

## Micro-Power Voltage Detector

### General Description

The RT9827 is a micro-power voltage detector supervising the power supply voltage level for microprocessors ( $\mu$ P) 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 3 $\mu$ A. The RT9827 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. RT9827 is provided in SC-82, SC-70-3, SOT-23-3, SOT-23-5 and SOT-89 packages.

### Ordering Information

RT9827	□	□	□	□	□
	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  $\pm 1.5\%$
- Low Supply Current 3 $\mu$ A
- No External Components Required
- Quick Reset within 20 $\mu$ s
- 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

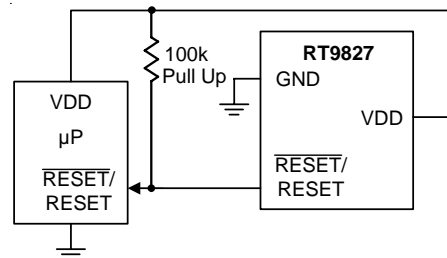
### Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical  $\mu$ P and  $\mu$ C Power Monitoring
- Portable/Battery-Powered Equipment

### Marking Information

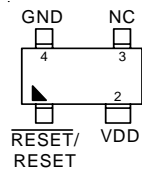
For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

### Typical Application Circuit

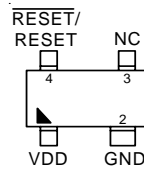


Pin Configurations

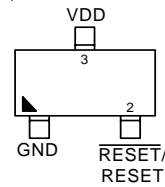
(TOP VIEW)



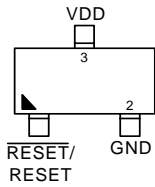
SC-82



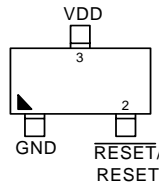
SC-82 (R-Type)



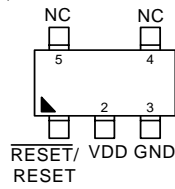
SC-70-3



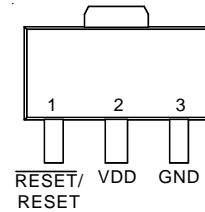
SOT-23-3



SOT-23-3 (L-Type)



SOT-23-5

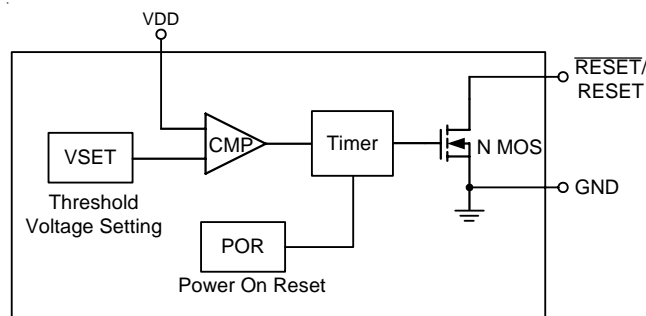


SOT-89

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	Supply Voltage Input.

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,  $P_D$  @  $T_A = 25^\circ C$ 
  - 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 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

