

## High Speed Differential Comparator

### AVAILABLE AS MILITARY SPECIFICATIONS

- MIL-STD-883, Paragraph 1.2.2 Compliant

### FEATURES

- Independent strobes
- High Speed: 20ns Max
- Tight delay matching on both outputs
- Complementary TTL outputs
- Operates from op amp supplies:  $\pm 15V$
- Low speed variation with overdrive variation
- Low input offset voltage
- Versatile supply voltage range

### OPTIONS

- Packages

14 Pin Ceramic DIP  
14 Pin Ceramic Flatpack  
10 Lead Metal Can

### MARKINGS

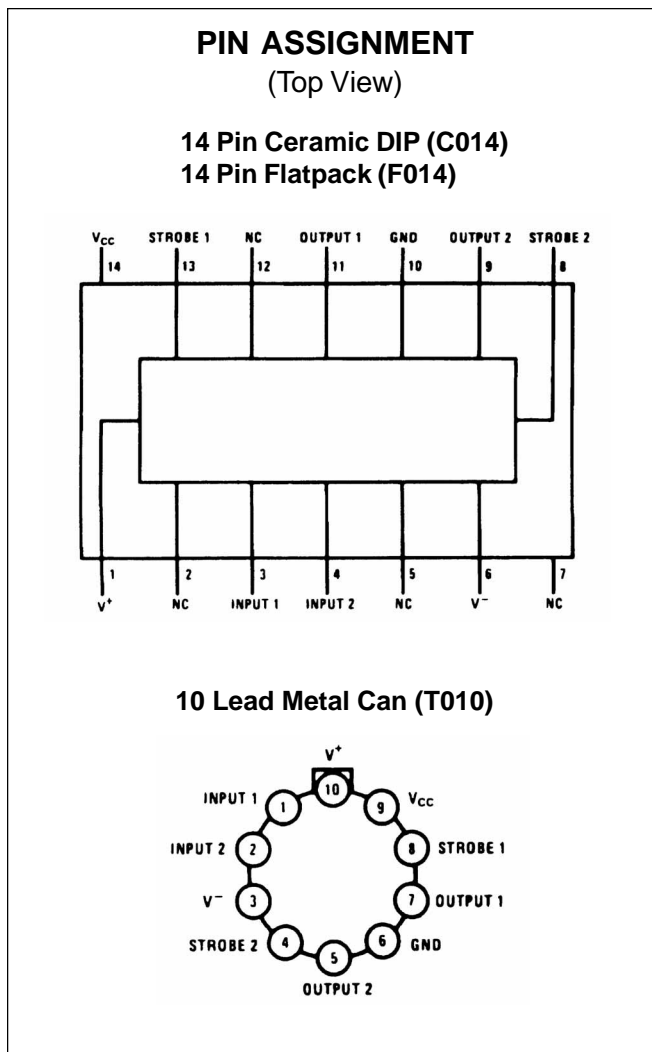
C014  
F014  
T010

### GENERAL DESCRIPTION

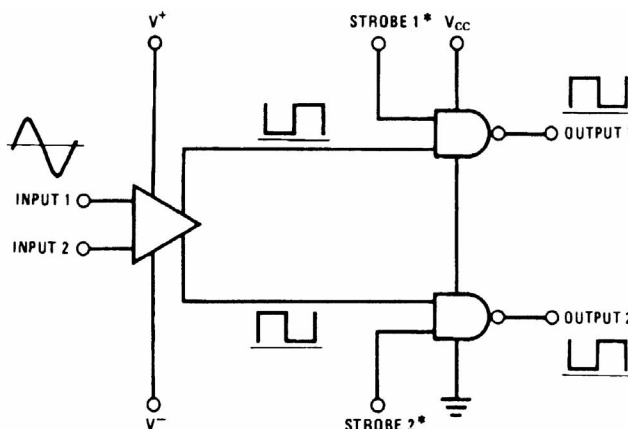
The LM161 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over similar devices for which it is a pin-for-pin replacement. The device has been optimized for greater speed performance and lower input offset voltage. Typically delay varies only 3 ns for over-drive variations of 5 mV to 500 mV. It may be operated from op amp supplies ( $\pm 15V$ ).

