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DATA SHEET

MAX6326/MAX6327/MAX6328/ MAX6346/MAX6347/MAX6348

3-pin ultra-low power SC70/SOT microprocessor reset circuit

Product data
Supersedes data of 2003 Apr 30

2003 Aug 05

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3-pin ultra-low power SC70/SOT microprocessor reset circuit

MAX632x/MAX634x

DESCRIPTION

The MAX6326/MAX6327//MAX6328/MAX6346/MAX6347/MAX6348 microprocessor (µP) reset circuits monitor power supplies in µP and digital systems. These devices eliminate external components and adjustments while providing excellent circuit reliability and low cost solution. They are used to monitor 2.5 V, 3 V, 3.3 V and 5 V power supplies.

They assert a reset signal when the V_{DD} supply voltage falls below a preset reset threshold voltage. The reset signal remains asserted for at least 100 ms after the V_{DD} rises above the reset threshold. The reset threshold are factory trimmable from 2.2 V to 4.63 V in approximately 100 mV increments. All these parts are guaranteed to assert a reset for V_{DD} down to 1 V. They have excellent immunity to fast transients on V_{DD}.

The devices vary in their output configuration. The MAX6326/MAX6346 have push-pull, active-LOW reset output; while the MAX6328/MAX6348 have open drain, active-LOW reset output. The MAX6327/MAX6347 have push-pull, active HIGH reset output.

The lower threshold MAX6326/MAX6327/MAX6328 have ultra-low supply current of typically 0.5 µA making them ideal for battery powered applications. All six devices are available in both the 3-pin SOT23 and SC70 packages.

FEATURES

- Ultra-low 1 µA (max) supply current
- Precision monitoring of 2.5 V, 3 V, 3.3 V, and 5 V power supply voltages
- Reset thresholds available from 2.2 V to 4.63 V
- Fully specified over temperature –40 °C to +85 °C
- 100 ms (min) power-on-reset delay time
- Power transient immunity
- Available in three versions: Push-Pull $\overline{\text{RESET}}$, Push-Pull RESET, and Open-Drain $\overline{\text{RESET}}$
- Pin compatible with MAX803/MAX809/MAX810
- Small, low cost, 3-pin SC70/SOT23 packages

APPLICATIONS

- Computers and controllers
- Power monitoring
- Portable/battery powered equipment
- Industrial equipment

SIMPLIFIED SYSTEM DIAGRAM

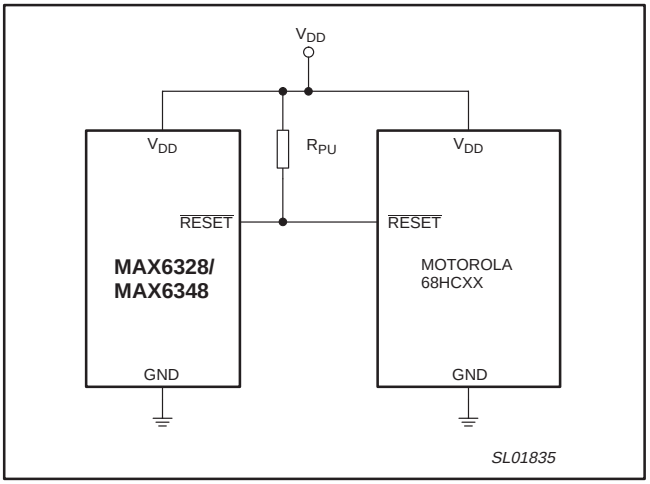


Figure 1. MAX6328/6348 simplified system diagram.

ORDERING INFORMATION

MAX632x

TYPE NUMBER	PACKAGE		TEMPERATURE RANGE	RESET	
	NAME	DESCRIPTION			
MAX6326-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	push-pull	Active-LOW reset output
MAX6326-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	push-pull	Active-LOW reset output
MAX6327-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	push-pull	Active-HIGH reset output
MAX6327-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	push-pull	Active-HIGH reset output
MAX6328-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	open-drain	Active-LOW reset output
MAX6328-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	open-drain	Active-LOW reset output

NOTE:

The device has five standard voltage output options, indicated by the XX on the “Type Number”.
Additional voltage output options may be available (see Table 1).

