# Micro-Power Voltage Detectors

## General Description

The RT9818 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 RT9818 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. RT9818 is provided in SC-82, SC-70-3, SOT-23-3, SOT-23-5 and SOT-89 packages.

## Ordering Information

RT9818□-□□□□

- Package Type
  - U3 : SC-70-3
  - V : SOT-23-3
  - VL : SOT-23-3 (L-Type)
  - B : SOT-23-5
  - X : SOT-89
  - 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**
- **N-Channel Open-Drain Output**
- **Small SC-82, SC-70-3, SOT-23-3, SOT-23-5, SOT-89 Packages**
- **RoHS Compliant and 100% Lead (Pb)-Free**

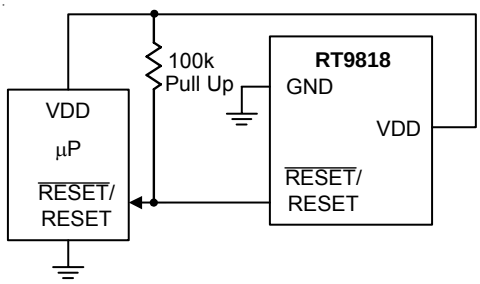
## Applications

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

## Marking Information

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

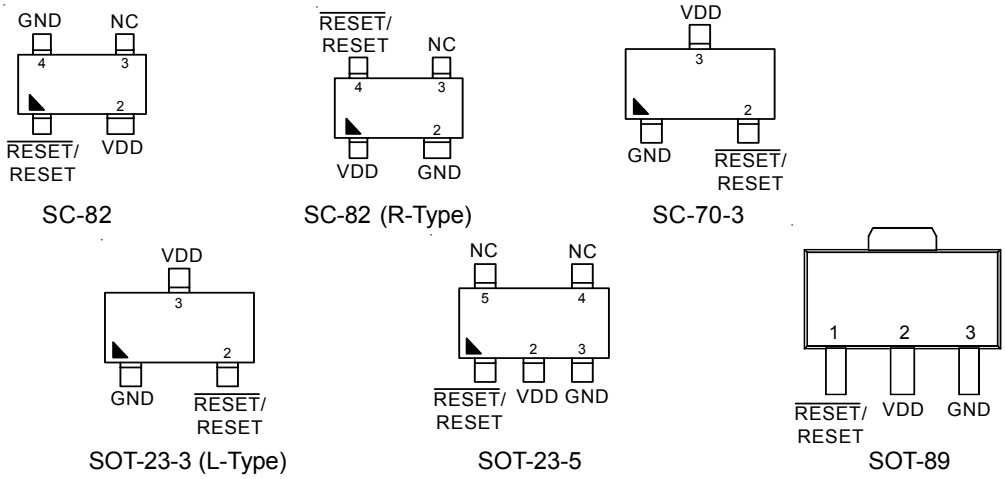
## Typical Application Circuit




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## Pin Configurations

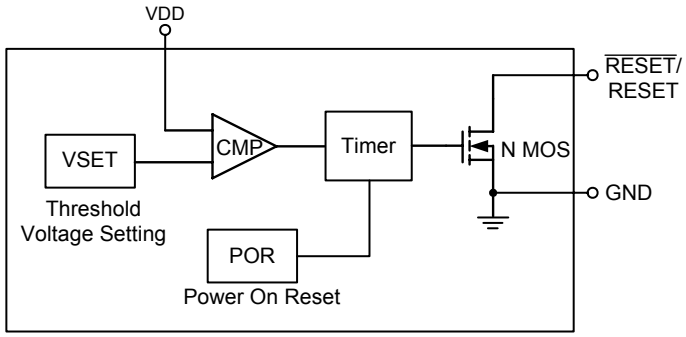
(TOP VIEW)



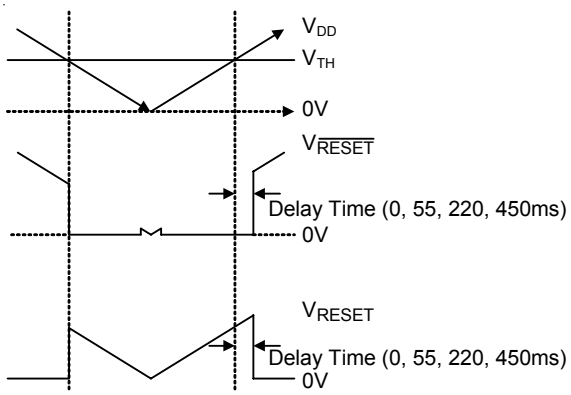

## Functional Pin Description

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

## Function Block Diagram




## Timing Diagram




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## Absolute Maximum Ratings (Note 1)

