

# 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

## **HEF4532B**

## **MSI**

## **8-input priority encoder**

Product specification  
File under Integrated Circuits, IC04

January 1995

# 8-input priority encoder

# HEF4532B MSI

### DESCRIPTION

The HEF4532B is an 8-input priority encoder with eight active HIGH priority inputs ( $I_0$  to  $I_7$ ), three active HIGH outputs ( $O_0$  to  $O_2$ ), an active HIGH enable input ( $E_{in}$ ), an active HIGH enable output ( $E_{out}$ ) and an active HIGH group select output (GS). Data is accepted on inputs  $I_0$  to  $I_7$ . The binary code

corresponding to the highest priority input ( $I_0$  to  $I_7$ ) which is HIGH, is generated on  $O_0$  to  $O_2$  if  $E_{in}$  is HIGH. Input  $I_7$  is assigned the highest priority. GS is HIGH when one or more priority inputs and  $E_{in}$  are HIGH.  $E_{out}$  is HIGH when  $I_0$  to  $I_7$  are LOW and  $E_{in}$  is HIGH.  $E_{in}$ , when LOW, forces all outputs ( $O_0$  to  $O_2$ , GS,  $E_{out}$ ) LOW.

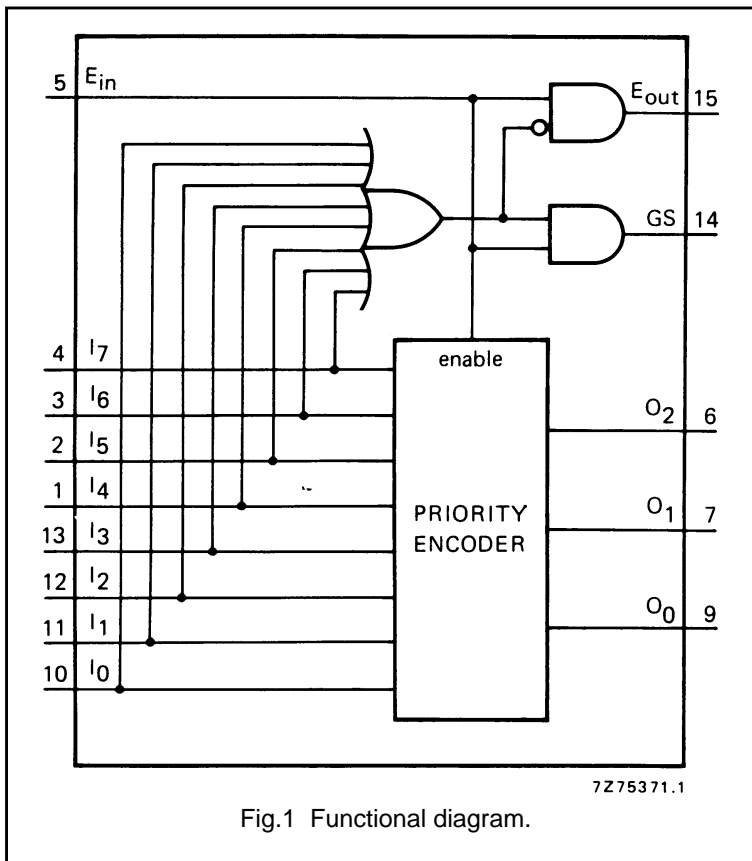


Fig.1 Functional diagram.

- HEF4532BP(N): 16-lead DIL; plastic (SOT38-1)
  - HEF4532BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
  - HEF4532BT(D): 16-lead SO; plastic (SOT109-1)
- ( ): Package Designator North America

### PINNING

- $I_0$  to  $I_7$  priority inputs
- $E_{in}$  enable input
- $E_{out}$  enable output
- GS group select output
- $O_0$  to  $O_2$  outputs

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

See Family Specifications

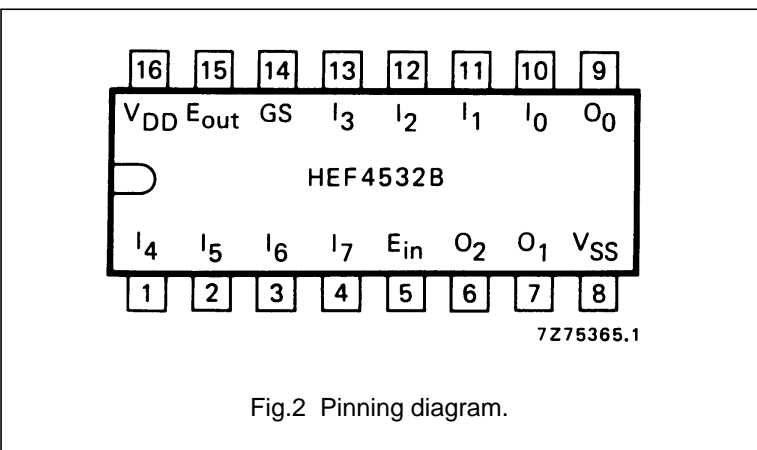


Fig.2 Pinning diagram.

