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### LOW VOLTAGE DETECTOR WITH OUTPUT DELAY

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NO. EA-027-160309

#### OUTLINE

The RN5VD 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, resistor net for detector threshold setting, an output driver, a hysteresis circuit, and an output delay circuit. The detector threshold is fixed with high accuracy internally and does not require any adjustment. Two output types, Nch open drain type and CMOS type are available.

Since the package for these ICs is SOT-23-5 package, high density mounting of the ICs on board is possible.

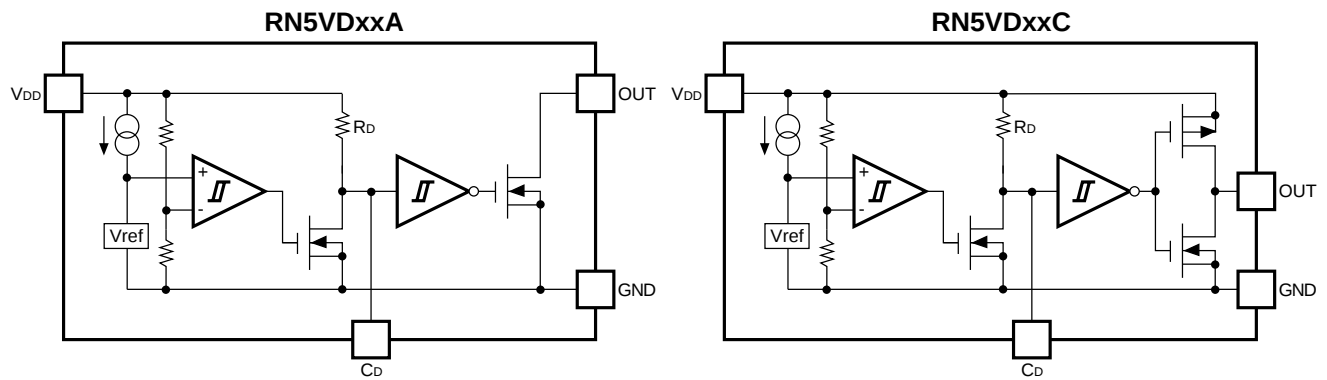
#### FEATURES

- Built-in Output Delay Circuit..... Typ. 100ms with an external capacitor : 0.15 $\mu$ F
- Supply Current..... Typ. 1.0 $\mu$ A (RN5VD15x,  $V_{DD}=3.5V$ )
- Operating Voltage Range..... 0.7 to 10.0V ( $T_{opt}=25^{\circ}C$ )
- Detector Threshold Range..... 0.9V to 6.0V (0.1V steps)
- Detector Threshold Accuracy.....  $\pm 2.5\%$
- Temperature-Drift Coefficient of Detector Threshold ..... Typ.  $\pm 100ppm/^{\circ}C$
- Output Types..... Nch Open Drain and CMOS
- Package ..... SOT-23-5

#### APPLICATIONS

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

BLOCK DIAGRAMS

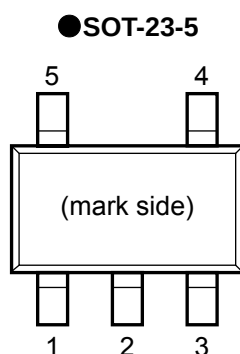


SELECTION GUIDE

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

| Product Name                                                                                       | Package  | Quantity per Reel | Pb Free | Halogen Free |
|----------------------------------------------------------------------------------------------------|----------|-------------------|---------|--------------|
| RN5VDxx*A-TR-FE                                                                                    | SOT-23-5 | 3,000 pcs         | Yes     | Yes          |
| xx: The detector threshold can be designated in the range from 0.9V(09) to 6.0V(60) in 0.1V steps. |          |                   |         |              |
| * : Designation of Output Type<br>(A) Nch Open Drain<br>(C) CMOS                                   |          |                   |         |              |

## PIN CONFIGURATION



## PIN DESCRIPTION

| Pin No. | Symbol          | Pin Description                                        |
|---------|-----------------|--------------------------------------------------------|
| 1       | OUT             | Output Pin ("L" at Detection)                          |
| 2       | V <sub>DD</sub> | Input Pin                                              |
| 3       | GND             | Ground Pin                                             |
| 4       | NC              | No Connection                                          |
| 5       | C <sub>D</sub>  | Pin for external capacitor ( for setting output delay) |

## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Item                          | Ratings     |                                              | Unit |
|---------------------|-------------------------------|-------------|----------------------------------------------|------|
| V <sub>DD</sub>     | Supply Voltage                | 12          |                                              | V    |
| V <sub>OUT</sub>    | Output Voltage                | CMOS        | V <sub>SS</sub> -0.3 to V <sub>DD</sub> +0.3 | V    |
|                     |                               | Nch         | V <sub>SS</sub> -0.3~12                      |      |
| I <sub>OUT</sub>    | Output Current                | 70          |                                              | mA   |
| P <sub>D</sub>      | Power Dissipation (SOT-23-5)* | 420         |                                              | mW   |
| T <sub>opt</sub>    | Operating Temperature Range   | -40 to +85  |                                              | °C   |
| T <sub>stg</sub>    | Storage Temperature Range     | -55 to +125 |                                              | °C   |
| T <sub>solder</sub> | Lead Temperature (Soldering)  | 260°C 10s   |                                              |      |

\* ) 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

## • RN5VD09A/C

T<sub>opt</sub>=25°C

| Symbol                                  | Item                                          | Conditions                                    |                                               | Min.  | Typ.  | Max.  | Unit.  |
|-----------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------|-------|-------|--------|
| -V <sub>DET</sub>                       | Detector Threshold                            |                                               |                                               | 0.878 | 0.900 | 0.922 | V      |
| V <sub>HYS</sub>                        | Detector Threshold Hysteresis                 |                                               |                                               | 0.027 | 0.045 | 0.063 | V      |
| I <sub>SS</sub>                         | Supply Current                                | V <sub>DD</sub> =0.8V                         |                                               |       | 1.5   | 3.7   | μA     |
|                                         |                                               | V <sub>DD</sub> =2.9V                         |                                               |       | 0.9   | 2.7   |        |
| V <sub>DDH</sub>                        | Maximum Operating Voltage                     |                                               |                                               |       |       | 10    | V      |
| V <sub>DDL</sub>                        | Minimum Operating Voltage<br>(Note 1)         | T <sub>opt</sub> =25°C                        |                                               |       | 0.55  | 0.70  | V      |
|                                         |                                               | -30°C≤T <sub>opt</sub> ≤85°C                  |                                               |       | 0.65  | 0.80  |        |
| I <sub>OUT</sub>                        | Output Current                                | Nch                                           | V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.7V | 0.01  | 0.05  |       | mA     |
|                                         |                                               |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =0.85V | 0.05  | 0.50  |       |        |
|                                         |                                               | Pch                                           | V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =4.5V | 1.0   | 2.0   |       | mA     |
| V <sub>TCD</sub>                        | CD pin Threshold Voltage                      | V <sub>DD</sub> =0.99V                        |                                               | 0.297 | 0.495 | 0.693 | V      |
| I <sub>CD</sub>                         | CD pin Sink Current                           | V <sub>DS</sub> =0.1V, V <sub>DD</sub> =0.7V  |                                               | 2.0   | 30    |       | μA     |
|                                         |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =0.85V |                                               | 10.0  | 100.0 |       |        |
| R <sub>D</sub>                          | Delay Resistance                              |                                               |                                               | 0.5   | 1.0   | 2.0   | MΩ     |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | -30°C≤T <sub>opt</sub> ≤85°C                  |                                               |       | ±100  |       | ppm/°C |

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470kΩ, and the pull-up voltage is set at 5.0V.

## • RN5VD18A/C

T<sub>opt</sub>=25°C

| Symbol                                  | Item                                          | Conditions                                             | Min.  | Typ.         | Max.         | Unit.  |
|-----------------------------------------|-----------------------------------------------|--------------------------------------------------------|-------|--------------|--------------|--------|
| -V <sub>DET</sub>                       | Detector Threshold                            |                                                        | 1.755 | 1.800        | 1.845        | V      |
| V <sub>HYS</sub>                        | Detector Threshold Hysteresis                 |                                                        | 0.054 | 0.090        | 0.126        | V      |
| I <sub>SS</sub>                         | Supply Current                                | V <sub>DD</sub> =1.7V                                  |       | 2.5          | 5.0          | μA     |
|                                         |                                               | V <sub>DD</sub> =3.8V                                  |       | 1.0          | 3.0          |        |
| V <sub>DDH</sub>                        | Maximum Operating Voltage                     |                                                        |       |              | 10           | V      |
| V <sub>DDL</sub>                        | Minimum Operating Voltage<br>(Note 1)         | T <sub>opt</sub> =25°C<br>-30°C≤T <sub>opt</sub> ≤85°C |       | 0.55<br>0.65 | 0.70<br>0.80 | V      |
| I <sub>OUT</sub>                        | Output Current                                | Nch<br>V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.7V   | 0.01  | 0.05         |              | mA     |
|                                         |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V           | 1.0   | 2.0          |              |        |
|                                         |                                               | Pch<br>V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =4.5V   | 1.0   | 2.0          |              | mA     |
| V <sub>TCD</sub>                        | CD pin Threshold Voltage                      | V <sub>DD</sub> =1.98V                                 | 0.693 | 0.990        | 1.287        | V      |
| I <sub>CD</sub>                         | CD pin Sink Current                           | V <sub>DS</sub> =0.1V, V <sub>DD</sub> =0.7V           | 2.0   | 30           |              | μA     |
|                                         |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V           | 200.0 | 800.0        |              |        |
| R <sub>D</sub>                          | Delay Resistance                              |                                                        | 0.5   | 1.0          | 2.0          | MΩ     |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | -30°C≤T <sub>opt</sub> ≤85°C                           |       | ±100         |              | ppm/°C |

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470kΩ, and the pull-up voltage is set at 5.0V.

