0\$; &6(7\$QD0RJ 'HYLFHV,QF 0D[LP,QWHJUDWHG,&&203\$5\$75 : 92/75() 62,&

ABSOLUTE MAXIMUM RATINGS

V+ to V-, V+ to GND, GND to V-....-0.3V, +12V Inputs Current: IN +. IN -. HYST......20mA

ounom.	·····	
Voltage:	IN_+, IN, HYST	(V+ + 0.3V) to (V 0.3V)
Dutputs		
Current:	REF	20mA
	OUT	50mA
Voltage:	REF	(V+ + 0.3V) to (V 0.3V)
	OUT_(MAX9_1/9_4)	
	(MAX9_2/9_3)	
OUT_Sh	ort-Circuit Duration	Continuous
Continuous	Power Dissipation (TA	= +70°C)
8-Bump	UCSP (derate 4.7mW/°	C above +70°C)379mW

8-Pin Plastic DIP (derate 9.09mW/°C above +70°C) ...727mW 8-Pin SO (derate 5.88mW/°C above +70°C)471mW 8-Pin μMAX (derate 4.1mW/°C above +70°C)330mW 16-Pin Plastic DIP (derate 10.53mW/°C above +70°C)696mW 0perating Temperature Ranges MAX97_C_ _/MAX98_C_ _....0°C to +70°C MAX97_E_ _/MAX98_E_ _...40°C to +85°C Storage Temperature Range65°C to +150°C Lead Temperature (soldering, 10s)+300°C Bump Temperature (soldering) Reflow+235°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—5V OPERATION

 $(V+ = 5V, V- = GND = 0V, T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$.) (Note 1)

PARAMETER	CONDITIONS				MIN	ТҮР	МАХ	UNITS		
POWER REQUIREMENTS										
Supply Voltage Range	(Note 2)				2.5		11	V		
Output Voltage Range					0		11	V		
		MAX9_1,		$T_A = +25^{\circ}C$		2.5	3.2			
		HYST = REI	EF	C/E temp ranges			4			
		ΜΔΧΩ72		$T_A = +25^{\circ}C$		2.5	3.2			
	IN+ = IN- +	WIAA972		C/E temp ranges			4			
Supply Current	100mV	MAX982/		$T_A = +25^{\circ}C$		3.1	4.5	μA		
		HYST = RE	ĒF	C/E temp ranges			6			
		MAX9_4		$T_A = +25^{\circ}C$		5.5	6.5			
				C/E temp ranges			8.5			
COMPARATOR										
Input Offset Voltage	$V_{CM} = 2.5V$						±10	mV		
Input Leakage Current (IN-, IN+)	IN+ = IN- = 2.5	V		C/E temp ranges		±0.01	±5	nA		
Input Leakage Current (HYST)	MAX9_1/MAX9	82/MAX9_3				±0.02		nA		
Input Common-Mode Voltage Range	Input Common-Mode Voltage Range		V-		V+ - 1.3	V				
Common-Mode Rejection Ratio	V- to (V+ - 1.3V)				0.1	1.0	mV/V		
Power-Supply Rejection Ratio	V+ = 2.5V to 11	V				0.1	1.0	mV/V		
Voltage Noise	100Hz to 100kHz				20		μV _{RMS}			
Hysteresis Input Voltage Range	MAX9_1/MAX982/MAX9_3			REF - 0.05		REF	V			
Response Time (High-to-Low	T _A = +25°C, 10	$T_A = +25^{\circ}C$, 100pF load, (erdrive = 10mV		12		110		
Transition)	$1M\Omega$ pullup to V	$1M\Omega$ pullup to V+ Overdrive = 100mV				4		μs		
Response Time (Low-to-High Transition) (Note 3)	Time (Low-to-High $T_A = +25^{\circ}C$, 100pF load, 1M Ω pullup to V+				300		μs			

ELECTRICAL CHARACTERISTICS—5V OPERATION (continued)

 $(V + = 5V, V - = GND = 0V, T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$.) (Note 1)

