19-0138; Rev 3; 8/03

MAXIM

Ultra-Fast Precision TTL Comparator

General Description

The Maxim MXL1016 (10ns, typ) high-speed, complementary-output comparator is designed specifically to interface directly to TTL logic while operating from either a dual ±5V supply or a single +5V supply.

The MXL1016 remains stable with the outputs in the active region, which greatly reduces output instabillity common with slow-moving input signals. In addition, an output latch (LE) is provided.

For lower-power, higher-performance comparators, see the MAX912/MAX913 dual/single comparators data sheet. The MAX913 is an improved plug-in replacement for the MXL1016 and the MAX912 is the dual equivalent to the MAX913.

Features

- **Ultra Fast (10ns, typ)**
- **Single +5V or Dual ±5V Supply Operation**
- **Complementary TTL Outputs**
- **Low Offset Voltage: 1mV**
- **No Minimum Input Slew-Rate Requirement**
- **No Power-Supply Current Spiking**
- **Output Latch**

Applications

High-Speed A/D Converters

Zero-Crossing Detectors

Current Sense for Switching Regulators

High-Speed Sampling Circuits

High-Speed Triggers

Line Receivers

Extended Range V/F Converters

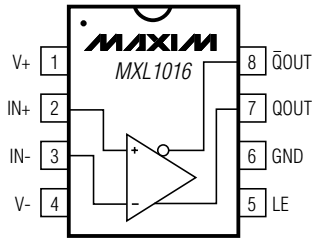
Fast Pulse Height/Width Discriminators

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MXL1016CN8	0°C to +70°C	8 Plastic DIP
MXL1016CS8	0°C to +70°C	8 SO

Pin Configuration

TOP VIEW



DIP/SO

Pin Description

PIN	NAME	FUNCTION
1	V+	Positive Power Supply +5V
2	IN+	Noninverting Input
3	IN-	Inverting Input
4	V-	Negative Power Supply, -5V for dual supply or GND for single supply
5	LE	Latch Enable. QOUT and $\overline{Q}$OUT are latched when LE is high
6	GND	Ground
7	QOUT	TTL Output
8	$\overline{Q}$OUT	Complementary TTL Output

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ABSOLUTE MAXIMUM RATINGS

Positive Supply Voltage.....7V
Negative Supply Voltage .....-7V
V+ to V- 13V
Differential Input Voltage
MXL1016.....±5V
Input Voltage (either input)
MXL1016 .....Equal to Supplies
Latch Pin Voltage .....Equal to Supplies
Output Current (continuous).....±20mA
Continuous Power Dissipation (T_A = +70°C)
8-Pin Plastic DIP (derate 9.09mW/°C above +70°C) ...727mW
8-Pin SO (derate 5.88mW/°C above +70°C).....471mW
Operating Temperature Ranges:
MXL1016.....0°C to +70°C
Storage Temperature Range .....-65°C to +150°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+ = 5V, V- = -5V, $V_{OUT}(Q)$ = 1.4V, V_{LE} = 0V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Offset Voltage (Note 2)	V_{OS}	$R_S \le 100\Omega$	T_A = +25°C		1.0	±3	mV
			T_A = T_{MIN} to T_{MAX}			3.5	
Input Offset-Voltage Drift	$\Delta V_{OS}/\Delta T$	T_A = T_{MIN} to T_{MAX}			4		µV/°C
Input Offset Current (Note 2)	I_{OS}	T_A = +25°C			0.3	1	µA
		T_A = T_{MIN} to T_{MAX}				1.3	
Input Bias Current (Note 3)	I_B	T_A = +25°C			5	10	µA
		T_A = T_{MIN} to T_{MAX}				13	
Input Voltage Range	V_{CM}	Dual +5V and -5V supply		-3.75		+3.50	V
		Single 5V supply		+1.25		+3.50	
Common-Mode Rejection Ratio	CMRR	-3.75V ≤ V_{CM} ≤ 3.5V		80	96		dB
Power-Supply Rejection Ratio	PSRR	Positive supply: 4.6V ≤ V+ ≤ 5.4V		60	75		dB
		Negative supply: -2V ≥ V- ≥ -7V		80	100		
Small-Signal Voltage Gain	A_V	1V ≤ V_{OUT} ≤ 2V, T_A = +25°C		1400	3000		V/V
Output High Voltage	V_{OH}	V+ ≥ 4.6V	I_{OUT} = 1mA	2.7	3.4		V
			I_{OUT} = 10mA	2.4	3.0		
Output Low Voltage	V_{OL}	I_{SINK} = 4mA			0.3	0.5	V
		I_{SINK} = 10mA, T_A = +25°C			0.4		
Positive Supply Current	I+	(Note 4)			25	35	mA
Negative Supply Current	I-	(Note 4)			3	5	mA

ELECTRICAL CHARACTERISTICS (continued)

(V+ = 5V, V- = -5V, V_{OUT}(Q) = 1.4V, V_{LE} = 0V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Latch Pin High Input Voltage	V_{IH}			2.0			V
Latch Pin Low Input Voltage	V_{IL}					0.8	V
Latch Pin Current	I_{IL}	V_{LE} = 0V				-500	µA
Propagation Delay (Note 5)	t_{PD}	ΔV_{IN} = 100mV, OD = 5mV	T_A = +25°C		10	14	ns
						16	
		ΔV_{IN} = 100mV, OD = 20mV	T_A = +25°C		9	12	
						15	
Differential Propagation Delay (Note 5)	Δt_{PD}	ΔV_{IN} = 100mV, OD = 5mV, T_A = +25°C				4	ns
Latch Setup Time	t_{SU}	(Note 6)			2		ns
Latch Hold Time	t_H	(Note 6)			2		ns

Note 1: All specifications are 100% tested at T_A = +25°C, unless otherwise noted. Specification limits over temperature (T_A = T_{MIN} to T_{MAX}) are guaranteed by design.

