National Semiconductor

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# DM54148 Priority Encoder

## General Description

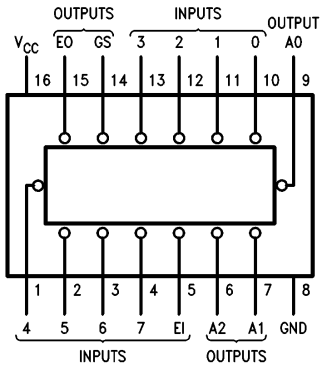
This TTL encoder features priority decoding of the input data to ensure that only the highest-order data line is encoded. The DM54148 encodes eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input E1 and enable output E0) has been provided to allow octal expansion without the need for external circuitry. For all types, data inputs and outputs are active at the low logic level.

## Features

- Encodes 8 data lines to 3-line binary (octal)
- Applications include:
  - N-bit encoding
  - Code converters and generators

## Connection Diagram

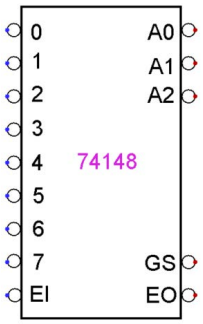
**Dual-In-Line Package**




TL/F/6545–1

**Order Number DM54148J or DM54148W**
**See NS Package Number J16A or W16A**

## Symbol




## Truth Table

**DM54148**

| Inputs | | | | | | | | | Outputs | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **E1** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **A2** | **A1** | **A0** | **GS** | **E0** |
| H | X | X | X | X | X | X | X | X | H | H | H | H | H |
| L | H | H | H | H | H | H | H | H | H | H | H | H | L |
| L | X | X | X | X | X | X | X | L | L | L | L | L | H |
| L | X | X | X | X | X | X | L | H | L | L | H | L | H |
| L | X | X | X | X | X | L | H | H | L | H | L | L | H |
| L | X | X | X | X | L | H | H | H | L | H | H | L | H |
| L | X | X | X | L | H | H | H | H | H | L | L | L | H |
| L | X | X | L | H | H | H | H | H | H | L | H | L | H |
| L | X | L | H | H | H | H | H | H | H | H | L | L | H |
| L | L | H | H | H | H | H | H | H | H | H | H | L | H |

H = High Logic Level, L = Low Logic Level, X = Don't Care

  RRD-B30M105/Printed in U. S. A.

## 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 | 5.5V |
| Operating Free Air Temperature Range DM54 | −55°C to +125°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 | DM54148 | | | Units |
|---|---|---|---|---|---|
| | | Min | Nom | Max | |
| $V_{CC}$ | 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 | | | −0.8 | mA |
| $I_{OL}$ | Low Level Output Current | | | 16 | mA |
| $T_A$ | Free Air Operating Temperature | −55 | | 125 | °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, $I_I$ = −12 mA | | | | −1.5 | V |
| $V_{OH}$ | High Level Output Voltage | $V_{CC}$ = Min, $I_{OH}$ = Max<br>$V_{IL}$ = Max, $V_{IH}$ = Min | | 2.4 | | | V |
| $V_{OL}$ | Low Level Output Voltage | $V_{CC}$ = Min, $I_{OL}$ = Max<br>$V_{IH}$ = Min, $V_{IL}$ = Max | | | | 0.4 | V |
| $I_I$ | Input Current @Max Input Voltage | $V_{CC}$ = Max, $V_I$ = 5.5V | | | | 1 | mA |
| $I_{IH}$ | High Level Input Current | $V_{CC}$ = Max<br>$V_I$ = 2.4V | 0 Input | | | 40 | μA |
| | | | Others | | | 80 | |
| $I_{IL}$ | Low Level Input Current | $V_{CC}$ = Max<br>$V_I$ = 0.4V | 0 Input | | | −1.6 | mA |
| | | | Others | | | −3.2 | |
| $I_{OS}$ | Short Circuit Output Current | $V_{CC}$ = Max (Note 2) | | −35 | | −85 | mA |
| $I_{CC1}$ | Supply Current | $V_{CC}$ = Max (Note 3) | | | 40 | 60 | mA |
| $I_{CC2}$ | Supply Current | $V_{CC}$ = Max (Note 4) | | | 35 | 55 | mA |

