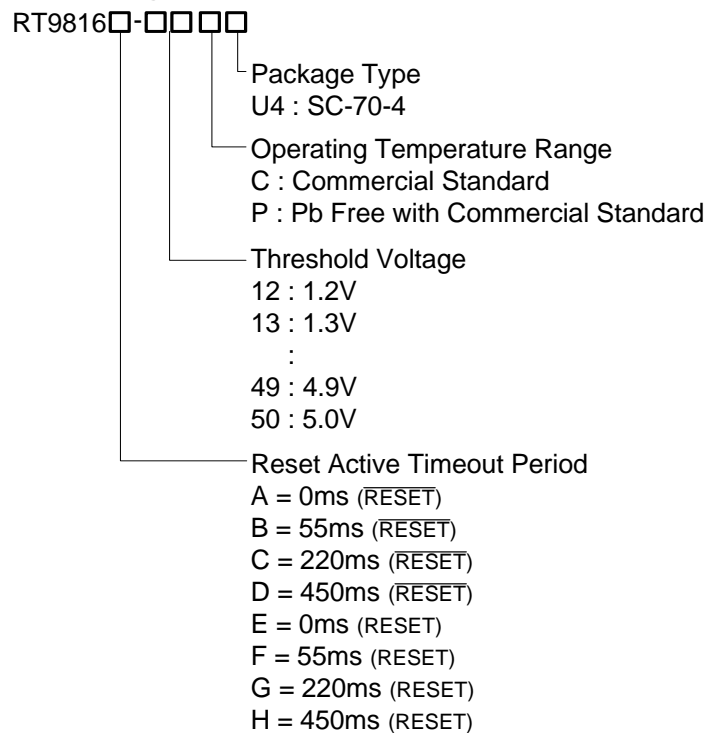# Micro-Power Voltage Detectors with Manual Reset

General Description

The RT9816 is a micro-power voltage detector with deglitched manual reset input 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 1.0V to 5V, which covers most digital applications. It features low supply current of 3μA. The RT9816 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. To pull reset signal low manually, just pull the manual reset input (MR) below the specified V_{IL} level. RT9816 is provided in SC-70 package.

Ordering Information

RT9816☐-☐☐☐☐

Package Type
U4 : SC-70-4

Operating Temperature Range
C : Commercial Standard
P : Pb Free with Commercial Standard

Threshold Voltage
12 : 1.2V
13 : 1.3V
:
49 : 4.9V
50 : 5.0V

Reset Active Timeout Period
A = 0ms ($\overline{RESET}$)
B = 55ms ($\overline{RESET}$)
C = 220ms ($\overline{RESET}$)
D = 450ms ($\overline{RESET}$)
E = 0ms (RESET)
F = 55ms (RESET)
G = 220ms (RESET)
H = 450ms (RESET)

Note :

RichTek Pb-free products are :

−RoHS compliant and compatible with the current require-
 ments of IPC/JEDEC J-STD-020.

−Suitable for use in SnPb or Pb-free soldering processes.

−100%matte tin (Sn) plating.

Features

- **Internally Fixed Threshold 1.0V 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**
- **800ns Glitch Immunity of Manual Reset Input**
- **Low Functional Supply Voltage 0.9V**
- **N-Channel Open-Drain Output,**
- **Small 4-Pin SC-70 Package**
- **RoHS Compliant and 100% Lead (Pb)-Free**

Applications

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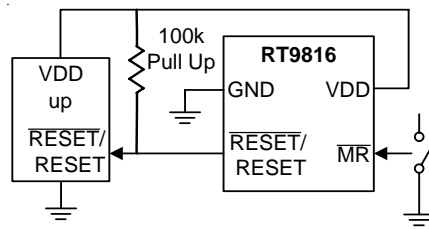- Portable/Battery-Powered Equipment

Marking Information

For marking information, contact our sales representative directly or through a RichTek distributor located in your area, otherwise visit our website for detail.

