



MOTOROLA

10-LINE-TO-4-LINE AND 8-LINE-TO-3-LINE PRIORITY ENCODERS

The SN54/74LS147 and the SN54/74LS148 are Priority Encoders. They provide priority decoding of the inputs to ensure that only the highest order data line is encoded. Both devices have data inputs and outputs which are active at the low logic level.

The LS147 encodes nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition does not require an input condition because zero is encoded when all nine data lines are at a high logic level.

The LS148 encodes eight data lines to three-line (4-2-1) binary (octal). By providing cascading circuitry (Enable Input EI and Enable Output EO) octal expansion is allowed without needing external circuitry.

The SN54/74LS748 is a proprietary Motorola part incorporating a built-in deglitcher network which minimizes glitches on the GS output. The glitch occurs on the negative going transition of the EI input when data inputs 0-7 are at logical ones.

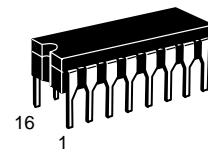
The only dc parameter differences between the LS148 and the LS748 are that (1) Pin 10 (input 0) has a fan-in of 2 on the LS748 versus a fan-in of 1 on the LS148; (2) Pins 1, 2, 3, 4, 11, 12 and 13 (inputs 1, 2, 3, 4, 5, 6, 7) have a fan-in of 3 on the LS748 versus a fan-in of 2 on the LS148.

The only ac difference is that t_{PHL} from EI to EO is changed from 40 to 45 ns.

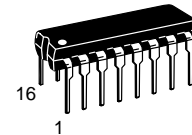
**SN54/74LS147
SN54/74LS148
SN54/74LS748**

