |               |
| $t_{\text{reset}}$                                    | Output Delay Time for detect *             | $V_{\text{DD}}=V_{\text{DET}} \rightarrow V_{\text{DET}}-0.1\text{V}$   |   | 15        |                               | $\mu\text{s}$                         |               |
| $t_{\text{delay}}$                                    | Output Delay Time for release              | $V_{\text{DD}}=0.8\text{V} \rightarrow V_{\text{DET}}+1.0$              | 204                                     | 240       | 276                           | ms                                    |               |

\*) Guaranteed by design, not mass production tested.

#### 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.

\* R3134K (DFN(PLP)1212-6) and R3134Q (SC-88A) are the discontinued products as of March, 2016.

## R3134x

### • "H" Output Voltage ( $V_{OH}$ ) table

$T_{opt}=25^{\circ}\text{C}$

| Products   | Detector Threshold<br>$V_{DET}$ (V)      | "H" Output Voltage $V_{OH}$ (V)                        |               |      |      |
|------------|--|--|---------------|------|------|
|            |  | Conditions   | Min.          | Typ. | Max. |
| R3134xxxEC | $V_{DET} < 1.2\text{V}$                  | $V_{DD}=V_{DET}+0.1\text{V}$ , $I_{OH}=50\mu\text{A}$  | 0.8× $V_{DD}$ |      |      |
|            | $1.2\text{V} \leq V_{DET} < 2.0\text{V}$ | $V_{DD}=V_{DET}+0.1\text{V}$ , $I_{OH}=150\mu\text{A}$ |               |      |      |
|            | $2.0\text{V} \leq V_{DET} < 3.1\text{V}$ | $V_{DD}=V_{DET}+0.1\text{V}$ , $I_{OH}=500\mu\text{A}$ |               |      |      |
|            | $3.1\text{V} \leq V_{DET}$               | $V_{DD}=V_{DET}+0.1\text{V}$ , $I_{OH}=800\mu\text{A}$ |               |      |      |

$V_{DET}$  is a set value.

### • "L" Output Voltage ( $V_{OL}$ ) table

$T_{opt}=25^{\circ}\text{C}$

| Products   | Detector Threshold<br>$V_{DET}$ (V)      | "L" Output Voltage $V_{OL}$ (V)                        |      |      |      |
|------------|--|--|------|------|------|
|            |  | Conditions   | Min. | Typ. | Max. |
| R3134xxxEx | $V_{DET} < 1.2\text{V}$                  | $V_{DD}=V_{DET}-0.1\text{V}$ , $I_{OL}=200\mu\text{A}$ |      |      | 0.04 |
|            | $1.2\text{V} \leq V_{DET} < 2.0\text{V}$ | $V_{DD}=V_{DET}-0.1\text{V}$ , $I_{OL}=750\mu\text{A}$ |      |      | 0.06 |
|            | $2.0\text{V} \leq V_{DET} < 3.1\text{V}$ | $V_{DD}=V_{DET}-0.1\text{V}$ , $I_{OL}=1.2\text{mA}$   |      |      | 0.05 |
|            | $3.1\text{V} \leq V_{DET}$               | $V_{DD}=V_{DET}-0.1\text{V}$ , $I_{OL}=3.2\text{mA}$   |      |      | 0.06 |

$V_{DET}$  is a set value.

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## DETECTOR THRESHOLD SPECIFICATIONS BY PART NUMBER

• R3134x

| Part Number | Operating Voltage |       |                     |      | Detector Threshold |       |       | Supply Current 1         |      |      |
|-------------|-------------------|-------|---------------------|------|--------------------|-------|-------|--------------------------|------|------|
|             | VDD [V]           |       |                     |      | VDET [V]           |       |       | ISS1 [μA]                |      |      |
|             | Conditions        | Min.  | Conditions          | Min. | Min.               | Typ.  | Max.  | Conditions               | Typ. | Max. |
| R3134x23Ex2 | Topt=25°C         | 0.75  | -40°C ≤ Topt ≤ 85°C | 0.85 | 2.278              | 2.320 | 2.362 | VDD=VDET-0.1V<br>IOUT=0A | 0.8  | 2.0  |
| R3134x26Ex3 |                   |       |                     |      | 2.583              | 2.630 | 2.677 |                          |      |      |
| R3134x29Ex3 |                   |       |                     |      | 2.877              | 2.930 | 2.983 |                          |      |      |
| R3134x30Ex8 |                   |       |                     |      | 3.025              | 3.080 | 3.135 |                          |      |      |
| R3134x43Ex8 |                   |       |                     |      | 4.301              | 4.380 | 4.459 |                          |      |      |
| R3134x46Ex3 |                   |       |                     |      | 4.547              | 4.630 | 4.713 |                          |      |      |
| R3134x10Ex  | Topt=25°C         | 0.75  | -40°C ≤ Topt ≤ 85°C | 0.85 | 0.982              | 1.000 | 1.018 | VDD=VDET-0.1V<br>IOUT=0A | 0.8  | 2.0  |
| R3134x11Ex  |                   |       |                     |      | 1.080              | 1.100 | 1.120 |                          |      |      |
| R3134x12Ex  |                   |       |                     |      | 1.178              | 1.200 | 1.222 |                          |      |      |
| R3134x13Ex  |                   |       |                     |      | 1.277              | 1.300 | 1.323 |                          |      |      |
| R3134x14Ex  |                   |       |                     |      | 1.375              | 1.400 | 1.425 |                          |      |      |
| R3134x15Ex  |                   |       |                     |      | 1.473              | 1.500 | 1.527 |                          |      |      |
| R3134x16Ex  |                   |       |                     |      | 1.571              | 1.600 | 1.629 |                          |      |      |
| R3134x17Ex  |                   |       |                     |      | 1.669              | 1.700 | 1.731 |                          |      |      |
| R3134x18Ex  |                   |       |                     |      | 1.768              | 1.800 | 1.832 |                          |      |      |
| R3134x19Ex  |                   |       |                     |      | 1.866              | 1.900 | 1.934 |                          |      |      |
| R3134x20Ex  |                   |       |                     |      | 1.964              | 2.000 | 2.036 |                          |      |      |
| R3134x21Ex  |                   |       |                     |      | 2.062              | 2.100 | 2.138 |                          |      |      |
| R3134x22Ex  |                   |       |                     |      | 2.160              | 2.200 | 2.240 |                          |      |      |
| R3134x23Ex  |                   |       |                     |      | 2.259              | 2.300 | 2.341 |                          |      |      |
| R3134x24Ex  |                   |       |                     |      | 2.357              | 2.400 | 2.443 |                          |      |      |
| R3134x25Ex  |                   |       |                     |      | 2.455              | 2.500 | 2.545 |                          |      |      |
| R3134x26Ex  |                   |       |                     |      | 2.553              | 2.600 | 2.647 |                          |      |      |
| R3134x27Ex  |                   |       |                     |      | 2.651              | 2.700 | 2.749 |                          |      |      |
| R3134x28Ex  |                   |       |                     |      | 2.750              | 2.800 | 2.850 |                          |      |      |
| R3134x29Ex  |                   |       |                     |      | 2.848              | 2.900 | 2.952 |                          |      |      |
| R3134x30Ex  |                   |       |                     |      | 2.946              | 3.000 | 3.054 |                          | 0.9  |      |
| R3134x31Ex  |                   |       |                     |      | 3.044              | 3.100 | 3.156 |                          |      |      |
| R3134x32Ex  |                   |       |                     |      | 3.142              | 3.200 | 3.258 |                          |      |      |
| R3134x33Ex  |                   |       |                     |      | 3.241              | 3.300 | 3.359 |                          |      |      |
| R3134x34Ex  |                   |       |                     |      | 3.339              | 3.400 | 3.461 |                          |      |      |
| R3134x35Ex  |                   |       |                     |      | 3.437              | 3.500 | 3.563 |                          |      |      |
| R3134x36Ex  |                   |       |                     |      | 3.535              | 3.600 | 3.665 |                          |      |      |
| R3134x37Ex  |                   |       |                     |      | 3.633              | 3.700 | 3.767 |                          |      |      |
| R3134x38Ex  |                   |       |                     |      | 3.732              | 3.800 | 3.868 |                          |      |      |
| R3134x39Ex  |                   |       |                     |      | 3.830              | 3.900 | 3.970 |                          |      |      |
| R3134x40Ex  |                   |       |                     |      | 3.928              | 4.000 | 4.072 |                          |      |      |
| R3134x41Ex  |                   |       |                     |      | 4.026              | 4.100 | 4.174 |                          |      |      |
| R3134x42Ex  |                   |       |                     |      | 4.124              | 4.200 | 4.276 |                          |      |      |
| R3134x43Ex  |                   |       |                     |      | 4.223              | 4.300 | 4.377 |                          |      |      |
| R3134x44Ex  | 4.321             | 4.400 | 4.479               |      |                    |       |       |                          |      |      |
| R3134x45Ex  | 4.419             | 4.500 | 4.581               |      |                    |       |       |                          |      |      |
| R3134x46Ex  | 4.517             | 4.600 | 4.683               |      |                    |       |       |                          |      |      |
| R3134x47Ex  | 4.615             | 4.700 | 4.785               |      |                    |       |       |                          |      |      |
| R3134x48Ex  | 4.714             | 4.800 | 4.886               |      |                    |       |       |                          |      |      |
| R3134x49Ex  | 4.812             | 4.900 | 4.988               |      |                    |       |       |                          |      |      |
| R3134x50Ex  | 4.910             | 5.000 | 5.090               |      |                    |       |       |                          |      |      |