Pin Configurations

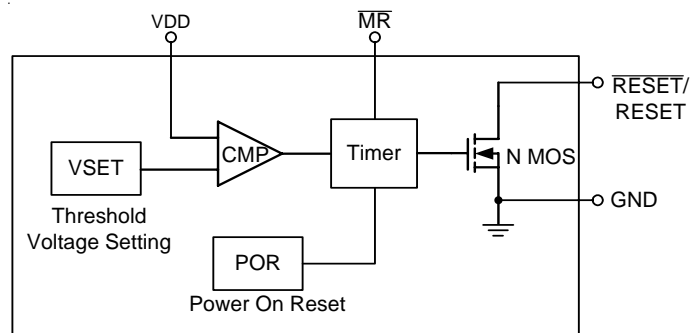(TOP VIEW)
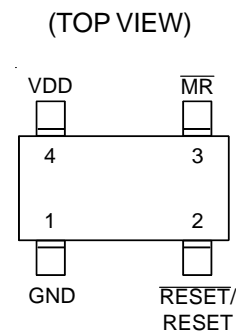
SC-70-4

Typical Application Circuit

Functional Pin Description

Pin Name	Pin Function
GND	Ground Pin
$\overline{\text{RESET}}$	Active Low Open-Drain Reset Output
RESET	Active High Open-Drain Reset Output
$\overline{\text{MR}}$	Manual Reset
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-70-4 --- 0.25W
- Package Thermal Resistance   (Note 4)
  - SC-70-4, θ_{JA} -- 400°C
- Lead Temperature (Soldering, 10sec.)-- 260°C
- Storage Temperature Range --- −65°C to 125°C
- ESD Susceptibility   (Note 2)
  - HBM (Human Body Mode) -- 2kV
  - MM (Machine Mode) -- 200V

Recommended Operating Conditions   (Note 3)

- Junction Temperature Range -- −40°C to 125°C

Electrical Characteristics

(V_{DD} = 3V, unless otherwise specified)

