# 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 μsec 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 μA ($V_{CC}$ = 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°C to 105°C
- These Devices are Pb−Free and are RoHS Compliant

### Typical Applications

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

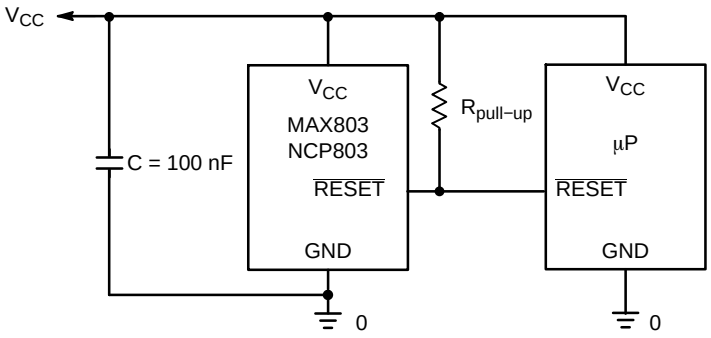


**Figure 1. Typical Application Diagram**

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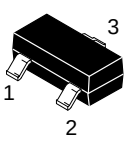
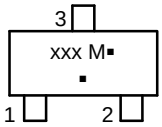
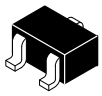
### MARKING DIAGRAM

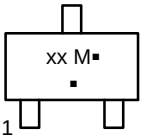



**SOT−23 (TO−236) CASE 318**



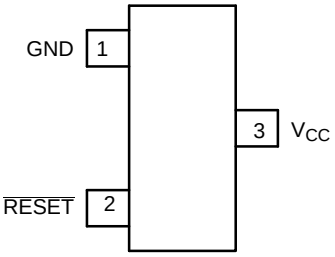
**SC−70 (SOT−323) CASE 419**




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

(Note: Microdot may be in either location)

### PIN CONFIGURATION




**SOT−23/SC−70**

(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 8 of this data sheet.