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**R3134x**

| Supply Current 2         |      |      | Supply Current 3    |      |      | "H" Output Voltage               |                     |
|--------------------------|------|------|---------------------|------|------|----------------------------------|---------------------|
| Iss2 [ $\mu$ A]          |      |      | Iss3 [ $\mu$ A]     |      |      | Voh [V]                          |                     |
| Conditions               | Typ. | Max. | Conditions          | Typ. | Max. | Conditions                       | Min.                |
| VDD=VDET+0.1V<br>IOUT=0A | 0.8  | 2.0  | VDD=6.0V<br>IOUT=0A | 1.2  | 3.0  | VDD=VDET+0.1V<br>IOH=500 $\mu$ A | 0.8 $\times$<br>VDD |
|                          |      |      |                     | 1.0  | 2.5  | VDD=VDET+0.1V<br>IOH=800 $\mu$ A |                     |
| VDD=VDET+0.1V<br>IOUT=0A | 0.8  | 2.0  | VDD=6.0V<br>IOUT=0A | 1.4  | 3.6  | VDD=VDET+0.1V<br>IOH=50 $\mu$ A  | 0.8 $\times$<br>VDD |
|                          |      |      |                     |      |      | VDD=VDET+0.1V<br>IOH=150 $\mu$ A |                     |
|                          |      |      |                     | 1.2  | 3.0  | VDD=VDET+0.1V<br>IOH=500 $\mu$ A |                     |
|                          |      |      |                     |      |      | VDD=VDET+0.1V<br>IOH=800 $\mu$ A |                     |
|                          |      |      |                     | 1.0  | 2.5  | VDD=VDET+0.1V<br>IOH=800 $\mu$ A |                     |
|                          |      |      |                     |      |      | 0.8                              |                     |



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**R3134x**

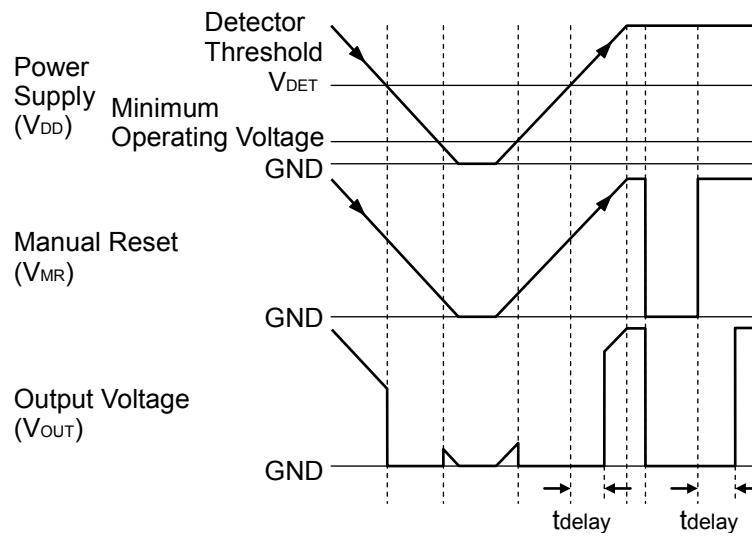
| Part Number | "L" Output Voltage         |      | MR pin "H" Input Voltage |              | MR pin "L" Input Voltage |             | MR pin pull-up resistance |      |      |      |                |              |                |             |           |     |     |     |
|-------------|----------------------------|------|--------------------------|--------------|--------------------------|-------------|---------------------------|------|------|------|----------------|--------------|----------------|-------------|-----------|-----|-----|-----|
|             | VoL [V]                    |      | VIH [V]                  |              | VIL [V]                  |             | RMR [MΩ]                  |      |      |      |                |              |                |             |           |     |     |     |
|             | Conditions                 | Max. | Conditions               | Min.         | Conditions               | Max.        | Conditions                | Min. | Typ. | Max. |                |              |                |             |           |     |     |     |
| R3134x23Ex2 | VDD=VDET-0.1V<br>IOL=1.2mA | 0.05 | VDD ≥ VDET+0.1           | 0.75×<br>VDD | VDD ≥ VDET+0.1           | 0.2×<br>VDD | Topt=25°C                 | 0.5  | 1.0  | 4.0  |                |              |                |             |           |     |     |     |
| R3134x26Ex3 |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x29Ex3 |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x30Ex8 |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x43Ex8 | VDD=VDET-0.1V<br>IOL=3.2mA | 0.06 | VDD ≥ VDET+0.1           | 0.75×<br>VDD | VDD ≥ VDET+0.1           | 0.2×<br>VDD | Topt=25°C                 | 0.5  | 1.0  | 4.0  |                |              |                |             |           |     |     |     |
| R3134x46Ex3 |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x10Ex  | VDD=VDET-0.1V<br>IOL=200μA | 0.04 |                          |              |                          |             |                           |      |      |      | VDD ≥ VDET+0.1 | 0.75×<br>VDD | VDD ≥ VDET+0.1 | 0.2×<br>VDD | Topt=25°C | 0.5 | 1.0 | 4.0 |
| R3134x11Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x12Ex  | VDD=VDET-0.1V<br>IOL=750μA | 0.06 | VDD ≥ VDET+0.1           | 0.75×<br>VDD | VDD ≥ VDET+0.1           | 0.2×<br>VDD | Topt=25°C                 | 0.5  | 1.0  | 4.0  |                |              |                |             |           |     |     |     |
| R3134x13Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x14Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x15Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x16Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x17Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x18Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x19Ex  | VDD=VDET-0.1V<br>IOL=1.2mA | 0.05 | VDD ≥ VDET+0.1           | 0.75×<br>VDD | VDD ≥ VDET+0.1           | 0.2×<br>VDD | Topt=25°C                 | 0.5  | 1.0  | 4.0  |                |              |                |             |           |     |     |     |
| R3134x20Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x21Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x22Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x23Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x24Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x25Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x26Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x27Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x28Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x29Ex  | VDD=VDET-0.1V<br>IOL=3.2mA | 0.06 | VDD ≥ VDET+0.1           | 0.75×<br>VDD | VDD ≥ VDET+0.1           | 0.2×<br>VDD | Topt=25°C                 | 0.5  | 1.0  | 4.0  |                |              |                |             |           |     |     |     |
| R3134x30Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x31Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x32Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x33Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x34Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x35Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x36Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x37Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x38Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x39Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x40Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x41Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x42Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x43Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x44Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x45Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x46Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x47Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x48Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x49Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |
| R3134x50Ex  |                            |      |                          |              |                          |             |                           |      |      |      |                |              |                |             |           |     |     |     |

\* R3134K (DFN(PLP)1212-6) and R3134Q (SC-88A) are the discontinued products as of March, 2016.