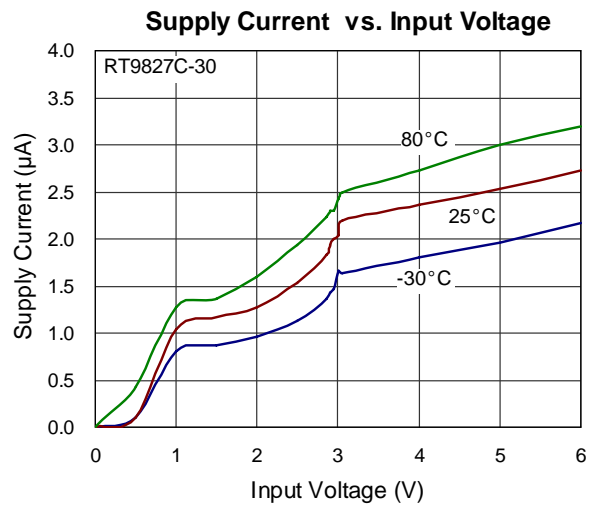
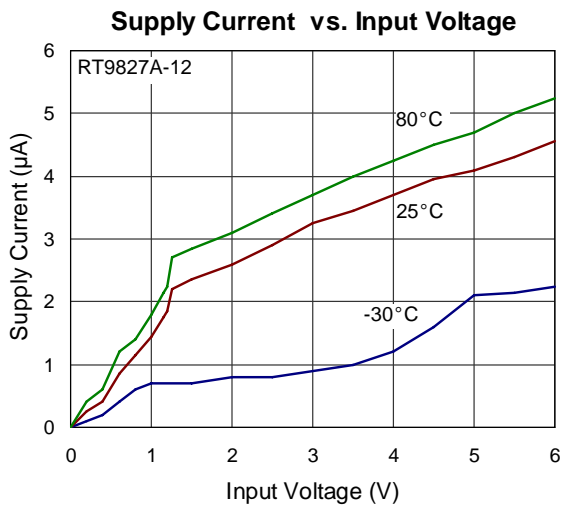
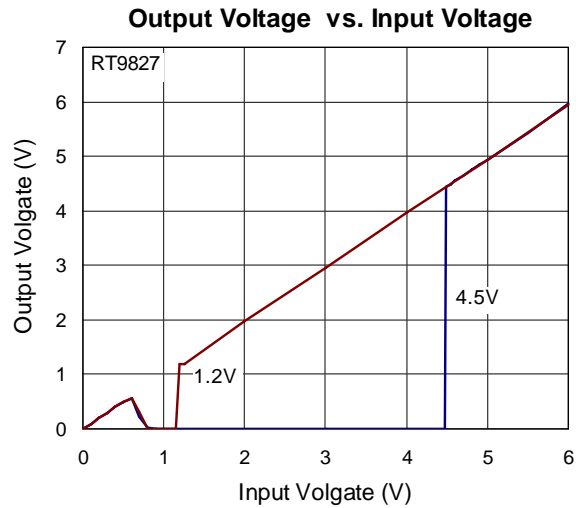
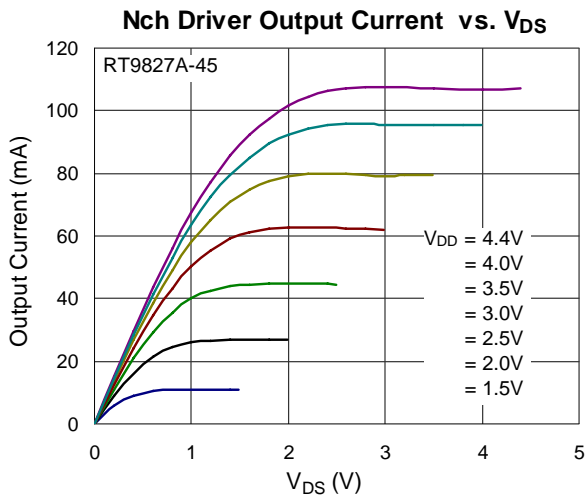
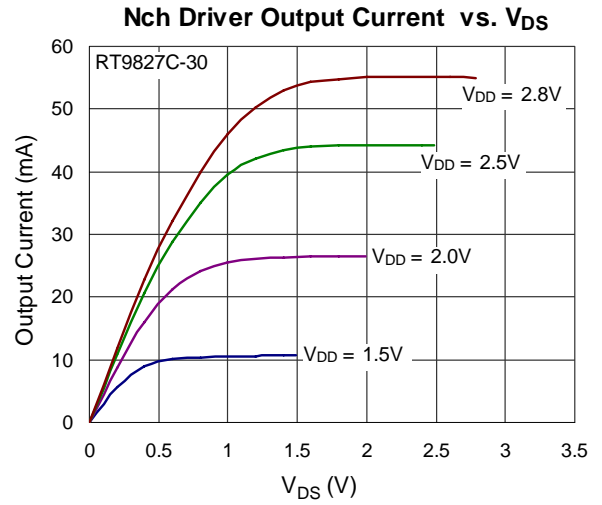
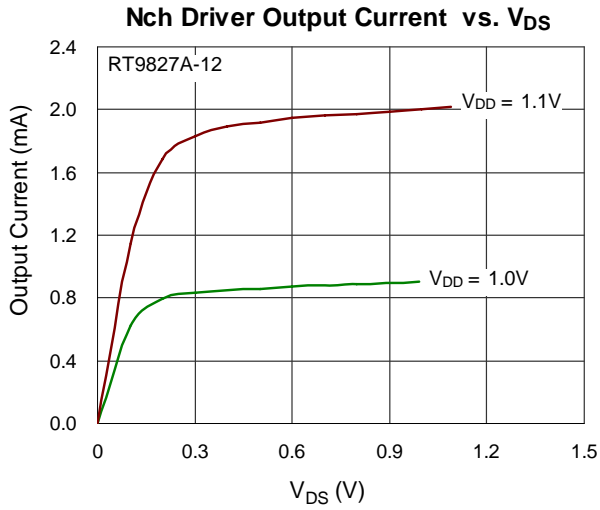
**Electrical Characteristics**