- Terminal Voltage (with Respect to GND)
  $V_{DD}$ ---------- –0.3V to 6V
- All Other Inputs ---------- –0.3V to ($V_{DD}$ + 0.3V)
- Input Current, $I_{VDD}$ ---------- 20mA
- Power Dissipation, $P_D$ @ $T_A$ = 25°C
  SC-70 / SC-82 ---------- 0.25W
  SOT-23-3 ---------- 0.4W
  SOT-23-5 ---------- 0.4W
  SOT-89 ---------- 0.55W
- Package Thermal Resistance (Note 2)
  SC-70 / SC-82, $\theta_{JA}$ ---------- 400°C/W
  SOT-23-3, $\theta_{JA}$ ---------- 250°C/W
  SOT-23-5, $\theta_{JA}$ ---------- 250°C/W
  SOT-89, $\theta_{JA}$ ---------- 180°C/W
- Lead Temperature (Soldering, 10sec.) ---------- 260°C
- Storage Temperature Range ---------- –65°C to 150°C
- ESD Susceptibility (Note 3)
  HBM (Human Body Model) ---------- 2kV

## 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, unless otherwise specified)

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating $V_{DD}$ ($V_{OUT}$) Range | | $V_{DD}$ | | 0.9 | – | 6 | V |
| Supply Current | | $I_{DD}$ | $V_{TH}$ = 3V, $V_{DD}$ = 4.5V, $T_A$ = 27°C | -- | 3 | 8 | μA |
| Reset Threshold | | $V_{TH}$ | $T_A$ = 27°C | -- | 1.2 to 5 | -- | V |
| Threshold Voltage Accuracy | | $\Delta V_{TH}$ | $T_A$ = 27°C | –1.5 | – | 1.5 | % |
| $V_{DD}$ Drop to Reset Delay | | $t_{RD}$ | Drop = $V_{TH}$ –125mV | -- | 20 | -- | μs |
| Reset Active Time Out Period | RT9818A/E | $t_{RP}$ | $V_{DD} \geq 1.02 \times V_{TH}$ | -- | 0 | -- | ms |
| | RT9818B/F | | | 35 | 55 | 75 | |
| | RT9818C/G | | | 143 | 220 | 297 | |
| | RT9818D/H | | | 292 | 450 | 608 | |
| RESET Output Voltage Low (Note 5) | | $V_{OL}$ | 3 = $V_{DD}$ < $V_{TH}$ $I_{SINK}$ > 3.5mA | -- | – | 0.4 | V |
| Hysteresis Width | | $V_{HYS}$ | | -- | 0.01$V_{TH}$ | 0.016$V_{TH}$ | V |

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**Note 1.** Stresses beyond those listed "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and 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 may affect device reliability.

**Note 2.** $\theta_{JA}$ is measured at $T_A$ = 25°C on a low effective thermal conductivity single-layer test board per JEDEC 51-3.

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

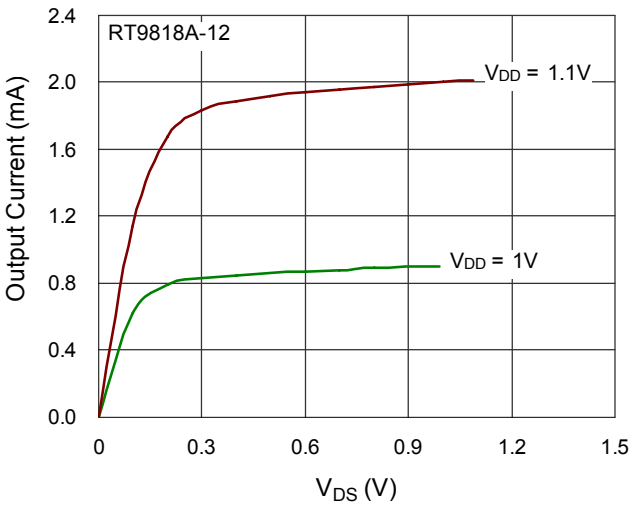
**Note 4.** The device is not guaranteed to function outside its operating conditions.

**Note 5.** The voltage $V_{OL}$ can be calculated by $V_{OL} = V_{DD} - Ir * R$. Where R is the pull-up resistor and Ir is the current flowing through the pull-up resistor. For typical application (R=100kΩ), $V_{OL}$ is less than 0.2V.

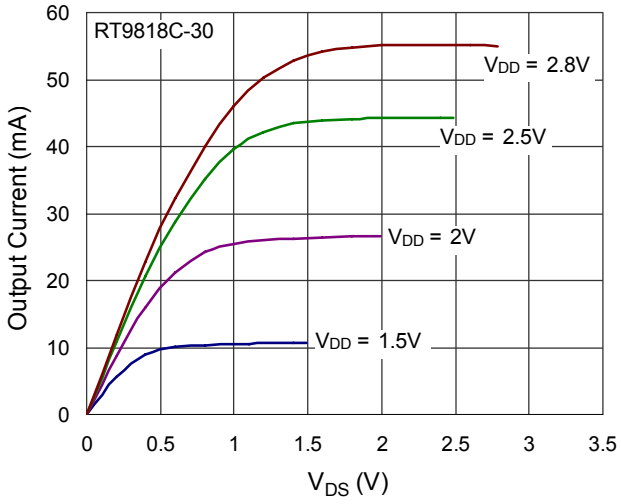
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## Typical Operating Characteristics