**10-LINE-TO-4-LINE
AND 8-LINE-TO-3-LINE
PRIORITY ENCODERS**

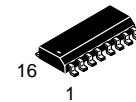
LOW POWER SCHOTTKY



**J SUFFIX
CERAMIC
CASE 620-09**



**N SUFFIX
PLASTIC
CASE 648-08**

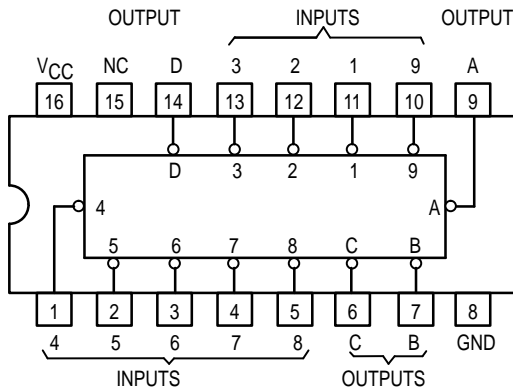


**D SUFFIX
SOIC
CASE 751B-03**

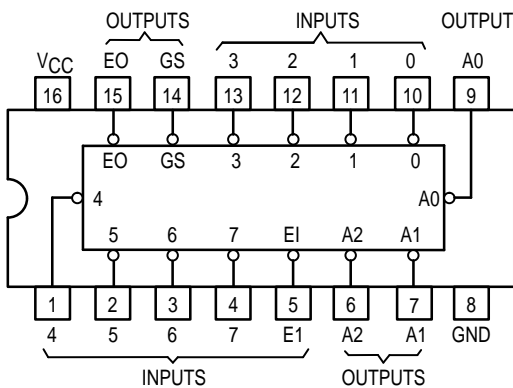
ORDERING INFORMATION

SN54LSXXXJ Ceramic
SN74LSXXXN Plastic
SN74LSXXXD SOIC

**SN54/74LS147
(TOP VIEW)**



**SN54/74LS148
SN54/74LS748
(TOP VIEW)**



SN54/74LS147 • SN54/74LS148 • SN54/74LS748

**SN54/74LS147
FUNCTION TABLE**

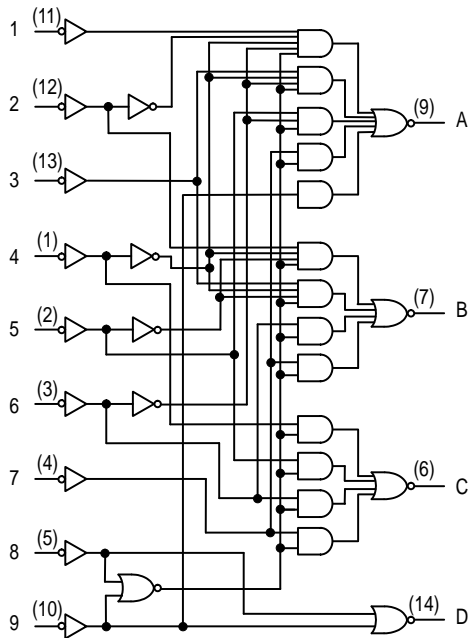
| INPUTS | | | | | | | | | OUTPUTS | | | |
|--------|---|---|---|---|---|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | D | C | B | A |
| H | H | H | H | H | H | H | H | H | H | H | H | H |
| X | X | X | X | X | X | X | X | L | L | H | H | L |
| X | X | X | X | X | X | X | L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

**SN54/74LS148
SN54/74LS748
FUNCTION TABLE**

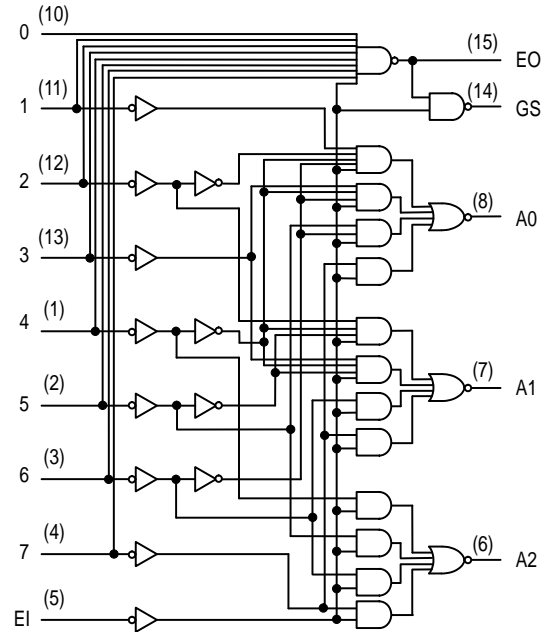
| INPUTS | | | | | | | | OUTPUTS | | | | | |
|--------|---|---|---|---|---|---|---|---------|----|----|----|----|----|
| EI | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A2 | A1 | A0 | GS | EO |
| H | X | X | X | X | X | X | X | X | H | H | H | H | H |
| L | H | H | H | H | H | H | H | H | H | H | H | H | L |
| 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 | L | H | 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 = Irrelevant

FUNCTIONAL BLOCK DIAGRAMS



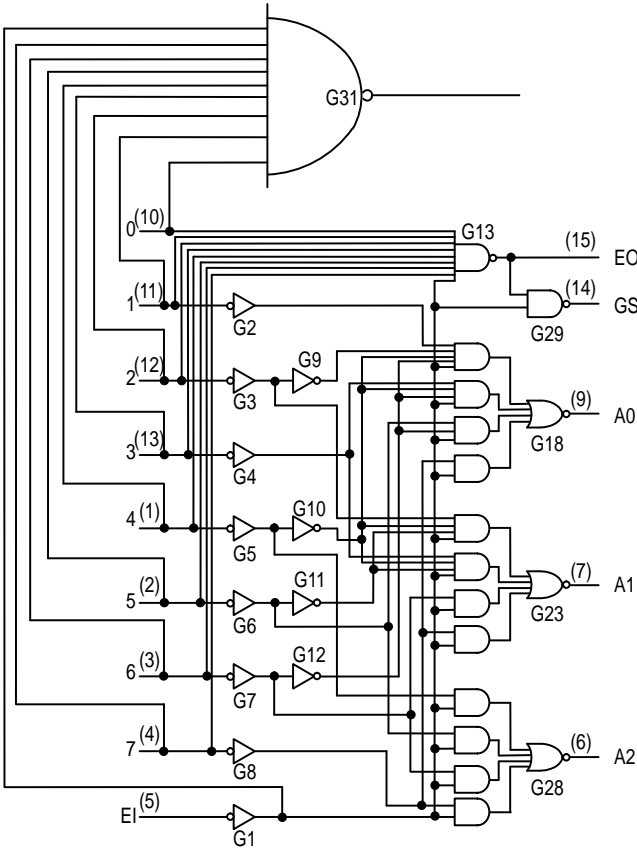
SN54/74LS147



SN54/74LS148

SN54/74LS147 • SN54/74LS148 • SN54/74LS748

FUNCTIONAL BLOCK DIAGRAMS (continued)



