

DM74ALS38A

Quadruple 2-Input NAND Buffer with Open-Collector Outputs

General Description

This device contains four independent gates, each of which performs the logic NAND function. The open-collector outputs require external pull-up resistors for proper logical operation.

Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC} (Min) - V_{OH}}{N_1 (I_{OH}) + N_2 (I_{IH})}$$

$$R_{MIN} = \frac{V_{CC} (Max) - V_{OL}}{I_{OL} - N_3 (I_{IL})}$$

Where: $N_1 (I_{OH})$ = total maximum output HIGH current for all outputs tied to pull-up resistor
 $N_2 (I_{IH})$ = total maximum input HIGH current for all inputs tied to pull-up resistor
 $N_3 (I_{IL})$ = total maximum input LOW current for all inputs tied to pull-up resistor

Features

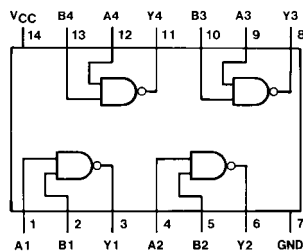
- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and V_{CC} range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin for pin compatible with LS TTL counterpart
- Improved AC performance over LS38
- Improved line receiving characteristics

Ordering Code:

| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| DM74ALS38AM | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| DM74ALS38AN | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



Function Table

$$Y = \overline{AB}$$

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

H = HIGH Logic Level
L = LOW Logic Level

Absolute Maximum Ratings (Note 1)

| | |
|--------------------------------------|-----------------|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| High Level Output Voltage | 7V |
| Operating Free Air Temperature Range | 0°C to +70°C |
| Storage Temperature Range | -65°C to +150°C |
| Typical θ_{JA} | |
| N Package | 83.0°C/W |
| M Package | 114.0°C/W |

Note 1: 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 tables 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 | Min | Nom | Max | Units |
|----------|--------------------------------|-----|-----|-----|-------|
| V_{CC} | Supply Voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | HIGH Level Input Voltage | 2 | | | V |
| V_{IL} | LOW Level Input Voltage | | | 0.8 | V |
| V_{OH} | HIGH Level Output Voltage | | | 5.5 | V |
| I_{OL} | LOW Level Output Current | | | 24 | mA |
| T_A | Free Air Operating Temperature | 0 | | 70 | °C |

Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at $V_{CC} = 5V$, $T_A = 25^\circ C$.

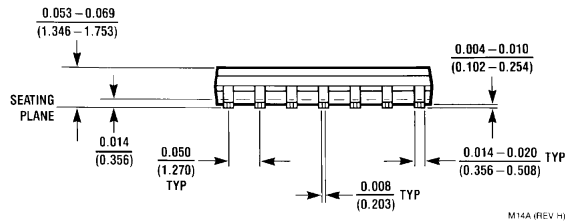
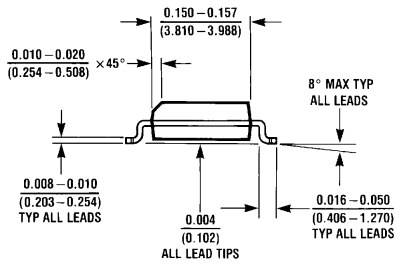
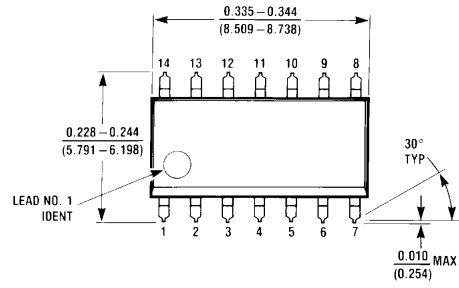
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------|--|--|-----|------|------|---------|
| V_{IK} | Input Clamp Voltage | $V_{CC} = 4.5V$, $I_I = -18 mA$ | | | -1.5 | V |
| I_{OH} | HIGH Level Output Current | $V_{CC} = 4.5V$, $V_{OH} = 5.5V$ | | | 100 | μA |
| V_{OL} | LOW Level Output Voltage | $V_{CC} = 4.5V$ $V_{IH} = 2V$ $I_{OL} = 24 mA$ | | 0.35 | 0.5 | V |
| I_I | Input Current at Maximum Input Voltage | $V_{CC} = 5.5V$, $V_{IH} = 7V$ | | | 0.1 | mA |
| I_{IH} | HIGH Level Input Current | $V_{CC} = 5.5V$, $V_{IH} = 2.7V$ | | | 20 | μA |
| I_{IL} | LOW Level Input Current | $V_{CC} = 5.5V$, $V_{IL} = 0.4V$ | | | -0.1 | mA |
| I_{CCH} | Supply Current with Outputs HIGH | $V_{CC} = 5.5V$, $V_I = 0V$ | | 0.86 | 1.6 | mA |
| I_{CCL} | Supply Current with Outputs LOW | $V_{CC} = 5.5V$, $V_I = 4.5V$ | | 4.0 | 7.8 | mA |