PARAMETER	CO	NDITIONS	MIN	ТҮР	MAX	UNITS	
	MAX9_2/MAX9_3, IOU	T = 1.8mA			V-+0.4		
Output Low Voltage	MAX9_1/MAX9_4, I _{OU}	T = 1.8mA			GND + 0.4	V	
Output Leakage Current	V _{OUT} = 11V					100	nA
REFERENCE (MAX9_1/MAX982/	MAX9_3/MAX9_4 ONLY	7)					
	MAX971/MAX973/	C temp range	1%	1.170	1.182	1.194	V
Poforonoo Voltago	MAX974	E temp range	2%	1.158		1.206	
Reference voltage	MAX981-MAX984	C temp range	2%	1.158	1.182	1.206	
		E temp range	3%	1.147		1.217	
Source Current	$T_A = +25^{\circ}C$	15	25				
	C/E temp ranges		6			μΑ	
Sink Current	$T_A = +25^{\circ}C$		8	15			
SIRK Current	C/E temp ranges		4			μΑ	
Voltage Noise	100Hz to 100kHz			100		μVRMS	

ELECTRICAL CHARACTERISTICS—3V OPERATION

(V+ = 3V, V- = GND = 0V, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}$ C.) (Note 1)

PARAMETER	CONDITIONS			MIN	ТҮР	МАХ	UNITS
POWER REQUIREMENTS							
			$T_A = +25^{\circ}C$		2.4	3.0	
		WAX9_1	C/E temp ranges			3.8	
			$T_A = +25^{\circ}C$		2.4	3.0	
Supply Current	HYST = REF,	IVIAA972	C/E temp ranges			3.8	
Supply Current	100 mV	MAX982/	$T_A = +25^{\circ}C$		3.4	4.3	μΑ
		MAX9_3	C/E temp ranges			5.8	
		MAX9_4	$T_A = +25^{\circ}C$		5.2	6.2	
			C/E temp ranges			8.0	
COMPARATOR							
Input Offset Voltage	$V_{CM} = 1.5V$					±10	mV
Input Leakage Current (IN-, IN+)	IN + = IN - = 1.5	ōV	C/E temp ranges		±0.01	±5	nA
Input Leakage Current (HYST)	MAX9_1/MAX9	982/MAX9_3			±0.02		nA
Input Common-Mode Voltage Range			V-		V+ - 1.3	V	
Common-Mode Rejection Ratio	V- to (V+ - 1.3V)				0.2	1	mV/V
Power-Supply Rejection Ratio	V+ = 2.5V to 11V				0.1	1	mV/V
Voltage Noise	100Hz to 100kHz				20		μV _{RMS}
Hysteresis Input Voltage Range	MAX9_1/MAX982/MAX9_3			REF - 0.05		REF	V

ELECTRICAL CHARACTERISTICS—3V OPERATION (continued)

 $(V + = 3V, V - = GND = 0V, T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$.) (Note 1)

PARAMETER	CONDITIONS				MIN	TYP	MAX	UNITS
Response Time (High-to-Low	e Time (High-to-Low $T_A = +25^{\circ}C$, 100pF load, Overdrive = 10m h) $1M\Omega$ pullup to V+ Overdrive = 100m		10mV		12			
Transition)			Overdrive =	100mV		4		μs
Response Time (Low-to-High Transition) (Note 3)	$T_A = +25^{\circ}C$, 100pF lo		300		μs			
Output Low Voltage	MAX9_2/MAX9_3, IOU) = דנ).8mA				V- + 0.4	
Oulput Low Voltage	MAX9_1/MAX9_4, IOU			GND + 0.4	v			
Output Leakage Current	$V_{OUT} = 11V$				100	nA		
REFERENCE								
	MAX971/MAX973/	C te	emp range	1%	1.170	1.182	1.194	V
Poforopoo Voltago	MAX974	E te	emp range	2%	1.158		1.206	
nererence voltage	MAX981-MAX984	C te	emp range	2%	1.158	1.182	1.206	
		E te	emp range	3%	1.147		1.217	
Source Current	$T_A = +25^{\circ}C$				15	25		μA
Source Current	C/E temp ranges				6			
Sink Current	$T_A = +25^{\circ}C$				8	15		
	C/E temp ranges				4			μΑ
Voltage Noise	100Hz to 100kHz		100		μVRMS			

Note 1: The MAX972EBL is 100% tested at $T_A = +25^{\circ}C$. Temperature limits are guaranteed by design.

Note 2: MAX974/MAX984 comparators work below 2.5V; see Low-Voltage Operation section for more details.