**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.

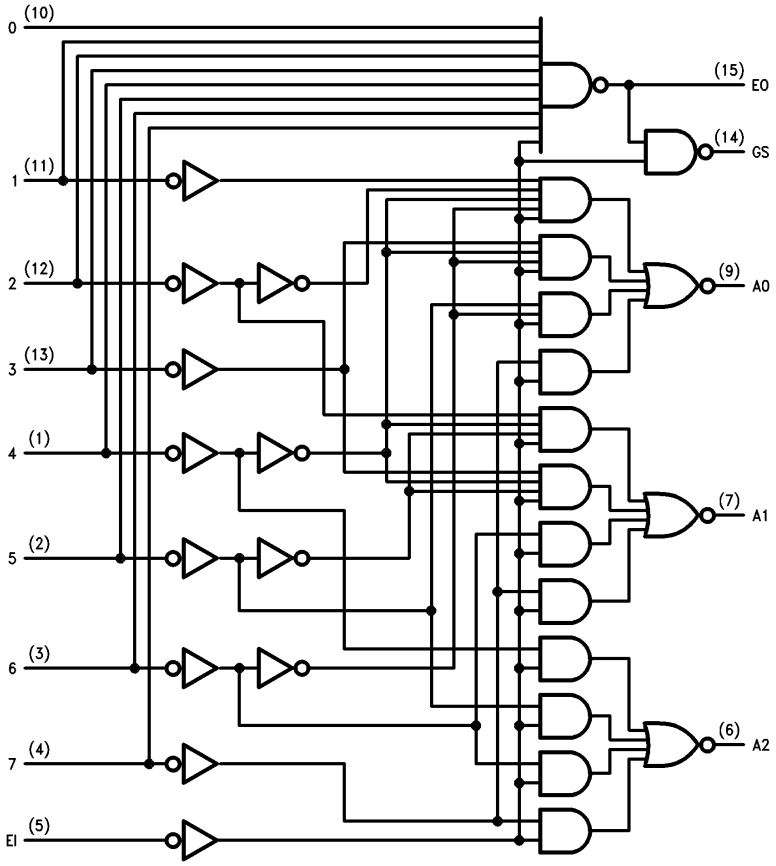
**Note 3:** $I_{CC1}$ is measured with inputs E1 and 7 grounded, other inputs and outputs open.

