

# MAX803 Series, NCP803 Series

## Very Low Supply Current 3-Pin Microprocessor Reset Monitor

The MAX803/NCP803 is a cost-effective system supervisor circuit designed to monitor  $V_{CC}$  in digital systems and provide a reset signal to the host processor when necessary. No external components are required.

The reset output is driven active within 10  $\mu$ sec of  $V_{CC}$  falling through the reset voltage threshold. Reset is maintained active for a timeout period which is trimmed by the factory after  $V_{CC}$  rises above the reset threshold. The MAX803/NCP803 has an open drain active-low  $\overline{\text{RESET}}$  output. Both devices are available in SOT-23 and SC-70 packages.

The MAX803/NCP803 is optimized to reject fast transient glitches on the  $V_{CC}$  line. Low supply current of 0.5  $\mu$ A ( $V_{CC} = 3.2$  V) make these devices suitable for battery powered applications.

### Features

- Precision  $V_{CC}$  Monitor for 1.5 V, 2.5 V, 3.0 V, 3.3 V, and 5.0 V Supplies
- Precision Monitoring Voltages from 1.2 V to 4.9 V Available in 100 mV Steps
- Four Guaranteed Minimum Power-On Reset Pulse Width Available (1 ms, 20 ms, 100 ms, and 140 ms)
- $\overline{\text{RESET}}$  Output Guaranteed to  $V_{CC} = 1.0$  V
- Low Supply Current
- $V_{CC}$  Transient Immunity
- No External Components
- Wide Operating Temperature:  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$
- Pb-Free Packages are Available

### Typical Applications

- Computers
- Embedded Systems
- Battery Powered Equipment
- Critical Microprocessor Power Supply Monitoring

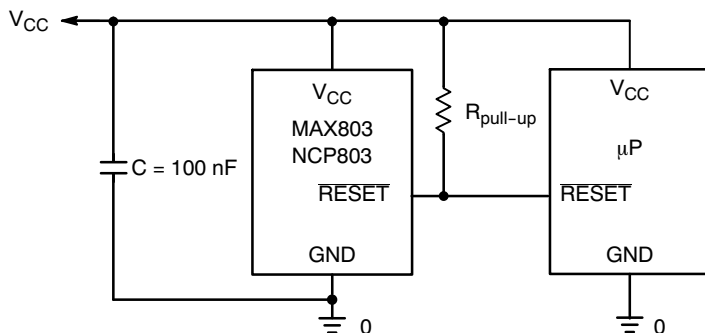


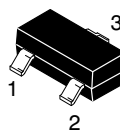
Figure 1. Typical Application Diagram



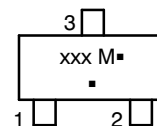
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<http://onsemi.com>

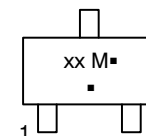
### MARKING DIAGRAM



SOT-23  
(TO-236)  
CASE 318



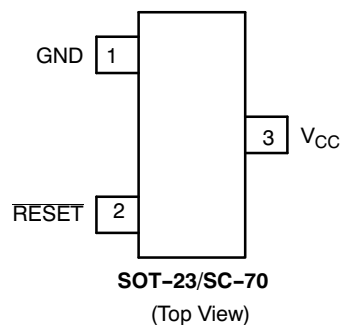
SC-70  
(SOT-323)  
CASE 419



xxx = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### PIN CONFIGURATION



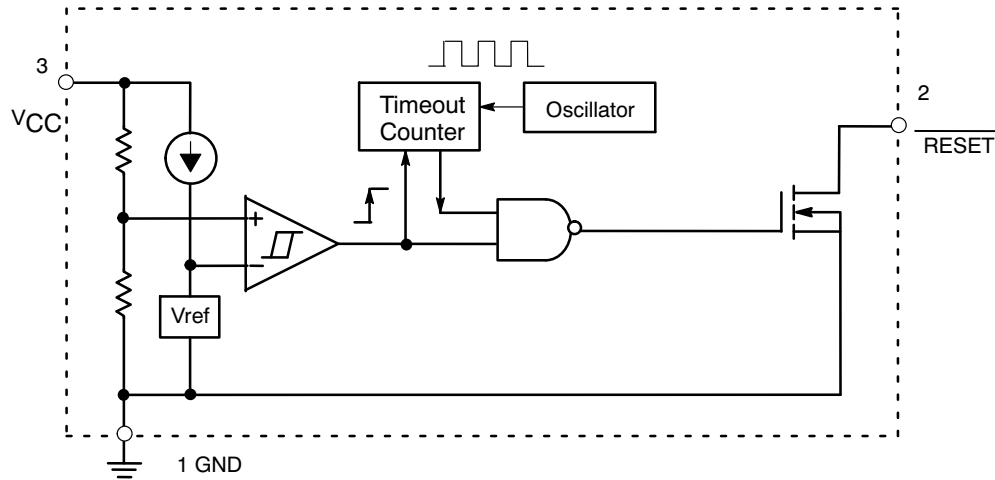
### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 7 of this data sheet.

