

# DM9324 5-Bit Comparator

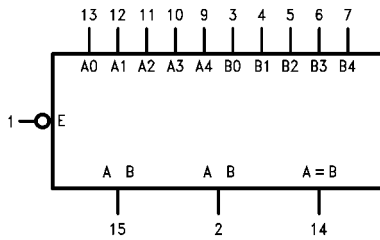
## General Description

The DM9324 expandable comparators provide comparison between two 5-bit words and give three outputs—"less than", "greater than" and "equal to". A HIGH on the active LOW Enable Input forces all three outputs LOW.

## Ordering Code:

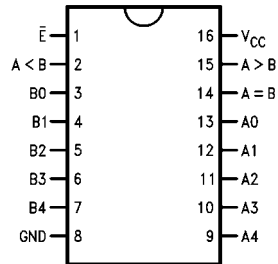
| Order Number | Package Number | Package Description   |
|--------------|----------------|---|
| DM9324N      | N16E           | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

## Logic Symbol



V<sub>CC</sub> = Pin 16  
GND = Pin 6

## Connection Diagram



## Pin Descriptions

| Pin Names | Description                           |
|-----------|---------------------------------------|
| $\bar{E}$ | Enable Input (Active LOW)             |
| A0–A4     | Word A Parallel Inputs                |
| B0–B4     | Word B Parallel Inputs                |
| A < B     | A Less than B Output (Active HIGH)    |
| A > B     | A Greater than B Output (Active HIGH) |
| A = B     | A Equal to B Output (Active HIGH)     |

## Truth Table

| $\bar{E}$ | Inputs          |                | Outputs |       |       |
|-----------|-----------------|----------------|---------|-------|-------|
|           | A <sub>n</sub>  | B <sub>n</sub> | A < B   | A > B | A = B |
| H         | X               | X              | L       | L     | L     |
| L         | Word A = Word B |                | L       | L     | H     |
| L         | Word A > Word B |                | L       | H     | L     |
| L         | Word B > Word A |                | H       | L     | L     |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

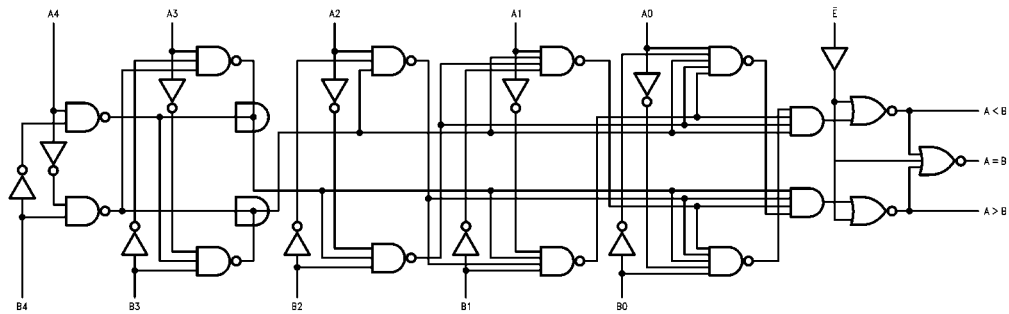
## Functional Description

The '24 5-bit comparators use combinational circuitry to directly generate "A greater than B" and "A less than B" outputs. As evident from the logic diagram, these outputs are generated in only three gate delays. The "A equals B" output is generated in one additional gate delay by decoding the "A neither less than nor greater than B" condition with a NOR gate. All three outputs are activated by the active LOW Enable Input ( $\bar{E}$ ).

Tying the  $A > B$  output from one device into an A input on another device and the  $A < B$  output into the corresponding B input permits easy expansion.

The A4 and B4 inputs are the most significant inputs and A0, B0 the least significant. Thus if A4 is HIGH and B4 is LOW, the  $A > B$  output will be HIGH regardless of all other inputs except  $\bar{E}$ .