## R3134x

| Output Delay Time for Release  |      |      |      | Detector Threshold Temperature Coefficient    |      |
|--|------|------|------|---|------|
| t <sub>delay</sub> [ms]  |      |      |      | ΔV <sub>DET</sub> /ΔT <sub>opt</sub> [ppm/°C] |      |
| Conditions   | Min. | Typ. | Max. | Conditions                                    | Typ. |
| V <sub>DD</sub> =0.8V→<br>V <sub>DET</sub> +1.0V<br>T <sub>opt</sub> =25°C | 204  | 240  | 276  | -40°C ≤ T <sub>opt</sub> ≤ 85°C               | ±100 |
| V <sub>DD</sub> =0.8V→<br>V <sub>DET</sub> +1.0V<br>T <sub>opt</sub> =25°C | 204  | 240  | 276  | -40°C ≤ T <sub>opt</sub> ≤ 85°C               | ±100 |

## TIMING CHART



R3134x Operating Diagram

## DEFINITION OF OUTPUT DELAY TIME

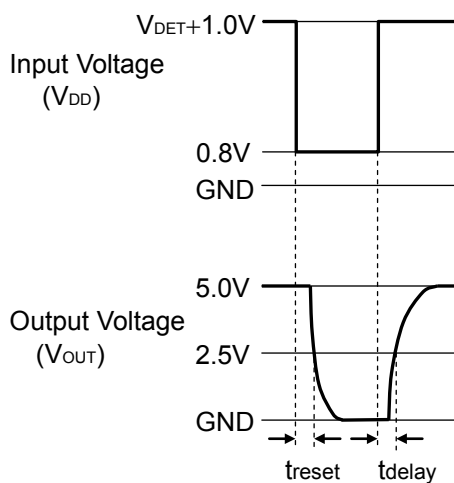
Output Delay Time ( $t_{delay}$ ) is specified as follows:

1. In the case of Nch Open Drain Output:

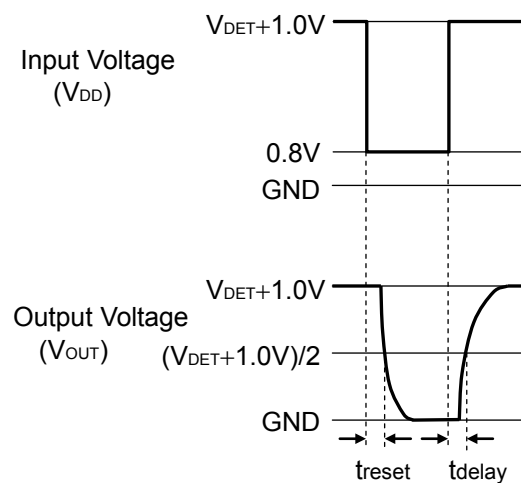
The time interval from rising edge of  $V_{DD}$  pulse 0.8V to  $V_{DET}+1.0V$  to the time at which the output reaches 2.5V under the condition that the output pin ( $D_{OUT}$ ) is pulled up to 5V through a 470k $\Omega$  resistor.

2. In the case of CMOS Output:

The time interval from rising edge of  $V_{DD}$  pulse 0.8V to  $V_{DET}+1.0V$  to the time at the output reaches  $(V_{DET}+1.0V)/2$ .



Nch Open Drain Output  
(R3134xxxEA)

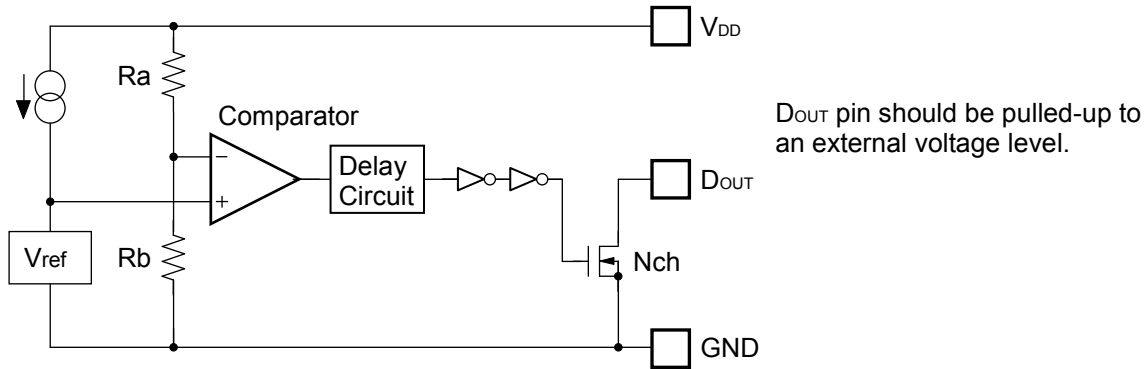


CMOS Output  
(R3134xxxEC)

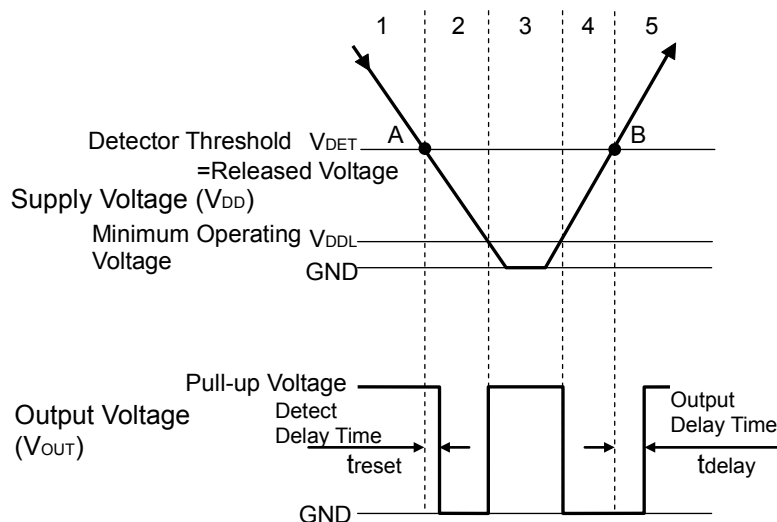
## R3134x

## OPERATION

### • Operation of R3134xxxEA



Block Diagram



Operation Diagram

### • Explanation of operation

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

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

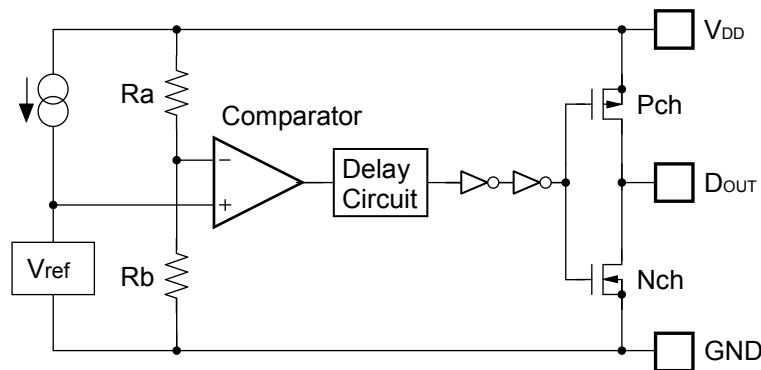
Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite. The output voltage is equal to the pull-up voltage.

