

## 54LS20/DM54LS20/DM74LS20 Dual 4-Input NAND Gates

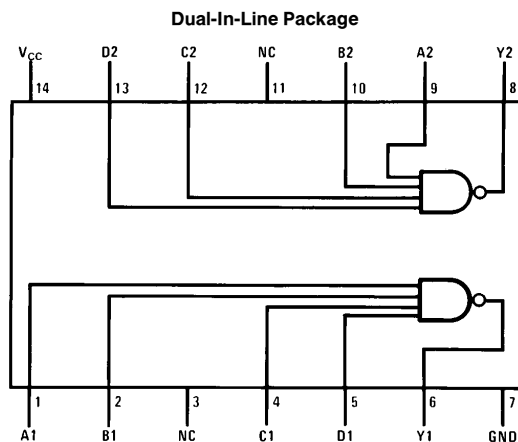
### General Description

This device contains two independent gates each of which performs the logic NAND function.

### Features

- Alternate Military/Aerospace device (54LS20) is available. Contact a National Semiconductor Sales Office/Distributor for specifications

### Connection Diagram



TL/F/6355-1

Order Number 54LS20DMQB, 54LS20FMQB, 54LS20LMQB,  
DM54LS20J, DM54LS20W, DM74LS20M or DM74LS20N  
See NS Package Number E20A, J14A, M14A, N14A or W14B

### Function Table

$$Y = \overline{ABCD}$$

Inputs				Output
A	B	C	D	Y
X	X	X	L	H
X	X	L	X	H
X	L	X	X	H
L	X	X	X	H
H	H	H	H	L

H = High Logic Level

L = Low Logic Level

X = Either Low or High Logic Level

**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 and 54LS	−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	DM54LS20			DM74LS20			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7			0.8	V
I <sub>OH</sub>	High Level Output Current			−0.4			−0.4	mA
I <sub>OL</sub>	Low Level Output Current			4			8	mA
T <sub>A</sub>	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 <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = −18 mA			−1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max	DM54 2.5	3.4		V
			DM74 2.7	3.4		
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min	DM54 DM74	0.25 0.35	0.4 0.5	V
		I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = Min	DM74	0.25	0.4	
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 7V			0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			−0.36	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	DM54 DM74	−20 −20	−100 −100	mA
I <sub>CCH</sub>	Supply Current with Outputs High	V <sub>CC</sub> = Max		0.4	0.8	
I <sub>CCL</sub>	Supply Current with Outputs Low	V <sub>CC</sub> = Max		1.2	2.2	mA

**Switching Characteristics** at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C (See Section 1 for Test Waveforms and Output Load)

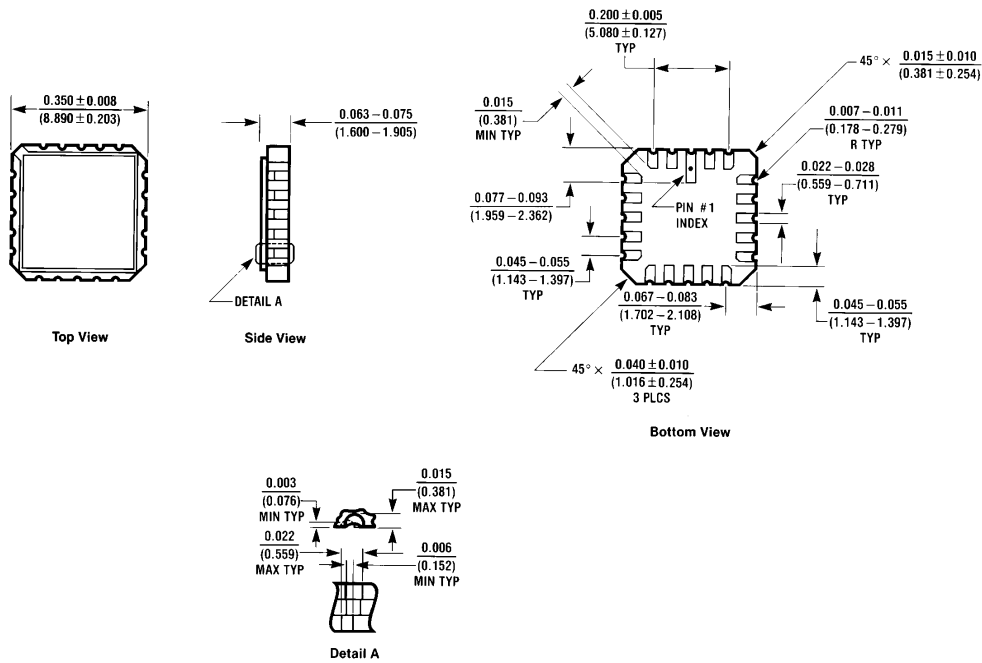
Symbol	Parameter	R <sub>L</sub> = 2 kΩ				Units
		C <sub>L</sub> = 15 pF		C <sub>L</sub> = 50 pF		
		Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output	3	10	4	15	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output	3	10	4	15	ns