Complementary outputs having maximum skew are provided. Applications involve high speed analog to digital converters and zero-crossing detectors in disk file systems.

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### LOGIC DIAGRAM



\*Output is low when current is drawn from strobe pin.



**ABSOLUTE MAXIMUM RATINGS\***

Supply Voltage, V+ .....5V to 15V  
 Supply Voltage, V-.....-6V to -15V  
 Supply Voltage, V<sub>CC</sub> .....4.5V to 5.5V  
 Output Voltage.....+7.0V  
 Differential Input Voltage.....±5V  
 Input Common Mode Voltage.....±6V  
 Operating Temperature Range, .....-55°C to 125°C  
 Storage Temperature Range.....-65°C to 150°C  
 Lead Temperature (Soldering, 10 Sec.).....260°C

\*Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

**ELECTRICAL CHARACTERISTICS**

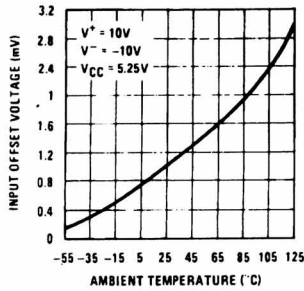
(V+ = +10V; V<sub>CC</sub> = +5V, V- = -10V, T<sub>MIN</sub> ≤ T<sub>A</sub> ≤ T<sub>MAX</sub>, Unless otherwise specified)

PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage			1	3	mV
Input Bias Current	T <sub>A</sub> = 25°C		5	20	μA
Input Offset Current	T <sub>A</sub> = 25°C		2	3	μA
Voltage Gain	T <sub>A</sub> = 25°C		3		V/mV
Input Resistance	T <sub>A</sub> = 25°C, f = 1kHz		20		kΩ
Logical "1" Output Voltage	V <sub>CC</sub> = 4.75V, I <sub>SOURCE</sub> = -0.5mA	2.4	3.3		V
Logical "0" Output Voltage	V <sub>CC</sub> = 4.75V, I <sub>SINK</sub> = 6.4mA			0.4	V
Strobe Input "1" Current (Output Enabled)	V <sub>CC</sub> = 5.25V, I <sub>STROBE</sub> = 2.4mA			200	μA
Strobe Input "0" Current (Output Disabled)	V <sub>CC</sub> = 5.25V, I <sub>STROBE</sub> = 0.4mA			-1.6	mA
Strobe Input "0" Voltage	V <sub>CC</sub> = 4.75V			0.8	V
Strobe Input "1" Voltage	V <sub>CC</sub> = 4.75V	2			V
Output Short Circuit Current	V <sub>CC</sub> = 5.25V, V <sub>OUT</sub> = 0V	-18		-55	mA
Supply Current I <sup>+</sup>	V+ = 10V, V- = -10V, V <sub>CC</sub> = 5.25V, -55°C ≤ T <sub>A</sub> ≤ 125°C			4.5	mA
Supply Current I <sup>-</sup>	V+ = 10V, V- = -10V, V <sub>CC</sub> = 5.25V, -55°C ≤ T <sub>A</sub> ≤ 125°C			10	mA
Supply Current I <sub>CC</sub>	V+ = 10V, V- = -10V, V <sub>CC</sub> = 5.25V, -55°C ≤ T <sub>A</sub> ≤ 125°C			18	mA
TRANSIENT RESPONSE	V <sub>IN</sub> = 50mV overdrive <sup>1</sup>				
Propagation Delay Time (t <sub>pd(0)</sub> )	T <sub>A</sub> = 25°C		14	20	ns
Propagation Delay Time (t <sub>pd(1)</sub> )	T <sub>A</sub> = 25°C		14	20	ns
Delay Between Output A and B	T <sub>A</sub> = 25°C		2	5	ns
Strobe Delay Time (t <sub>pd(0)</sub> )	T <sub>A</sub> = 25°C		8		ns
Strobe Delay Time (t <sub>pd(1)</sub> )	T <sub>A</sub> = 25°C		8		ns

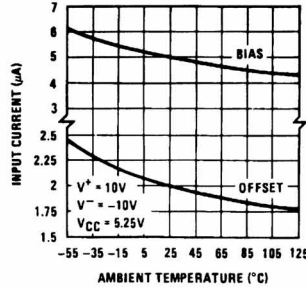
**NOTES:** 1. Measurements using AC test circuit, Fanout = 1. The devices are faster at low supply voltages.