**• RN5VD27A/C**
 $T_{opt}=25^{\circ}\text{C}$ 

| Symbol                                  | Item                                          | Conditions                                                                               |                                           | Min.  | Typ.         | Max.         | Unit.                   |
|-----------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------|-------|--------------|--------------|-------------------------|
| $-V_{DET}$                              | Detector Threshold                            |                                                                                          |                                           | 2.633 | 2.700        | 2.767        | V                       |
| $V_{HYS}$                               | Detector Threshold Hysteresis                 |                                                                                          |                                           | 0.081 | 0.135        | 0.189        | V                       |
| $I_{SS}$                                | Supply Current                                | $V_{DD}=2.6\text{V}$                                                                     |                                           |       | 3.5          | 7.0          | $\mu\text{A}$           |
|                                         |                                               | $V_{DD}=4.7\text{V}$                                                                     |                                           |       | 1.1          | 3.3          |                         |
| $V_{DDH}$                               | Maximum Operating Voltage                     |                                                                                          |                                           |       |              | 10           | V                       |
| $V_{DDL}$                               | Minimum Operating Voltage<br>(Note 1)         | $T_{opt}=25^{\circ}\text{C}$<br>$-30^{\circ}\text{C}\leq T_{opt}\leq 85^{\circ}\text{C}$ |                                           |       | 0.55<br>0.65 | 0.70<br>0.80 | V                       |
| $I_{OUT}$                               | Output Current                                | Nch                                                                                      | $V_{DS}=0.05\text{V}, V_{DD}=0.7\text{V}$ | 0.01  | 0.05         |              | mA                      |
|                                         |                                               |                                                                                          | $V_{DS}=0.5\text{V}, V_{DD}=1.5\text{V}$  | 1.0   | 2.0          |              |                         |
|                                         |                                               | Pch                                                                                      | $V_{DS}=-2.1\text{V}, V_{DD}=4.5\text{V}$ | 1.0   | 2.0          |              | mA                      |
| $V_{TCD}$                               | CD pin Threshold Voltage                      | $V_{DD}=2.97\text{V}$                                                                    |                                           | 1.188 | 1.485        | 1.782        | V                       |
| $I_{CD}$                                | CD pin Sink Current                           | $V_{DS}=0.1\text{V}, V_{DD}=0.7\text{V}$                                                 |                                           | 2.0   | 30           |              | $\mu\text{A}$           |
|                                         |                                               | $V_{DS}=0.5\text{V}, V_{DD}=1.5\text{V}$                                                 |                                           | 200.0 | 800.0        |              |                         |
| $R_D$                                   | Delay Resistance                              |                                                                                          |                                           | 0.5   | 1.0          | 2.0          | $\text{M}\Omega$        |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | $-30^{\circ}\text{C}\leq T_{opt}\leq 85^{\circ}\text{C}$                                 |                                           |       | $\pm 100$    |              | ppm/ $^{\circ}\text{C}$ |

( Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470k $\Omega$ , and the pull-up voltage is set at 5.0V.

## • RN5VD36A/C

T<sub>opt</sub>=25°C

| Symbol                                  | Item                                          | Conditions                                             |                                               | Min.  | Typ.         | Max.         | Unit.  |
|-----------------------------------------|-----------------------------------------------|--------------------------------------------------------|-----------------------------------------------|-------|--------------|--------------|--------|
| -V <sub>DET</sub>                       | Detector Threshold                            |                                                        |                                               | 3.510 | 3.600        | 3.690        | V      |
| V <sub>HYS</sub>                        | Detector Threshold Hysteresis                 |                                                        |                                               | 0.108 | 0.180        | 0.252        | V      |
| I <sub>SS</sub>                         | Supply Current                                | V <sub>DD</sub> =3.47V                                 |                                               |       | 4.5          | 9.0          | μA     |
|                                         |                                               | V <sub>DD</sub> =5.6V                                  |                                               |       | 1.2          | 3.6          |        |
| V <sub>DDH</sub>                        | Maximum Operating Voltage                     |                                                        |                                               |       |              | 10           | V      |
| V <sub>DDL</sub>                        | Minimum Operating Voltage<br>(Note 1)         | T <sub>opt</sub> =25°C<br>-30°C≤T <sub>opt</sub> ≤85°C |                                               |       | 0.55<br>0.65 | 0.70<br>0.80 | V      |
| I <sub>OUT</sub>                        | Output Current                                | Nch                                                    | V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.7V | 0.01  | 0.05         |              | mA     |
|                                         |                                               |                                                        | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V  | 1.0   | 2.0          |              |        |
|                                         |                                               | Pch                                                    | V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =4.5V | 1.0   | 2.0          |              | mA     |
| V <sub>TCD</sub>                        | CD pin Threshold Voltage                      | V <sub>DD</sub> =3.96V                                 |                                               | 1.584 | 1.980        | 2.376        | V      |
| I <sub>CD</sub>                         | CD pin Sink Current                           | V <sub>DS</sub> =0.1V, V <sub>DD</sub> =0.7V           |                                               | 2.0   | 30           |              | μA     |
|                                         |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V           |                                               | 200.0 | 800.0        |              |        |
| R <sub>D</sub>                          | Delay Resistance                              |                                                        |                                               | 0.5   | 1.0          | 2.0          | MΩ     |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | -30°C≤T <sub>opt</sub> ≤85°C                           |                                               |       | ±100         |              | ppm/°C |

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470kΩ, and the pull-up voltage is set at 5.0V.

**• RN5VD45A/C**
 $T_{opt}=25^{\circ}\text{C}$ 

| Symbol                                  | Item                                          | Conditions                                                                               |                                           | Min.  | Typ.         | Max.         | Unit.                   |
|-----------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------|-------|--------------|--------------|-------------------------|
| $-V_{DET}$                              | Detector Threshold                            |                                                                                          |                                           | 4.388 | 4.500        | 4.612        | V                       |
| $V_{HYS}$                               | Detector Threshold Hysteresis                 |                                                                                          |                                           | 0.135 | 0.225        | 0.315        | V                       |
| $I_{SS}$                                | Supply Current                                | $V_{DD}=4.34\text{V}$                                                                    |                                           |       | 5.5          | 11.0         | $\mu\text{A}$           |
|                                         |                                               | $V_{DD}=6.5\text{V}$                                                                     |                                           |       | 1.3          | 3.9          |                         |
| $V_{DDH}$                               | Maximum Operating Voltage                     |                                                                                          |                                           |       |              | 10           | V                       |
| $V_{DDL}$                               | Minimum Operating Voltage<br>(Note 1)         | $T_{opt}=25^{\circ}\text{C}$<br>$-30^{\circ}\text{C}\leq T_{opt}\leq 85^{\circ}\text{C}$ |                                           |       | 0.55<br>0.65 | 0.70<br>0.80 | V                       |
| $I_{OUT}$                               | Output Current                                | Nch                                                                                      | $V_{DS}=0.05\text{V}, V_{DD}=0.7\text{V}$ | 0.01  | 0.05         |              | mA                      |
|                                         |                                               |                                                                                          | $V_{DS}=0.5\text{V}, V_{DD}=1.5\text{V}$  | 1.0   | 2.0          |              |                         |
|                                         |                                               | Pch                                                                                      | $V_{DS}=-2.1\text{V}, V_{DD}=8.0\text{V}$ | 1.5   | 3.0          |              | mA                      |
| $V_{TCD}$                               | CD pin Threshold Voltage                      | $V_{DD}=4.95\text{V}$                                                                    |                                           | 1.980 | 2.475        | 2.970        | V                       |
| $I_{CD}$                                | CD pin Sink Current                           | $V_{DS}=0.1\text{V}, V_{DD}=0.7\text{V}$                                                 |                                           | 2.0   | 30           |              | $\mu\text{A}$           |
|                                         |                                               | $V_{DS}=0.5\text{V}, V_{DD}=1.5\text{V}$                                                 |                                           | 200.0 | 800.0        |              |                         |
| $R_D$                                   | Delay Resistance                              |                                                                                          |                                           | 0.5   | 1.0          | 2.0          | $\text{M}\Omega$        |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | $-30^{\circ}\text{C}\leq T_{opt}\leq 85^{\circ}\text{C}$                                 |                                           |       | $\pm 100$    |              | ppm/ $^{\circ}\text{C}$ |

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470k $\Omega$ , and the pull-up voltage is set at 5.0V.

## • RN5VD54A/C

T<sub>opt</sub>=25°C

| Symbol                                  | Item                                          | Conditions                                             |                                               | Min.  | Typ.         | Max.         | Unit.  |
|-----------------------------------------|-----------------------------------------------|--------------------------------------------------------|-----------------------------------------------|-------|--------------|--------------|--------|
| -V <sub>DET</sub>                       | Detector Threshold                            |                                                        |                                               | 5.265 | 5.400        | 5.535        | V      |
| V <sub>HYS</sub>                        | Detector Threshold Hysteresis                 |                                                        |                                               | 0.162 | 0.270        | 0.378        | V      |
| I <sub>SS</sub>                         | Supply Current                                | V <sub>DD</sub> =5.2V                                  |                                               |       | 6.0          | 12.0         | μA     |
|                                         |                                               | V <sub>DD</sub> =7.4V                                  |                                               |       | 1.4          | 4.2          |        |
| V <sub>DDH</sub>                        | Maximum Operating Voltage                     |                                                        |                                               |       |              | 10           | V      |
| V <sub>DDL</sub>                        | Minimum Operating Voltage<br>(Note 1)         | T <sub>opt</sub> =25°C<br>-30°C≤T <sub>opt</sub> ≤85°C |                                               |       | 0.55<br>0.65 | 0.70<br>0.80 | V      |
| I <sub>OUT</sub>                        | Output Current                                | Nch                                                    | V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.7V | 0.01  | 0.05         |              | mA     |
|                                         |                                               |                                                        | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V  | 1.0   | 2.0          |              |        |
|                                         |                                               | Pch                                                    | V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =8.0V | 1.5   | 3.0          |              | mA     |
| V <sub>TC</sub>                         | CD pin Threshold Voltage                      | V <sub>DD</sub> =5.94V                                 |                                               | 2.376 | 2.970        | 3.564        | V      |
| I <sub>CD</sub>                         | CD pin Sink Current                           | V <sub>DS</sub> =0.1V, V <sub>DD</sub> =0.7V           |                                               | 2.0   | 30           |              | μA     |
|                                         |                                               | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V           |                                               | 200.0 | 800.0        |              |        |
| R <sub>D</sub>                          | Delay Resistance                              |                                                        |                                               | 0.5   | 1.0          | 2.0          | MΩ     |
| $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ | Detector Threshold<br>Temperature Coefficient | -30°C≤T <sub>opt</sub> ≤85°C                           |                                               |       | ±100         |              | ppm/°C |

(Note 1) Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less, provided that in the case of Nch Open Drain Type Products, the pull-up resistance is set at 470kΩ, and the pull-up voltage is set at 5.0V.

