

LM160/LM360 High Speed Differential Comparator

General Description

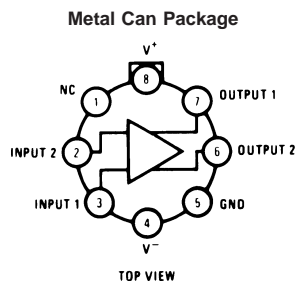
The LM160/LM360 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over the μ A760/ μ A760C, for which it is a pin-for-pin replacement. The device has been optimized for greater speed, input impedance and fan-out, and lower input offset 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 convertors and zero-crossing detectors in disk file systems.

Features

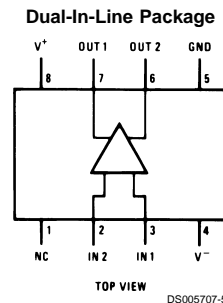
- Guaranteed high speed: 20 ns max
- Tight delay matching on both outputs
- Complementary TTL outputs
- High input impedance
- Low speed variation with overdrive variation
- Fan-out of 4
- Low input offset voltage
- Series 74 TTL compatible

Connection Diagrams



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

Note 1: Also available in SMD# 5962-8767401



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					
$(t_{pd} \text{ of } +V_{IN1}) - (t_{pd} \text{ of } -V_{IN2})$	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
$(t_{pd} \text{ of } +V_{IN2}) - (t_{pd} \text{ of } -V_{IN1})$	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
$(t_{pd} \text{ of } +V_{IN1}) - (t_{pd} \text{ of } +V_{IN2})$	$T_A = 25^\circ\text{C}$ (Notes 2, 7)		2		ns
$(t_{pd} \text{ of } -V_{IN1}) - (t_{pd} \text{ of } -V_{IN2})$	$T_A = 25^\circ\text{C}$ (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)	$I_{OUT} = -320 \mu\text{A}, V_S = \pm 4.5\text{V}$	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

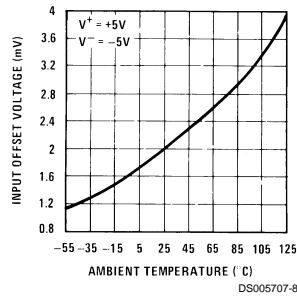
Note 8: Refer to RETS 160X for LM160H, LM160J-14 and LM160J military specifications.

Electrical Characteristics (Continued)

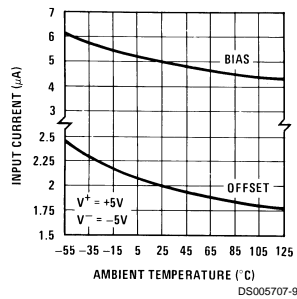
Note 9: Human body model, 1.5 kΩ in series with 100 pF.

Typical Performance Characteristics

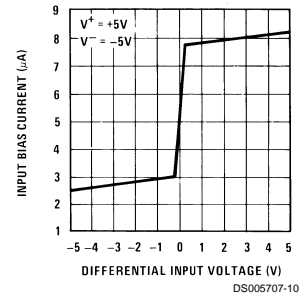
Offset Voltage



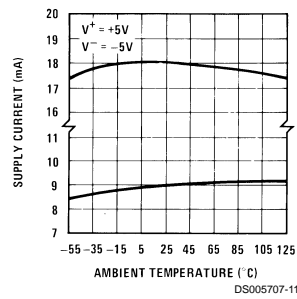
Input Current vs Ambient Temperature



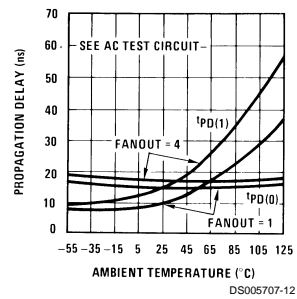
Input Characteristics



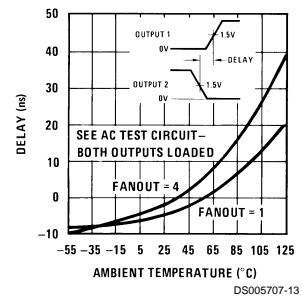
Supply Current vs Ambient Temperature



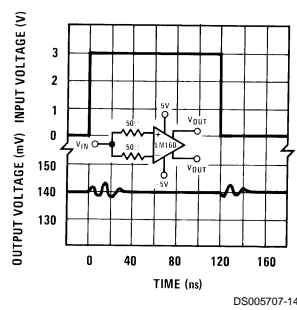
Propagation Delay vs Ambient Temperature



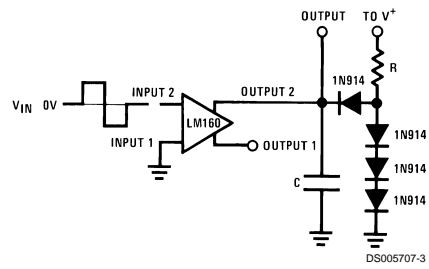
Delay of Output 1 With Respect to Output 2 vs Ambient Temperature



