

DATA SHEET

For a complete data sheet, please also download:

- The IC04 LOCMOS HE4000B Logic Family Specifications HEF, HEC
- The IC04 LOCMOS HE4000B Logic Package Outlines/Information HEF, HEC

HEF4724B

MSI

8-bit addressable latch

Product specification
File under Integrated Circuits, IC04

January 1995

8-bit addressable latch

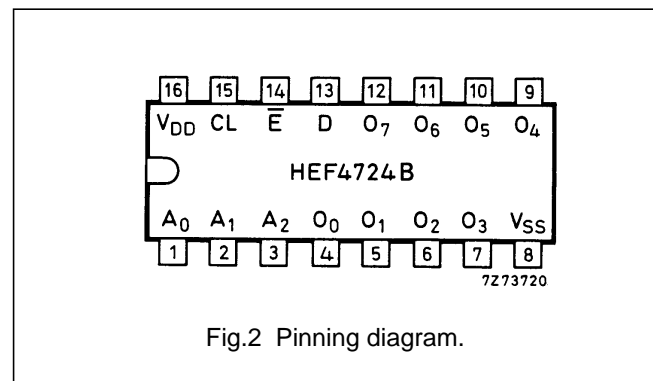
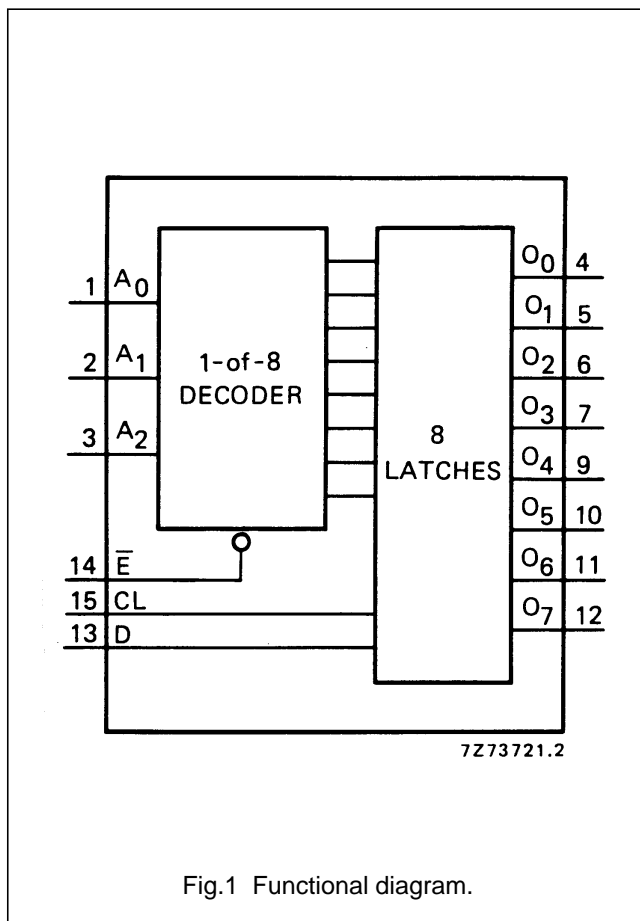
HEF4724B MSI

DESCRIPTION

The HEF4724B is an 8-bit addressable latch with three address inputs (A_0 to A_2), a data input (D), an active LOW enable input (\bar{E}), an active HIGH clear input (CL), and eight parallel latch outputs (O_0 to O_7).

When \bar{E} and CL are HIGH, all outputs (O_0 to O_7) are LOW. Eight-channel demultiplexing or active HIGH 1-of-8 decoding with output enable operation occurs when CL is HIGH and \bar{E} is LOW. When CL and \bar{E} are LOW, the

selected output (O_0 to O_7 ; determined by A_0 to A_2) follows D . When \bar{E} goes HIGH, the contents of the latch are stored. When operating in the addressable latch mode ($\bar{E} = CL = LOW$), changing more than one bit of A_0 to A_2 could impose a transient wrong address. Therefore, this should only be done while in the memory mode ($\bar{E} = HIGH, CL = LOW$).