## MAX803 Series, NCP803 Series



**Figure 2. NCP803, MAX803 Series Open-Drain Active-Low Output**

### PIN DESCRIPTION

Pin No.	Symbol	Description
1	GND	Ground
2	RESET	RESET output remains low while $V_{CC}$ is below the reset voltage threshold, and for a reset timeout period after $V_{CC}$ rises above reset threshold.
3	$V_{CC}$	Supply Voltage: $C = 100 \text{ nF}$ is recommended as a bypass capacitor between $V_{CC}$ and GND.

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage ( $V_{CC}$ to GND)	$V_{CC}$	-0.3 to 6.0	V
RESET Output Voltage (CMOS)		-0.3 to ( $V_{CC} + 0.3$ )	V
Input Current, $V_{CC}$		20	mA
Output Current, $\overline{\text{RESET}}$		20	mA
$dV/dt$ ( $V_{CC}$ )		100	V/ $\mu\text{sec}$
Thermal Resistance, Junction-to-Air (Note 1)	SOT-23 SC-70 $R_{\theta JA}$	301 314	$^{\circ}\text{C/W}$
Operating Junction Temperature Range	$T_J$	-40 to +105	$^{\circ}\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 Seconds)	$T_{sol}$	+260	$^{\circ}\text{C}$
ESD Protection Human Body Model (HBM): Following Specification JESD22-A114 Machine Model (MM): Following Specification JESD22-A115		2000 200	V
Latchup Current Maximum Rating: Following Specification JESD78 Class II Positive Negative	$I_{Latchup}$	200 200	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- This is based on a 35x35x1.6mm FR4 PCB with 10mm<sup>2</sup> of 1 oz copper traces under natural convection conditions and a single component characterization.
- The maximum package power dissipation limit must not be exceeded.

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}} \quad \text{with } T_{J(max)} = 150^{\circ}\text{C}$$

## MAX803 Series, NCP803 Series

**ELECTRICAL CHARACTERISTICS**  $T_A = -40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  unless otherwise noted. Typical values are at  $T_A = +25^{\circ}\text{C}$ . (Note 3)

Characteristic	Symbol	Min	Typ	Max	Unit
V <sub>CC</sub> Range $T_A = 0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		1.0 1.2	- -	5.5 5.5	V
Supply Current V <sub>CC</sub> = 3.3 V $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = 85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ V <sub>CC</sub> = 5.5 V $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = 85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$	I <sub>CC</sub>	- - - -	0.5 - 0.8 -	1.2 2.0 1.8 2.5	μA
Reset Threshold (V <sub>in</sub> Decreasing) (Note 4) MAX803SQ463/NCP803SN463 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ MAX803SQ438/NCP803SN438 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ MAX803SQ308/NCP803SN308 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ MAX803SQ293/NCP803SN293 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ NCP803SN263 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ NCP803SN232 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ NCP803SN160 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$ MAX803SN120, MAX803SQ120 $T_A = +25^{\circ}\text{C}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ $T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$	V <sub>TH</sub>	4.56 4.51 4.40 4.31 4.27 4.16 3.04 3.00 2.92 2.89 2.85 2.78 2.59 2.55 2.50 2.29 2.26 2.20 1.58 1.56 1.52 1.18 1.17 1.14	4.63 - - 4.38 - - 3.08 - - 2.93 - - 2.63 - - 2.32 - - 1.60 - - 1.20 - -	4.70 4.75 4.88 4.45 4.49 4.60 3.11 3.15 3.23 2.96 3.00 3.08 2.66 2.70 2.76 2.35 2.38 2.45 1.62 1.64 1.68 1.22 1.23 1.26	V
Detector Voltage Threshold Temperature Coefficient		-	30	-	ppm/°C
V <sub>CC</sub> to Reset Delay V <sub>CC</sub> = V <sub>TH</sub> to (V <sub>TH</sub> - 100 mV)		-	10	-	μsec
Reset Active TimeOut Period (Note 5) MAX803SN(Q)293D1 MAX803SN(Q)293D2/MAX803SN(Q)308D2 MAX803SN(Q)293D3 MAX803SN(Q)293	t <sub>RP</sub>	1.0 20 100 140	- - - -	3.3 66 330 460	msec
RESET Output Voltage Low V <sub>CC</sub> = V <sub>TH</sub> - 0.2 V 1.6 V ≤ V <sub>TH</sub> ≤ 2.0 V, I <sub>SINK</sub> = 0.5 mA 2.1 V ≤ V <sub>TH</sub> ≤ 4.0 V, I <sub>SINK</sub> = 1.2 mA 4.1 V ≤ V <sub>TH</sub> ≤ 4.9 V, I <sub>SINK</sub> = 3.2 mA	V <sub>OL</sub>	-	-	0.3	V
RESET Leakage Current V <sub>CC</sub> > V <sub>TH</sub> , RESET De-asserted	I <sub>LEAK</sub>	-	-	1	μA

