

## DM74ALS133 13-Input NAND Gate

### General Description

This device contains a single gate, which performs the logic NAND function.

### Features

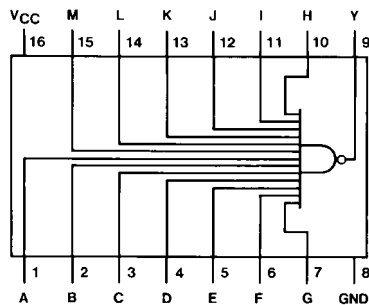
- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and  $V_{CC}$  range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin for pin compatible with Schottky and low power Schottky TTL counterpart
- Improved AC performance over Schottky and low power Schottky counterparts

### Ordering Code:

| Order Number | Package Number | Package Description                                                         |
|--------------|----------------|-----------------------------------------------------------------------------|
| DM74ALS133M  | M16A           | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| DM74ALS133N  | N16E           | 16-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

$Y = ABCDEFGHIJKLM$

| Inputs              | Output |
|---------------------|--------|
| A thru M            | Y      |
| All Inputs H        | L      |
| One or More Input L | H      |

H = HIGH Logic Level  
L = LOW Logic Level

**Absolute Maximum Ratings**(Note 1)

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 7V              |
| Operating Free Air Temperature Range | 0°C to +70°C    |
| Storage Temperature Range            | –65°C to +150°C |
| Typical $\theta_{JA}$                |                 |
| N Package                            | 85.0°C/W        |
| M Package                            | 111.0°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     |
| $I_{OH}$ | HIGH Level Output Current      |     |     | –0.4 | mA    |
| $I_{OL}$ | LOW Level Output Current       |     |     | 8    | 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  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ .

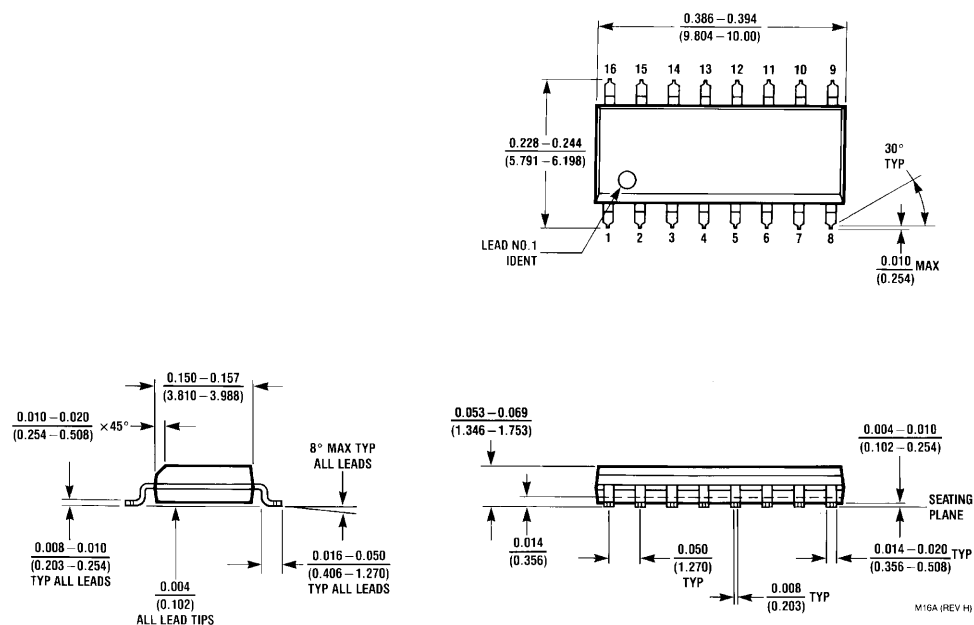
| Symbol   | Parameter                             | Conditions                                                  | Min          | Typ  | Max  | Units   |
|----------|---------------------------------------|-------------------------------------------------------------|--------------|------|------|---------|
| $V_{IK}$ | Input Clamp Voltage                   | $V_{CC} = 4.5V$ , $I_I = -18\text{ mA}$                     |              |      | –1.5 | V       |
| $V_{OH}$ | HIGH Level Output Voltage             | $I_{OH} = -0.4\text{ mA}$<br>$V_{CC} = 4.5V\text{ to }5.5V$ | $V_{CC} - 2$ |      |      | V       |
| $V_{OL}$ | LOW Level Output Voltage              | $V_{CC} = 4.5V$<br>$I_{OL} = 4\text{ mA}$                   |              | 0.25 | 0.4  | V       |
|          |                                       | $I_{OL} = 8\text{ mA}$                                      |              | 0.35 | 0.5  | V       |
| $I_I$    | Input Current @ 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   | $\mu A$ |
| $I_{IL}$ | LOW Level Input Current               | $V_{CC} = 5.5V$ , $V_{IL} = 0.4V$                           |              |      | –0.1 | mA      |
| $I_O$    | Output Drive Current                  | $V_{CC} = 5.5V$<br>$V_O = 2.25V$                            | –30          |      | –112 | mA      |
| $I_{CC}$ | Supply Current                        | $V_{CC} = 5.5V$<br>Outputs HIGH                             |              | 0.24 | 0.34 | mA      |
|          |                                       | Outputs LOW                                                 |              | 0.56 | 0.8  | mA      |

**Switching Characteristics**

over recommended operating free air temperature range

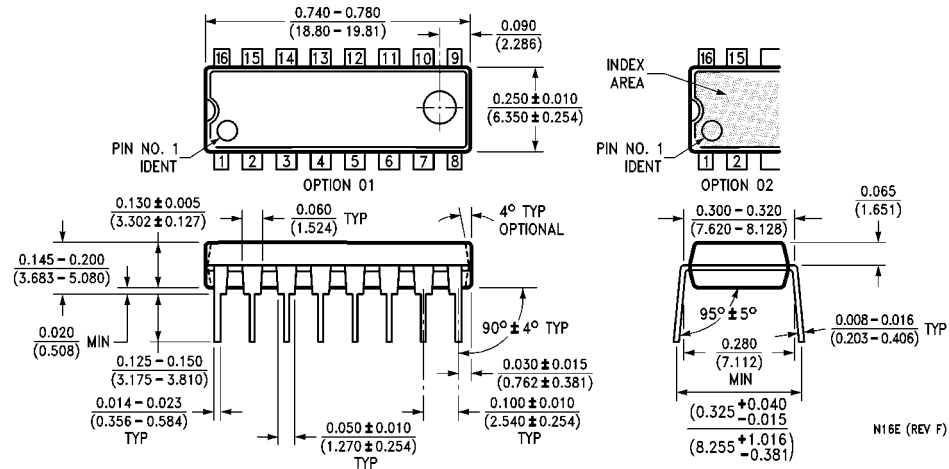
| Symbol    | Parameter                                          | Conditions                                          | Min | Max | Units |
|-----------|----------------------------------------------------|-----------------------------------------------------|-----|-----|-------|
| $t_{PLH}$ | Propagation Delay Time<br>LOW-to-HIGH Level Output | $V_{CC} = 4.5V\text{ to }5.5V$<br>$R_L = 500\Omega$ | 3   | 11  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>HIGH-to-LOW Level Output | $C_L = 50\text{ pF}$                                | 5   | 25  | ns    |

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



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow  
Package Number M16A**

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



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N16E

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