

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
μP Reset Circuits

## Absolute Maximum Ratings

Terminal Voltage (with respect to GND)

|                                                          |                                   |
|----------------------------------------------------------|-----------------------------------|
| V <sub>CC</sub> .....                                    | -0.3V to +6V                      |
| RESET, $\overline{\text{RESET}}$ (push-pull) .....       | -0.3V to (V <sub>CC</sub> + 0.3V) |
| $\overline{\text{RESET}}$ (open drain) .....             | -0.3V to +6V                      |
| Input Current (V <sub>CC</sub> ) .....                   | 20mA                              |
| Output Current (RESET, $\overline{\text{RESET}}$ ) ..... | 20mA                              |
| Rate of Rise (V <sub>CC</sub> ) .....                    | 100V/μs                           |

Continuous Power Dissipation (T<sub>A</sub> = +70°C)

|                                                |                 |
|------------------------------------------------|-----------------|
| 3-Pin SC70 (derate 2.7mW/°C above +70°C) ..... | 174mW           |
| 3-Pin SOT23 (derate 4mW/°C above +70°C) .....  | 320mW           |
| Operating Temperature Range .....              | -40°C to +85°C  |
| Storage Temperature Range .....                | -65°C to +150°C |
| Lead Temperature (soldering, 10s) .....        | +300°C          |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and 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 affect device reliability.

## Electrical Characteristics

(V<sub>CC</sub> = full range, T<sub>A</sub> = -40°C to +85°C, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C and V<sub>CC</sub> = 3V.) (Note 1)

| PARAMETER                                              | SYMBOL               | CONDITIONS                                                                                                                    |                                 | MIN                    | TYP             | MAX                    | UNITS  |
|--------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|-----------------|------------------------|--------|
| V <sub>CC</sub> Range                                  |                      | T <sub>A</sub> = 0°C to +70°C                                                                                                 |                                 | 1.0                    |                 | 5.5                    | V      |
|                                                        |                      | T <sub>A</sub> = -40°C to +85°C                                                                                               |                                 | 1.2                    |                 | 5.5                    |        |
| Supply Current                                         | I <sub>CC</sub>      | MAX632_ only, V <sub>CC</sub> = 3.0V for V <sub>TH</sub> ≤ 2.93V, V <sub>CC</sub> = 3.2V for V <sub>TH</sub> > 2.93V, no load |                                 |                        | 0.5             | 1.0                    | μA     |
|                                                        |                      | V <sub>CC</sub> = 5.5V, no load                                                                                               |                                 |                        | 1.0             | 1.75                   |        |
| Reset Threshold                                        | V <sub>TH</sub>      | Table 1                                                                                                                       | T <sub>A</sub> = +25°C          | V <sub>TH</sub> - 1.5% | V <sub>TH</sub> | V <sub>TH</sub> + 1.5% | V      |
|                                                        |                      |                                                                                                                               | T <sub>A</sub> = -40°C to +85°C | V <sub>TH</sub> - 2.5% | V <sub>TH</sub> | V <sub>TH</sub> + 2.5% |        |
| Reset Threshold Tempco                                 | ΔV <sub>TH</sub> /°C |                                                                                                                               |                                 |                        | 40              |                        | ppm/°C |
| V <sub>CC</sub> to Reset Delay                         |                      | V <sub>CC</sub> = V <sub>TH</sub> to (V <sub>TH</sub> - 100mV)                                                                |                                 |                        | 20              |                        | μs     |
| Reset Active Timeout Period                            |                      |                                                                                                                               |                                 | 100                    | 185             | 280                    | ms     |
| RESET Output Voltage (MAX6326/MAX6328/MAX6346/MAX6348) | V <sub>OL</sub>      | I <sub>SINK</sub> = 1.6mA, V <sub>CC</sub> > 2.1V, reset asserted                                                             |                                 |                        |                 | 0.3                    | V      |
|                                                        |                      | I <sub>SINK</sub> = 100μA, V <sub>CC</sub> ≥ 1.2V, reset asserted                                                             |                                 |                        |                 | 0.4                    |        |
| RESET Output Voltage (MAX6326/MAX6346)                 | V <sub>OH</sub>      | I <sub>SOURCE</sub> = 500μA, V <sub>CC</sub> = 3.2V, MAX6326 only                                                             |                                 | 0.8 · V <sub>CC</sub>  |                 |                        | V      |
|                                                        |                      | I <sub>SOURCE</sub> = 800μA, V <sub>CC</sub> = 4.5V, V <sub>TH</sub> ≤ 4.38V                                                  |                                 | 0.8 · V <sub>CC</sub>  |                 |                        |        |
|                                                        |                      | I <sub>SOURCE</sub> = 800μA, V <sub>CC</sub> = V <sub>TH</sub> (MAX), V <sub>TH</sub> ≥ 4.5V                                  |                                 | 0.8 · V <sub>CC</sub>  |                 |                        |        |
| RESET Output Voltage (MAX6327/MAX6347)                 | V <sub>OH</sub>      | I <sub>SOURCE</sub> = 500μA, V <sub>CC</sub> ≥ 2.1V, reset asserted                                                           |                                 | 0.8 · V <sub>CC</sub>  |                 |                        | V      |
|                                                        |                      | I <sub>SOURCE</sub> = 50μA, V <sub>CC</sub> ≥ 1.2V, reset asserted                                                            |                                 | 0.8 · V <sub>CC</sub>  |                 |                        |        |
|                                                        | V <sub>OL</sub>      | I <sub>SINK</sub> = 1.2mA, V <sub>CC</sub> ≥ 3.2V, reset not asserted, MAX6327 only                                           |                                 |                        |                 | 0.3                    |        |
|                                                        |                      | I <sub>SINK</sub> = 3.2mA, V <sub>CC</sub> ≥ 4.5V, reset not asserted, V <sub>TH</sub> ≤ 4.38V                                |                                 |                        |                 | 0.4                    |        |
|                                                        |                      | I <sub>SINK</sub> = 3.2mA, V <sub>CC</sub> = V <sub>TH</sub> (MAX), V <sub>TH</sub> ≥ 4.5V                                    |                                 |                        |                 | 0.4                    |        |
| RESET Threshold Hysteresis                             |                      | MAX6326/MAX6327/MAX6328                                                                                                       |                                 |                        | 6.3             |                        | mV     |
|                                                        |                      | MAX6346/MAX6347/MAX6348                                                                                                       |                                 |                        | 9.5             |                        |        |
| Open-Drain RESET Output Leakage Current                |                      |                                                                                                                               |                                 |                        |                 | 0.1                    | μA     |