Note 3: Low-to-high response time is the result of the 1MΩ pullup and the 100pF capacitive load, based on three time constants. A faster response time is achieved with a smaller RC.



MAX971-MAX974/MAX981-MAX984

M/XI/M



Typical Operating Characteristics (continued)

Pin Description

		PIN				
MAX971/ MAX981	МАХ	972	MAX982	MAX973/ MAX983	NAME	FUNCTION
DIP/SO/ µMAX	DIP/SO/ µMAX	UCSP	DIP/SO/ µMAX	DIP/SO/ µMAX		
1					GND	Ground. Connect to V- for single-supply operation.
2	2	C2	2	2	V-	Negative Supply. Connect to GND for single-supply operation (MAX9_1).
3			—	—	IN+	Noninverting Comparator Input
4			_	_	IN-	Inverting Comparator Input
5	_	_	5	5	HYST	Hysteresis Input. Connect to REF if not used. Input voltage range is from V_{REF} to (V_{REF} - 50mV).
6	_	_	6	6	REF	Reference Output. 1.182V with respect to V
7	7	A2	7	7	V+	Positive Supply
8	_	_	_	_	OUT	Comparator Output. Sinks current to GND.
_	1	A1	1	1	OUTA	Comparator A Open-Drain Output. Sinks current to V
_	3	C1	3	3	INA+	Noninverting Input of Comparator A
_	4	B1	_	_	INA-	Inverting Input of Comparator A
_	5	B3	_	4	INB-	Inverting Input of Comparator B
_	6	C3	4		INB+	Noninverting Input of Comparator B
_	8	A3	8	8	OUTB	Comparator B Open-Drain Output. Sinks current to V

Pin Description (continued)

PIN		
MAX974 MAX984	NAME	FUNCTION
1	OUTB	Comparator B Open-Drain Output. Sinks current to GND.
2	OUTA	Comparator A Open-Drain Output. Sinks current to GND.
3	V+	Positive Supply
4	INA-	Inverting Input of Comparator A
5	INA+	Noninverting Input of Comparator A
6	INB-	Inverting Input of Comparator B
7	INB+	Noninverting Input of Comparator B
8	REF	Reference Output. 1.182V with respect to V
9	V-	Negative Supply. Connect to ground for single-supply operation.
10	INC-	Inverting Input of Comparator C
11	INC+	Noninverting Input of Comparator C
12	IND-	Inverting Input of Comparator D
13	IND+	Noninverting Input of Comparator D
14	GND	Ground. Connect to V- for single-supply operation.
15	OUTD	Comparator D Open-Drain Output. Sinks current to GND.
16	OUTC	Comparator C Open-Drain Output. Sinks current to GND.

Detailed Description

The MAX971–MAX974/MAX981–MAX984 comprise various combinations of a micropower 1.182V reference and micropower comparators. The *Typical Operating Circuit* shows the MAX971/MAX981 configuration, and Figures 1a–1d show the MAX9_2–MAX9_4 configurations.

Internal hysteresis in the MAX9_1, MAX982, and MAX9_3 provides the easiest method for implementing hysteresis. It also produces faster hysteresis action and consumes much less current than circuits using external positive feedback.

Power-Supply and Input Signal Ranges

This family of devices operates from a single 2.5V to 11V power supply. The MAX9_1 and MAX9_4 have a separate ground for the output driver, allowing operation with dual supplies ranging from $\pm 1.25V$ to $\pm 5.5V$. Connect V- to GND when operating the MAX9_1 or MAX9_4 from a single supply. The maximum total supply voltage in this case is still 11V.

For proper comparator operation, the input signal can range from the negative supply (V-) to within one volt of the positive supply (V+ - 1V). The guaranteed common-mode input voltage range extends from V- to (V+ - 1.3V). The inputs can be taken above and below the supply rails by up to 300mV without damage.



Figure 1a. MAX972 Functional Diagram



Figure 1b. MAX982 Functional Diagram







Figure 1d. MAX974/MAX984 Functional Diagram



Figure 2. Threshold Hysteresis Band

Low-Voltage Operation: V+ = 1V (MAX9_4 Only)

The guaranteed minimum operating voltage is 2.5V (or $\pm 1.25V$). As the total supply voltage falls below 2.5V, performance degrades and the supply current falls. The reference will not function below about 2.2V, although the comparators will continue to operate with a total supply voltage as low as 1V. While the MAX9_4 has comparators that may be used at supply voltages below 2V, the MAX9_1/MAX9_2/MAX9_3 may not be used with supply voltages below 2.5V.