## TYPICAL PERFORMANCE CHARACTERISTICS

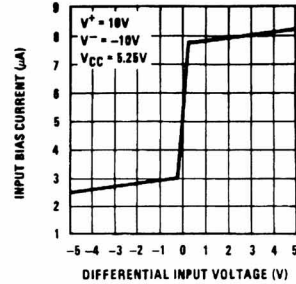
Offset Voltage



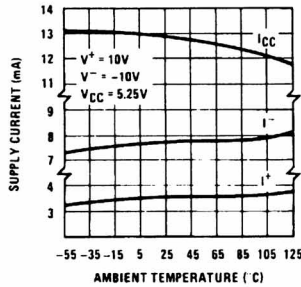
Input Currents vs Ambient Temperature



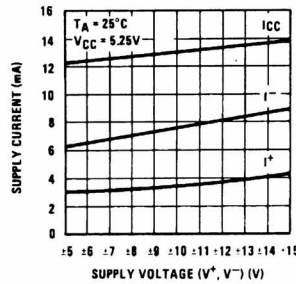
Input Characteristics



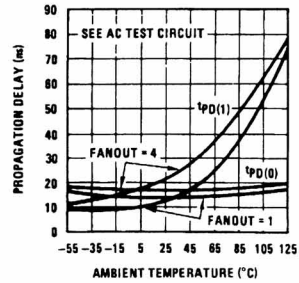
Supply Current vs Ambient Temperature



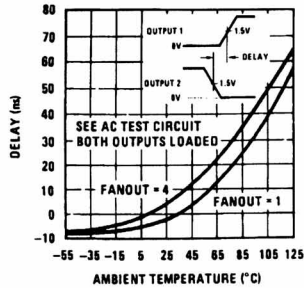
Supply Current vs Supply Voltage



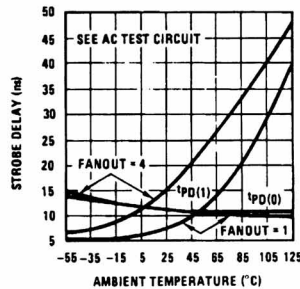
Propagation Delay vs Ambient Temperature



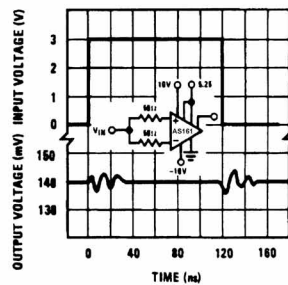
Delay of Output 1 With Respect to Output 2 vs Ambient Temperature