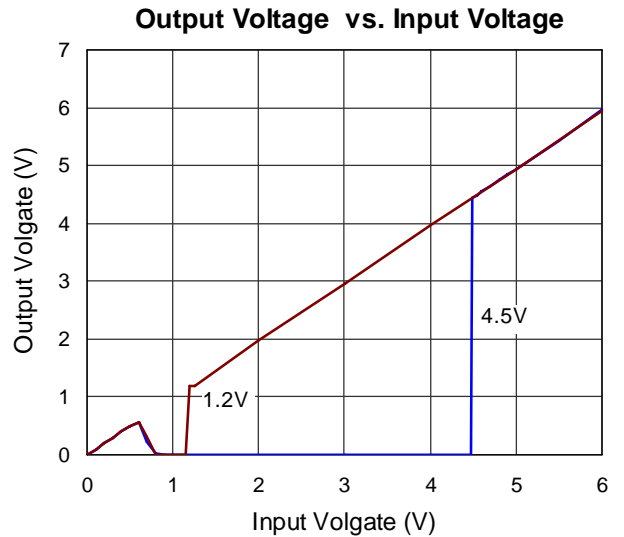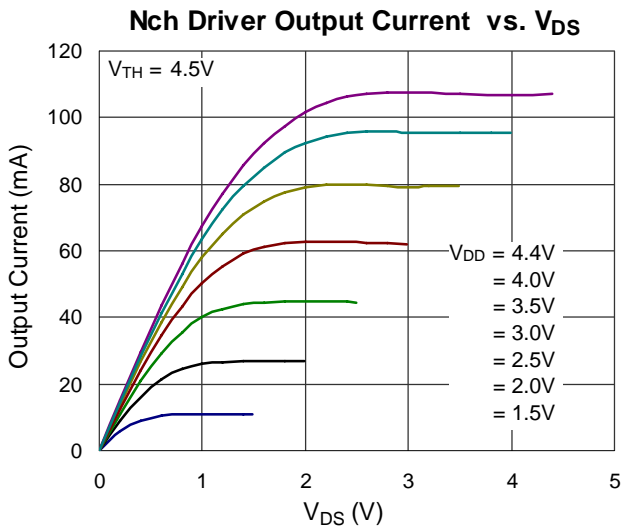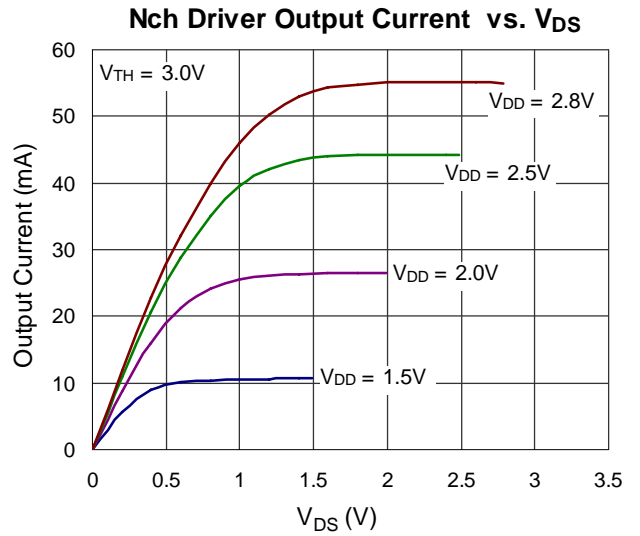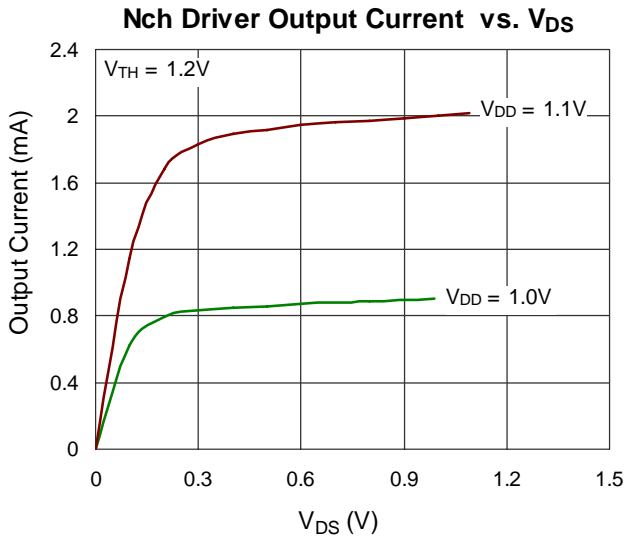| Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Operating V_{DD} (V_{OUT}) Range		V_{DD}		0.9	--	6	V
Supply Current		I_{DD}	V_{TH} = 3V , V_{DD} = 4.5V T_A = 27°C	--	3	--	μA
Reset Threshold		V_{TH}	T_A = 27°C	--	1.2 to 5.0	--	V
MR Input Threshold		V_{IL}	T_A = 27°C, V_{TH} > 1.2V	--	0.25V_{DD}	--	V