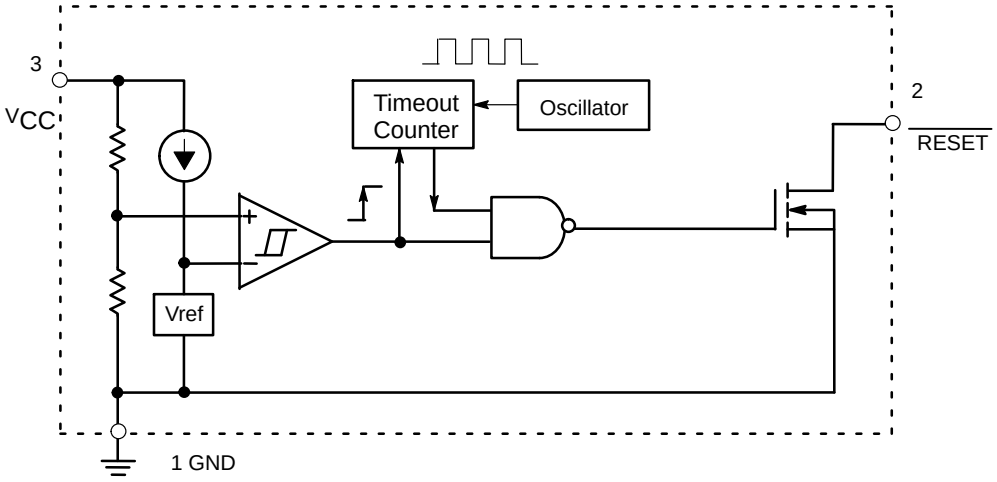



**Figure 2. NCP803, MAX803 Series Open−Drain Active−Low Output**

## PIN DESCRIPTION

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | $\overline{\text{RESET}}$ | $\overline{\text{RESET}}$ 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 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/μsec |
| Thermal Resistance, Junction−to−Air (Note 1) SOT−23<br>SC−70 | $R_{\theta JA}$ | 301<br>314 | °C/W |
| Operating Junction Temperature Range | $T_J$ | −40 to +125 | °C |
| Storage Temperature Range | $T_{stg}$ | −65 to +150 | °C |
| Lead Temperature (Soldering, 10 Seconds) | $T_{sol}$ | +260 | °C |
| ESD Protection<br>Human Body Model (HBM): Following Specification JESD22−A114<br>Machine Model (MM): Following Specification JESD22−A115 | | <br>2000<br>200 | V |
| Latchup Current Maximum Rating: Following Specification JESD78 Class II<br>Positive<br>Negative | $I_{Latchup}$ | <br>200<br>200 | mA |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. This based on a 35x35x1.6mm FR4 PCB with 10mm$^2$ of 1 oz copper traces under natural convention conditions and a single component characterization.
2. The maximum package power dissipation limit must not be exceeded.

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

**ELECTRICAL CHARACTERISTICS** $T_A$ = −40°C to +105°C unless otherwise noted. Typical values are at $T_A$ = +25°C. (Note 3)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ Range | | | | | V |
| $T_A$ = 0°C to +70°C | | 1.0 | – | 5.5 | |
| $T_A$ = −40°C to +105°C (Note 4) | | 1.2 | – | 5.5 | |
| Supply Current | $I_{CC}$ | | | | μA |
| $V_{CC}$ = 3.3 V | | | | | |
| $T_A$ = −40°C to +85°C | | – | 0.5 | 1.2 | |
| $T_A$ = 85°C to +105°C (Note 5) | | – | – | 2.0 | |
| $V_{CC}$ = 5.5 V | | | | | |
| $T_A$ = −40°C to +85°C | | – | 0.8 | 1.8 | |
| $T_A$ = 85°C to +105°C (Note 5) | | – | – | 2.5 | |
| Reset Threshold ($V_{in}$ Decreasing) (Note 6) | $V_{TH}$ | | | | V |
| MAX803SQ463/NCP803SN463 | | | | | |
| $T_A$ = +25°C | | 4.56 | 4.63 | 4.70 | |
| $T_A$ = −40°C to +85°C | | 4.51 | – | 4.75 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 4.40 | – | 4.88 | |
| MAX803SQ438/NCP803SN438 | | | | | |
| $T_A$ = +25°C | | 4.31 | 4.38 | 4.45 | |