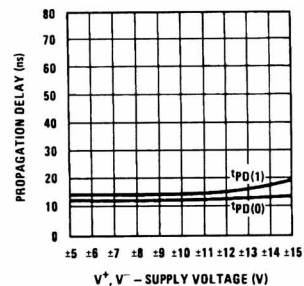
Strobe Delay vs Ambient Temperature



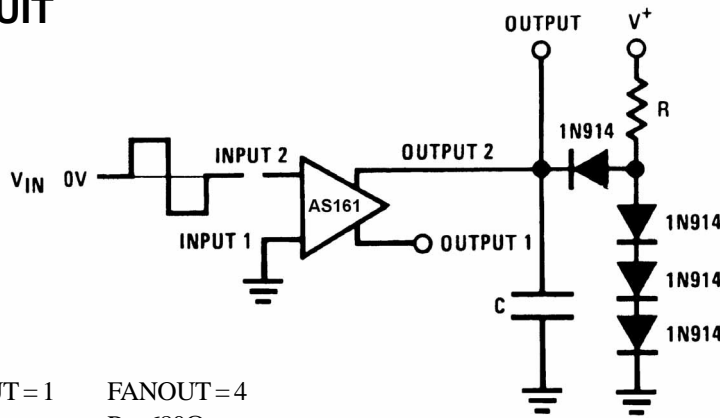
Common-Mode Pulse Response



Propagation Delay vs Supply Voltage

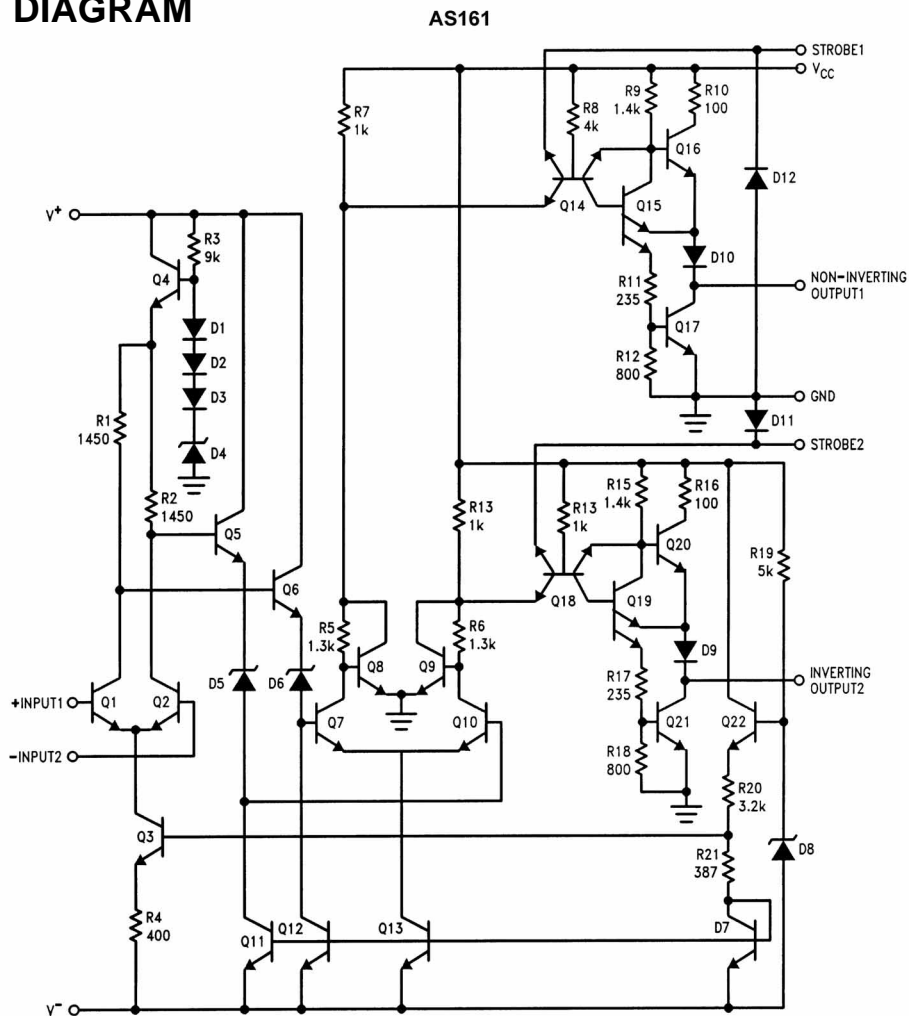


**AC TEST CIRCUIT**



$V_{IN} = \pm 50mV$       FANOUT = 1      FANOUT = 4  
 $V^+ = +10V$           R = 2.4k            R = 680 $\Omega$   
 $V^- = -10V$           C = 15pF           C = 30pF  
 $V_{CC} = 5.25V$