		V_{IH}	T_A = 27°C, V_{TH} > 1.2V	--	0.7V_{DD}	--	
		V_{IL}	T_A = 27°C, V_{TH} < 1.2V	--	--	0.3	
		V_{IH}	T_A = 27°C, V_{TH} < 1.2V	0.7	--	--	
MR Glitch Rejection				--	800	--	ns
Threshold Voltage Accuracy		ΔV_{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	RT9816A/E	t_{RP}	$V_{DD} \geq 1.02 \times V_{TH}$	--	0	--	ms
	RT9816B/F			--	55	--	ms
	RT9816C/G			--	220	--	ms
	RT9816D/H			--	450	--	ms
RESET Output Voltage Low		V_{OL}	3 = V_{DD} < V_{TH} I_{SINK} >3.5mA	--	0.4	--	V
Hysteresis Width		V_{HYS}			0.01V_{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.
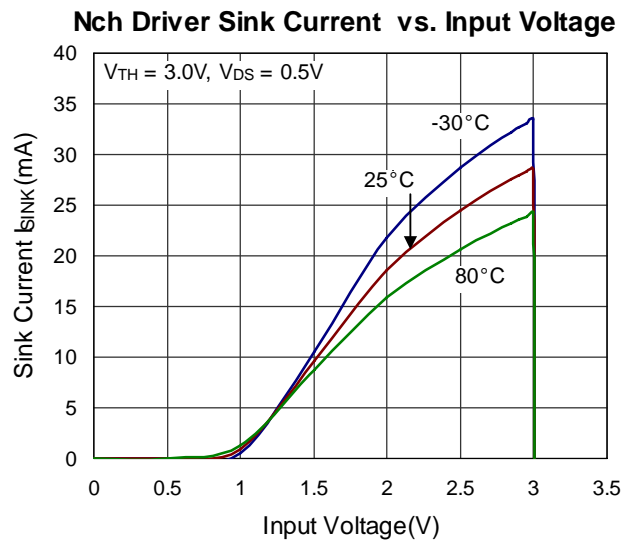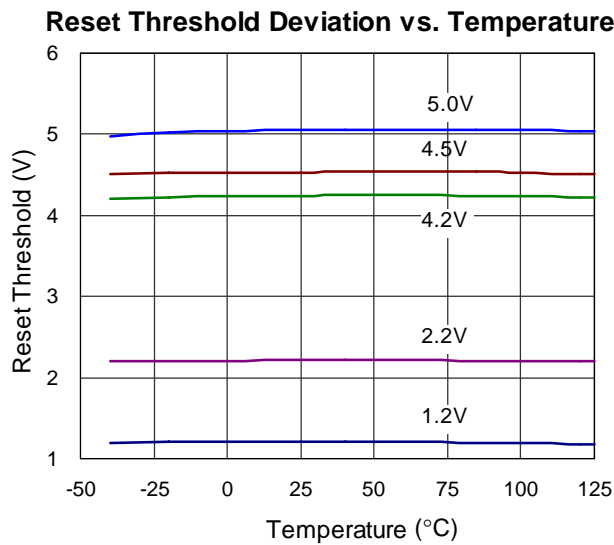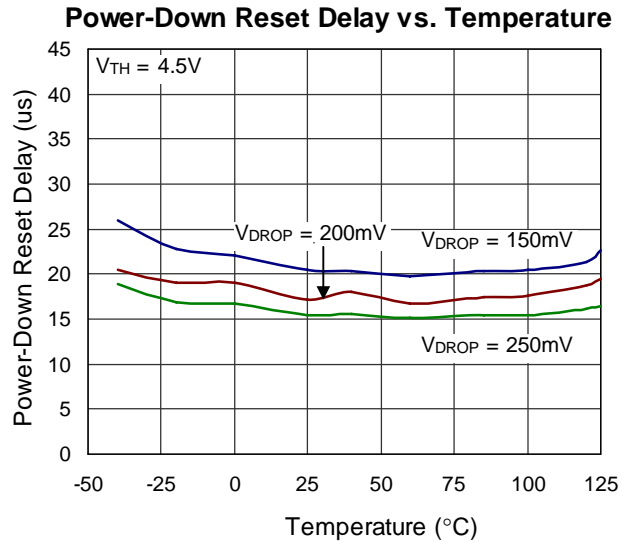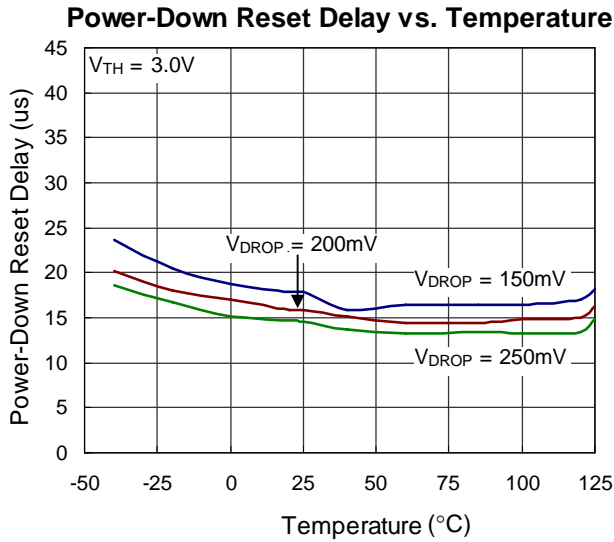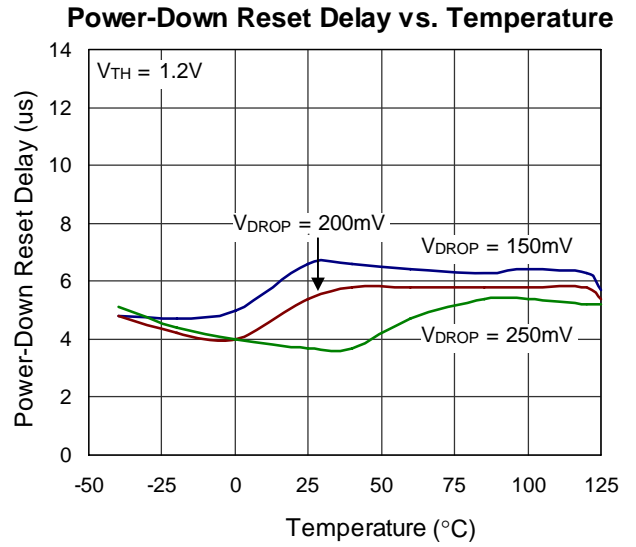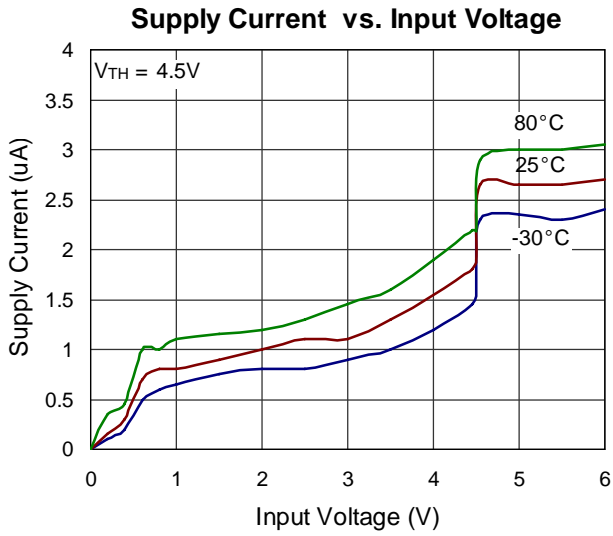
Note 2. Devices are ESD sensitive. Handling precaution recommended.