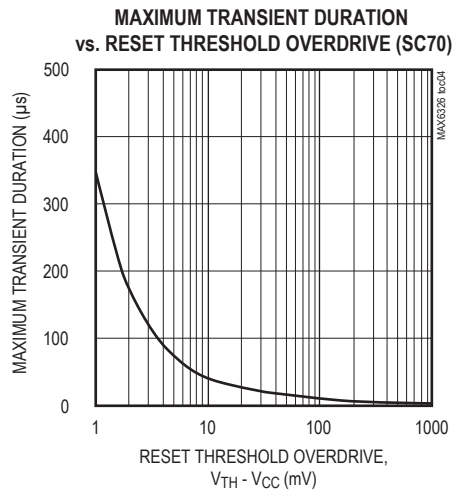
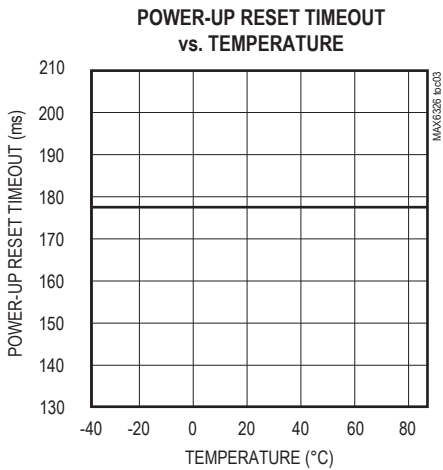
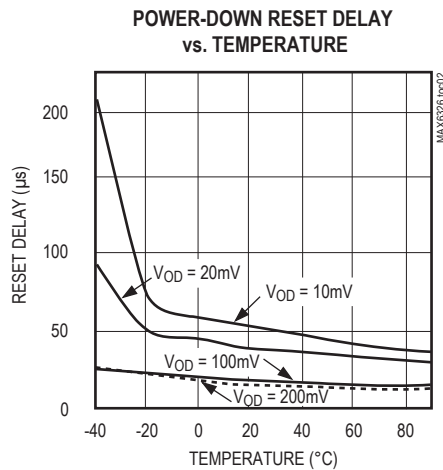
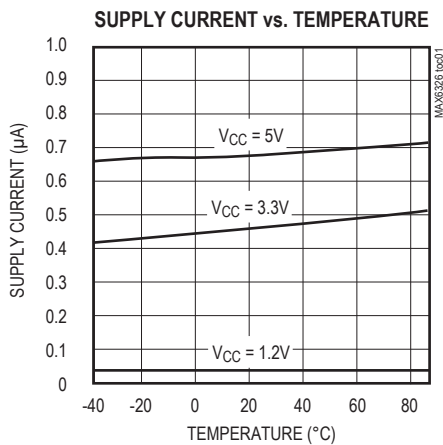
**Note 1:** Overtemperature limits are guaranteed by design and not production tested.