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

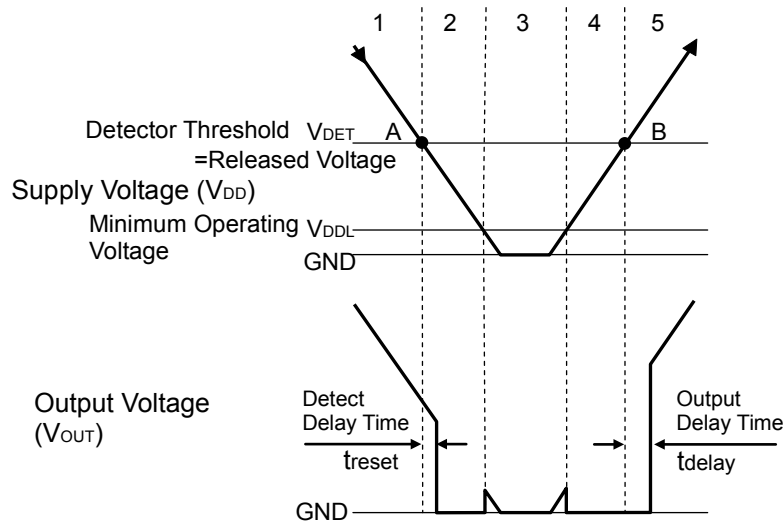
Step 5. At Point "B",  $V_{ref} \leq V_{DD} \times R_b / (R_a + R_b)$  is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the pull-up voltage. The voltage level of Point B means a released voltage ( $V_{DET}$ ).

\*) There is no hysteresis range between the detector threshold and the released voltage.

• Operation of R3134xxxEC



Block Diagram



Operation Diagram

• Explanation of operation

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

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

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

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

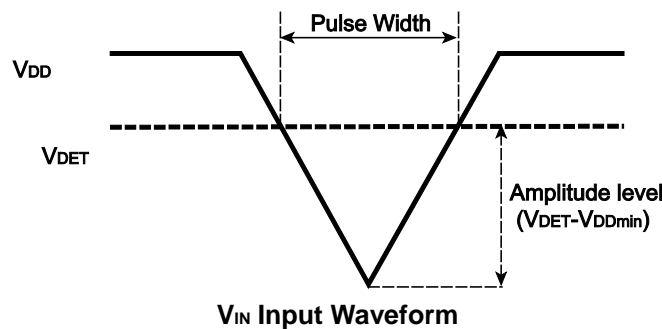
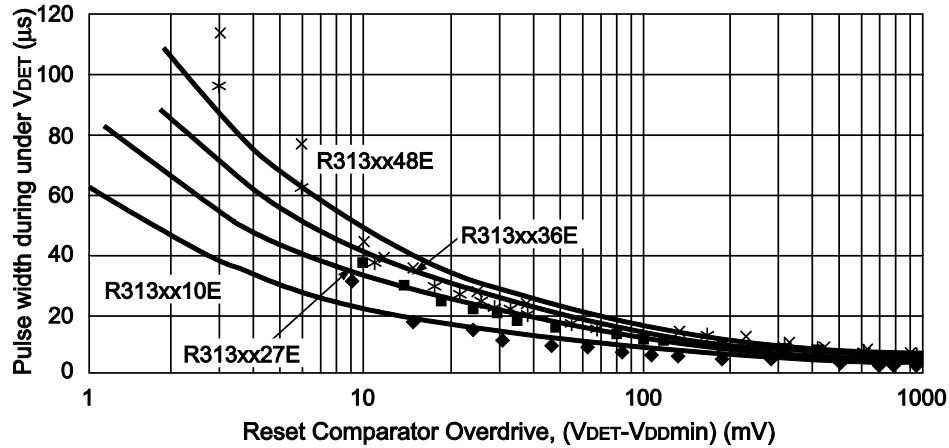
Step 5. At Point "B",  $V_{ref} \leq V_{DD} \times R_b / (R_a + R_b)$  is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the supply voltage ( $V_{DD}$ ). The voltage level of Point B means a released voltage ( $V_{DET}$ ).

\*) There is no hysteresis range between the detector threshold and the released voltage.

## R3134x

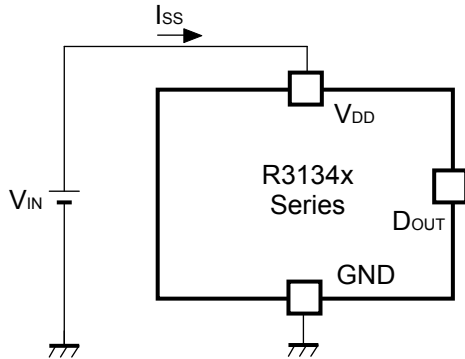
### Detector Operation vs. glitch input voltage to the V<sub>DD</sub> pin

When the IC is released and a large pulse (glitch) crosses the detector threshold is forced, the IC may not maintain the released condition. The amplitude of the pulse ( $V_{DET}-V_{DDmin}$ ) and the pulse width the IC can maintain the released level is described in the graph as follows:

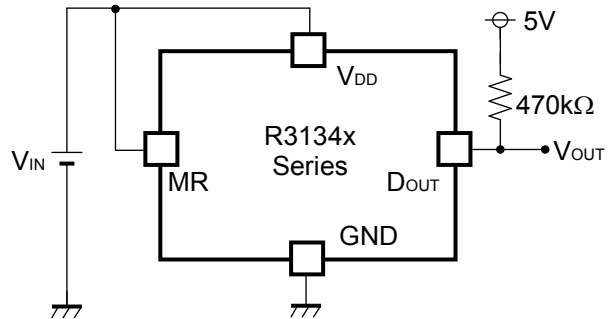


The graph above shows the condition for the maximum transient duration without generating a reset. If the larger amplitude or larger pulse width noise than the graph may be on the  $V_{DD}$ , the reset signal may be generated.

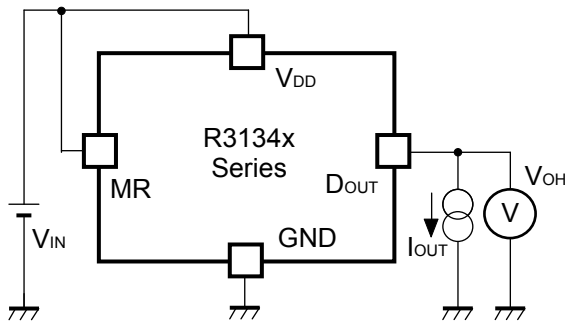
## TEST CIRCUITS



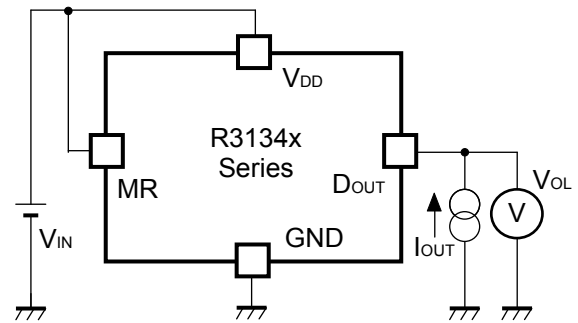
**Supply Current Test Circuit**



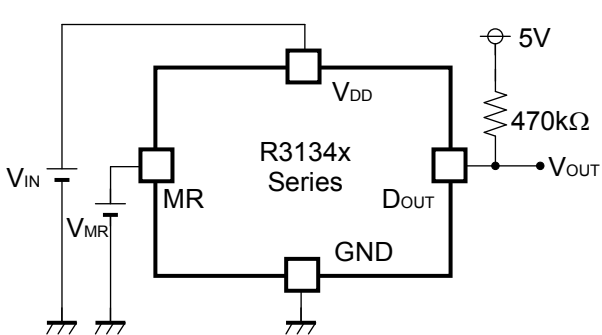
**Detector Threshold Test Circuit**  
(Pull-up circuit is not necessary for CMOS Output type.)