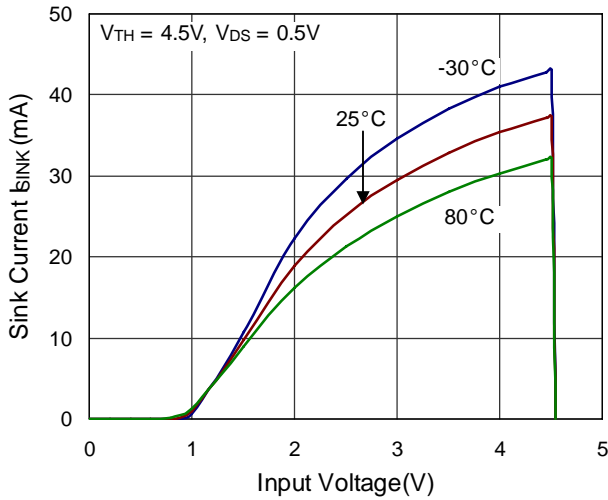**Note 3.** The device is not guaranteed to function outside its operating conditions.

Note 4. θ_{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.

Typical Operating Characteristics

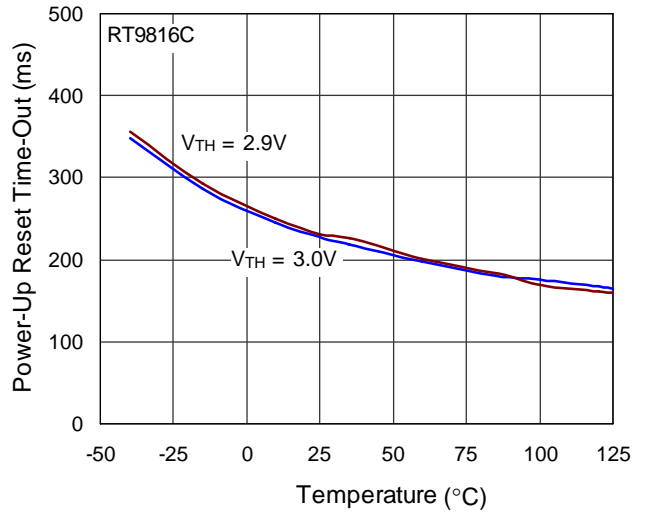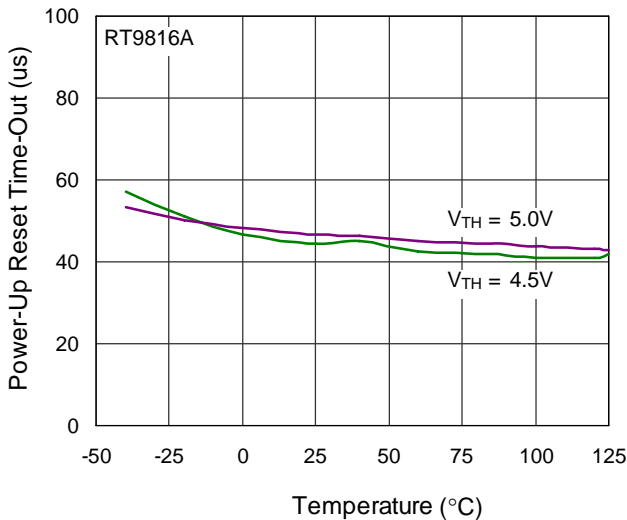**Nch Driver Output Current vs. V$_{DS}$**

$V_{TH} = 1.2V$

Nch Driver Output Current vs. V$_{DS}$

$V_{TH} = 3.0V$

Nch Driver Output Current vs. V$_{DS}$

$V_{TH} = 4.5V$

Output Voltage vs. Input Voltage

Supply Current vs. Input Voltage

$V_{TH} = 1.2V$

Supply Current vs. Input Voltage

$V_{TH} = 3.0V$

Supply Current vs. Input Voltage

V_{TH} = 4.5V

Supply Current (uA) vs. Input Voltage (V)

80°C
25°C
-30°C

Power-Down Reset Delay vs. Temperature

V_{TH} = 1.2V

Power-Down Reset Delay (us) vs. Temperature (°C)

V_{DROP} = 200mV
V_{DROP} = 150mV
V_{DROP} = 250mV

Power-Down Reset Delay vs. Temperature

V_{TH} = 3.0V

Power-Down Reset Delay (us) vs. Temperature (°C)

V_{DROP} = 200mV
V_{DROP} = 150mV
V_{DROP} = 250mV

Power-Down Reset Delay vs. Temperature

V_{TH} = 4.5V

Power-Down Reset Delay (us) vs. Temperature (°C)

V_{DROP} = 200mV
V_{DROP} = 150mV
V_{DROP} = 250mV

Reset Threshold Deviation vs. Temperature

Reset Threshold (V) vs. Temperature (°C)

5.0V
4.5V
4.2V
2.2V
1.2V

Nch Driver Sink Current vs. Input Voltage

V_{TH} = 3.0V, V_{DS} = 0.5V

Sink Current I_{SINK} (mA) vs. Input Voltage (V)

