

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 μ 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 μ 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°C to 105°C
- Pb-Free Packages are Available

Typical Applications

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

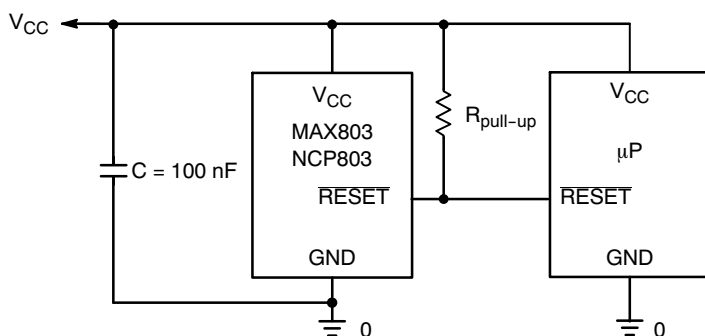


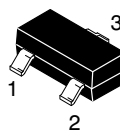
Figure 1. Typical Application Diagram



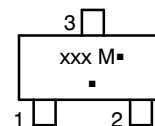
ON Semiconductor®

<http://onsemi.com>

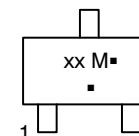
MARKING DIAGRAM



SOT-23
(TO-236)
CASE 318



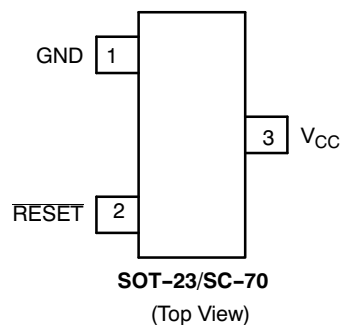
SC-70
(SOT-323)
CASE 419



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

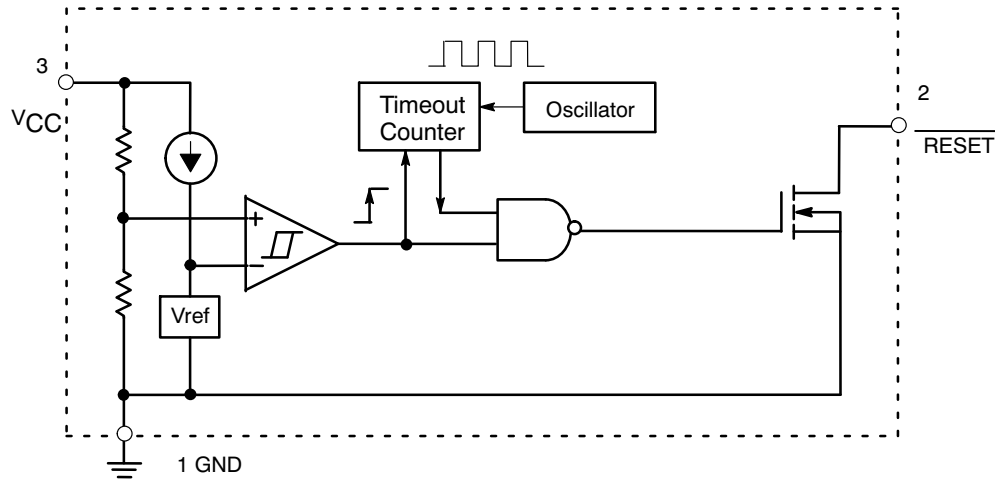


Figure 2. NCP803, MAX803 Series Open-Drain Active-Low Output

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 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 SC-70 $R_{\theta JA}$ | 301 314 | $^{\circ}\text{C}/\text{W}$ |
| 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 10mm² 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 _{CC} 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 _{CC} = 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 _{CC} = 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 _{CC} | - - - - | 0.5 - 0.8 - | 1.2 2.0 1.8 2.5 | μA |
| Reset Threshold (V _{in} 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 _{TH} | 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 _{CC} to Reset Delay V _{CC} = V _{TH} to (V _{TH} - 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 _{RP} | 1.0 20 100 140 | - - - - | 3.3 66 330 460 | msec |
| RESET Output Voltage Low 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 | V _{OL} | - | - | 0.3 | V |
| RESET Leakage Current V _{CC} > V _{TH} , RESET De-asserted | I _{LEAK} | - | - | 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