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

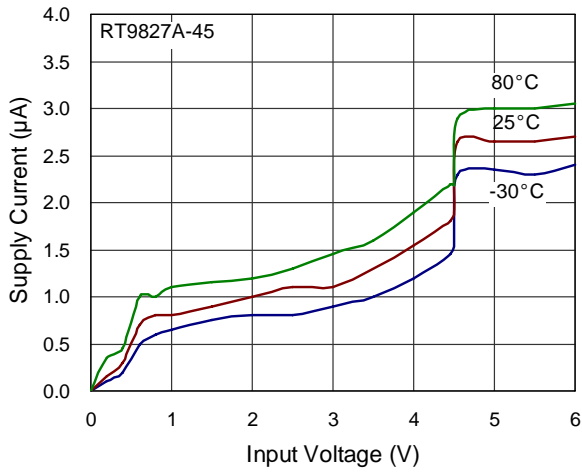
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Operating $V_{DD}$ ( $V_{OUT}$ ) Range	$V_{DD}$		0.9	--	6	V	
Supply Current	$I_{DD}$	$V_{TH} = 3V$ , $V_{DD} = 4.5V$	--	3	8	$\mu A$	
Reset Threshold	$V_{TH}$		--	1.2 to 5	--	V	
Threshold Voltage Accuracy	$\Delta V_{TH}$		-1.5	--	1.5	%	
$V_{DD}$ Drop to Reset Delay	$t_{RD}$	Drop = $V_{TH} - 125mV$	--	20	--	$\mu s$	
Reset Active Time Out Period	RT9827A/E	$t_{RP}$	$V_{DD} \geq 1.02 \times V_{TH}$	--	0	--	ms
	RT9827B/F			35	55	75	
	RT9827C/G			143	220	297	
	RT9827D/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	$V_{HYS}$		--	$0.01V_{TH}$	$0.016V_{TH}$	V	

- 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  $T_A = 25^\circ\text{C}$  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.
- Note 5.** The voltage  $V_{OL}$  can be calculated by  $V_{OL} = V_{DD} - I_r * R$ . Where R is the pull-up resistor and  $I_r$  is the current flowing through the pull-up resistor. For typical application ( $R=100\text{k}\Omega$ ),  $V_{OL}$  is less than 0.2V.