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
μP Reset Circuits

Typical Operating Characteristics

(T<sub>A</sub> = +25°C, unless otherwise noted.)



Pin Description

| PIN                                |                    | NAME                      | FUNCTION                                                                                                                                                                                                                                                                                             |
|------------------------------------|--------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAX6326/MAX6346<br>MAX6328/MAX6348 | MAX6327<br>MAX6347 |                           |                                                                                                                                                                                                                                                                                                      |
| 1                                  | 1                  | GND                       | Ground                                                                                                                                                                                                                                                                                               |
| 2                                  | —                  | $\overline{\text{RESET}}$ | Active-Low Reset Output. $\overline{\text{RESET}}$ remains low while V <sub>CC</sub> is below the reset threshold and for at least 100ms after V <sub>CC</sub> rises above the reset threshold. $\overline{\text{RESET}}$ is open-drain on the MAX6328/MAX6348 and push-pull on the MAX6326/MAX6346. |
| —                                  | 2                  | RESET                     | Active-High Reset Output. RESET remains high while V <sub>CC</sub> is below the reset threshold and for at least 100ms after V <sub>CC</sub> rises above the reset threshold.                                                                                                                        |
| 3                                  | 3                  | V <sub>CC</sub>           | Supply Voltage                                                                                                                                                                                                                                                                                       |

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
μP Reset Circuits

## Applications Information

### Interfacing to μPs with Bidirectional Reset Pins

Since the  $\overline{\text{RESET}}$  output on the MAX6328/MAX6348 is open drain, these devices interface easily with microprocessors (μPs) that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the μP supervisor's  $\overline{\text{RESET}}$  output directly to the microcontroller's (μC's)  $\overline{\text{RESET}}$  pin with a single pull-up resistor allows either device to assert reset (Figure 1).

### Negative-Going $V_{CC}$ Transients

In addition to issuing a reset to the μP during power-up, power-down, and brownout conditions, these devices are relatively immune to short-duration, negative-going  $V_{CC}$  transients (glitches).

The *Typical Operating Characteristics* show the Maximum Transient Duration vs. Reset Threshold Overdrive graph, for which reset pulses are not generated. The graph shows the maximum pulse width that a negative-going  $V_{CC}$  transient may typically have when issuing a reset signal. As the amplitude of the transient increases, the maximum allowable pulse width decreases.

