

General Description

The MAX6315 low-power CMOS microprocessor (μ P) supervisory circuit is designed to monitor power supplies in μ P and digital systems. It provides excellent circuit reliability and low cost by eliminating external components and adjustments. The MAX6315 also provides a debounced manual reset input.

This device performs a single function: it asserts a reset signal whenever the V_{CC} supply voltage falls below a preset threshold or whenever manual reset is asserted. Reset remains asserted for an internally programmed interval (reset timeout period) after V_{CC} has risen above the reset threshold or manual reset is deasserted. The MAX6315's open-drain RESET output can be pulled up to a voltage higher than V_{CC} .

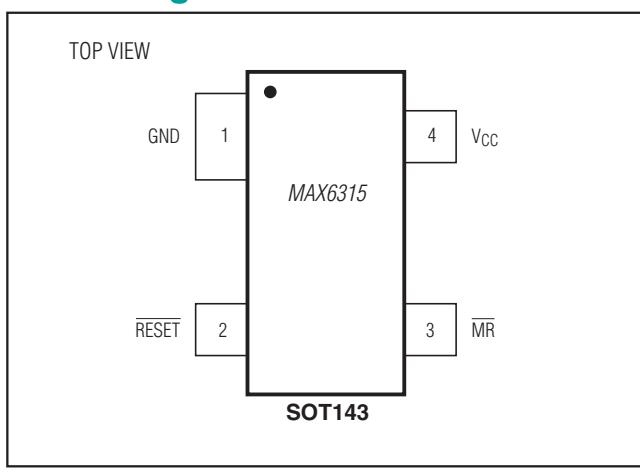
The MAX6315 comes with factory-trimmed reset threshold voltages in 100mV increments from 2.5V to 5V. Preset timeout periods of 1ms, 20ms, 140ms, and 1120ms (min) are also available. The device comes in a SOT143 package.

For microcontrollers (μ Cs) and μ Ps with bidirectional reset pins, see the MAX6314 data sheet.

Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical μ P and μ C Power Monitoring
- Portable/Battery-Powered Equipment

Pin Configuration



Benefits and Features

- Supervisory Circuit Ensures Reliable System Operation with Minimal Power Consumption
 - Precision, Factory-Set V_{CC} Reset Thresholds: 100mV Increments from 2.5V to 5V
 - Four Reset Timeout Periods Available: 1ms, 20ms, 140ms, or 1120ms (min)
 - Immune to Short V_{CC} Transients
 - Open-Drain RESET Output Can Exceed V_{CC}
 - Guaranteed Over Temperature
 - 5 μ A Supply Current
- Pin Compatible with MAX811
- Saves Space
 - 4-Pin SOT143 Package

Ordering Information

PART [†]	NOMINAL V_{TH} (V)	MIN t _{RP} (ms)	TOP MARK ^{††}
MAX6315US50D1-T	5.00	1	FX__

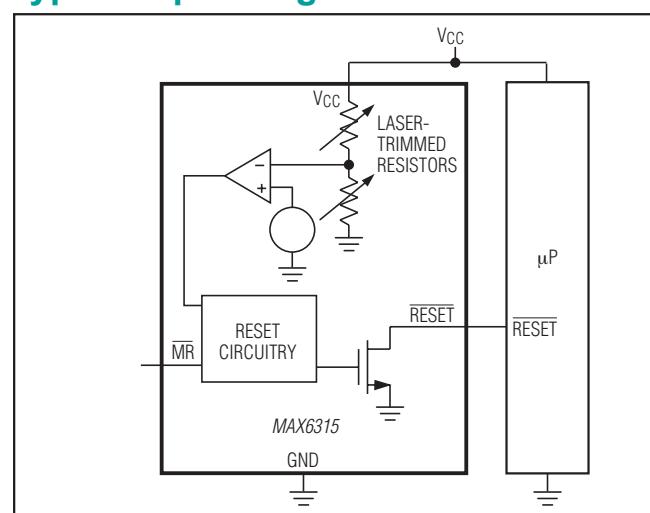
[†]The MAX6315 is available in a SOT143 package, -40°C to +125°C temperature range.