## Logic Diagram



## Absolute Maximum Ratings (Note 1)

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 5.5V            |
| Operating Free Air Temperature Range | 0°C to +70°C    |
| Storage Temperature Range            | -65°C to +150°C |

**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                 | 4.75 | 5   | 5.25 | V     |
| $V_{IH}$ | HIGH Level Input Voltage       | 2    |     |      | V     |
| $V_{IL}$ | LOW Level Input Voltage        |      |     | 0.8  | V     |
| $I_{OH}$ | HIGH Level Output Current      |      |     | -0.8 | mA    |
| $I_{OL}$ | LOW Level Output Current       |      |     | 16   | mA    |
| $T_A$    | Free Air Operating Temperature | 0    |     | 70   | °C    |

## Electrical Characteristics

Over recommended operating free air temperature range (unless otherwise noted)

| Symbol   | Parameter                         | Conditions  | Min | Typ (Note 2) | Max  | Units |
|----------|-----------------------------------|---|-----|--------------|------|-------|
| $V_I$    | Input Clamp Voltage               | $V_{CC} = \text{Min}, I_I = -12 \text{ mA}$                         |     |              | -1.5 | V     |
| $V_{OH}$ | HIGH Level Output Voltage         | $V_{CC} = \text{Min}, I_{OH} = \text{Max}$<br>$V_{IL} = \text{Max}$ | 2.4 | 3.4          |      | V     |
| $V_{OL}$ | LOW Level Output Voltage          | $V_{CC} = \text{Min}, I_{OL} = \text{Max}$<br>$V_{IH} = \text{Min}$ |     | 0.2          | 0.4  | V     |
| $I_I$    | Input Current @ Max Input Voltage | $V_{CC} = \text{Max}, V_I = 5.5 \text{ V}$                          |     |              | 1    | mA    |
| $I_{IH}$ | HIGH Level Input Current          | $V_{CC} = \text{Max}, V_I = 2.4 \text{ V}$                          |     |              | 80   | μA    |
| $I_{IL}$ | LOW Level Input Current           | $V_{CC} = \text{Max}, V_I = 0.4 \text{ V}$                          |     |              | -3.2 | mA    |
| $I_{OS}$ | Short Circuit Output Current      | $V_{CC} = \text{Max}$ (Note 3)                                      | -20 |              | -70  | mA    |
| $I_{CC}$ | Supply Current                    | $V_{CC} = \text{Max}$   |     |              | 81   | mA    |

**Note 2:** All typicals are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{ C}$ .

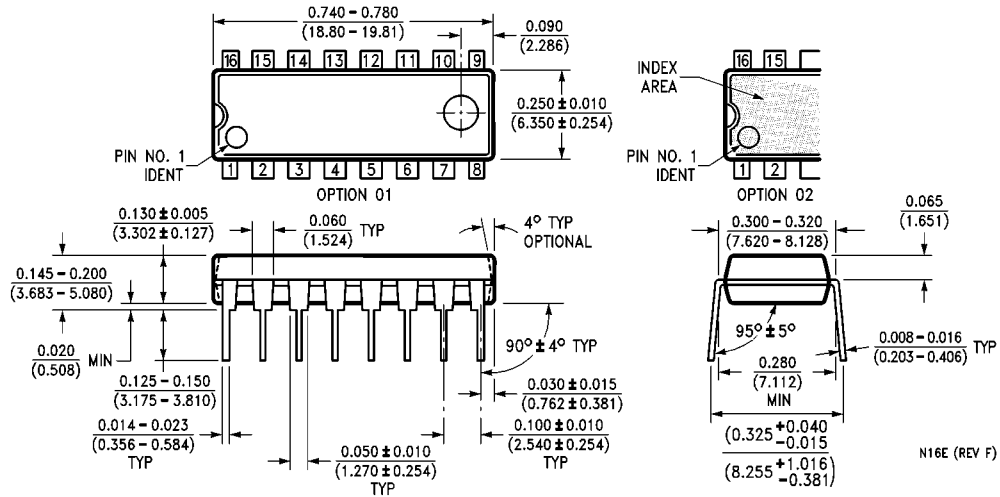
**Note 3:** Not more than one output should be shorted at a time.

## Switching Characteristics

$V_{CC} = +5.0 \text{ V}, T_A = +25^\circ \text{ C}$

| Symbol    | Parameter           | $C_L = 15 \text{ pF}$ |     | Units |
|-----------|---------------------|-----------------------|-----|-------|
|           |                     | Min                   | Max |       |
| $t_{PLH}$ | Propagation Delay   |                       | 14  | ns    |
| $t_{PHL}$ | $\bar{E}$ to A = B  |                       | 14  |       |
| $t_{PLH}$ | Propagation Delay   |                       | 25  | ns    |
| $t_{PHL}$ | $A_n, B_n$ to A > B |                       | 22  |       |
| $t_{PLH}$ | Propagation Delay   |                       | 26  | ns    |
| $t_{PHL}$ | $A_n, B_n$ to A < B |                       | 21  |       |
| $t_{PLH}$ | Propagation Delay   |                       | 30  | ns    |
| $t_{PHL}$ | $A_n, B_n$ to A = B |                       | 32  |       |

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



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

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