At low supply voltages, the comparators' output sink capability is reduced and the propagation delay increases (see *Typical Operating Characteristics*). The useful input voltage range extends from the negative supply to a little under 1V below the positive supply, which is slightly closer to the positive rail than when the device operates from higher supply voltages. Test your prototype over the full temperature and supply-voltage range if you anticipate operation below 2.5V.

Comparator Output

With 100mV of overdrive, propagation delay is typically 3μ s. The *Typical Operating Characteristics* show the propagation delay for various overdrive levels. The open-drain outputs are intended for wire-ORed and level-shifting applications. The maximum output voltage is 11V above V-, and may be applied even when no supply voltage is present (V+ = V-).

The MAX9_1 and MAX9_4 outputs sink current to GND, making these devices ideal for bipolar to single-ended conversion and level-shifting applications.

The negative supply does not affect the output sink current. The positive supply provides gate drive for the output N-channel MOSFET and heavily influences the output current capability, especially at low supply voltages (see *Typical Operating Characteristics* section).

The MAX9_2 and MAX9_3 have no GND pin, and their outputs sink current to V-.

Voltage Reference

The internal bandgap voltage reference has an output of 1.182V above V-. Note that the REF voltage is referenced to V-, not to GND. Its accuracy is $\pm 1\%$ (MAX971/MAX973/MAX974) or $\pm 2\%$ (MAX981–MAX984) in the 0°C to $\pm 70^{\circ}$ C range. The REF output is typically capable of sourcing 25µA and sinking 15µA. Do not bypass the REF output.

Noise Considerations

Although the comparators have a very high gain, useful gain is limited by noise. This is shown in the Transfer Function graph (see *Typical Operating Characteristics*). As the input voltage approaches the comparator's offset, the output begins to bounce back and forth; this peaks when $V_{IN} = V_{OS}$. (The lowpass filter shown on the graph averages out the bouncing, making the transfer function easy to observe.) Consequently, the comparator has an effective wideband peak-to-peak noise of around 300µV. The voltage reference has peak-to-peak noise approaching 1mV. Thus, when a comparator is used with the reference, the combined peak-to-peak noise is about 1mV. This, of course, is much higher than the RMS noise of the individual components. Take care in your layout to avoid capacitive coupling from any output to the reference pin. Crosstalk can significantly increase the actual noise of the reference.



Figure 3. Programming the HYST Pin

Applications Information

Hysteresis

Hysteresis increases the comparators' noise margin by increasing the upper threshold and decreasing the lower threshold (Figure 2).

Hysteresis (MAX9_1/MAX982/MAX9_3)

To add hysteresis to the MAX9_1, MAX982, or MAX9_3, connect resistor R1 between REF and HYST, and connect resistor R2 between HYST and V- (Figure 3). If no hysteresis is required, connect HYST to REF. When hysteresis is added, the upper threshold increases by the same amount that the lower threshold decreases. The hysteresis band (the difference between the upper and lower thresholds, V_{HB}) is approximately equal to twice the voltage between REF and HYST. The HYST input can be adjusted to a maximum voltage of REF and to a minimum voltage of (REF - 50mV). The maximum difference between REF and HYST (50mV) will therefore produce a 100mV (max) hysteresis band. Use the following equations to determine R1 and R2:

$$R1 = \frac{V_{HB}}{(2 \times I_{REF})}$$
$$R2 = \frac{\left(1.182 - \frac{V_{HB}}{2}\right)}{I_{REF}}$$

where I_{REF} (the current sourced by the reference) should not exceed the REF source capability, and should be significantly larger than the HYST input current. I_{REF} values between 0.1µA and 4µA are usually appropriate. If 2.4M Ω is chosen for R2 (I_{REF} = 0.5µA), the equation for R1 and V_{HB} can be approximated as:

R1 (k Ω) = V_{HB}(mV)

When hysteresis is obtained in this manner for the MAX982/MAX9_3, the same hysteresis applies to both comparators.

