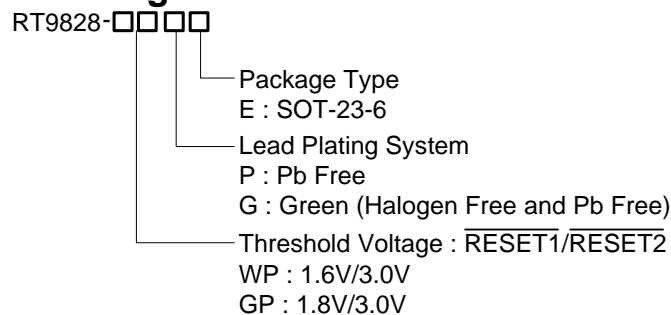


Dual Micro-Power Voltage Detectors

General Description

The RT9828 is a micro-power voltage detector supervising the power supply voltage level for microprocessors (uP) or digital systems. It provides internally fixed threshold levels ranging from 1.2V to 5V, which covers most digital applications. It features low supply current of 6uA. The RT9828 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 the V_{DD} exceeds the threshold level, the reset signal will be released after a certain delay time. The RT9828 is available in SOT-23-6 package.

Ordering Information



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.

Marking Information

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

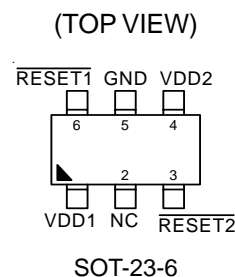
Features

- High Accuracy $\pm 1.5\%$
- Low Supply Current 6uA
- Quick Reset within 20us
- Built-in 55ms Recovery Delay
- Low Functional Supply Voltage 0.9V
- Dual N-Channel Open-Drain Output
- Small SOT-23-6 Packages
- RoHS Compliant and 100% Lead (Pb)-Free

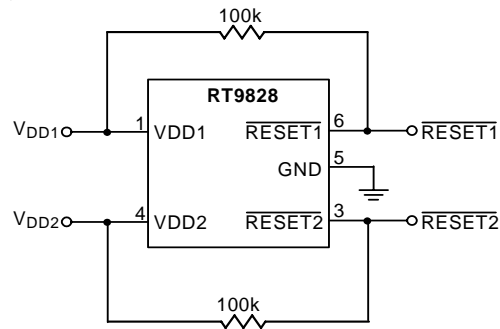
Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical uP and uC Power Monitoring
- Portable/Battery-Powered Equipment

Pin Configurations



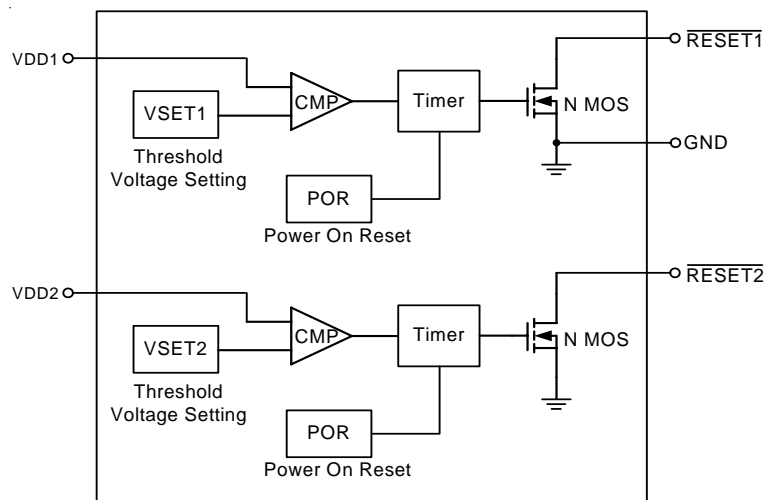
Typical Application Circuit



Functional Pin Description

Pin No.	Pin Name	Pin Function
1	VDD1	Input of Detector1.
2	NC	No Internal Connection. It should be floating.
3	$\overline{\text{RESET2}}$	Active Low Open-Drain Reset Pin of Detector2.
4	VDD2	Input of Detector2.
5	GND	Ground.
6	$\overline{\text{RESET1}}$	Active Low Open-Drain Reset Pin of Detector1.

