# Micro-Power Voltage Detectors

## General Description

The RT9819 is a micro-power voltage detector supervising the power supply voltage level for microprocessors (µP) or digital systems. It provides internally fixed threshold levels with 0.1V per step ranging from 1.2V to 5V, which covers most digital applications. It features low supply current of 3µA. The RT9819 performs supervisory function by sending out a reset signal whenever the $V_{DD}$ voltage falls below a preset threshold level. This reset signal will last the whole period before $V_{DD}$ recovering. Once $V_{DD}$ recovered upcrossing the threshold level, the reset signal will be released after a certain delay time. RT9819 is provided in SC-70-3, SC-82 and SOT-23-3 packages.

## Ordering Information

RT9819□-□□□□

- Package Type
  - U3 : SC-70-3
  - V : SOT-23-3
  - VL : SOT-23-3 (L-Type)
  - Y : SC-82
  - YR : SC-82 (R-Type)
- Lead Plating System
  - P : Pb Free
  - G : Green (Halogen Free and Pb Free)
- Threshold Voltage
  - 12 : 1.2V
  - 13 : 1.3V
  - :
  - 49 : 4.9V
  - 50 : 5.0V
- Reset Active Timeout Period
  - A = 0ms ($\overline{\text{RESET}}$)
  - B = 55ms ($\overline{\text{RESET}}$)
  - C = 220ms ($\overline{\text{RESET}}$)
  - D = 450ms ($\overline{\text{RESET}}$)
  - E = 0ms (RESET)
  - F = 55ms (RESET)
  - G = 220ms (RESET)
  - H = 450ms (RESET)

Note :

Richtek products are :

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- Suitable for use in SnPb or Pb-free soldering processes.

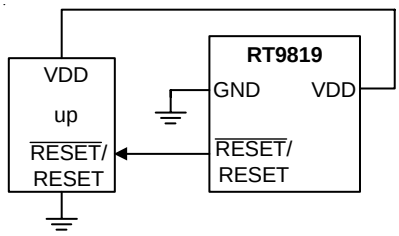
## Features

- **Internally Fixed Threshold 1.2V to 5V in 0.1V Step**
- **High Accuracy ±1.5%**
- **Low Supply Current 3µA**
- **No External Components Required**
- **Quick Reset within 20µs**
- **Built-in Recovery Delay Include 0ms, 55ms, 220ms, 450ms Options**
- **Low Functional Supply Voltage 0.9V**
- **CMOS Push-Pull Output**
- **Small SC-70-3, SC-82 and SOT-23-3 Packages**
- **RoHS Compliant and 100% Lead (Pb)-Free**

## Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical µP and µC Power Monitoring
- Portable/Battery-Powered Equipment

## Typical Application Circuit

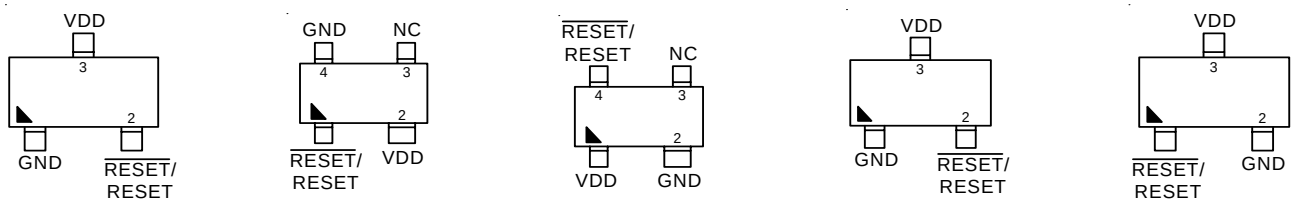



## Marking Information

For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

## Pin Configurations

(TOP VIEW)

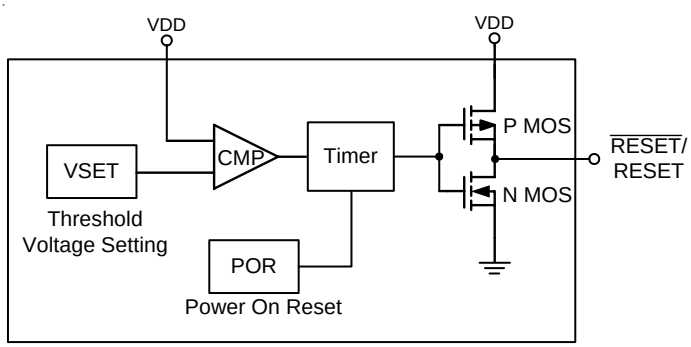



SC-70-3 SC-82 SC-82 (R-Type) SOT-23-3 SOT-23-3 (L-Type)

## Functional Pin Description

| Pin Name | Pin Function |
|---|---|
| GND | Ground |
| $\overline{\text{RESET}}$ | Active Low Push-Pull Reset Output |
| RESET | Active High Push-Pull Reset Output |
| VDD | Power Pin |

