



LM361 - High Speed Differential Comparator

Features

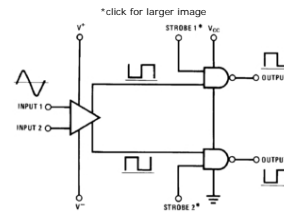
- Independent strobes
- Guaranteed high speed: 20 ns max
- Tight delay matching on both outputs
- Complementary TTL outputs
- Operates from op amp supplies: $\pm 15V$
- Low speed variation with overdrive variation
- Low input offset voltage
- Versatile supply voltage range

Typical Application

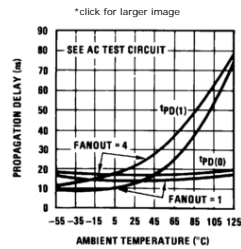
Parametric Table

Response Time	0.014 μs
Output Bus	Differential
Supply Min	11 Volt
Supply Max	32 Volt
Channels	1 Channels
Offset Voltage max, 25C	1 mV
Output Current	50 mA
Input Range	Differential
Supply Current Per Channel	13 mA
PowerWise Rating 3	182 $\mu A \times u s$
Max Input Bias Current	30000 nA
Special Features	Strobe
Temperature Min	0 deg C
Temperature Max	70 deg C
Function	Comparator

Block Diagram



Typical Performance



Datasheet

	RoHS Compliance Information
LM161/LM361 High Speed Differential Comparators	
LM161/LM361 High Speed Differential Comparators (Japanese)	

Package Availability, Models

Part Number	Package							Factory Lead Time		Models	Std Pack Size	Package Marking Format
	Type	Pins	Spec.	MSL Rating	Peak Reflow	RoHS Report	CAD Symbols	Weeks	Qty			
LM361M	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A	rail of 55	NSUZXYTT LM361M
			NOPB	1	260			6 weeks	2000			
LM361MX	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A	reel of 2500	NSUZXYTT LM361M
			NOPB	1	260			6 weeks	3000			
LM361N	MDIP	14	STD	1	NA	RoHS	Download	Full production		N/A	rail of 25	NSUZXYTTE# LM361N
			NOPB	1	NA			6 weeks	500			

LM361H	TO-100	10	STD	1	NA	RoHS	Download	Full production		N/A				box of 500	NSZXYTTE# LM361H
			NOPB	1	NA			6 weeks	1000						
LM361 MWC	Wafer						Lifetime buy		N/A					wafer jar of N/A	
							N/A	20000							

Obsolete Versions

Obsolete Part	Alternate Part or Supplier	Source	Last Time Buy Date
LM361J	NONE	NONE	04/04/95

General Description

The LM161/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.

Reliability Metrics

Part Number	Process	EFR Reject	EFR Sample Size	PPM *	LTA Rejects	LTA Device Hours	FITS	MTTF (Hours)
LM361 MWC	SLM	0	42786	0	0	3352500	2	951281028
LM361H	SLM	0	42786	0	0	3352500	2	951281028
LM361M	SLM	0	42786	0	0	3352500	2	951281028
LM361MX	SLM	0	42786	0	0	3352500	2	951281028
LM361N	SLM	0	42786	0	0	3352500	2	951281028

Note: The Early Failure Rates were calculated as point estimates. The Long Term Failure Rates were calculated at 60% confidence using the Arrhenius equation at 0.7eV activation energy and derating the assumed stress temperature of 150°C to an application temperature of 55°C.

LM161/LM361 High Speed Differential Comparators

General Description

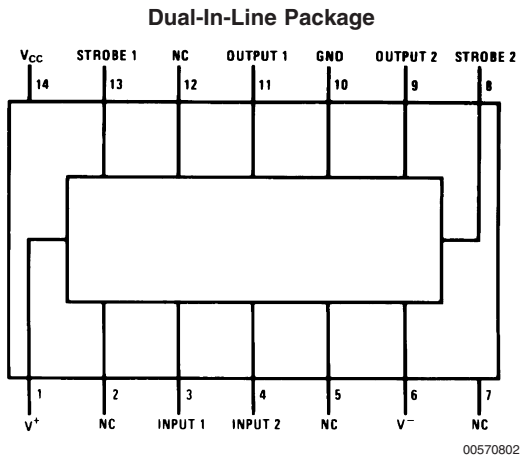
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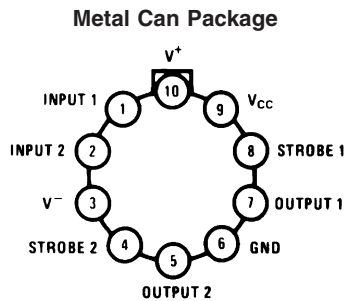
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Connection Diagrams