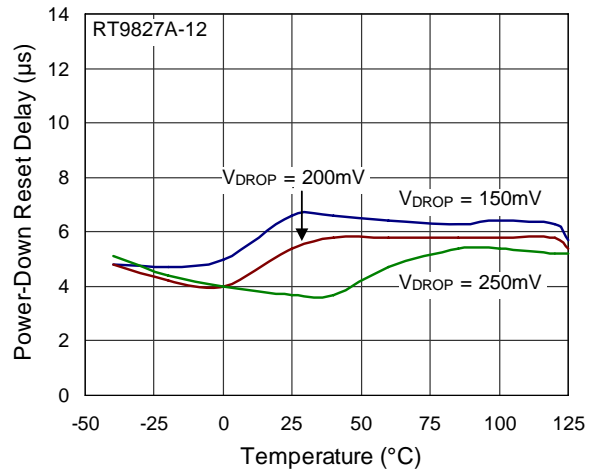
**Typical Operating Characteristics**



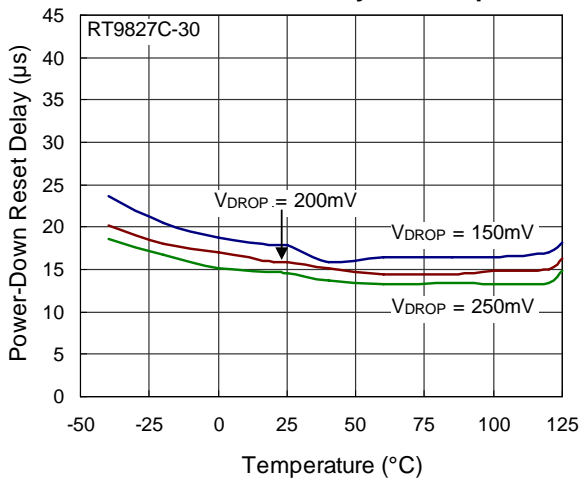
Supply Current vs. Input Voltage



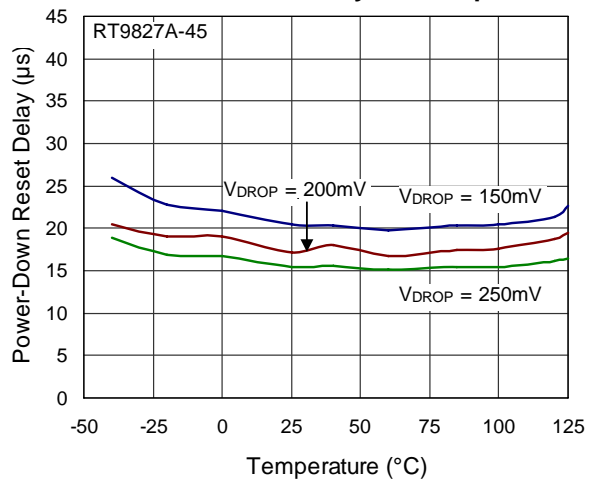
Power-Down Reset Delay vs. Temperature



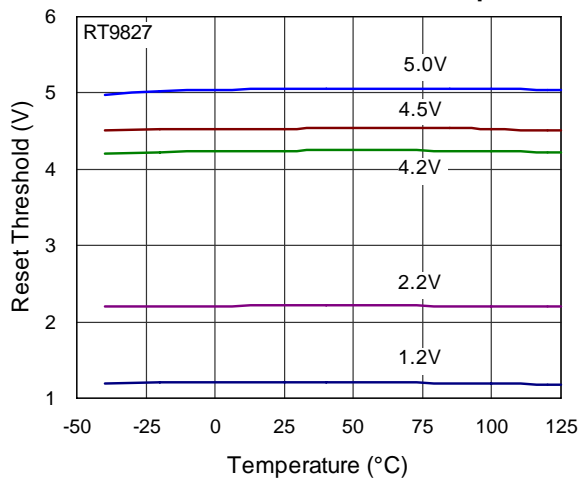
Power-Down Reset Delay vs. Temperature