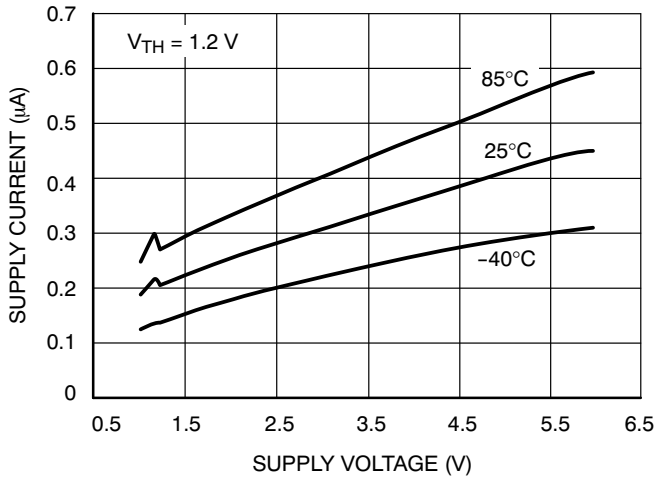


Figure 3. Supply Current vs. Supply Voltage

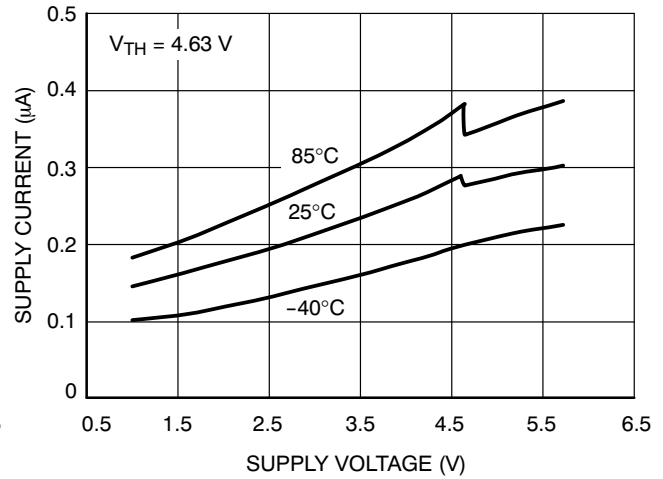


Figure 4. Supply Current vs. Supply Voltage

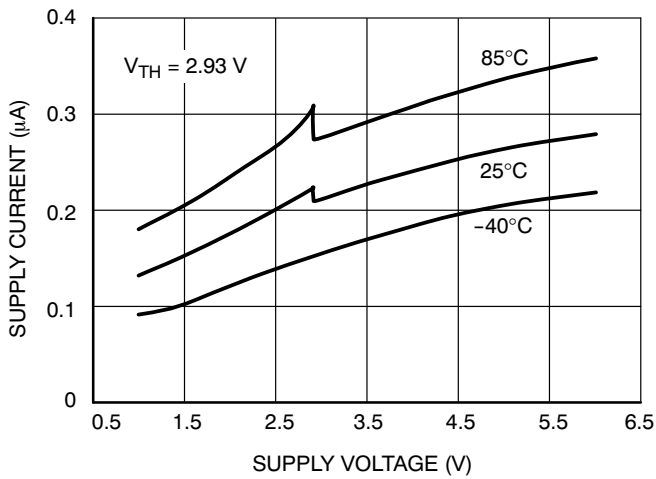


Figure 5. Supply Current vs. Supply Voltage

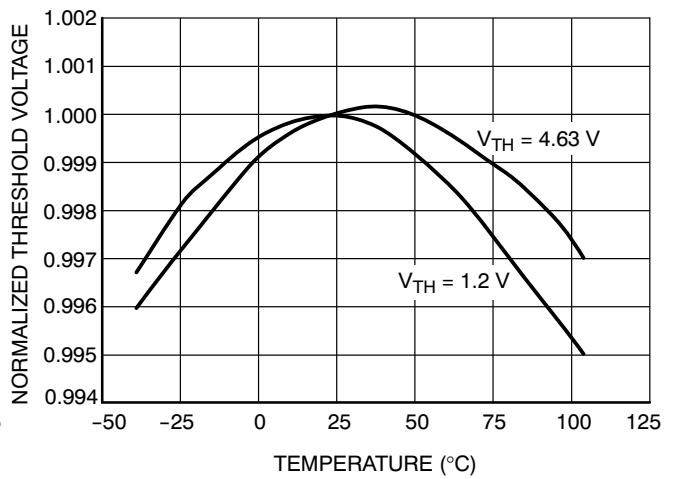


Figure 6. Normalized Reset Threshold Voltage vs. Temperature

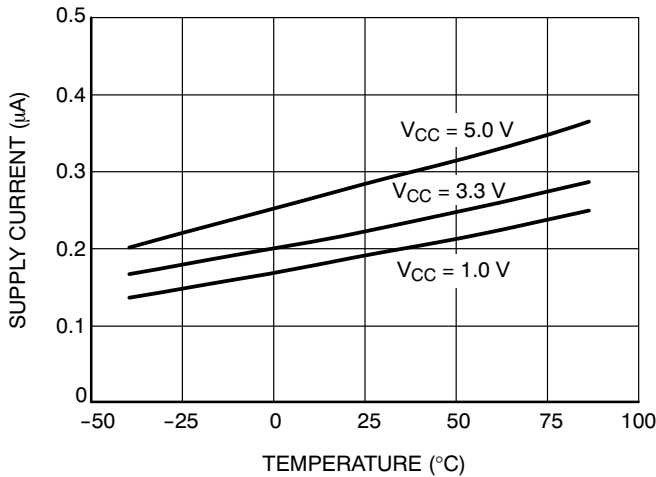


Figure 7. Supply Current vs. Temperature