**Note 4:** $I_{CC2}$ is measured with all inputs and all outputs open.

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

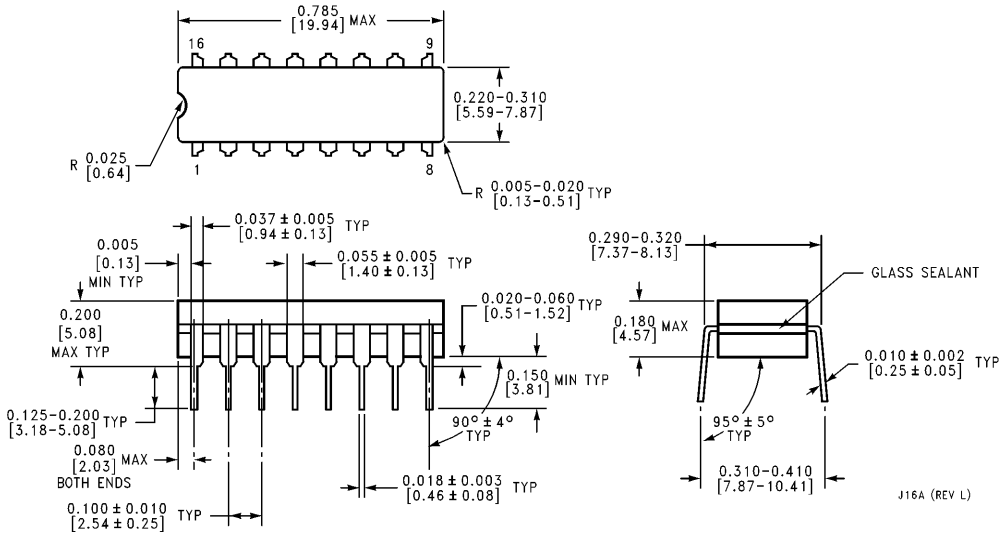
| Symbol | Parameter | From (Input) To (Output) | Waveform | $R_L = 400\Omega$, $C_L = 15$ pF | | Units |
|---|---|---|---|---|---|---|
| | | | | Min | Max | |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | 0 thru 7 to A0, 1, 2 | In-Phase Output | | 15 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | 0 thru 7 to A0, 1, 2 | | | 14 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | 0 thru 7 to A0, 1, 2 | Out-of-Phase Output | | 19 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | 0 thru 7 to A0, 1, 2 | | | 19 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | 0 thru 7 to E0 | Out-of-Phase Output | | 10 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | 0 thru 7 to E0 | | | 25 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | 0 thru 7 to GS | In-Phase Output | | 30 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | 0 thru 7 to GS | | | 25 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | E1 to A0, 1, 2 | In-Phase Output | | 16 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | E1 to A0, 1, 2 | | | 15 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | E1 to GS | In-Phase Output | | 13 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | E1 to GS | | | 15 | ns |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | E1 to E0 | In-Phase Output | | 15 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | E1 to E0 | | | 30 | ns |

## Logic Diagram



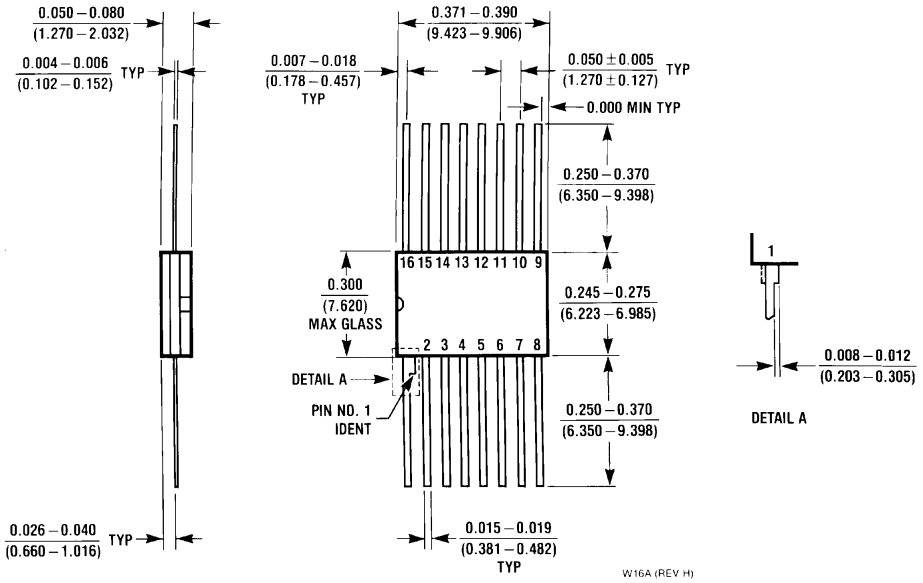

TL/F/6545–2

## Physical Dimensions inches (millimeters)




**16-Lead Ceramic Dual-In-Line Package (J)**
**Order Number DM54148J**
**NS Package Number J16A**

## Physical Dimensions inches (millimeters) (Continued)




**16-Lead Ceramic Flat Package (W)**
**Order Number DM54148W**
**NS Package Number W16A**

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