- HEF4724BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4724BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4724BT(D): 16-lead SO; plastic (SOT109-1)
- (): Package Designator North America

PINNING

- A_0 to A_2 address inputs
- A data input
- \bar{E} enable input (active LOW)
- CL clear input (active HIGH)
- O_0 to O_7 parallel latch outputs

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

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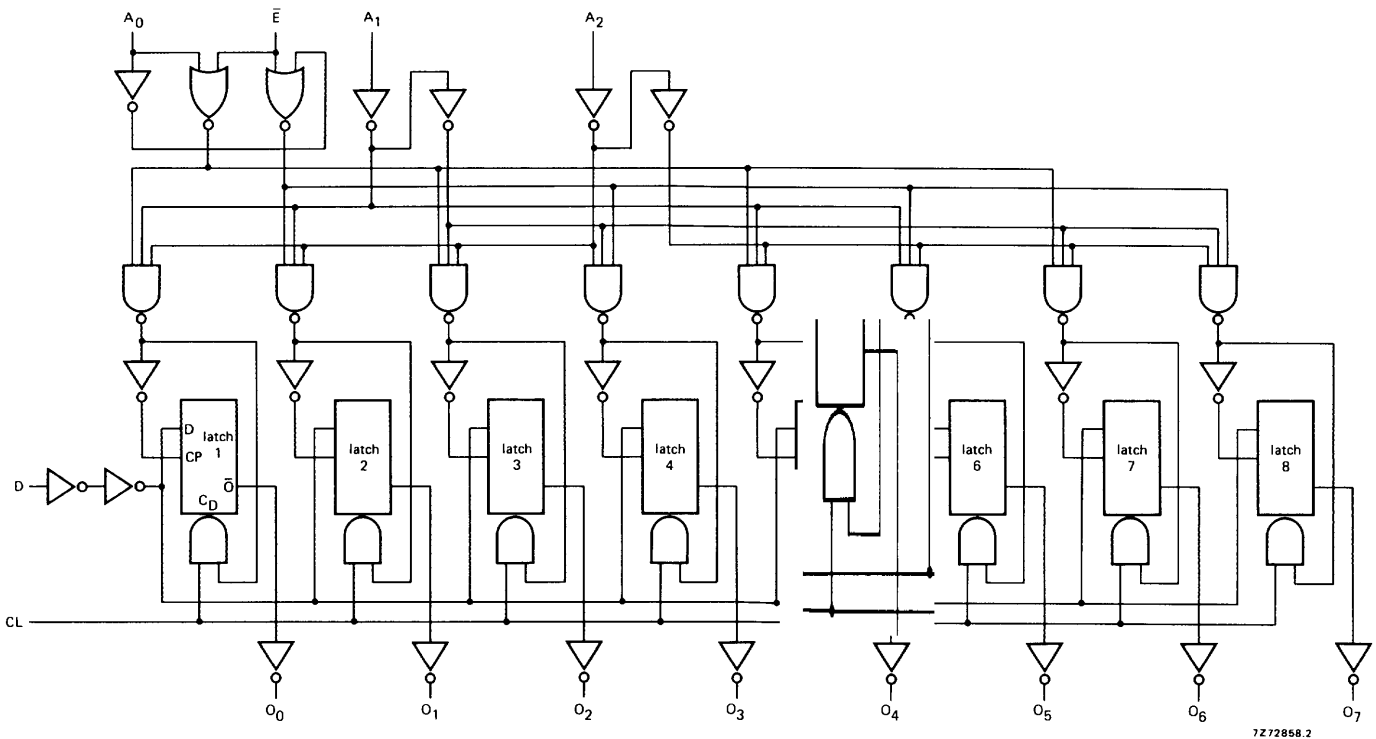


Fig.3 Logic diagram.

