FAIRCHILD SEMICONDUCTOR™

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# MM74HC148
# 8-3 Line Priority Encoder

## General Description

The MM74HC148 priority encoder utilizes advanced silicon-gate CMOS technology. It has the high noise immunity and low power consumption typical of CMOS circuits, as well as the speeds and output drive similar to LB-TTL.

This priority encoder accepts 8 input request lines 0–7 and outputs 3 lines A0–A2. The priority encoding ensures that only the highest order data line is encoded. Cascading circuitry (enable input EI and enable output EO) has been provided to allow octal expansion without the need for external circuitry. All data inputs and outputs are active at the low logic level.

All inputs are protected from damage due to static discharge by internal diode clamps to $V_{CC}$ and ground.

## Features

- Typical propagation delay: 13 ns
- Wide supply voltage range: 2V–6V

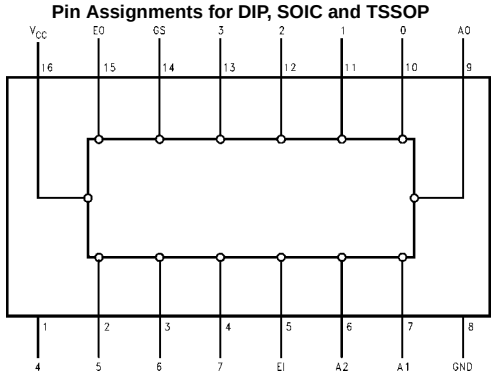
## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| MM74HC148M | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150” Narrow |
| MM74HC148MTC | MTC16 | 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| MM74HC148N | 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