3. Production testing done at  $T_A = 25^{\circ}\text{C}$ , over temperature limits guaranteed by design.

4. Contact your ON Semiconductor sales representative for other threshold voltage options.

5. Contact your ON Semiconductor sales representative for timeout options availability for other threshold voltage options.

# MAX803 Series, NCP803 Series

## TYPICAL OPERATING CHARACTERISTICS

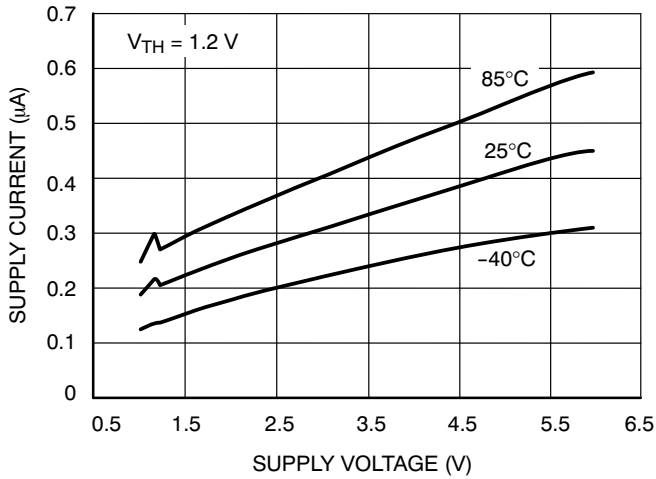


Figure 3. Supply Current vs. Supply Voltage