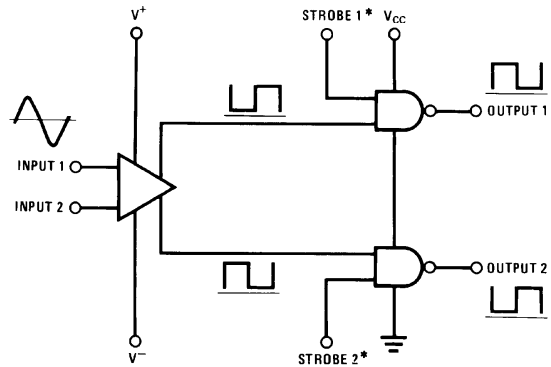
Top View

Order Number LM361M, LM361MX or LM361N
See NS Package Number M14A or N14A



Order Number LM161H/883 or LM361H
See NS Package Number H10C

Logic Diagram



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

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Absolute Maximum Ratings (Note 1)

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

Positive Supply Voltage, V^+	+16V
Negative Supply Voltage, V^-	-16V
Gate Supply Voltage, V_{CC}	+7V
Output Voltage	+7V
Differential Input Voltage	$\pm 5V$
Input Common Mode Voltage	$\pm 6V$
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
	-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

	Min	Typ	Max
LM361	5V		15V
Supply Voltage V^-			
LM161	-6V		-15V
LM361	-6V		-15V
Supply Voltage V_{CC}			
LM161	4.5V	5V	5.5V
LM361	4.75V	5V	5.25V
ESD Tolerance (Note 5)			1600V
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.

Operating Conditions

	Min	Typ	Max
Supply Voltage V^+			
LM161	5V		15V

Electrical Characteristics

($V^+ = +10V$, $V_{CC} = +5V$, $V^- = -10V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless noted)

Parameter	Conditions	Limits						Units
		LM161			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 (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
Supply Current I^+	$V^+=10V$, $V^-=-10V$, $V_{CC}=5.25V$, $-55^\circ C \leq T_A \leq 125^\circ C$			4.5				mA

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

Parameter	Conditions	Limits						Units
		LM161			LM361			
		Min	Typ	Max	Min	Typ	Max	
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

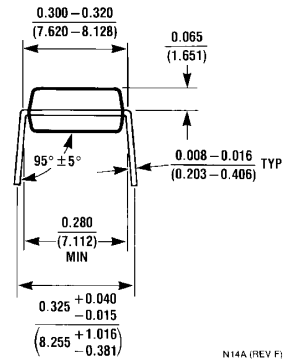
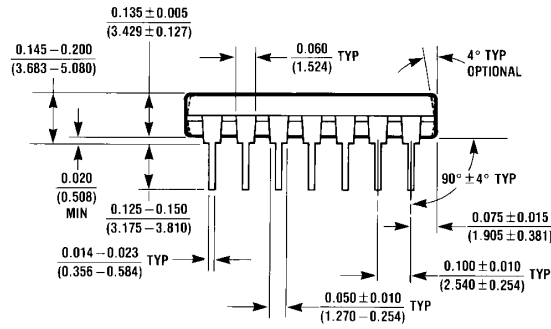
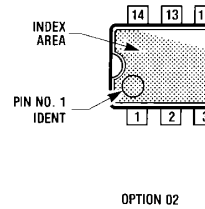
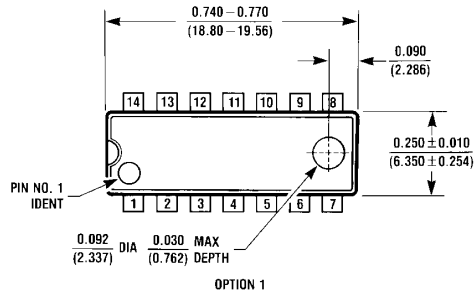
Note 1: The device may be damaged by use beyond the maximum ratings.**Note 2:** Typical thermal impedances are as follows:

	<u>H Package</u>	<u>J Package</u>	<u>N Package</u>
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		

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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.**Note 5:** Human body model, 1.5 kΩ in series with 100 pF.

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Molded Dual-In-Line Package (N)
 Order Number LM361N
 NS Package Number N14A

N14A (REV F)