

LM161/LM261/LM361

T-73-53



National Semiconductor

LM161/LM261/LM361

High Speed Differential Comparators

General Description

The LM161/LM261/LM361 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over the SE529/NE529 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 ($\pm 15V$).

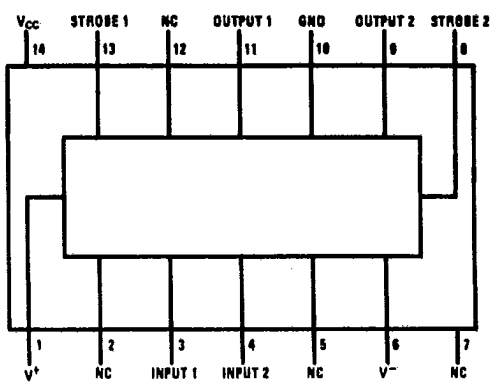
Complementary outputs having maximum skew are provided. Applications involve high speed analog to digital converters and zero-crossing detectors in disk file systems.

Features

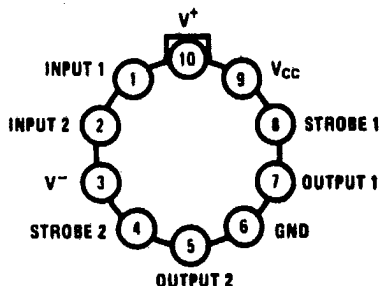
- Independent strobes
- Guaranteed high speed 20 ns max
- Tight delay matching on both outputs
- Complementary TTL outputs
- Operates from op amp supplies $\pm 15V$
- Low speed variation with overdrive variation
- Low Input offset voltage
- Versatile supply voltage range

Connection Diagrams

Dual-In-Line Package



Metal Can Package

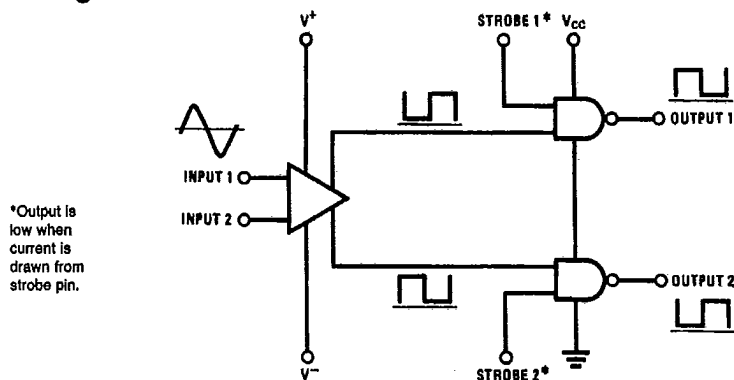


Order Number LM161H, LM261H or LM361H
See NS Package H10C

Top View

Order Number LM161J, LM261J, LM361J,
LM361M or LM361N
See NS Package Number J14A, M14A or N14A

Logic Diagram



Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications. (Note 4)

Positive Supply Voltage, V ⁺	+16V
Negative Supply Voltage, V ⁻	-16V
Gate Supply Voltage, V _{CC}	+7V
Output Voltage	+7V
Differential Input Voltage	±5V
Input Common Mode Voltage	±6V
Power Dissipation	600 mW
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	T_{MIN} T_{MAX}
LM161	-55°C to +125°C
LM261	-25°C to +85°C
LM361	0°C to +70°C
Lead Temp. (Soldering, 10 seconds)	260°C
For Any Device Lead Below V ⁻	0.3V

Operating Conditions

	Min	Typ	Max
Supply Voltage V ⁺			
LM161/LM261	5V		15V
LM361	5V		15V
Supply Voltage V ⁻			
LM161/LM261	-6V		-15V
LM361	-6V		-15V
Supply Voltage V _{CC}			
LM161/LM261	4.5V	5V	5.5V
LM361	4.75V	5V	5.25V

ESD rating to be determined.
 Soldering Information
 Dual-In-Line Package
 Soldering (10 seconds) 260°C
 Small Outline Package
 Vapor Phase (60 seconds) 215°C
 Infrared (15 seconds) 220°C

See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.

Electrical Characteristics (V⁺ = +10V, V_{CC} = +5V, V⁻ = -10V, T_{MIN} ≤ T_A ≤ T_{MAX}, unless noted)

Parameter	Conditions	Limits						Units
		LM161/LM261			LM361			
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage			1	3		1	5	mV
Input Bias Current	T _A = 25°C		5	20		10	30	μA μA
Input Offset Current	T _A = 25°C		2	3		2	5	μA μA
Voltage Gain	T _A = 25°C		3			3		V/mV
Input Resistance	T _A = 25°C, f = 1 kHz		20			20		kΩ
Logical "1" Output Voltage	V _{CC} = 4.75V, I _{SOURCE} = -0.5 mA	2.4	3.3		2.4	3.3		V
Logical "0" Output Voltage	V _{CC} = 4.75V, I _{SINK} = 6.4 mA			0.4			0.4	V
Strobe Input "1" Current (Output Enabled)	V _{CC} = 5.25V, V _{STROBE} = 2.4V			200			200	μA
Strobe Input "0" Current (Output Disabled)	V _{CC} = 5.25V, V _{STROBE} = 0.4V			-1.6			-1.6	mA
Strobe Input "0" Voltage	V _{CC} = 4.75V			0.8			0.8	V
Strobe Input "1" Voltage	V _{CC} = 4.75V	2			2			V
Output Short Circuit Current	V _{CC} = 5.25V, V _{OUT} = 0V	-18		-55	-18		-55	mA