| $T_A$ = −40°C to +85°C | | 4.27 | | 4.49 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 4.16 | | 4.60 | |
| NCP803SN400 | | | | | |
| $T_A$ = +25°C | | 3.94 | 4.00 | 4.06 | |
| $T_A$ = −40°C to +85°C | | 3.90 | | 4.10 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 3.80 | | 4.20 | |
| MAX803SQ308/NCP803SN308 | | | | | |
| $T_A$ = +25°C | | 3.04 | 3.08 | 3.11 | |
| $T_A$ = −40°C to +85°C | | 3.00 | – | 3.15 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 2.92 | – | 3.23 | |
| MAX803SQ293/NCP803SN293 | | | | | |
| $T_A$ = +25°C | | 2.89 | 2.93 | 2.96 | |
| $T_A$ = −40°C to +85°C | | 2.85 | – | 3.00 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 2.78 | – | 3.08 | |
| NCP803SN263 | | | | | |
| $T_A$ = +25°C | | 2.59 | 2.63 | 2.66 | |
| $T_A$ = −40°C to +85°C | | 2.55 | – | 2.70 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 2.50 | – | 2.76 | |
| NCP803SN232 | | | | | |
| $T_A$ = +25°C | | 2.29 | 2.32 | 2.35 | |
| $T_A$ = −40°C to +85°C | | 2.26 | – | 2.38 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 2.20 | – | 2.45 | |
| NCP803SN160 | | | | | |
| $T_A$ = +25°C | | 1.58 | 1.60 | 1.62 | |
| $T_A$ = −40°C to +85°C | | 1.56 | – | 1.64 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 1.52 | – | 1.68 | |
| MAX803SN120, MAX803SQ120 | | | | | |
| $T_A$ = +25°C | | 1.18 | 1.20 | 1.22 | |
| $T_A$ = −40°C to +85°C | | 1.17 | – | 1.23 | |
| $T_A$ = +85°C to +105°C (Note 5) | | 1.14 | – | 1.26 | |
| Detector Voltage Threshold Temperature Coefficient | | – | 30 | – | ppm/°C |
| $V_{CC}$ to Reset Delay $V_{CC}$ = $V_{TH}$ to ($V_{TH}$ − 100 mV) | | – | 10 | – | μsec |
| Reset Active TimeOut Period (Note 6) | $t_{RP}$ | | | | msec |
| MAX803SN(Q)293D1 | | 1.0 | – | 3.3 | |
| MAX803SN(Q)293D2/MAX803SN(Q)308D2 | | 20 | – | 66 | |
| MAX803SN(Q)293D3 | | 100 | – | 330 | |
| MAX803SN(Q)293 | | 140 | – | 460 | |
| $\overline{\text{RESET}}$ Output Voltage Low | $V_{OL}$ | – | – | 0.3 | V |
| $V_{CC}$ = $V_{TH}$ − 0.2 V | | | | | |
| 1.6 V ≤ $V_{TH}$ ≤ 2.0 V, $I_{SINK}$ = 0.5 mA | | | | | |
| 2.1 V ≤ $V_{TH}$ ≤ 4.0 V, $I_{SINK}$ = 1.2 mA | | | | | |
| 4.1 V ≤ $V_{TH}$ ≤ 4.9 V, $I_{SINK}$ = 3.2 mA | | | | | |
| $\overline{\text{RESET}}$ Leakage Current $V_{CC}$ > $V_{TH}$, $\overline{\text{RESET}}$ De−asserted | $I_{LEAK}$ | – | – | 1 | μA |

