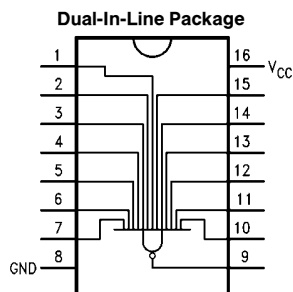


DM54LS133/DM74LS133 13-Input NAND Gate

General Description

This device contains one, 13-input gate that performs the logic NAND functions.

Connection Diagram



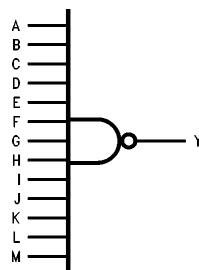
TL/F/9818-1

Order Number DM54LS133E, DM54LS133J,
DM54LS133N, DM74LS133M or DM74LS133N
See NS Package Number E20A, J16A, M16A, N16E or W16A

Function Table

Inputs A through M	Output Y
All Inputs H	L
One or More Inputs L	H

Logic Diagram



TL/F/9818-2

POSITIVE LOGIC

$$Y = \overline{A \cdot B \cdot C \cdot D \cdot E \cdot F \cdot G \cdot H \cdot I \cdot J \cdot K \cdot L \cdot M} \text{ or}$$

$$Y = \overline{A} + \overline{B} + \overline{C} + \overline{D} + \overline{E} + \overline{F} + \overline{G} + \overline{H} + \overline{I} + \overline{J} + \overline{K} + \overline{L} + \overline{M}$$

Absolute Maximum Ratings (Note)

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

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the “Electrical Characteristics” table are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	DM54LS133			DM74LS133			Units
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage	2			2			V
V _{IL}	Low Level Input Voltage			0.7			0.8	V
I _{OH}	High Level Output Current			−0.4			−0.4	mA
I _{OL}	Low Level Output Current			4			8	mA
T _A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics Over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = −18 mA			−1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max	DM54 2.5			V
			DM74 2.7	3.4		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min	DM54		0.4	V
			DM74	0.35	0.5	
		I _{OL} = 4 mA, V _{CC} = Min	DM74	0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V V _I = 10V	DM74		0.1	mA
			DM54			
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V			20	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V			−0.4	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54 −20		−100	mA
			DM74 −20		−100	
I _{CCH}	Supply Current with Outputs High	V _{CC} = Max, V _{IN} = GND			0.5	mA
I _{CCL}	Supply Current with Outputs Low	V _{CC} = Max, V _{IN} = Open			1.1	mA

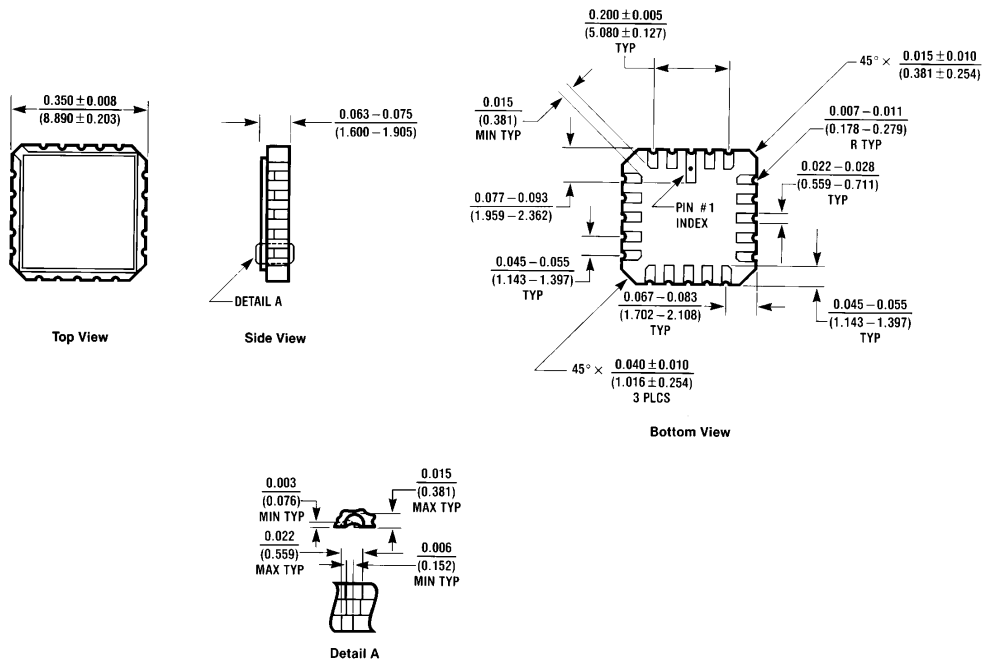
Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics at V_{CC} = 5V and T_A = 25°C