## ELECTRICAL CHARACTERISTICS BY DETECTOR THRESHOLD

## • RN5VD09A/C to RN5VD39A/C

| Part Number. | Detector Threshold    |       |       | Hysteresis           |       |       | Supply Current 1                                    |      |      | Supply Current 2                                   |      |      | Output Current 1                                               |      |      | Output Current 2                                              |                            |      |      |  |  |  |  |  |  |  |
|--------------|-----------------------|-------|-------|----------------------|-------|-------|-----------------------------------------------------|------|------|----------------------------------------------------|------|------|----------------------------------------------------------------|------|------|---------------------------------------------------------------|----------------------------|------|------|--|--|--|--|--|--|--|
|              | -V <sub>DET</sub> (V) |       |       | V <sub>HYS</sub> (V) |       |       | I <sub>SS1</sub> (μA)                               |      |      | I <sub>SS2</sub> (μA)                              |      |      | I <sub>OUT1</sub> (mA)                                         |      |      | I <sub>OUT2</sub> (mA)                                        |                            |      |      |  |  |  |  |  |  |  |
|              | Min.                  | Typ.  | Max.  | Min.                 | Typ.  | Max.  | conditions                                          | Typ. | Max. | conditions                                         | Typ. | Max. | conditions                                                     | Min. | Typ. | conditions                                                    | Min.                       | Typ. |      |  |  |  |  |  |  |  |
| RN5VD09A/C   | 0.878                 | 0.900 | 0.922 | 0.027                | 0.045 | 0.063 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.10V | 1.5  | 3.7  | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>+2.0V | 0.9  | 2.7  | Nch<br>V <sub>DS</sub> =<br>0.05V<br>V <sub>DD</sub> =<br>0.7V | 0.01 | 0.05 | Nch<br>V <sub>DS</sub> =<br>0.5V<br>V <sub>DD</sub> =<br>1.5V | V <sub>DD</sub> =<br>0.85V | 0.05 | 0.50 |  |  |  |  |  |  |  |
| RN5VD10A/C   | 0.975                 | 1.000 | 1.025 | 0.030                | 0.050 | 0.070 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD11A/C   | 1.073                 | 1.100 | 1.127 | 0.033                | 0.055 | 0.077 |                                                     | 1.8  | 4.5  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD12A/C   | 1.170                 | 1.200 | 1.230 | 0.036                | 0.060 | 0.084 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD13A/C   | 1.268                 | 1.300 | 1.332 | 0.039                | 0.065 | 0.091 |                                                     | 2.0  | 5.0  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD14A/C   | 1.365                 | 1.400 | 1.435 | 0.042                | 0.070 | 0.098 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD15A/C   | 1.463                 | 1.500 | 1.537 | 0.045                | 0.075 | 0.105 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD16A/C   | 1.560                 | 1.600 | 1.640 | 0.048                | 0.080 | 0.112 |                                                     | 2.5  | 5.0  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD17A/C   | 1.658                 | 1.700 | 1.742 | 0.051                | 0.085 | 0.119 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD18A/C   | 1.755                 | 1.800 | 1.845 | 0.054                | 0.090 | 0.126 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD19A/C   | 1.853                 | 1.900 | 1.947 | 0.057                | 0.095 | 0.133 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD20A/C   | 1.950                 | 2.000 | 2.050 | 0.060                | 0.100 | 0.140 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD21A/C   | 2.048                 | 2.100 | 2.152 | 0.063                | 0.105 | 0.147 |                                                     | 3.0  | 6.0  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD22A/C   | 2.145                 | 2.200 | 2.255 | 0.066                | 0.110 | 0.154 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD23A/C   | 2.243                 | 2.300 | 2.357 | 0.069                | 0.115 | 0.161 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD24A/C   | 2.340                 | 2.400 | 2.460 | 0.072                | 0.120 | 0.168 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD25A/C   | 2.438                 | 2.500 | 2.562 | 0.075                | 0.125 | 0.175 |                                                     | 3.5  | 7.0  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD26A/C   | 2.535                 | 2.600 | 2.665 | 0.078                | 0.130 | 0.182 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD27A/C   | 2.633                 | 2.700 | 2.767 | 0.081                | 0.135 | 0.189 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD28A/C   | 2.730                 | 2.800 | 2.870 | 0.084                | 0.140 | 0.196 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD29A/C   | 2.828                 | 2.900 | 2.972 | 0.087                | 0.145 | 0.203 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD30A/C   | 2.925                 | 3.000 | 3.075 | 0.090                | 0.150 | 0.210 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.13V | 4.0  | 8.0  | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>+2.0V | 1.2  | 3.6  | Nch<br>V <sub>DS</sub> =<br>0.05V<br>V <sub>DD</sub> =<br>0.7V | 0.01 | 0.05 | Nch<br>V <sub>DS</sub> =<br>0.5V<br>V <sub>DD</sub> =<br>1.5V | 1.0                        | 2.0  |      |  |  |  |  |  |  |  |
| RN5VD31A/C   | 3.023                 | 3.100 | 3.177 | 0.093                | 0.155 | 0.217 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD32A/C   | 3.120                 | 3.200 | 3.280 | 0.096                | 0.160 | 0.224 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD33A/C   | 3.218                 | 3.300 | 3.382 | 0.099                | 0.165 | 0.231 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD34A/C   | 3.315                 | 3.400 | 3.485 | 0.102                | 0.170 | 0.238 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD35A/C   | 3.413                 | 3.500 | 3.587 | 0.105                | 0.175 | 0.245 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD36A/C   | 3.510                 | 3.600 | 3.690 | 0.108                | 0.180 | 0.252 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD37A/C   | 3.608                 | 3.700 | 3.792 | 0.111                | 0.185 | 0.259 |                                                     | 4.5  | 9.0  |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD38A/C   | 3.705                 | 3.800 | 3.895 | 0.114                | 0.190 | 0.266 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |
| RN5VD39A/C   | 3.803                 | 3.900 | 3.997 | 0.117                | 0.195 | 0.273 |                                                     |      |      |                                                    |      |      |                                                                |      |      |                                                               |                            |      |      |  |  |  |  |  |  |  |

(Note) Refer to the previously defined "Minimum Operating Voltage".

Condition 1 : T<sub>opt</sub>=25°CCondition 2 : -30°C≤T<sub>opt</sub>≤85°C

T<sub>opt</sub>=25°C

| Output Current 3                             |      |      | Minimum Operating Voltage                               |                                                         | CD Pin Threshold Voltage  |              |             |              | CD Pin Output Current 1          |      |      | CD Pin Output Current 2          |               |      | Delay Resistance |      |      | Detector Threshold Tempco.                       |                         |      |
|----------------------------------------------|------|------|---------------------------------------------------------|---------------------------------------------------------|---------------------------|--------------|-------------|--------------|----------------------------------|------|------|----------------------------------|---------------|------|------------------|------|------|--------------------------------------------------|-------------------------|------|
| IOUT3 (mA)                                   |      |      | VDDL (V)                                                |                                                         | VTCD (V)                  |              |             |              | ICD1 (μA)                        |      |      | ICD2 (μA)                        |               |      | RD (MΩ)          |      |      | $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ (ppm/°C) |                         |      |
| conditions                                   | Min. | Typ. | Typ.                                                    | Max.                                                    | conditions                | Min.         | Typ.        | Max.         | conditions                       | Min. | Typ. | conditions                       | Min.          | Typ. | Min.             | Typ. | Max. | conditions                                       | Typ.                    |      |
| Pch<br><br>VDS=<br>-2.1V<br><br>VDD=<br>4.5V | 1.0  | 2.0  | (Note1)<br>Condition1<br>0.55<br><br>Condition2<br>0.65 | (Note1)<br>Condition1<br>0.70<br><br>Condition2<br>0.80 | VDD=<br>(-VDET)<br>× 1.1V | VDD×<br>0.3  | VDD×<br>0.5 | VDD×<br>0.7  | VDS=<br>0.1V<br><br>VDD=<br>0.7V | 2.0  | 30   | VDS=<br>0.5V<br><br>VDD=<br>1.5V | VDD=<br>0.85V | 10   | 100              | 0.5  | 1.0  | 2.0                                              | -30°C≤<br>Topt<br>≤85°C | ±100 |
|                                              |      |      |                                                         |                                                         |                           |              |             |              |                                  |      |      |                                  | VDD=<br>1.0V  | 50   | 200              |      |      |                                                  |                         |      |
|                                              |      |      |                                                         |                                                         |                           | VDD×<br>0.35 | VDD×<br>0.5 | VDD×<br>0.65 |                                  |      |      |                                  |               |      |                  |      |      |                                                  |                         |      |
|                                              |      |      |                                                         |                                                         |                           | VDD×<br>0.4  | VDD×<br>0.5 | VDD×<br>0.6  |                                  |      |      |                                  |               |      |                  |      |      |                                                  |                         |      |