SN54/74LS748

SN54/74LS147 • SN54/74LS148 • SN54/74LS748

GUARANTEED OPERATING RANGES

| Symbol | Parameter | | Min | Typ | Max | Unit |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol | Parameter | Limits | | | Unit | Test Conditions | |
|------------------|---|--------|-------|------------------------------|------|--|---|
| | | Min | Typ | Max | | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs | |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs | |
| | | 74 | | 0.8 | | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA | |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table | |
| | | 74 | 2.7 | 3.5 | V | | |
| V _{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | I _{OL} = 4.0 mA | V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | I _{OL} = 8.0 mA | |
| I _{IH} | Input HIGH Current All Others Input 0 (LS748) Inputs 1–7 (LS148) Inputs 1–7 (LS748) | | | 20 40 40 60 | μA | V _{CC} = MAX, V _{IN} = 2.7 V | |
| | All Others Input 0 (LS748) Inputs 1–7 (LS148) Inputs 1–7 (LS748) | | | 0.1 0.2 0.2 0.3 | mA | V _{CC} = MAX, V _{IN} = 7.0 V | |
| I _{IL} | Input LOW Current All Others Input 0 (LS748) Inputs 1–7 (LS148) Inputs 1–7 (LS748) | | | -0.4 -0.8 -0.8 -1.2 | mA | V _{CC} = MAX, V _{IN} = 0.4 V | |
| I _{OS} | Short Circuit Current (Note 1) | -20 | | -100 | mA | V _{CC} = MAX | |
| I _{CCH} | Power Supply Current Output HIGH | | | 17 | mA | V _{CC} = MAX, All Inputs = 4.5 V | |
| I _{CCL} | Output LOW | | | 20 | mA | V _{CC} = MAX, Inputs 7 & E1 = GND All Other Inputs = 4.5 V | |

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

SN54/74LS147 • SN54/74LS148 • SN54/74LS748

AC CHARACTERISTICS ($V_{CC} = 5.0\text{ V}$, $T_A = 25^\circ\text{C}$)

SN54/74LS147

| Symbol | From (Input) | To (Output) | Waveform | Limits | | | Unit | Test Conditions |
|------------------|--------------|-------------|---------------------|--------|-----|-----|------|--|
| | | | | Min | Typ | Max | | |
| t _{PLH} | Any | Any | In-phase output | | 12 | 18 | ns | C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | | | | | 12 | 18 | | |
| t _{PLH} | Any | Any | Out-of-phase output | | 21 | 33 | ns | |
| t _{PHL} | | | | | 15 | 23 | | |

SN54/74LS148

SN54/74LS748

| Symbol | From (Input) | To (Output) | Waveform | Limits | | | Unit | Test Conditions | |
|------------------|--------------|---------------|---------------------|--------|-----|-----|------|--|--------------------|
| | | | | Min | Typ | Max | | | |
| t _{PLH} | 1 thru 7 | A0, A1, or A2 | In-phase output | | 14 | 18 | ns | C _L = 15 pF, R _L = 2.0 kΩ | |
| t _{PHL} | | | | | 15 | 25 | | | |
| t _{PLH} | 1 thru 7 | A0, A1, or A2 | Out-of-phase output | | 20 | 36 | ns | | |
| t _{PHL} | | | | | 16 | 29 | | | |
| t _{PLH} | 0 thru 7 | EO | Out-of-phase output | | 7.0 | 18 | ns | | |
| t _{PHL} | | | | | 25 | 40 | | | |
| t _{PLH} | 0 thru 7 | GS | In-phase output | | 35 | 55 | ns | | |
| t _{PHL} | | | | | 9.0 | 21 | | | |
| t _{PLH} | EI | A0, A1, or A2 | In-phase output | | 16 | 25 | ns | | |
| t _{PHL} | | | | | 12 | 25 | | | |
| t _{PLH} | EI | GS | In-phase output | | 12 | 17 | ns | | |
| t _{PHL} | | | | | 14 | 36 | | | |
| t _{PLH} | EI | EO | In-phase output | | 12 | 21 | ns | | |
| t _{PHL} | | | | | 28 | 40 | | | |
| | | | | | 30 | 45 | | | (LS148) (LS748) |