19-2656; Rev 3; 6/10

MAXIM

µP Reset Circuits with Long Manual Reset Setup Period

General Description

The MAX6443–MAX6452 low-current microprocessor reset circuits feature single or dual manual reset inputs with an extended setup period. Because of the extended setup period, short switch closures (nuisance resets) are ignored.

On all devices, the reset output asserts when any of the monitored supply voltages drops below its specified threshold. The reset output remains asserted for the reset timeout period (210ms typ) after all monitored supplies exceed their reset thresholds. The reset output is one-shot pulse asserted for the reset timeout period (140ms min) when selected manual reset input(s) are held low for an extended setup timeout period. These devices ignore manual reset transitions of less than the extended setup timeout period.

The MAX6443–MAX6448 are single fixed-voltage µP supervisors. The MAX6443/MAX6444 have a single extended manual reset input. The MAX6445/MAX6446 have two extended manual reset inputs. The MAX6447/MAX6448 have one extended and one immediate manual reset input.

The MAX6449–MAX6452 have one fixed-threshold µP supervisor and one adjustable-threshold µP supervisor. The MAX6449/MAX6450 have two delayed manual reset inputs. The MAX6451/MAX6452 have one delayed and one immediate manual reset input.

The MAX6443–MAX6452 have an active-low $\overline{\text{RESET}}$ with push-pull or open-drain output logic options. These devices, offered in small SOT packages, are fully guaranteed over the extended temperature range (-40°C to +85°C).

Applications

Set-Top Boxes

Consumer Electronics

DVD Players

Cable/DSL Modems

MP3 Players

Industrial Equipment

Automotive

Medical Devices

Features

- **Single- or Dual-Supply Voltage Monitors**
- **Precision Factory-Set Reset Thresholds from 1.6V to 4.6V**
- **Adjustable Threshold to Monitor Voltages Down to 0.63V (MAX6449–MAX6452)**
- **Single or Dual Manual Reset Inputs with Extended Setup Period**
- **Optional Short Setup Time Manual Reset Input (MAX6447/MAX6448 and MAX6451/MAX6452)**
- **Immune to Short Voltage Transients**
- **Low 6µA Supply Current**
- **Guaranteed Valid Reset Down to V_{CC} = 1.0V**
- **Active-Low $\overline{\text{RESET}}$ (Push-Pull or Open-Drain) Outputs**
- **140ms (min) Reset Timeout Period**
- **Small SOT143 and SOT23 Packages**

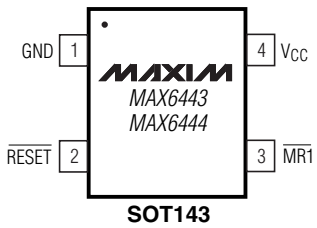
Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX6443US_ _ _-T	-40°C to +85°C	4 SOT143
MAX6444US_ _ _-T	-40°C to +85°C	4 SOT143

Note: *The first "_ _ " is a placeholder for the threshold voltage level of the devices. A desired threshold level is set by the two-number suffix found in Table 1. The third "_" is a placeholder for the manual reset setup period of the devices. A desired setup period is set by the letter suffix found in Table 2. All devices are available in tape-and-reel only. There is a 2500-piece minimum order increment for standard versions (Table 2). Sample stock is typically held on standard versions only. Nonstandard versions require a minimum order increment of 10,000 pieces. Contact factory for availability.*

Devices are available in both leaded and lead-free packaging. Specify lead-free by replacing "-T" with "+T" when ordering.

Pin Configurations



Pin Configurations continued at end of data sheet.

µP Reset Circuits with Long Manual Reset Setup Period

ABSOLUTE MAXIMUM RATINGS

All Voltages Referenced to GND
V_{CC} .....-0.3V to +6V
Open-Drain $\overline{RESET}$ .....-0.3V to +6V
Push-Pull $\overline{RESET}$ .....-0.3V to (V_{CC} + 0.3V)
$\overline{MR1}$, MR2, $\overline{MR2}$, RSTIN .....-0.3V to +6V
Input Current, All Pins.....±20mA
Continuous Power Dissipation (T_A = +70°C)
4-Pin SOT143 (derate 4.0mW/°C above +70°C).....320mW
5-Pin SOT23 (derate 7.1mW/°C above +70°C).....571mW
6-Pin SOT23 (derate 8.7mW/°C above +70°C).....696mW
Operating Temperature Range ..... -40°C to +85°C
Junction Temperature.....+150°C
Storage Temperature Range.....-65°C to +150°C
Lead Temperature (soldering, 10s).....+300°C
Soldering Temperature (reflow)
Lead(Pb)-free.....+260°C
Containing lead..... +240°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_{CC} = 1.0V to 5.5V, T_A = -40°C to +85°C, unless otherwise specified. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Operating Voltage Range	V_{CC}			1.0		5.5	V
V_{CC} Supply Current	I_{CC}	V_{CC} = 5.5V, no load			7	20	µA
		V_{CC} = 3.6V, no load			6	16	
V_{CC} Reset Threshold	V_{TH}	46		4.50	4.63	4.75	V
		44		4.25	4.38	4.50	
		31		3.00	3.08	3.15	
		29		2.85	2.93	3.00	
		26		2.55	2.63	2.70	
		23		2.25	2.32	2.38	
		22		2.12	2.19	2.25	
		17		1.62	1.67	1.71	
		16		1.52	1.58	1.62	
Reset Threshold Tempco					60		ppm/°C
Reset Threshold Hysteresis					2 × V_{TH}		mV
RSTIN Threshold	$V_{TH-RSTIN}$	MAX6449–MAX6452	T_A = 0°C to +85°C	0.615	0.630	0.645	V
			T_A = -40°C to +85°C	0.610		0.650	
RSTIN Threshold Hysteresis	V_{HYST}	MAX6449–MAX6452			2.5		mV
RSTIN Input Current	I_{RSTIN}	MAX6449–MAX6452		-25		+25	nA
RSTIN to Reset Output Delay		MAX6449–MAX6452, V_{RSTIN} falling at 1mV/µs			15		µs
Reset Timeout Period	t_{RP}			140	210	280	ms
V_{CC} to $\overline{RESET}$ Output Delay	t_{RD}	V_{CC} falling at 1mV/µs			20		µs
Manual Reset Minimum Setup Period Pulse Width	t_{MR}	K		6.72	10.08	13.44	s
		L		4.48	6.72	8.96	
		S		2.24	3.36	4.48	
		T		1.12	1.68	2.24	

ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = 1.0V to 5.5V, T_A = -40°C to +85°C, unless otherwise specified. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
MR2 Minimum Setup Period Pulse Width		MAX6447/MAX6448/MAX6451/MAX6452	1			µs
MR2 Glitch Rejection		MAX6447/MAX6448/MAX6451/MAX6452		100		ns
MR2 to $\overline{RESET}$ Delay		MAX6447/MAX6448/MAX6451/MAX6452		200		ns
Manual Reset Timeout Period	t_{MRP}		140	210	280	ms
$\overline{MR1}$ to V_{CC} Pullup Impedance			25	50	75	kΩ
$\overline{MR2}$ to V_{CC} Pullup Impedance		MAX6445/MAX6446/MAX6449/MAX6450	25	50	75	kΩ
$\overline{RESET}$ Output Low (Open Drain or Push-Pull)	V_{OL}	V_{CC} ≥ 1.00V, I_{SINK} = 50µA, $\overline{RESET}$ asserted			0.3	V
		V_{CC} ≥ 1.20V, I_{SINK} = 100µA, $\overline{RESET}$ asserted			0.3	
		V_{CC} ≥ 2.55V, I_{SINK} = 1.2mA, $\overline{RESET}$ asserted			0.3	
		V_{CC} ≥ 4.25V, I_{SINK} = 3.2mA, $\overline{RESET}$ asserted			0.4	
$\overline{RESET}$ Output High (Push-Pull)	V_{OH}	V_{CC} ≥ 1.80V, I_{SOURCE} = 200µA, $\overline{RESET}$ deasserted	0.8 × V_{CC}			V
		V_{CC} ≥ 3.15V, I_{SOURCE} = 500µA, $\overline{RESET}$ deasserted	0.8 × V_{CC}			
		V_{CC} ≥ 4.75V, I_{SOURCE} = 800µA, $\overline{RESET}$ deasserted	0.8 × V_{CC}			
$\overline{RESET}$ Open-Drain Leakage Current	I_{LKG}	$\overline{RESET}$ deasserted			1	µA
$\overline{MR1}$, $\overline{MR2}$, MR2 Input Low Voltage	V_{IL}				0.3 × V_{CC}	V
$\overline{MR1}$, $\overline{MR2}$, MR2 Input High Voltage	V_{IH}		0.7 × V_{CC}			V

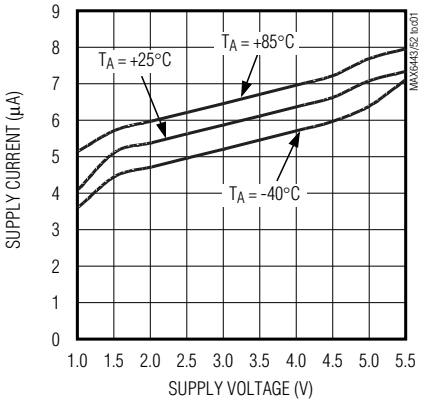
Note 1: Devices production tested at T_A = +25°C. Overtemperature limits are guaranteed by design.

µP Reset Circuits with Long Manual Reset Setup Period

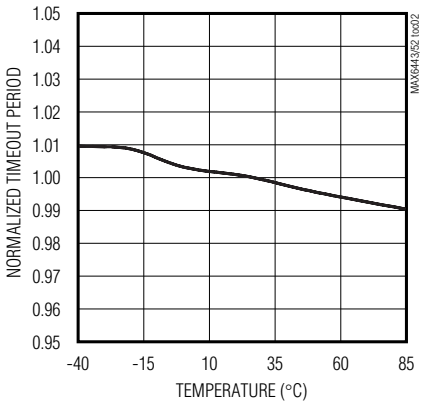
Typical Operating Characteristics

(V_{CC} = 3.3V, T_A = +25°C, unless otherwise noted.)

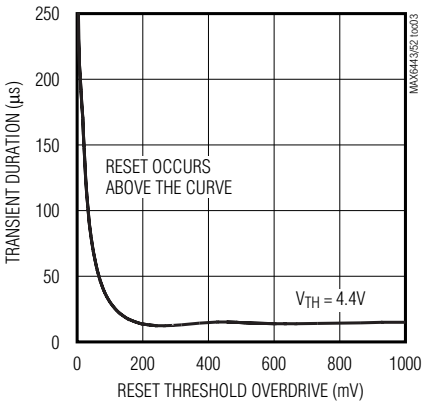
SUPPLY CURRENT vs. SUPPLY VOLTAGE



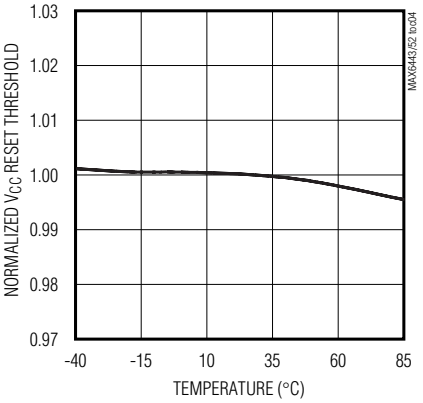
NORMALIZED RESET TIMEOUT PERIOD vs. TEMPERATURE



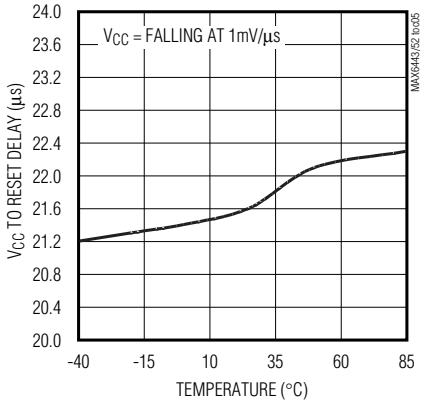
MAXIMUM TRANSIENT DURATION vs. RESET THRESHOLD OVERDRIVE