## Function Block Diagram



## Absolute Maximum Ratings (Note 1)

- Terminal Voltage (with Respect to GND)
  $V_{DD}$ ---------- –0.3V to 6.0V
- All Other Inputs ---------- –0.3V to $V_{DD}$+0.3V
- Input Current, $I_{VDD}$ ---------- 20mA
- Power Dissipation, PD @ $T_A$ = 25°C
  SC-70-3/SC-82 ---------- 0.25W
  SOT-23-3 ---------- 0.4W
- Package Thermal Resistance (Note 2)
  SC-70-3/SC-82, $\theta_{JA}$ ---------- 400°C /W
  SOT-23-3, $\theta_{JA}$ ---------- 250°C /W
- Lead Temperature (Soldering, 10sec.) ---------- 260°C
- Storage Temperature Range ---------- –65°C to 125°C
- ESD Susceptibility (Note 3)
  HBM (Human Body Mode) ---------- 2kV
  MM (Machine Mode) ---------- 200V

## Recommended Operating Conditions (Note 4)

- Junction Temperature Range ---------- –40°C to 125°C
- Ambient Temperature Range ---------- –40°C to 85°C

## Electrical Characteristics

($V_{DD}$ = 3V, $T_A$ = 25°C, unless otherwise specified)

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Operating $V_{DD}$ ($V_{OUT}$) Range | | $V_{DD}$ | RT9819A/B/C/D | 0.9 | -- | 6 | V |
| | | | RT9819E/F/G/H | 1.1 | -- | 6 | |
| Supply Current | | $I_{DD}$ | $V_{TH}$ = 3V , $V_{DD}$ = 4.5V | -- | 3 | 8 | μA |
| Reset Threshold | | $V_{TH}$ | | -- | 1.2 to 5.0 | -- | V |
| Threshold Voltage Accuracy | | $\Delta V_{TH}$ | | –1.5 | -- | +1.5 | % |
| Threshold Voltage Hysteresis | | $V_{HYS}$ | | -- | 0.01 $V_{TH}$ | -- | V |
| $V_{DD}$ Drop to Reset Delay | | $t_{RD}$ | Drop = $V_{TH}$ –125mV | -- | 20 | -- | μs |
| Reset Active Time Out Period | RT9819A/E | $t_{RP}$ | $V_{DD} \geq 1.02 \times V_{TH}$ | -- | 0 | -- | ms |
| | RT9819B/F | | | 35 | 55 | 75 | ms |
| | RT9819C/G | | | 143 | 220 | 297 | ms |
| | RT9819D/H | | | 292 | 450 | 608 | ms |
| $\overline{RESET}$ Output Voltage Low | | $V_{OL}$ | $V_{DD}$ < $V_{TH(MIN)}$ ,$I_{SINK}$ = 3.5mA, $V_{TH} \geq$ 3V | -- | -- | 0.4 | V |
| | | | $V_{DD}$ < $V_{TH(MIN)}$ ,$I_{SINK}$ = 1.2mA, $V_{TH} \geq$ 1.8V | -- | -- | 0.3 | |
| | | | $V_{TH(MIN)}$ > $V_{DD}$ > 1V, $I_{SINK}$ = 0.5mA | -- | -- | 0.3 | |

*To be continued*

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $\overline{\text{RESET}}$ Output Voltage High | $V_{OH}$ | $V_{DD} > V_{TH(MAX)}$ , $I_{SOURCE} = 800\mu A$, $V_{TH} \geq 3V$ | $V_{DD} - 1.5$ | -- | -- | V |
| | | $V_{DD} > V_{TH(MAX)}$ , $I_{SOURCE} = 500\mu A$, $V_{TH} \geq 1.8V$ | $0.8\ V_{DD}$ | -- | -- | |
| | | $V_{DD} > V_{TH(MAX)}$ , $I_{SOURCE} = 200\mu A$, $V_{TH} \geq 1.1V$ | $0.8\ V_{DD}$ | -- | -- | |
| RESET Output Voltage Low | $V_{OL}$ | $V_{DD} > V_{TH(MAX)}$ , $I_{SINK} = 3.5mA$, $V_{TH} \geq 3V$ | -- | -- | 0.4 | V |
| | | $V_{DD} > V_{TH(MAX)}$ , $I_{SINK} = 1.2mA$, $V_{TH} \geq 1.8V$ | -- | -- | 0.3 | |
| | | $V_{DD} > V_{TH(MAX)}$ , $I_{SINK} = 0.5mA$, $V_{TH} \geq 1.2V$ | -- | -- | 0.3 | |
| RESET Output Voltage High | $V_{OH}$ | $1.1V < V_{DD} < V_{TH(MIN)}$ , $I_{SOURCE} = 200\mu A$ | $0.8\ V_{DD}$ | -- | -- | V |
| | | $1.8V < V_{DD} < V_{TH(MIN)}$ , $I_{SOURCE} = 500\mu A$ | $0.8\ V_{DD}$ | -- | -- | |
| | | $3V < V_{DD} < V_{TH(MIN)}$ , $I_{SOURCE} = 800\mu A$ | $V_{DD} - 1.5$ | -- | -- | |