3. Production testing done at $T_A$ = 25°C, over temperature limits guaranteed by design.
4. For NCV automotive devices, this temperature range is $T_A$ = −40°C to +125°C.
5. For NCV automotive devices, this temperature range is $T_A$ = +85°C to +125°C.
6. Contact your ON Semiconductor sales representative for other threshold voltage and timeout options.

## TYPICAL OPERATING CHARACTERISTICS

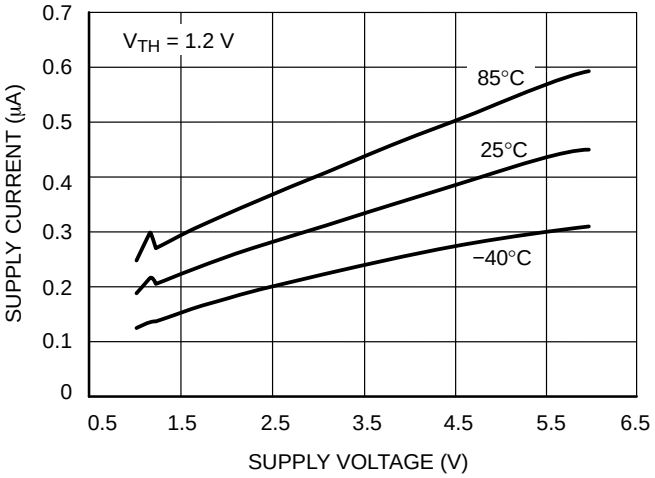



**Figure 3. Supply Current vs. Supply Voltage**

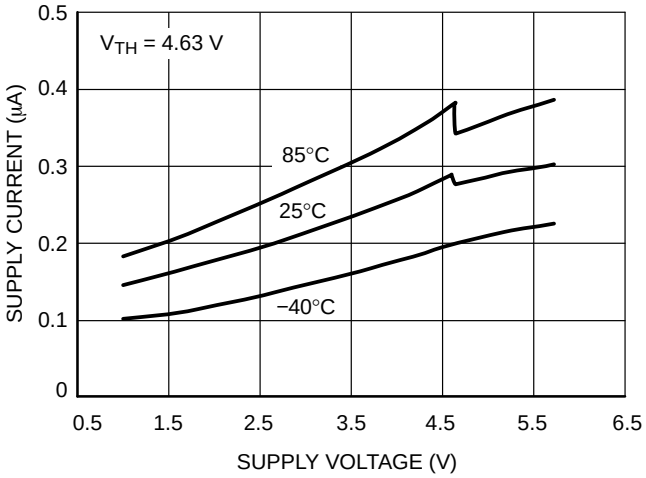



**Figure 4. Supply Current vs. Supply Voltage**

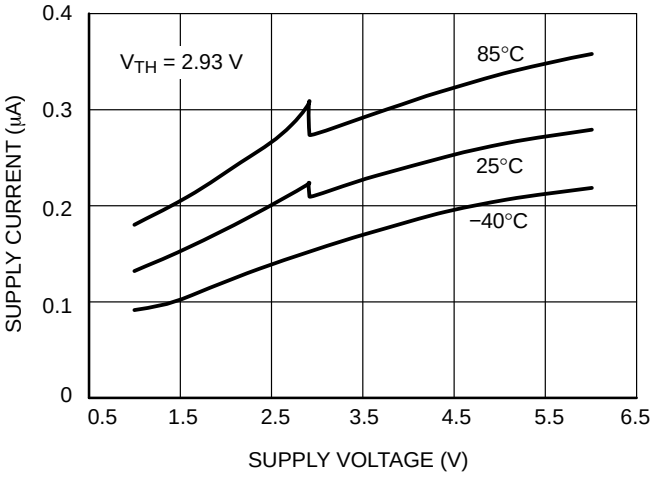



