

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 (± 15 V).

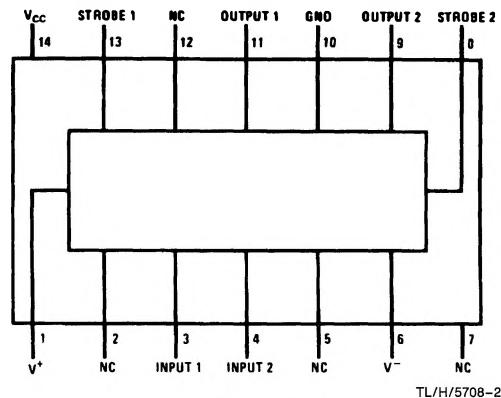
Complementary outputs having maximum skew are provided. Applications involve high speed analog to digital converters and zero-crossing detectors in disk file systems.

Features

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

Connection Diagrams

Dual-In-Line Package

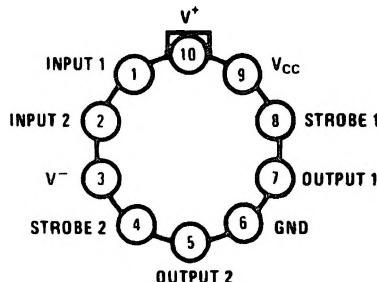


Top View

Order Number LM161J, LM261J, LM361J,
LM361M or LM361N

See NS Package Number J14A, M14A or N14A

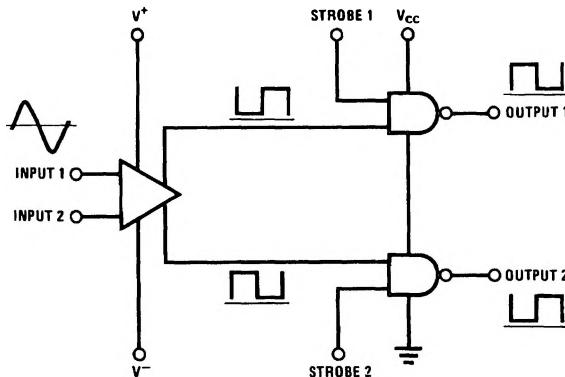
Metal Can Package



TL/H/5708-3

Order Number LM161H, LM261H or LM361H
See NS Package H10C

Logic Diagram



TL/H/5708-4

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, 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 ($V^+ = + 10V$, $V_{CC} = + 5V$, $V^- = - 10V$, $T_{MIN} \leq T_A \leq T_{MAX}$, 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	$T_A = 25^\circ C$		5	20		10	30	μA	
Input Offset Current	$T_A = 25^\circ C$		2	3		2	5	μA	
Voltage Gain	$T_A = 25^\circ C$		3			3		V/mV	
Input Resistance	$T_A = 25^\circ C$, $f = 1$ kHz		20			20		k Ω	
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	$V_{CC} = 5.25V$, $V_{STROBE} = 2.4V$			200			200	μA	
Strobe Input "0" Current	$V_{CC} = 5.25V$, $V_{STROBE} = 0.4V$			- 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	

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.

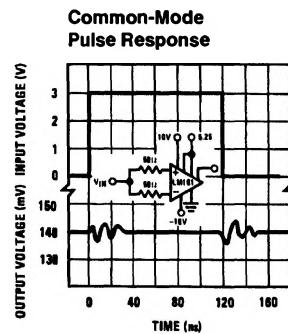
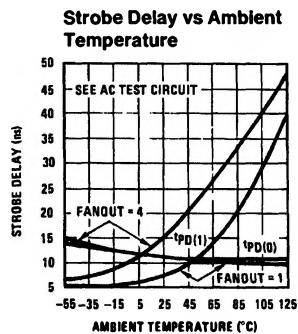
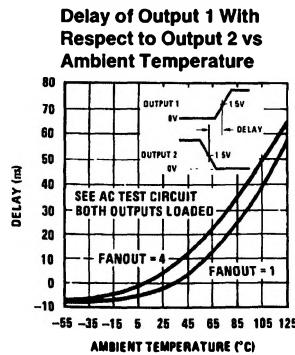
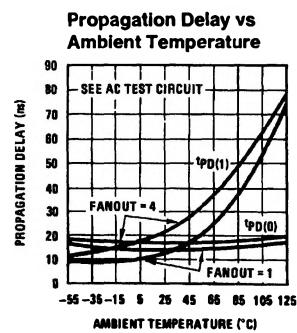
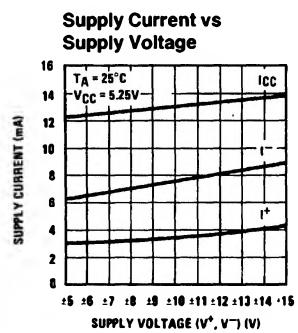
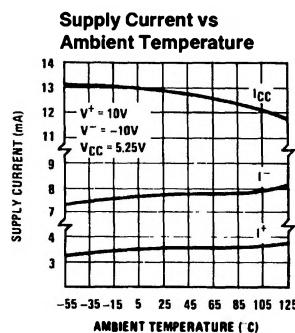
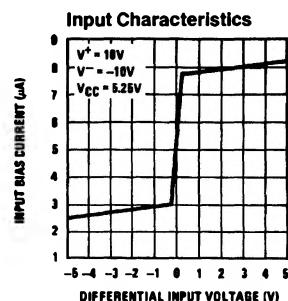
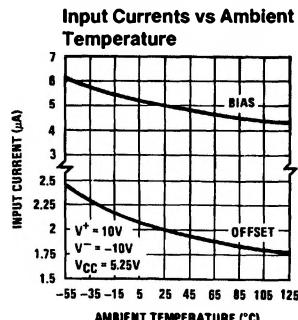
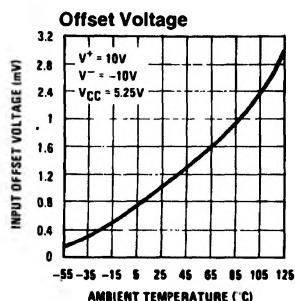
Note 2: Typical thermal impedances are as follows:

	H Package	J Package	N Package
θ _{JA}	230°C/W (Still Air) 190°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.

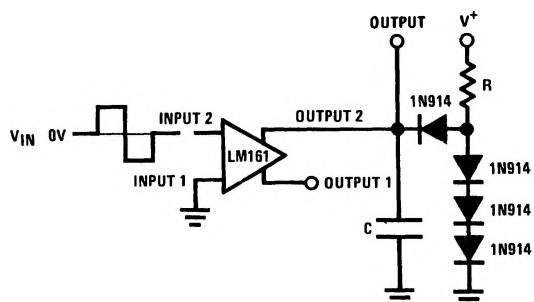
Typical Performance Characteristics



TL/H/5708-5

AC Test Circuit

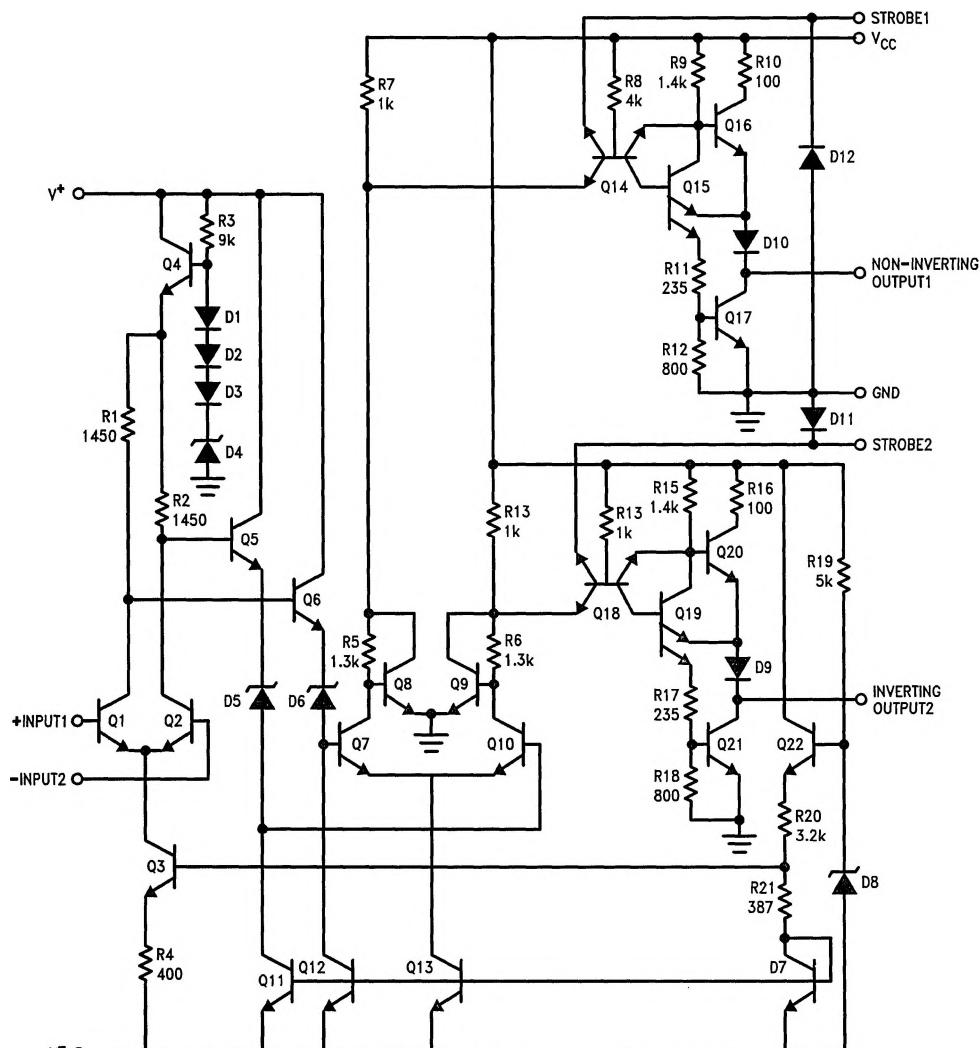
$V_{IN} = \pm 50\text{ mV}$ FANOUT = 1 FANOUT = 4
 $V^+ = +10\text{V}$ $R = 2.4\text{k}$ $R = 680\Omega$
 $V^- = -10\text{V}$ $C = 15\text{ pF}$ $C = 30\text{ pF}$
 $V_{CC} = 5.25\text{V}$



TL/H/5708-6

Schematic Diagram

LM161



R10, R16: 85
 R11, R17: 205

TL/H/5708-1