Note 2: Input offset voltage is defined as the average of the two input offset voltages, measured by forcing first one output, then the other to 1.4V. Input offset current is defined in the same way.

Note 3: Input bias current (I_B) is defined as the average of the two input currents.

Note 4: Supply currents are measured with V_{OUT} (Q) driven to both V_{OH} and V_{OL} (not 1.4V).

Note 5: t_{PD} and Δt_{PD} cannot be measured in automatic handling equipment with low values of overdrive. Characterization and correlation tests have shown that t_{PD} and Δt_{PD} limits can be guaranteed by design. Electrical Characteristic DC tests are performed to guarantee that all internal bias conditions are correct. For low overdrive conditions, V_{OS} is added to overdrive.

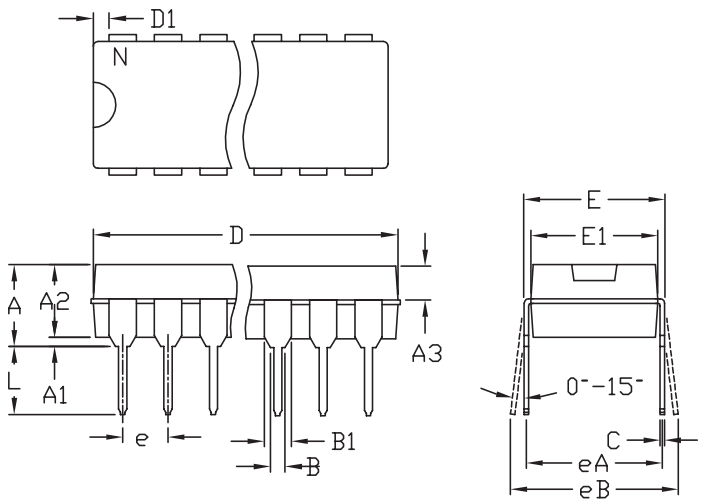
Note 6: Input latch setup time, t_{SU}, is the interval in which the input signal must be stable prior to asserting the latch signal. The hold time, t_H, is the interval after the latch is asserted in which the input signal must be stable.

Ultra-Fast Precision TTL Comparator

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 **www.maxim-ic.com/packages**.)

PDIPN.EPS



	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	---	0.180	---	4.572
A1	0.015	---	0.38	---
A2	0.125	0.175	3.18	4.45
A3	0.055	0.080	1.40	2.03
B	0.015	0.022	0.381	0.56
B1	0.045	0.065	1.14	1.65
C	0.008	0.014	0.2	0.355
D1	0.005	0.080	0.13	2.03
E	0.300	0.325	7.62	8.26
E1	0.240	0.310	6.10	7.87
e	0.100 BSC.		2.54 BSC.	
eA	0.300 BSC.		7.62 BSC.	
eB	0.400 BSC.		10.16 BSC.	
L	0.115	0.150	2.921	3.81

	INCHES		MILLIMETERS			
	MIN	MAX	MIN	MAX	N	MS001
D	0.348	0.390	8.84	9.91	8	AB
D	0.735	0.765	18.67	19.43	14	AC
D	0.745	0.765	18.92	19.43	16	AA
D	0.885	0.915	22.48	23.24	18	AD
D	1.015	1.045	25.78	26.54	20	AE
D	1.14	1.265	28.96	32.13	24	AF
D	1.360	1.380	34.54	35.05	28	*5

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. CONTROLLING DIMENSION: MILLIMETER
4. MEETS JEDEC MS001-XX AS SHOWN IN ABOVE TABLE
5. SIMILIAR TO JEDEC MO-058AB
6. N = NUMBER OF PINS

MAXIM 120 SAN GABRIEL DR SUNNYVALE CA 94086 FAX (408) 737 7194 PROPRIETARY INFORMATION

TITLE: PACKAGE FAMILY OUTLINE: PDIP .300" | 1/1 | 21-0043 D DOCUMENT CONTROL NUMBER REV

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**.)

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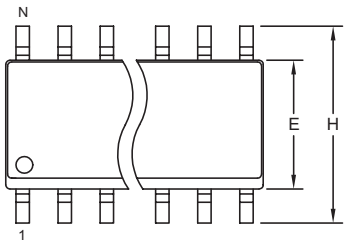
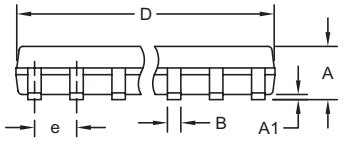


TOP VIEW

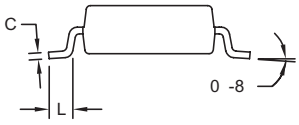
DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
e	0.050 BSC		1.27 BSC	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27

VARIATIONS:

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX	N	MS012
D	0.189	0.197	4.80	5.00	8	AA
D	0.337	0.344	8.55	8.75	14	AB
D	0.386	0.394	9.80	10.00	16	AC



FRONT VIEW



SIDE VIEW

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS012.
6. N = NUMBER OF PINS.

DALLAS SEMICONDUCTOR MAXIM

PROPRIETARY INFORMATION

TITLE: PACKAGE OUTLINE, .150" SOIC

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0041	B	1/1