XX (type number suffix)	Voltage (Typical)
22	2.2 V
23	2.3 V
26	2.6 V
29	2.9 V
31	3.1 V

MAX634x

TYPE NUMBER	PACKAGE		TEMPERATURE RANGE	RESET	
	NAME	DESCRIPTION			
MAX6346-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	push-pull	Active-LOW reset output
MAX6346-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	push-pull	Active-LOW reset output
MAX6347-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	push-pull	Active-HIGH reset output
MAX6347-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	push-pull	Active-HIGH reset output
MAX6348-XXD	SOT23-3	Plastic small outline package; 3 leads; body width 1.5 mm	–40 °C to +85 °C	open-drain	Active-LOW reset output
MAX6348-XXW	SC70-3	Plastic small outline package; 3 leads; body width 1.15 mm	–40 °C to +85 °C	open-drain	Active-LOW reset output

NOTE:

The device has two standard voltage output options, indicated by the XX on the “Type Number”.
Additional voltage output options may be available (see Table 1).

XX (type number suffix)	Voltage (Typical)
44	4.4 V
46	4.6 V

PINNING

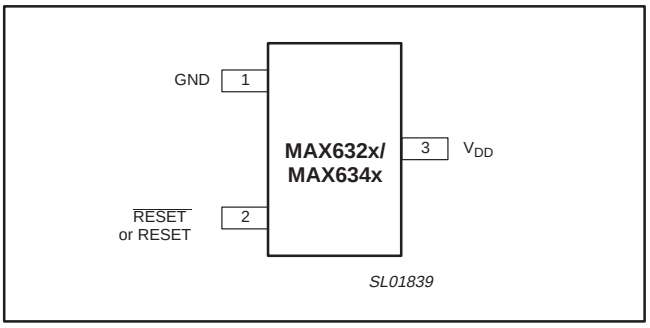


Figure 2. Pin configuration.

MAX6326/MAX6346, MAX6328/MAX6348 pin description

PIN	SYMBOL	DESCRIPTION
1	GND	Device ground
2	$\overline{\text{RESET}}$	Active-LOW Reset Output. $\overline{\text{RESET}}$ remains LOW while V_{DD} is below the reset threshold and for a reset delay time of at least 100 ms after V_{DD} rises above the reset threshold. MAX6328/MAX6348 have open-drain output and the MAX6326/MAX6346 are Push-Pull output.
3	V_{DD}	Positive supply voltage

MAX6327/MAX6347 pin description

PIN	SYMBOL	DESCRIPTION
1	GND	Device ground
2	RESET	Active-HIGH Reset Output. RESET remains high while V_{DD} is below the reset threshold and remains HIGH for at least 100 ms after V_{DD} rises above the reset threshold.
3	V_{DD}	Positive supply voltage

MAXIMUM RATINGS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DD}	Supply voltage		–0.3	6.0	V
$V_{i(\overline{RESET})}$	Input voltage at $\overline{\text{RESET}}$ pin (MAX6326/MAX6346, MAX6328/MAX6348)		–0.3	6.0	V
$I_{i(VDD)}$	Input current at V_{DD} pin		–	20	mA
I_o	Output current ($\overline{\text{RESET}}$ pin)		–	20	mA
P	Power dissipation	3-pin SOT23 (derate 4 mW/°C above T_{amb} = 70 °C)	–	320	mW
		3-pin SC70 (derate 2.7 mW/°C above T_{amb} = 70 °C)	–	174	
T_{opr}	Operating temperature		–40	+85	°C
T_{stg}	Storage temperature		–65	+150	°C

ELECTRICAL CHARACTERISTICS

V_{DD} = full range (T_{amb} = –40 °C to +85 °C) unless otherwise noted; typical values are at T_{amb} = +25 °C, and V_{DD} = 3 V (Note 1).