^{††}The first two letters in the package top mark identify the part, while the remaining two letters are the lot tracking code. Devices are available in both leaded and lead-free packaging. Specify lead(Pb)-free by replacing "-T" with "+T" when ordering.

Note: All devices available in tape-and-reel only. Contact factory for availability.

Ordering Information continued at end of data sheet.

Typical Operating Circuit



Absolute Maximum Ratings

V _{CC}	-0.3V to +6.0V
RESET	-0.3V to +6.0V
All Other Pins	-0.3V to (V _{CC} + 0.3V)
Input Current (V _{CC})	.20mA
Output Current (RESET)	.20mA
Rate of Rise (V _{CC})	100V/ μ s

Continuous Power Dissipation (T _A = +70°C)	
SOT143 (derate 4mW/ $^{\circ}$ C above +70°C)	320mW
Operating Temperature Range	-40°C to +125°C
Storage Temperature Range	-65°C to +160°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_{CC} = +2.5V to +5.5V, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Voltage Range	V _{CC}	T _A = -40°C to +85°C	1.0	5.5	5.5	V
V _{CC} Supply Current	I _{CC}	V _{CC} = 5.5V, no load (-40°C to +85°C)	5	12	12	μ A
		V _{CC} = 5.5V, no load (-40°C to +125°C)		15	15	
		V _{CC} = 3.6V, no load (-40°C to +85°C)	4	10	10	
		V _{CC} = 3.6V, no load (-40°C to +125°C)		12	12	
Reset Threshold (Note 1)	V _{TH}	T _A = +25°C	V _{TH} - 1.8%	V _{TH}	V _{TH} + 1.8%	V
		T _A = -40°C to +85°C	V _{TH} - 2.5%	V _{TH}	V _{TH} + 2.5%	
		T _A = -40°C to +125°C	V _{TH} - 3.5%	V _{TH}	V _{TH} + 3.5%	
Reset Threshold Tempco	$\Delta V_{TH}/^{\circ}$ C			60		ppm/ $^{\circ}$ C
V _{CC} to Reset Delay		V _{CC} = falling at 1mV/ μ s		35		μ s
Reset Timeout Period	t _{RP}	MAX6315US_D1-T (-40°C to +85°C)	1	1.4	2	ms
		MAX6315US_D1-T (-40°C to +125°C)	0.8		2.4	
		MAX6315US_D2-T (-40°C to +85°C)	20	28	40	
		MAX6315US_D2-T (-40°C to +125°C)	16		48	
		MAX6315US_D3-T (-40°C to +85°C)	140	200	280	
		MAX6315US_D3-T (-40°C to +125°C)	112		336	
		MAX6315US_D4-T (-40°C to +85°C)	1120	1570	2240	
		MAX6315US_D4-T (-40°C to +125°C)	896		2688	

