General Description

The MAX6326/MAX6327/MAX6328 microprocessor (µP) supervisory circuits monitor the power supplies in µP and digital systems. These devices provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with 3Vpowered circuits.

These circuits perform a single function: they assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 100ms after V_{CC} has risen above the reset threshold. The only difference between the devices is their output. The MAX6326 (push/pull) and MAX6328 (opendrain) have an active-low RESET output. The MAX6327 has an active-high push/pull RESET. All three parts are guaranteed to be in the correct state for Vcc down to 1V. The reset comparator is designed to ignore fast transients on V_{CC}. Reset thresholds are factorytrimmable between 2.63V and 3.08V in approximately 100mV increments. Nine standard versions are available. Contact the factory for availability of nonstandard versions.

Ultra-low supply currents (1µA max) make the MAX6326/ MAX6327/MAX6328 ideal for use in portable equipment. All three come in 3-pin SOT23 packages.

	Applications
Computers	Intelligent Instruments
Controllers	Automotive
Critical µP and µC Power Monitoring	Portable/Battery-Powered Equipment

Selector Guide (standard versions*)

OUTPUT STAGE	NOMINAL V _{TH} (V)
Push/pull RESET	3.08
Push/pull RESET	2.93
Push/pull RESET	2.63
Push/pull RESET	3.08
Push/pull RESET	2.93
Push/pull RESET	2.63
Open-drain RESET	3.08
Open-drain RESET	2.93
Open-drain RESET	2.63
	OUTPUT STAGE Push/pull RESET Push/pull RESET Push/pull RESET Push/pull RESET Push/pull RESET Push/pull RESET Open-drain RESET Open-drain RESET Open-drain RESET

*Sample stock is generally held on all standard versions.

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Maxim Integrated Products 1

MAX6326/MAX6327/MAX6328

Features

- Ultra-Low 1µA (max) Supply Current
- Precision Monitoring of 3V and 3.3V Power-Supply Voltages
- RESET Thresholds Available from 2.63V to 3.08V in 100mV Increments
- Fully Specified over Temperature
- 100ms (min) Power-On Reset Pulse Width
- Low Cost
- Available in Three Versions: Push/Pull RESET, Push/Pull RESET, and Open-Drain RESET
- Guaranteed RESET Valid to Vcc = 1V
- Power-Supply Transient Immunity
- No External Components
- 3-Pin SOT23 Package
- Pin Compatible with MAX809/MAX810

Ordering Information

PART [†]	TEMP. RANGE	PIN-PACKAGE
MAX6326URT	-40°C to +85°C	3 SOT23-3
MAX6327URT	-40°C to +85°C	3 SOT23-3
MAX6328UR -T	-40°C to +85°C	3 SOT23-3

+The MAX6326/MAX6327/MAX6328 are available in factory-set V_{CC} reset thresholds from 2.63V to 3.08V in approximately 0.1V increments. Choose the desired reset-threshold suffix from Table 1, and insert it in the blank spaces following "UR" to complete the part number. There are nine standard versions with a required order increment of 2,500 pieces. Sample stocks are generally held on the standard versions only (see the Selector Guide). Required order increment is 10,000 pieces for nonstandard versions. Contact factory for availability. All devices available in tapeand-reel only.

Pin Configuration



For free samples & the latest literature: http://www.maxim-ic.com, or phone 1-800-998-8800. For small orders, phone 408-737-7600 ext. 3468.

ABSOLUTE MAXIMUM RATINGS

Terminal Voltage (with respect to GND)

Vcc	-0.3V to 6V
RESET, RESET (push/pull)	0.3V to (VCC + 0.3V)
RESET (open drain)	0.3V to 6.0V
Input Current (V _{CC})	
Output Current (RESET, RESET)	

Rate of Rise (V _{CC})	100V/µs
Continuous Power Dissipation $(T_A = +70^{\circ}C)$	
SOT23 (derate 4mW/°C above +70°C)	320mW
Operating Temperature Ranges	40°C to +85°C
Storage Temperature Range	65°C to +160°C
Lead Temperature (soldering, 10sec)	+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_{CC} = full range, $T_A = -40^{\circ}$ C to $+85^{\circ}$ C, unless otherwise noted. Typical values are at $T_A = +25^{\circ}$ C and V_{CC} = 3V.)

