

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

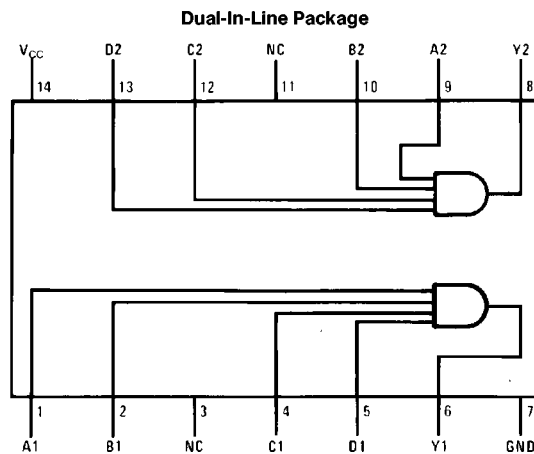
General Description

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)

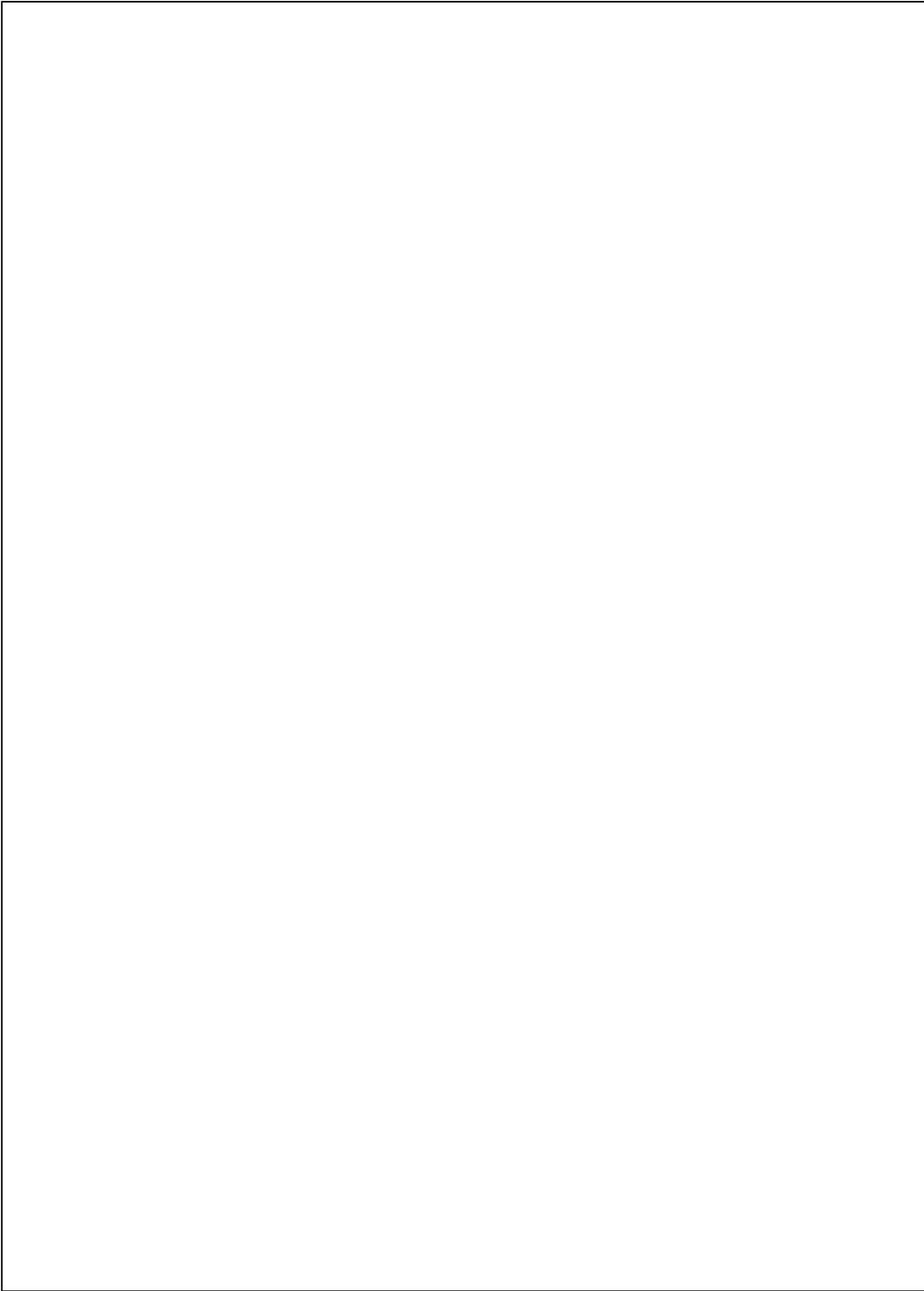
| Symbol | Parameter | Conditions | Min | Typ (Note 1) | Max | Units |
|------------------|---------------------------------------|---|--------------|--------------|-------|-------|
| V _I | Input Clamp Voltage | V _{CC} = Min, I _I = -18 mA | | | -1.5 | V |
| V _{OH} | High Level Output Voltage | V _{CC} = Min, I _{OH} = Max, V _{IH} = Min | DM54 2.5 | 3.4 | | V |
| V _{OL} | Low Level Output Voltage | V _{CC} = Min, I _{OL} = Max, V _{IL} = Max | DM54 0.25 | 0.25 | 0.4 | V |
| | | | DM74 0.35 | 0.35 | 0.5 | |
| | | I _{OL} = 4 mA, V _{CC} = Min | DM74 0.25 | 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 (Note 2) | V _{CC} = Max | 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)