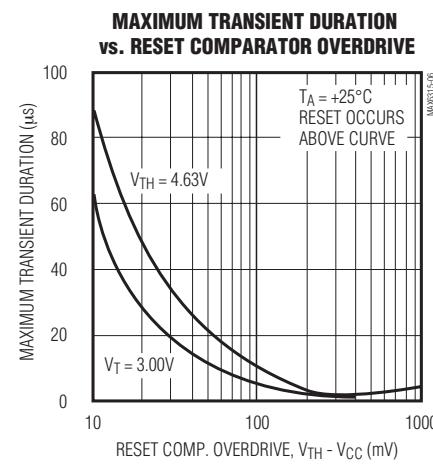
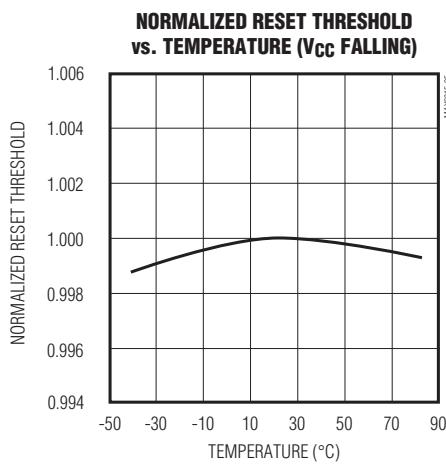
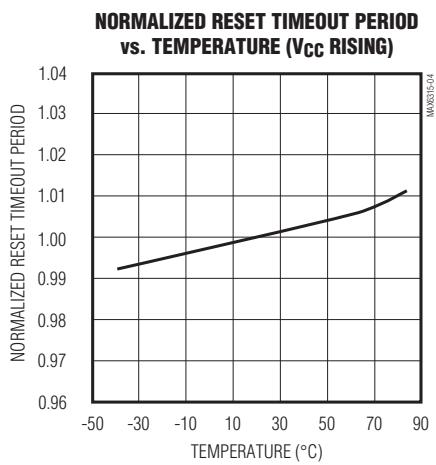
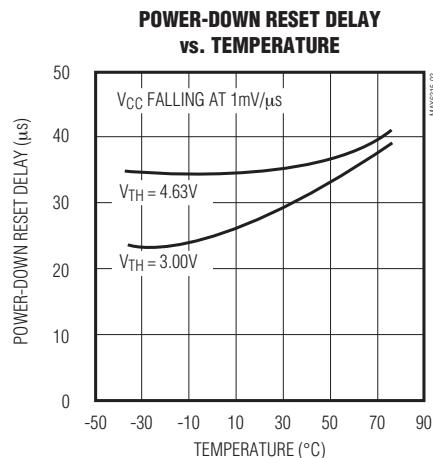
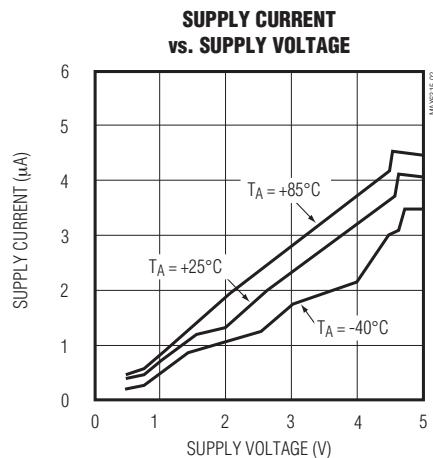
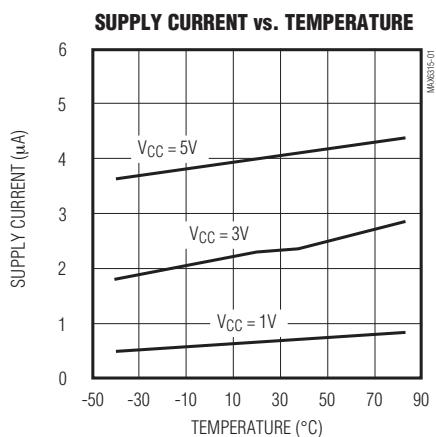
MANUAL RESET INPUT

MR Input Threshold	V _{IL}	V _{TH} > 4.0V	0.8	V		
	V _{IH}		2.4			
	V _{IL}	V _{TH} < 4.0V	0.3 x V _{CC}			
	V _{IH}		0.7 x V _{CC}			
MR Minimum Input Pulse			1	μ s		
MR Glitch Rejection			100	ns		
MR to Reset Delay			500	ns		
MR Pullup Resistance			32	63	100	k Ω
RESET Output Voltage	V _{OL}	V _{CC} > 4.25V, I _{SINK} = 3.2mA	0.4	V		
		V _{CC} > 2.5V, I _{SINK} = 1.2mA	0.3			
		V _{CC} > 1.2V, I _{SINK} = 0.5mA	0.3			
		V _{CC} > 1.0V, I _{SINK} = 80 μ A	0.3			
RESET Output Leakage Current		V _{CC} > V _{TH} , RESET deasserted	1	μ A		

Note 1: The MAX6315 monitors V_{CC} through an internal factory-trimmed voltage-divider that programs the nominal reset threshold. Factory-trimmed reset thresholds are available in 100mV increments from 2.5V to 5V (see the *Ordering Information*).

Typical Operating Characteristics

($T_A = +25^\circ\text{C}$, unless otherwise noted.)