Switching Characteristics

over recommended operating free air temperature range

| Symbol | Parameter | Conditions | Min | Max | Units |
|-----------|--|--|-----|-----|-------|
| t_{PLH} | Propagation Delay Time LOW-to-HIGH Level Output | $V_{CC} = 4.5V$ to $5.5V$ $R_L = 500\Omega$ | 10 | 33 | ns |
| t_{PHL} | Propagation Delay Time HIGH-to-LOW Level Output | $C_L = 50 pF$ | 2 | 12 | ns |

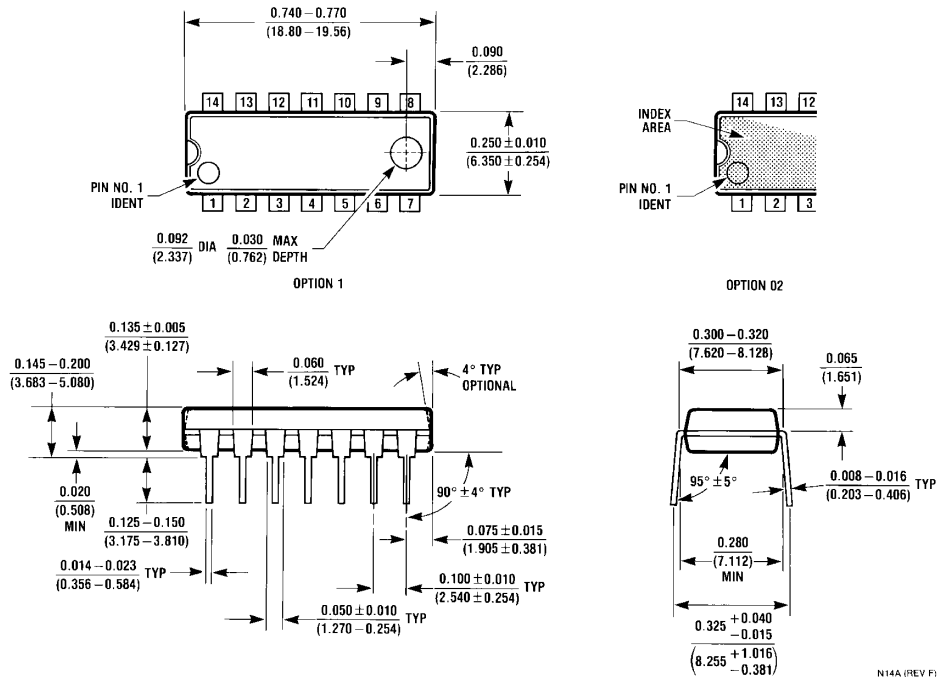
Physical Dimensions inches (millimeters) unless otherwise noted



M14A (REV H)

**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M14A**

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



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