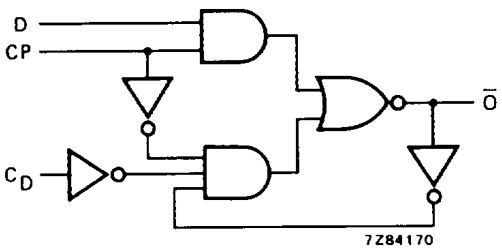


Fig.4 Logic diagram (one latch).

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MODE SELECTION

| \bar{E} | CL | MODE |
|-----------|----|-------------------------------------|
| L | L | addressable latch |
| H | L | memory |
| L | H | active HIGH 8-channel demultiplexer |
| H | H | clear |

FUNCTION TABLE

| CL | \bar{E} | D | A ₀ | A ₁ | A ₂ | O ₀ | O ₁ | O ₂ | O ₃ | O ₄ | O ₅ | O ₆ | O ₇ | MODE |
|----|-----------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--|
| H | H | X | X | X | X | L | L | L | L | L | L | L | L | clear |
| H | L | D ₁ | L | L | L | D ₁ | L | L | L | L | L | L | L | demultiplexer; unaddressed latch is cleared |
| H | L | D ₁ | H | L | L | L | D ₁ | L | L | L | L | L | L | |
| H | L | D ₁ | L | H | L | L | L | D ₁ | L | L | L | L | L | |
| H | L | D ₁ | H | H | L | L | L | L | D ₁ | L | L | L | L | |
| H | L | D ₁ | L | L | H | L | L | L | L | D ₁ | L | L | L | |
| H | L | D ₁ | H | L | H | L | L | L | L | L | D ₁ | L | L | |
| H | L | D ₁ | L | H | H | L | L | L | L | L | L | D ₁ | L | |
| H | L | D ₁ | H | H | H | L | L | L | L | L | L | L | D ₁ | |
| L | H | X | X | X | X | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | memory |
| L | L | D ₁ | L | L | L | D ₁ | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | addressable latch; unaddressed latch holds previous state |
| L | L | D ₁ | H | L | L | O _{n-1} | D ₁ | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | |
| L | L | D ₁ | L | H | L | O _{n-1} | O _{n-1} | D ₁ | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | |
| L | L | D ₁ | H | H | L | O _{n-1} | O _{n-1} | O _{n-1} | D ₁ | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | |
| L | L | D ₁ | L | L | H | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | D ₁ | O _{n-1} | O _{n-1} | O _{n-1} | |
| L | L | D ₁ | H | L | H | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | D ₁ | O _{n-1} | O _{n-1} | |
| L | L | D ₁ | L | H | H | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | D ₁ | O _{n-1} | |
| L | L | D ₁ | H | H | H | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | O _{n-1} | D ₁ | |

Notes

1. H = HIGH state (the more positive voltage)
L = LOW state (the less positive voltage)
X = state is immaterial
O_{n-1} = state before the positive transition of \bar{E}
D₁ = either HIGH or LOW

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| | V_{DD} V | TYPICAL FORMULA FOR P (μW) | |
|---|---------------|---|---|
| Dynamic power dissipation per package (P) | 5 10 15 | $700 f_i + \sum (f_o C_L) \times V_{DD}^2$ $3700 f_i + \sum (f_o C_L) \times V_{DD}^2$ $10\,800 f_i + \sum (f_o C_L) \times V_{DD}^2$ | where f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load capacitance (pF) $\sum (f_o C_L)$ = sum of outputs V_{DD} = supply voltage (V) |