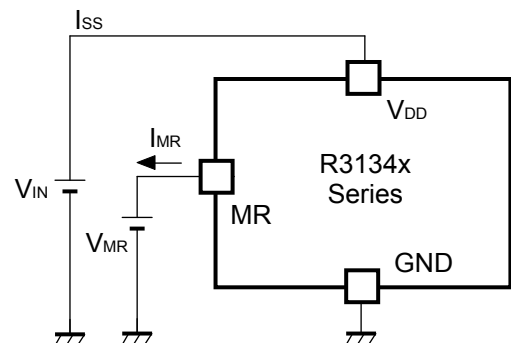
**"H" Output Voltage Test Circuit**  
(CMOS Output Type only)



**"L" Output Voltage Test Circuit**



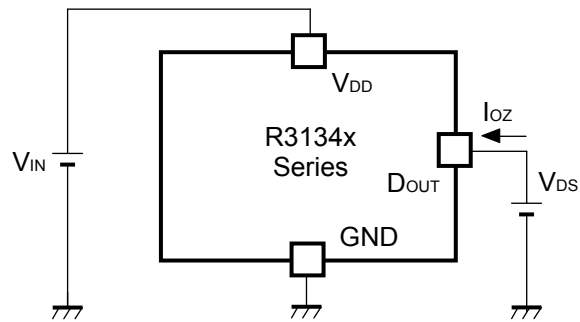
**MR pin Input Voltage Test Circuit**  
(Pull-up circuit is not necessary for CMOS Output type.)



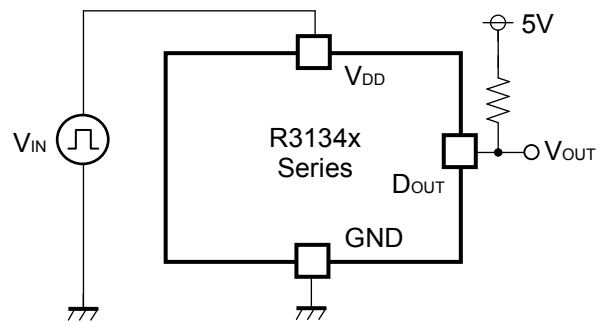
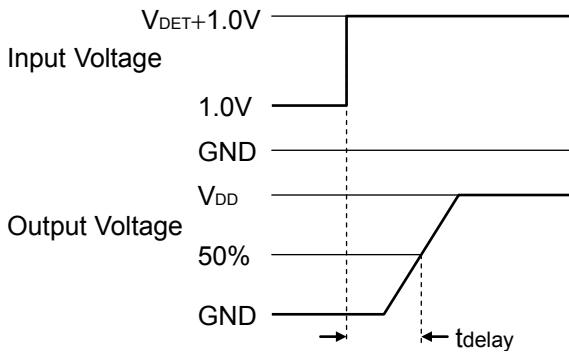
**MR pin Pull-up Resistance Test Circuit**

\* R3134K (DFN(PLP)1212-6) and R3134Q (SC-88A) are the discontinued products as of March, 2016.

## R3134x



**Off Leakage Current Test Circuit**



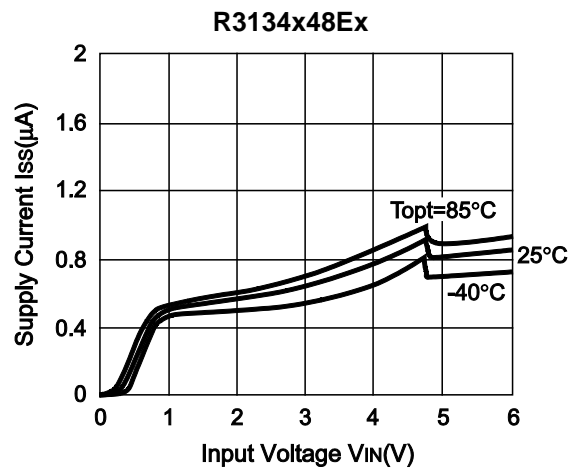
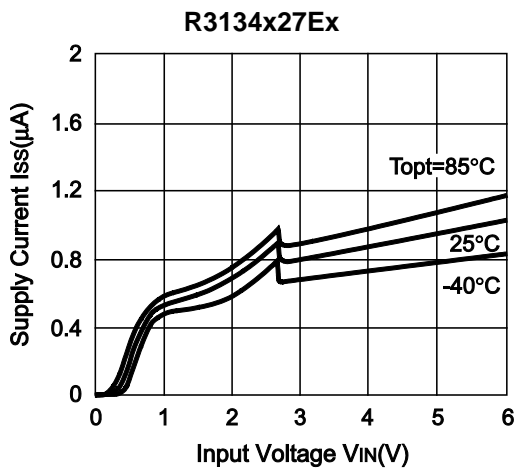
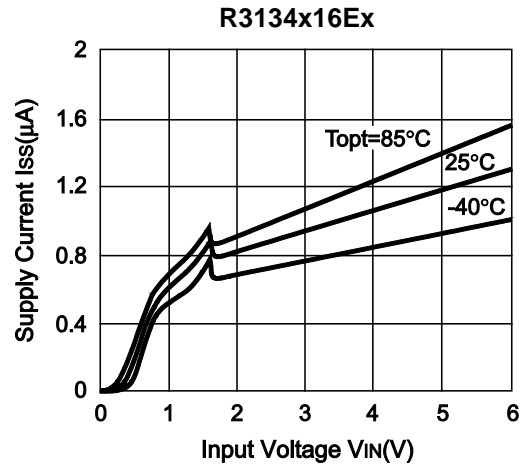
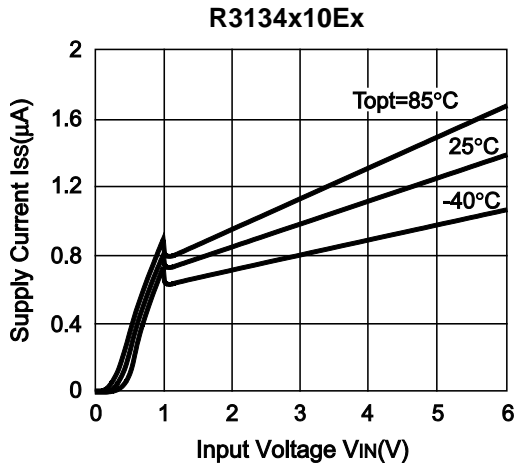
**Output Delay Time Test Circuit**

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

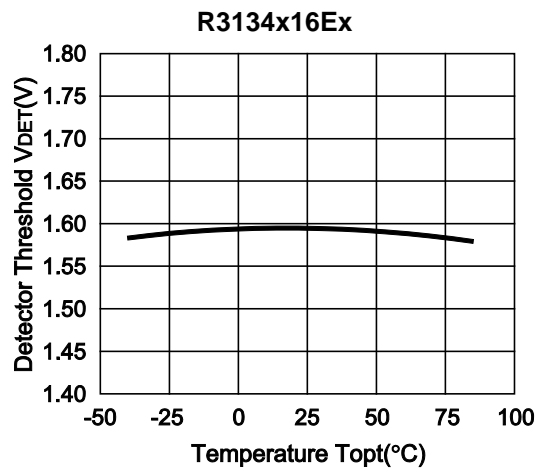
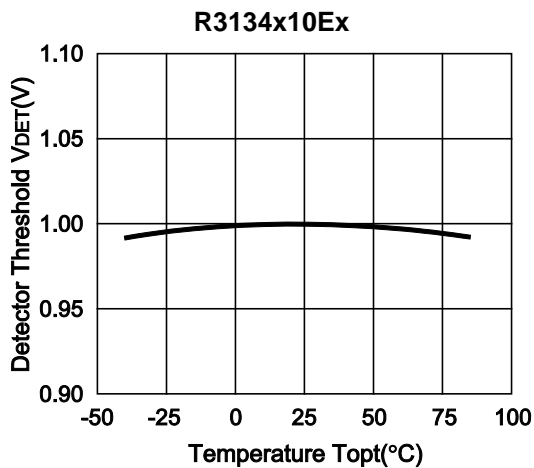