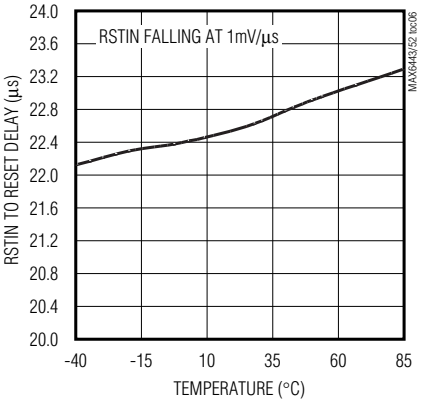
NORMALIZED V_{CC} RESET THRESHOLD vs. TEMPERATURE



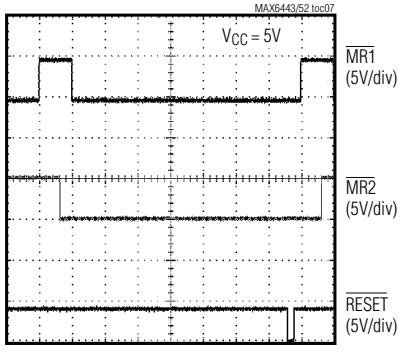
V_{CC} TO RESET DELAY vs. TEMPERATURE



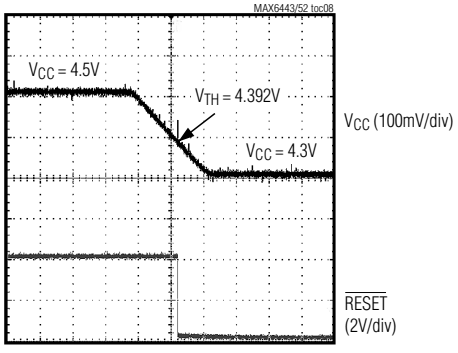
RSTIN TO RESET DELAY vs. TEMPERATURE (RSTIN FALLING)



MANUAL RESET TO RESET DELAY (MAX6445L/MAX6446L/MAX6449L/MAX6450L)



V_{CC} TO $\overline{RESET}$ DELAY



µP Reset Circuits with Long Manual Reset Setup Period

Pin Description

PIN					NAME	FUNCTION
MAX6443 MAX6444	MAX6445 MAX6446	MAX6447 MAX6448	MAX6449 MAX6450	MAX6451 MAX6452		
1	2	2	2	2	GND	Ground
2	1	1	1	1	$\overline{RESET}$	Active-Low Push-Pull or Open-Drain Output. $\overline{RESET}$ changes from high to low when V_{CC} or RSTIN drops below its selected reset threshold and remains low for the 210ms reset timeout period after all monitored power-supply inputs exceed their selected reset thresholds. $\overline{RESET}$ is one-shot pulsed low for the reset timeout period (140ms min) after selected manual reset inputs are asserted longer than the specified setup period. For the open-drain output, use a minimum 20kΩ pullup resistor to V_{CC} .
3	—	3	—	3	$\overline{MR1}$	Manual Reset Input, Active Low. Internal 50kΩ pullup to V_{CC}. Pull $\overline{MR1}$ low for the typical input pulse width (t_{MR}) to one-shot pulse $\overline{RESET}$ for the reset timeout period.
—	3	—	3	—		Manual Reset Input, Active Low. Pull both $\overline{MR1}$ and $\overline{MR2}$ low for the typical input pulse width (t_{MR}) to one-shot pulse $\overline{RESET}$ for the reset timeout period.
4	4	4	4	4	V_{CC}	V_{CC} Voltage Input. Power supply and input for the primary microprocessor voltage reset monitor.
—	5	—	6	—	$\overline{MR2}$	Manual Reset Input, Active Low. Internal 50kΩ pullup to V_{CC}. Pull both $\overline{MR1}$ and $\overline{MR2}$ low for the typical input pulse width (t_{MR}) to one-shot pulse $\overline{RESET}$ for the reset timeout period.
—	—	5	—	6	MR2	Manual Reset Input. Pull the MR2 high to immediately one-shot pulse $\overline{RESET}$ for the reset timeout period.
—	—	—	5	5	RSTIN	Reset Input. High-impedance input to the adjustable reset comparator. Connect RSTIN to the center point of an external resistor-divider to set the threshold of the externally monitored voltage.

Detailed Description

Reset Output

The reset output is typically connected to the reset input of a microprocessor (µP). A µP's reset input starts or restarts the µP in a known state. The MAX6443–MAX6452 µP supervisory circuits provide the reset logic to prevent code-execution errors during power-up, power-down and brownout conditions (see the *Typical Operating Circuit*).

$\overline{RESET}$ changes from high to low whenever the monitored voltages (RSTIN or V_{CC}) drop below the reset threshold voltages. Once V_{RSTIN} and V_{CC} exceed their respective reset threshold voltages, $\overline{RESET}$ remains low for the reset timeout period and then goes high. $\overline{RESET}$ is one-shot pulsed whenever selected manual reset inputs are asserted. $\overline{RESET}$ stays asserted for the normal reset timeout period (140ms min).

$\overline{RESET}$ is guaranteed to be in the proper output logic state for V_{CC} inputs ≥ 1V. For applications requiring valid reset logic when V_{CC} is less than 1V, see the *Ensuring a Valid $\overline{RESET}$ Output Down to V_{CC} = 0V* section.

µP Reset Circuits with Long Manual Reset Setup Period

Manual Reset Input Options

Unlike typical manual reset functions associated with supervisors, each device in the MAX6443–MAX6452 family includes at least one manual reset input, which must be held logic-low for an extended setup period (t_{MR}) before the $\overline{RESET}$ output asserts. When valid manual reset input conditions/setup periods are met, the $\overline{RESET}$ output is one-shot pulse asserted low for a fixed reset timeout period (140ms min). Existing front-panel pushbutton switches (i.e., power on/off, channel up/down, or mode select) can be used to drive the manual reset inputs. The extended manual reset setup period prevents nuisance system resets during normal front-panel usage or resulting from inadvertent short-term pushbutton closure.

The MAX6443/MAX6444, MAX6447/MAX6448, and MAX6451/MAX6452 include a single manual reset input with extended setup period ($\overline{MR1}$). The MAX6445/MAX6446 and MAX6449/MAX6450 include two manual reset inputs ($\overline{MR1}$ and $\overline{MR2}$) with extended setup periods. For dual $\overline{MR1}$, $\overline{MR2}$ devices, both inputs must be held low simultaneously for the extended setup period (t_{MR}) before the reset output is pulse asserted. The dual extended setup provides greater protection from nuisance resets. (For example, the user or service technician is informed to simultaneously push both the on/off button and the channel-select button for 6.72s (L suffix) to reset the system.)