Hysteresis (MAX972/MAX9_4)

Hysteresis can be implemented with any comparator using positive feedback, as shown in Figure 4. This approach generally draws more current than circuits using the HYST pin on the MAX9_1/MAX982/MAX9_3, and the high feedback impedance slows hysteresis. In addition, because the output does not source current, any increase in the upper threshold is dependent on the load or pullup resistor on the output.



Figure 4. External Hysteresis

Board Layout and Bypassing

Power-supply bypass capacitors are not needed if the supply impedance is low, but 100nF bypass capacitors should be used when the supply impedance is high or when the supply leads are long. Minimize signal lead lengths to reduce stray capacitance between the input and output that might cause instability. Do not bypass the reference output.

Window Detector

The MAX9_3 is ideal for making window detectors (undervoltage/overvoltage detectors). The schematic is shown in Figure 5, with component values selected for a 4.5V undervoltage threshold and a 5.5V overvoltage threshold. Choose different thresholds by changing the values of R1, R2, and R3. To prevent chatter at the output when the supply voltage is close to a threshold, hysteresis has been added using R4 and R5. Taken alone, OUTA would provide an active-low undervoltage indication, and OUTB would give an active-low overvoltage indication. Wired-ORing the two outputs provides an active-high, power-good signal.

The design procedure is as follows:

1) Choose the required hysteresis level and calculate values for R4 and R5 according to the formulas in the *Hysteresis (MAX9_1/MAX982/MAX9_3)* section. In this example, \pm 5mV of hysteresis has been added at the comparator input (V_H = V_{HB}/2). This means that the hysteresis apparent at V_{IN} will be larger because of the input resistor divider.

- 2) Select R1. The leakage current into INB- is normally under 1nA, so the current through R1 should exceed 100nA for the thresholds to be accurate. R1 values up to about 10M Ω can be used, but values in the 100k Ω to 1M Ω range are usually easier to deal with. In this example, choose R1 = 294k Ω .
- 3) Calculate R2 + R3. The overvoltage threshold should be 5.5V when $V_{\rm IN}$ is rising. The design equation is as follows:

$$R2 + R3 = R1 \times \left(\frac{V_{OTH}}{V_{REF} + V_{H}} - 1\right)$$
$$= 294k\Omega \times \left(\frac{5.5}{(1.182 + 0.005)} - 1\right)$$
$$= 1.068M\Omega$$

4) Calculate R2. The undervoltage threshold should be 4.5V when $\rm V_{IN}$ is falling. The design equation is as follows:

$$R2 = (R1 + R2 + R3) \times \frac{(V_{REF} - V_{H})}{V_{UTH}} - R1$$
$$= (294k\Omega + 1.068M\Omega) \times \frac{(1.182 - 0.005)}{4.5}$$
$$- 294k\Omega$$
$$= 62.2k\Omega$$

Choose R2 = $61.9k\Omega$ (1% standard value).

R3 = (R2 + R3) - R2

$$= 1.068 M \Omega - 61.9 k \Omega$$

= $1.006M\Omega$

Choose R3 = $1M\Omega$ (1% standard value)

 Verify the resistor values. The equations are as follows, evaluated for the above example: Overvoltage Threshold:

$$V_{OTH} = (V_{REF} + V_H) \times \frac{(R1 + R2 + R3)}{R1}$$

= 5.474V

Undervoltage Threshold:

$$V_{\text{UTH}} = (V_{\text{REF}} - V_{\text{H}}) \times \frac{(\text{R1} + \text{R2} + \text{R3})}{(\text{R1} + \text{R2})}$$

= 4.484V

where the hysteresis voltage $V_H = V_{REF} \times \frac{R5}{R4}$.



Figure 5. Window Detector

Battery Switchover Circuit

The switchover from line-powered DC to a backup battery is often accomplished with diodes. But this simple method is sometimes unacceptable, due to the voltage drop and associated power loss across the diode in series with the battery. Figure 6's circuit replaces the diode with a P-channel MOSFET controlled by one of the MAX9_3 comparator outputs.

When the DC wall adapter drops below 4V (determined by R1 and R2), OUTA goes low, turning on Q1. Comparator B is used to measure the battery voltage, and gives a "low-battery" indication when the battery drops below 3.6V.

