

# 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

## HEF4028B MSI 1-of-10 decoder

Product specification  
File under Integrated Circuits, IC04

January 1995

## 1-of-10 decoder

**HEF4028B**  
**MSI**

### DESCRIPTION

The HEF4028B is a 4-bit BCD to 1-of-10 active HIGH decoder. A 1-2-4-8 BCD code applied to inputs  $A_0$  to  $A_3$  causes the selected output to be HIGH, the other nine will be LOW. If desired, the device may be used as a 1-of-8 decoder with enable; 3-bit octal inputs are applied to inputs  $A_0$ ,  $A_1$  and  $A_2$  selecting an output  $O_0$  to  $O_7$ . Input  $A_3$  then becomes an active LOW enable, forcing the selected output LOW when  $A_3$  is HIGH. The HEF4028B may also be used as an 8-output ( $O_0$  to  $O_7$ ) demultiplexer with  $A_0$  to  $A_2$  as address inputs and  $A_3$  as an active LOW data input. The outputs are fully buffered for best performance.

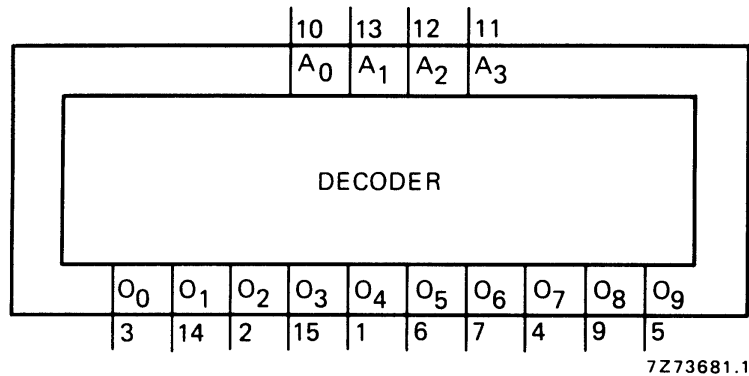


Fig.1 Functional diagram.

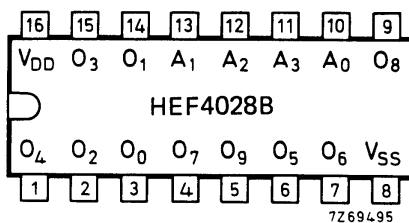


Fig.2 Pinning diagram.

- HEF4028BP(N): 16-lead DIL; plastic (SOT38-1)  
 HEF4028BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)  
 HEF4028BT(D): 16-lead SO; plastic (SOT109-1)  
 ( ): Package Designator North America

### PINNING

- $A_0$  to  $A_3$  address inputs, 1-2-4-8 BCD  
 $O_0$  to  $O_9$  outputs (active HIGH)

