

54LS21/DM54LS21/DM74LS21 Dual 4-Input AND Gates

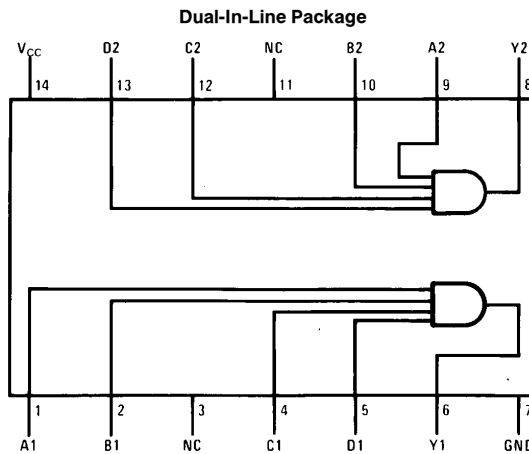
General Description

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

Features

- Alternate Military/Aerospace device (54LS21) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram



TL/F/6356-1

Order Number 54LS21DMQB, 54LS21FMQB, 54LS21LMQB,
DM54LS21J, DM54LS21W, DM74LS21M or DM74LS21N
See NS Package Number E20A, J14A, M14A, N14A or W14B

Function Table

$$Y = ABCD$$

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

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	DM54LS21			DM74LS21			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 _{IH} = Min	DM54 2.5	3.4		V
			DM74 2.7	3.4		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IL} = Max	DM54	0.25	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			0.1	mA
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			−0.36	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		1.2	2.4	mA
I _{CCL}	Supply Current with Outputs Low	V _{CC} = Max		2.2	4.4	mA

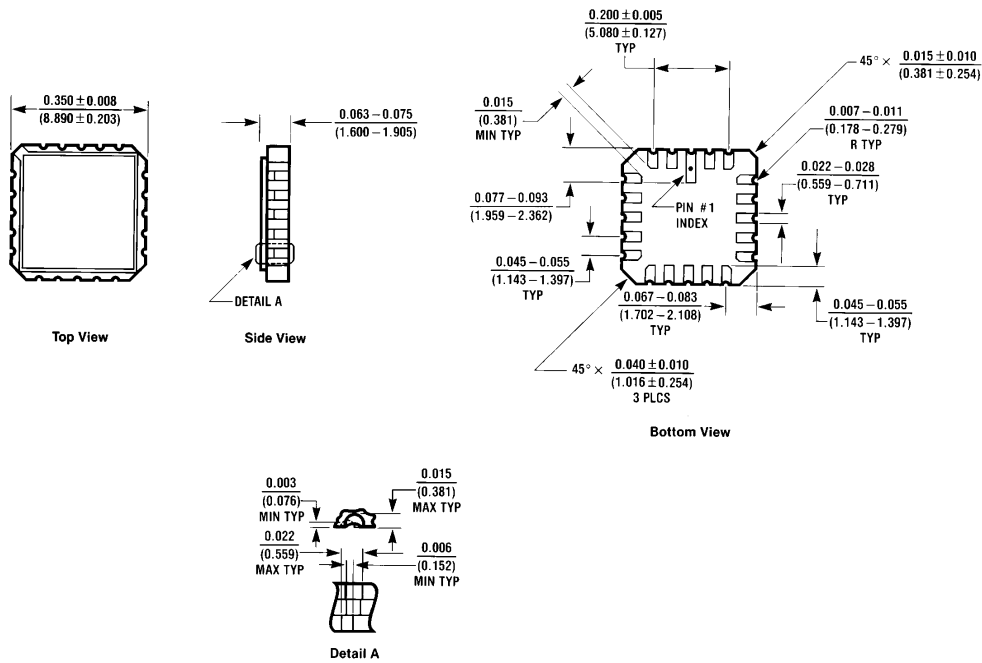
Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	4	13	6	18	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	3	11	5	18	ns

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

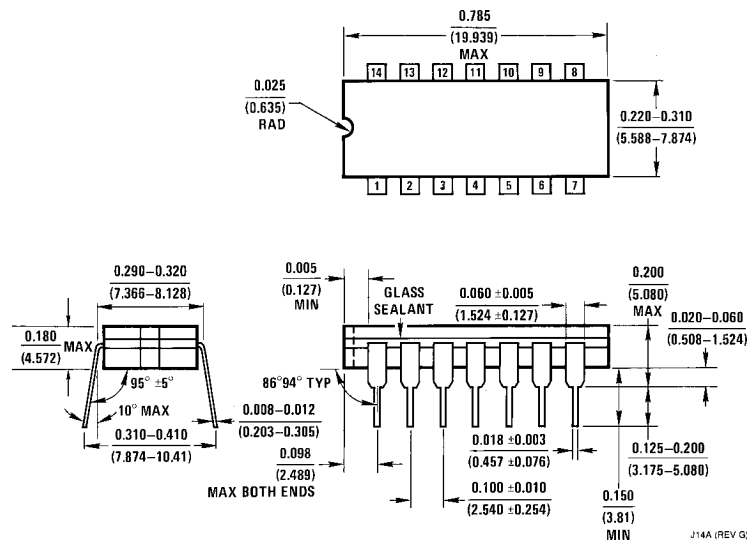
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

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 DM54LS21J
NS Package Number J14A

J14A (REV G)

Technical drawings of the M14A connector showing top, side, and end views with dimensions in inches and millimeters.