**Figure 5. Supply Current vs. Supply Voltage**

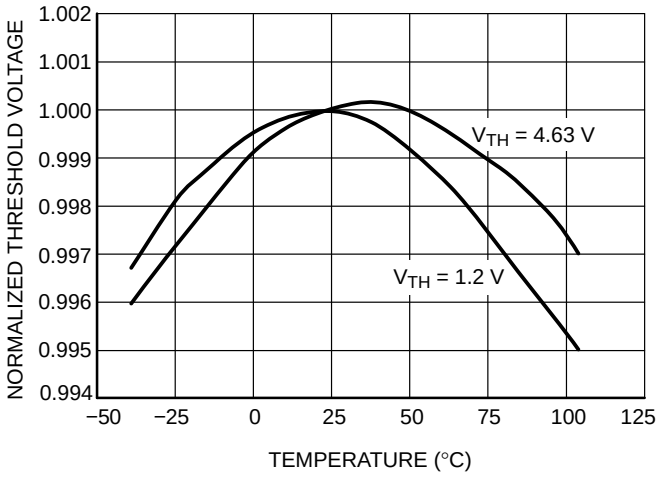



**Figure 6. Normalized Reset Threshold Voltage vs. Temperature**

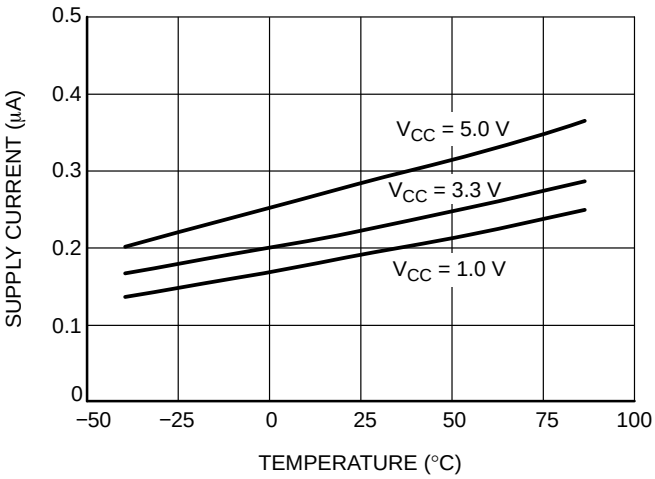



**Figure 7. Supply Current vs. Temperature**

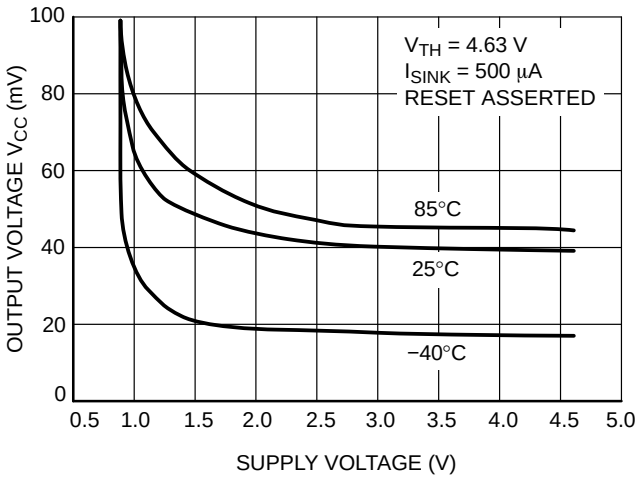



**Figure 8. Output Voltage Low vs. Supply Voltage**

## TYPICAL OPERATING CHARACTERISTICS

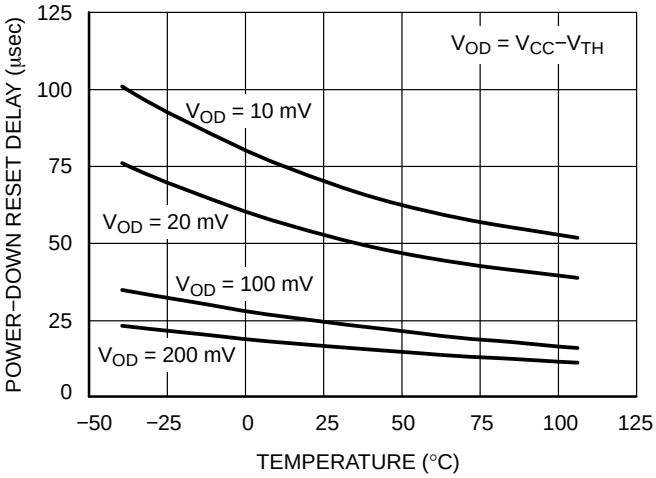



**Figure 9. Power−Down Reset Delay vs. Temperature and Overdrive ($V_{TH}$ = 1.2 V)**

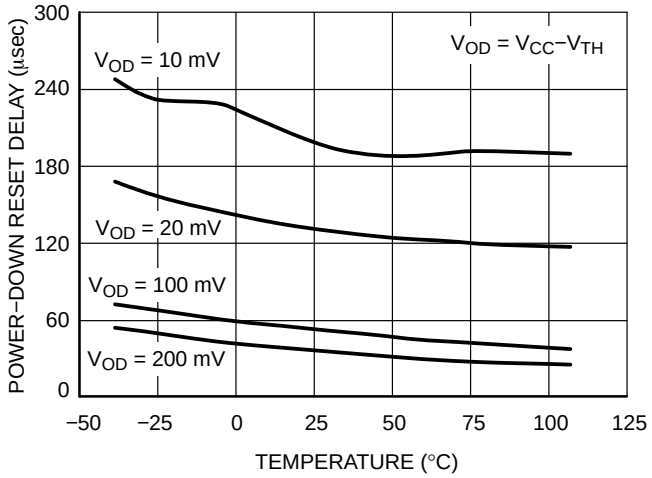



