



DM54147/DM74147, DM54148/DM74148 Priority Encoders

General Description

These TTL encoders feature priority decoding of the input data to ensure that only the highest-order data line is encoded. The DM54147 and DM74147 encode nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition requires no input condition as zero is encoded when all nine data lines are at a high logic level. All inputs are buffered to represent one normalized Series 54/74 load. The DM54148 and DM74148 encode eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input E1 and enable output EO) 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

DM54147, DM74147

- Encodes 10-line decimal to 4-line BCD
- Applications include:
 - Keyboard encoding
 - Range selection

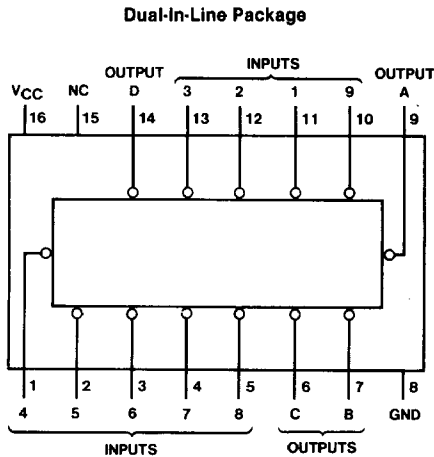
- Typical data delay 10 ns
 - Typical power dissipation 225 mW
- DM54148, DM74148**
- Encodes 8 data lines to 3-line binary (octal)
 - Applications include:
 - N-bit encoding
 - Code converters and generators
 - Typical data delay 10 ns
 - Typical power dissipation 190 mW

Absolute Maximum Ratings (Note 1)

| | |
|---------------------------|----------------|
| Supply Voltage | 7V |
| Input Voltage | 5.5V |
| Storage Temperature Range | -65°C to 150°C |

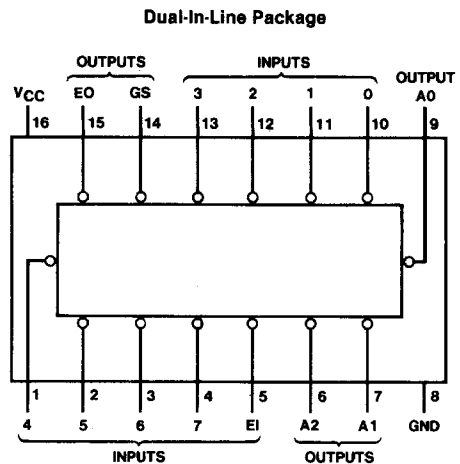
Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device can not be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Connection Diagrams



54147 (J) 74147 (J,N)

TL/F/6545-1



54148 (J) 74148 (J,N)

TL/F/6545-2

Recommended Operating Conditions

| Sym | Parameter | DM54147 | | | DM74147 | | | 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 | | | 0.8 | | | 0.8 | V |
| I _{OH} | High Level Output Current | | | -0.8 | | | -0.8 | mA |
| I _{OL} | Low Level Output Current | | | 16 | | | 16 | mA |
| T _A | Free Air Operating Temperature | -55 | | 125 | 0 | | 70 | °C |

'147 Electrical Characteristics

over recommended operating free air temperature (unless otherwise noted)

| Sym | 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 V _{IL} = Max, V _{IH} = Min | 2.4 | | | V |
| V _{OL} | Low Level Output Voltage | V _{CC} = Min, I _{OL} = Max 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, V _I = 2.4V | | | 40 | μA |
| I _{IL} | Low Level Input Current | V _{CC} = Max, V _I = 0.4V | | | -1.6 | mA |
| I _{OS} | Short Circuit Output Current | V _{CC} = Max (Note 2) | DM54 | -35 | -85 | mA |
| | | | DM74 | -35 | -85 | |
| I _{CC1} | Supply Current | V _{CC} = Max (Note 3) | | 50 | 70 | mA |
| I _{CC2} | Supply Current | V _{CC} = Max (Note 4) | | 42 | 62 | 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 input 7 grounded, other inputs and outputs open.

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

***147 Switching Characteristics**at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

| Parameter | From (Input) To (Output) | Waveform | $R_L = 400\Omega$ $C_L = 15\text{ pF}$ | | | Units |
|---|-----------------------------------|------------------------|---|-----|-----|-------|
| | | | Min | Typ | Max | |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 9 to Output | In-Phase Output | | 9 | 14 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 9 to Output | | | 7 | 11 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 9 to Output | Out-of-Phase Output | | 13 | 19 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 9 to A, B, C, D | | | 12 | 19 | ns |

Recommended Operating Conditions

| Sym | Parameter | DM54148 | | | DM74148 | | | 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 | | | 0.8 | | | 0.8 | V |
| I _{OH} | High Level Output Current | | | -0.8 | | | -0.8 | mA |
| I _{OL} | Low Level Output Current | | | 16 | | | 16 | mA |
| T _A | Free Air Operating Temperature | -55 | | 125 | 0 | | 70 | °C |

'148 Electrical Characteristics

over recommended operating free air temperature (unless otherwise noted)

| Sym | 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 V _{IL} = Max, V _{IH} = Min | 2.4 | | | V |
| V _{OL} | Low Level Output Voltage | V _{CC} = Min, I _{OL} = Max 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 V _I = 2.4V | 0 Input | | 40 | μA |
| | | | Others | | 80 | |
| I _{IL} | Low Level Input Current | V _{CC} = Max V _I = 0.4V | 0 Input | | -1.6 | mA |
| | | | Others | | -3.2 | |
| I _{OS} | Short Circuit Output Current | V _{CC} = Max (Note 2) | DM54 | -35 | -85 | mA |
| | | | DM74 | -35 | -85 | |
| 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.