Pin Description

PIN	NAME	FUNCTION
1	GND	Ground
2	<u>RESET</u>	Active-Low Open-Drain Output. Connect to an external pullup resistor. Can be pulled up to a voltage higher than V_{CC} , but less than 6V.
3	<u>MR</u>	Manual Reset Input. A logic-low on <u>MR</u> asserts reset. Reset remains asserted as long as <u>MR</u> is low, and for the reset timeout period (t_{RP}) after the reset conditions are terminated. Connect to V_{CC} if not used.
4	V_{CC}	Supply Voltage and Reset Threshold Monitor Input

Detailed Description

Reset Output

A microprocessor's (μ P's) reset input starts the μ P in a known state. The MAX6315 asserts reset to prevent code-execution errors during power-up, power-down, or brownout conditions. $\overline{\text{RESET}}$ is guaranteed to be a logic-low for $\text{V}_{\text{CC}} > 1\text{V}$ (see the *Electrical Characteristics* table). Once V_{CC} exceeds the reset threshold, the internal timer keeps $\overline{\text{RESET}}$ asserted for the reset timeout period (t_{RP}); after this interval $\overline{\text{RESET}}$ goes high. If a brownout condition occurs (monitored voltage dips below its programmed reset threshold), $\overline{\text{RESET}}$ goes low. Any time V_{CC} dips below the reset threshold, the internal timer resets to zero and $\overline{\text{RESET}}$ goes low. The internal timer starts when V_{CC} returns above the reset threshold, and $\overline{\text{RESET}}$ remains low for the reset timeout period.

The MAX6315's $\overline{\text{RESET}}$ output structure is a simple open-drain n-channel MOSFET switch. Connect a pullup resistor to any supply in the 0V to +6V range. Select a resistor value large enough to register a logic low when $\overline{\text{RESET}}$ is asserted (see the *Electrical Characteristics* table), and small enough to register a logic high while supplying all input current and leakage paths connected to the $\overline{\text{RESET}}$ line. A 10k Ω pullup is sufficient in most applications.

Often, the pullup connected to the MAX6315's $\overline{\text{RESET}}$ output will connect to the supply voltage 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 1). This is one useful feature of an open-drain output. Keep in mind that as the MAX6315's V_{CC} decreases below 1V, so does the IC's ability to sink current at $\overline{\text{RESET}}$. Finally, with any pullup, $\overline{\text{RESET}}$ will be pulled high as V_{CC} decays toward 0V. The voltage where this occurs depends on the pullup resistor value and the voltage to which it connects (see the *Electrical Characteristics* table).

Manual-Reset Input

Many μ P-based products require manual-reset capability, allowing the operator, a test technician, or external logic circuitry to initiate a reset. A logic low on $\overline{\text{MR}}$ asserts reset. Reset remains asserted while $\overline{\text{MR}}$ is low, and for the reset active timeout period after $\overline{\text{MR}}$ returns high.

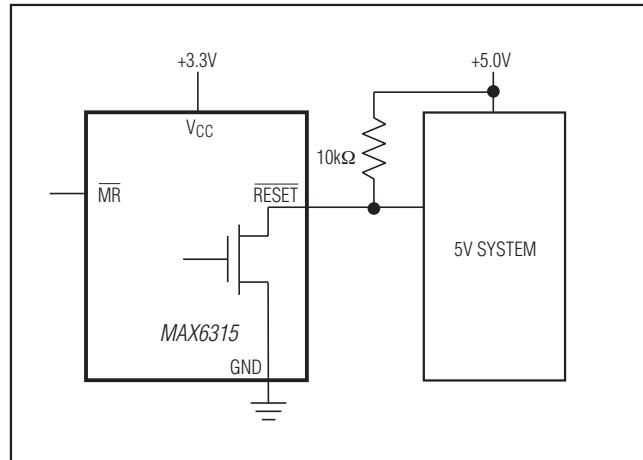


Figure 1. MAX6315 Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies

$\overline{\text{MR}}$ has an internal 63k Ω pullup resistor, so it can be left open if not used. Connect a normally open momentary switch from $\overline{\text{MR}}$ to GND to create a manual-reset function; external debounce circuitry is not required. If $\overline{\text{MR}}$ is driven from long cables or if the device is used in a noisy environment, connecting a 0.1 μF capacitor from $\overline{\text{MR}}$ to ground provides additional noise immunity.