**Pin Assignments for DIP, SOIC and TSSOP**



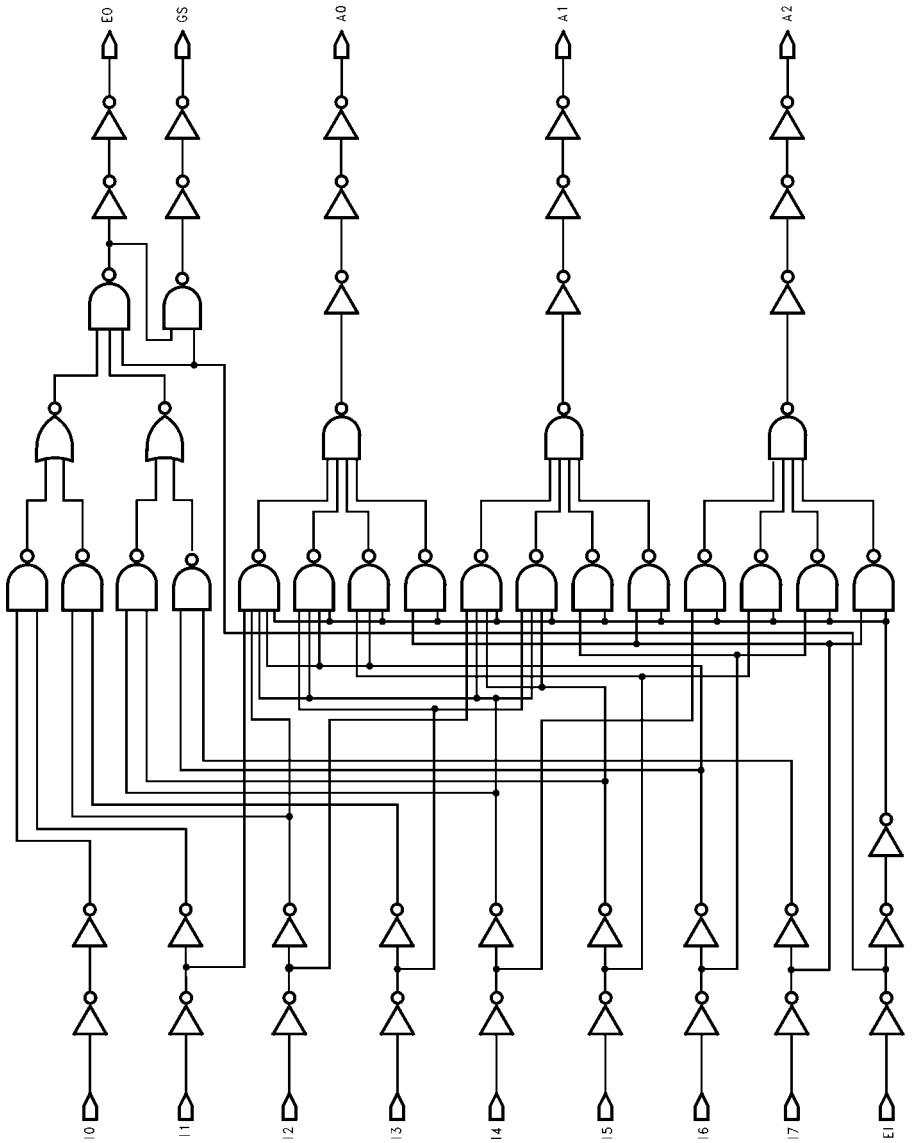

## Truth Table

| Inputs | | | | | | | | | Outputs | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EI** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **A2** | **A1** | **A0** | **GS** | **EO** |
| 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 |

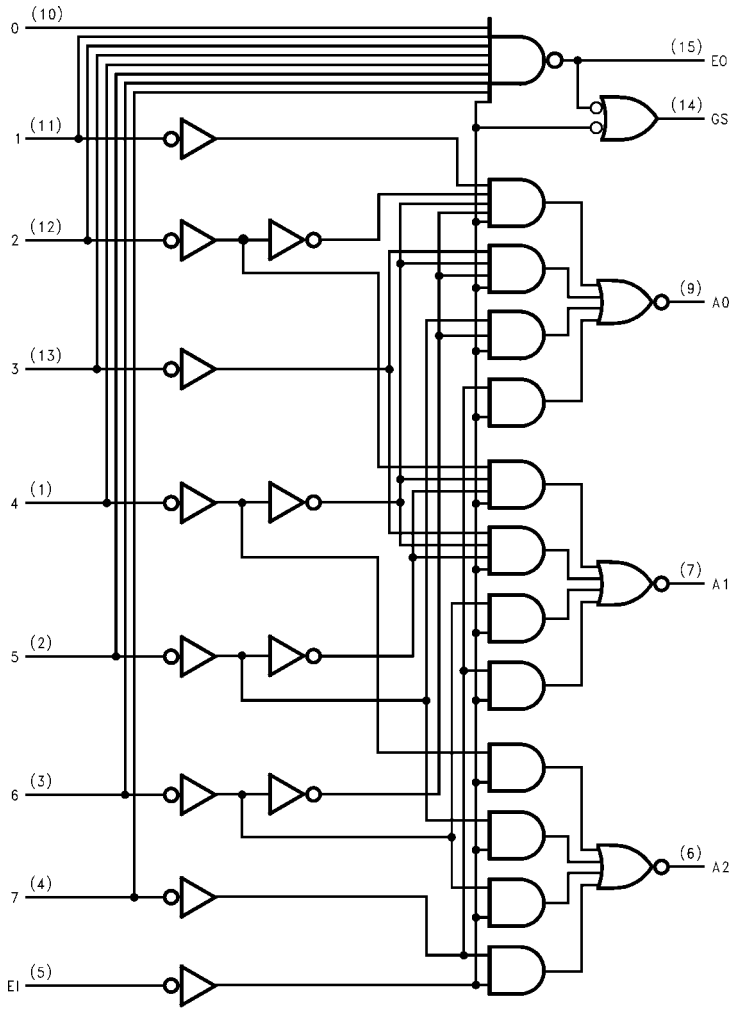
H = HIGH
L = LOW
X = Irrelevant

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## Schematic Diagram



## Logic Diagram



## Absolute Maximum Ratings (Note 1)

(Note 2)

| | |
|---|---|
| Supply Voltage ($V_{CC}$) | −0.5 to +7.0V |
| DC Input Voltage ($V_{IN}$) | −1.5 to $V_{CC}$ +1.5V |
| DC Output Voltage ($V_{OUT}$) | −0.5 to $V_{CC}$ +0.5V |
| Clamp Diode Current ($I_{IK}$, $I_{OK}$) | ±20 mA |
| DC Output Current, per pin ($I_{OUT}$) | ±25 mA |
| DC $V_{CC}$ or GND Current, per pin ($I_{CC}$) | ±50 mA |
| Storage Temperature Range ($T_{STG}$) | −65°C to +150°C |
| Power Dissipation ($P_D$) | |
| (Note 3) | 600 mW |
| S.O. Package only | 500 mW |
| Lead Temperature ($T_L$) | |
| (Soldering 10 seconds) | 260°C |

## Recommended Operation Conditions

| | Min | Max | Units |
|---|---|---|---|
| Supply Voltage ($V_{CC}$) | 2 | 6 | V |
| DC Input or Output Voltage | | | |
| ($V_{IN}$, $V_{OUT}$) | 0 | $V_{CC}$ | V |
| Operating Temperature Range ($T_A$) | −40 | +85 | °C |
| Input Rise or Fall Times | | | |
| ($t_r$, $t_f$) $V_{CC}$ = 2.0V | | 1000 | ns |
| $V_{CC}$ = 4.5V | | 500 | ns |
| $V_{CC}$ = 6.0V | | 400 | ns |

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating—plastic "N" package: −12 mW/°C from 65°C to 85°C.