Top View:

- Overall width: $0.335 - 0.344$ (8.509 - 8.738)
- Pin pitch: $0.028 - 0.0244$ (5.791 - 6.198)
- Pin numbers: 14, 13, 12, 11, 10, 9, 8 (top); 1, 2, 3, 4, 5, 6, 7 (bottom)
- Lead No. 1 IDENT
- 30° TYP
- MAX 0.010 (0.254)

Side View:

- Lead height: $0.010 - 0.020$ (0.254 - 0.508) $\times 45^\circ$
- Lead width: $0.150 - 0.157$ (3.810 - 3.988)
- 8° MAX TYP ALL LEADS
- 0.008 - 0.010 (0.203 - 0.254) TYP ALL LEADS
- 0.004 (0.102)
- 0.016 - 0.050 (0.406 - 1.270) TYP ALL LEADS

End View:

- Seating Plane
- 0.053 - 0.069 (1.346 - 1.753)
- 0.014 (0.356)
- 0.050 (1.270) TYP
- 0.008 (0.203) TYP
- 0.004 - 0.010 (0.102 - 0.254)
- 0.014 - 0.020 (0.356 - 0.508) TYP

M14A (REV H)

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 1 to Pin 7 Spacing: 0.250 ± 0.010 (6.350 \pm 0.254)
- Pin 1 Diameter: 0.092 DIA (2.337)
- Pin 1 Depth: 0.030 MAX (0.762)

Side View Dimensions:

- Pin 1 to Pin 7 Spacing: 0.135 ± 0.005 (3.429 \pm 0.127)
- Pin 1 to Pin 7 Spacing: $0.125 - 0.150$ (3.175 - 3.810)
- Pin 1 to Pin 7 Spacing: $0.14 - 0.023$ TYP (3.55 - 0.584)
- Pin 1 to Pin 7 Spacing: 0.060 TYP (1.524)
- Pin 1 to Pin 7 Spacing: 4° TYP (OPTIONAL)
- Pin 1 to Pin 7 Spacing: $90^\circ \pm 4^\circ$ TYP
- Pin 1 to Pin 7 Spacing: 0.075 ± 0.015 (1.905 \pm 0.381)
- Pin 1 to Pin 7 Spacing: 0.100 ± 0.010 (2.540 \pm 0.254) TYP
- Pin 1 to Pin 7 Spacing: 0.050 ± 0.010 TYP (1.270 - 0.254)

OPTION D2

Top View Dimensions:

- Overall Length: $0.300 - 0.320$ (7.620 - 8.128)
- Pin 1 to Pin 3 Spacing: 0.065 (1.651)
- Pin 1 to Pin 3 Spacing: $0.008 - 0.016$ TYP (0.203 - 0.406)
- Pin 1 to Pin 3 Spacing: $95^\circ \pm 5^\circ$
- Pin 1 to Pin 3 Spacing: 0.280 (7.112) MIN
- Pin 1 to Pin 3 Spacing: $0.325 - 0.040 - 0.015$ (8.255 \pm 0.381)

Side View Dimensions:

- Pin 1 to Pin 3 Spacing: $0.008 - 0.016$ TYP (0.203 - 0.406)
- Pin 1 to Pin 3 Spacing: $95^\circ \pm 5^\circ$
- Pin 1 to Pin 3 Spacing: 0.280 (7.112) MIN
- Pin 1 to Pin 3 Spacing: $0.325 - 0.040 - 0.015$ (8.255 \pm 0.381)

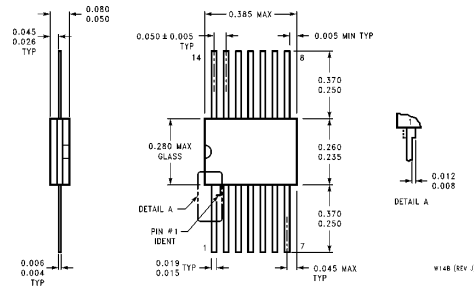
INDEX AREA

PIN NO. 1 IDENT

N14A (REV F)

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Physical Dimensions inches (millimeters) (Continued)



14-Lead Ceramic Flat Package (W)
Order Number 54LS21FMQB or DM54LS21W
NS Package Number W14B

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