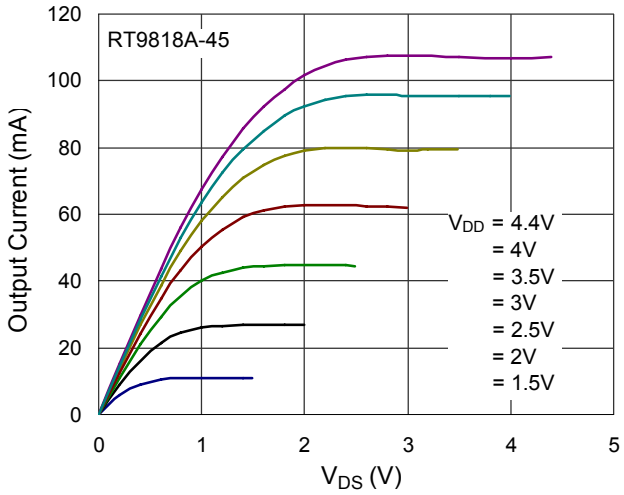
**Nch Driver Output Current vs. $V_{DS}$**



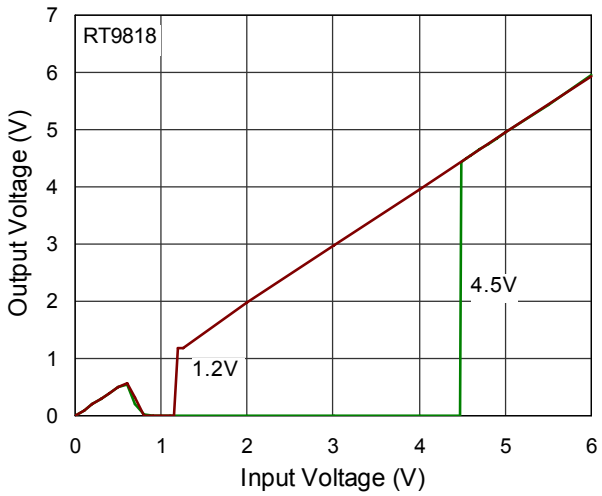

**Nch Driver Output Current vs. $V_{DS}$**



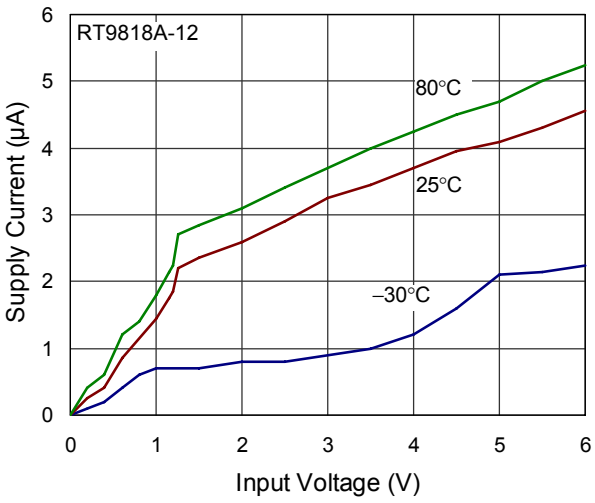

**Nch Driver Output Current vs. $V_{DS}$**



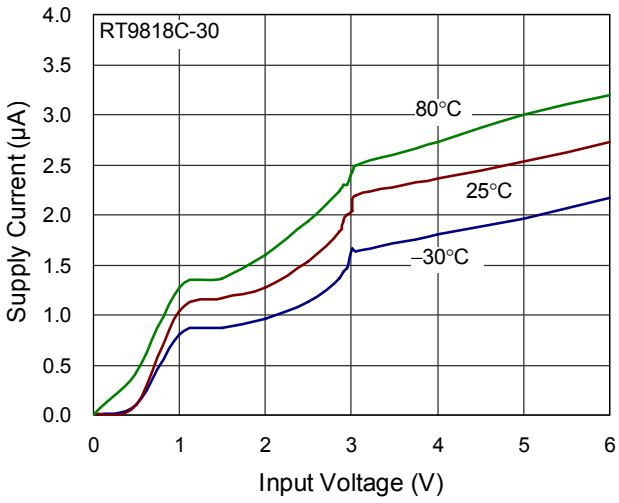