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
	V_{DD} range	T_{amb} = 0 °C to +70 °C	1.0		5.5	V
		T_{amb} = –40 °C to +85 °C	1.2		5.5	V
I_{DD}	Supply current	MAX632x only, V_{DD} = 3.0 V for $V_{th} \leq$ 2.93 V, V_{DD} = 3.2 V for V_{th} > 2.93 V, no load	–	0.5	1.0	µA
		V_{DD} = 5.5 V, no load	–	1.0	1.75	µA
V_{th}	Reset threshold (Table 1)	T_{amb} = +25 °C	V_{th} – 1.5%	V_{th}	V_{th} + 1.5%	V
		T_{amb} = –40 °C to +85 °C	V_{th} – 2.5%	V_{th}	V_{th} + 2.5%	V
ΔV_{th}/°C	Reset threshold temperature coefficient		–	40	–	ppm/°C
t_{RD}	V_{CC} to Reset release delay	V_{DD} = V_{th} to (V_{th} – 100 mV)	–	20	–	µs
t_{RP}	Reset active timeout period		100	185	280	ms
$V_{OL(\overline{RESET})}$	$\overline{RESET}$ output voltage (reset asserted)	I_{SINK} = 1.6 mA, V_{DD} > 2.1 V	–		0.3	V
		I_{SINK} = 100 mA, $V_{DD} \geq$ 1.2 V	–		0.4	V
$V_{OH(\overline{RESET})}$	$\overline{RESET}$ output voltage (reset released)	I_{SOURCE} = 500 mA, V_{DD} = 3.2 V, MAX6326 only	0.8 × V_{CC}		–	V
		I_{SOURCE} = 800 µA, V_{DD} = 4.5 V, $V_{th} \leq$ 4.38 V	0.8 × V_{CC}		–	V
		I_{SOURCE} = 800 µA, V_{DD} = $V_{th(MAX)}$, $V_{th} \geq$ 4.5 V	0.8 × V_{CC}		–	V
$V_{OH(RESET)}$	RESET output voltage (reset asserted) (MAX6327/MAX6347)	I_{SOURCE} = 500 µA, $V_{DD} \geq$ 2.1 V	0.8 × V_{CC}		–	V
		I_{SOURCE} = 50 µA, $V_{DD} \geq$ 1.2 V	0.8 × V_{CC}		–	V
$V_{OL(RESET)}$	RESET output voltage (reset released) (MAX6327/MAX6347)	I_{SINK} = 1.2 mA, $V_{DD} \geq$ 3.2 V (MAX6327 only)	–		0.3	V
		I_{SINK} = 3.2 mA, $V_{DD} \geq$ 3.2 V, $V_{th} \leq$ 4.38 V	–		0.4	V
		I_{SINK} = 3.2 mA, V_{DD} = $V_{th(MAX)}$, $V_{th} \geq$ 4.5 V	–		0.4	V
V_{hys}	RESET threshold hysteresis	MAX6326/MAX6327/MAX6328	–	6.3	–	mV
		MAX6346/MAX6347/MAX6348	–	9.5	–	mV
	Open-drain $\overline{RESET}$ output leakage current		–		0.1	µA

NOTE:

1. Over-temperature limits are guaranteed by design and are not production tested.

Table 1. Factory-trimmed Reset Thresholds (Note 1)

PART	SUFFIX (XX)	RESET THRESHOLD VOLTAGE, V_{th} (V)				
		T_{amb} = +25 °C			T_{amb} = –40 °C to +85 °C	
		MIN	TYP	MAX	MIN	MAX
MAX632x-XX	22	2.167	2.200	2.233	2.145	2.250
MAX632x-XX	23	2.285	2.320	2.355	2.262	2.375
MAX632x-XX	24 (Note 2)	2.364	2.400	2.436	2.340	2.460
MAX632x-XX	25 (Note 2)	2.462	2.500	2.537	2.437	2.562
MAX632x-XX	26	2.591	2.630	2.669	2.564	2.696
MAX632x-XX	27 (Note 2)	2.660	2.700	2.741	2.633	2.768
MAX632x-XX	28 (Note 2)	2.758	2.800	2.842	2.730	2.870
MAX632x-XX	29	2.886	2.930	2.974	2.857	3.000
MAX632x-XX	30 (Note 2)	2.955	3.000	3.045	2.925	3.075
MAX632x-XX	31	3.034	3.080	3.126	3.003	3.150
MAX634x-XX	33 (Note 2)	3.250	3.300	3.350	3.217	3.383
MAX634x-XX	34 (Note 2)	3.349	3.400	3.451	3.315	3.485
MAX634x-XX	35 (Note 2)	3.447	3.500	3.552	3.412	3.587
MAX634x-XX	36 (Note 2)	3.546	3.600	3.654	3.510	3.690
MAX634x-XX	37 (Note 2)	3.644	3.700	3.755	3.607	3.792
MAX634x-XX	38 (Note 2)	3.743	3.800	3.857	3.705	3.895
MAX634x-XX	39 (Note 2)	3.841	3.900	3.958	3.802	3.997
MAX634x-XX	40 (Note 2)	3.940	4.000	4.060	3.900	4.100
MAX634x-XX	41 (Note 2)	4.038	4.100	4.161	3.997	4.202
MAX634x-XX	42 (Note 2)	4.137	4.200	4.263	4.095	4.305
MAX634x-XX	43 (Note 2)	4.235	4.300	4.364	4.192	4.407
MAX634x-XX	44	4.314	4.380	4.446	4.270	4.489
MAX634x-XX	45 (Note 2)	4.432	4.500	4.567	4.387	4.612
MAX634x-XX	46	4.560	4.630	4.699	4.514	4.746

NOTES:
1. Factory-trimmed reset thresholds are available in 100 mV increments with ±1.5% tolerance at room temperature.
2. Consult factory for availability.

