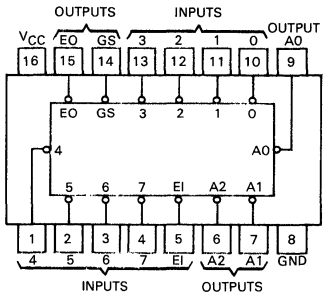
MOTOROLA

# SN54LS/74LS348
# SN54LS/74LS848

## 8-INPUT PRIORITY ENCODER

**LOW POWER SCHOTTKY**




J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

**DESCRIPTION** — 1The SN54LS/74LS348 and the SN54LS/74LS848 are eight input priority encoders which provide the 8-line to 3-line function.

The outputs(A0–A2) and inputs (0–7) are active low. The active low input which has the highest priority (input 7 has the highest) is represented on the outputs (output A0 is the lowest bit). An example would be if inputs 1, 2 and 4 were low, then a binary 4 would be represented on the outputs.

The GS (Group Signal) output is active low when any of the inputs are low. It serves to indicate when any of the inputs are active.

A0, A1 and A2 are three-state outputs. This allows for up to 64 line expansion without the need for special external circuitry.

A logical one on the Enable Input (EI) forces A0, A1 and A2 to the disabled state and outputs GS and EO to the high state. A high on all data inputs (0–7) together with a low on the EI input disables outputs A0, A1, and A2 and forces output GS to the high state and output EO to the low state.

Use of the EI input in conjunction with the EO output provides for the capability of having priority encoding of n input signals.

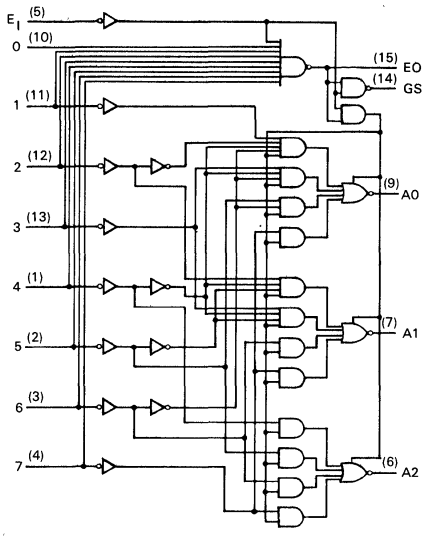
The LS848 has special internal circuitry providing for a greatly reduced negative going glitch on the GS (Group Signal) output and on a reduced tendency for the A0, A1 and A2 outputs to become momentarily enabled. Both of these occurrences happen when the EI input goes from a logical one to a logical zero and all data inputs (0–7) are held at logical ones. The internal glitch reduction circuitry does add an additional fan-in of one on all data inputs (compared to that of the LS348).

**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 | Z | Z | Z | H | H |
| L | H | H | H | H | H | H | H | H | Z | Z | Z | 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 = irrelevant
Z = high impedance state

**BLOCK DIAGRAMS**

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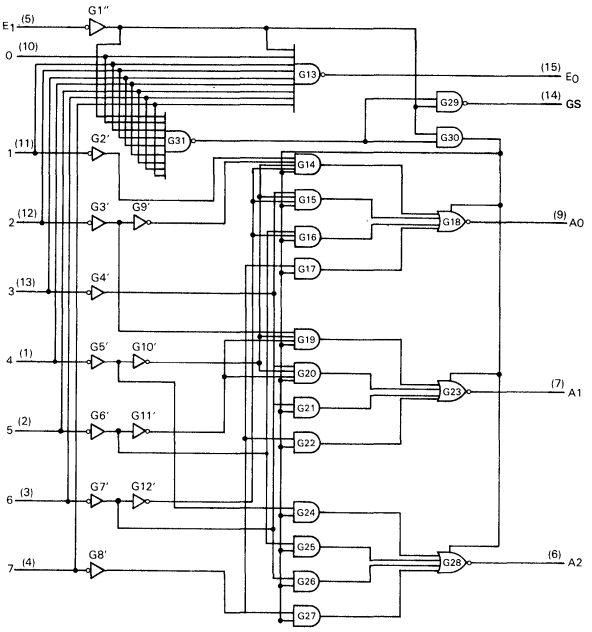


SN54LS/74LS848

**GUARANTEED OPERATING RANGES**

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 54<br>74 | 4.5<br>4.75 | 5.0<br>5.0 | 5.5<br>5.25 | V |
| $T_A$ | Operating Ambient Temperature Range | 54<br>74 | −55<br>0 | 25<br>25 | 125<br>70 | °C |
| $I_{OH}$ | Output Current — High EO, GS | 54,74 | | | −0.4 | mA |
| $I_{OH}$ | Output Current — High A0, A1, A2<br>A0, A1, A2 | 54<br>74 | | | −1.0<br>−2.6 | mA |
| $I_{OL}$ | Output Current — Low EO, GS | 54<br>74 | | | 4.0<br>8.0 | mA |
| $I_{OL}$ | Output Current — Low A0, A1, A2<br>A0, A1, A2 | 54<br>74 | | | 12<br>24 | mA |