The MAX6443–MAX6452 $\overline{RESET}$ output is pulse asserted once for the reset timeout period after each valid manual reset input condition. At least one manual reset input must be released (go high) and then be driven low for the extended setup period before $\overline{RESET}$ asserts again. Internal timing circuitry debounces low-to-high manual reset logic transitions, so no external circuitry is required. Figure 1 illustrates the single manual reset function of the MAX6443/MAX6444 single-voltage monitors, and Figure 2 represents the dual manual reset function of the MAX6445/MAX6446 and MAX6449/MAX6450.

The MAX6447/MAX6448 and MAX6451/MAX6452 include both an extended setup period and immediate setup period manual reset inputs. A low-to-high MR2 rising edge transition immediately pulse asserts the $\overline{RESET}$ output for the reset timeout period (140ms min). If the MAX6447/MAX6448 and MAX6451/MAX6452 MR2 input senses another rising edge before the end of the 140ms timeout period (Figure 3), the internal timer clears and begins counting again. If no rising edges are detected within the 210ms timeout period, $\overline{RESET}$ deasserts. The high-to-low transition on MR2 input is internally debounced for 210ms to ensure that there are no false $\overline{RESET}$ assertions when MR2 is driven from high to low (Figure 4). The MR2 input can be used for system test purposes or smart-card-detect applications (see the *Applications Information* section).

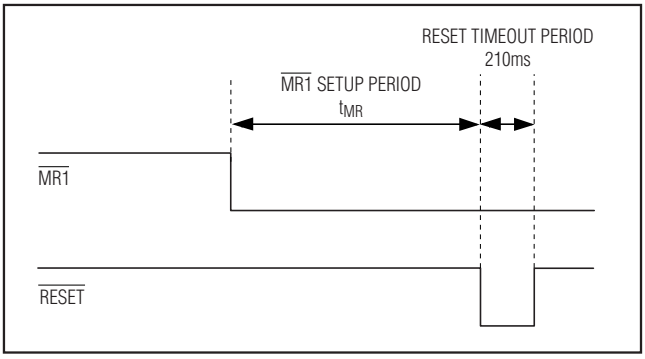


Figure 1. MAX6443/MAX6444 Manual Reset Timing Diagram

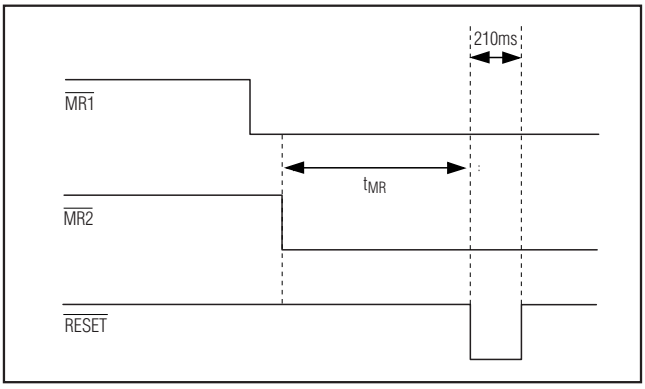


Figure 2. MAX6445/MAX6446/MAX6449/MAX6450 Manual Reset Timing Diagram

Adjustable Input Voltage (RSTIN)

The MAX6449–MAX6452 monitor the voltage on RSTIN using an adjustable reset threshold set with an external resistor voltage-divider (Figure 5). Use the following formula to calculate the externally monitored voltage (V_{MON-TH}):

$$V_{MON-TH} = V_{TH-RSTIN} \times (R1 + R2)/R2$$

where V_{MON-TH} is the desired reset threshold voltage and $V_{TH-RSTIN}$ is the reset input threshold (0.63V). Resistors R1 and R2 can have very high values to minimize current consumption because of low leakage currents. Set R2 to some conveniently high value (250kΩ, for example), and calculate R1 based on the desired reset threshold voltage, using the following formula:

$$R1 = R2 \times (V_{MON-TH}/V_{TH-RSTIN} - 1)\ \Omega$$

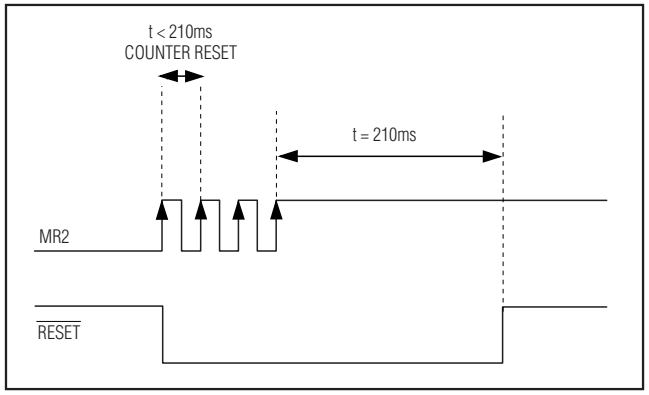


Figure 3. MAX6447/MAX6448/MAX6451/MAX6452 MR2 Assertion DebouncingTiming Diagram

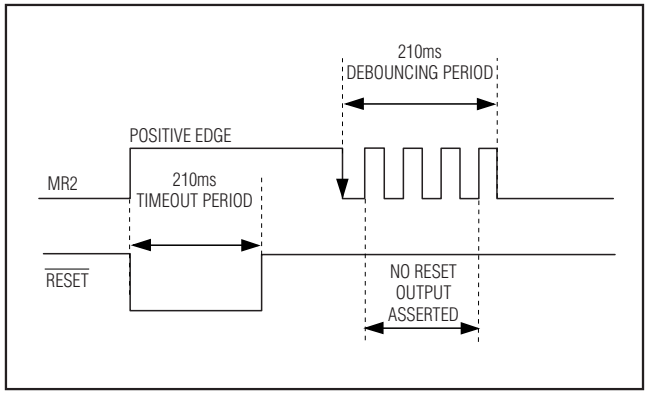


Figure 4. MAX6447/MAX6448/MAX6451/MAX6452 MR2 Deassertion Debouncing Timing Diagram