## RN5VD

### • RN5VD40A/C to RN5VD60A/C

| Part Number. | Detector Threshold    |       |       | Hysteresis           |       |       | Supply Current 1                                    |                                                     |      | Supply Current 2                                   |      |      | Output Current 1                                                                   |      |      | Output Current 2                                                                  |      |      |
|--------------|-----------------------|-------|-------|----------------------|-------|-------|-----------------------------------------------------|-----------------------------------------------------|------|----------------------------------------------------|------|------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|------|
|              | -V <sub>DET</sub> (V) |       |       | V <sub>HYS</sub> (V) |       |       | I <sub>SS1</sub> (μA)                               |                                                     |      | I <sub>SS2</sub> (μA)                              |      |      | I <sub>OUT1</sub> (mA)                                                             |      |      | I <sub>OUT2</sub> (mA)                                                            |      |      |
|              | Min.                  | Typ.  | Max.  | Min.                 | Typ.  | Max.  | conditions                                          | Typ.                                                | Max. | conditions                                         | Typ. | Max. | conditions                                                                         | Min. | Typ. | conditions                                                                        | Min. | Typ. |
| RN5VD40A/C   | 3.900                 | 4.000 | 4.100 | 0.120                | 0.200 | 0.280 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.16V | 5.0                                                 | 10.0 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>+2.0V | 1.3  | 3.9  | N <sub>ch</sub><br><br>V <sub>DS</sub> =<br>0.05V<br><br>V <sub>DD</sub> =<br>0.7V | 0.01 | 0.05 | N <sub>ch</sub><br><br>V <sub>DS</sub> =<br>0.5V<br><br>V <sub>DD</sub> =<br>1.5V | 1.0  | 2.0  |
| RN5VD41A/C   | 3.998                 | 4.100 | 4.202 | 0.123                | 0.205 | 0.287 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD42A/C   | 4.095                 | 4.200 | 4.305 | 0.126                | 0.210 | 0.294 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD43A/C   | 4.193                 | 4.300 | 4.407 | 0.129                | 0.215 | 0.301 |                                                     | 5.5                                                 | 11.0 |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD44A/C   | 4.290                 | 4.400 | 4.510 | 0.132                | 0.220 | 0.308 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD45A/C   | 4.388                 | 4.500 | 4.612 | 0.135                | 0.225 | 0.315 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD46A/C   | 4.485                 | 4.600 | 4.715 | 0.138                | 0.230 | 0.322 |                                                     | 6.0                                                 | 12.0 |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD47A/C   | 4.583                 | 4.700 | 4.817 | 0.141                | 0.235 | 0.329 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD48A/C   | 4.680                 | 4.800 | 4.920 | 0.144                | 0.240 | 0.336 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD49A/C   | 4.778                 | 4.900 | 5.022 | 0.147                | 0.245 | 0.343 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.20V | 6.5                                                 | 13.0 | 1.4                                                | 4.2  |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD50A/C   | 4.875                 | 5.000 | 5.125 | 0.150                | 0.250 | 0.350 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD51A/C   | 4.973                 | 5.100 | 5.227 | 0.153                | 0.255 | 0.357 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD52A/C   | 5.070                 | 5.200 | 5.330 | 0.156                | 0.260 | 0.364 |                                                     | 6.5                                                 | 13.0 |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD53A/C   | 5.168                 | 5.300 | 5.432 | 0.159                | 0.265 | 0.371 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD54A/C   | 5.265                 | 5.400 | 5.535 | 0.162                | 0.270 | 0.378 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD55A/C   | 5.363                 | 5.500 | 5.637 | 0.165                | 0.275 | 0.385 |                                                     | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>-0.20V | 6.5  |                                                    |      | 13.0 | 1.4                                                                                | 4.2  |      |                                                                                   |      |      |
| RN5VD56A/C   | 5.460                 | 5.600 | 5.740 | 0.168                | 0.280 | 0.392 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD57A/C   | 5.558                 | 5.700 | 5.842 | 0.171                | 0.285 | 0.399 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD58A/C   | 5.655                 | 5.800 | 5.945 | 0.174                | 0.290 | 0.406 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD59A/C   | 5.753                 | 5.900 | 6.047 | 0.177                | 0.295 | 0.413 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |
| RN5VD60A/C   | 5.850                 | 6.000 | 6.150 | 0.180                | 0.300 | 0.420 |                                                     |                                                     |      |                                                    |      |      |                                                                                    |      |      |                                                                                   |      |      |

(Note) Refer to the previously defined "Minimum Operating Voltage".

Condition 1 : T<sub>opt</sub>=25°C

Condition 2 : -30°C≤T<sub>opt</sub>≤85°C

T<sub>opt</sub>=25°C

| Output Current 3                                                               |      |      | Minimum Operating Voltage                               |                                                         | C <sub>D</sub> Pin Threshold Voltage               |                          |                          |                           | C <sub>D</sub> Pin Output Current 1                        |      |      | C <sub>D</sub> Pin Output Current 2 |                           |      | Delay Resistance       |      |      | Detector Threshold Tempco.                       |                                                  |
|--------------------------------------------------------------------------------|------|------|---------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------|--------------------------|--------------------------|---------------------------|------------------------------------------------------------|------|------|-------------------------------------|---------------------------|------|------------------------|------|------|--------------------------------------------------|--------------------------------------------------|
| I <sub>OUT3</sub> (mA)                                                         |      |      | V <sub>DDL</sub> (V)                                    |                                                         | V <sub>TCD</sub> (V)                               |                          |                          |                           | I <sub>CD1</sub> (μA)                                      |      |      | I <sub>OUT1</sub> (mA)              |                           |      | I <sub>OUT2</sub> (mA) |      |      | $\frac{\Delta-V_{DET}}{\Delta T_{opt}}$ (ppm/°C) |                                                  |
| conditions                                                                     | Min. | Typ. | Typ.                                                    | Max.                                                    | conditions                                         | Min.                     | Typ.                     | Max.                      | conditions                                                 | Min. | Typ. | conditions                          | Min.                      | Typ. | conditions             | Typ. | Max. | conditions                                       | Typ.                                             |
| P <sub>ch</sub><br>V <sub>DS</sub> =<br>-2.1V<br><br>V <sub>DD</sub> =<br>8.0V | 1.5  | 3.0  | (Note1)<br>Condition1<br>0.55<br><br>Condition2<br>0.65 | (Note1)<br>Condition1<br>0.70<br><br>Condition2<br>0.80 | V <sub>DD</sub> =<br>(-V <sub>DET</sub> )<br>×1.1V | V <sub>DD</sub> ×<br>0.4 | V <sub>DD</sub> ×<br>0.5 | V <sub>DD</sub> ×<br>0.6V | V <sub>DS</sub> =<br>0.1V<br><br>V <sub>DD</sub> =<br>0.7V | 2.0  | 30   | V <sub>DS</sub> =<br>0.5V           | V <sub>DD</sub> =<br>1.5V | 200  | 800                    | 0.5  | 1.0  | 2.0                                              | -30°C ≤<br>T <sub>opt</sub><br>≤85°C<br><br>±100 |

OPERATION

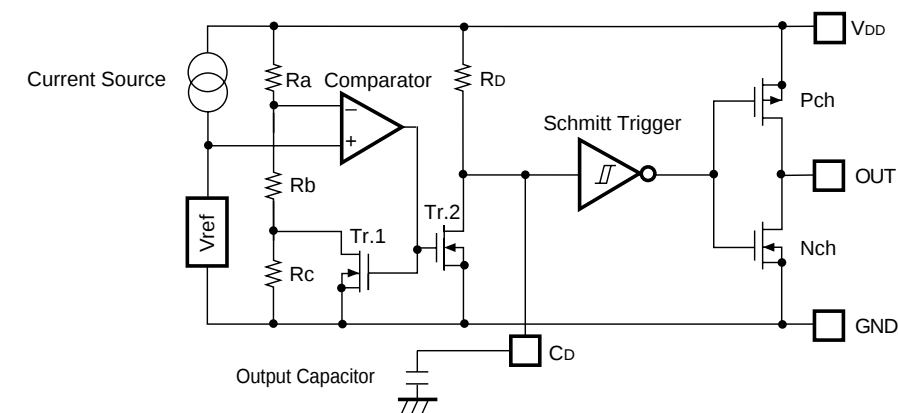


Fig. 1 Block Diagram

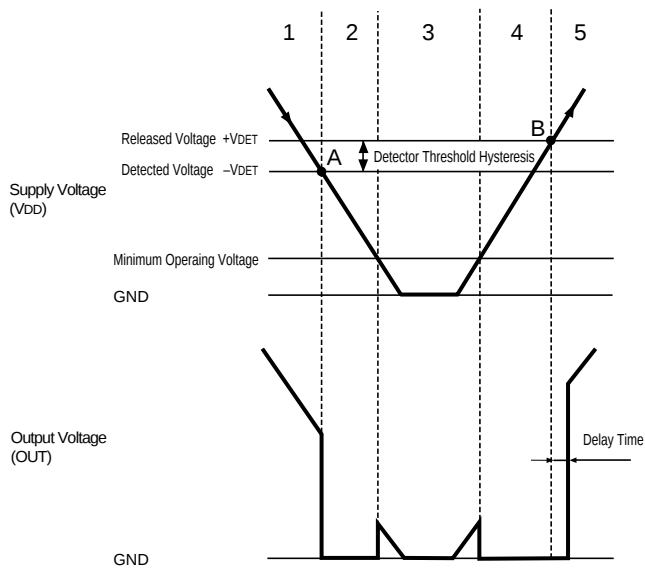


Fig. 2 Operation Diagram

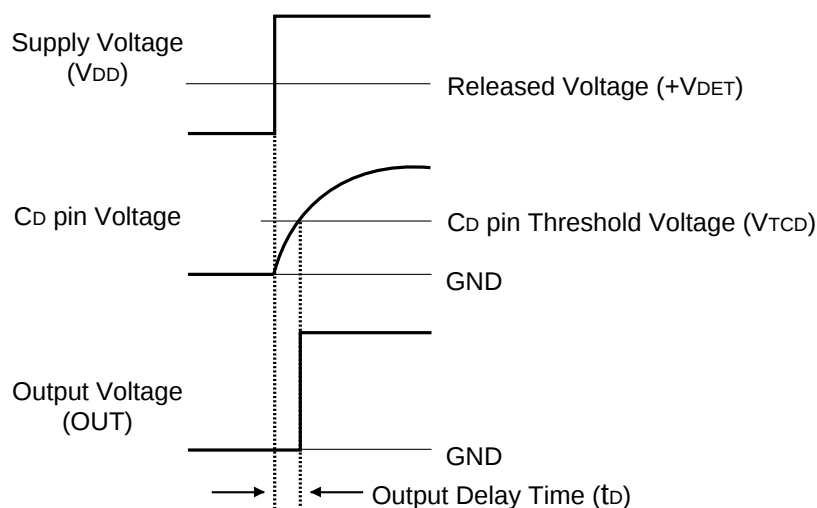
| Step                             | Step 1 | Step 2 | Step 3     | Step 4     | Step 5 |
|----------------------------------|--------|--------|------------|------------|--------|
| Comparator (-) Pin Input Voltage | I      | II     | II         | II         | I      |
| Comparator Output           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