'148 Switching Characteristicsat $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

| Parameter | From (Input) To (Output) | Waveform | $R_L = 400\Omega$ $C_L = 15\text{ pF}$ | | | Units |
|---|-----------------------------------|------------------------|---|-----|-----|-------|
| | | | Min | Typ | Max | |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 9 to A0, 1, 2 | In-Phase Output | | 10 | 15 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 9 to A0, 1, 2 | | | 9 | 14 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 9 to A0, 1, 2 | Out-of-Phase Output | | 13 | 19 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 9 to A0, 1, 2 | | | 12 | 19 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 7 to E0 | Out-of-Phase Output | | 6 | 10 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 7 to E0 | | | 14 | 25 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | 0 thru 7 to GS | In-Phase Output | | 18 | 30 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | 0 thru 7 to GS | | | 14 | 25 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | E1 to A0, 1, 2 | In-Phase Output | | 10 | 15 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | E1 to A0, 1, 2 | | | 10 | 15 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | E1 to GS | In-Phase Output | | 8 | 12 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | E1 to GS | | | 10 | 15 | ns |
| t_{PLH} Propagation Delay Time Low to High Level Output | E1 to E0 | In-Phase Output | | 10 | 15 | ns |
| t_{PHL} Propagation Delay Time High to Low Level Output | E1 to E0 | | | 17 | 30 | ns |

Function Tables

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| Inputs | | | | | | | | | Outputs | | | |
|--------|---|---|---|---|---|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | D | C | B | A |
| H | H | H | H | H | H | H | H | H | H | H | H | H |
| X | X | X | X | X | X | X | X | L | L | H | H | L |
| X | X | X | X | X | X | X | L | H | L | H | H | H |
| X | X | X | X | X | X | L | H | H | H | L | L | L |
| X | X | X | X | L | H | H | H | H | H | L | L | H |
| X | X | X | L | H | H | H | H | H | H | L | H | H |
| X | X | L | H | H | H | H | H | H | H | H | L | L |
| X | L | H | H | H | H | H | H | H | H | H | L | H |
| L | H | H | H | H | H | H | H | H | H | H | H | L |

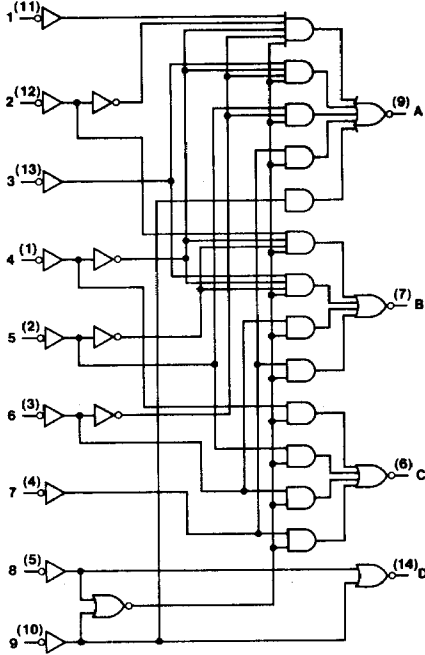
54148/74148

| 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 | 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

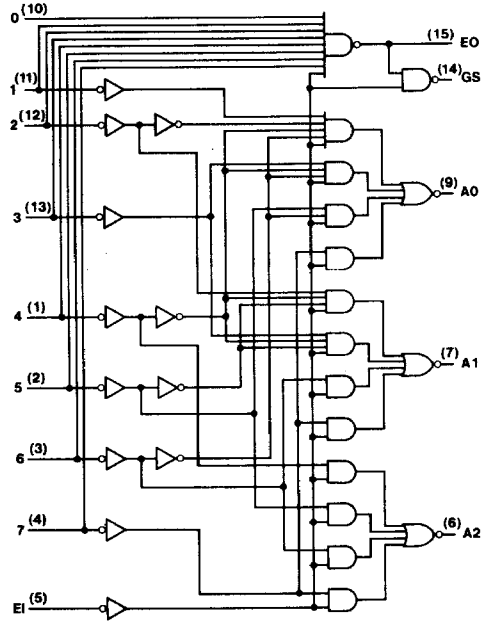
Logic Diagrams

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TL/F/6545-3

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TL/F/6545-4