Function Block Diagram



Available Voltage Version

Code	C	B	F	W	G	D	Y	H	E	J	K
Voltage	1.2	1.3	1.5	1.6	1.8	1.85	1.9	2	2.1	2.5	2.6
Code	T	L	M	N	V	P	Q	R	S	T	--
Voltage	2.65	2.7	2.8	2.85	2.9	3	3.1	3.2	3.3	5	--

Absolute Maximum Ratings (Note 1)

- Input Voltage (with Respect to GND)
 V_{DD1}/V_{DD2} ----- -0.3V to 6V
- All Other Inputs ----- -0.3V to $V_{DD} + 0.3V$
- Input Current, I_{DD1}/I_{DD2} ----- 20mA
- Power Dissipation, P_D @ $T_A = 25^\circ C$
 SOT-23-6 ----- 0.4W
- Package Thermal Resistance (Note 2)
 SOT-23-6, θ_{JA} ----- $250^\circ C/W$
- Lead Temperature (Soldering, 10sec.) ----- $260^\circ C$
- Junction Temperature ----- $150^\circ C$
- Storage Temperature Range ----- $-65^\circ C$ to $150^\circ C$
- ESD Susceptibility (Note 3)
 HBM (Human Body Mode) ----- 2kV
 MM (Machine Mode) ----- 200V

Recommended Operating Conditions (Note 4)

- Junction Temperature Range ----- $-40^\circ C$ to $125^\circ C$
- Ambient Temperature Range ----- $-40^\circ C$ to $85^\circ C$

Electrical Characteristics

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input Voltage	V_{DD1} / V_{DD2}		0.9	--	6	V
Supply Current	I_{VDD1} / I_{VDD2}	$V_{TH} = 3V$, $V_{DD} = 4.5V$	--	6	16	μA
Threshold Voltage Accuracy	ΔV_{TH}		-1.5	--	+1.5	%
V_{DD} Drop to Reset Delay	t_{RD}	Drop = $V_{TH} - 125mV$	--	20	--	us
Reset Active Time Out Period	t_{RP}	$V_{DD} \geq 1.02 \times V_{TH}$	--	55	--	ms
RESET Output Voltage Low	V_{OL}	$1.6 = V_{DD} < V_{TH}$, $I_{SINK} > 3.5mA$	--	--	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.

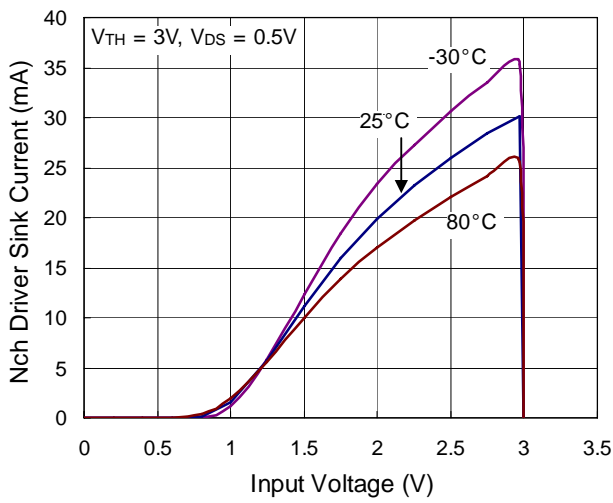
Note 2. θ_{JA} is measured in the natural convection at $T_A = 25^\circ C$ on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

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

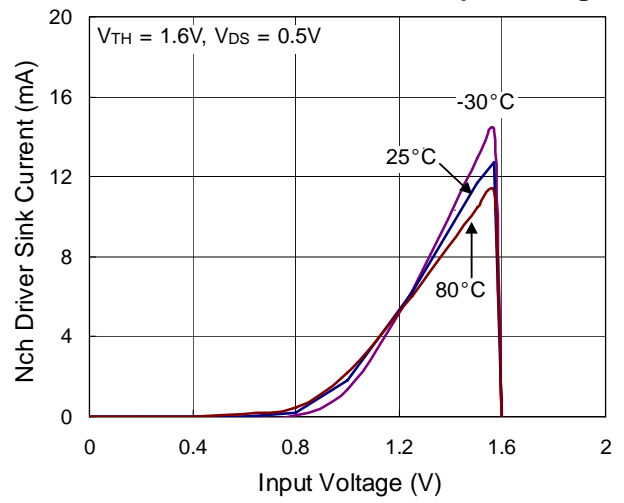
Note 4. The device is not guaranteed to function outside its operating conditions.

