

LM160/LM360 High Speed Differential Comparator

General Description

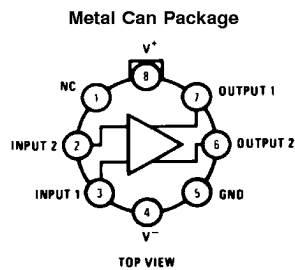
The LM160/LM360 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over the $\mu\text{A}760/\mu\text{A}760\text{C}$, for which it is a pin-for-pin replacement. The device has been optimized for greater speed, input impedance and fan-out, and lower input offset voltage. Typically delay varies only 3 ns for overdrive variations of 5 mV to 400 mV.

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

Features

- Guaranteed high speed: 20 ns max
- Tight delay matching on both outputs
- Complementary TTL outputs
- High input impedance
- Low speed variation with overdrive variation
- Fan-out of 4
- Low input offset voltage
- Series 74 TTL compatible

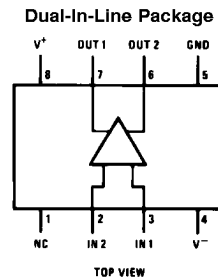
Connection Diagrams



DS005707-4

Order Number LM160H/883 (Note 1) or LM360H
See NS Package Number H08C

Note 1: Also available in SMD# 5962-8767401



DS005707-5

Order Number LM360M or LM360N
See NS Package Number M08A or N08E

Absolute Maximum Ratings (Notes 6, 8)

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

Positive Supply Voltage	+8V
Negative Supply Voltage	−8V
Peak Output Current	20 mA
Differential Input Voltage	±5V
Input Voltage	$V^+ \geq V_{IN} \geq V^-$
ESD Tolerance (Note 9)	1600V
Operating Temperature Range	
LM160	−55°C to +125°C
LM360	0°C to +70°C

Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec.)	260°C
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

($T_{MIN} \leq T_A \leq T_{MAX}$)

Parameter	Conditions	Min	Typ	Max	Units
Operating Conditions					
Supply Voltage V_{CC}^+		4.5	5	6.5	V
Supply Voltage V_{CC}^-		−4.5	−5	−6.5	V
Input Offset Voltage	$R_S \leq 200\Omega$		2	5	mV
Input Offset Current			0.5	3	μA
Input Bias Current			5	20	μA
Output Resistance (Either Output)	$V_{OUT} = V_{OH}$		100		Ω
Response Time	$T_A = 25^\circ\text{C}$, $V_S = \pm 5\text{V}$ (Notes 2, 7)		13	25	ns
	$T_A = 25^\circ\text{C}$, $V_S = \pm 5\text{V}$ (Notes 3, 7)		12	20	ns
	$T_A = 25^\circ\text{C}$, $V_S = \pm 5\text{V}$ (Notes 4, 7)		14		ns
Response Time Difference between Outputs					
(t_{pd} of $+V_{IN1}$) − (t_{pd} of $-V_{IN2}$)	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
(t_{pd} of $+V_{IN2}$) − (t_{pd} of $-V_{IN1}$)	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
(t_{pd} of $+V_{IN1}$) − (t_{pd} of $+V_{IN2}$)	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
(t_{pd} of $-V_{IN1}$) − (t_{pd} of $-V_{IN2}$)	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
Input Resistance	$f = 1\text{ MHz}$		17		kΩ
Input Capacitance	$f = 1\text{ MHz}$		3		pF
Average Temperature Coefficient of Input Offset Voltage	$R_S = 50\Omega$		8		μV/°C
Average Temperature Coefficient of Input Offset Current			7		nA/°C
Common Mode Input Voltage Range	$V_S = \pm 6.5\text{V}$	±4	±4.5		V
Differential Input Voltage Range		±5			V
Output High Voltage (Either Output)	$I_{OUT} = -320\text{ }\mu\text{A}$, $V_S = \pm 4.5\text{V}$	2.4	3		V
Output Low Voltage (Either Output)	$I_{SINK} = 6.4\text{ mA}$		0.25	0.4	V
Positive Supply Current	$V_S = \pm 6.5\text{V}$		18	32	mA
Negative Supply Current	$V_S = \pm 6.5\text{V}$		−9	−16	mA

Note 2: Response time measured from the 50% point of a 30 mVp-p 10 MHz sinusoidal input to the 50% point of the output.