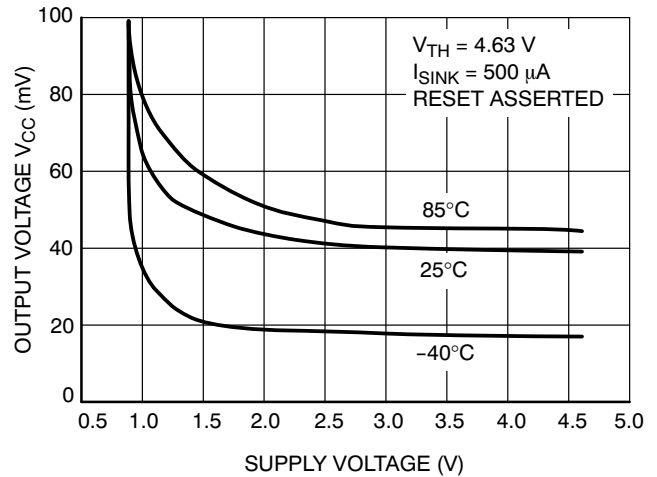


Figure 8. Output Voltage Low vs. Supply Voltage

MAX803 Series, NCP803 Series

TYPICAL OPERATING CHARACTERISTICS

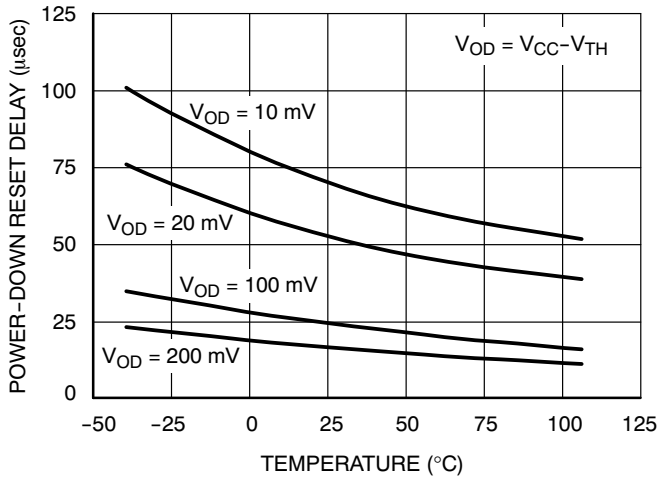


Figure 9. Power-Down Reset Delay vs. Temperature and Overdrive ($V_{TH} = 1.2\text{ V}$)

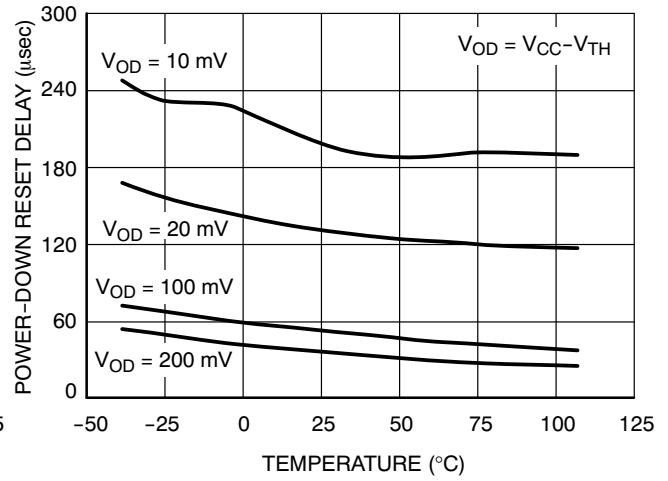


Figure 10. Power-Down Reset Delay vs. Temperature and Overdrive ($V_{TH} = 4.63\text{ V}$)