**Figure 10. Power−Down Reset Delay vs. Temperature and Overdrive ($V_{TH}$ = 4.63 V)**

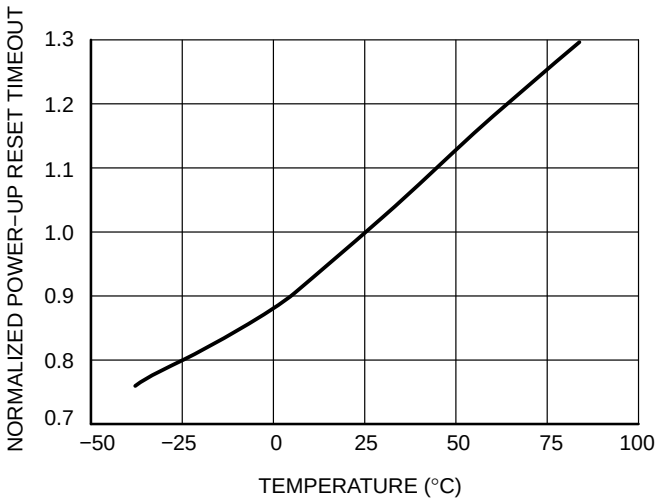



**Figure 11. Normalized Power−Up Reset vs. Temperature**

### 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.

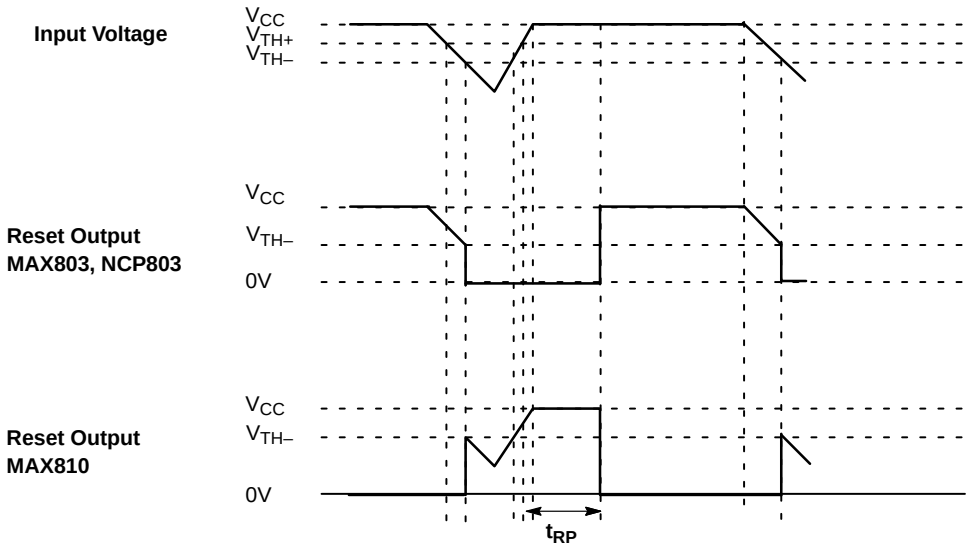
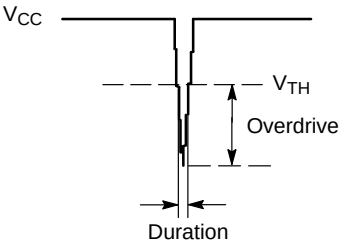



**Figure 12. Timing Waveforms**

## APPLICATIONS INFORMATION

### $V_{CC}$ Transient Rejection

The MAX803/NCP803 series provides accurate $V_{CC}$ 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 $V_{CC}$ pin of the MAX803.