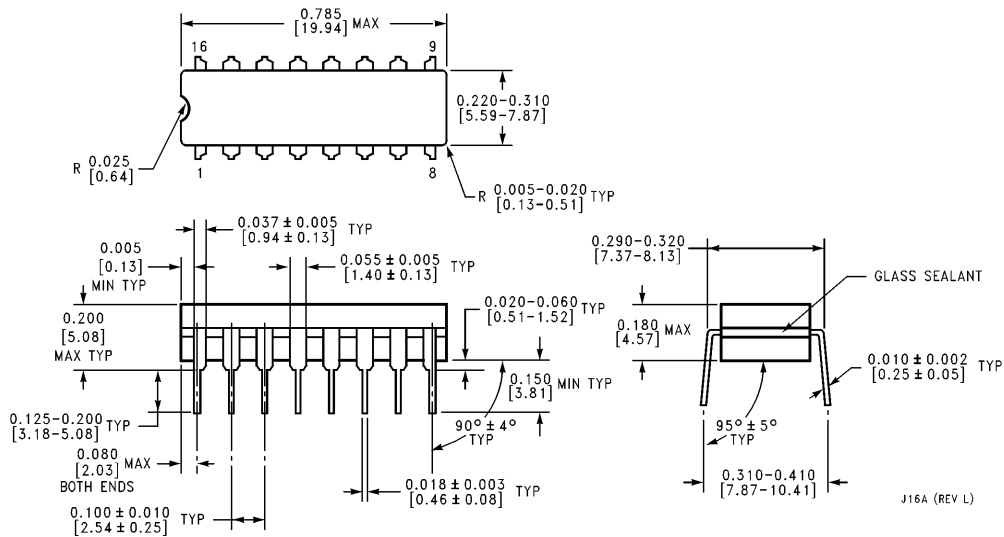
Symbol	Parameter	R _L = 2 kΩ, C _L = 15 pF		Units
		Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output		15	ns
t _{PHL}	Propagation Delay Time High to Low Level Output		38	ns

Physical Dimensions inches (millimeters)



Ceramic Leadless Chip Carrier Package (E)
Order Number DM54LS133E
NS Package Number E20A

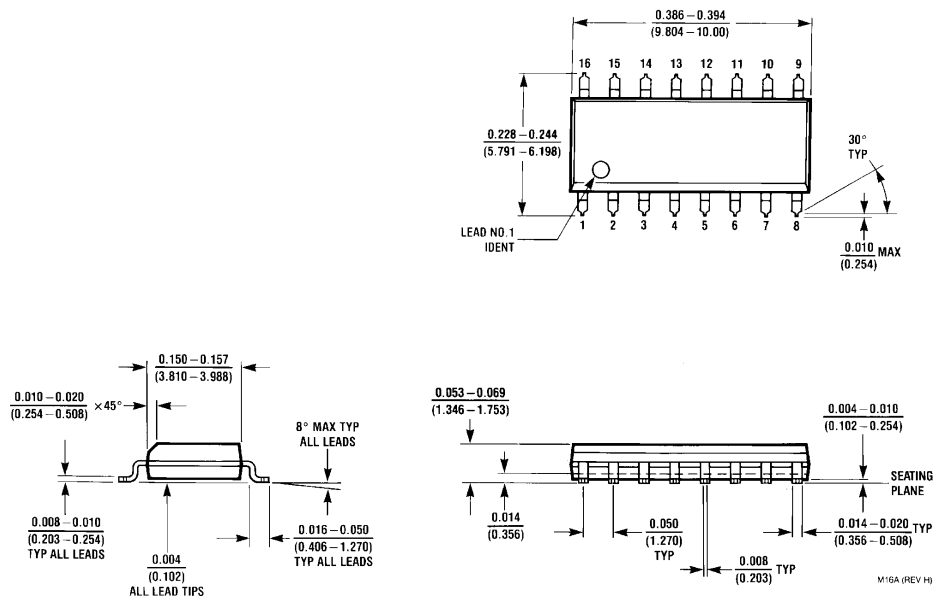
E20A (REV D)