## DC Electrical Characteristics (Note 4)

| Symbol | Parameter | Conditions | $V_{CC}$ | $T_A$ = 25°C | $T_A$ = −40 to 85°C | $T_A$ = −55 to 125°C | Units |
|---|---|---|---|---|---|---|---|
| | | | | Typ | Guaranteed Limits | | |
| $V_{IH}$ | Minimum HIGH Level | | 2.0V | | 1.5 | 1.5 | 1.5 | V |
| | Input Voltage | | 4.5V | | 3.15 | 3.15 | 3.15 | V |
| | | | 6.0V | | 4.2 | 4.2 | 4.2 | V |
| $V_{IL}$ | Maximum LOW Level | | 2.0V | | 0.5 | 0.5 | 0.5 | V |
| | Input Voltage | | 4.5V | | 1.35 | 1.35 | 1.35 | V |
| | | | 6.0V | | 1.8 | 1.8 | 1.8 | V |
| $V_{OH}$ | Minimum HIGH Level | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | Output Voltage | $\|I_{OUT}\| \leq 20$ μA | 2.0V | 2.0 | 1.9 | 1.9 | 1.9 | V |
| | | | 4.5V | 4.5 | 4.4 | 4.4 | 4.4 | V |
| | | | 6.0V | 6.0 | 5.9 | 5.9 | 5.9 | V |
| | | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | | $\|I_{OUT}\| \leq 4.0$ mA | 4.5V | 4.7 | 3.96 | 3.84 | 3.7 | V |
| | | $\|I_{OUT}\| \leq 5.2$ mA | 6.0V | 5.2 | 5.48 | 5.34 | 5.2 | V |
| $V_{OL}$ | Maximum LOW Level | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | Output Voltage | $\|I_{OUT}\| \leq 20$ μA | 2.0V | 0 | 0.1 | 0.1 | 0.1 | V |
| | | | 4.5V | 0 | 0.1 | 0.1 | 0.1 | V |
| | | | 6.0V | 0 | 0.1 | 0.1 | 0.1 | V |
| | | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | | $\|I_{OUT}\| \leq 4.0$ mA | 4.5V | 0.2 | 0.26 | 0.33 | 0.4 | V |
| | | $\|I_{OUT}\| \leq 5.2$ mA | 6.0V | 0.2 | 0.26 | 0.33 | 0.4 | V |
| $I_{IN}$ | Maximum Input Current | $V_{IN}$ = $V_{CC}$ or GND | 6.0V | | ±0.1 | ±1.0 | ±1.0 | μA |
| $I_{CC}$ | Maximum Quiescent Supply Current | $V_{IN}$ = $V_{CC}$ or GND<br>$I_{OUT}$ = 0 μA | 6.0V | | 8.0 | 80 | 160 | μA |

**Note 4:** For a power supply of 5V ±10% the worst case output voltages ($V_{OH}$, and $V_{OL}$) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case $V_{IH}$ and $V_{IL}$ occur at $V_{CC}$ = 5.5V and 4.5V respectively. (The $V_{IH}$ value at 5.5V is 3.85V.) The worst case leakage current ($I_{IN}$, $I_{CC}$, and $I_{OZ}$) occur for CMOS at the higher voltage and so the 6.0V values should be used.

## AC Electrical Characteristics

| Symbol | Parameter | Conditions | Typ | Guaranteed Limits | Units |
|---|---|---|---|---|---|
| $t_{PHL}$, $t_{PLH}$ | Maximum Propagation Delay, Any Input to Any Output | | 14 | | ns |