I. 
$$\frac{R_b + R_c}{R_a + R_b + R_c} \cdot V_{DD}$$

II. 
$$\frac{R_b}{R_a + R_b} \cdot V_{DD}$$

- Step 1. Output voltage is equal to pull-up voltage.
- Step 2. When input voltage ( $V_{DD}$ ) reaches the state of  $V_{ref} \geq V_{DD} \cdot (R_b + R_c) / (R_a + R_b + R_c)$  at point A (Detected Voltage  $-V_{DET}$ ), the output of comparator is reversed, so that output voltage becomes GND. Discharging is performed from  $C_D$  pin connected to an external capacitor. No delay time is generated.
- Step 3. Output voltage becomes indefinite when power source voltage ( $V_{DD}$ ) is smaller than minimum operating voltage. When the output is pulled up,  $V_{DD}$  is output.
- Step 4. Output voltage becomes equal to GND.
- Step 5. When input voltage ( $V_{DD}$ ) reaches the state of  $V_{ref} \leq V_{DD} \cdot R_b / (R_a + R_b)$  at Point B (Released Voltage  $+V_{DET}$ ), the output of comparator is reversed, and the external capacitor is charged through  $C_D$  pin, so that output voltage becomes equal to pulled-up voltage after a delay time  $t_D (=0.69 \times 10^6 \times C_D)$ .

### • Output Delay Operation



When the supply voltage crosses the released voltage (+VDET) from a low value to a value higher than the released voltage (+VDET), the CD pin voltage starts to increase (starts to charge the external capacitor).

The output voltage is maintained at “L” level until the CD pin voltage reaches to VTCD (CD pin threshold voltage) after that the output voltage is reversed to “H”.

The time period from beginning of charging capacitor to output voltage reversing represents the output delay ( $t_D$ ).

### • Output Delay Time

Delay time ( $t_D$ ) can be set accordance with the capacitance  $C_D$  of external capacitor as below

$$t_D = 0.69 \times 10^6 \times C_D \text{ (s)}$$

## TEST CIRCUITS

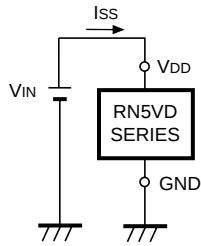


Fig. 3 Supply Current test Circuit

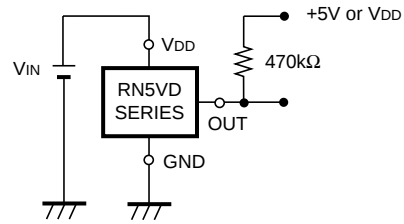


Fig. 4 Detector Threshold Test Circuit

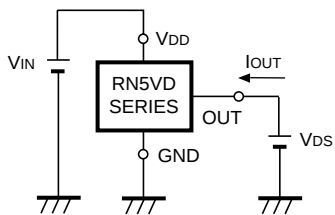


Fig. 5 Nch Driver Output Current Test Circuit

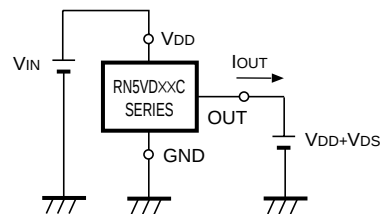


Fig. 6 Pch Driver Output Current Test Circuit

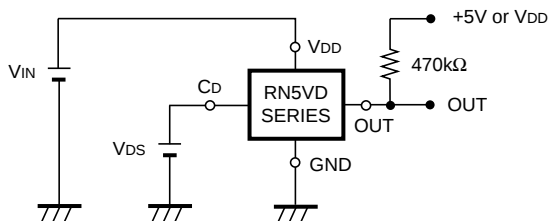


Fig. 7 Cd pin Threshold Voltage Test Circuit

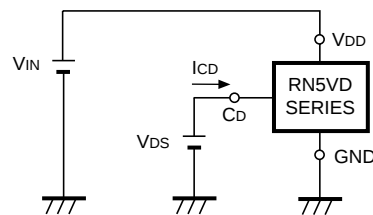


Fig. 8 Cd pin Sink Current Test Circuit

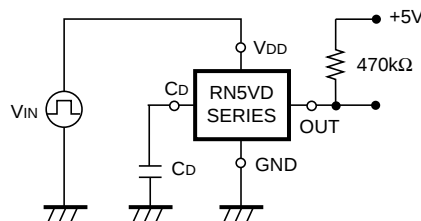
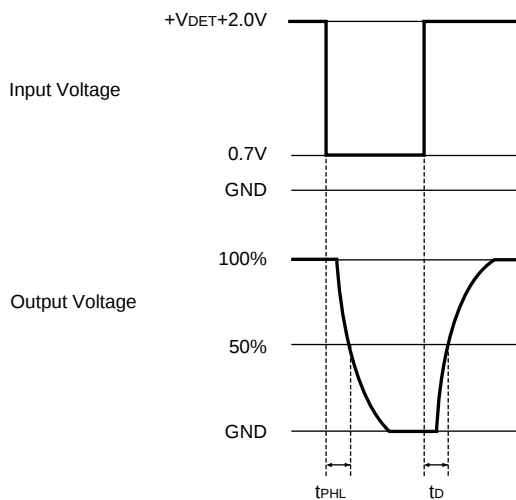
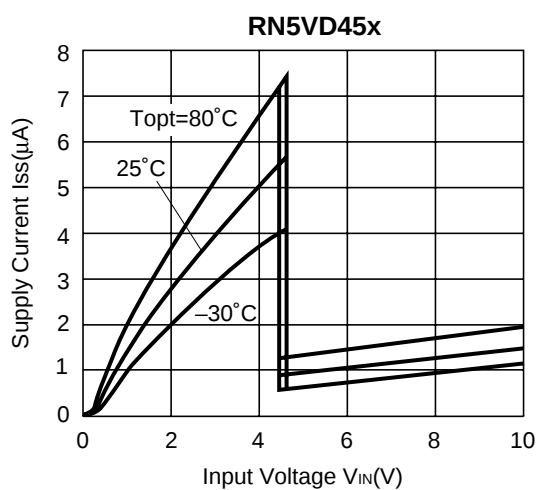
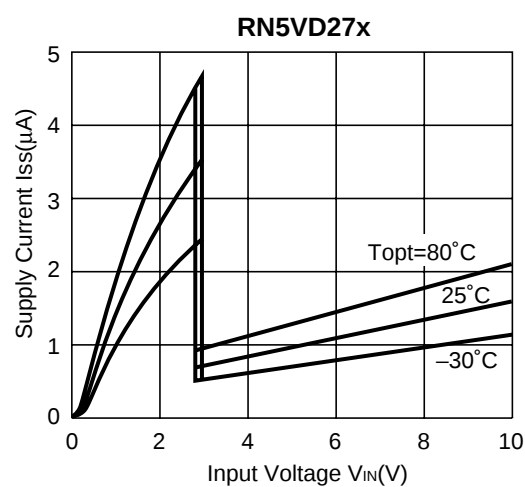
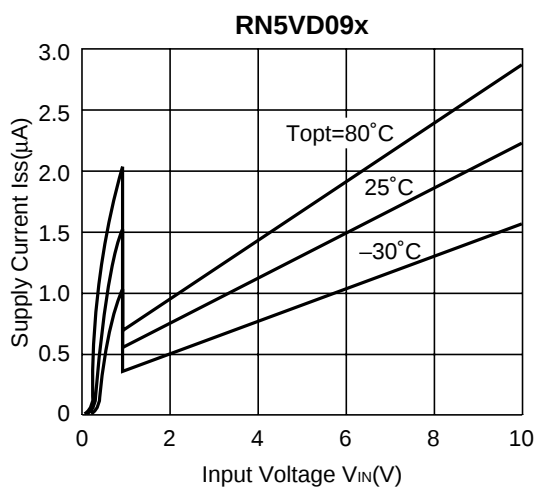


Fig. 9 Output Delay Time Test Circuit

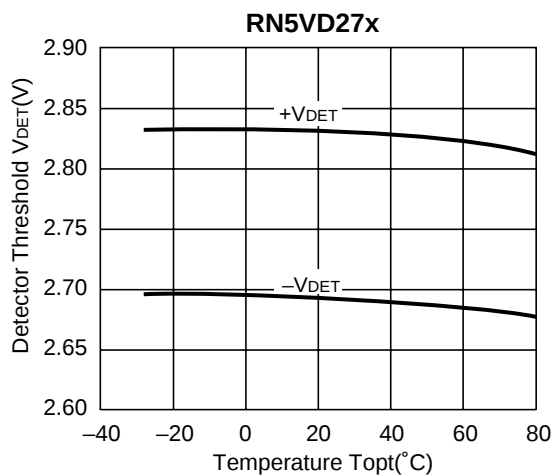
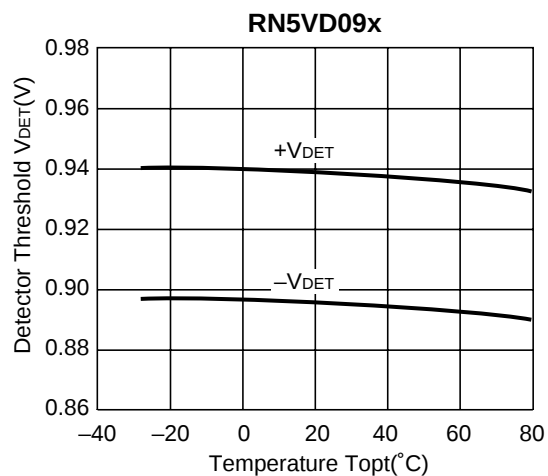
\*) at Fig.4,7,9. CMOS Output Type does not need a pull-up resistor.