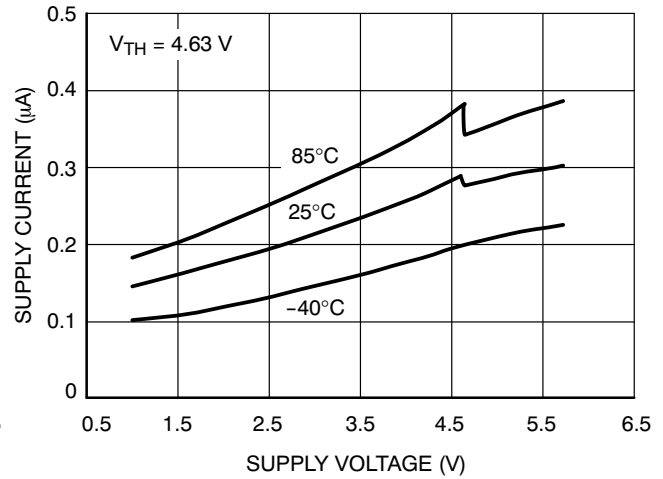


Figure 4. Supply Current vs. Supply Voltage

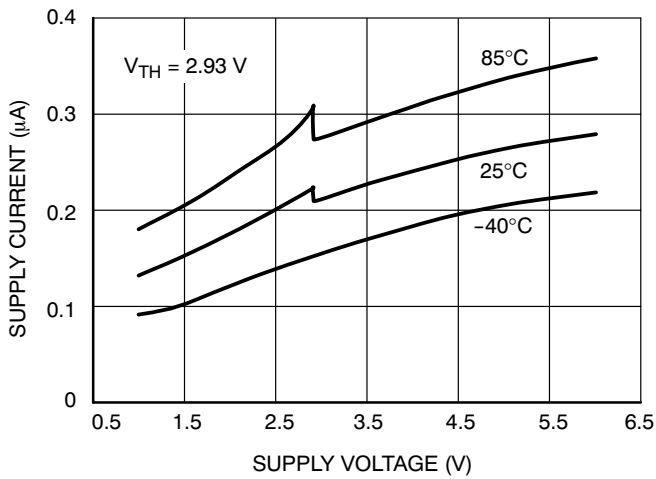


Figure 5. Supply Current vs. Supply Voltage

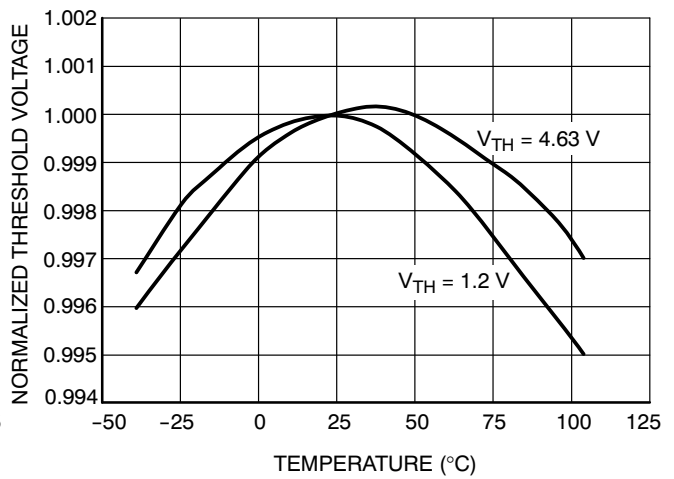


Figure 6. Normalized Reset Threshold Voltage vs. Temperature

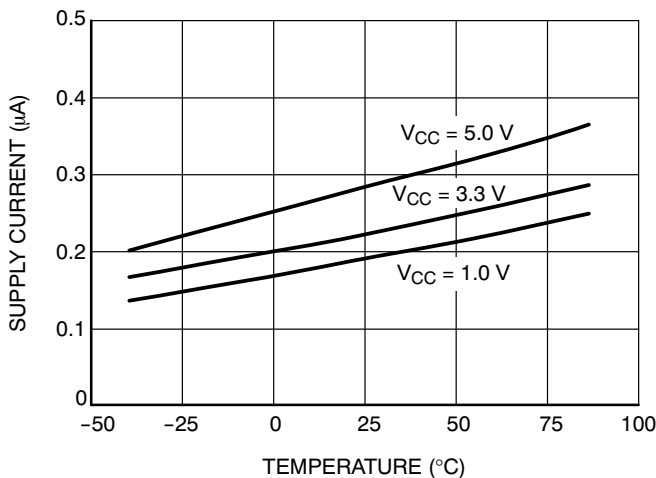


Figure 7. Supply Current vs. Temperature

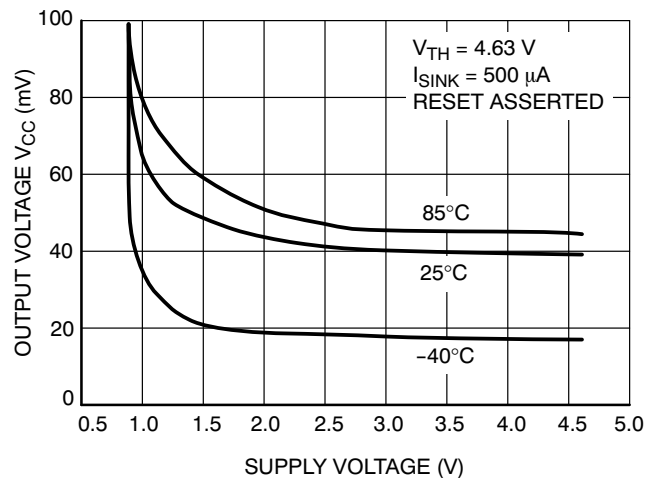
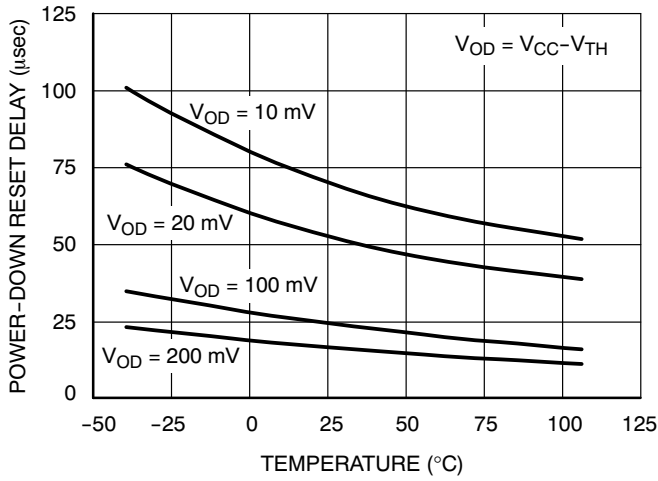