TYPICAL PERFORMANCE CURVES

MAX6326

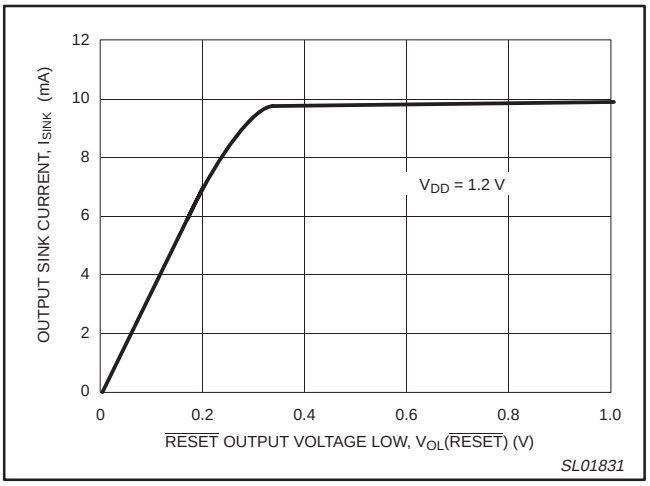


Figure 3. Output sink current vs. $\overline{RESET}$ output voltage low.

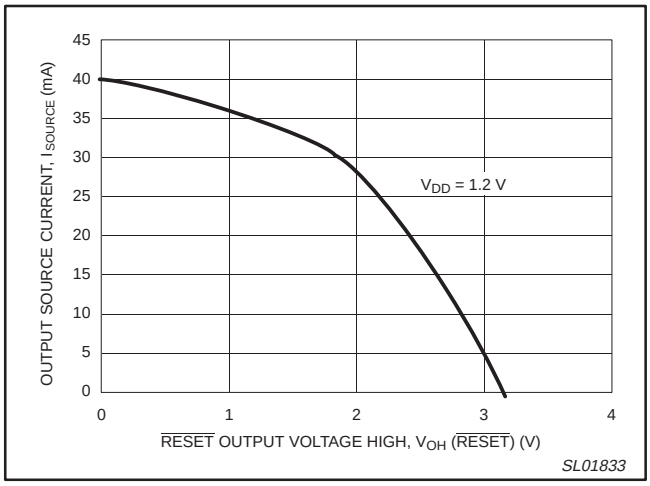


Figure 5. Output sink current vs. $\overline{RESET}$ output voltage high.

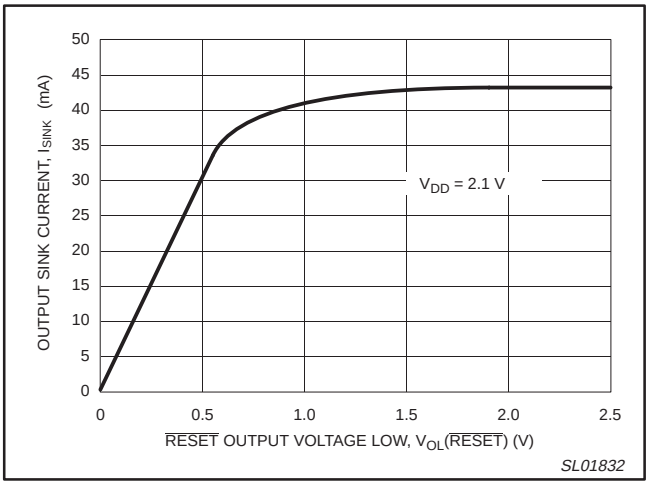


Figure 4. Output sink current vs. $\overline{RESET}$ output voltage low.

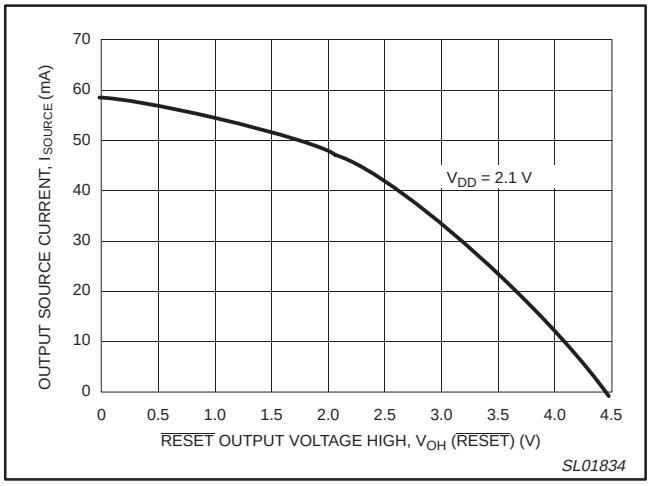


Figure 6. Output sink current vs. $\overline{RESET}$ output voltage high.