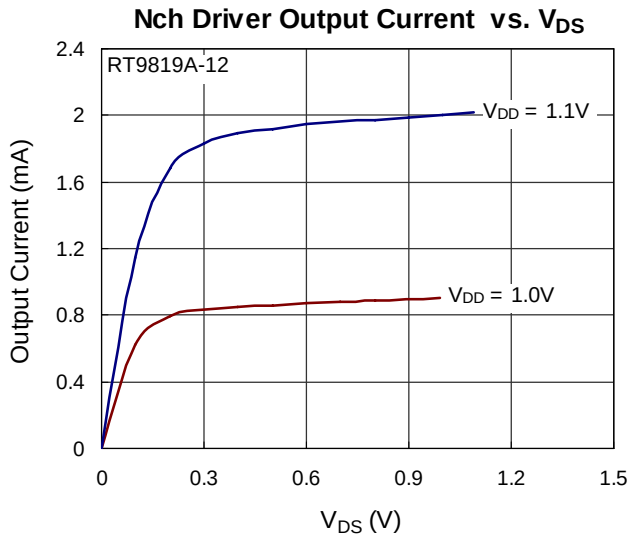
**Note 1.** Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

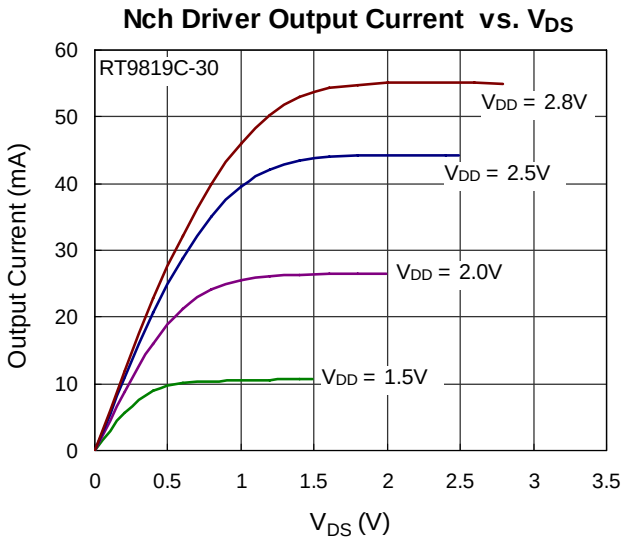
**Note 2.** $\theta_{JA}$ is measured in the natural convection at $T_A = 25°C$ on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

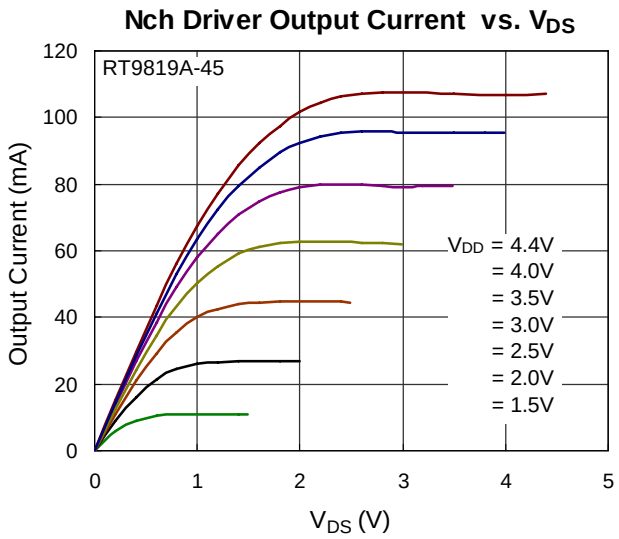
**Note 3.** Devices are ESD sensitive. Handling precaution is recommended.

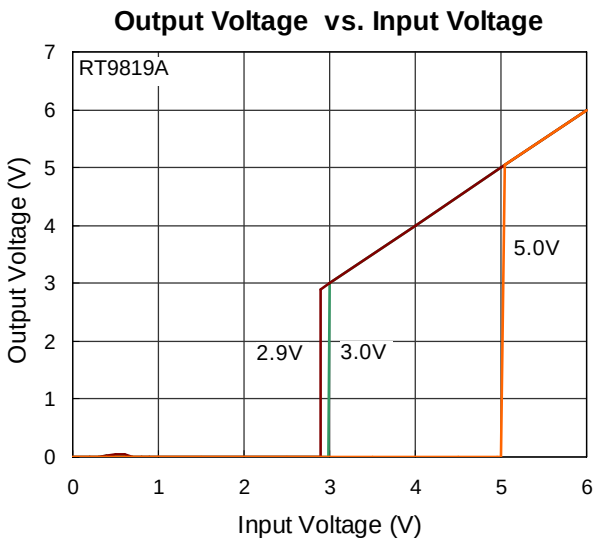
**Note 4.** The device is not guaranteed to function outside its operating conditions.