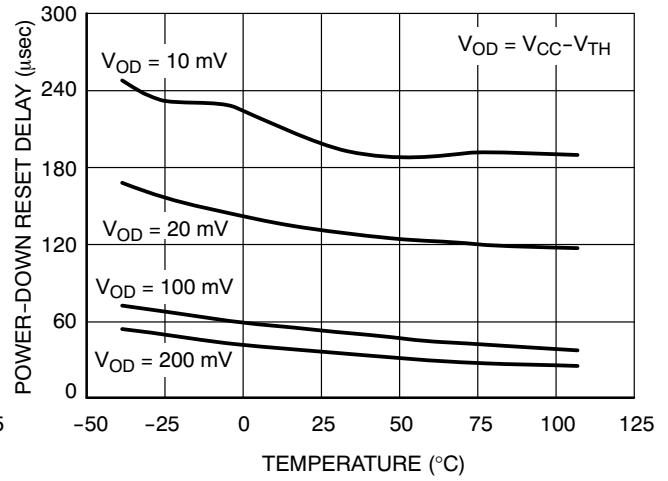
Figure 8. Output Voltage Low vs. Supply Voltage

# MAX803 Series, NCP803 Series

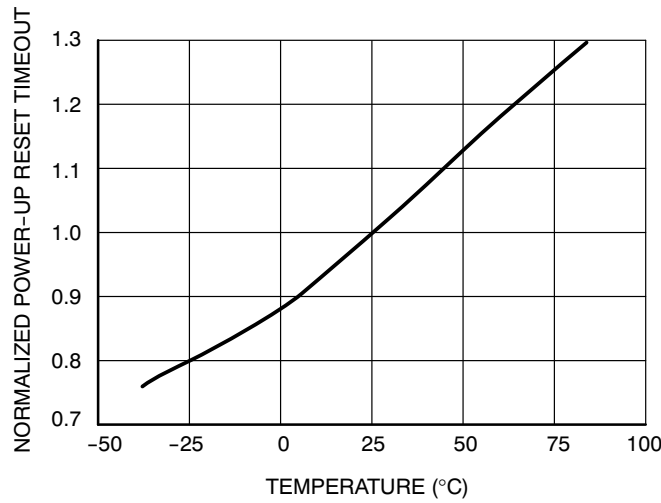
## TYPICAL OPERATING CHARACTERISTICS



**Figure 9. Power-Down Reset Delay vs. Temperature and Overdrive ( $V_{TH} = 1.2\text{ V}$ )**



**Figure 10. Power-Down Reset Delay vs. Temperature and Overdrive ( $V_{TH} = 4.63\text{ V}$ )**



**Figure 11. Normalized Power-Up Reset vs. Temperature**

## MAX803 Series, NCP803 Series

### Detail Operation Description

The MAX803, NCP803 series microprocessor reset supervisory circuits are designed to monitor the power supplies in digital systems and provide a reset signal to the processor without any external components. Figure 2 shows the timing diagram and a typical application below. Initially consider that input voltage  $V_{CC}$  is at a nominal level greater than the voltage detector upper threshold ( $V_{TH+}$ ). And the  $\overline{\text{RESET}}$  (RESET) output voltage (Pin 2) will be in the high state for MAX803 and NCP803 devices. If there is an input

power interruption and  $V_{CC}$  becomes significantly deficient, it will fall below the lower detector threshold ( $V_{TH-}$ ). This event causes the RESET output to be in the low state for the MAX803 and NCP803 devices. After completion of the power interruption,  $V_{CC}$  will rise to its nominal level and become greater than the  $V_{TH}$ . This sequence activates the internal oscillator circuitry and digital counter to count. After the count of the timeout period, the reset output will revert back to the original state.