AC CHARACTERISTICS $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 50\text{ pF}$; input transition times $\leq 20\text{ ns}$

| | V_{DD} V | SYMBOL | MIN. | TYP. | MAX. | TYPICAL EXTRAPOLATION FORMULA | | |
|--|---------------|-----------|-----------|------|------|--|--|--|
| Propagation delays $\bar{E} \rightarrow O_n$ HIGH to LOW | 5 | t_{PHL} | | 115 | 230 | ns | $88\text{ ns} + (0,55\text{ ns/pF}) C_L$ | |
| | 10 | | 50 | 95 | ns | $39\text{ ns} + (0,23\text{ ns/pF}) C_L$ | | |
| | 15 | | 35 | 70 | ns | $27\text{ ns} + (0,16\text{ ns/pF}) C_L$ | | |
| | LOW to HIGH | 5 | t_{PLH} | | 95 | 195 | ns | $68\text{ ns} + (0,55\text{ ns/pF}) C_L$ |
| | | 10 | | 40 | 80 | ns | $29\text{ ns} + (0,23\text{ ns/pF}) C_L$ | |
| | | 15 | | 30 | 55 | ns | $22\text{ ns} + (0,16\text{ ns/pF}) C_L$ | |
| $D \rightarrow O_n$ HIGH to LOW | 5 | t_{PHL} | | 95 | 190 | ns | $68\text{ ns} + (0,55\text{ ns/pF}) C_L$ | |
| | 10 | | 35 | 75 | ns | $24\text{ ns} + (0,23\text{ ns/pF}) C_L$ | | |
| | 15 | | 25 | 55 | ns | $17\text{ ns} + (0,16\text{ ns/pF}) C_L$ | | |
| | LOW to HIGH | 5 | t_{PLH} | | 85 | 170 | ns | $58\text{ ns} + (0,55\text{ ns/pF}) C_L$ |
| | | 10 | | 35 | 75 | ns | $24\text{ ns} + (0,23\text{ ns/pF}) C_L$ | |
| | | 15 | | 25 | 55 | ns | $17\text{ ns} + (0,16\text{ ns/pF}) C_L$ | |
| $A_n \rightarrow O_n$ HIGH to LOW | 5 | t_{PHL} | | 110 | 225 | ns | $83\text{ ns} + (0,55\text{ ns/pF}) C_L$ | |
| | 10 | | 45 | 95 | ns | $34\text{ ns} + (0,23\text{ ns/pF}) C_L$ | | |
| | 15 | | 35 | 70 | ns | $27\text{ ns} + (0,16\text{ ns/pF}) C_L$ | | |
| | LOW to HIGH | 5 | t_{PLH} | | 95 | 190 | ns | $68\text{ ns} + (0,55\text{ ns/pF}) C_L$ |
| | | 10 | | 40 | 80 | ns | $29\text{ ns} + (0,23\text{ ns/pF}) C_L$ | |
| | | 15 | | 30 | 55 | ns | $22\text{ ns} + (0,16\text{ ns/pF}) C_L$ | |
| $CL \rightarrow O_n$ HIGH to LOW | 5 | t_{PHL} | | 85 | 165 | ns | $58\text{ ns} + (0,55\text{ ns/pF}) C_L$ | |
| | 10 | | 35 | 70 | ns | $24\text{ ns} + (0,23\text{ ns/pF}) C_L$ | | |
| | 15 | | 25 | 50 | ns | $17\text{ ns} + (0,16\text{ ns/pF}) C_L$ | | |

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| | V _{DD} V | SYMBOL | MIN. | TYP. | MAX. | TYPICAL EXTRAPOLATION FORMULA |
|---------------------------------------|----------------------|-------------------|------|------|------|----------------------------------|
| Set-up times D → \bar{E} | 5 | t _{su} | 40 | 20 | ns | see also waveforms Fig.5 |
| | 10 | | 15 | 5 | ns | |
| | 15 | | 10 | 0 | ns | |
| A _n → \bar{E} | 5 | t _{su} | 40 | 20 | ns | |
| | 10 | | 20 | 10 | ns | |
| | 15 | | 15 | 5 | ns | |
| Hold times D → \bar{E} | 5 | t _{hold} | 20 | 0 | ns | |
| | 10 | | 15 | 5 | ns | |
| | 15 | | 15 | 5 | ns | |
| A _n → \bar{E} | 5 | t _{hold} | 50 | 25 | ns | |
| | 10 | | 20 | 10 | ns | |
| | 15 | | 15 | 5 | ns | |
| Minimum \bar{E} pulse width; LOW | 5 | t _{WEL} | 75 | 35 | ns | |
| | 10 | | 30 | 15 | ns | |
| | 15 | | 20 | 10 | ns | |
| Minimum CL pulse width; HIGH | 5 | t _{WCLH} | 70 | 35 | ns | |
| | 10 | | 30 | 15 | ns | |
| | 15 | | 20 | 10 | ns | |