**Output Voltage vs. Input Voltage**




**Supply Current vs. Input Voltage**

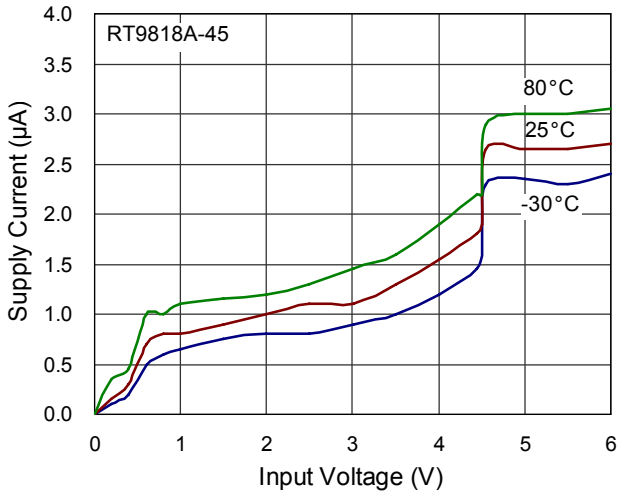



**Supply Current vs. Input Voltage**

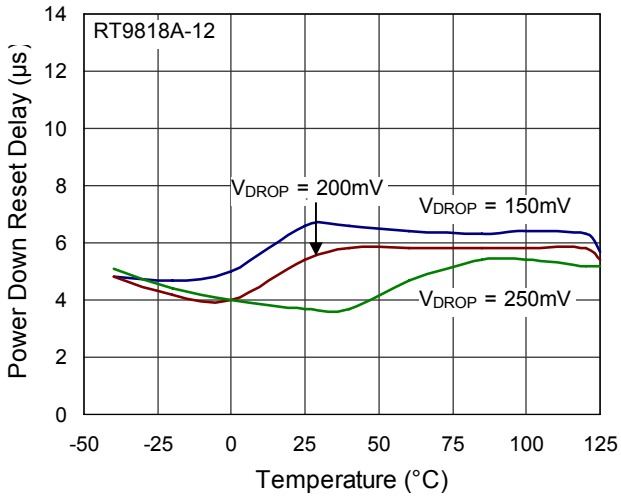



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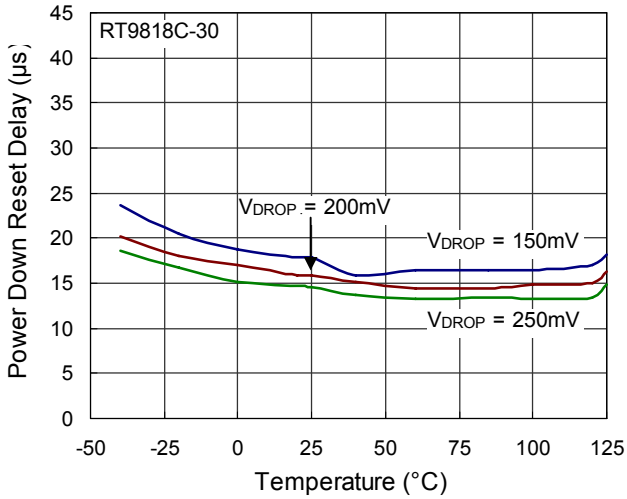
### Supply Current vs. Input Voltage