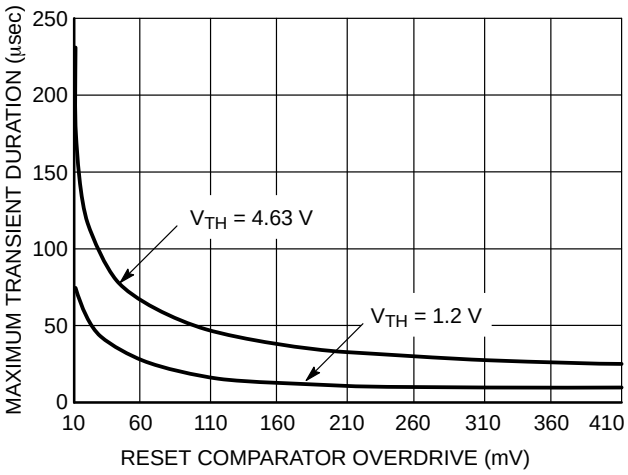




**Figure 13. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C**

### $\overline{\text{RESET}}$ Signal Integrity During Power−Down

The MAX803/NCP803 $\overline{\text{RESET}}$ output is valid to $V_{CC}$ = 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 $\overline{\text{RESET}}$ must be maintained valid to $V_{CC}$ = 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 $\overline{\text{RESET}}$ pin is required to be valid down to $V_{CC}$ = 0 V.

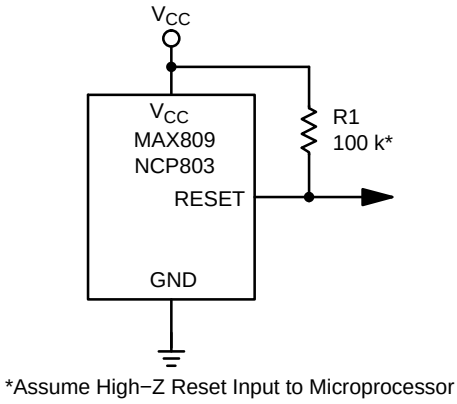



**Figure 14. RESET Signal Integrity**

### MAX803 $\overline{\text{RESET}}$ Output Allows Use With Two Power Supplies

In numerous applications the pullup resistor place on the $\overline{\text{RESET}}$ 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 blew 1 V, the $\overline{\text{RESET}}$ 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 $V_{CC}$ level that depends on the $R_{pullup}$ value and the voltage which is connected.

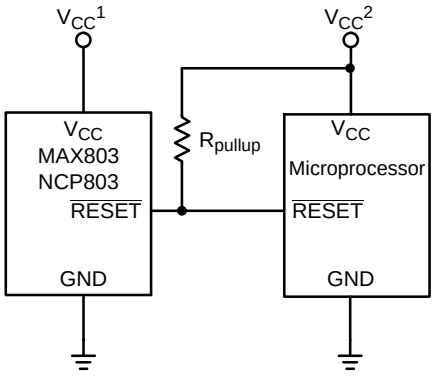



**Figure 15. MAX803 $\overline{\text{RESET}}$ Output with Two Supplies**

## ORDERING, MARKING AND THRESHOLD INFORMATION

| Part Number | Vth** (V) | Time out*** (ms) | Description | Marking | Package | Shipping† |
|---|---|---|---|---|---|---|
| NCP803SN160T1G | 1.60 | 140−460 | Open Drain $\overline{\text{RESET}}$ | SCQ | SOT23−3 (Pb−Free) | 3000 / Tape & Reel |
| NCP803SN232T1G | 2.32 | 140−460 | | SQR | SOT23−3 (Pb−Free) | |
| NCP803SN263T1G | 2.63 | 140−460 | | SQC | SOT23−3 (Pb−Free) | |
| NCP803SN293T1G | 2.93 | 140−460 | | SQD | SOT23−3 (Pb−Free) | |
| NCP803SN308T1G | 3.08 | 140−460 | | SQE | SOT23−3 (Pb−Free) | |
| NCP803SN400T1G | 4.00 | 140−460 | | RAD | SOT23−3 (Pb−Free) | |
| NCP803SN438T1G | 4.38 | 140−460 | | SQF | SOT23−3 (Pb−Free) | |
| 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) | |
| NCV803SQ308T1G* | | 140−460 | | ZA | | |
| 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) | |
| NCV803SQ308D2T1G* | | 20−66 | | CY | | |
| MAX803SQ293D3T1G | 2.93 | 100−330 | | YC | SC70−3 (Pb−Free) | |
| NCP803SN293T3G | 2.93 | 140−460 | | SQD | SOT23−3 (Pb−Free) | 10000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