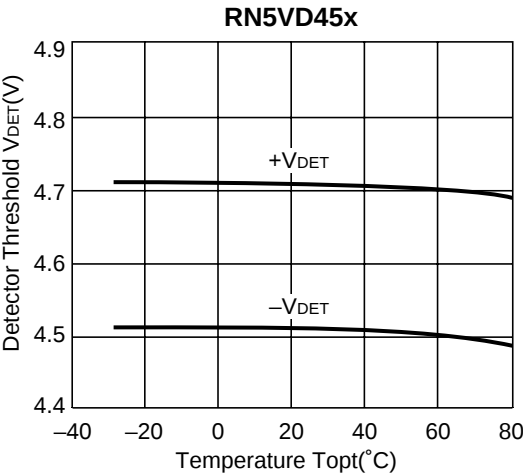
## TYPICAL CHARACTERISTICS

### 1) Supply Current vs. Input Voltage

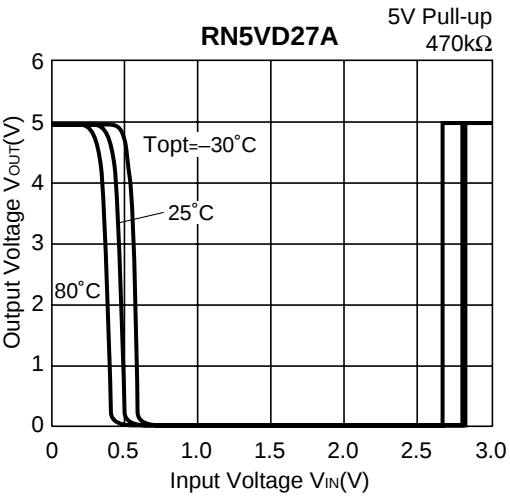
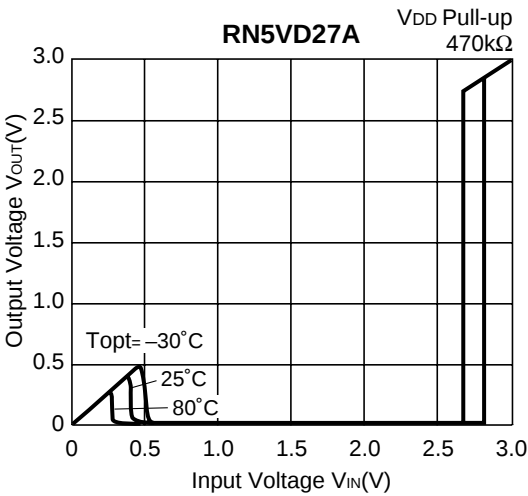
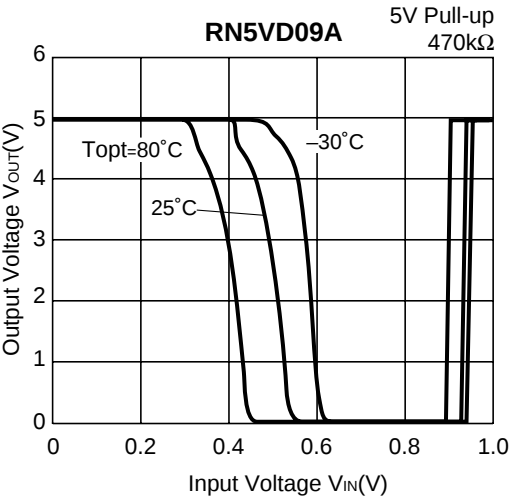
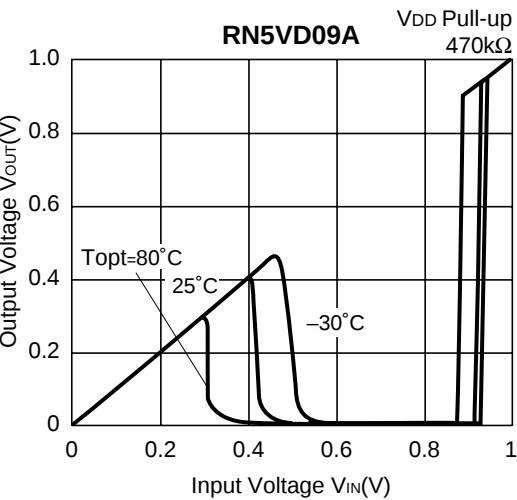


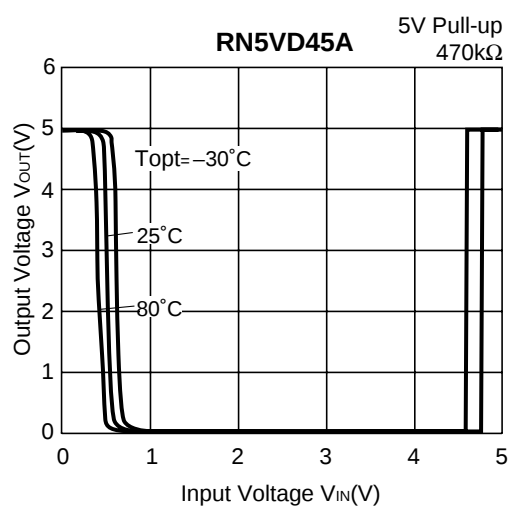
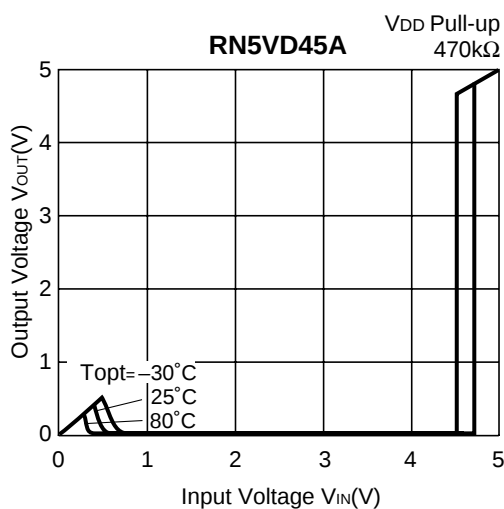
### 2) Detector Threshold vs. Temperature



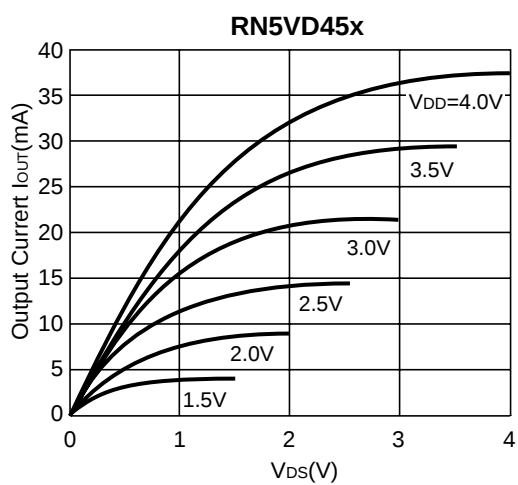
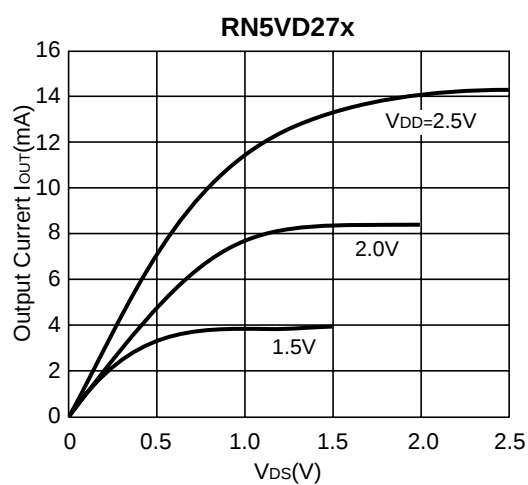
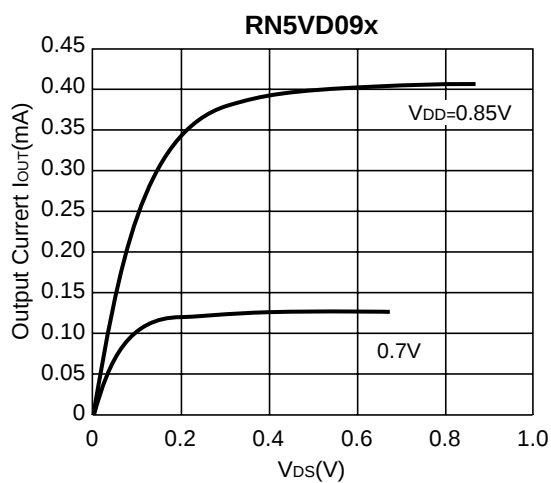