APPLICATION INFORMATION

Interfacing to µPs with Bidirectional Reset Pins

The MAX6328/MAX6348 RESET output is open drain and are easily interfaced with microprocessors which have bidirectional reset pins, such as the Motorola 68HC11. Directly connecting the MAX6328/MAX6348 RESET output to the µPs reset input and providing a pull-up resistor to V_{DD} allows either device to independently assert reset (Figure 7).

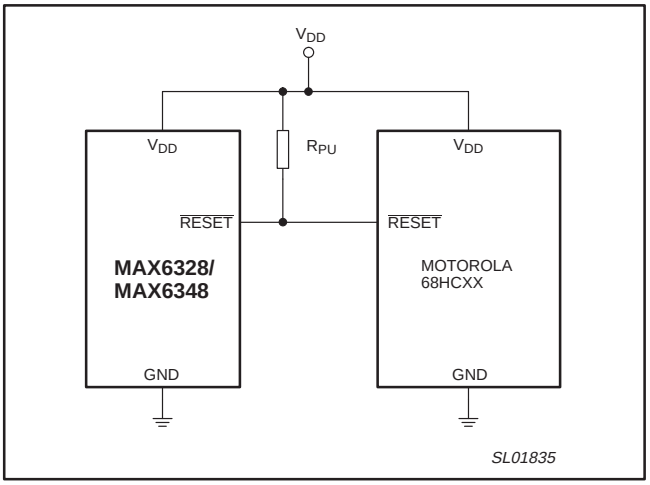


Figure 7. Interfacing to µPs with Bidirectional Reset Pins

Negative-going V_{DD} transients

The MAX6326-MAX6348 Series resets are relatively immune to short duration, negative-going V_{DD} transients or power glitches. This capability greatly reduces false resets with short-duration pulses.

Figure 8, Maximum Transient Duration versus Reset Comparator Overdrive, shows the maximum transient condition for which reset signal are not generated. The graph shows the maximum pulse width that a negative-going transient may have before it will generate a reset signal. Note: as the amplitude of the transient increases, the maximum allowable transient pulse width decreases.

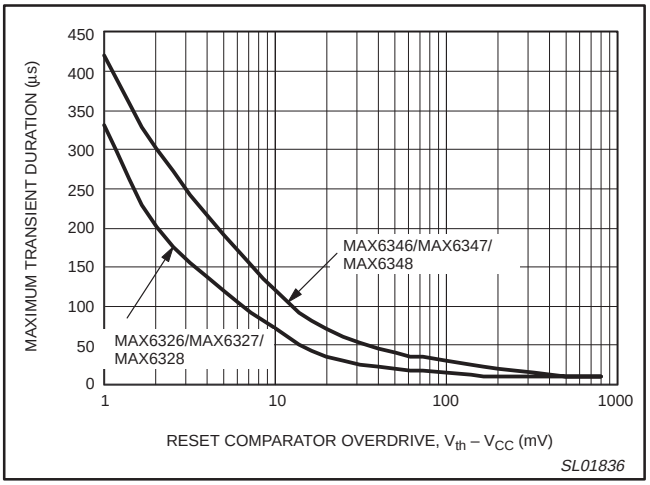
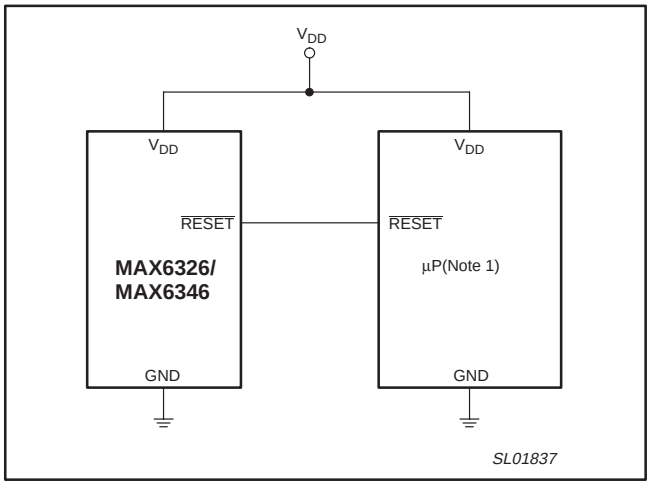


Figure 8. Maximum transient duration without causing a reset pulse versus reset comparator overdrive.