**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE** (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS MIN | LIMITS TYP | LIMITS MAX | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|---|
| $V_{IH}$ | 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 A0, A1, A2 | 54,74 | 2.4 | 3.1 | | V | $V_{CC}$ = MIN, $I_{OH}$ = MAX, $V_{IN}$ = $V_{IH}$ or $V_{IL}$ per Truth Table |
| | EO, GS | 54 | 2 5 | 3.5 | | V | |
| | EO, GS | 74 | 2.7 | 3.5 | | V | |
| $V_{OL}$ | Output LOW Voltage | 54,74 | | 0.25 | 0.4 | V | $I_{OL}$ = 4.0 mA; $V_{CC}$ = $V_{CC}$ MIN, $V_{IN}$ = $V_{IL}$ or $V_{IH}$ per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | $I_{OL}$ = 8.0 mA |
| $I_{IH}$ | Input HIGH Current<br>Input 0, EI — LS348 | | | | 20 | μA | $V_{CC}$ = MAX, $V_{IN}$ = 2.7 V |
| | Input 0 — LS848 | | | | 40 | μA | |
| | Other — LS348<br>Other — LS848 | | | | 40<br>60 | μA<br>μA | |
| | Input 0, EI — LS348 | | | | 0.1 | mA | $V_{CC}$ = MAX, $V_{IN}$ = 7.0 V |
| | Input 0 — LS848 | | | | 0.2 | mA | |
| | Other — LS348<br>Other — LS848 | | | | 0.2<br>0.3 | mA<br>mA | |
| $I_{IL}$ | Input LOW Current<br>Input 0, EI — LS348 | | | | −0.4 | mA | $V_{CC}$ = MAX, $V_{IN}$ = 0.4 V |
| | Input 0 — LS848 | | | | −0.8 | mA | |
| | Other — LS348<br>Other — LS848 | | | | −0.8<br>−1.2 | mA<br>mA | |
| $I_{OS}$ | Short Circuit Current | EO, GS | −20 | | −120 | mA | $V_{CC}$ = MAX |
| | | A0,A1,A2 | −30 | | −130 | mA | |
| $I_{CC}$ | Power Supply Current<br>Total, Output HIGH | | | 12 | 23 | mA | $V_{CC}$ = MAX, All Inputs and Outputs Open |
| | Total, Output LOW | | | 13 | 25 | | $V_{CC}$ = MAX, Inputs 7, E1 = GND All Others Open |

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**AC CHARACTERISTICS:** $V_{CC} = 5.0$ V, $T_A = 25°C$

| SYMBOL | FROM (INPUT) | TO (OUTPUT) | WAVEFORM | LS348 LIMITS | | | LS848 LIMITS | | | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | | |
| $t_{PLH}$ | 1 thru 7 | A0, A1, or A2 | In-Phase | | 11 | 17 | | 12 | 18 | ns | $C_L = 45$ pF |
| $t_{PHL}$ | | | output | | 20 | 30 | | 20 | 30 | | |
| $t_{PLH}$ | 1 thru 7 | A0, A1, or A2 | Out-of-Phase | | 23 | 35 | | 23 | 35 | ns | $R_L = 667\ \Omega$ |
| $t_{PHL}$ | | | output | | 23 | 35 | | 23 | 35 | | |
| $t_{PZH}$ | EI | A0, A1, or A2 | | | 25 | 39 | | 25 | 39 | ns | |
| $t_{PZL}$ | | | | | 24 | 41 | | 24 | 41 | | |
| $t_{PLH}$ | 0 thru 7 | EO | Out-of-Phase | | 11 | 18 | | 11 | 18 | ns | |
| $t_{PHL}$ | | | output | | 26 | 40 | | 26 | 40 | | |
| $t_{PLH}$ | 0 thru 7 | GS | In-Phase | | 38 | 55 | | 38 | 55 | ns | $C_L = 15$ pF |
| $t_{PHL}$ | | | output | | 9.0 | 21 | | 9.0 | 21 | | |
| $t_{PLH}$ | EI | GS | In-Phase | | 11 | 17 | | 11 | 17 | ns | $R_L = 2.0\ k\Omega$ |
| $t_{PHL}$ | | | output | | 14 | 36 | | 14 | 36 | | |
| $t_{PLH}$ | EI | EO | In-Phase | | 17 | 21 | | 17 | 21 | ns | |
| $t_{PHL}$ | | | output | | 25 | 40 | | 30 | 45 | | |
| $t_{PHZ}$ | EI | A0, A1 or A2 | | | 18 | 27 | | 18 | 27 | ns | $C_L = 5.0$ pF |
| $t_{PLZ}$ | | | | | 23 | 35 | | 23 | 35 | | $R_L = 667\ \Omega$ |

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