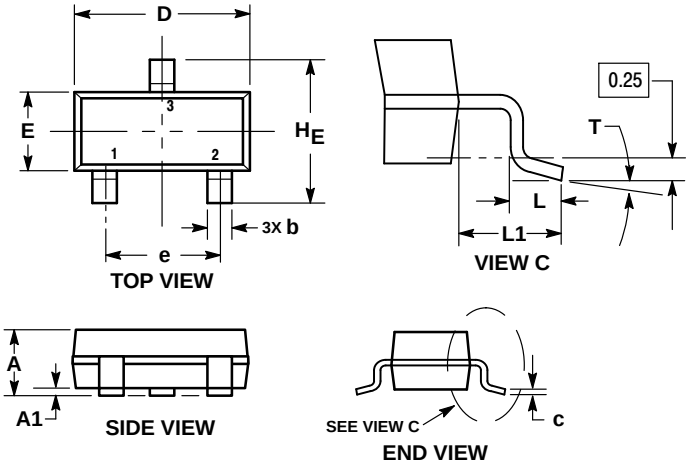
*NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

**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.

## PACKAGE DIMENSIONS

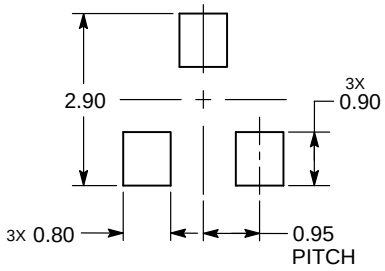
**SOT−23 (TO−236)**
CASE 318−08
ISSUE AR




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| 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 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| $H_E$ | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | −−− | 10° | 0° | −−− | 10° |

## RECOMMENDED SOLDERING FOOTPRINT*

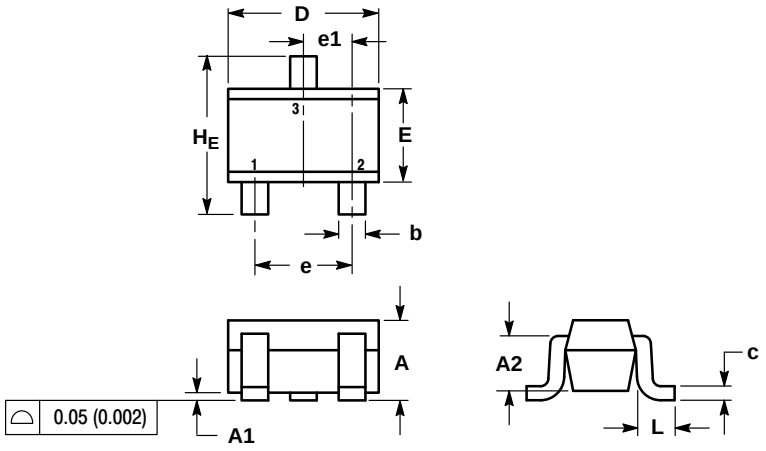



DIMENSIONS: MILLIMETERS

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

## PACKAGE DIMENSIONS

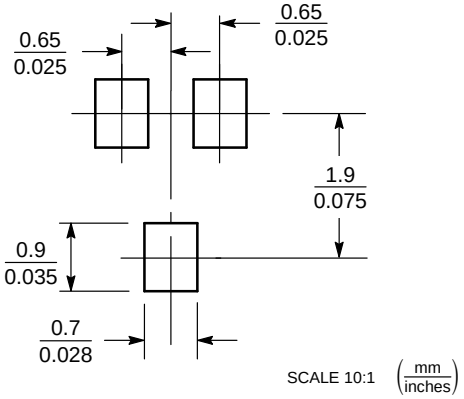
**SC−70 (SOT−323)**
CASE 419−04
ISSUE N




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

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | 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 | | 0.70 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 | 0.20 | 0.38 | 0.56 | 0.008 | 0.015 | 0.022 |
| $H_E$ | 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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