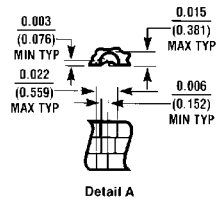
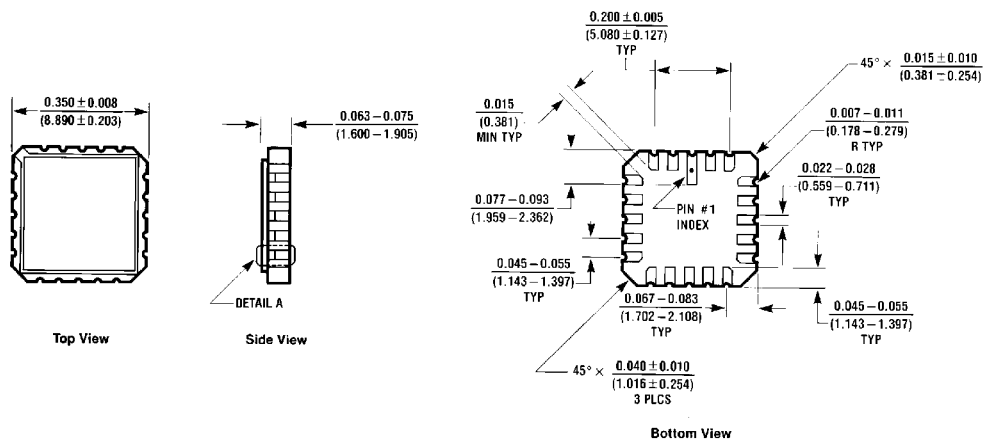
| Symbol | Parameter | R _L = 2 kΩ | | | | Units |
|------------------|---|------------------------|-----|------------------------|-----|-------|
| | | C _L = 15 pF | | C _L = 50 pF | | |
| | | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay Time Low to High Level Output | 4 | 13 | 6 | 18 | 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.