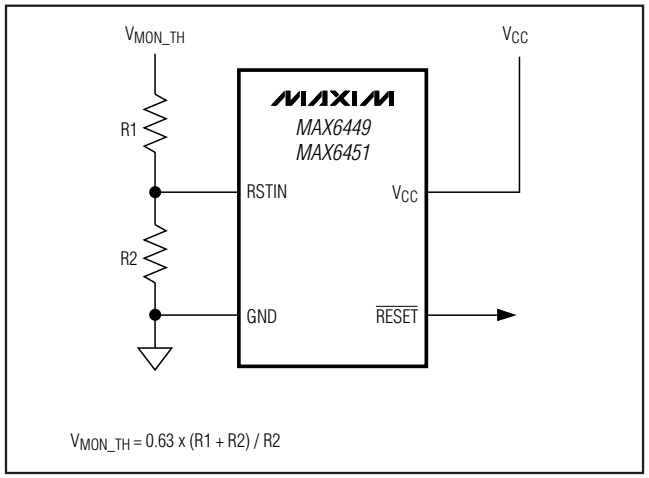


Figure 5. Calculating the Monitored Threshold Voltages

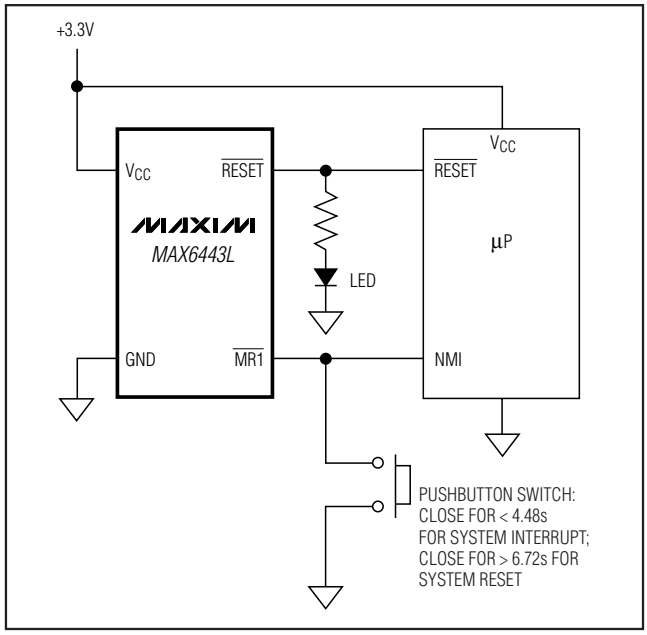


Figure 6. Interrupt Before Reset Application Circuit

Applications Information

Interrupt Before Reset

To minimize data loss and speed system recovery, many applications interrupt the processor or reset only portions of the system before a processor hard reset is asserted. The extended setup time of the MAX6443–MAX6452 manual reset inputs allows the same pushbutton (connected to both the processor interrupt and the extended MR1 input, as shown in Figure 6) to control both the interrupt and hard reset functions. If the pushbutton is closed for less than t_{MR}, the processor is only interrupted. If the system still does not respond properly, the pushbutton (or two buttons for the dual manual reset) can be closed for the full extended setup period to hard reset the processor. If desired, connect an LED to the RESET output to blink off (or on) for the reset timeout period to signify when the pushbutton is closed long enough for a hard reset (the same LED might be used as the front-panel power-on display).

Smart Card Insertion/Removal

The MAX6447/MAX6448/MAX6451/MAX6452 dual manual resets are useful in applications in which both an extended and immediate setup periods are needed. Figure 7 illustrates the insertion and removal of a smart card. MR1 monitors a front-panel pushbutton. When closed for t_{MR}, RESET one-shot pulses low for 140ms min. Because MR1 is internally pulled to V_{CC} through a 50kΩ resistor, the front-panel switch can be connected to