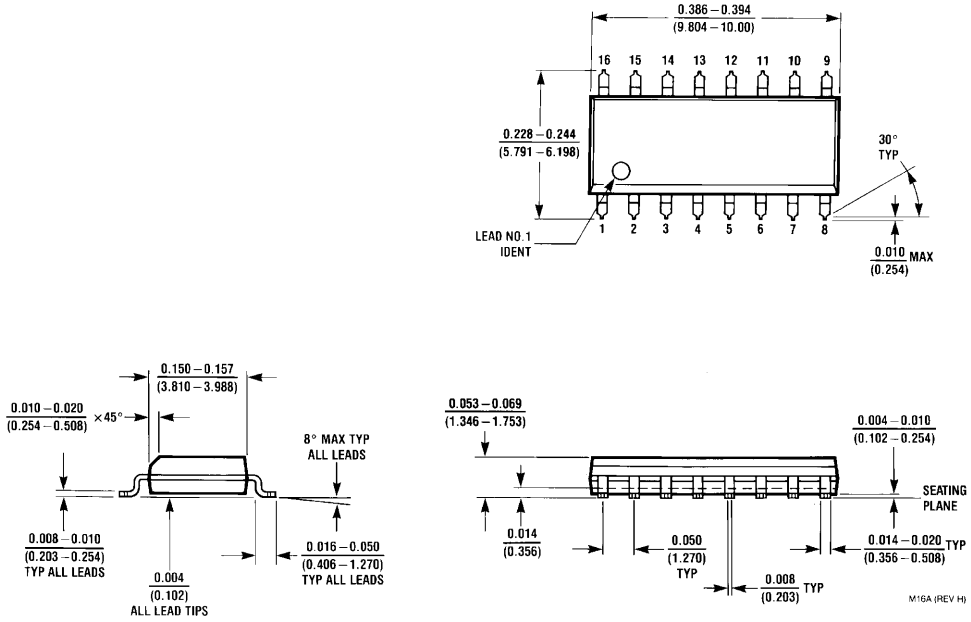
## AC Electrical Characteristics

$V_{CC}$ = 2.0V to 6.0V, $C_L$ = 50 pF, $t_r$ = $t_f$ = 6 ns (unless otherwise specified)

| Symbol | Parameter | Conditions | $V_{CC}$ | $T_A$ = 25°C | $T_A$ = −40°C to +85°C | $T_A$ = −55°C to +125°C | Units |
|---|---|---|---|---|---|---|---|
| | | | | Typ | Guaranteed Limits | | |
| $t_{PHL}$, $t_{PLH}$ | Inputs 0–7 | | 2.0V | | 140 | 175 | 210 | ns |
| | to Outputs | | 4.5V | 14 | 28 | 35 | 42 | ns |
| | A0, A1, A2 | | 6.0V | | 24 | 30 | 36 | ns |
| $t_{PHL}$, $t_{PLH}$ | Inputs 0–7 | | 2.0V | | 140 | 175 | 210 | ns |
| | to | | 4.5V | 15 | 28 | 35 | 42 | ns |
| | Output EO | | 6.0V | | 24 | 30 | 36 | ns |
| $t_{PHL}$, $t_{PLH}$ | Inputs 0–7 | | 2.0V | | 160 | 200 | 240 | ns |
| | to | | 4.5V | 17 | 32 | 40 | 48 | ns |
| | Output GS | | 6.0V | | 27 | 34 | 41 | ns |
| $t_{PHL}$, $t_{PLH}$ | Input EI | | 2.0V | | 160 | 200 | 240 | ns |
| | to Outputs | | 4.5V | 17 | 32 | 40 | 48 | ns |
| | A0, A1, A2 | | 6.0V | | 27 | 34 | 41 | ns |
| $t_{PHL}$, $t_{PLH}$ | Input EI | | 2.0V | | 100 | 125 | 150 | ns |
| | to | | 4.5V | 12 | 20 | 25 | 30 | ns |
| | Output GS | | 6.0V | | 17 | 21 | 26 | ns |
| $t_{PHL}$, $t_{PLH}$ | Input EI | | 2.0V | | 100 | 125 | 150 | ns |
| | to | | 4.5V | 12 | 20 | 25 | 30 | ns |
| | Output EO | | 6.0V | | 17 | 21 | 26 | ns |
| $t_f$, $t_r$ | Maximum | | 2.0V | | 75 | 95 | 110 | ns |
| | Output Rise | | 4.5V | 7 | 15 | 19 | 22 | ns |
| | and Fall Time | | 6.0V | | 13 | 16 | 19 | ns |
| $C_{pd}$ | Power Dissipation Capacitance (Note 5) | | | 52 | | | | pF |
| $C_{in}$ | Maximum Input Capacitance | | | 5 | 10 | 10 | 10 | pF |