System configurations with various µPs

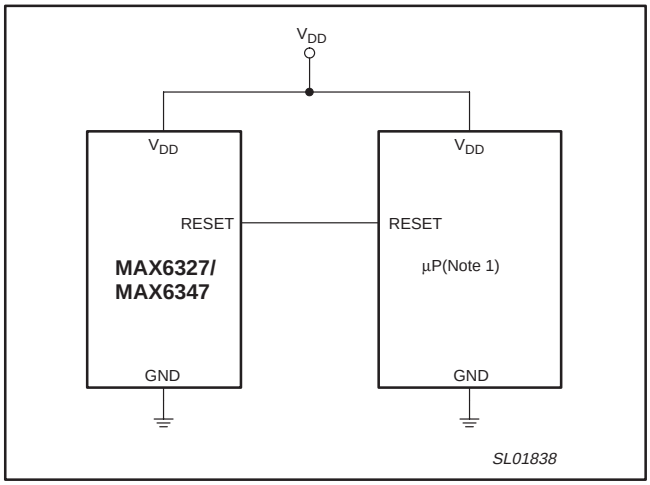
The MAX326-MAX6348 Series resets provide a system solution for various µPs. Figures 9 and 10, respectively, reference the Philips µPs which are compatible with the MAX6326/MAX6346 and MAX6327/MAX6347 system resets.



NOTE:

1. Philips microprocessors with active-LOW resets: All 16-bit devices from XA-family (XA-Cxx, XA-Gxx, XA-Sxx, XA-Hxx), all LPC7xx devices (P87LPC760/761/762/767/768/769, P80C591/P87C591 (with on-chip CAN controller).

Figure 9. µP System Diagram using MAX6326/MAX6328 Push-Pull, Active-LOW Resets



NOTE:

1. Philips microprocessors with active-HIGH resets : 8xC5x, 8xC3x, 8xC5xX2, 8xC3xX2, 8xC51Fx, 8xC51Rx+, 89C51Rx2, 89C66x, 8xC554, 8xC552, etc.