3) Output Voltage vs. Input Voltage

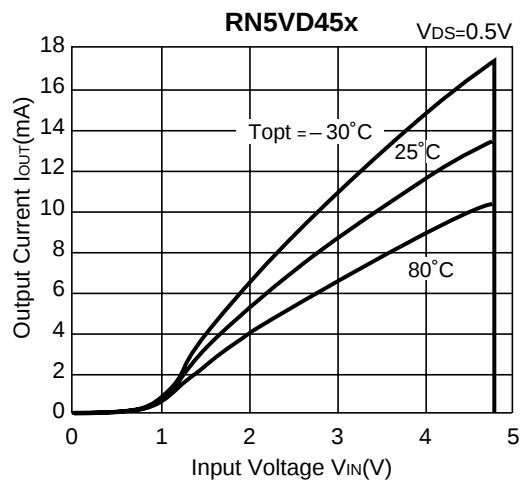
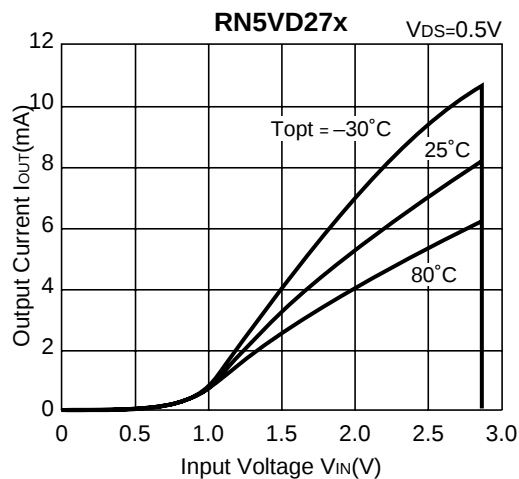
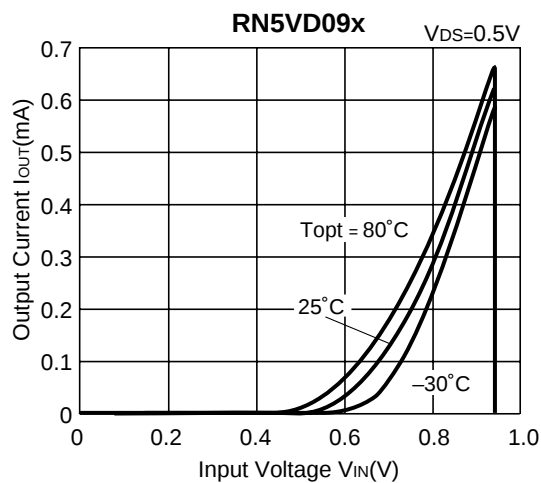




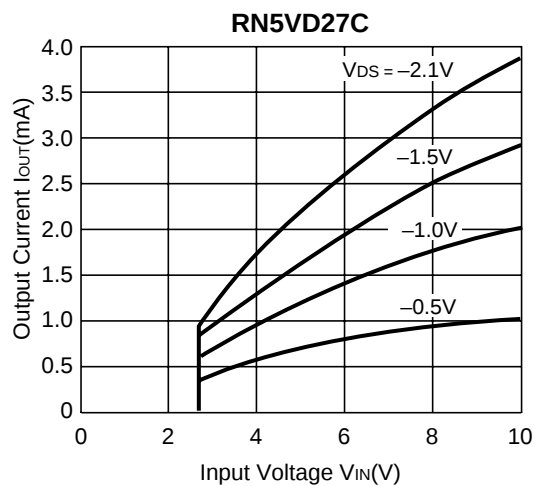
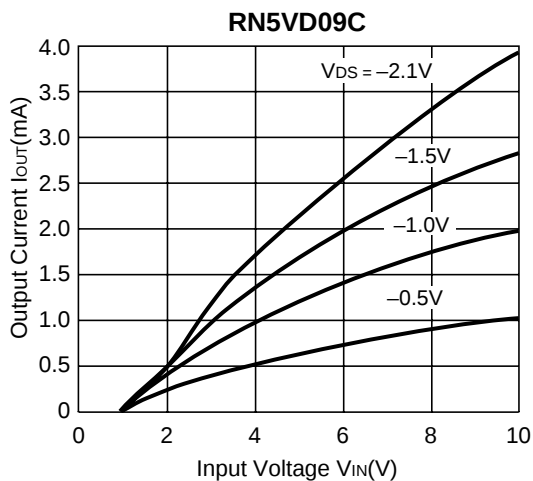
#### 4) Nch Driver Output Current vs. $V_{DS}$

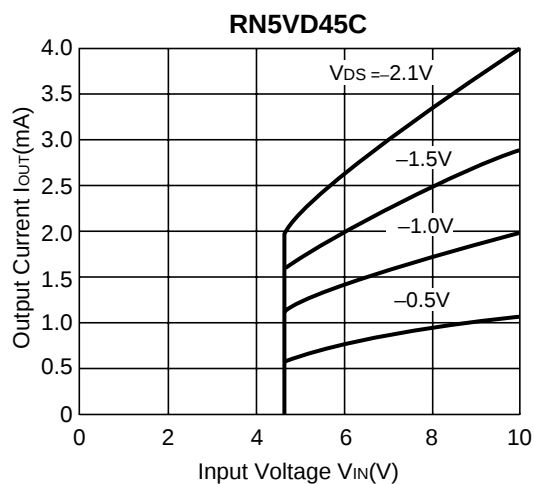


### 5) Nch Driver Output Current vs. Input Voltage

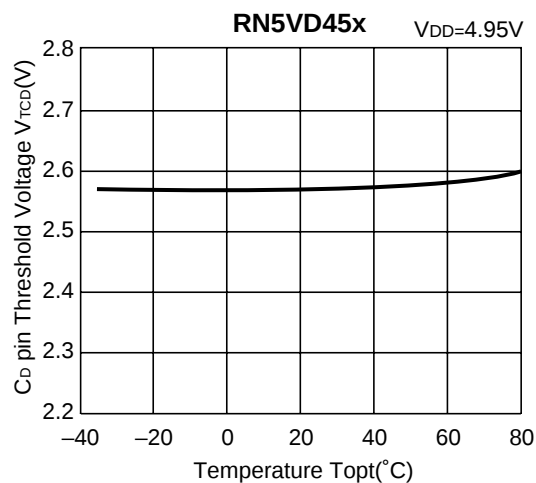
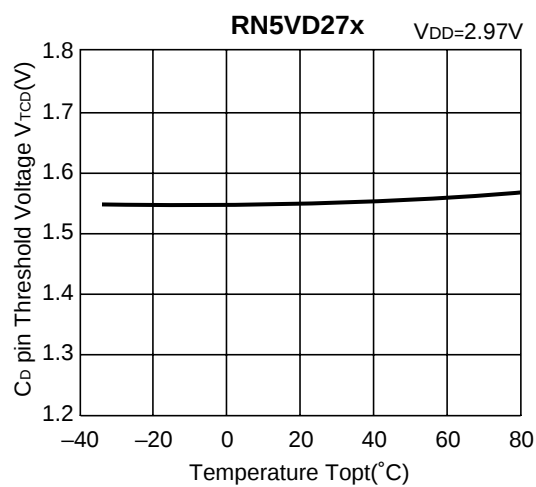
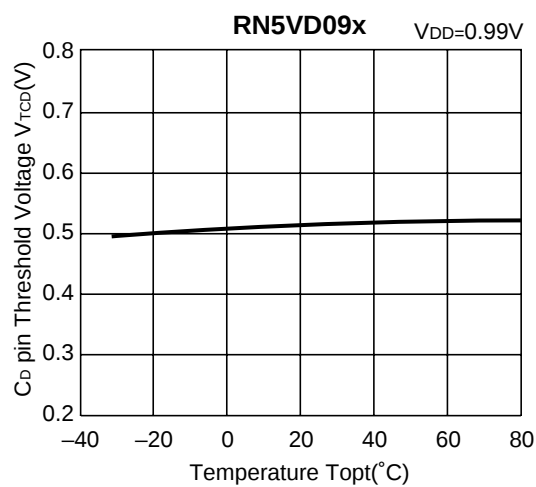


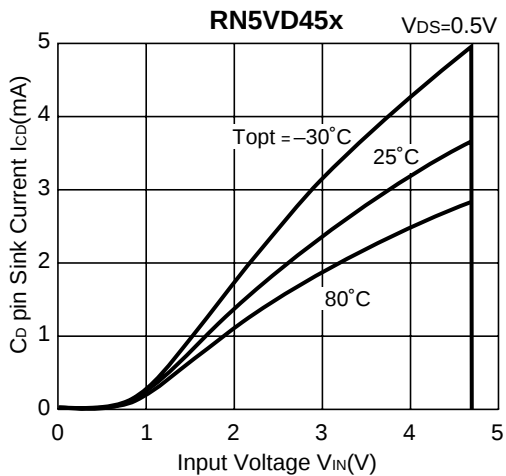
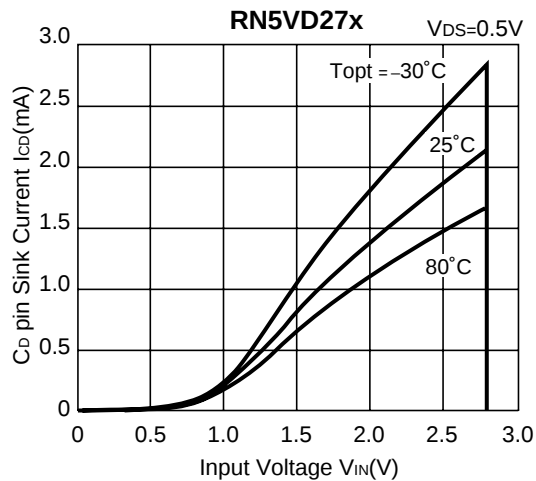
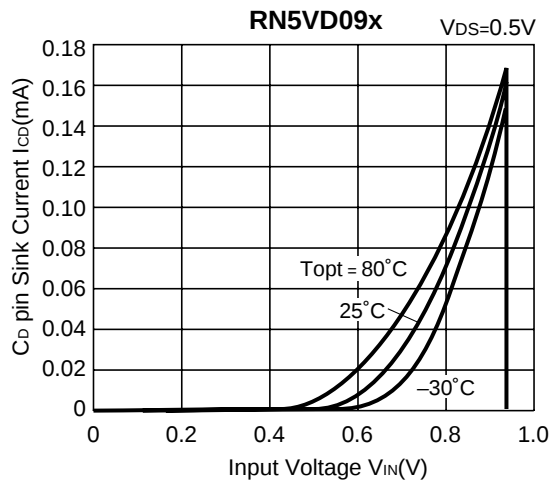
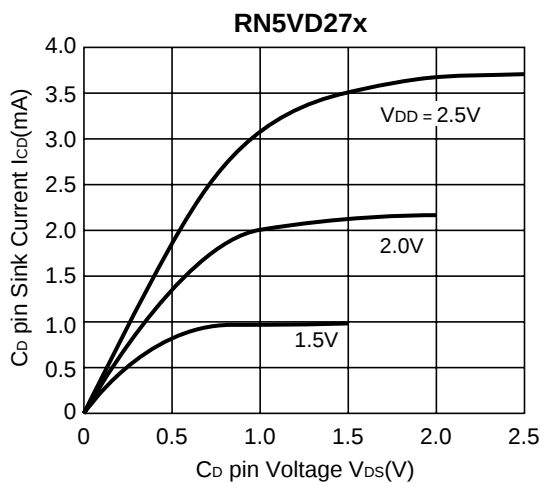
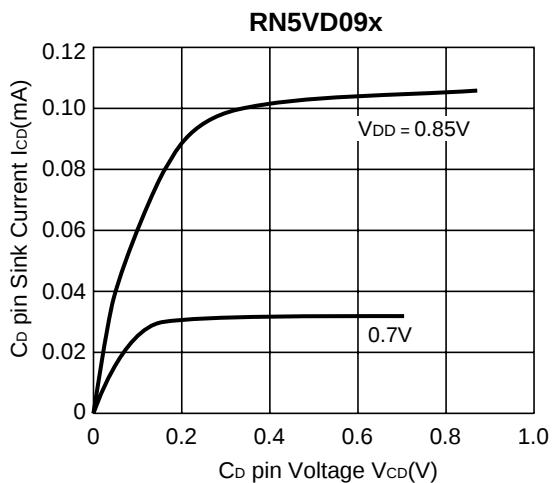
### 6) Pch Driver Output Current vs. Input Voltage