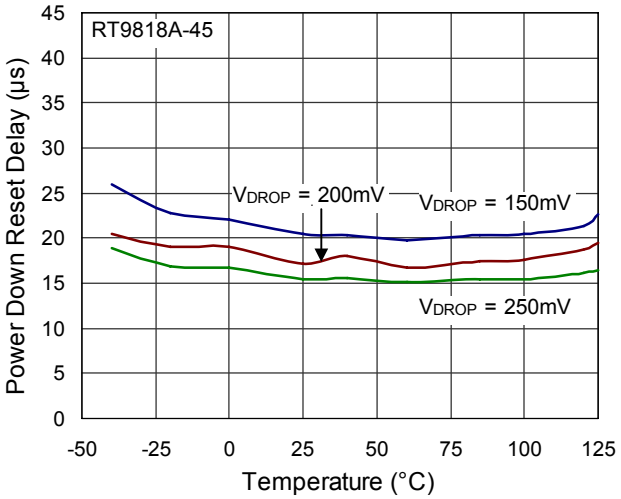

### Power Down Reset Delay vs. Temperature



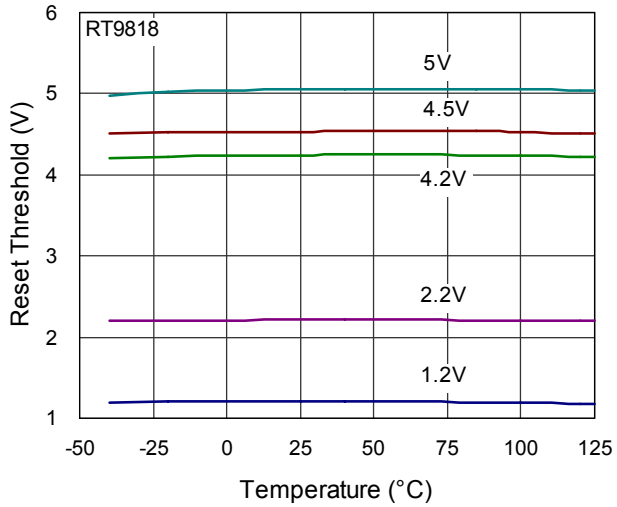

### Power Down Reset Delay vs. Temperature



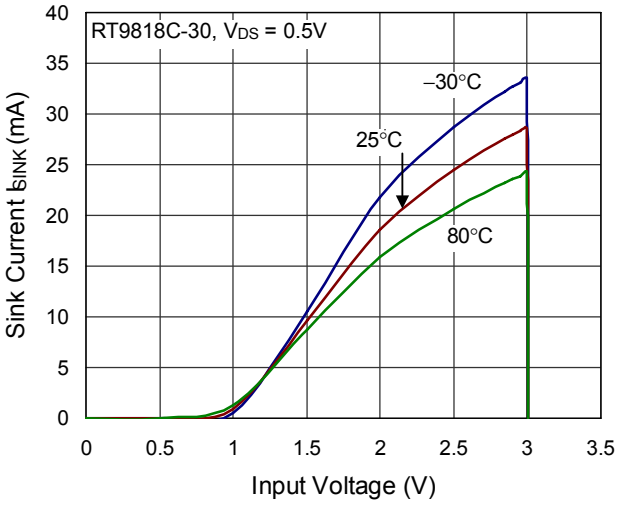

### Power Down Reset Delay vs. Temperature




### Reset Threshold Deviation vs. Temperature

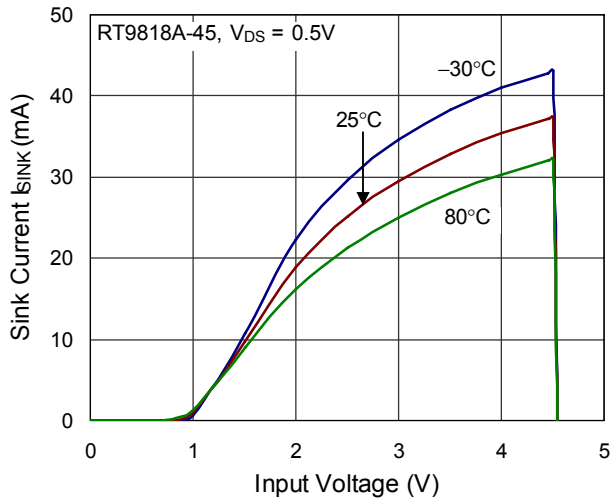



### Nch Driver Sink Current vs. Input Voltage

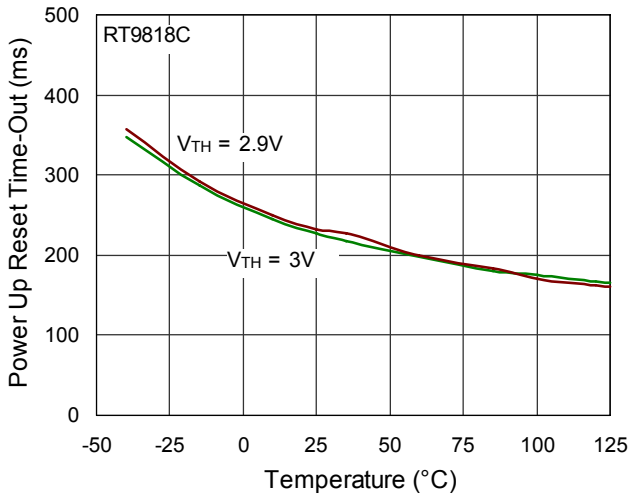



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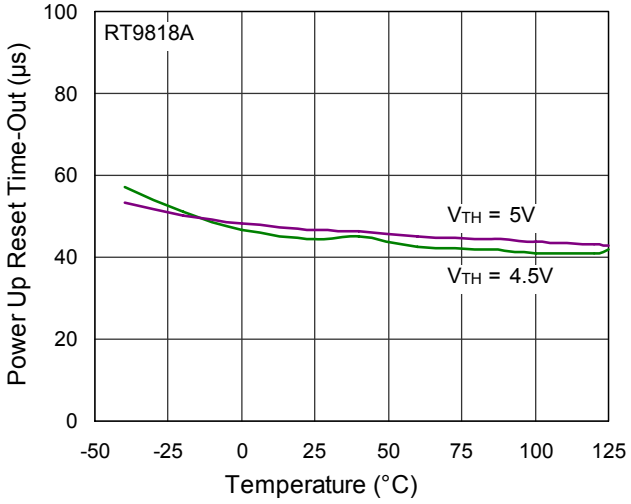
### Nch Driver Sink Current vs. Input Voltage