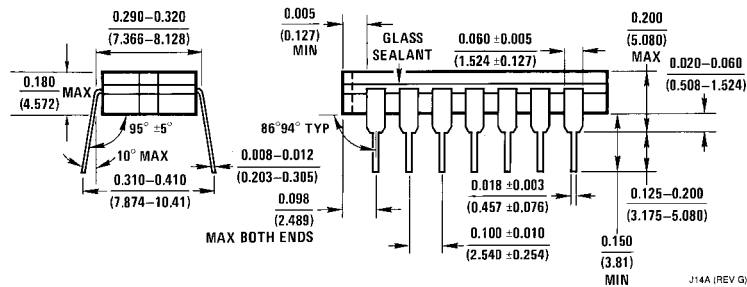
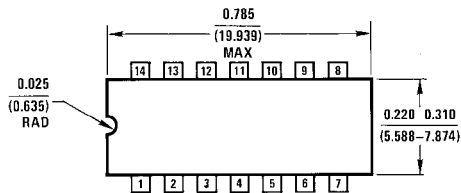


Physical Dimensions inches (millimeters)



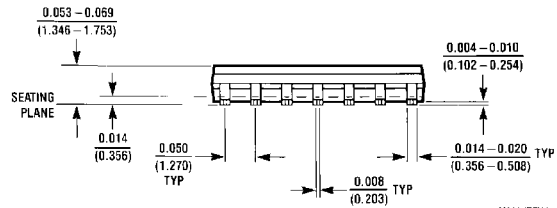
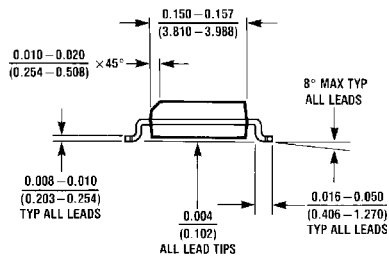
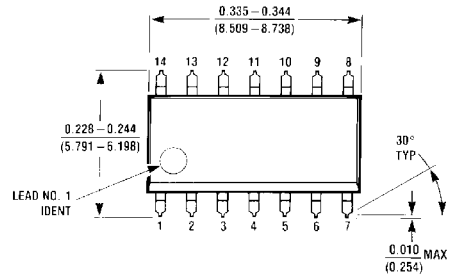
Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS20LMQB
NS Package Number E20A

E20A (REV D)



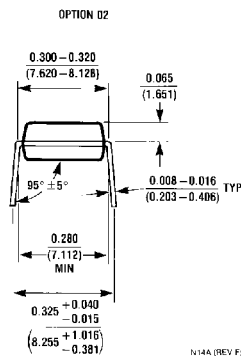
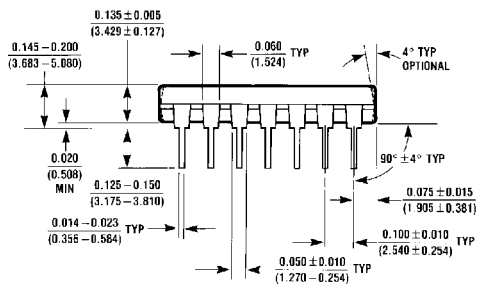
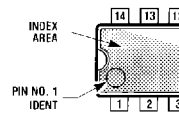
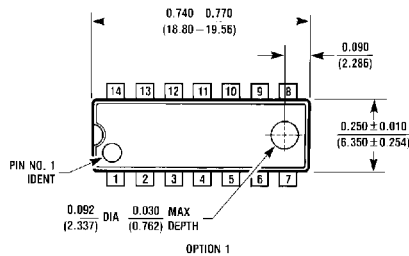
14-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS20DMQB or DM54LS21J
NS Package Number J14A

Physical Dimensions inches (millimeters) (Continued)



M14A (REV H)

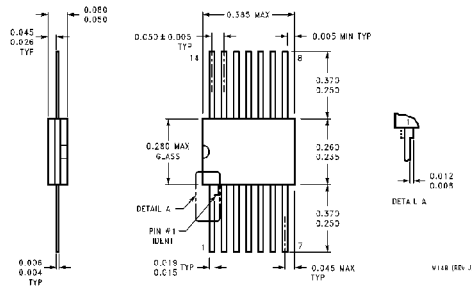
14-Lead Small Outline Molded Package (M)
Order Number DM74LS21M
NS Package Number M14A



N14A (REV F)

14-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS21N
NS Package Number N14A

Physical Dimensions inches (millimeters) (Continued)



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

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