Figure 10. µP System Diagram using MAX6327/MAX6347 Push-Pull, Active-HIGH Resets

PACKING METHOD

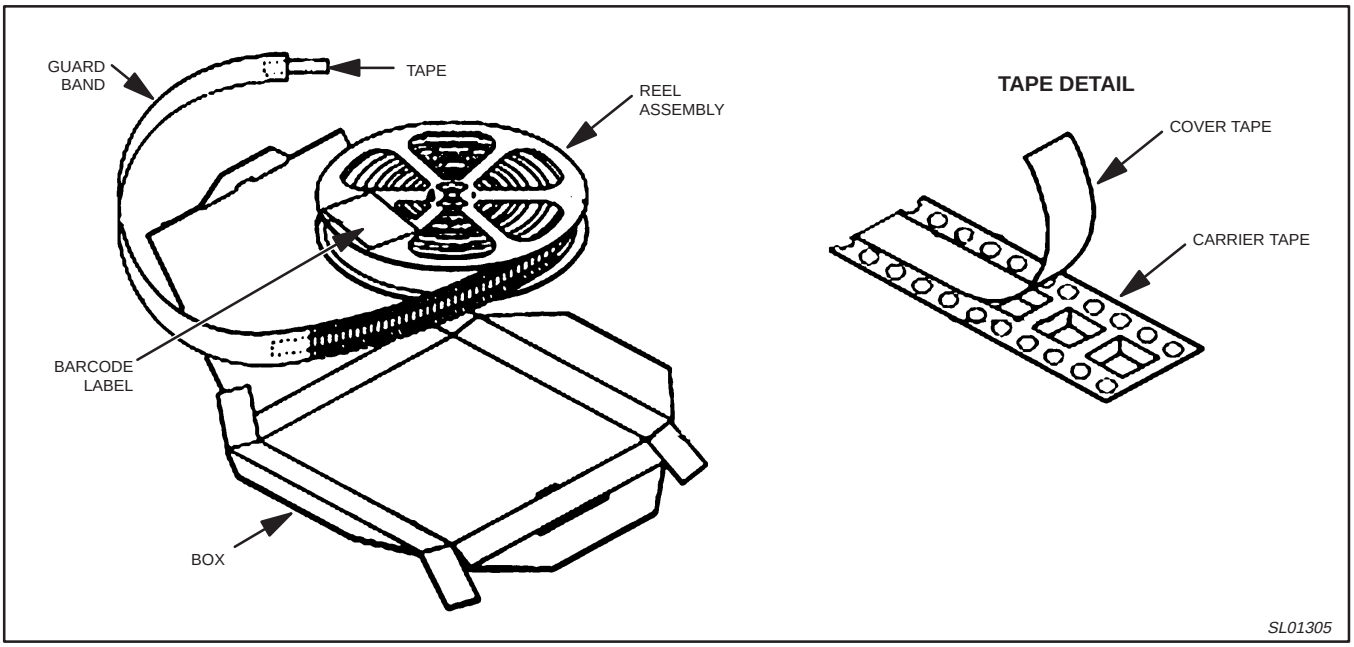
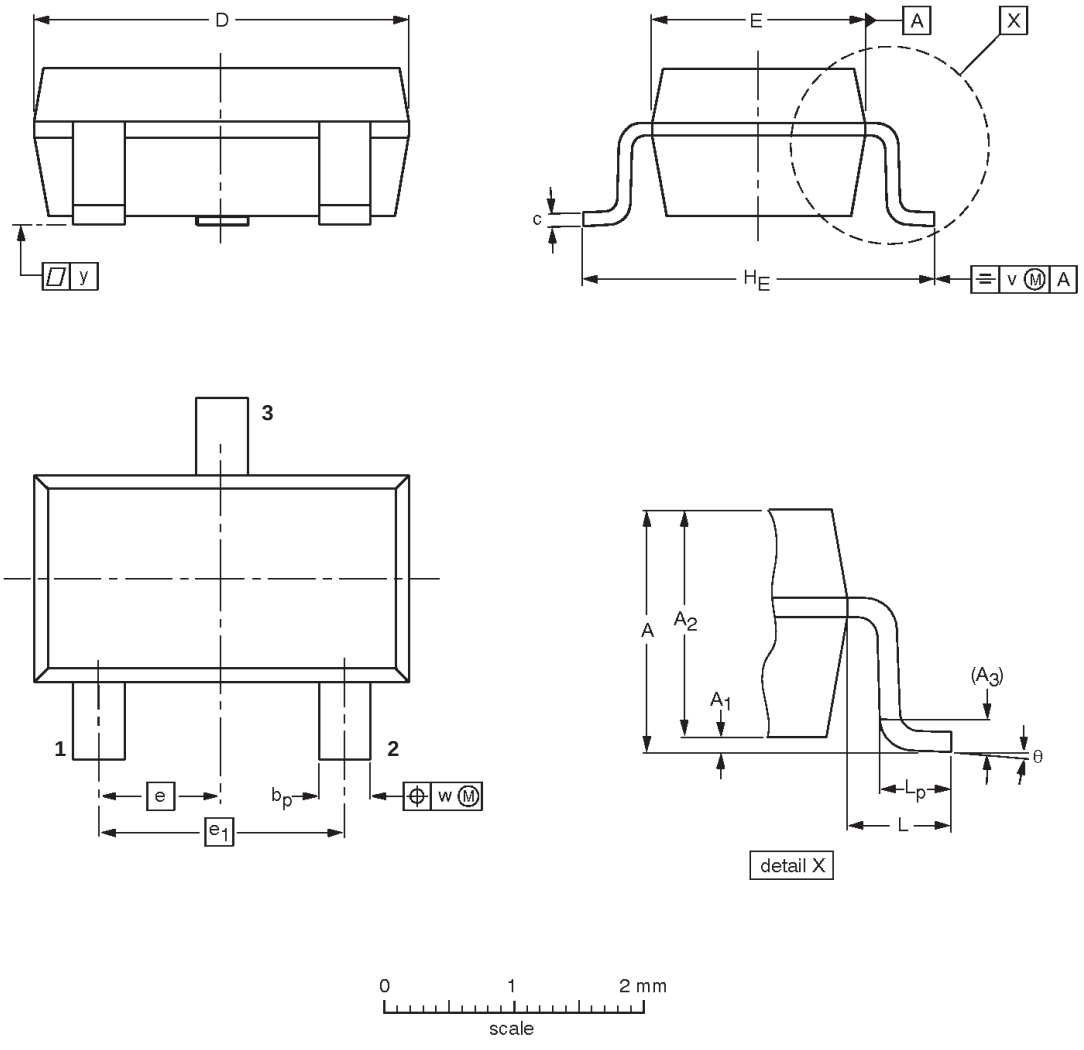


Figure 11. Tape and reel packing method.