Typical Operating Characteristics

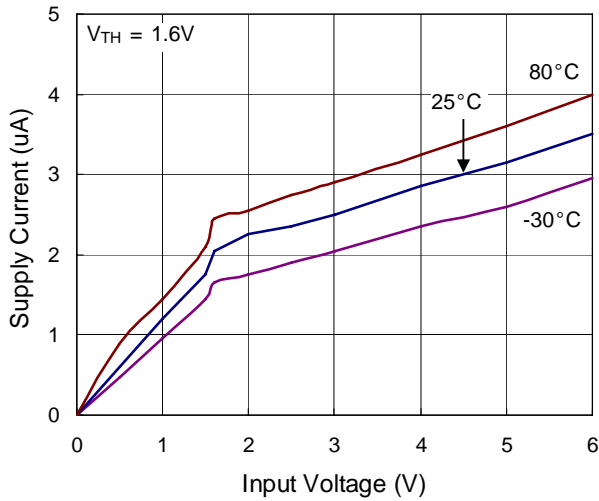
Nch Driver Sink Current vs. Input Voltage



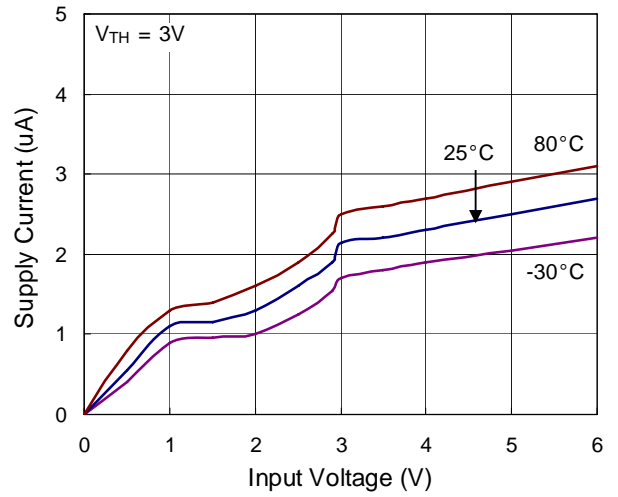
Nch Diver Sink Current vs. Input Voltage