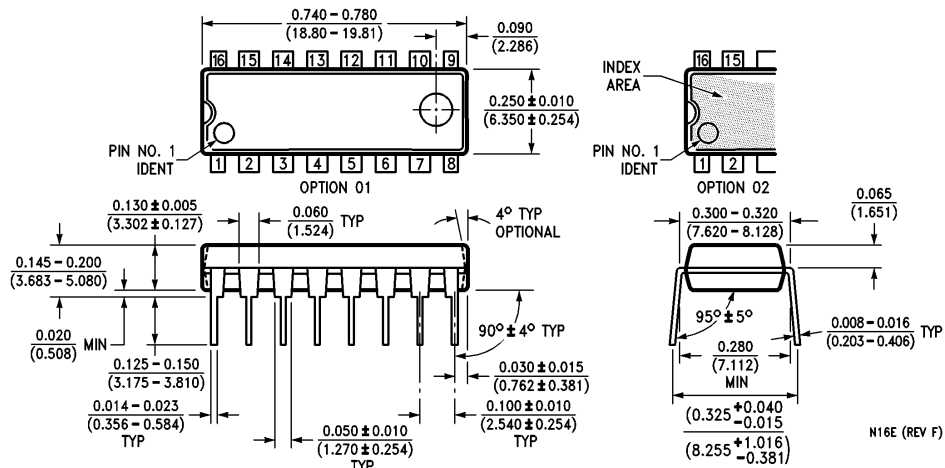
16-Lead Ceramic Dual-In-Line Package (J)
Order Number DM54LS133J
NS Package Number J16A

J16A (REV L)

Physical Dimensions inches (millimeters) (Continued)

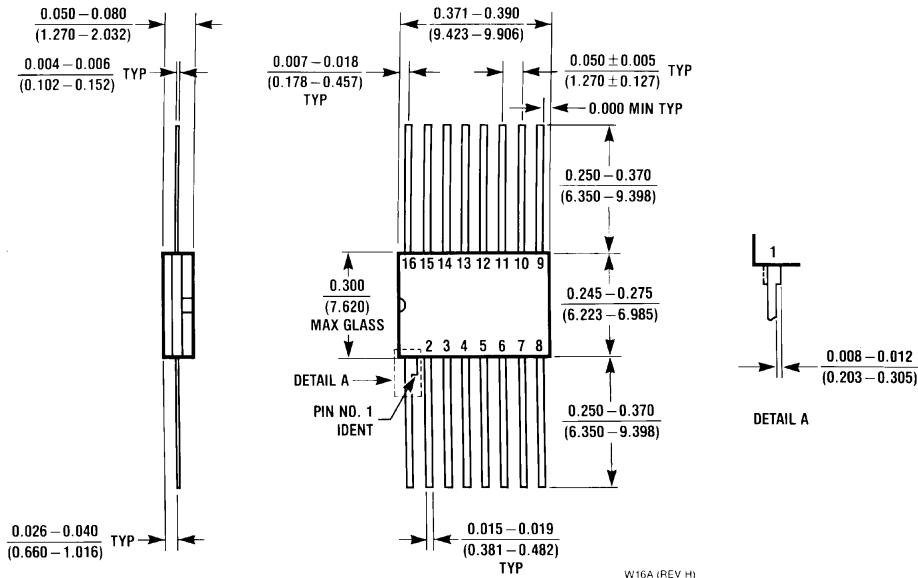


16-Lead Small Outline Molded Package (M)
Order Number DM74LS133M
NS Package Number M16A



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS133N
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)



16-Lead Ceramic Flat Package (W)
Order Number DM54LS133W
NS Package Number W16A

LIFE SUPPORT POLICY

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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