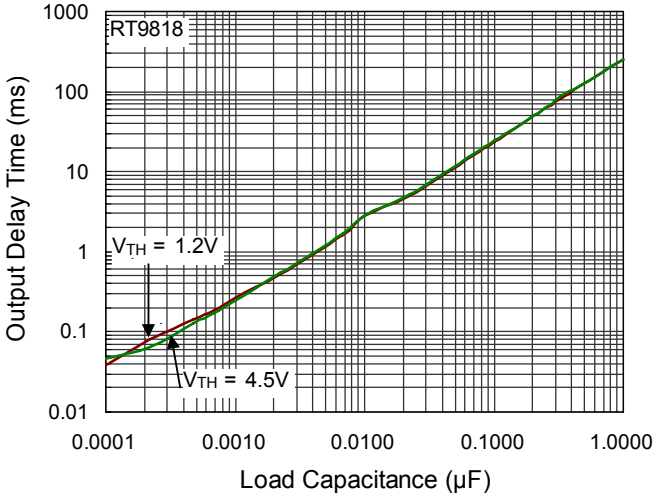

### Power Up Reset Time-Out vs. Temperature



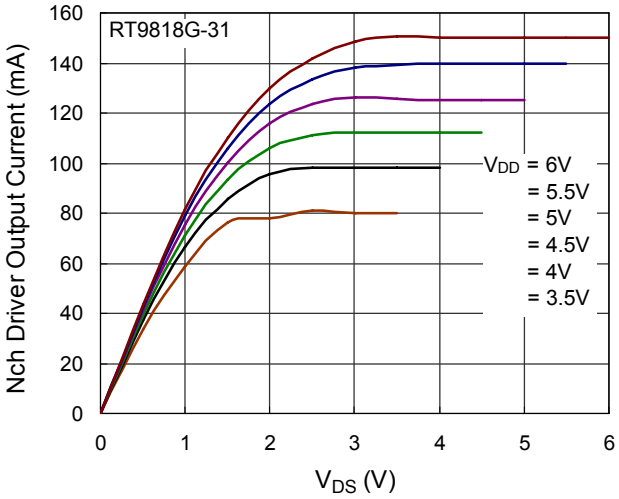

### Power Up Reset Time-Out vs. Temperature



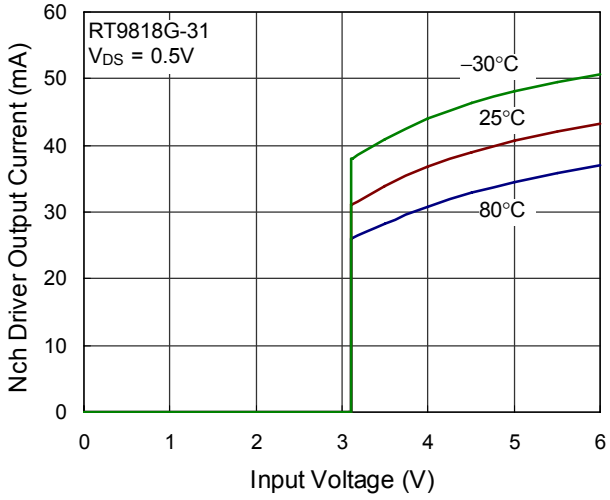

### Output Delay Time vs. Load Capacitance




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

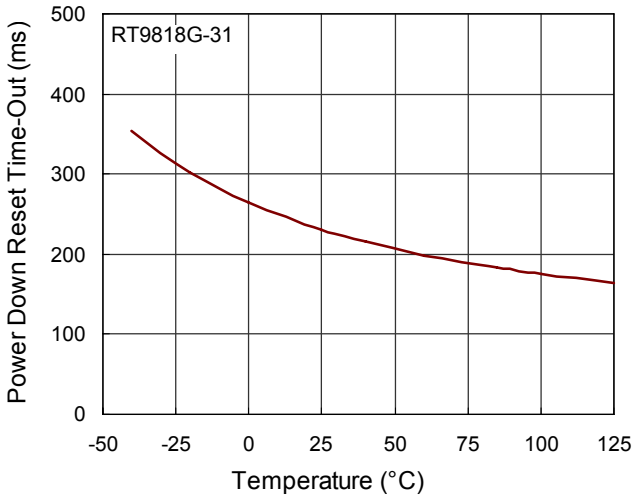



### Nch Driver Output Current vs. Input Voltage

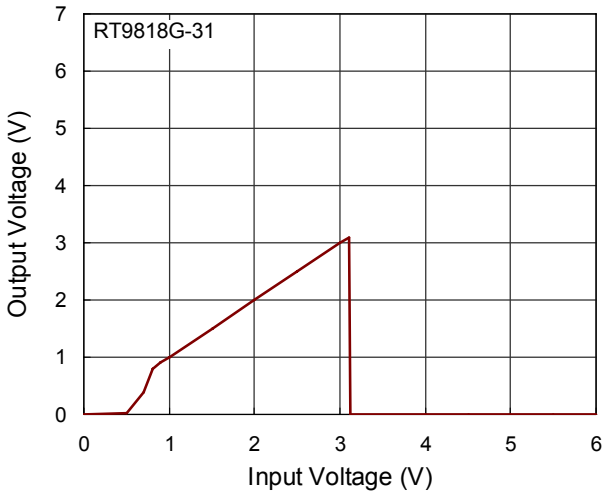



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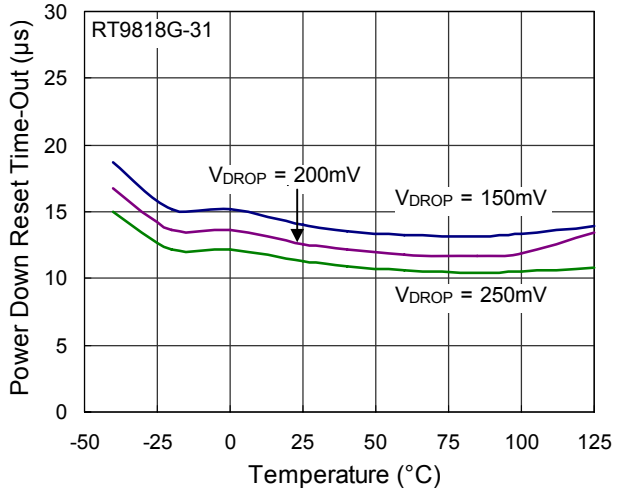
### Power Down Reset Time-Out vs. Temperature



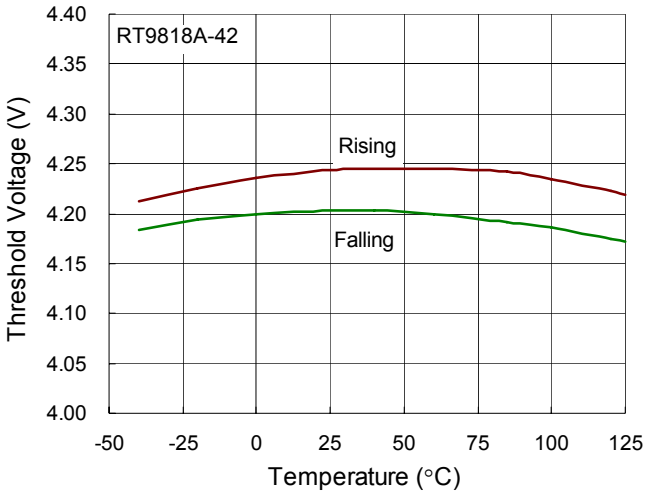