PARAMETER	SYMBOL	COND	ITIONS	MIN	TYP	MAX	UNITS
Vee Dange		$T_{A} = 0^{\circ}C \text{ to } + 70^{\circ}C$		1.0		5.5	
VCC Kaliye		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		1.2		5.5	v
Supply Current	Icc	$V_{CC} = 3.0V \text{ for } V_{TH} \le 2.93V,$ $V_{CC} = 3.2V \text{ for } V_{TH} > 2.93V, \text{ no load}$			0.5	1.0	μΑ
		$V_{CC} = 5.5V$, no load			1.0	1.5	
Reset Threshold	V±u	MAX632_URT (Table 1)	$T_A = +25^{\circ}C$	V _{TH} - 1.5%	V _{TH}	V _{TH} + 1.5%	- V
Reset meshold	• 11		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	V _{TH} - 2.5%	V_{TH}	V _{TH} + 2.5%	
Reset Threshold Tempco	$\Delta V_{TH}/^{\circ}C$				40		ppm/°C
V _{CC} to Reset Delay		$V_{CC} = V_{TH}$ to (V_{TH} - 100mV)			20		μs
Reset Active Timeout Period				100	185	280	ms
		I_{SINK} = 1.6mA, V_{CC} > 2.1V, reset asserted				0.3	
RESET Output Voltage (MAX6326/MAX6328)	V _{OL}	I _{SINK} = 100μA, reset asserted	$\begin{array}{l} V_{CC} > 1.0V, \\ T_A = 0^\circ C \text{ to } + 70^\circ C \end{array}$			0.4	V
			$\begin{array}{l} V_{CC} > 1.2V, \\ T_A = -40^\circ C \text{ to } +85^\circ C \end{array}$			0.4	
RESET Output Voltage	Vou	$I_{SOURCE} = 500\mu A$, $V_{CC} > 3.2V$, reset not asserted		0.8V _{CC}			
(MAX6326)	VОН	ISOURCE = 800µA, VCC >	4.5V, reset not asserted	Vcc - 1.5			
RESET Output Voltage (MAX6327)	Vон	ISOURCE = 500µA, V _{CC} > 2.1V, reset asserted		0.8V _{CC}			
		ISOURCE = 50µA, reset asserted	$V_{CC} > 1.0V,$ $T_A = 0^{\circ}C \text{ to } +70^{\circ}C$	0.8V _{CC}			V
			$V_{CC} > 1.2V,$ $T_{A} = -40^{\circ}C \text{ to } +85^{\circ}C$	0.8V _{CC}			
	Vol	I _{SINK} = 1.2mA, V _{CC} > 3.2V, reset not asserted				0.3	
		I_{SINK} = 3.2mA, V_{CC} > 4.5V, reset not asserted				0.4	



Typical Operating Characteristics

_Pin Description

PI	N		FUNCTION	
MAX6326/ MAX6328	MAX6327	NAME		
1	1	GND	Ground	
2	_	RESET	Active-Low Reset Output. $\overline{\text{RESET}}$ remains low while V_{CC} is below the reset threshold and for at least 100ms after V_{CC} rises above the reset threshold. $\overline{\text{RESET}}$ on the MAX6328 is open drain.	
_	2	RESET	Active-High Reset Output. RESET remains high while V_{CC} is below the reset threshold and for at least 100ms after V_{CC} rises above the reset threshold.	
3	3	V _{CC}	Supply Voltage (+3.0V or +3.3V)	

Applications Information

Interfacing to uPs with Bidirectional Reset Pins

Since the RESET output on the MAX6328 is open drain, this device interfaces easily with microprocessors (μ Ps) that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the μ P supervisor's RESET output directly to the microcontroller's (μ C's) 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 μ P 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 Vcc 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

_Chip Information

TRANSISTOR COUNT: 419

SUFFIX	T _A = +25°C			T _A = -40°C to +85°C		
	MIN	TYP (V _{TH})	MAX	MIN	MAX	
MAX632_UR31	3.034	3.080	3.126	3.003	3.150	
MAX632_UR30	2.955	3.000	3.045	2.925	3.075	
MAX632_UR29	2.886	2.930	2.974	2.857	3.000	
MAX632_UR28	2.758	2.800	2.842	2.730	2.870	
MAX632_UR27	2.660	2.700	2.741	2.633	2.768	
MAX632_UR26	2.591	2.630	2.669	2.564	2.696	

Table 1. Factory-Trimmed Reset Thresholds*

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

PART	TOP MARK	ORDER INCREMENT (k)
MAX6326UR31-T	FDAA	2.5
MAX6326UR30-T	FEAA	10
MAX6326UR29-T	FCAA	2.5
MAX6326UR28-T	FBAA	10
MAX6326UR27-T	FAAA	10
MAX6326UR26-T	EZAA	2.5
MAX6327UR31-T	FMAA	2.5
MAX6327UR30-T	FNAA	10
MAX6327UR29-T	FLAA	2.5

Table 2. Device-Marking Codes and Minimum-Order Increment

PART	TOP MARK	ORDER INCREMENT (k)
MAX6327UR28-T	FKAA	10
MAX6327UR27-T	FJAA	10
MAX6327UR26-T	FIAA	2.5
MAX6328UR31-T	FVAA	2.5
MAX6328UR30-T	FWAA	10
MAX6328UR29-T	FUAA	2.5
MAX6328UR28-T	FTAA	10
MAX6328UR27-T	FSAA	10
MAX6328UR26-T	FRAA	2.5

Tape-and-Reel Information





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6

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