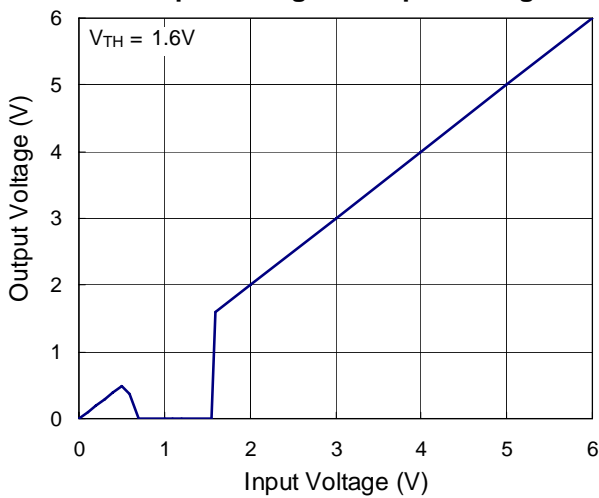
VDD1 Supply Current vs. Input Voltage



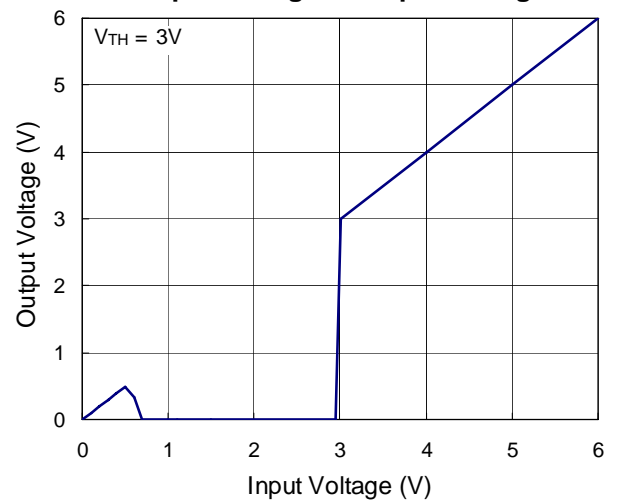
VDD2 Supply Current vs. Input Voltage



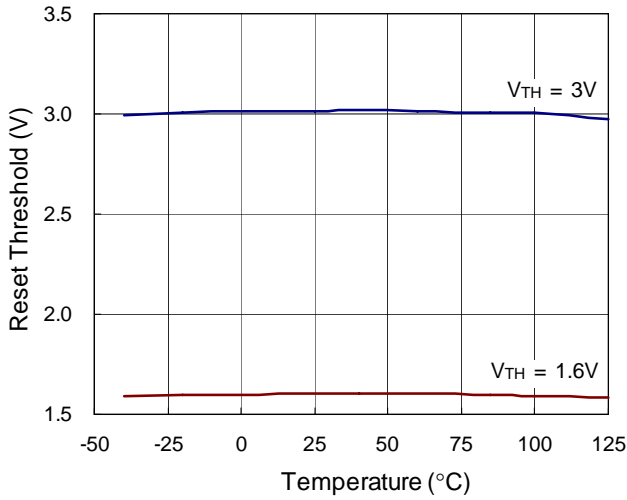
Output Voltage vs. Input Voltage



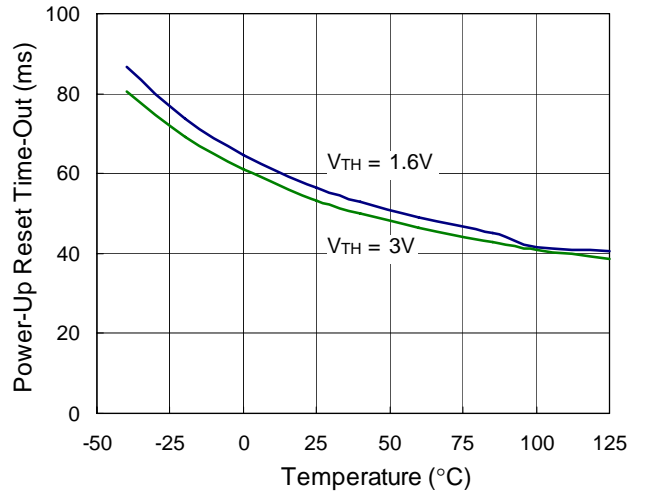
Output Voltage vs. Input Voltage



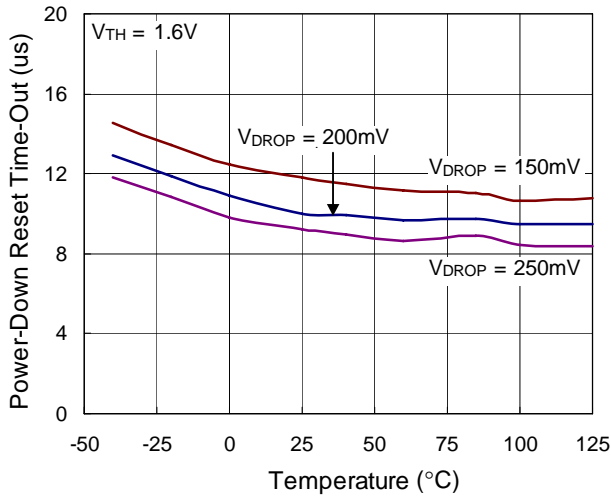
Reset Threshold Deviation vs. Temperature



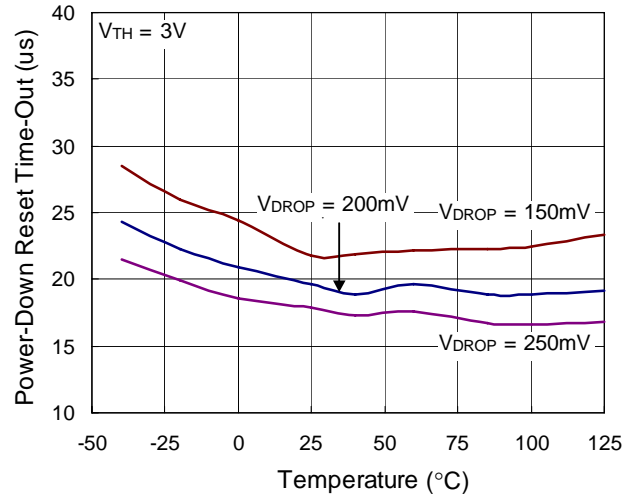
Power-Up Reset Time-Out vs. Temperature



Power-Down Reset Time-Out vs. Temperature



Power-Down Reset Time-Out vs. Temperature



Application Information

The RT9828 voltage detector monitors the input voltage to generate a reset signal while the input voltage is lower than the detecting threshold voltage level.

The $\overline{\text{RESET}}$ pin is an open drain output. It is recommended to connect a pull-up resistor between $\overline{\text{RESET}}$ pin and V_{IN} .

Figure 1 shows the timing diagram of VDD and $\overline{\text{RESET}}$ signals. When VDD is lower than V_{TH} , the $\overline{\text{RESET}}$ goes low after a short delay time t_{RD} . When VDD is higher than V_{TH} with a hysteresis (V_{HYS}), the $\overline{\text{RESET}}$ will be pulled up after the delay time t_{RP} . The typical value of the delay time t_{RD} and t_{RP} are showed in specification.