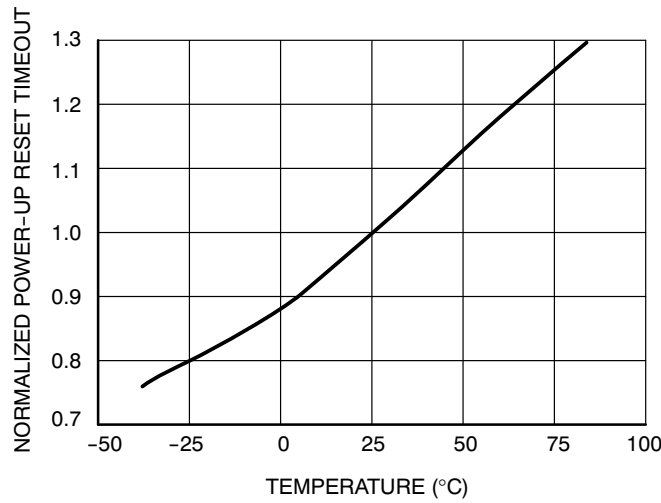


Figure 11. Normalized Power-Up Reset vs. Temperature

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.

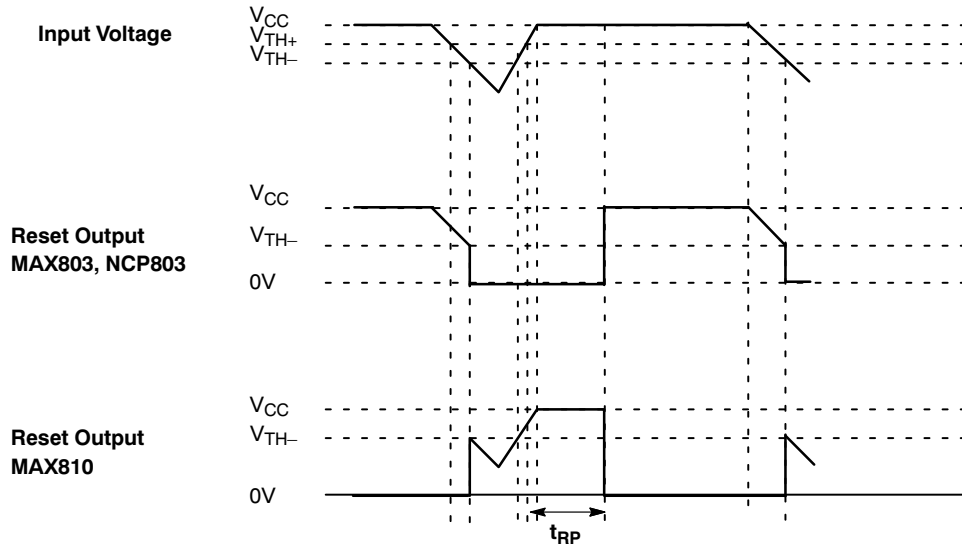


Figure 12. Timing Waveforms

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.

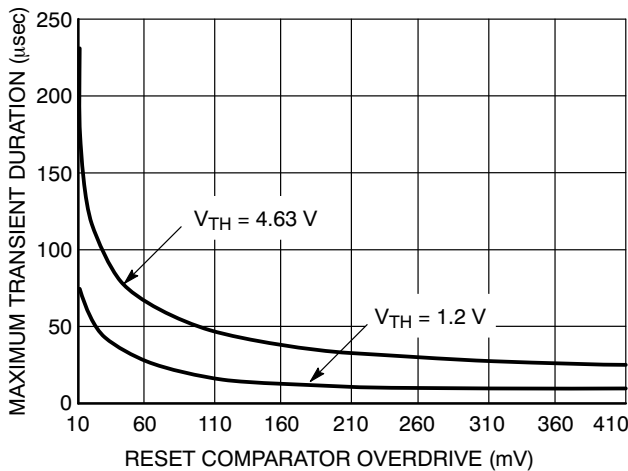
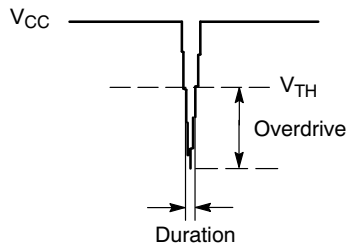
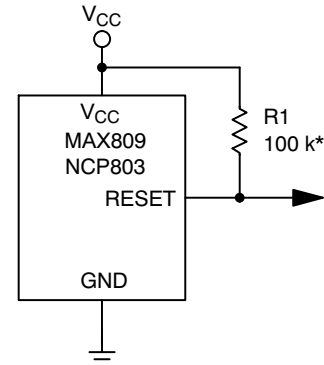


Figure 13. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C

RESET Signal Integrity During Power-Down

The MAX803/NCP803 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 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 RESET pin is required to be valid down to V_{CC} = 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 placed 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_{CC} level that depends on the R_{pullup} value and the voltage which is connected.