-30°C
25°C
80°C

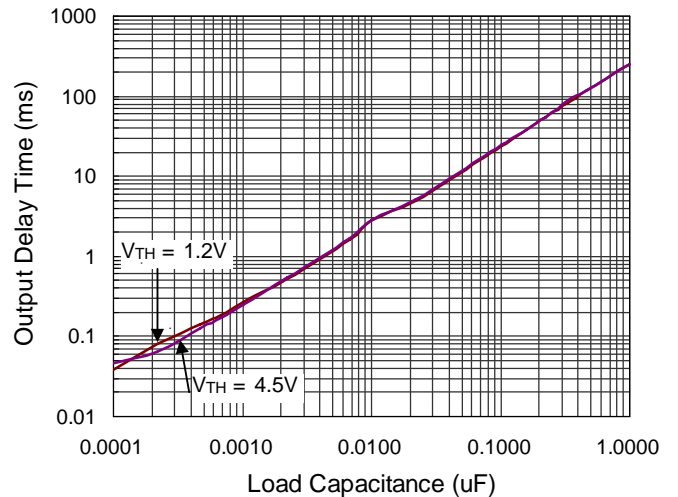**Nch Driver Sink Current vs. Input Voltage**

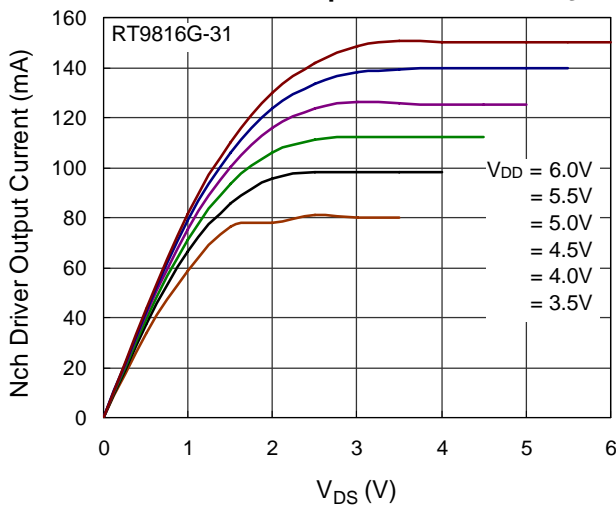**Power-Up Reset Time-Out vs. Temperature**

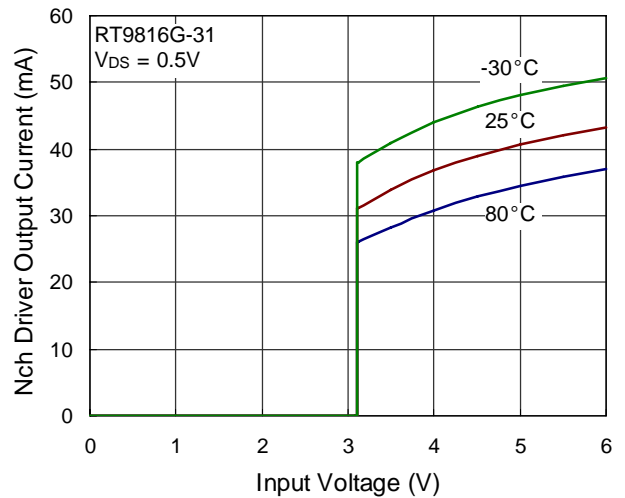

Power-Up Reset Time-Out vs. Temperature

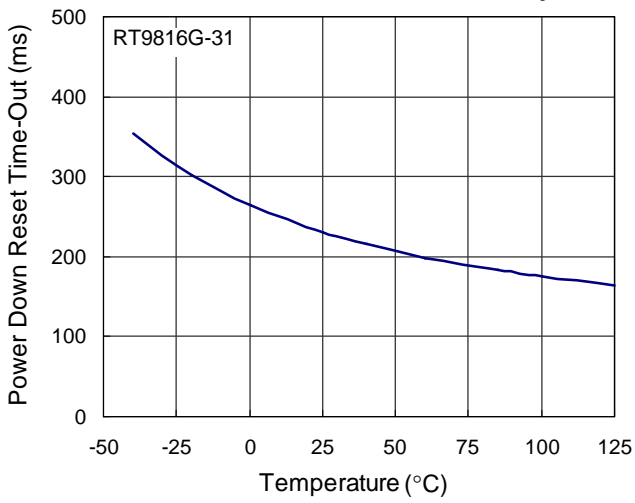**Output Delay Time vs. Load Capacitance**