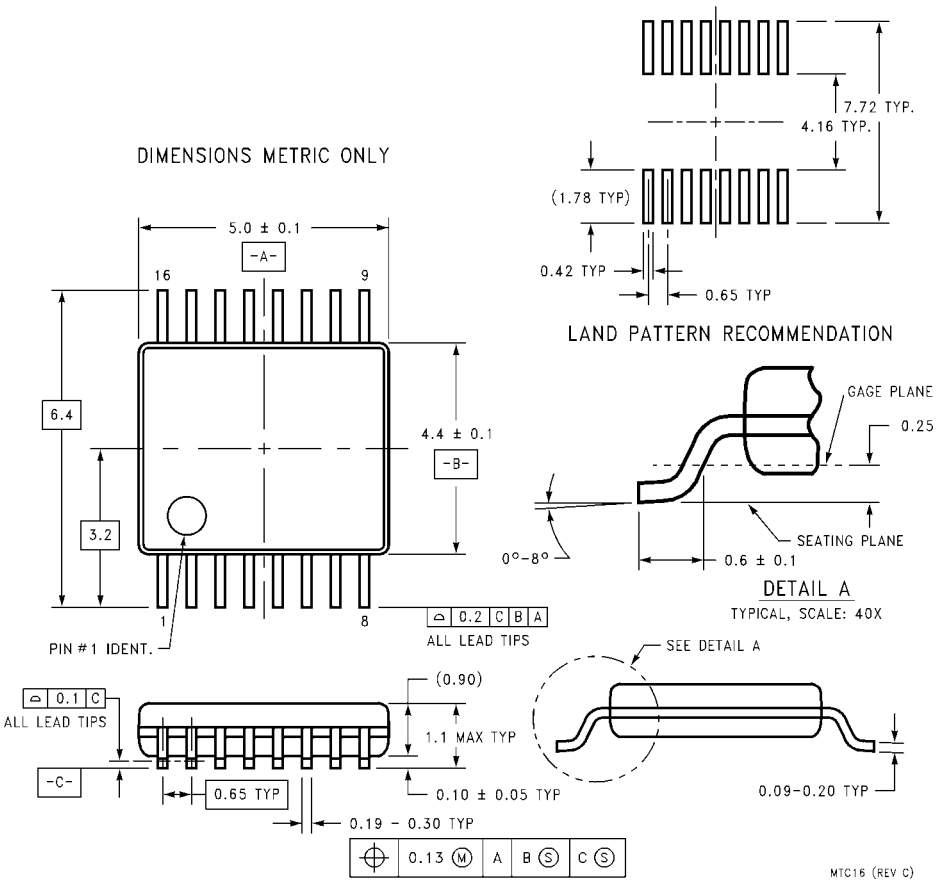
**Note 5:** $C_{pd}$ determines the no load dynamic power consumption, and the no load dynamic current consumption.

## Physical Dimensions inches (millimeters) unless otherwise noted



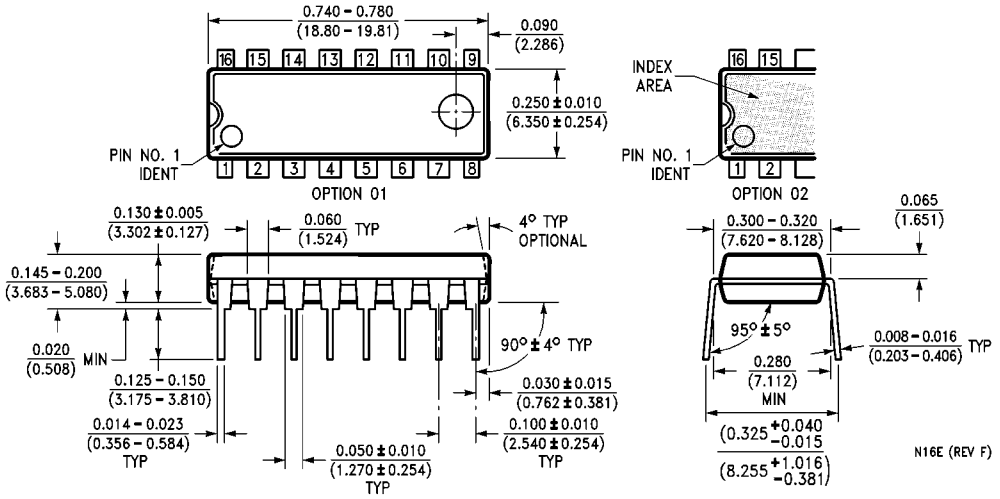

**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow**
**Package Number M16A**

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




**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**
**Package Number MTC16**

## 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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