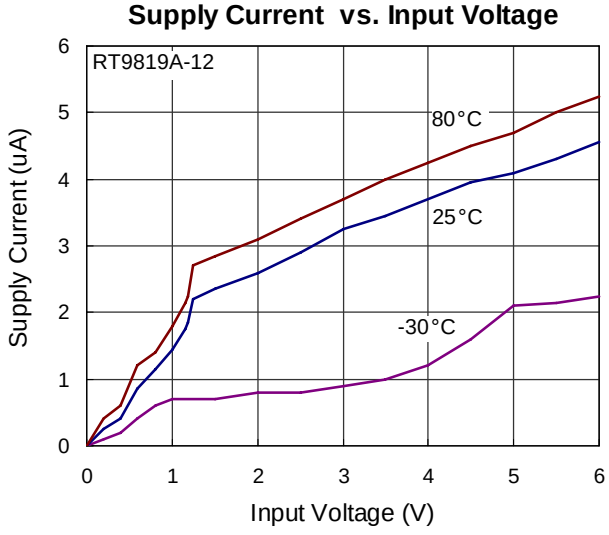
## Typical Operating Characteristics

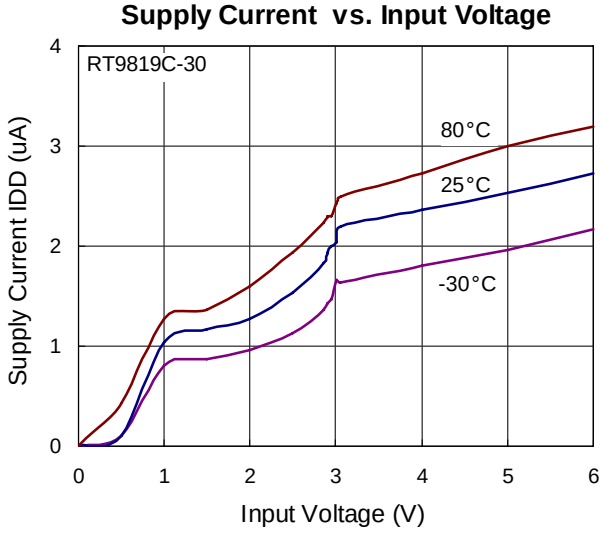


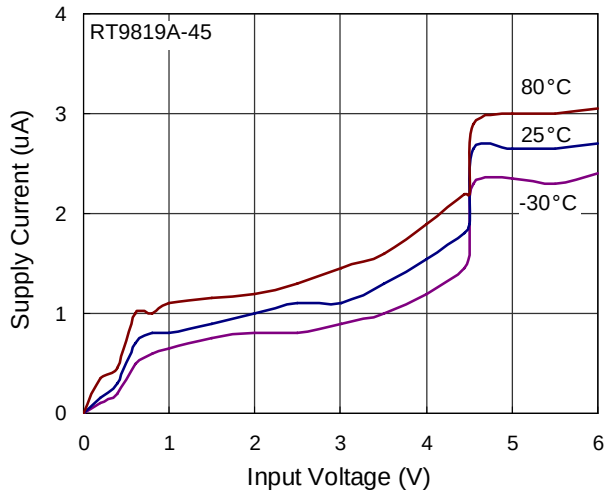



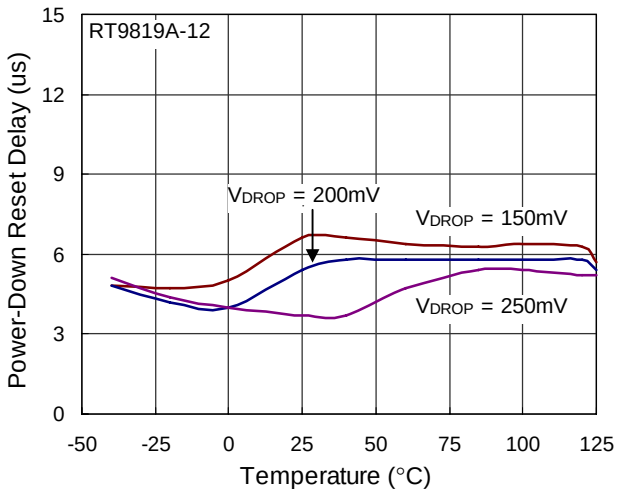



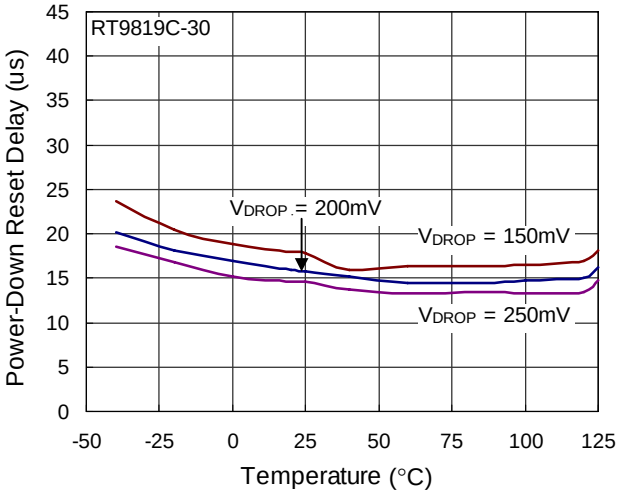