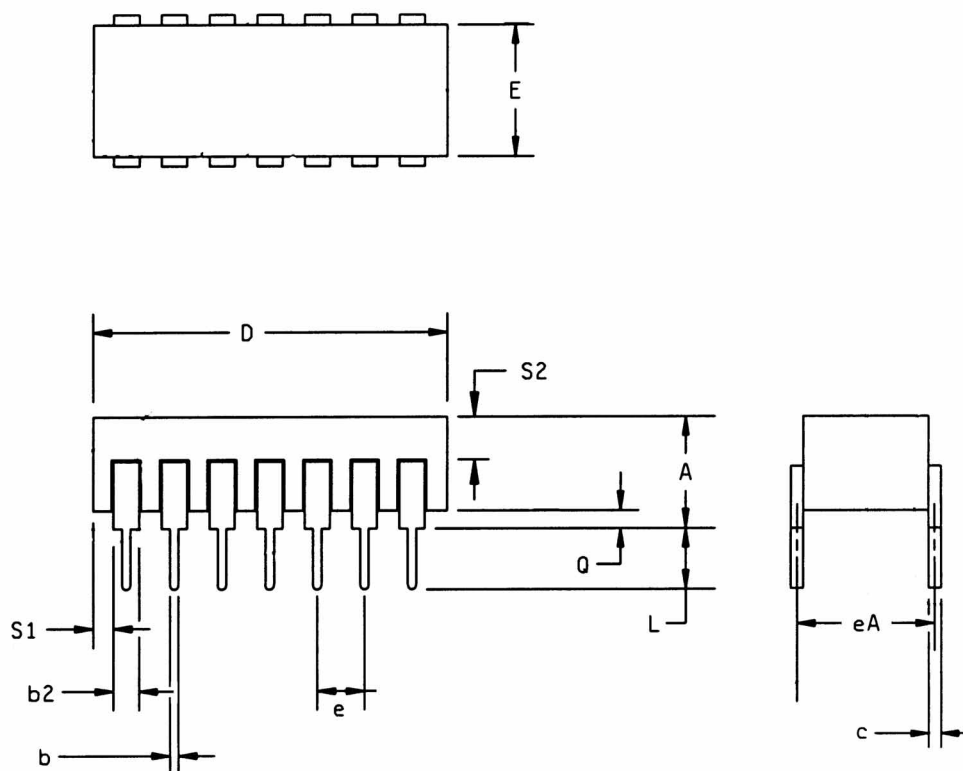
**SCHEMATIC DIAGRAM**



R10, R16: 85  
R11, R17: 205

**MECHANICAL DEFINITIONS\***

Package Designator C014

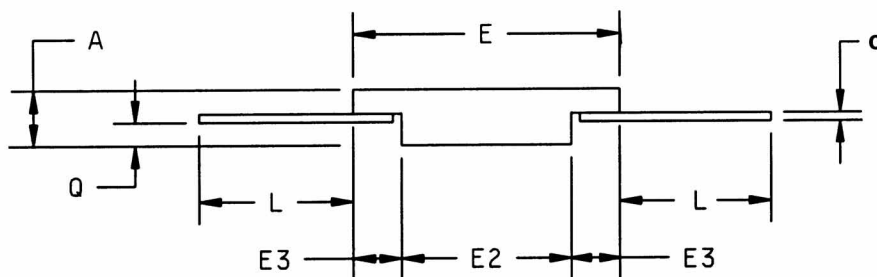
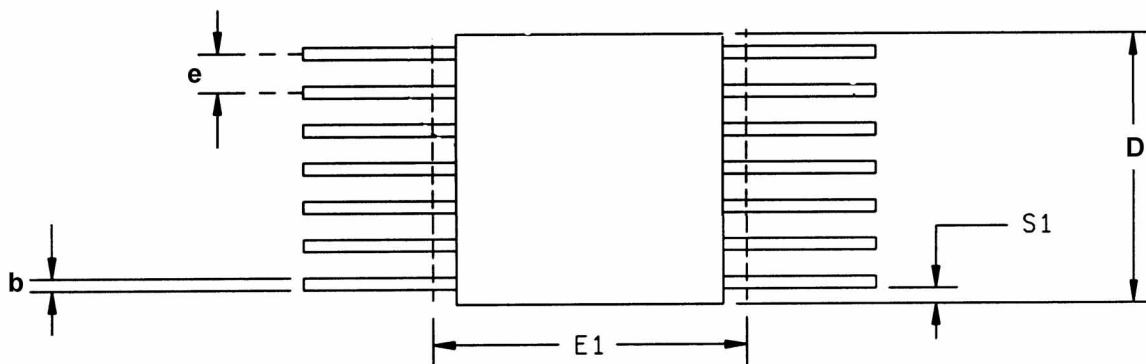