SOT23-3: plastic small outline package; 3 leads; body width 1.5 mm



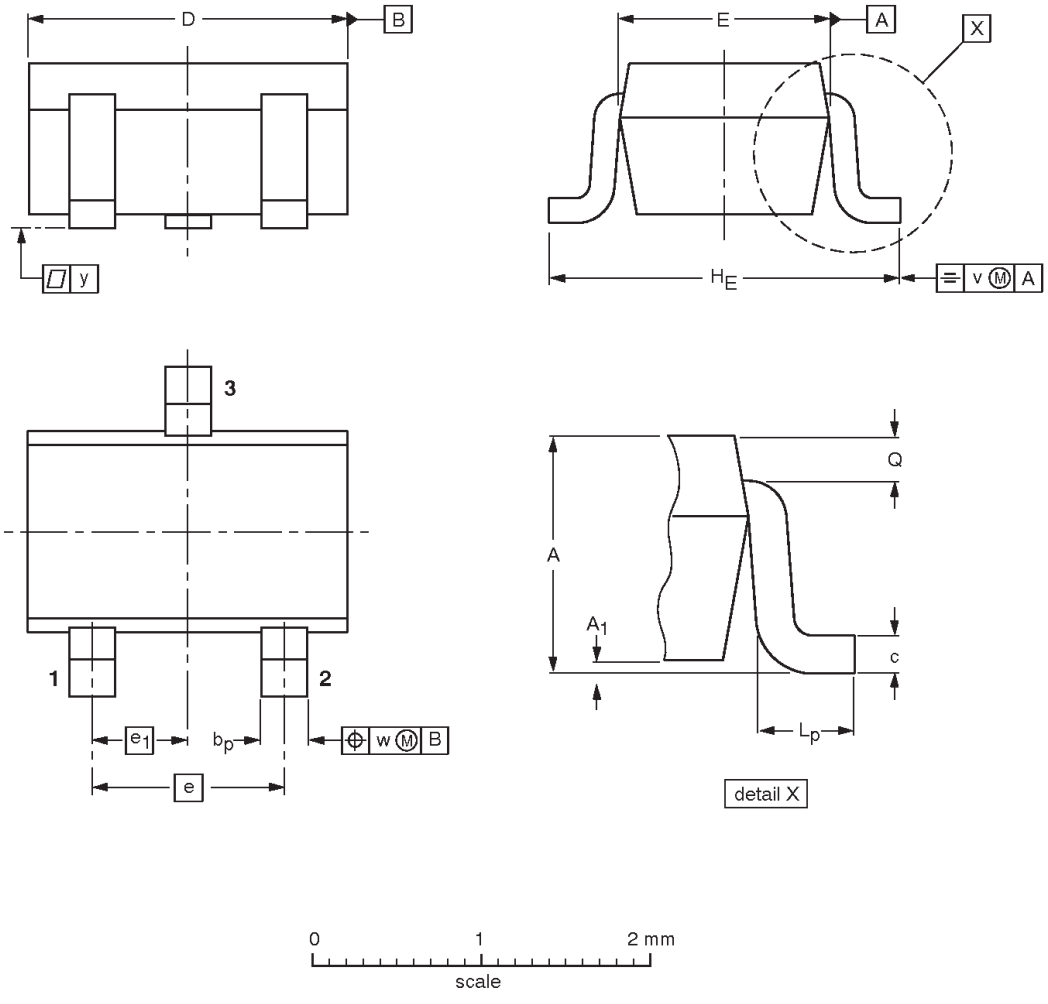
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p			y		θ
mm	1.35	0.15 0.05	1.2 1.0	0.025	0.55 0.41	0.22 0.08	3.00 2.70	1.70 1.50	0.95	1.90	3.00 2.60	0.60	0.55 0.35			0.1		8^o 0^o

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

SC70-3: plastic small outline package; 3 leads; body width 1.15 mm



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.0 0.8	0.1	0.4 0.25	0.225 0.10	2.1 1.9	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.4 0.1	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
			SC-70			

REVISION HISTORY

Rev	Date	Description
_2	20030805	**Product data (9397 750 11124). ECN 853-2423 30165 dated 30 July 2003. Supersedes data of 30 Arpil 2003 (9397 750 10686).** Modifications: • Table 1 on page 6, last row of table (suffix 46): V_{th} at T_{amb} = –40 to +85 °C: change from 4.3514 to 4.514 V.
_1	20030430	**Product data (9397 750 10686). ECN 853-2423 29823 of 15 April 2003.**

Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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