### Supply Current vs. Input Voltage



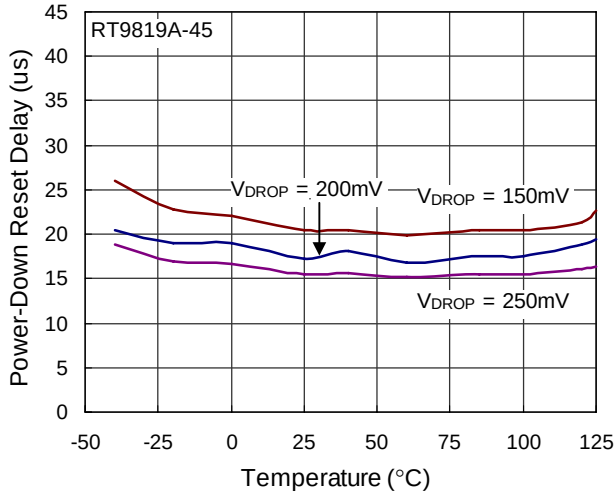

### Power-Down Reset Delay vs. Temperature



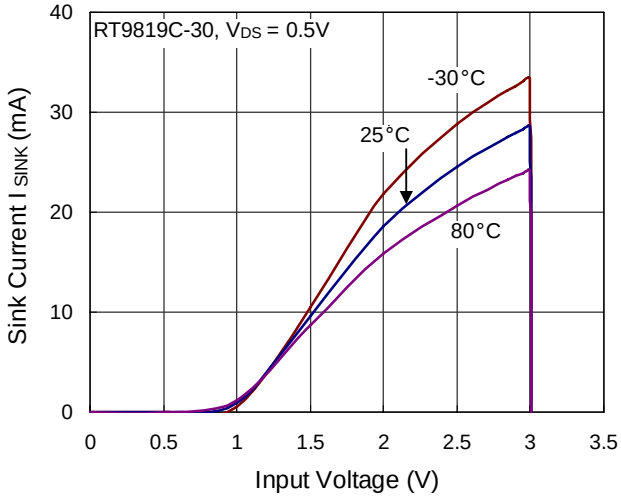

### Power-Down Reset Delay vs. Temperature



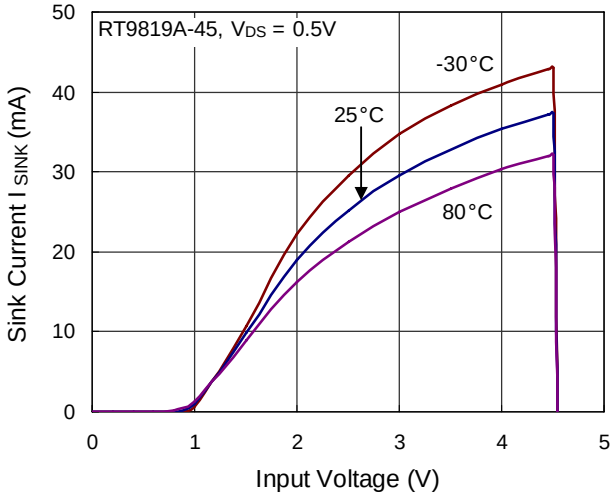

### Power-Down Reset Delay vs. Temperature