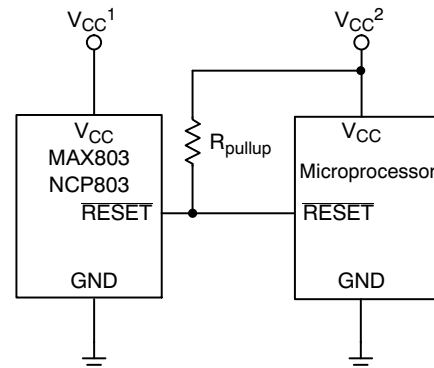


Figure 15. MAX803 RESET Output with Two Supplies

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) | |

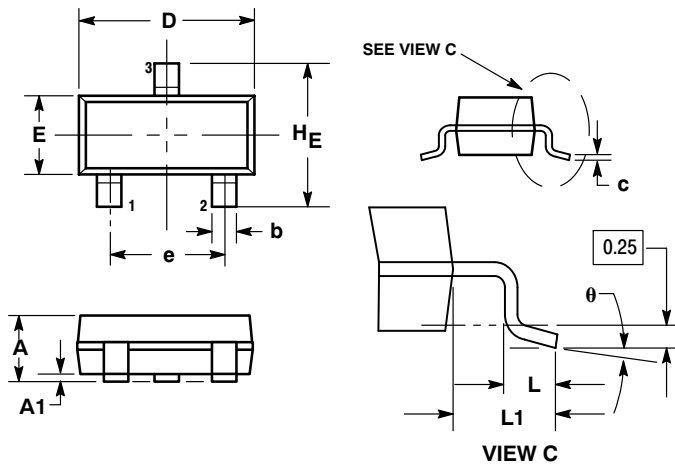
*Contact your ON Semiconductor sales representative for other threshold voltage options.

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

MAX803 Series, NCP803 Series

PACKAGE DIMENSIONS

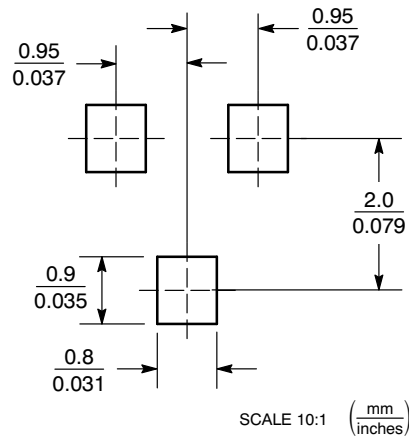
SOT-23 (TO236)
CASE 318-08
ISSUE AN



- 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*

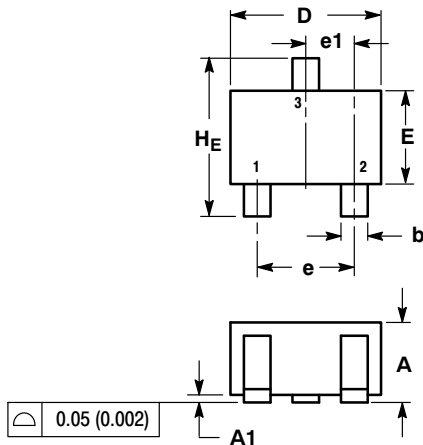


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MAX803 Series, NCP803 Series

PACKAGE DIMENSIONS

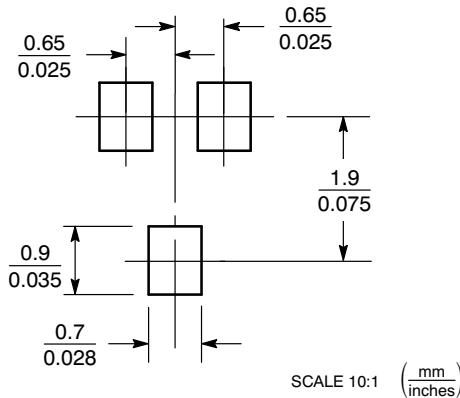
SC-70 (SOT-323)
CASE 419-04
ISSUE M



- 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 | | |
| HE | 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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