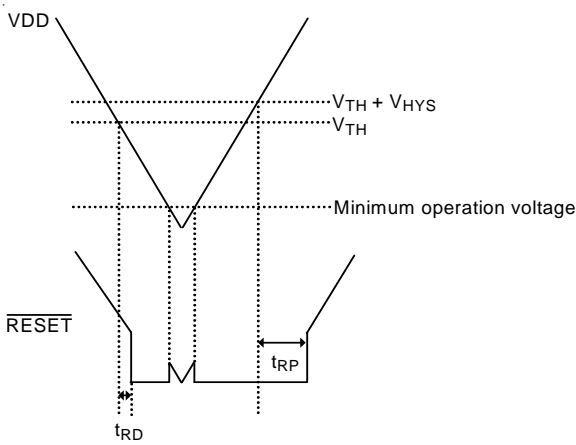


Figure 1. Timing Diagram

Thermal Considerations

For continuous operation, do not exceed absolute maximum operation junction temperature. The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient. The maximum power dissipation can be calculated by following formula :

$$P_{\text{D(MAX)}} = (T_{\text{J(MAX)}} - T_{\text{A}}) / \theta_{\text{JA}}$$

Where $T_{\text{J(MAX)}}$ is the maximum operation junction temperature 125°C , T_{A} is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

For recommended operating conditions specification of RT9828, where $T_{\text{J(MAX)}}$ is the maximum junction temperature of the die (125°C) and T_{A} is the maximum ambient temperature. The junction to ambient thermal resistance θ_{JA} is layout dependent. For SOT-23-6

packages, the thermal resistance θ_{JA} is $250^{\circ}\text{C}/\text{W}$ on the standard JEDEC 51-3 single layer thermal test board. The maximum power dissipation at $T_{\text{A}} = 25^{\circ}\text{C}$ can be calculated by following formula :

$$P_{\text{D(MAX)}} = (125^{\circ}\text{C} - 25^{\circ}\text{C}) / (250^{\circ}\text{C}/\text{W}) = 0.400\text{W}$$
 for SOT-23-6 packages

The maximum power dissipation depends on operating ambient temperature for fixed $T_{\text{J(MAX)}}$ and thermal resistance θ_{JA} . For RT9828 packages, the Figure 2 of derating curves allows the designer to see the effect of rising ambient temperature on the maximum power allowed.

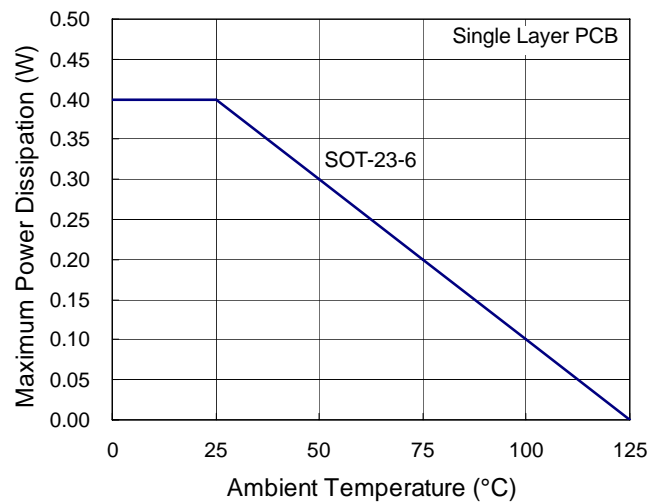
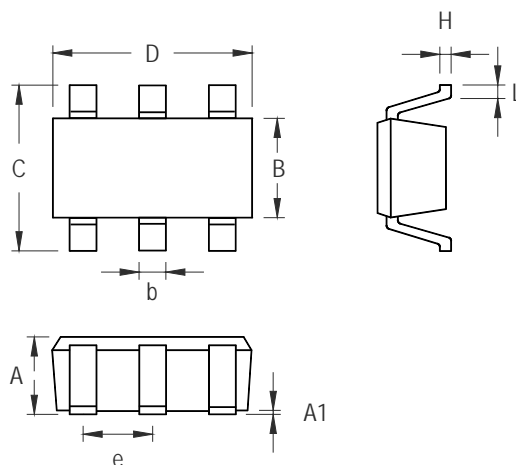


Figure 2. Derating Curves for RT9828 Packages

Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.031	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.250	0.560	0.010	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-23-6 Surface Mount Package

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