µP Reset Circuits with Long Manual Reset Setup Period

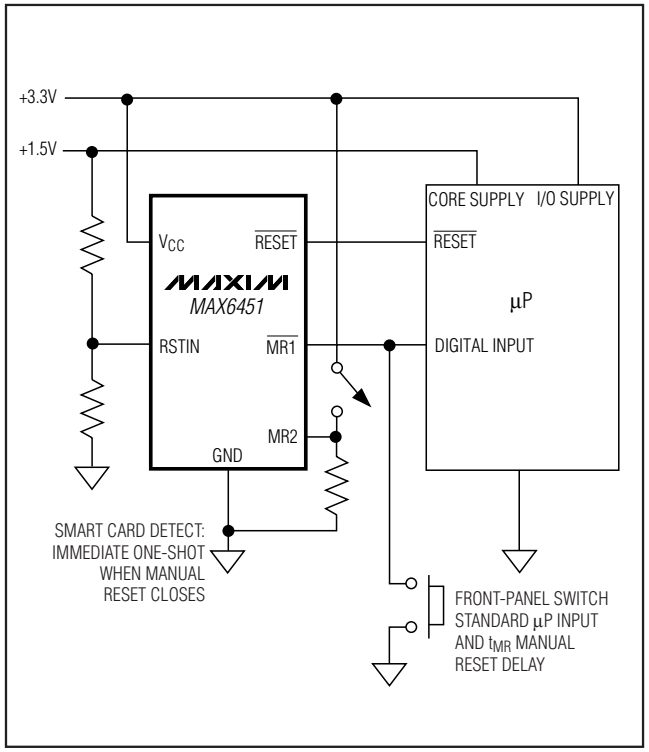


Figure 7. MAX6451/MAX6452 Application Circuit

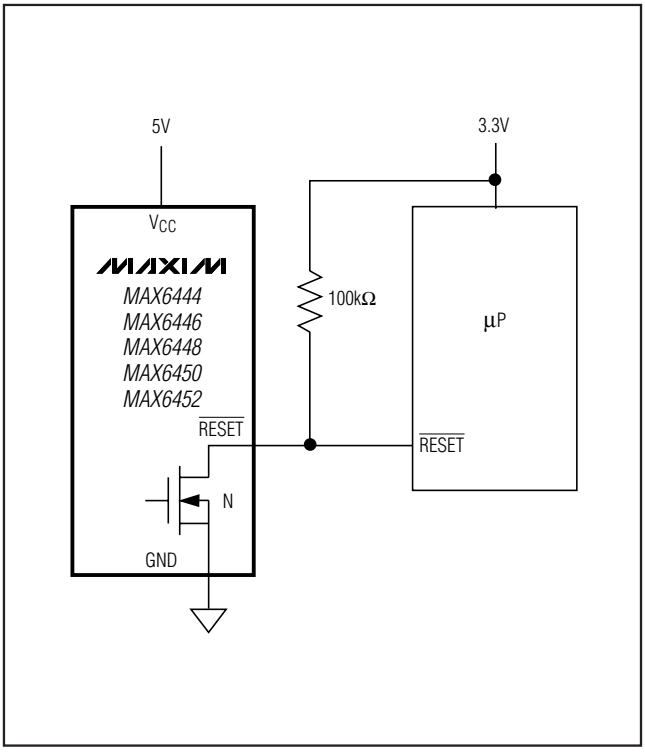


Figure 8. Interfacing to Other Voltage Levels

a microprocessor for general-purpose I/O control. MR2 monitors a switch to detect when a smart card is inserted. When the switch is closed high (card inserted), $\overline{RESET}$ one-shot pulses low for 140ms. MR2 is internally debounced for 210ms to prevent false resets when the smart card is removed.

Interfacing to Other Voltages for Logic Compatibility

The open-drain $\overline{RESET}$ output can be used to interface to a µP with other logic levels. As shown in Figure 8, the open-drain output can be connected to voltages from 0 to 6V.

Generally, the pullup resistor connected to the $\overline{RESET}$ connects to the supply voltage that is being monitored at the IC's V_{CC} pin. However, some systems may use the open-drain output to level-shift from the monitored supply to reset circuitry powered by some other supply (Figure 8). Keep in mind that as the supervisor's V_{CC} decreases toward 1V, so does the IC's ability to sink current at $\overline{RESET}$. $\overline{RESET}$ is pulled high as V_{CC} decays toward 0. The voltage where this occurs depends on the pullup resistor value and the voltage to which it is connected.

Ensuring a Valid $\overline{RESET}$ Down to V_{CC} = 0V (Push-Pull $\overline{RESET}$)

When V_{CC} falls below 1V, $\overline{RESET}$ current-sinking capabilities decline drastically. The high-impedance CMOS-logic inputs connected to $\overline{RESET}$ can drift to undetermined voltages. This presents no problems in most applications, because most µPs and other circuitry do not operate with V_{CC} below 1V.

In applications in which $\overline{RESET}$ must be valid down to 0V, add a pulldown resistor between $\overline{RESET}$ and GND for the push-pull outputs. The resistor sinks any stray leakage currents, holding $\overline{RESET}$ low (Figure 9). The value of the pulldown resistor is not critical; 100kΩ is large enough not to load $\overline{RESET}$ and small enough to pull $\overline{RESET}$ to ground. The external pulldown cannot be used with the open-drain reset outputs.

Transient Immunity

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, these supervisors are relatively immune to short-duration falling transients (glitches). The graph Maximum Transient Duration vs. Reset Threshold Overdrive in the *Typical Operating Characteristics* section shows this relationship.

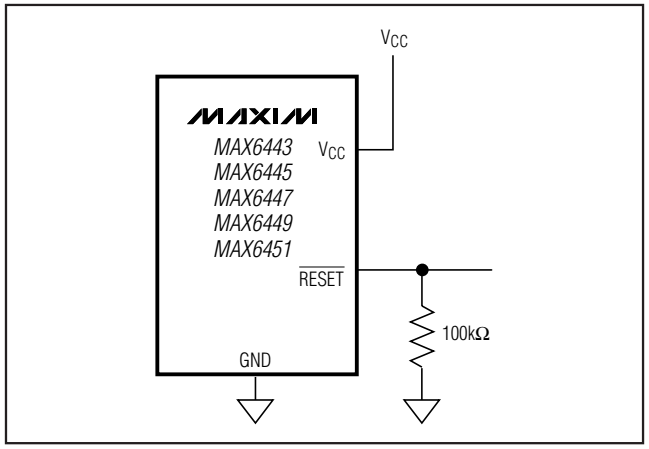


Figure 9. Ensuring $\overline{RESET}$ Valid to V_{CC} = 0V

The area below the curves of the graph is the region in which these devices typically do not generate a reset pulse. This graph was generated using a falling pulse applied to V_{CC}, starting above the actual reset threshold (V_{TH}) and ending below it by the magnitude indicated (reset threshold overdrive). As the magnitude of the transient increases (V_{CC} goes further below the reset threshold), the maximum allowable pulse width decreases. Typically, a V_{CC} transient that goes 100mV below the reset threshold and lasts 20µs or less does not cause a reset pulse to be asserted.

Table 1. Reset Voltage Threshold

PART NO. SUFFIX (_ _)	V_{CC} NOMINAL VOLTAGE THRESHOLD (V)
46	4.625
44	4.375
31	3.075
29	2.925
26	2.625
23	2.313
22	2.188
17	1.665
16	1.575

Table 2. Manual Reset Setup Period (t_{MR})