Note 3: Response time measured from the 50% point of a 2 Vp-p 10 MHz sinusoidal input to the 50% point of the output.

Note 4: Response time measured from the start of a 100 mV input step with 5 mV overdrive to the time when the output crosses the logic threshold.

Note 5: Typical thermal impedances are as follows:

Cavity DIP (J):	θ_{JA}	135°C/W	Header (H)	θ_{JA}	165°C/W	(Still Air)
Molded DIP (N):	θ_{JA}	130°C/W			67°C/W	(400 LF/min Air Flow)
				θ_{JC}	25°C/W	

Note 6: The device may be damaged if used beyond the maximum ratings.

Note 7: Measurements are made in AC Test Circuit, Fanout = 1

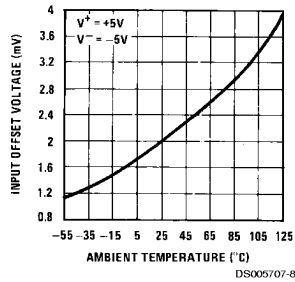
Note 8: Refer to RETS 160X for LM160H, LM160J-14 and LM160J military specifications.

Electrical Characteristics (Continued)

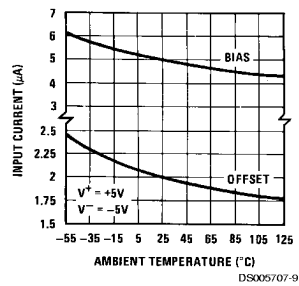
Note 9: Human body model, 1.5 k Ω in series with 100 pF.

Typical Performance Characteristics

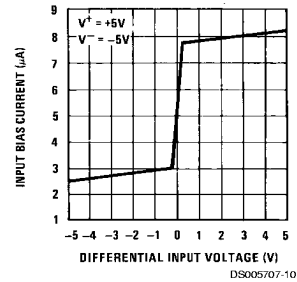
Offset Voltage



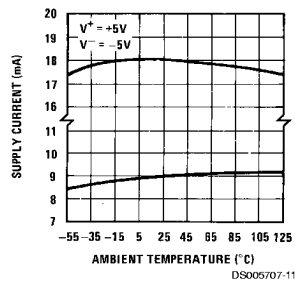
Input Current vs Ambient Temperature



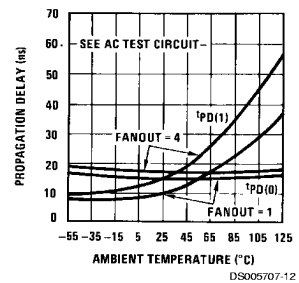
Input Characteristics



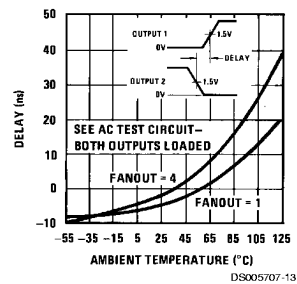
Supply Current vs Ambient Temperature



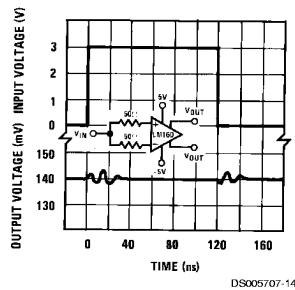
Propagation Delay vs Ambient Temperature



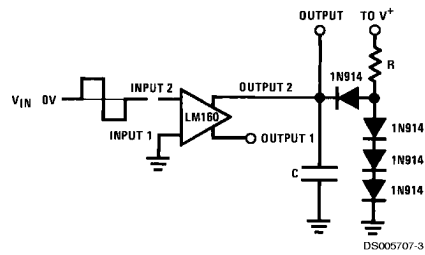
Delay of Output 1 With Respect to Output 2 vs Ambient Temperature