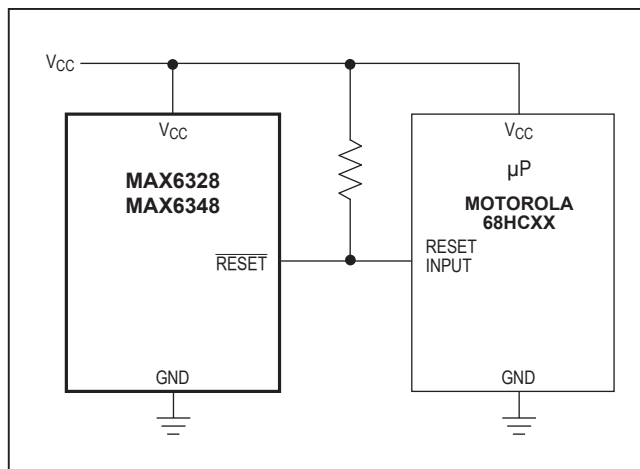


Figure 1. Interfacing to μPs with Bidirectional Reset Pins

**Table 1. Factory-Trimmed Reset Thresholds‡**

| PART      | SUFFIX | RESET THRESHOLD VOLTAGE, $V_{TH}$ (V) |       |       |                                                 |       |
|-----------|--------|---------------------------------------|-------|-------|-------------------------------------------------|-------|
|           |        | $T_A = +25^\circ\text{C}$             |       |       | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ |       |
|           |        | MIN                                   | TYP   | MAX   | MIN                                             | MAX   |
| MAX632__R | 22     | 2.167                                 | 2.200 | 2.233 | 2.145                                           | 2.250 |
| MAX632__R | 23     | 2.285                                 | 2.320 | 2.355 | 2.262                                           | 2.375 |
| MAX632__R | 24     | 2.364                                 | 2.400 | 2.436 | 2.340                                           | 2.460 |
| MAX632__R | 25     | 2.462                                 | 2.500 | 2.537 | 2.437                                           | 2.562 |
| MAX632__R | 26     | 2.591                                 | 2.630 | 2.669 | 2.564                                           | 2.696 |
| MAX632__R | 27     | 2.660                                 | 2.700 | 2.741 | 2.633                                           | 2.768 |
| MAX632__R | 28     | 2.758                                 | 2.800 | 2.842 | 2.730                                           | 2.870 |
| MAX632__R | 29     | 2.886                                 | 2.930 | 2.974 | 2.857                                           | 3.000 |
| MAX632__R | 30     | 2.955                                 | 3.000 | 3.045 | 2.925                                           | 3.075 |
| MAX632__R | 31     | 3.034                                 | 3.080 | 3.126 | 3.003                                           | 3.150 |
| MAX634__R | 33     | 3.250                                 | 3.300 | 3.350 | 3.217                                           | 3.383 |
| MAX634__R | 34     | 3.349                                 | 3.400 | 3.451 | 3.315                                           | 3.485 |
| MAX634__R | 35     | 3.447                                 | 3.500 | 3.552 | 3.412                                           | 3.587 |
| MAX634__R | 36     | 3.546                                 | 3.600 | 3.654 | 3.510                                           | 3.690 |
| MAX634__R | 37     | 3.644                                 | 3.700 | 3.755 | 3.607                                           | 3.792 |
| MAX634__R | 38     | 3.743                                 | 3.800 | 3.857 | 3.705                                           | 3.895 |

‡Factory-trimmed reset thresholds are available in approximately 100mV increments with a 1.5% room-temperature variance.

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
µP Reset Circuits

**Table 1. Factory-Trimmed Reset Thresholds‡ (continued)**

| PART      | SUFFIX | RESET THRESHOLD VOLTAGE, V <sub>TH</sub> (V) |       |       |                                 |       |
|-----------|--------|----------------------------------------------|-------|-------|---------------------------------|-------|
|           |        | T <sub>A</sub> = +25°C                       |       |       | T <sub>A</sub> = -40°C to +85°C |       |
|           |        | MIN                                          | TYP   | MAX   | MIN                             | MAX   |
| MAX634__R | 39     | 3.841                                        | 3.900 | 3.958 | 3.802                           | 3.997 |
| MAX634__R | 40     | 3.940                                        | 4.000 | 4.060 | 3.900                           | 4.100 |
| MAX634__R | 41     | 4.038                                        | 4.100 | 4.161 | 3.997                           | 4.202 |
| MAX634__R | 42     | 4.137                                        | 4.200 | 4.263 | 4.095                           | 4.305 |
| MAX634__R | 43     | 4.235                                        | 4.300 | 4.364 | 4.192                           | 4.407 |
| MAX634__R | 44     | 4.314                                        | 4.380 | 4.446 | 4.270                           | 4.489 |
| MAX634__R | 45     | 4.432                                        | 4.500 | 4.567 | 4.387                           | 4.612 |
| MAX634__R | 46     | 4.560                                        | 4.630 | 4.699 | 4.514                           | 4.746 |

‡Factory-trimmed reset thresholds are available in approximately 100mV increments with a 1.5% room-temperature variance.