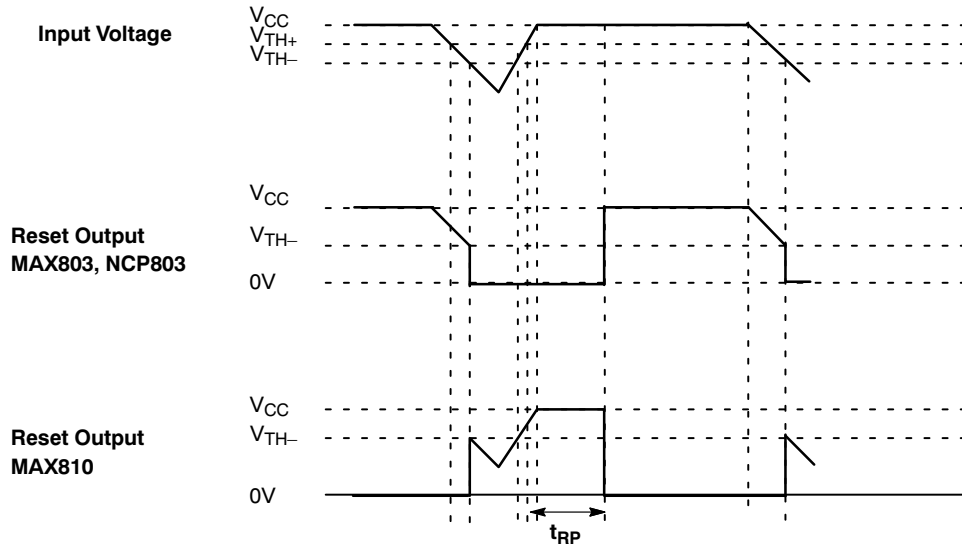


Figure 12. Timing Waveforms

# MAX803 Series, NCP803 Series

## APPLICATIONS INFORMATION

### V<sub>CC</sub> Transient Rejection

The MAX803/NCP803 series provides accurate V<sub>CC</sub> monitoring and reset timing during power-up, power-down, and brownout/sag conditions, and rejects negative-going transients (glitches) on the power supply line. Figure 13 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive which lies under the curve will not generate a reset signal. Combinations above the curve are detected as a brownout or power-down. Typically, transient that goes 100 mV below the reset threshold and lasts 5.0 μs or less will not cause a reset pulse. Transient immunity can be improved by adding a capacitor in close proximity to the V<sub>CC</sub> pin of the MAX803.

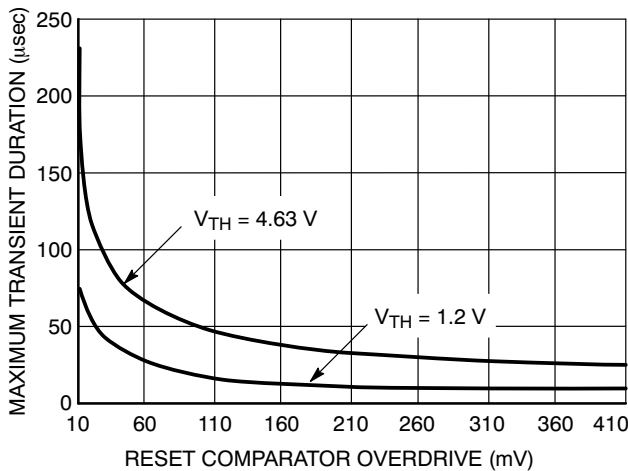
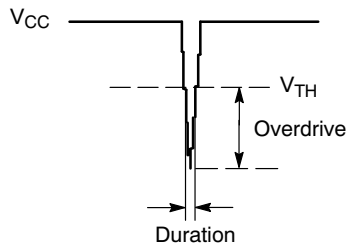
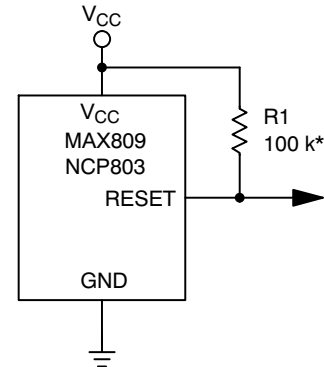