## TYPICAL CHARACTERISTICS

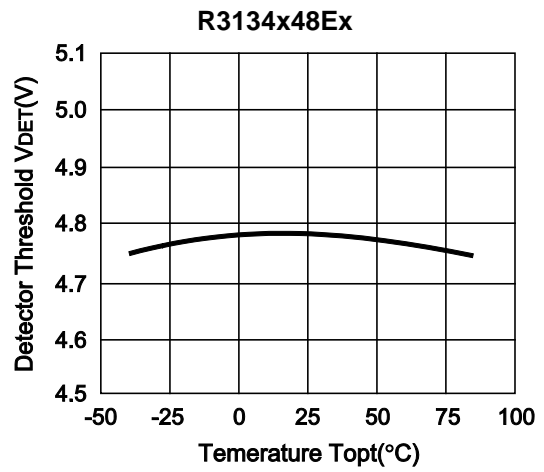
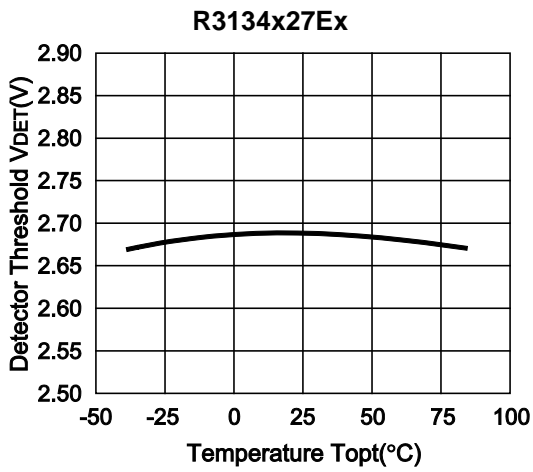
### 1) Supply Current vs. Input Voltage



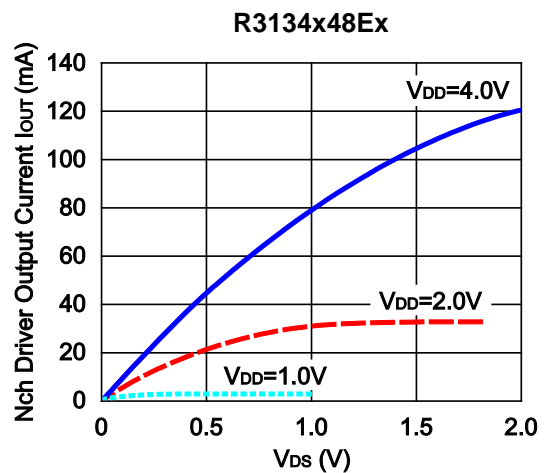
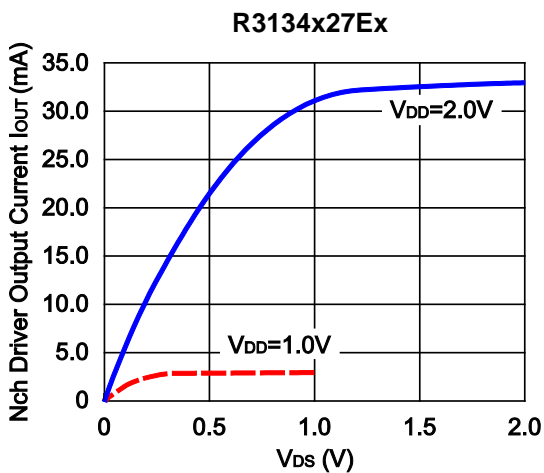
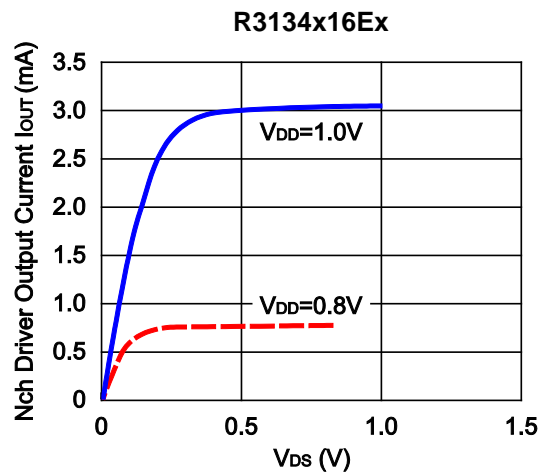
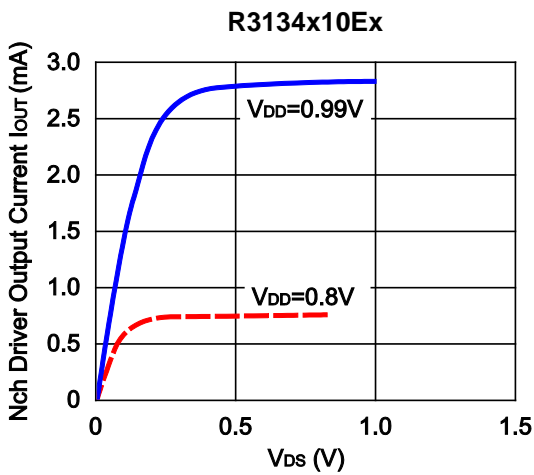
### 2) Detector Threshold vs. Temperature



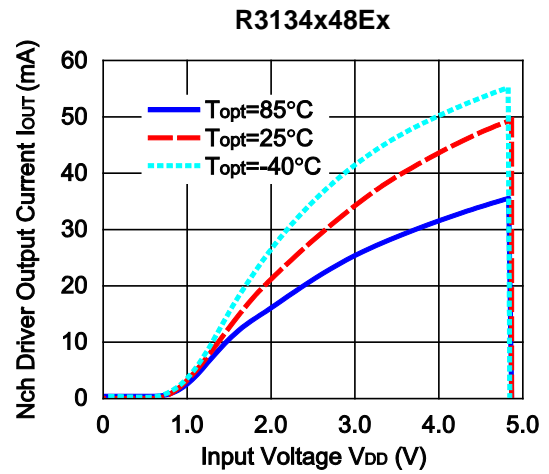
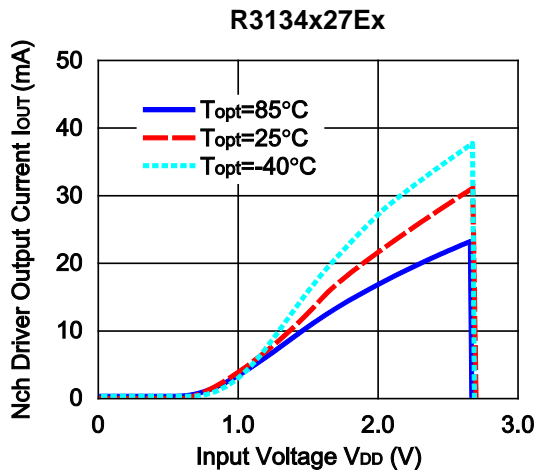
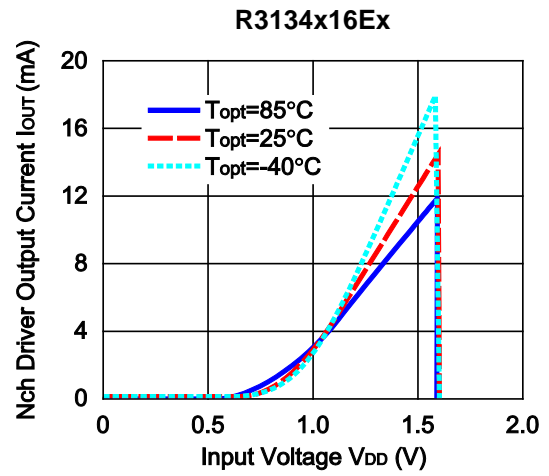
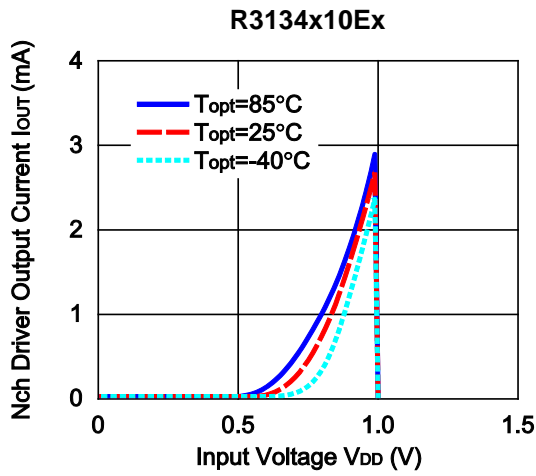
**R3134x**