**Table 2. Device Marking Codes and Minimum Order Increments**

| PART                  | TOP MARK |      | ORDER INCREMENT(k) |
|-----------------------|----------|------|--------------------|
|                       | SOT23    | SC70 |                    |
| <b>MAX6346</b> _R46-T | FZBI     | ACO  | 2.5                |
| MAX6346_R45-T         | FZBH     | —    | 10                 |
| MAX6346_R44-T         | FZBG     | ACK  | 2.5                |
| MAX6346_R43-T         | FZBF     | —    | 10                 |
| MAX6346_R42-T         | FZBE     | —    | 10                 |
| MAX6346_R41-T         | FZBD     | —    | 10                 |
| MAX6346_R40-T         | FZBC     | —    | 10                 |
| MAX6346_R39-T         | FZBB     | —    | 10                 |
| MAX6346_R38-T         | FZBA     | —    | 10                 |
| MAX6346_R37-T         | FZAZ     | —    | 10                 |
| MAX6346_R36-T         | FZAY     | —    | 10                 |
| MAX6346_R35-T         | FZAX     | —    | 10                 |
| MAX6346_R34-T         | FZAW     | —    | 10                 |
| MAX6346_R33-T         | FZAV     | —    | 10                 |
| <b>MAX6326</b> _R31-T | FDAA     | ACE  | 2.5                |
| MAX6326_R30-T         | FEAA     | —    | 10                 |
| MAX6326_R29-T         | FCAA     | ACP  | 2.5                |
| MAX6326_R28-T         | FBAA     | —    | 10                 |
| MAX6326_R27-T         | FAAA     | —    | 10                 |
| MAX6326_R26-T         | EZAA     | ACI  | 2.5                |
| MAX6326_R25-T         | EYAA     | —    | 10                 |
| MAX6326_R24-T         | EXAA     | —    | 10                 |
| MAX6326_R23-T         | EWAA     | ACH  | 2.5                |
| MAX6326_R22-T         | EHAA     | AAH  | 2.5                |

| PART                  | TOP MARK |      | ORDER INCREMENT (k) |
|-----------------------|----------|------|---------------------|
|                       | SOT23    | SC70 |                     |
| <b>MAX6347</b> _R46-T | FZBW     | ACF  | 2.5                 |
| MAX6347_R45-T         | FZBV     | —    | 10                  |
| MAX6347_R44-T         | FZBU     | ACL  | 2.5                 |
| MAX6347_R43-T         | FZBT     | —    | 10                  |
| MAX6347_R42-T         | FZBS     | —    | 10                  |
| MAX6347_R41-T         | FZBR     | —    | 10                  |
| MAX6347_R40-T         | FZBQ     | —    | 10                  |
| MAX6347_R39-T         | FZBP     | —    | 10                  |
| MAX6347_R38-T         | FZBO     | —    | 10                  |
| MAX6347_R37-T         | FZBN     | —    | 10                  |
| MAX6347_R36-T         | FZBM     | —    | 10                  |
| MAX6347_R35-T         | FZBL     | —    | 10                  |
| MAX6347_R34-T         | FZBK     | —    | 10                  |
| MAX6347_R33-T         | FZBJ     | —    | 10                  |
| <b>MAX6327</b> _R31-T | FMAA     | ACT  | 2.5                 |
| MAX6327_R30-T         | FNAA     | —    | 10                  |
| MAX6327_R29-T         | FLAA     | ACS  | 2.5                 |
| MAX6327_R28-T         | FKAA     | —    | 10                  |
| MAX6327_R27-T         | FJAA     | —    | 10                  |
| MAX6327_R26-T         | FIAA     | ACR  | 2.5                 |
| MAX6327_R25-T         | FHAA     | —    | 10                  |
| MAX6327_R24-T         | FGAA     | —    | 10                  |
| MAX6327_R23-T         | FFAA     | ACQ  | 2.5                 |
| MAX6327_R22-T         | EIAA     | AAI  | 2.5                 |