Applications Information

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 transients (glitches). The *Typical Operating Characteristics* show the Maximum Transient Duration vs. Reset Comparator Overdrive, for which reset pulses are not generated. The graph was produced using negative-going pulses, starting at $\text{V}_{\text{RST max}}$ and ending below the programmed reset threshold by the magnitude indicated (reset threshold overdrive). The graph shows the maximum pulse width that a negative-going V_{CC} transient may typically have without causing a reset pulse to be issued. As the transient amplitude increases (i.e., goes farther below the reset threshold), the maximum allowable pulse width decreases. A 0.1 μF bypass capacitor mounted close to V_{CC} provides additional transient immunity.

Ordering Information (continued)

PART [†]	NOMINAL V _{TH} (V)	MIN t _{RP} (ms)	TOP MARK ^{††}
MAX6315US49D1-T	4.90	1	FY__
MAX6315US48D1-T	4.80	1	FZ__
MAX6315US47D1-T	4.70	1	GA__
MAX6315US46D1-T	4.63	1	GB__
MAX6315US45D1-T	4.50	1	GC__
MAX6315US44D1-T^{†††}	4.39	1	GD__
MAX6315US43D1-T	4.30	1	GE__
MAX6315US42D1-T	4.20	1	GF__
MAX6315US41D1-T	4.10	1	GG__
MAX6315US40D1-T	4.00	1	GH__
MAX6315US39D1-T	3.90	1	GI__
MAX6315US38D1-T	3.80	1	GJ__
MAX6315US37D1-T	3.70	1	GK__
MAX6315US36D1-T	3.60	1	GL__
MAX6315US35D1-T	3.50	1	GM__
MAX6315US34D1-T	3.40	1	GN__
MAX6315US33D1-T	3.30	1	GO__
MAX6315US32D1-T	3.20	1	GP__
MAX6315US31D1-T	3.08	1	GQ__
MAX6315US30D1-T	3.00	1	GR__
MAX6315US29D1-T	2.93	1	GS__
MAX6315US28D1-T	2.80	1	GT__
MAX6315US27D1-T	2.70	1	GU__
MAX6315US26D1-T^{†††}	2.63	1	GV__
MAX6315US25D1-T	2.50	1	GW__

PART [†]	NOMINAL V _{TH} (V)	MIN t _{RP} (ms)	TOP MARK ^{††}
MAX6315US50D2-T	5.00	20	GX__
MAX6315US49D2-T	4.90	20	GY__
MAX6315US48D2-T	4.80	20	GZ__
MAX6315US47D2-T	4.70	20	HA__
MAX6315US46D2-T	4.63	20	HB__
MAX6315US45D2-T	4.50	20	HC__
MAX6315US44D2-T^{†††}	4.39	20	HD__
MAX6315US43D2-T	4.30	20	HE__
MAX6315US42D2-T	4.20	20	HF__
MAX6315US41D2-T	4.10	20	HG__
MAX6315US40D2-T	4.00	20	HH__
MAX6315US39D2-T	3.90	20	HI__
MAX6315US38D2-T	3.80	20	HJ__
MAX6315US37D2-T	3.70	20	HK__
MAX6315US36D2-T	3.60	20	HL__
MAX6315US35D2-T	3.50	20	HM__
MAX6315US34D2-T	3.40	20	HN__
MAX6315US33D2-T	3.30	20	HO__
MAX6315US32D2-T	4.20	20	HP__
MAX6315US31D2-T	3.08	20	HQ__
MAX6315US30D2-T	3.00	20	HR__
MAX6315US29D2-T	2.93	20	HS__
MAX6315US28D2-T	2.80	20	HT__
MAX6315US27D2-T	2.70	20	HU__
MAX6315US26D2-T^{†††}	2.63	20	HV__
MAX6315US25D2-T	2.50	20	HW__

[†]The MAX6315 is available in a SOT143 package, -40°C to +125°C temperature range.

^{††}The first two letters in the package top mark identify the part, while the remaining two letters are the lot tracking code.