SYMBOL	ASI SPECIFICATIONS	
	MIN	MAX
A	---	0.200
b	0.014	0.026
b2	0.045	0.065
c	0.008	0.018
D	---	0.785
E	0.220	0.310
e	0.100 BCS	
eA	0.300 BSC	
L	0.125	0.200
Q	0.015	0.060
S1	0.005	---
S2	0.005	---

\*All measurements are in inches.

**MECHANICAL DEFINITIONS\***

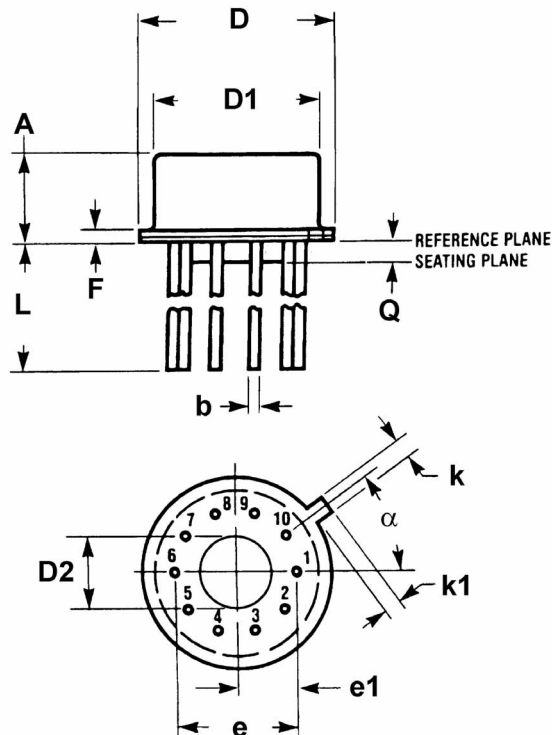
Package Designator F014



SYMBOL	ASI SPECIFICATIONS	
	MIN	MAX
A	0.045	0.085
b	0.010	0.022
C	0.004	0.009
D	---	0.390
E	0.235	0.260
E1	---	0.280
E2	0.125	---
E3	0.030	---
e	0.050 BSC	
L	0.250	0.370
Q	0.026	0.045
S1	0.005	---

\*All measurements are in inches.

**MECHANICAL DEFINITIONS\***  
Package Designator T010



SYMBOL	ASI SPECIFICATIONS	
	MIN	MAX
A	0.165	0.185
b	0.016	0.019
D	0.335	0.375
D1	0.305	0.335
D2	0.110	0.160
e	0.230 BSC	
e1	0.115 BSC	
F	---	0.040
k	0.027	0.034
k1	0.027	0.045
L	0.500	0.750
Q	0.010	0.045
$\alpha$	36° BSC	

\*All measurements are in inches.

## ORDERING INFORMATION

EXAMPLE: AS161C014/MIL

Device Number	Package Type	Process
AS161	C014	/*

EXAMPLE: AS161F014/MIL

Device Number	Package Type	Process
AS161	F014	/*

EXAMPLE: AS161T010/MIL

Device Number	Package Type	Process
AS161	T010	/*

### \*AVAILABLE PROCESSES

XT = Extended Temperature Range -55°C to +125°C

MIL = /883 equivalent processing  
compliant to paragraph 1.2.2 -55°C to +125°C