Common-Mode Pulse Response

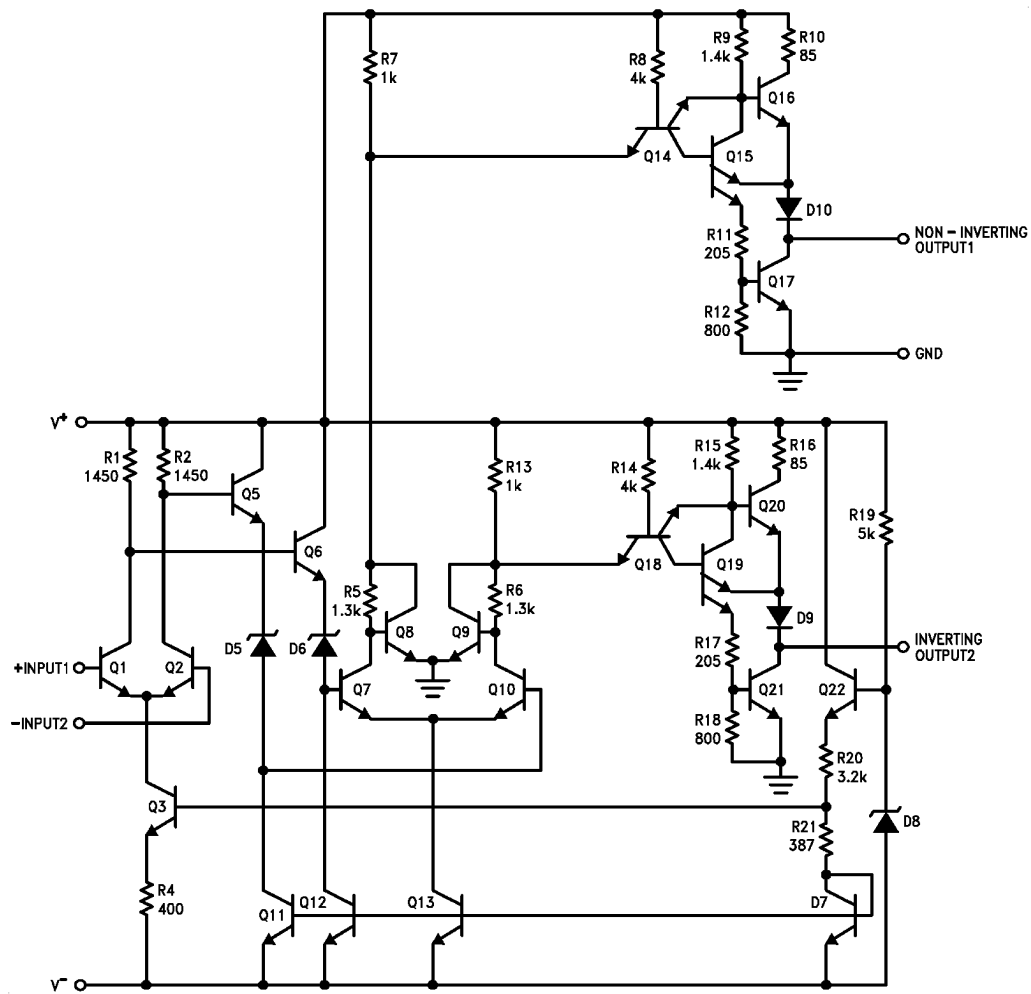


AC Test Circuit

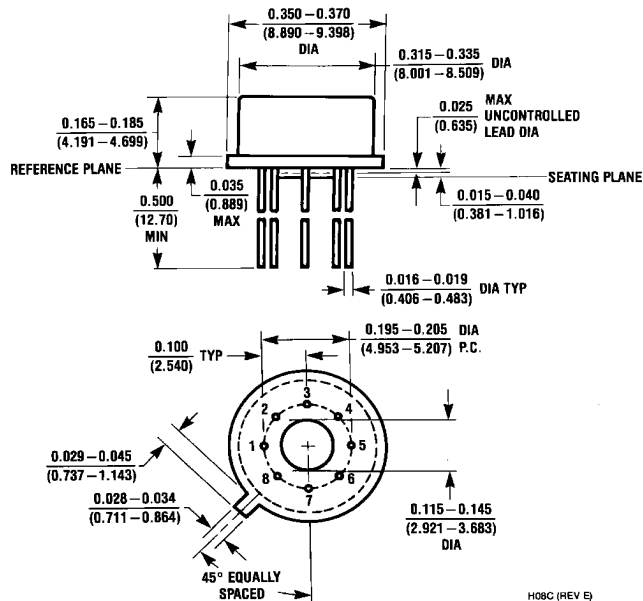


$V_{IN} = \pm 50 \text{ mV}$ FANOUT=1 FANOUT=4
 $V^+ = +5V$ $R = 2.4k$ $R = 630\Omega$
 $V^- = -5V$ $C = 15 \text{ pF}$ $C = 30 \text{ pF}$

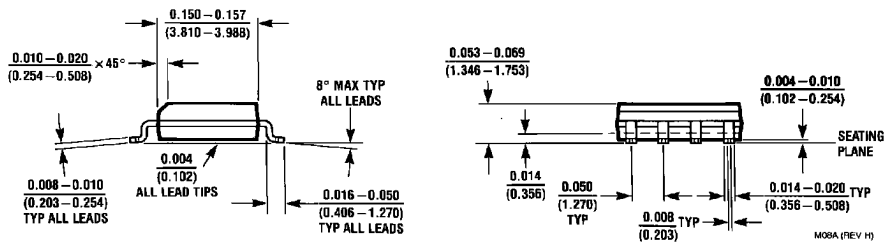
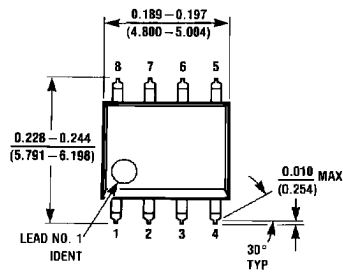
Schematic Diagram