### FAMILY DATA, $I_{DD}$ LIMITS category MSI

See Family Specifications

1-of-10 decoder

HEF4028B  
MSI

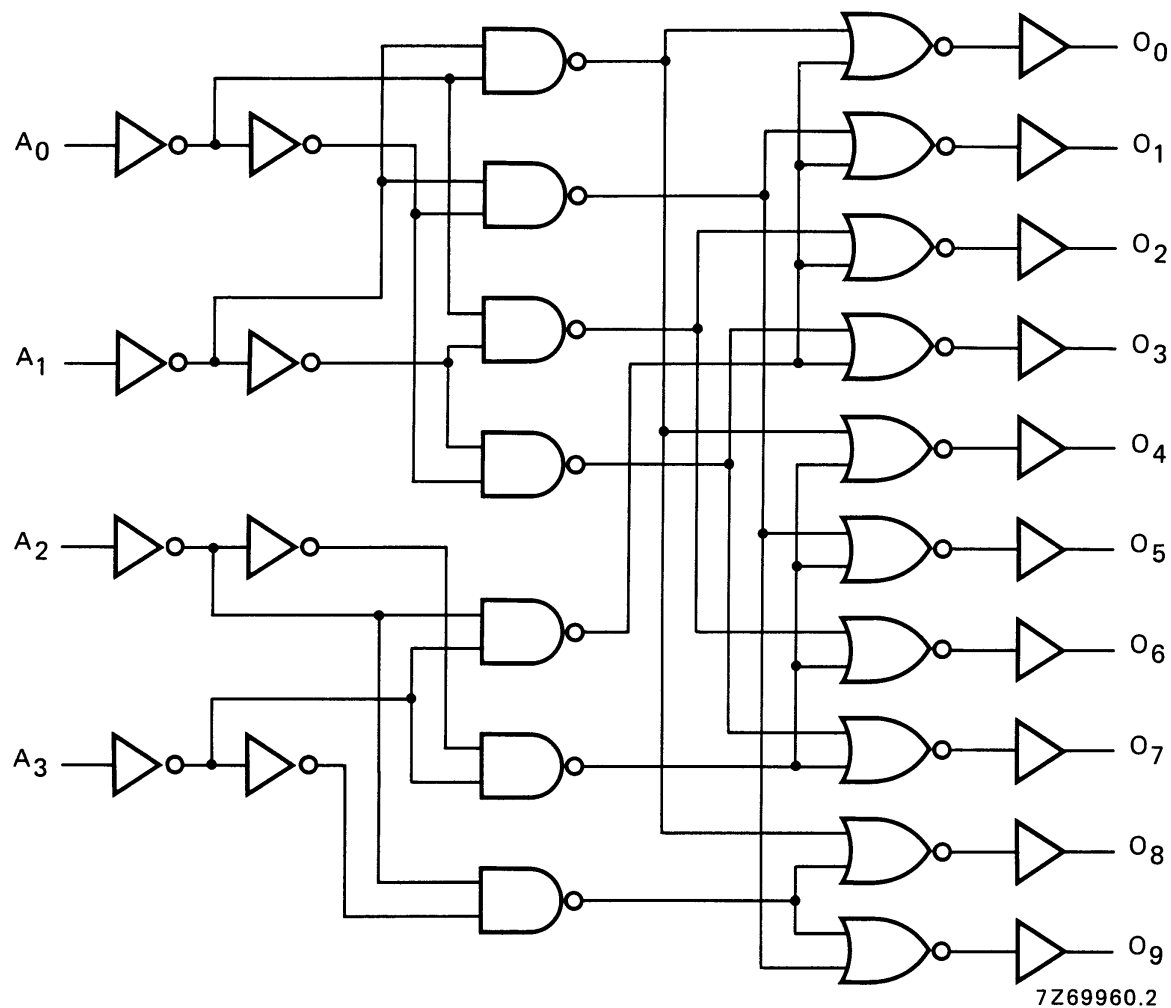


Fig.3 Logic diagram.

1-of-10 decoder

HEF4028B  
MSI

TRUTH TABLE

| INPUTS         |                |                |                | OUTPUTS        |                |                |                |                |                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> | O <sub>0</sub> | O <sub>1</sub> | O <sub>2</sub> | O <sub>3</sub> | O <sub>4</sub> | O <sub>5</sub> | O <sub>6</sub> | O <sub>7</sub> | O <sub>8</sub> | O <sub>9</sub> |
| L              | L              | L              | L              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| L              | L              | L              | H              | L              | H              | L              | L              | L              | L              | L              | L              | L              | L              |
| L              | L              | H              | L              | L              | L              | H              | L              | L              | L              | L              | L              | L              | L              |
| L              | L              | H              | H              | L              | L              | L              | H              | L              | L              | L              | L              | L              | L              |
| L              | H              | L              | L              | L              | L              | L              | L              | H              | L              | L              | L              | L              | L              |
| L              | H              | L              | H              | L              | L              | L              | L              | L              | H              | L              | L              | L              | L              |
| L              | H              | H              | L              | L              | L              | L              | L              | L              | L              | H              | L              | L              | L              |
| L              | H              | H              | H              | L              | L              | L              | L              | L              | L              | L              | H              | L              | L              |
| H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | H              | L              |
| H              | L              | L              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | H              |
| H              | L              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| H              | L              | H              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| H              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| H              | H              | L              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| H              | H              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |
| H              | H              | H              | H              | L              | L              | L              | L              | L              | L              | L              | L              | L              | L              |