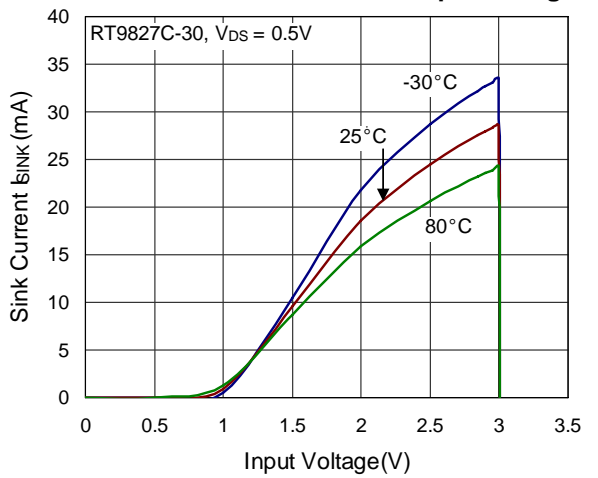
Power-Down Reset Delay vs. Temperature

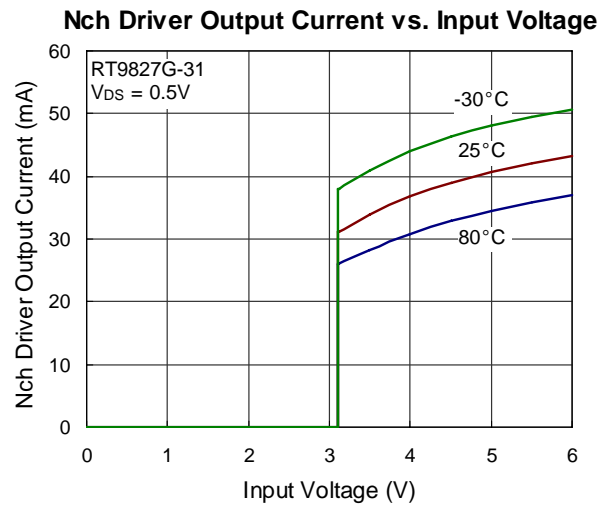
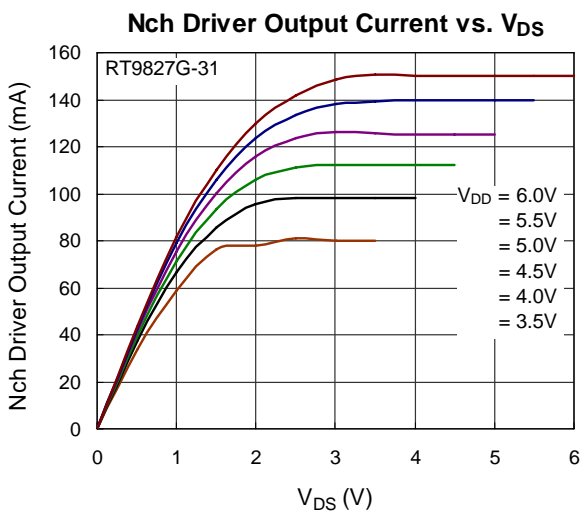
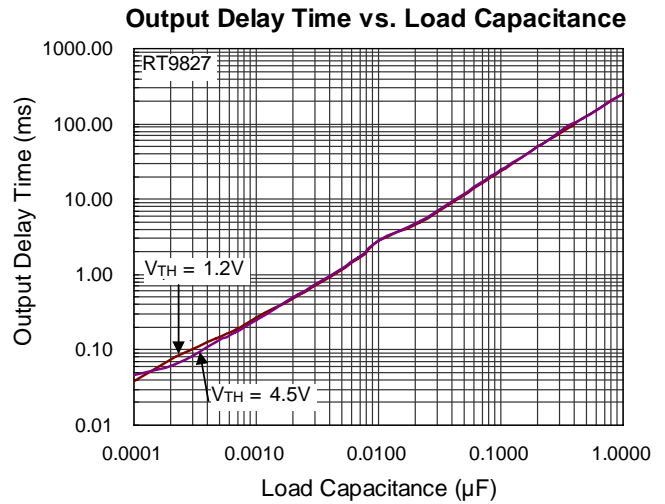
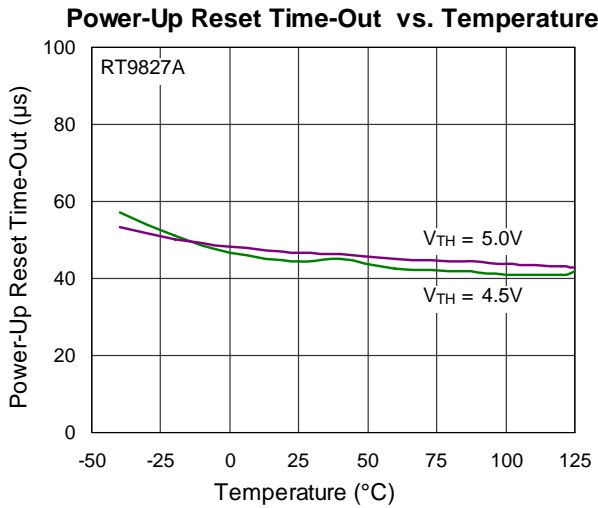
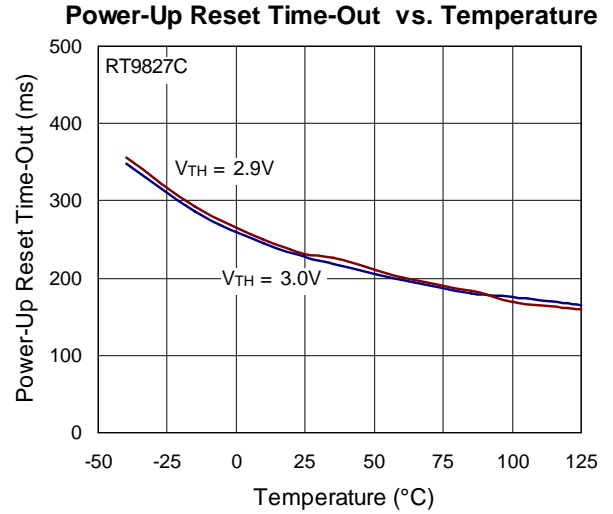
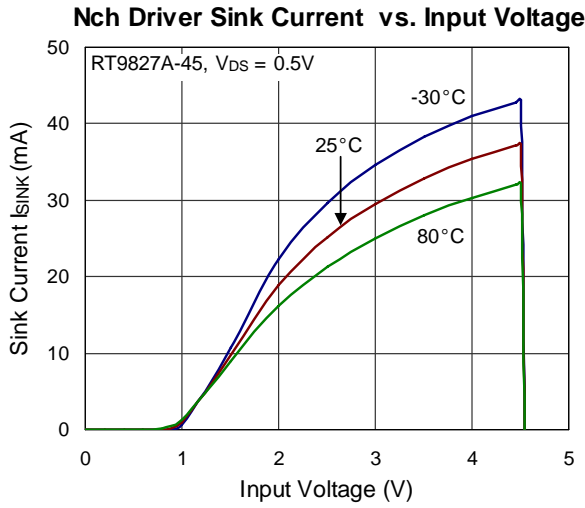