DS90C05/07-1

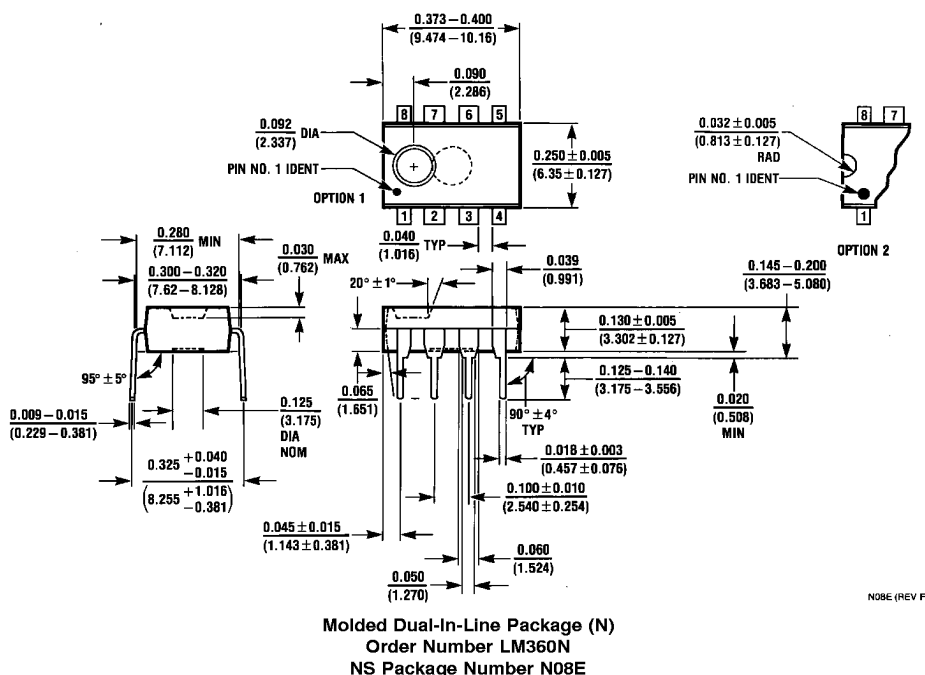
Physical Dimensions inches (millimeters) unless otherwise noted

Metal Can Package (H)
Order Number LM160H/883 or LM360H
NS Package Number H08C



Molded Dual-In-Line Package (M)
Order Number LM360M
NS Package Number M08A

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



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