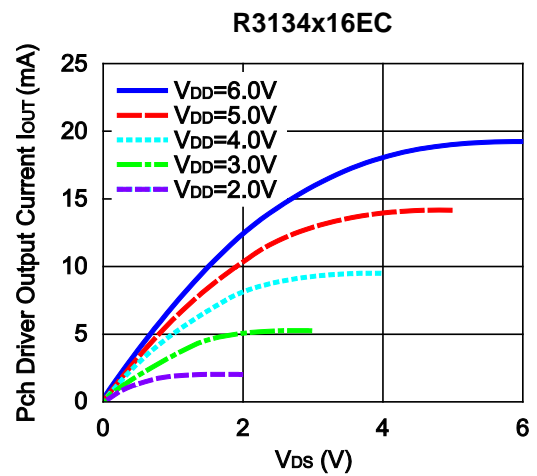
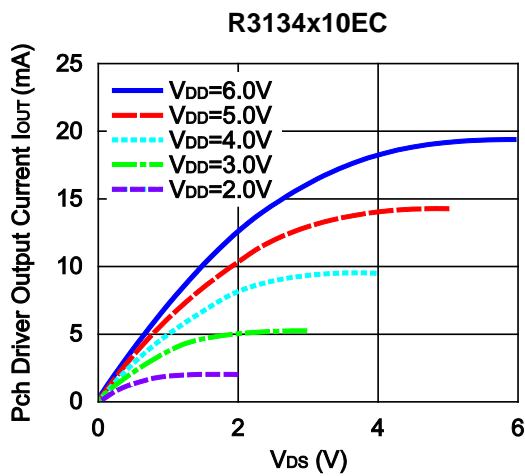
**3) Nch Driver Output Current vs. V<sub>DS</sub> (T<sub>opt</sub>=25°C)**



4) Nch Driver Output Current vs. Input Voltage

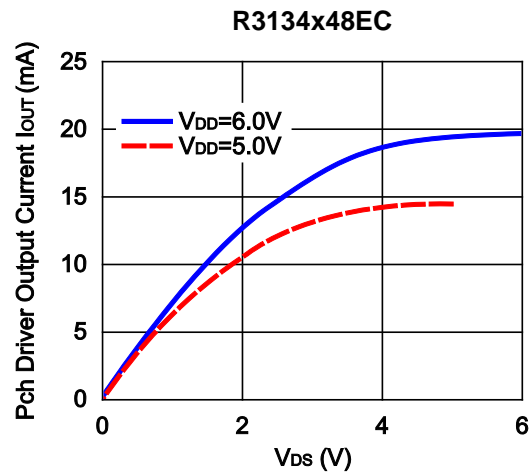
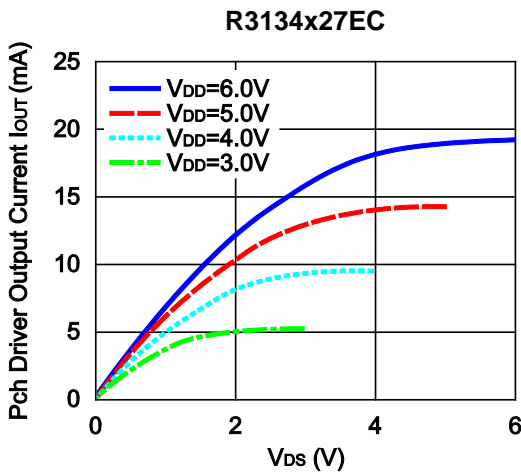


5) Pch Driver Output Current vs. V<sub>DS</sub>

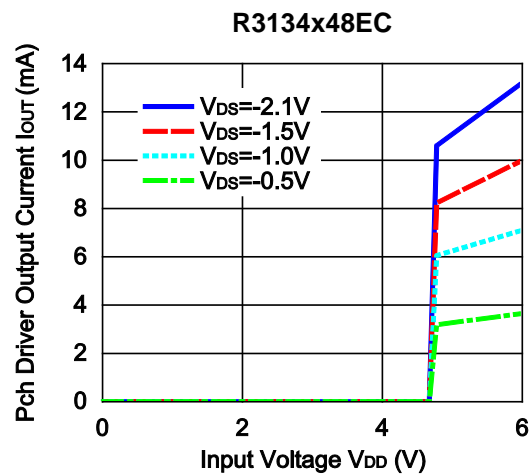
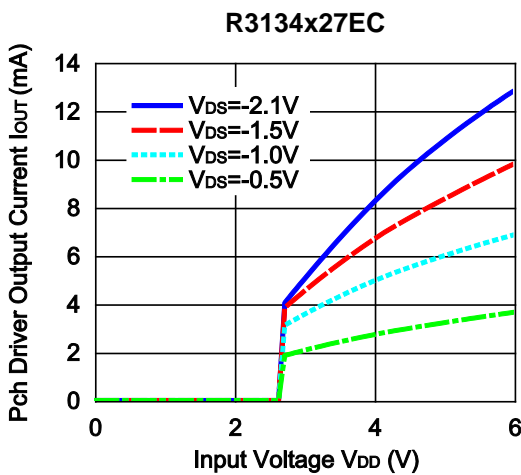
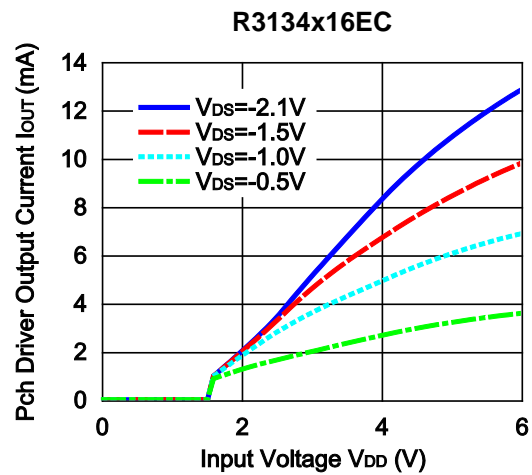
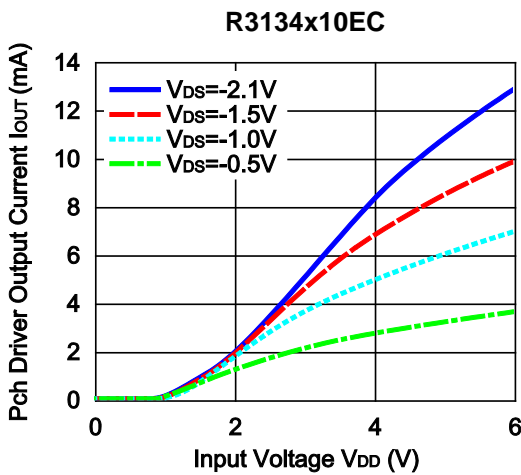


\* R3134K (DFN(PLP)1212-6) and R3134Q (SC-88A) are the discontinued products as of March, 2016.