Notes

- 1. H = HIGH state (the more positive voltage)  
L = LOW state (the less positive voltage)
- 2. Extraordinary states.

1-of-10 decoder

HEF4028B  
MSI

AC CHARACTERISTICS

V<sub>SS</sub> = 0 V; T<sub>amb</sub> = 25 °C; C<sub>L</sub> = 50 pF; input transition times ≤ 20 ns

|                                                                      | V <sub>DD</sub><br>V | SYMBOL           | TYP. | MAX. |    | TYPICAL EXTRAPOLATION<br>FORMULA    |
|----------------------------------------------------------------------|----------------------|------------------|------|------|----|-------------------------------------|
| Propagation delays<br>A <sub>n</sub> → O <sub>n</sub><br>HIGH to LOW | 5                    | t <sub>PHL</sub> | 100  | 200  | ns | 73 ns + (0,55 ns/pF) C <sub>L</sub> |
|                                                                      | 10                   |                  | 40   | 80   | ns | 29 ns + (0,23 ns/pF) C <sub>L</sub> |
|                                                                      | 15                   |                  | 30   | 60   | ns | 22 ns + (0,16 ns/pF) C <sub>L</sub> |
|                                                                      | 5                    | t <sub>PLH</sub> | 90   | 180  | ns | 63 ns + (0,55 ns/pF) C <sub>L</sub> |
|                                                                      | 10                   |                  | 40   | 80   | ns | 29 ns + (0,23 ns/pF) C <sub>L</sub> |
|                                                                      | 15                   |                  | 30   | 60   | ns | 22 ns + (0,16 ns/pF) C <sub>L</sub> |
| Output transition times<br>HIGH to LOW                               | 5                    | t <sub>THL</sub> | 60   | 120  | ns | 10 ns + (1,0 ns/pF) C <sub>L</sub>  |
|                                                                      | 10                   |                  | 30   | 60   | ns | 9 ns + (0,42 ns/pF) C <sub>L</sub>  |
|                                                                      | 15                   |                  | 20   | 40   | ns | 6 ns + (0,28 ns/pF) C <sub>L</sub>  |
|                                                                      | 5                    | t <sub>TLH</sub> | 60   | 120  | ns | 10 ns + (1,0 ns/pF) C <sub>L</sub>  |
|                                                                      | 10                   |                  | 30   | 60   | ns | 9 ns + (0,42 ns/pF) C <sub>L</sub>  |
|                                                                      | 15                   |                  | 20   | 40   | ns | 6 ns + (0,28 ns/pF) C <sub>L</sub>  |

|                                                 | V <sub>DD</sub><br>V | TYPICAL FORMULA FOR P (μW)                                                               |                                                                                                                                                                                                                            |
|-------------------------------------------------|----------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dynamic power<br>dissipation per<br>package (P) | 5                    | 350 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup>   | where<br>f <sub>i</sub> = input freq. (MHz)<br>f <sub>o</sub> = output freq. (MHz)<br>C <sub>L</sub> = total load cap. (pF)<br>∑ (f <sub>o</sub> C <sub>L</sub> ) = sum of outputs<br>V <sub>DD</sub> = supply voltage (V) |
|                                                 | 10                   | 2 200 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup> |                                                                                                                                                                                                                            |
|                                                 | 15                   | 7 350 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup> |                                                                                                                                                                                                                            |