### Output Voltage vs. Input Voltage



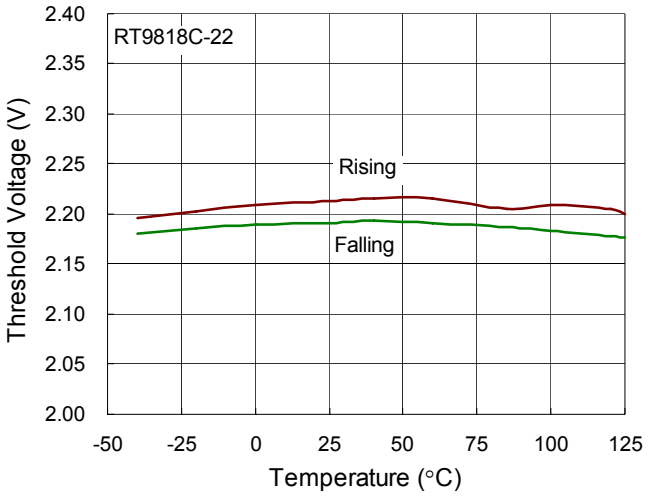

### Power Down Reset Time-Out vs. Temperature




### Threshold Voltage vs. Temperature




### Threshold Voltage vs. Temperature




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## Application Information

### Multiple Supplies

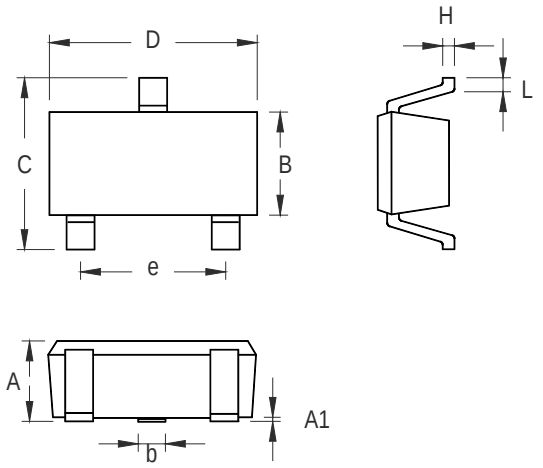
Mainly, the pull-up connected to the RT9818 will connect to the supply voltage that is being monitored at the IC's VDD pin. However, some systems may use the open-drain output to level-shift from the monitored supply to reset circuitry powered by some other supply.