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

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

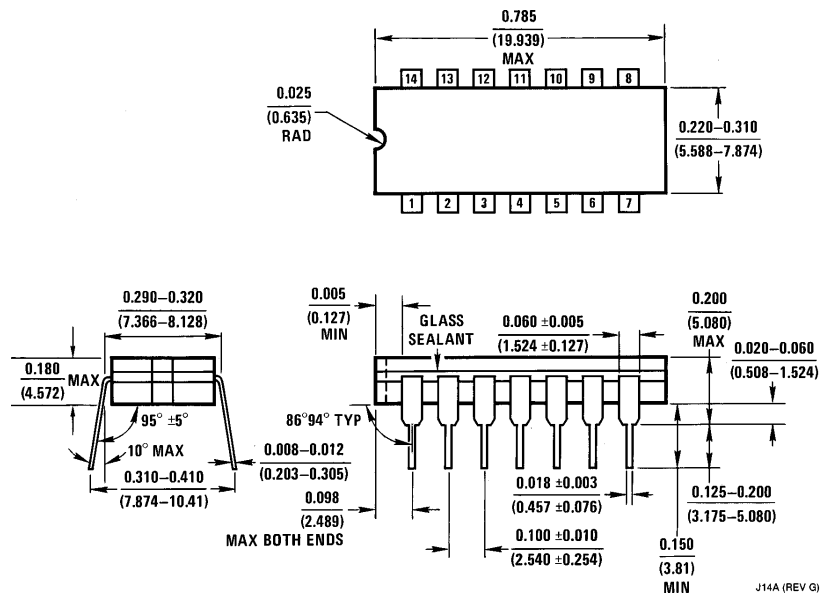


# Physical Dimensions inches (millimeters)



**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS20LMQB**  
**NS Package Number E20A**

E20A (REV D)



**14-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS20DMQB or DM54LS20J**  
**NS Package Number J14A**

J14A (REV G)

The image contains three mechanical drawings of the M14A connector, showing top, side, and end views with dimensions in inches and millimeters.

**Top View:** Shows the connector's footprint. Dimensions include a total width of 0.335 - 0.344 (8.509 - 8.738) and a total length of 0.228 - 0.244 (5.791 - 6.198). Pin numbers 1 through 14 are indicated. A 30° TYP angle is shown for the lead tips. A dimension of 0.010 MAX (0.254) is shown for the lead height. A label "LEAD NO. 1 IDENT" points to a specific lead.

**Side View:** Shows the profile of the connector. Dimensions include a total height of 0.010 - 0.020 (0.254 - 0.508) and a lead height of 0.004 (0.102). A 45° angle is shown for the lead tip. A dimension of 0.016 - 0.050 (0.406 - 1.270) TYP ALL LEADS is shown for the lead length. A dimension of 0.008 - 0.010 (0.203 - 0.254) TYP ALL LEADS is shown for the lead width. A dimension of 0.0150 - 0.157 (3.810 - 3.988) is shown for the body width. A dimension of 8° MAX TYP ALL LEADS is shown for the lead angle.

**End View:** Shows the connector's end profile. Dimensions include a total width of 0.053 - 0.069 (1.346 - 1.753) and a lead height of 0.004 - 0.010 (0.102 - 0.254). A dimension of 0.014 (0.356) is shown for the lead height. A dimension of 0.050 (1.270) TYP is shown for the lead length. A dimension of 0.008 (0.203) TYP is shown for the lead width. A dimension of 0.014 - 0.020 (0.356 - 0.508) TYP is shown for the lead length. A "SEATING PLANE" is indicated.