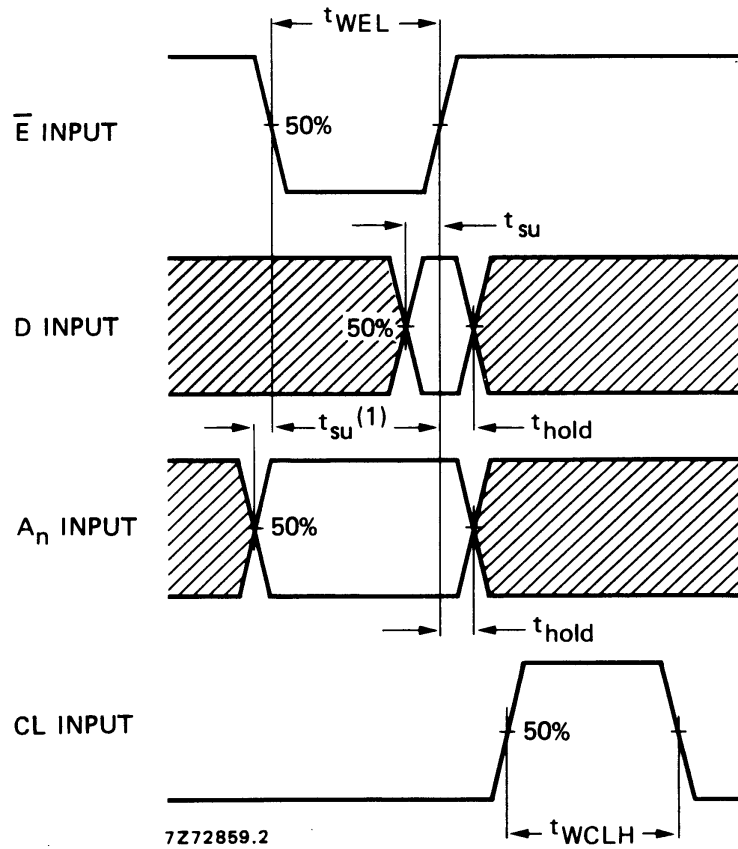
AC CHARACTERISTICS

V_{SS} = 0 V; T_{amb} = 25 °C; C_L = 50 pF; input transition times ≤ 20 ns

| | V _{DD} V | SYMBOL | MIN. | TYP. | MAX. | TYPICAL EXTRAPOLATION FORMULA | |
|---|----------------------|------------------|------|------|------|------------------------------------|------------------------------------|
| Output transition times HIGH to LOW | 5 | t _{THL} | | 60 | 120 | ns | 10 ns + (1,0 ns/pF) C _L |
| | 10 | | 30 | 60 | ns | 9 ns + (0,42 ns/pF) C _L | |
| | 15 | | 20 | 40 | ns | 6 ns + (0,28 ns/pF) C _L | |
| LOW to HIGH | 5 | t _{TLH} | | 60 | 120 | ns | 10 ns + (1,0 ns/pF) C _L |
| | 10 | | 30 | 60 | ns | 9 ns + (0,42 ns/pF) C _L | |
| | 15 | | 20 | 40 | ns | 6 ns + (0,28 ns/pF) C _L | |

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(1) The address to enable set-up time is the time before the HIGH to LOW enable transition that the address must be stable so that the correct latch is addressed and the other latches are not affected.

Fig.5 Waveforms showing minimum \bar{E} and CL pulse widths, set-up times, hold times. Set-up and hold times are shown as positive values but may be specified as negative values.