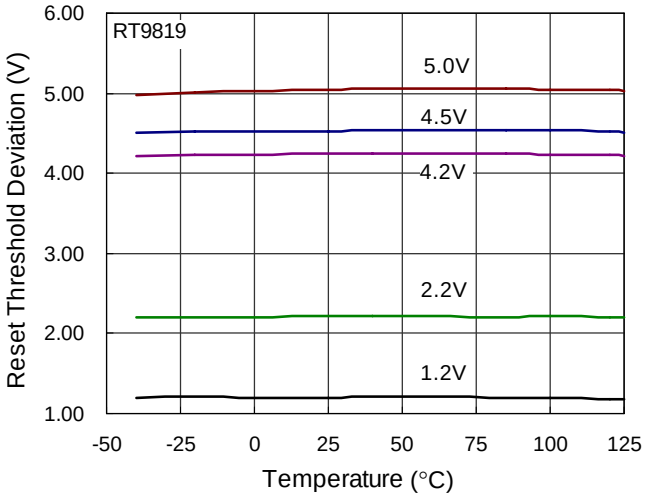

### Nch Driver Sink Current vs. Input Voltage



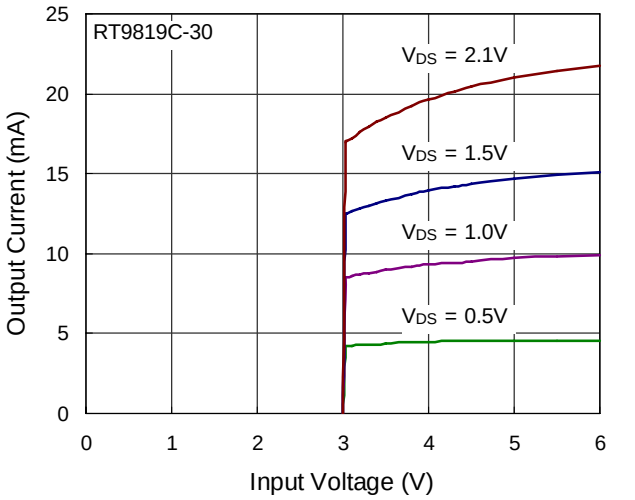

### Nch Driver Sink Current vs. Input Voltage



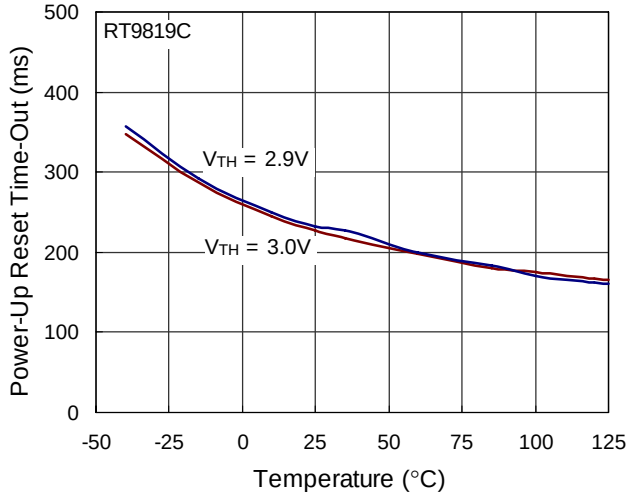
**Reset Threshold Deviation vs. Temperature**