**OPTION 1**

Top View Dimensions:

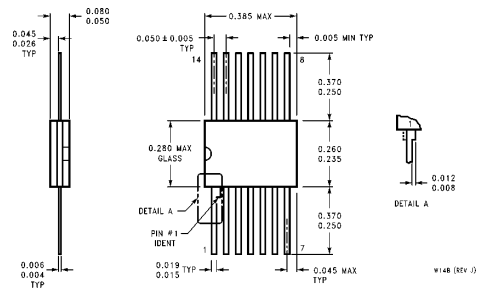
- Overall Length:  $0.740 - 0.770$  (18.80 - 19.56)
- Pin 8 to Pin 13 Spacing:  $0.090$  (2.286)
- Pin 13 to Pin 12 Spacing:  $0.250 \pm 0.010$  (6.350  $\pm$  0.254)
- Pin 12 to Pin 11 Spacing:  $0.092$  DIA (2.337)
- Pin 11 to Pin 10 Spacing:  $0.030$  MAX (0.762) DEPTH
- Pin 10 to Pin 9 Spacing:  $0.092$  DIA (2.337)
- Pin 9 to Pin 8 Spacing:  $0.092$  DIA (2.337)
- Pin 8 to Pin 7 Spacing:  $0.092$  DIA (2.337)
- Pin 7 to Pin 6 Spacing:  $0.092$  DIA (2.337)
- Pin 6 to Pin 5 Spacing:  $0.092$  DIA (2.337)
- Pin 5 to Pin 4 Spacing:  $0.092$  DIA (2.337)
- Pin 4 to Pin 3 Spacing:  $0.092$  DIA (2.337)
- Pin 3 to Pin 2 Spacing:  $0.092$  DIA (2.337)
- Pin 2 to Pin 1 Spacing:  $0.092$  DIA (2.337)

Side View Dimensions:

- Pin 1 to Pin 2 Spacing:  $0.135 \pm 0.005$  (3.429  $\pm$  0.127)
- Pin 2 to Pin 3 Spacing:  $0.060$  TYP (1.524)
- Pin 3 to Pin 4 Spacing:  $0.060$  TYP (1.524)
- Pin 4 to Pin 5 Spacing:  $0.060$  TYP (1.524)
- Pin 5 to Pin 6 Spacing:  $0.060$  TYP (1.524)
- Pin 6 to Pin 7 Spacing:  $0.060$  TYP (1.524)
- Pin 7 to Pin 8 Spacing:  $0.060$  TYP (1.524)
- Pin 8 to Pin 9 Spacing:  $0.060$  TYP (1.524)
- Pin 9 to Pin 10 Spacing:  $0.060$  TYP (1.524)
- Pin 10 to Pin 11 Spacing:  $0.060$  TYP (1.524)
- Pin 11 to Pin 12 Spacing:  $0.060$  TYP (1.524)
- Pin 12 to Pin 13 Spacing:  $0.060$  TYP (1.524)
- Pin 13 to Pin 14 Spacing:  $0.060$  TYP (1.524)
- Pin 14 to Pin 15 Spacing:  $0.060$  TYP (1.524)
- Pin 15 to Pin 16 Spacing:  $0.060$  TYP (1.524)
- Pin 16 to Pin 17 Spacing:  $0.060$  TYP (1.524)
- Pin 17 to Pin 18 Spacing:  $0.060$  TYP (1.524)
- Pin 18 to Pin 19 Spacing:  $0.060$  TYP (1.524)
- Pin 19 to Pin 20 Spacing:  $0.060$  TYP (1.524)
- Pin 20 to Pin 21 Spacing:  $0.060$  TYP (1.524)
- Pin 21 to Pin 22 Spacing:  $0.060$  TYP (1.524)
- Pin 22 to Pin 23 Spacing:  $0.060$  TYP (1.524)
- Pin 23 to Pin 24 Spacing:  $0.060$  TYP (1.524)
- Pin 24 to Pin 25 Spacing:  $0.060$  TYP (1.524)
- Pin 25 to Pin 26 Spacing:  $0.060$  TYP (1.524)
- Pin 26 to Pin 27 Spacing:  $0.060$  TYP (1.524)
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- Pin 90 to Pin 91 Spacing:  $0.060$  TYP (1.524)
- Pin 91 to Pin 92 Spacing:  $0.060$  TYP (1.524)
- Pin 92 to Pin 93 Spacing:  $0.060$  TYP (1.524)
- Pin 93 to Pin 94 Spacing:  $0.060$  TYP (1.524)
- Pin 94 to Pin 95 Spacing:  $0.060$  TYP (1.524)
- Pin 95 to Pin 96 Spacing:  $0.060$  TYP (1.

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Physical Dimensions inches (millimeters) (Continued)



14-Lead Ceramic Flat Package (W)  
Order Number 54LS20FMB or DM54LS20W  
NS Package Number W14B

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