Figure 13. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C

### RESET Signal Integrity During Power-Down

The MAX803/NCP803 RESET output is valid to V<sub>CC</sub> = 1.0 V. Below this voltage the output becomes an “open circuit” and does not sink current. This means CMOS logic inputs to the Microprocessor will be floating at an undetermined voltage. Most digital systems are completely shutdown well above this voltage. However, in situations where RESET must be maintained valid to V<sub>CC</sub> = 0 V, since

the NCP803/MAX803 has Open-Drain and active-low output, it typically uses a pullup resistor. With this device, RESET will most likely not maintain an active condition, but will drift to a non-active level due to the pullup resistor and the reduced sinking capability of the open-drain device. Therefore, this device is not recommended for applications where the RESET pin is required to be valid down to V<sub>CC</sub> = 0 V.



\*Assume High-Z Reset Input to Microprocessor

Figure 14. RESET Signal Integrity

### MAX803 RESET Output Allows Use With Two Power Supplies

In numerous applications the pullup resistor place on the RESET output is connected to the supply voltage monitored by the IC. Nevertheless, a different supply voltage can also power this output and so level-shift from the monitored supply to reset the microprocessor. However, if the NCP803/MAX803's supply goes below 1 V, the RESET output ability to sink current will decrease and the result is a high state on the pin even though the supply's IC is under the threshold level. This occurs at a V<sub>CC</sub> level that depends on the R<sub>pullup</sub> value and the voltage which is connected.

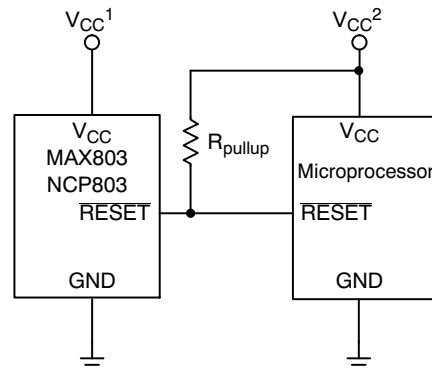


Figure 15. MAX803 RESET Output with Two Supplies

## ORDERING, MARKING AND THRESHOLD INFORMATION

## MAX803 Series, NCP803 Series

### ORDERING, MARKING AND THRESHOLD INFORMATION

Part Number	Vth* (V)	Time out** (ms)	Description	Marking	Package	Shipping
NCP803SN160T1	1.60	140-460	Open Drain RESET	SCQ	SOT23-3	3000 / Tape & Reel
NCP803SN160T1G	1.60	140-460		SCQ	SOT23-3 (Pb-Free)	
NCP803SN232T1	2.32	140-460		SQR	SOT23-3	
NCP803SN232T1G	2.32	140-460		SQR	SOT23-3 (Pb-Free)	
NCP803SN263T1	2.63	140-460		SQC	SOT23-3	
NCP803SN263T1G	2.63	140-460		SQC	SOT23-3 (Pb-Free)	
NCP803SN293T1	2.93	140-460		SQD	SOT23-3	
NCP803SN293T1G	2.93	140-460		SQD	SOT23-3 (Pb-Free)	
NCP803SN308T1	3.08	140-460		SQE	SOT23-3	
NCP803SN308T1G	3.08	140-460		SQE	SOT23-3 (Pb-Free)	
NCP803SN438T1	4.38	140-460		SQF	SOT23-3	
NCP803SN438T1G	4.38	140-460		SQF	SOT23-3 (Pb-Free)	
NCP803SN463T1	4.63	140-460		SQG	SOT23-3	
NCP803SN463T1G	4.63	140-460		SQG	SOT23-3 (Pb-Free)	
NCP803SN120T1G	1.20	140-460		SSW	SOT23-3 (Pb-Free)	
NCP803SN293D1T1G	2.93	1-3.3		SSX	SOT23-3 (Pb-Free)	
NCP803SN293D2T1G	2.93	20-66		SSY	SOT23-3 (Pb-Free)	
NCP803SN293D3T1G	2.93	100-330		SSZ	SOT23-3 (Pb-Free)	
MAX803SQ120T1G	1.20	140-460		ZV	SC70-3 (Pb-Free)	
MAX803SQ263T1G	2.63	140-460		SX	SC70-3 (Pb-Free)	
MAX803SQ293T1G	2.93	140-460		ZW	SC70-3 (Pb-Free)	
MAX803SQ308T1G	3.08	140-460		ZX	SC70-3 (Pb-Free)	
MAX803SQ438T1G	4.38	140-460		ZY	SC70-3 (Pb-Free)	
MAX803SQ463T1G	4.63	140-460		ZZ	SC70-3 (Pb-Free)	
MAX803SQ293D1T1G	2.93	1-3.3		YA	SC70-3 (Pb-Free)	
MAX803SQ293D2T1G	2.93	20-66		YB	SC70-3 (Pb-Free)	
MAX803SQ308D2T1G	3.08	20-66		SY	SC70-3 (Pb-Free)	
MAX803SQ293D3T1G	2.93	100-330		YC	SC70-3 (Pb-Free)	