^{†††}Sample stocks generally held on the bolded products; also, the bolded products have 2,500 piece minimum-order quantities. Non-bolded products have 10,000 piece minimum-order quantities. Contact factory for details.

Devices are available in both leaded and lead(Pb)-free packaging. Specify lead-free by replacing “-T” with “+T” when ordering.

Note: All devices available in tape-and-reel only. Contact factory for availability.

Ordering Information (continued)

PART [†]	NOMINAL V _{TH} (V)	MIN t _{RP} (ms)	TOP MARK ^{††}
MAX6315US50D3-T	5.00	140	HX__
MAX6315US49D3-T	4.90	140	HY__
MAX6315US48D3-T	4.80	140	HZ__
MAX6315US47D3-T	4.70	140	IA__
MAX6315US46D3-T^{†††}	4.63	140	IB__
MAX6315US45D3-T	4.50	140	IC__
MAX6315US44D3-T^{†††}	4.39	140	ID__
MAX6315US43D3-T	4.30	140	IE__
MAX6315US42D3-T	4.20	140	IF__
MAX6315US41D3-T	4.10	140	IG__
MAX6315US40D3-T	4.00	140	IH__
MAX6315US39D3-T	3.90	140	II__
MAX6315US38D3-T	3.80	140	IJ__
MAX6315US37D3-T	3.70	140	IK__
MAX6315US36D3-T	3.60	140	IL__
MAX6315US35D3-T	3.50	140	IM__
MAX6315US34D3-T	3.40	140	IN__
MAX6315US33D3-T	3.30	140	IO__
MAX6315US32D3-T	3.20	140	IP__
MAX6315US31D3-T^{†††}	3.08	140	IQ__
MAX6315US30D3-T	3.00	140	IR__
MAX6315US29D3-T^{†††}	2.93	140	IS__
MAX6315US28D3-T	2.80	140	IT__
MAX6315US27D3-T	2.70	140	IU__
MAX6315US26D3-T^{†††}	2.63	140	IV__
MAX6315US25D3-T	2.50	140	IW__

[†]The MAX6315 is available in a SOT143 package, -40°C to +125°C temperature range.

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Chip Information

TRANSISTOR COUNT: 519

PART [†]	NOMINAL V _{TH} (V)	MIN t _{RP} (ms)	TOP MARK ^{††}
MAX6315US50D4-T	5.00	1120	IX__
MAX6315US49D4-T	4.90	1120	IY__
MAX6315US48D4-T	4.80	1120	IZ__
MAX6315US47D4-T	4.70	1120	JA__
MAX6315US46D4-T	4.63	1120	JB__
MAX6315US45D4-T	4.50	1120	JC__
MAX6315US44D4-T^{†††}	4.39	1120	JD__
MAX6315US43D4-T	4.30	1120	JE__
MAX6315US42D4-T	4.20	1120	JF__
MAX6315US41D4-T	4.10	1120	JG__
MAX6315US40D4-T	4.00	1120	JH__
MAX6315US39D4-T	3.90	1120	JI__
MAX6315US38D4-T	3.80	1120	JJ__
MAX6315US37D4-T	3.70	1120	JK__
MAX6315US36D4-T	3.60	1120	JL__
MAX6315US35D4-T	3.50	1120	JM__
MAX6315US34D4-T	3.40	1120	JN__
MAX6315US33D4-T	3.30	1120	JO__
MAX6315US32D4-T	3.20	1120	JP__
MAX6315US31D4-T	3.08	1120	JQ__
MAX6315US30D4-T	3.00	1120	JR__
MAX6315US29D4-T	2.93	1120	JS__
MAX6315US28D4-T	2.80	1120	JT__
MAX6315US27D4-T	2.70	1120	JU__
MAX6315US26D4-T^{†††}	2.63	1120	JV__
MAX6315US25D4-T	2.50	1120	JW__

Package Information

For the latest package outline information and land patterns (footprints), go to 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.
4 SOT35	U4+1	21-0052	90-0183

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
4	4/15	Updated <i>Benefits and Features</i> and <i>Package Information</i> , added <i>Revision History</i>	1, 7

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.

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