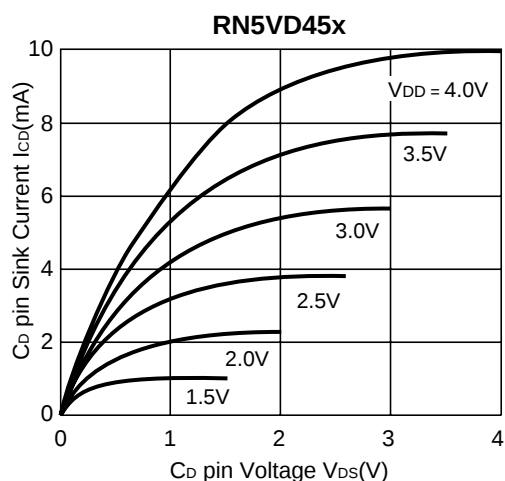




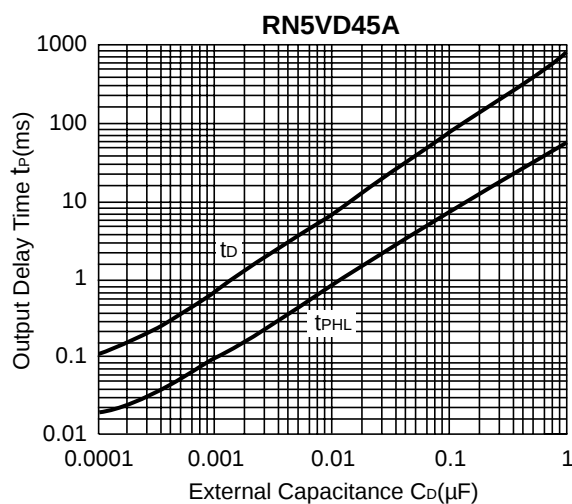
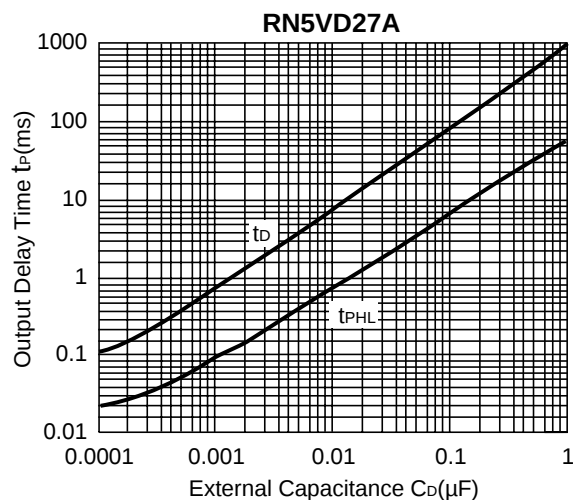
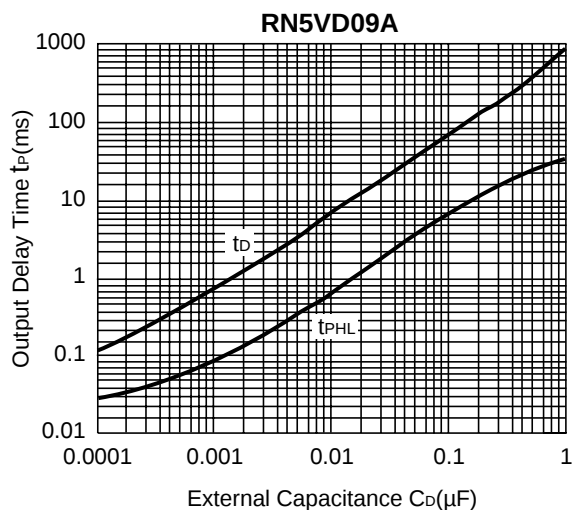
## 7) Cd pin Threshold Voltage vs. Temperature



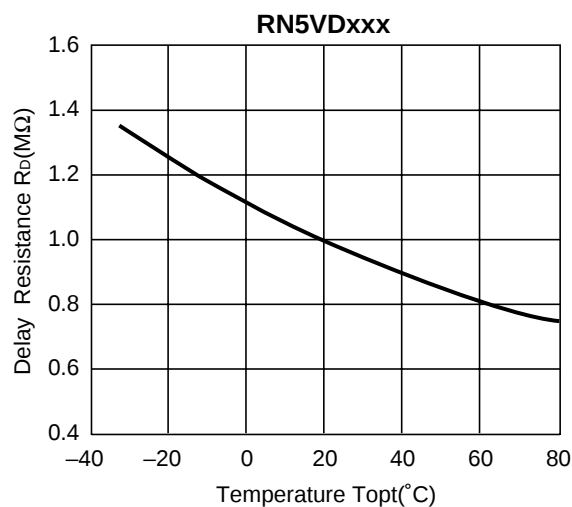
**8) CD pin Sink Current vs. Input Voltage**

**9) CD pin Sink Current vs. CD pin Voltage**




# 10) Output delay Time vs. External Capacitance



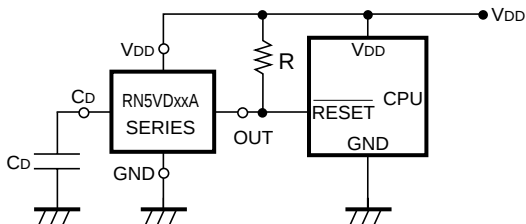
# 11) Delay Resistance vs. Temperature



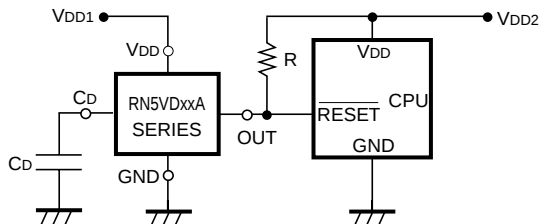
## TYPICAL APPLICATIONS

### • RN5VDxxA CPU Reset Circuit (Nch Open Drain Output)

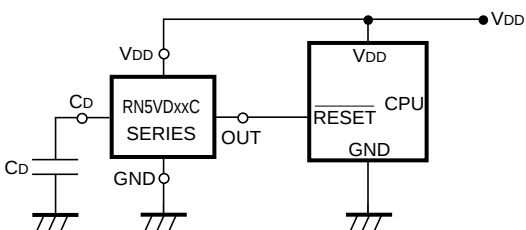
**(1) Input Voltage to RN5VDxxA is the same as the input voltage to CPU.**



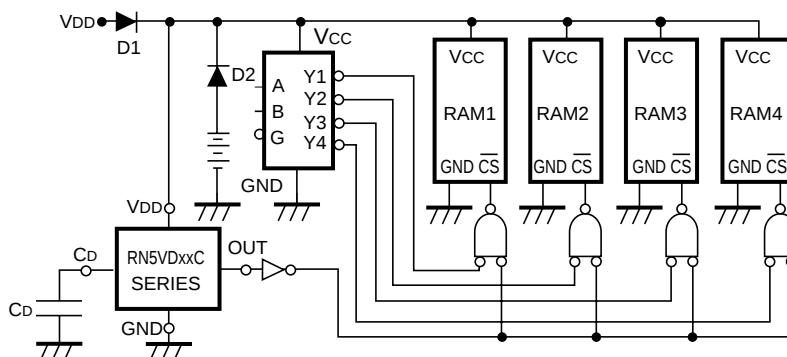
**(2) Input Voltage to RN5VDxxA is different from the input voltage to CPU.**



- **RN5VDxxC CPU Reset Circuit (CMOS Output)**



- **Memory Back-up Circuit**



### • Manual Reset 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]  $\times$  [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]  $\times$  [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  $V_{DD}$  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 k $\Omega$  or less as a guide, and connect  $C_{IN}$  of 0.1  $\mu F$  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.

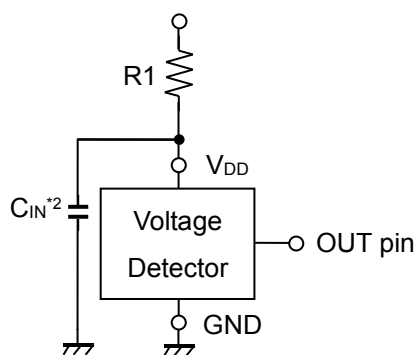


Figure A

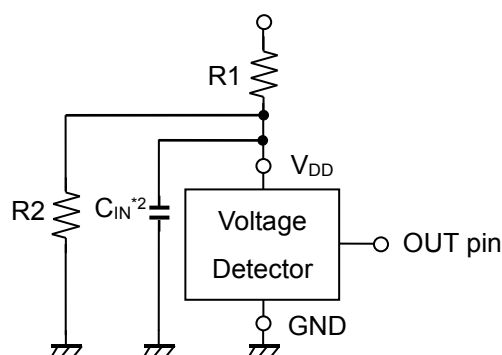


Figure B

<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.



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