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
μP Reset Circuits

**Table 2. Device Marking Codes and Minimum Order Increments (continued)**

| PART                  | TOP MARK |      | ORDER INCREMENT (k) |
|-----------------------|----------|------|---------------------|
|                       | SOT23    | SC70 |                     |
| <b>MAX6348</b> _R46-T | SOT23    | SC70 |                     |
| MAX6348_R46-T         | FZCK     | ACN  | 2.5                 |
| MAX6348_R45-T         | FZCJ     | —    | 10                  |
| MAX6348_R44-T         | FZCI     | ACM  | 2.5                 |
| MAX6348_R43-T         | FZCH     | —    | 10                  |
| MAX6348_R42-T         | FZCG     | —    | 10                  |
| MAX6348_R41-T         | FZCF     | —    | 10                  |
| MAX6348_R40-T         | FZCE     | —    | 10                  |
| MAX6348_R39-T         | FZCD     | —    | 10                  |
| MAX6348_R38-T         | FZCC     | —    | 10                  |
| MAX6348_R37-T         | FZCB     | —    | 10                  |
| MAX6348_R36-T         | FZCA     | —    | 10                  |
| MAX6348_R35-T         | FZBZ     | —    | 10                  |

| PART                  | TOP MARK |      | ORDER INCREMENT (k) |
|-----------------------|----------|------|---------------------|
|                       | SOT23    | SC70 |                     |
| MAX6348_R34-T         | FZBY     | —    | 10                  |
| MAX6348_R33-T         | FZBX     | —    | 10                  |
| <b>MAX6328</b> _R31-T | FVAA     | ACW  | 2.5                 |
| MAX6328_R30-T         | FWAA     | —    | 10                  |
| MAX6328_R29-T         | FUAA     | ACV  | 2.5                 |
| MAX6328_R28-T         | FTAA     | —    | 10                  |
| MAX6328_R27-T         | FSAA     | —    | 10                  |
| MAX6328_R26-T         | FRAA     | ACJ  | 2.5                 |
| MAX6328_R25-T         | FQAA     | —    | 10                  |
| MAX6328_R24-T         | FPAA     | —    | 10                  |
| MAX6328_R23-T         | FOAA     | ACU  | 2.5                 |
| MAX6328_R22-T         | EJAA     | AAJ  | 2.5                 |

### Selector Guide (standard versions\*)

| PART          | NOMINAL $V_{TH}$ (V) |
|---------------|----------------------|
| MAX634__R46-T | 4.63                 |
| MAX634__R44-T | 4.38                 |
| MAX632__R31-T | 3.08                 |
| MAX632__R29-T | 2.93                 |
| MAX632__R26-T | 2.63                 |
| MAX632__R23-T | 2.32                 |
| MAX632__R22-T | 2.20                 |

\*Sample stock is generally held on all standard versions.

### Chip Information

TRANSISTOR COUNT: 419

### Package Information

For the latest package outline information and land patterns (footprints), go to [www.maximintegrated.com/packages](http://www.maximintegrated.com/packages). Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

| PACKAGE TYPE | PACKAGE CODE | OUTLINE NO.             | LAND PATTERN NO.        |
|--------------|--------------|-------------------------|-------------------------|
| 3 SC70       | X3-2         | <a href="#">21-0075</a> | <a href="#">90-0208</a> |
| 3 SOT23      | U3-1         | <a href="#">21-0051</a> | <a href="#">90-0179</a> |

MAX6326/MAX6327/  
MAX6328/MAX6346/  
MAX6347/MAX6348

3-Pin, Ultra-Low-Power SC70/SOT  
μP Reset Circuits

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION                                                               | PAGES<br>CHANGED |
|--------------------|------------------|---------------------------------------------------------------------------|------------------|
| 0                  | 12/05            | Initial release                                                           | —                |
| 1                  | 4/14             | No /V OPNs; removed Automotive reference from <i>Applications</i> section | 1                |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

*Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time. The parametric values (min and max limits) shown in the Electrical Characteristics table are guaranteed. Other parametric values quoted in this data sheet are provided for guidance.*