\*Contact your ON Semiconductor sales representative for other threshold voltage options.

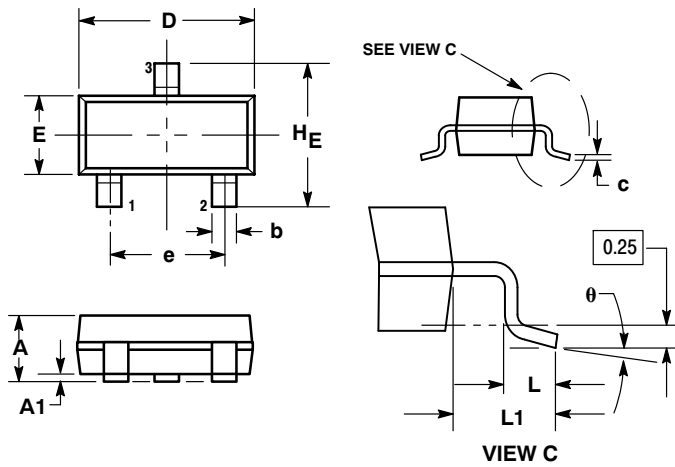
\*\*Contact your ON Semiconductor sales representative for timeout options availability for other threshold voltage options.



# MAX803 Series, NCP803 Series

## PACKAGE DIMENSIONS

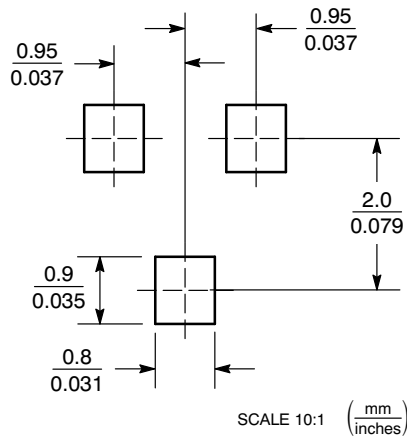
SOT-23 (TO236)  
CASE 318-08  
ISSUE AN



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104

## SOLDERING FOOTPRINT\*

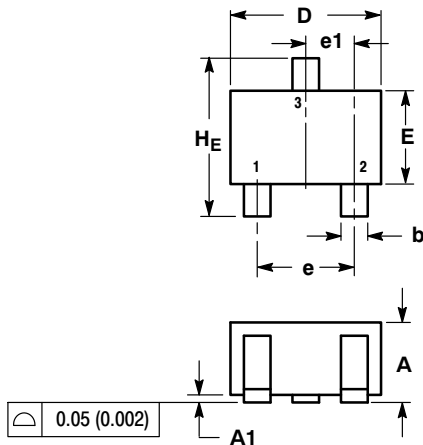


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MAX803 Series, NCP803 Series

## PACKAGE DIMENSIONS

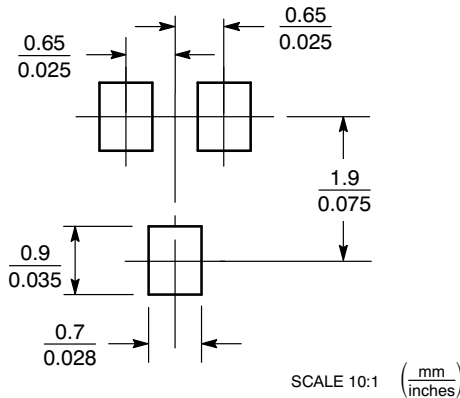
SC-70 (SOT-323)  
CASE 419-04  
ISSUE M



- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.7 REF			0.028 REF		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.425 REF			0.017 REF		
H <sub>E</sub>	2.00	2.10	2.40	0.079	0.083	0.095

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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