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Electrical Characteristics (Continued)

(V⁺ = +10V, V_{CC} = +5V, V⁻ = -10V, T_{MIN} ≤ T_A ≤ T_{MAX}, unless noted)

Parameter	Conditions	Limits						Units
		LM161/LM261			LM361			
		Min	Typ	Max	Min	Typ	Max	
Supply Current I ⁺	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, -55°C ≤ T _A ≤ 125°C			4.5				mA
Supply Current I ⁺	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, 0°C ≤ T _A ≤ 70°C					5		mA
Supply Current I ⁻	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, -55°C ≤ T _A ≤ 125°C			10				mA
Supply Current I ⁻	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, 0°C ≤ T _A ≤ 70°C					10		mA
Supply Current I _{CC}	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, -55°C ≤ T _A ≤ 125°C			18				mA
Supply Current I _{CC}	V ⁺ = 10V, V ⁻ = -10V, V _{CC} = 5.25V, 0°C ≤ T _A ≤ 70°C					20		mA
Transient Response	V _{IN} = 50 mV overdrive (Note 3)							
Propagation Delay Time (t _{pd(0)})	T _A = 25°C		14	20		14	20	ns
Propagation Delay Time (t _{pd(1)})	T _A = 25°C		14	20		14	20	ns
Delay Between Output A and B	T _A = 25°C		2	5		2	5	ns
Strobe Delay Time (t _{pd(0)})	T _A = 25°C		8			8		ns
Strobe Delay Time (t _{pd(1)})	T _A = 25°C		8			8		ns

Note 1: The device may be damaged by use beyond the maximum ratings.

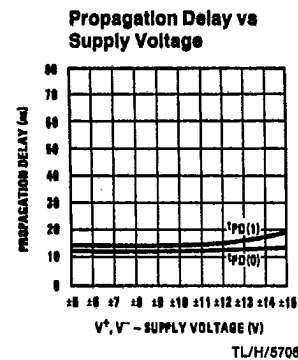
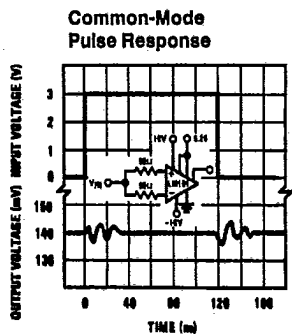
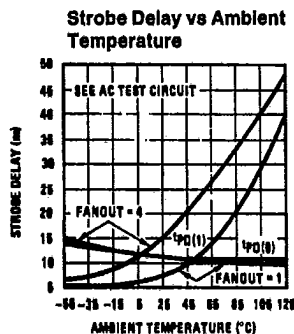
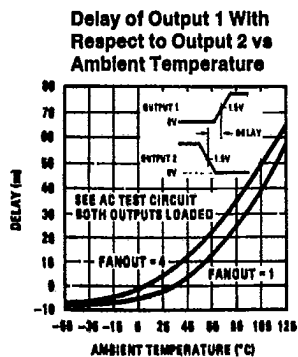
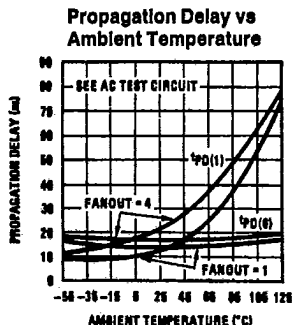
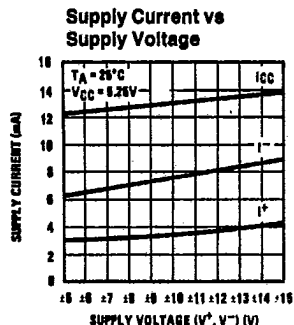
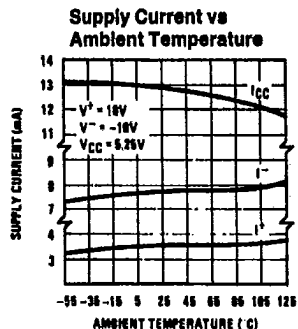
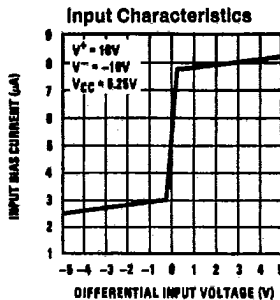
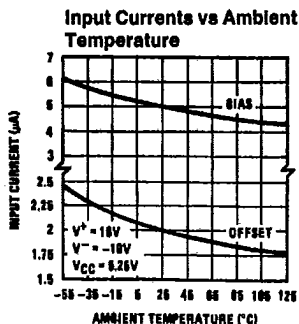
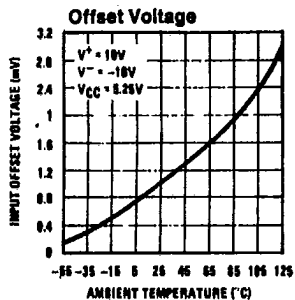
Note 2: Typical thermal impedances are as follows:

	H Package	J Package	N Package
θ _{JA}	165°C/W (Still Air) 67°C/W (400 LF/Min Air Flow)	112°C/W	105°C/W
θ _{JC}	25°C/W		

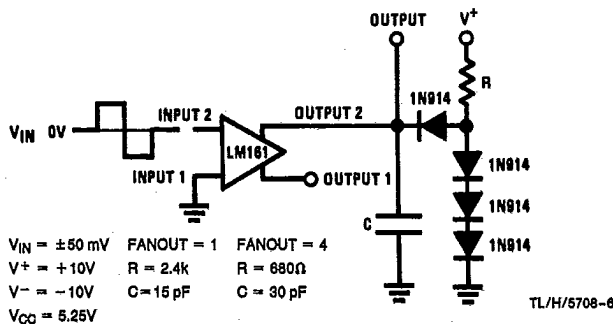
Note 3: Measurements using AC Test circuit, Fanout = 1. The devices are faster at low supply voltages.

Note 4: Refer to RETS161X for LM161H and LM161J military specifications.

Typical Performance Characteristics



AC Test Circuit



TL/H/5708-5

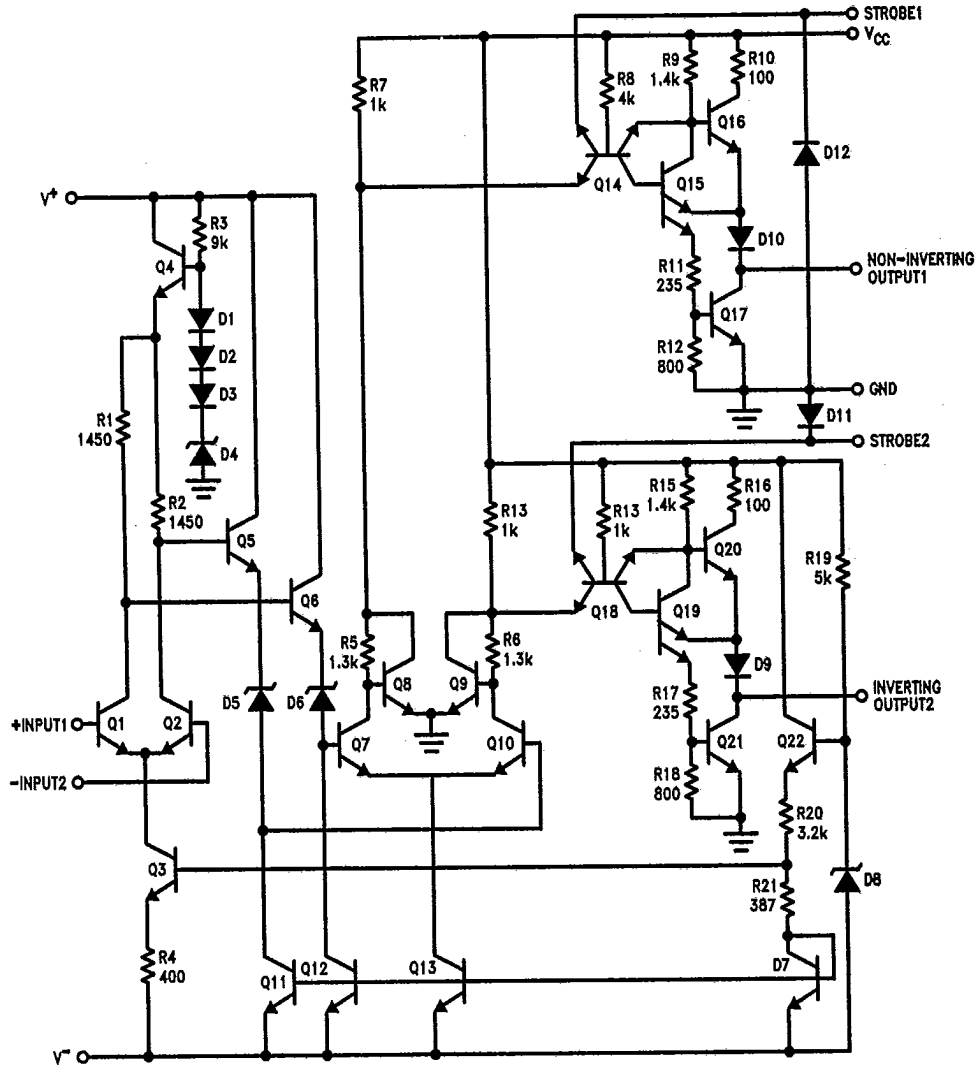
TL/H/5708-6

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Schematic Diagram

LM161



R10, R16: 85
R11, R17: 205

TL/H/5708-1