Nch Driver Output Current vs. V_{DS}
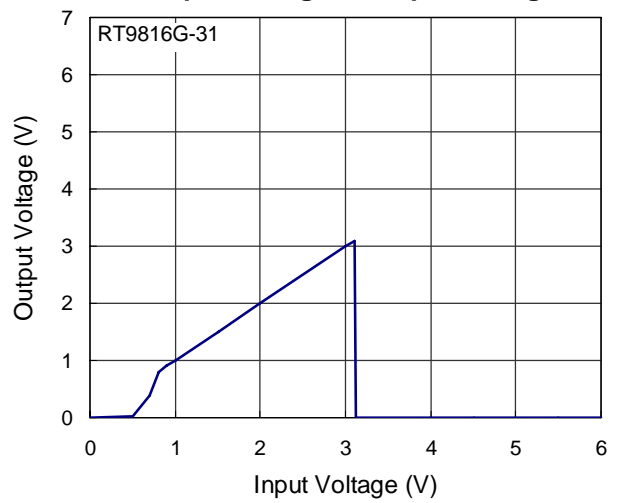

Nch Driver Output Current vs. Input Voltage
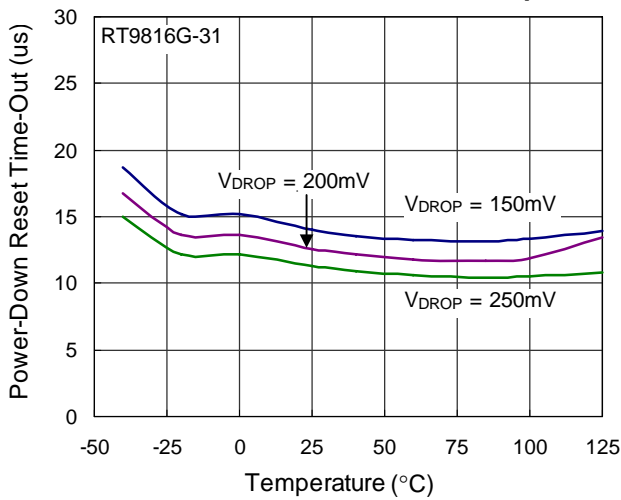
Power Down Reset Time-Out vs. Temperature

Output Voltage vs. Input Voltage

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

Application Information

Multiple Supplies

Mainly, the pull-up connected to the RT9816 will connect to the supply voltage that is being monitored at the IC′s VCC 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.

Outline Dimension
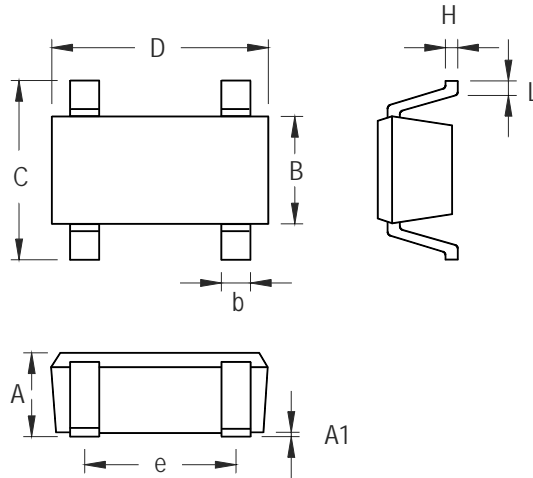
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.053
b	0.150	0.400	0.006	0.016
C	1.800	2.450	0.071	0.096
D	1.800	2.250	0.071	0.089
e	1.300		0.051	
H	0.080	0.260	0.003	0.010
L	0.210	0.460	0.008	0.018

SC-70-4 Surface Mount Package