### 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.

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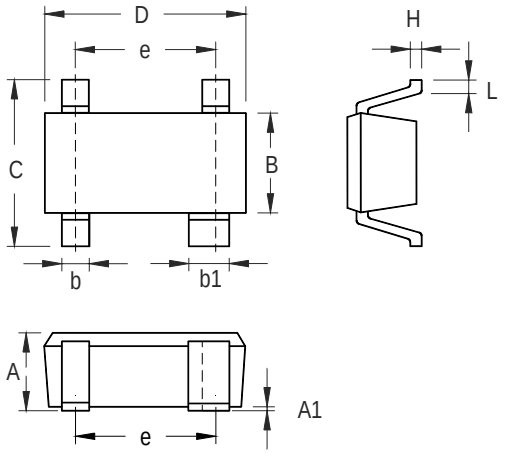
## Outline Dimension




| 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**

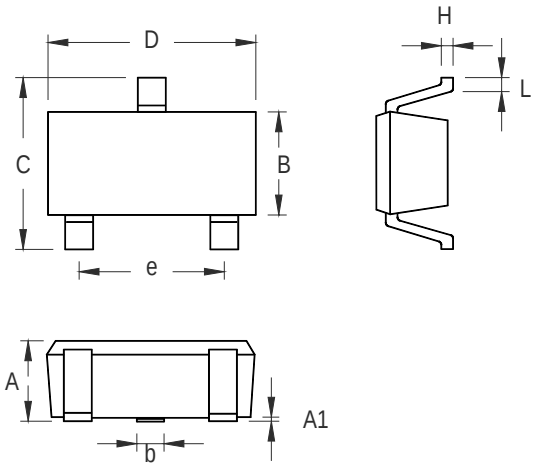
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| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.800 | 1.100 | 0.031 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| B | 1.150 | 1.350 | 0.045 | 0.053 |
| b | 0.150 | 0.400 | 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**

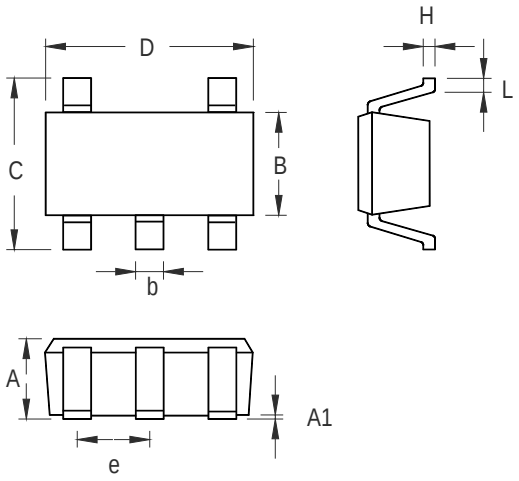
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| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.889 | 1.295 | 0.035 | 0.051 |
| A1 | 0.000 | 0.152 | 0.000 | 0.006 |
| B | 1.397 | 1.803 | 0.055 | 0.071 |
| b | 0.356 | 0.508 | 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**

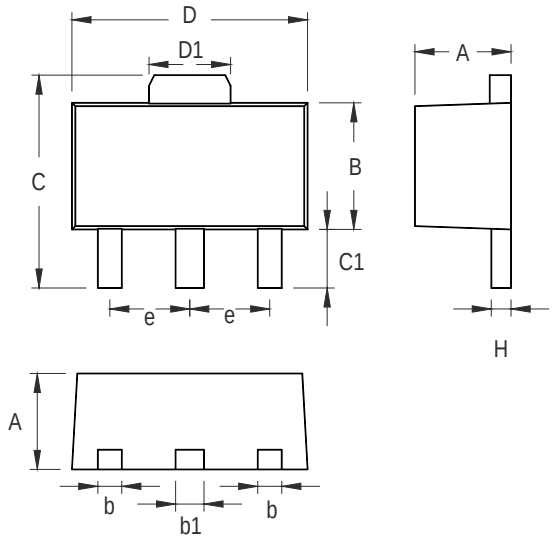
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| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.889 | 1.295 | 0.035 | 0.051 |
| A1 | 0.000 | 0.152 | 0.000 | 0.006 |
| B | 1.397 | 1.803 | 0.055 | 0.071 |
| b | 0.356 | 0.559 | 0.014 | 0.022 |
| C | 2.591 | 2.997 | 0.102 | 0.118 |
| D | 2.692 | 3.099 | 0.106 | 0.122 |
| e | 0.838 | 1.041 | 0.033 | 0.041 |
| H | 0.080 | 0.254 | 0.003 | 0.010 |
| L | 0.300 | 0.610 | 0.012 | 0.024 |

**SOT-23-5 Surface Mount Package**

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| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.397 | 1.600 | 0.055 | 0.063 |
| b | 0.356 | 0.483 | 0.014 | 0.019 |
| B | 2.388 | 2.591 | 0.094 | 0.102 |
| b1 | 0.406 | 0.533 | 0.016 | 0.021 |
| C | 3.937 | 4.242 | 0.155 | 0.167 |
| C1 | 0.787 | 1.194 | 0.031 | 0.047 |
| D | 4.394 | 4.597 | 0.173 | 0.181 |
| D1 | 1.397 | 1.753 | 0.055 | 0.069 |
| e | 1.448 | 1.549 | 0.057 | 0.061 |
| H | 0.356 | 0.432 | 0.014 | 0.017 |

**3-Lead SOT-89 Surface Mount Package**

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