Common-Mode Pulse Response

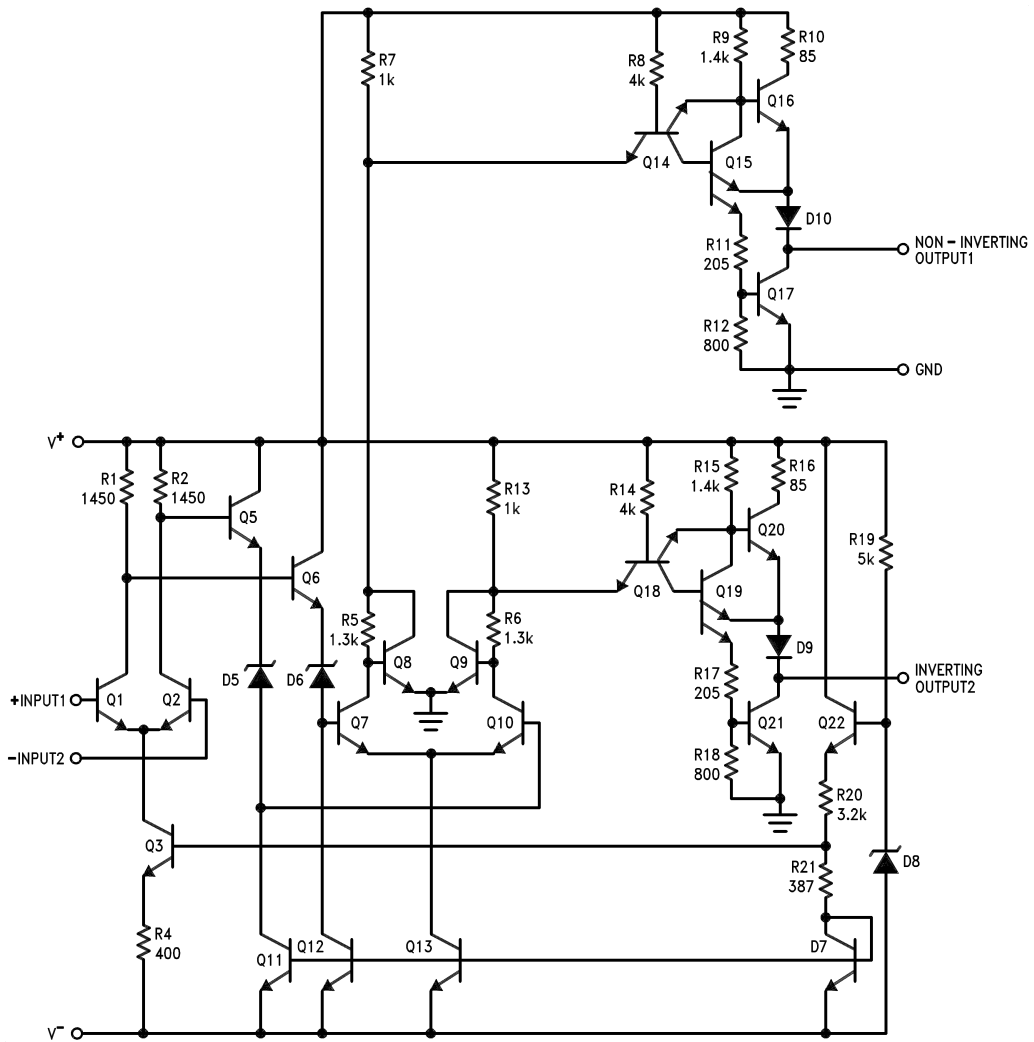


AC Test Circuit



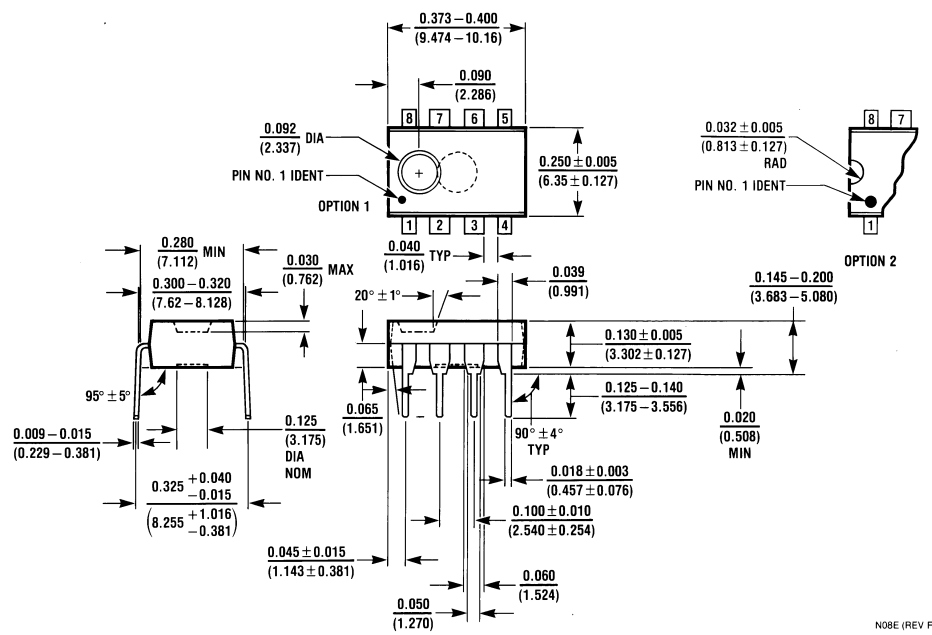
$V_{IN} = \pm 50 \text{ mV}$ FANOUT=1 FANOUT=4
 $V^+ = +5\text{V}$ $R = 2.4\text{k}$ $R = 630\Omega$
 $V^- = -5\text{V}$ $C = 15 \text{ pF}$ $C = 30 \text{ pF}$

Schematic Diagram



DS005707-1

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



Molded Dual-In-Line Package (N)
Order Number LM360N
NS Package Number N08E

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