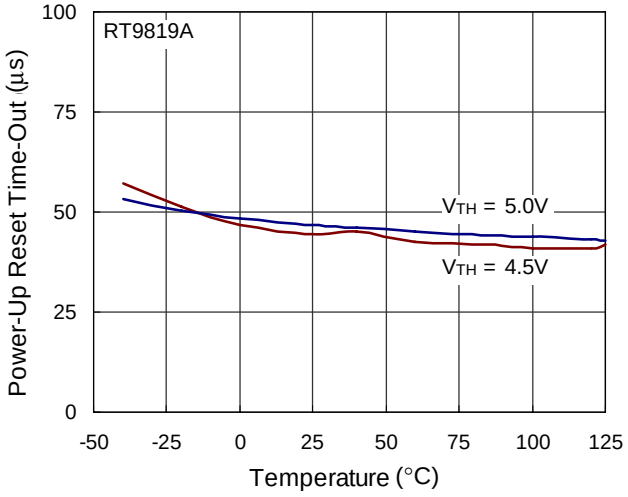

**Pch Driver Output Current vs. Input Voltage**



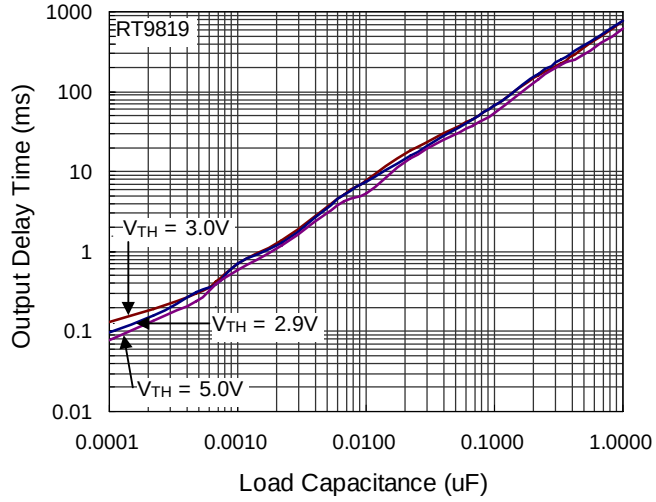

**Power-Up Reset Time-Out vs. Temperature**



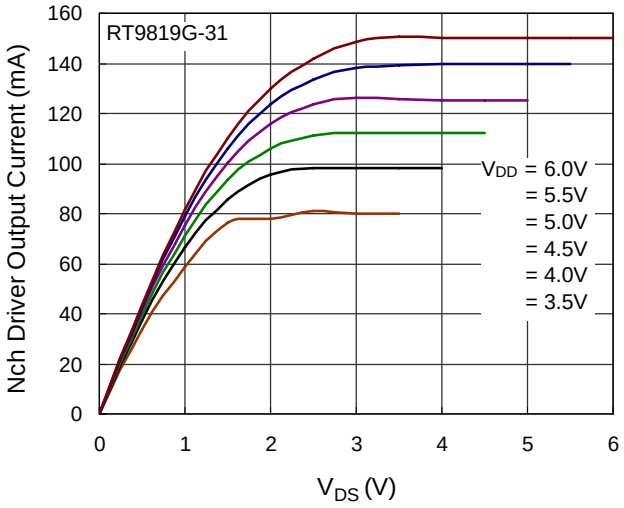

**Power-Up Reset Time-Out vs. Temperature**



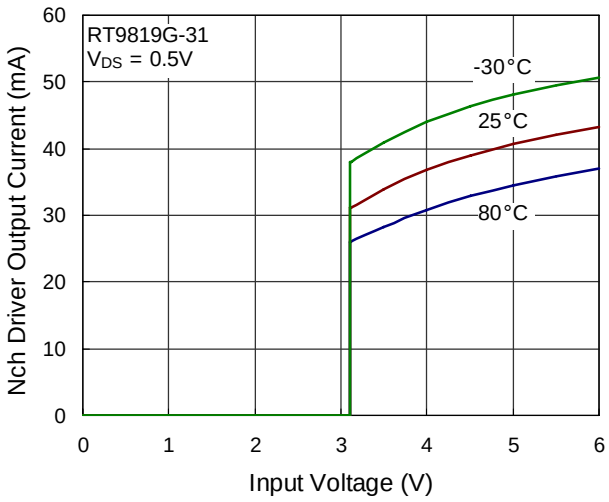

**Output Delay Time vs. Load Capacitance**



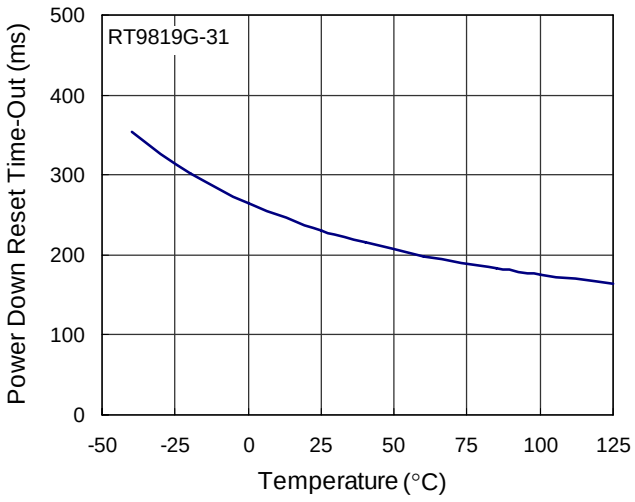

**Nch Driver Output Current vs. $V_{DS}$**



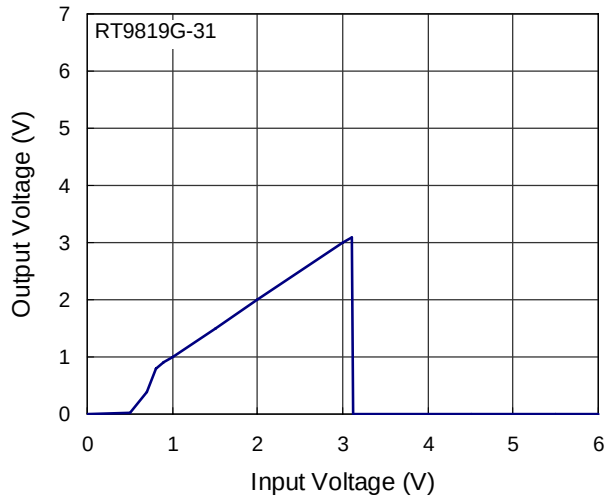
### Nch Driver Output Current vs. Input Voltage