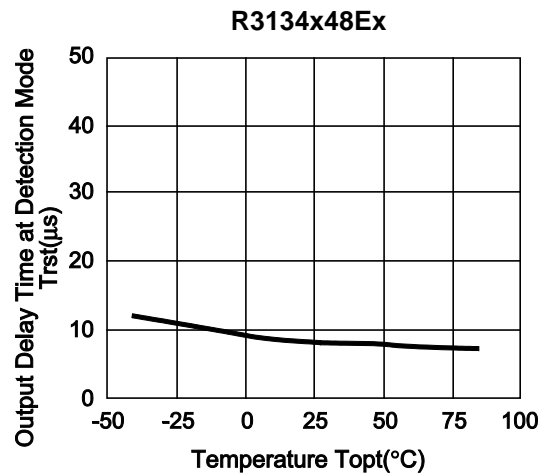
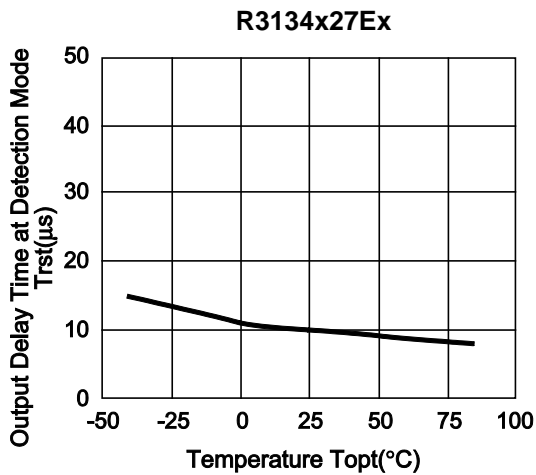
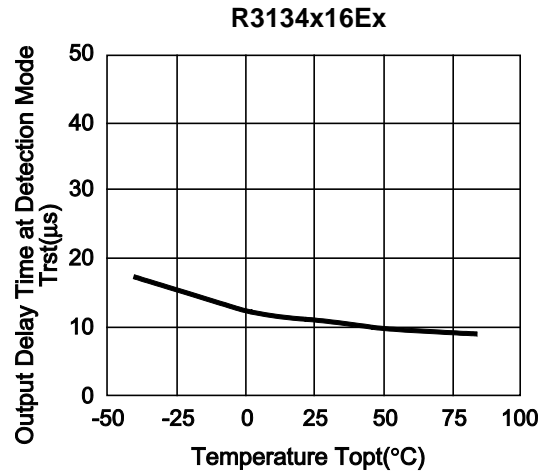
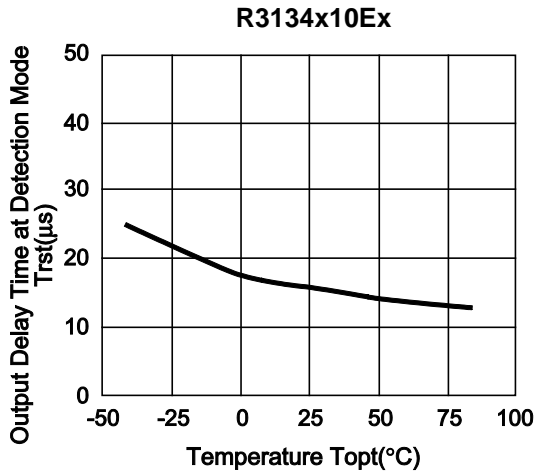
## R3134x



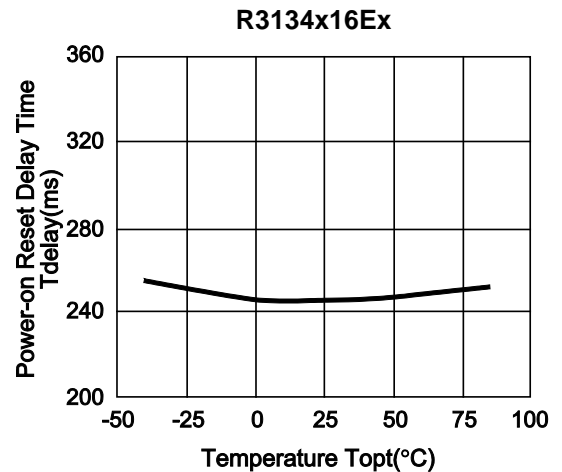
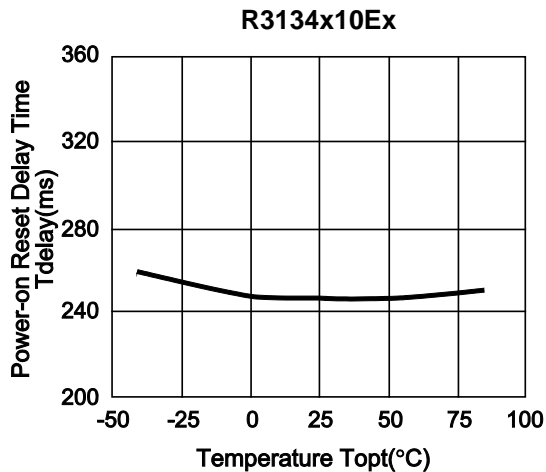
### 6) Pch Driver Output Current vs. Input Voltage



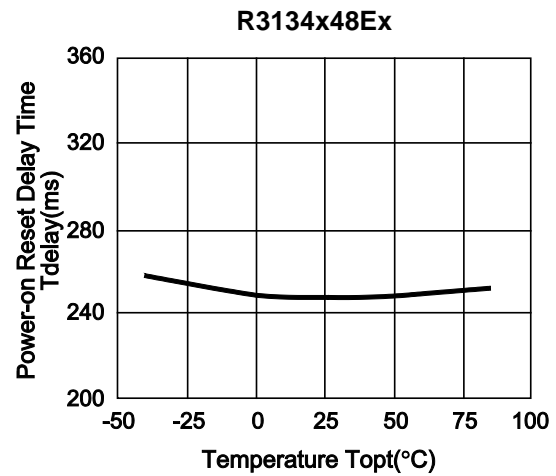
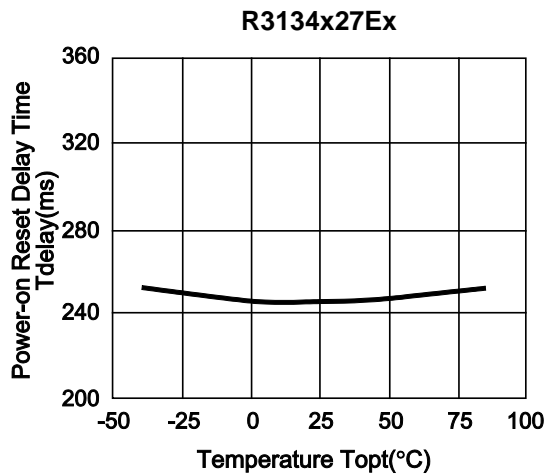
7) Output Delay Time at Detection Mode vs. Temperature



8) Power-on Reset Delay Time vs. Temperature



## R3134x



## TECHNICAL NOTES

### When connecting resistors to the device's input pin

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

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

As shown in Figure A/B, set R1 to become 100 kΩ or less as a guide, and connect C<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.

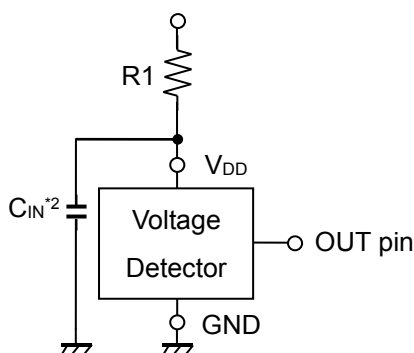


Figure A

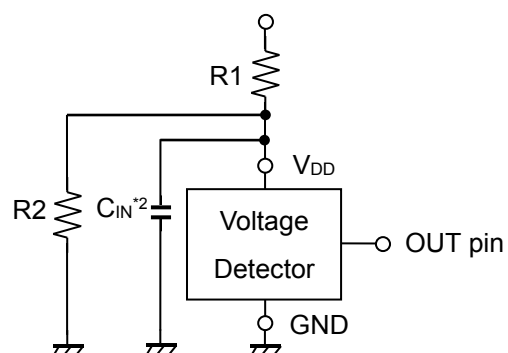


Figure B

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

\*2 Note the bias dependence of capacitors.



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