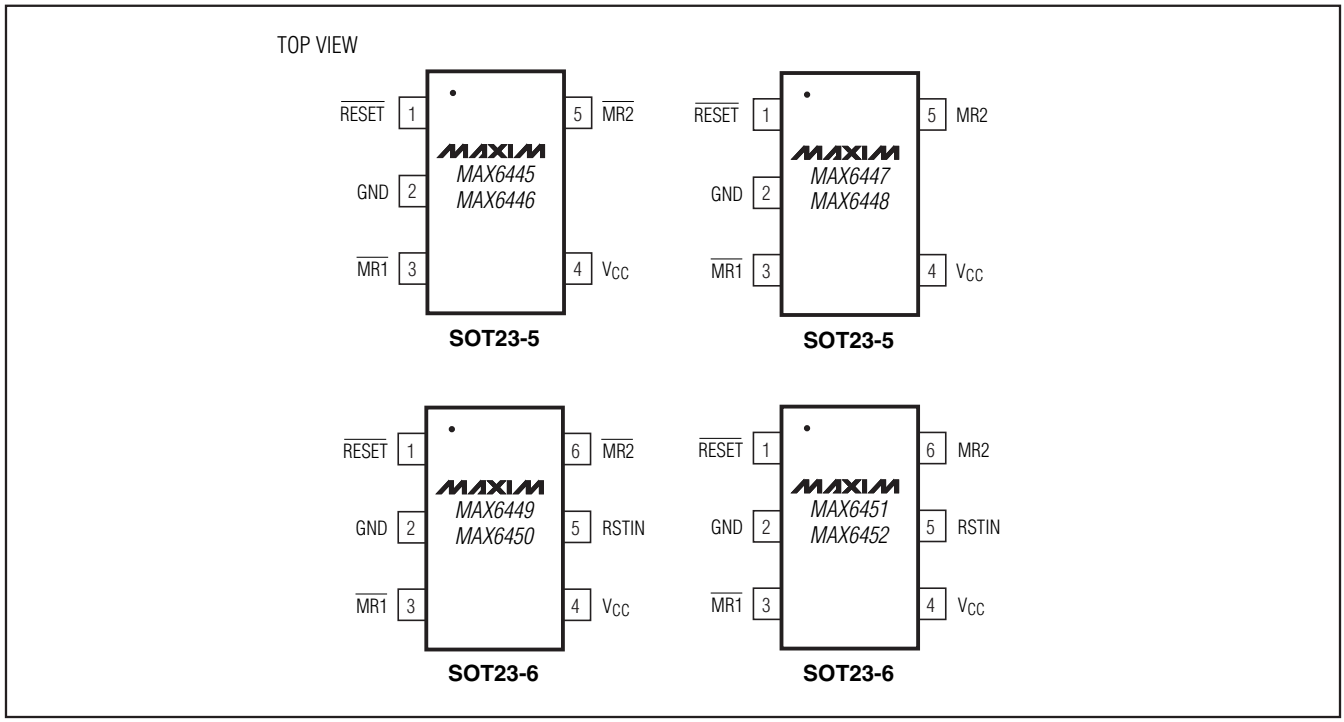
PART NO. SUFFIX (_)	MANUAL RESET SETUP PERIOD (s)
K	10.08
L	6.72
S	3.36
T	1.68

Table 3. Standard Versions Table

PART	TOP MARK	PART	TOP MARK
MAX6443US16L	KAFW	**MAX6448**UK16L	AEER
MAX6443US23L	KAFX	MAX6448UK23L	AEES
MAX6443US26L	KAFY	MAX6448UK26L	AEET
MAX6443US29L	KAFK	MAX6448UK29L	AEEU
MAX6443US46L	KAFZ	MAX6448UK46L	AEEV
MAX6444US16L	KAGA	**MAX6449**UT16L	ABEL
MAX6444US23L	KAGB	MAX6449UT23L	ABNP
MAX6444US26L	KAGC	MAX6449UT26L	ABNQ
MAX6444US29L	KAGD	MAX6449UT29L	ABNR
MAX6444US46L	KAFL	MAX6449UT46L	ABNS
MAX6445UK16L	AEEF	**MAX6450**UT16L	ABEM
MAX6445UK23L	AEEG	MAX6450UT23L	ABNX
MAX6445UK26L	AEEH	MAX6450UT26L	ABNY
MAX6445UK29L	AEEI	MAX6450UT29L	ABNZ
MAX6445UK46L	AEAO	MAX6450UT46L	ABOA
MAX6446UK16L	AEEN	**MAX6451**UT16L	ABNT
MAX6446UK23L	AEEO	MAX6451UT23L	ABEN
MAX6446UK26L	AEEP	MAX6451UT26L	ABNU
MAX6446UK29L	AEAP	MAX6451UT29L	ABNV
MAX6446UK46L	AEEQ	MAX6451UT46L	ABNW
MAX6447UK16L	AEEJ	**MAX6452**UT16L	ABOB
MAX6447UK23L	AEEK	MAX6452UT23L	ABOC
MAX6447UK26L	AEAQ	MAX6452UT26L	ABOD
MAX6447UK29L	AEEL	MAX6452UT29L	ABOE
MAX6447UK46L	AEEM	MAX6452UT46L	ABOF

µP Reset Circuits with Long Manual Reset Setup Period

Pin Configurations (continued)



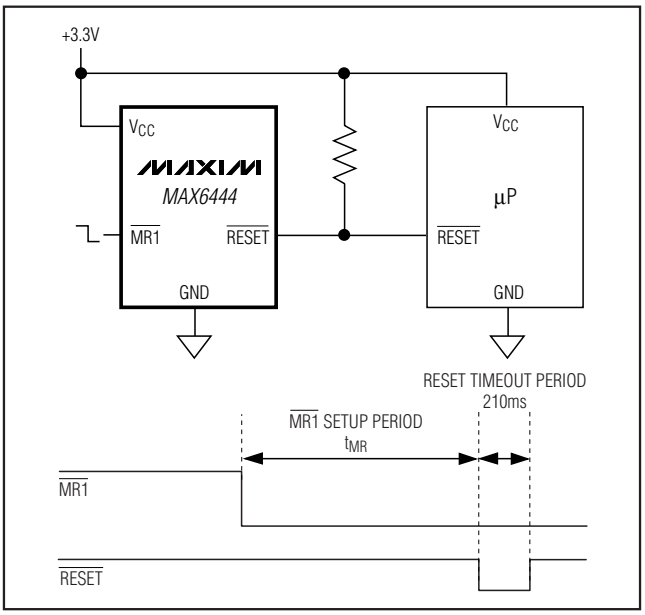
Ordering Information (continued)

PART	TEMP RANGE	PIN-PACKAGE
MAX6445UK_ _ _-T	-40°C to +85°C	5 SOT23
MAX6446UK_ _ _-T	-40°C to +85°C	5 SOT23
MAX6447UK_ _ _-T	-40°C to +85°C	5 SOT23
MAX6448UK_ _ _-T	-40°C to +85°C	5 SOT23
MAX6449UT_ _ _-T	-40°C to +85°C	6 SOT23
MAX6450UT_ _ _-T	-40°C to +85°C	6 SOT23
MAX6451UT_ _ _-T	-40°C to +85°C	6 SOT23
MAX6452UT_ _ _-T	-40°C to +85°C	6 SOT23

Note: *The first "_ _ " is a placeholder for the threshold voltage level of the devices. A desired threshold level is set by the two-number suffix found in Table 1. The third "_" is a placeholder for the manual reset setup period of the devices. A desired setup period is set by the letter suffix found in Table 2. All devices are available in tape-and-reel only. There is a 2500-piece minimum order increment for standard versions (Table 2). Sample stock is typically held on standard versions only. Nonstandard versions require a minimum order increment of 10,000 pieces. Contact factory for availability.*

Devices are available in both leaded and lead-free packaging. Specify lead-free by replacing "-T" with "+T" when ordering.