Level-Shifter

Figure 7 shows a circuit to shift from bipolar $\pm 5V$ inputs to single-ended 5V outputs. The 10k Ω resistors protect the comparator inputs, and do not materially affect the circuit's operation.



3.3V 5V 3 V+ MAXIN \leq MAX974 INA+ MAX984 OUTA INA- \leq INB+ OUTB INB-6 Ş 11 INC+ OUTC 16 INC-10 Ş IND+ 13 OUTD 15 12 IND-8 REF - N.C. GND V-14 9 -5V

Figure 7. Level Shifter: ±5V Input to Single-Ended 3.3V Output

Figure 6. Battery Switchover Circuit

UCSP Applications Information

For the latest application details on UCSP contruction, dimensions, tape carrier information, printed circuit board techniques, bump-pad layout and recommended reflow temperature profile as well as the latest information on reliability testing results, go to Maxim's web site at www.maxim-ic.com/ucsp to find the Application Note: UCSP-A Wafer-Level Chip-Scale Package.



Ordering Information (continued)

NGE	PIN-PACKAGE	PART	TEMP RANGE
85°C	8 Plastic Dip	MAX981CSA	0°C to +70°C
85°C	8 SO	MAX981CUA	0°C to +70°C
′0°C	8 Plastic Dip	MAX981EPA	-40°C to +85°C
′0°C	8 SO	MAX981ESA	-40°C to +85°C
′0°C	8 µMAX	MAX982CPA	0°C to +70°C
85°C	8 UCSP-8	MAX982CSA	0°C to +70°C
85°C	8 Plastic Dip	MAX982CUA	0°C to +70°C
85°C	8 SO	MAX982EPA	-40°C to +85°C
′0°C	8 Plastic Dip	MAX982ESA	-40°C to +85°C
′0°C	8 SO	MAX983CPA	0°C to +70°C
′0°C	8 µMAX	MAX983CSA	0°C to +70°C
85°C	8 Plastic Dip	MAX983CUA	0°C to +70°C
85°C	8 SO	MAX983EPA	-40°C to +85°C
′0°C	16 Plastic Dip	MAX983ESA	-40°C to +85°C
′0°C	16 Narrow SO	MAX984CPE	0°C to +70°C
85°C	16 Plastic Dip	MAX984CSE	0°C to +70°C
85°C	16 Narrow SO	MAX984EPE	-40°C to +85°C
′0°C	8 Plastic Dip	MAX984ESE	-40°C to +85°C
		-	

PART	TEMP RANGE	PIN-PACKAGE
MAX971EPA	-40°C to +85°C	8 Plastic Dip
MAX971ESA	-40°C to +85°C	8 SO
MAX972CPA	0°C to +70°C	8 Plastic Dip
MAX972CSA	0°C to +70°C	8 SO
MAX972CUA	0°C to +70°C	8 µMAX
MAX972EBL-T*	-40°C to +85°C	8 UCSP-8
MAX972EPA	-40°C to +85°C	8 Plastic Dip
MAX972ESA	-40°C to +85°C	8 SO
MAX973CPA	0°C to +70°C	8 Plastic Dip
MAX973CSA	0°C to +70°C	8 SO
MAX973CUA	0°C to +70°C	8 µMAX
MAX973EPA	-40°C to +85°C	8 Plastic Dip
MAX973ESA	-40°C to +85°C	8 SO
MAX974CPE	0°C to +70°C	16 Plastic Dip
MAX974CSE	0°C to +70°C	16 Narrow SO
MAX974EPE	-40°C to +85°C	16 Plastic Dip
MAX974ESE	-40°C to +85°C	16 Narrow SO
MAX981CPA	0°C to +70°C	8 Plastic Dip

Chip Information

PIN-PACKAGE

8 SO

8 SO

8 SO

8 SO

8 SO

8 SO

8 µMAX

8 µMAX

8 µMAX

8 Plastic Dip

16 Plastic Dip

16 Narrow SO

16 Plastic Dip

16 Narrow SO

MAX971/MAX972/MAX973/MAX981/MAX982/MAX984 TRANSISTOR COUNT: 164 MAX974/MAX984 TRANSISTOR COUNT: 267

*UCSP top mark is "ABC."

Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to <u>www.maxim-ic.com/packages</u>.)





Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)



Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600

© 2003 Maxim Integrated Products

Printed USA

is a registered trademark of Maxim Integrated Products.

17