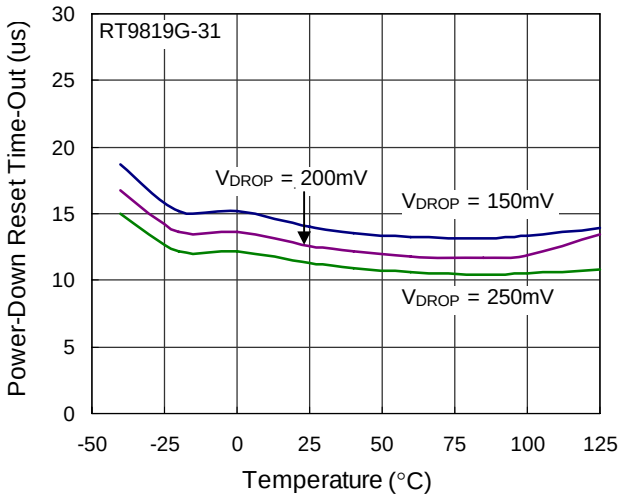

### Power Down Reset Time-Out vs. Temperature




### Output Voltage vs. Input Voltage




### Power-Down Reset Time-Out vs. Temperature

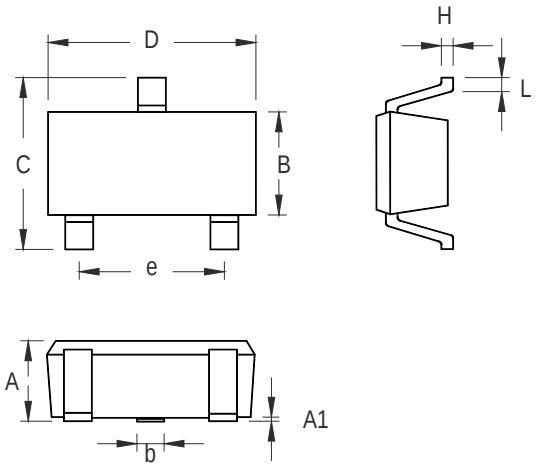


## Application Information

### Benefits of Highly Accurate Reset Threshold

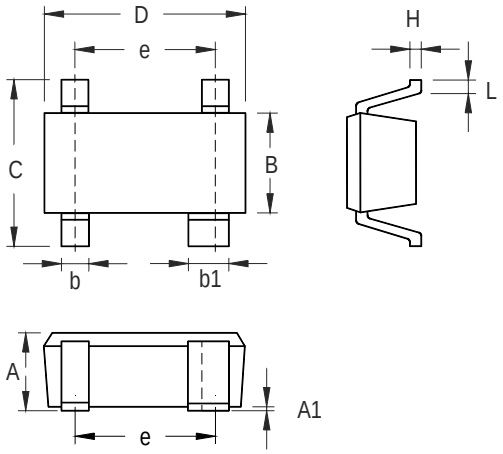
Most µP supervisor ICs have reset threshold voltages between 1% and 1.5% below the value of nominal supply voltages. This ensures a reset will not occur within 1% of the nominal supply, but will occur when the supply is 1.5% below nominal.

## Outline Dimension



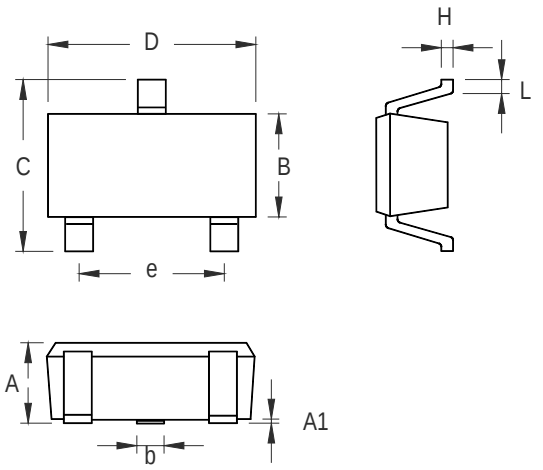

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.800 | 1.100 | 0.031 | 0.044 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| B | 1.150 | 1.350 | 0.045 | 0.054 |
| b | 0.150 | 0.400 | 0.006 | 0.016 |
| C | 1.800 | 2.450 | 0.071 | 0.096 |
| D | 1.800 | 2.250 | 0.071 | 0.089 |
| e | 1.300 | | 0.051 | |
| H | 0.080 | 0.260 | 0.003 | 0.010 |
| L | 0.210 | 0.460 | 0.008 | 0.018 |

**SC-70-3 Surface Mount Package**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.800 | 1.100 | 0.031 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| B | 1.150 | 1.350 | 0.045 | 0.053 |
| b | 0.150 | 0.400 | 0.006 | 0.016 |
| b1 | 0.350 | 0.500 | 0.014 | 0.020 |
| C | 1.800 | 2.450 | 0.071 | 0.096 |
| D | 1.800 | 2.200 | 0.071 | 0.087 |
| e | 1.300 | | 0.051 | |
| H | 0.080 | 0.260 | 0.003 | 0.010 |
| L | 0.200 | 0.460 | 0.008 | 0.018 |

**SC-82 Surface Mount Package**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.889 | 1.295 | 0.035 | 0.051 |
| A1 | 0.000 | 0.152 | 0.000 | 0.006 |
| B | 1.397 | 1.803 | 0.055 | 0.071 |
| b | 0.356 | 0.508 | 0.014 | 0.020 |
| C | 2.591 | 2.997 | 0.102 | 0.118 |
| D | 2.692 | 3.099 | 0.106 | 0.122 |
| e | 1.803 | 2.007 | 0.071 | 0.079 |
| H | 0.080 | 0.254 | 0.003 | 0.010 |
| L | 0.300 | 0.610 | 0.012 | 0.024 |

**SOT-23-3 Surface Mount Package**

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