Typical Operating Circuit

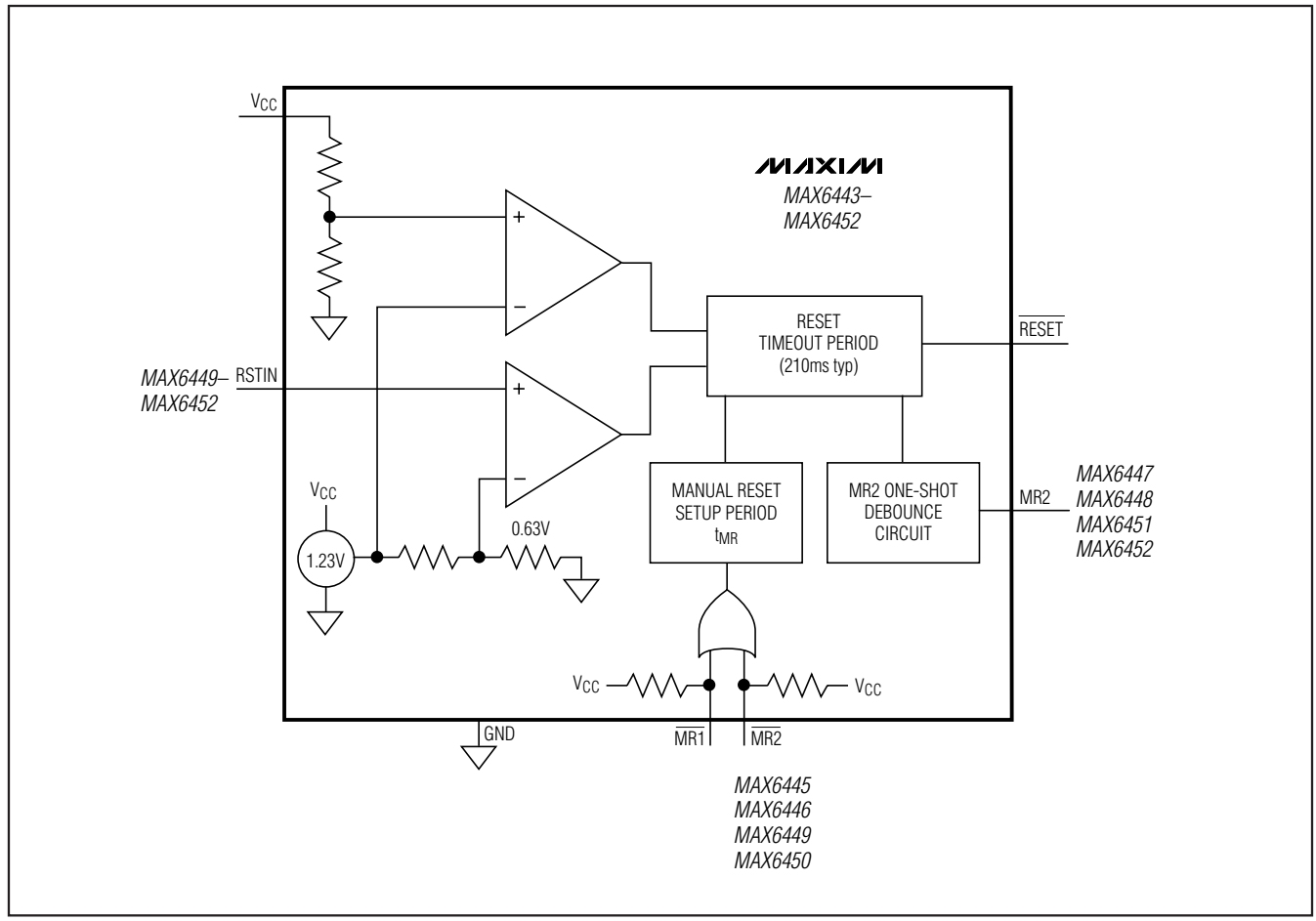


µP Reset Circuits with Long Manual Reset Setup Period

Selector Guide

PART	$\overline{MR1}$ EXT. SETUP	MR2 (NO SETUP)	$\overline{MR2}$ EXT. SETUP	RSTIN	PUSH-PULL $\overline{RESET}$	OPEN-DRAIN $\overline{RESET}$
MAX6443	✔	—	—	—	✔	—
MAX6444	✔	—	—	—	—	✔
MAX6445	✔	—	✔	—	✔	—
MAX6446	✔	—	✔	—	—	✔
MAX6447	✔	✔	—	—	✔	—
MAX6448	✔	✔	—	—	—	✔
MAX6449	✔	—	✔	✔	✔	—
MAX6450	✔	—	✔	✔	—	✔
MAX6451	✔	✔	—	✔	✔	—
MAX6452	✔	✔	—	✔	—	✔

Functional Diagram



µP Reset Circuits with Long Manual Reset Setup Period

Chip Information

PROCESS: BiCMOS

Package Information

For the latest package outline information and land patterns, go to **www.maxim-ic.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.
4 SOT143	U4-1	21-0052	90-0183
5 SOT23	U5-1	21-0057	90-0174
6 SOT23	U6-1	21-0058	90-0175

µP Reset Circuits with Long Manual Reset Setup Period

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/02	Initial release	—
3	6/10	Revised the *General Description*, *Features*, *Applications*, *Ordering Information*, *Absolute Maximum Ratings*, *Electrical Characteristics*, *Typical Operating Characteristics*, *Pin Description*, the *Manual Reset Input Options, Interrupt Before Reset*, and *Smart Card Insertion/Removal* sections, *Functional Diagram*, *Typical Operating Circuit*, *Selector Guide*, Figures 1, 6, and 7, as well as Tables 2 and 3 to add extended setup timeout specifications.	1, 2, 4, 5–12