Reset Threshold Deviation vs. Temperature

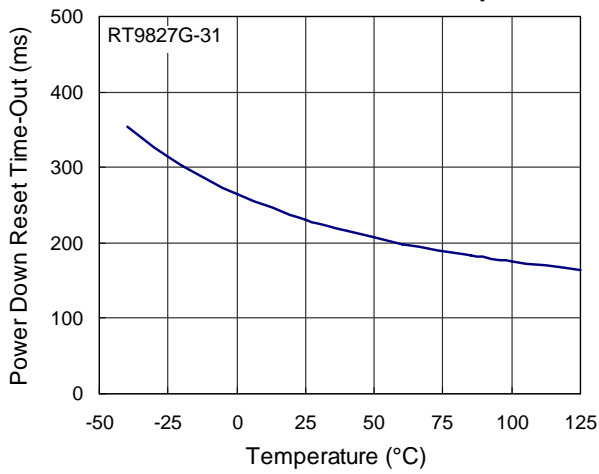


Nch Driver Sink Current vs. Input Voltage

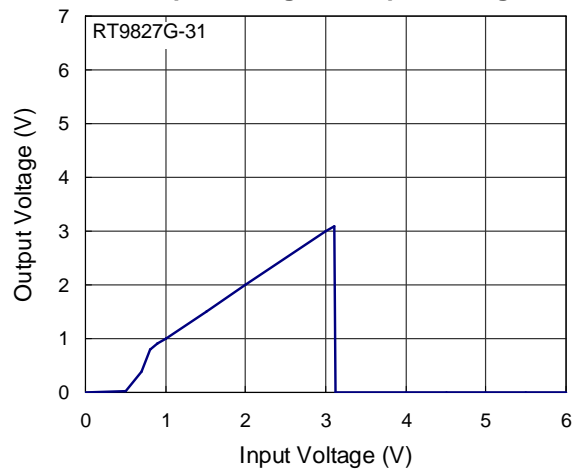




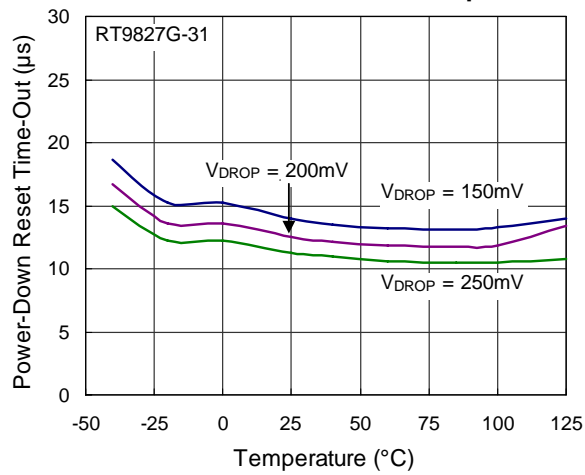
**Power Down Reset Time-Out vs. Temperature**



**Output Voltage vs. Input Voltage**



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





## Application Information

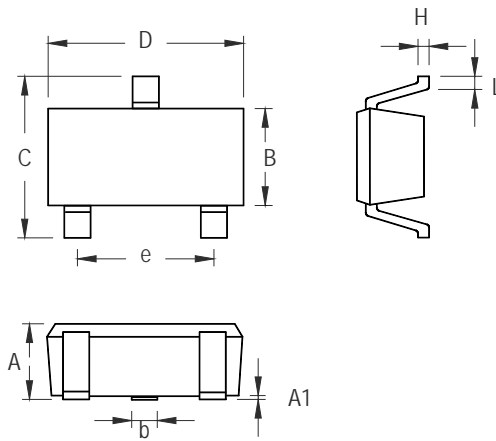
### Multiple Supplies

Mainly, the pull-up connected to the RT9827 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

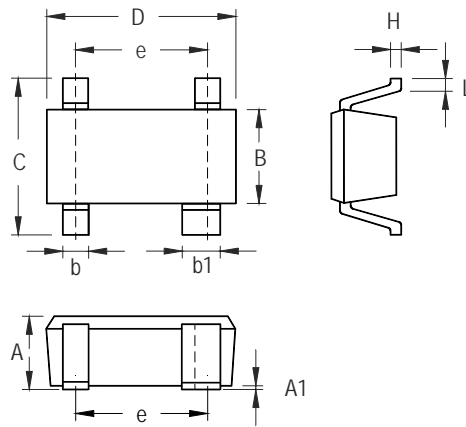
Most  $\mu$ P supervisor ICs have reset threshold voltages between 1% and 1.5% below the value of nominal supply voltages. This ensures a reset will not occur within 1% of the nominal supply, but will occur when the supply is 1.5% below nominal.

Outline Dimension



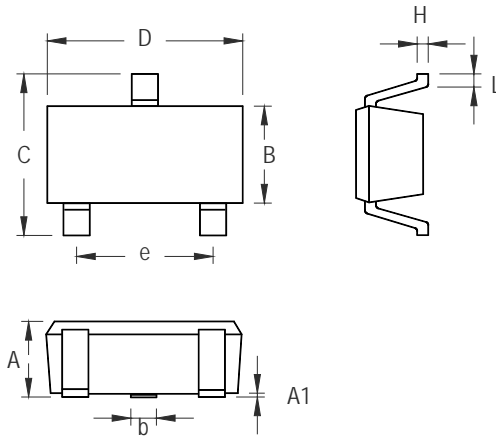
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.044
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.054
b	0.150	0.400	0.006	0.016
C	1.800	2.450	0.071	0.096
D	1.800	2.250	0.071	0.089
e	1.300		0.051	
H	0.080	0.260	0.003	0.010
L	0.210	0.460	0.008	0.018

SC-70-3 Surface Mount Package



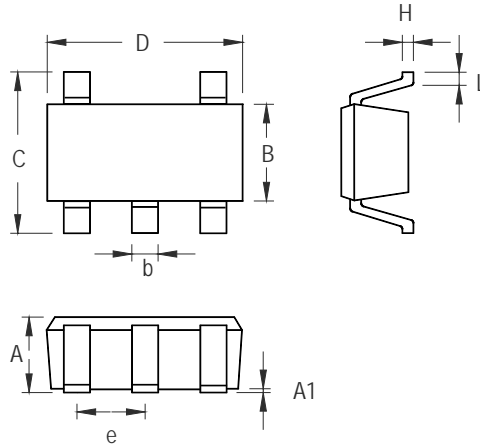
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.053
b	0.150	0.400	0.006	0.016
b1	0.350	0.500	0.014	0.020
C	1.800	2.450	0.071	0.096
D	1.800	2.200	0.071	0.087
e	1.300		0.051	
H	0.080	0.260	0.003	0.010
L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

**SC-82 Surface Mount Package**



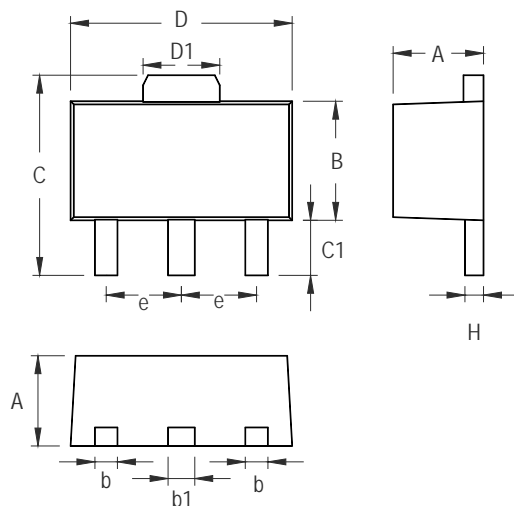
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.508	0.014	0.020
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	1.803	2.007	0.071	0.079
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012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

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



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**



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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