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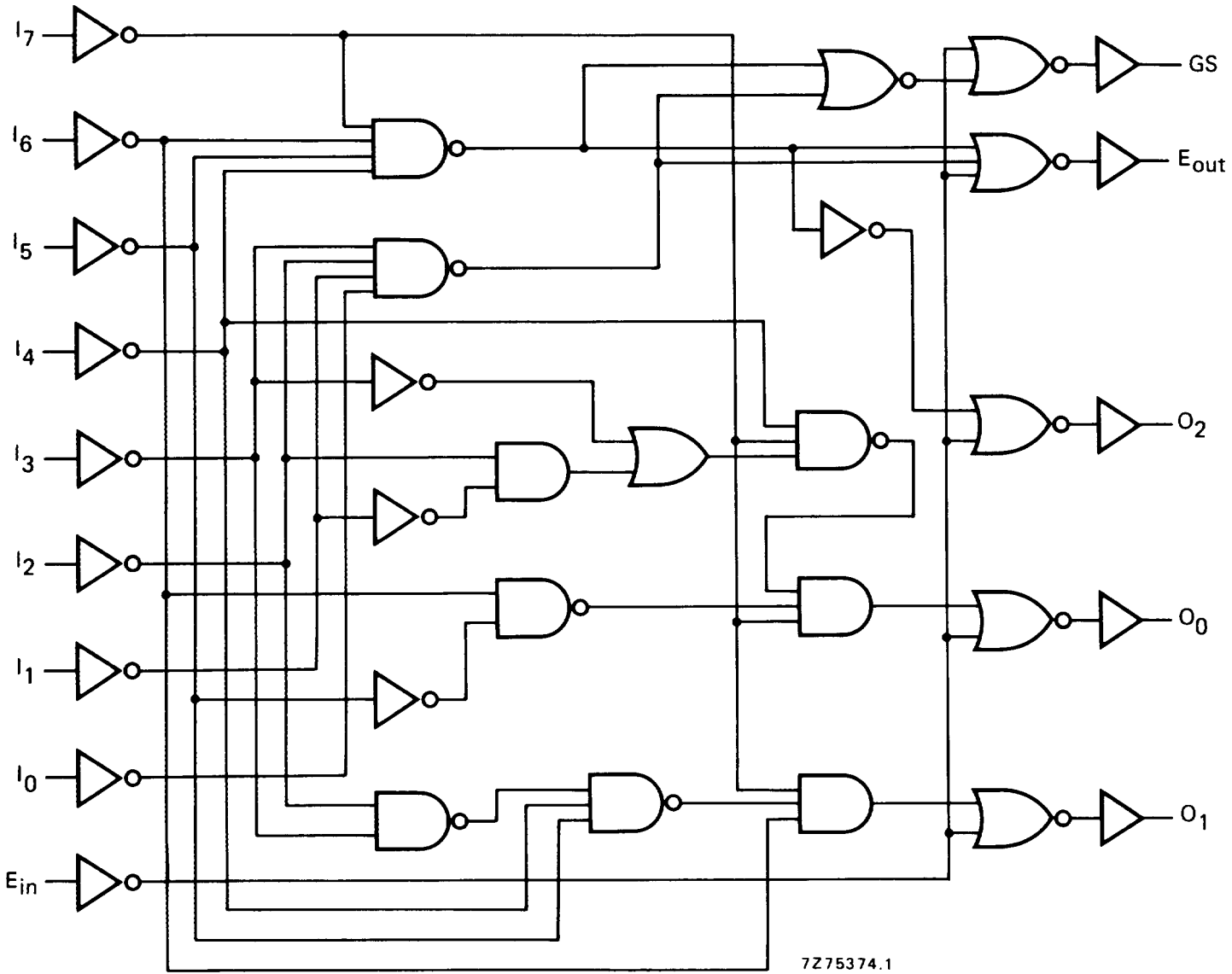


Fig.3 Logic diagram.

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## TRUTH TABLE

INPUTS									OUTPUTS				
E <sub>in</sub>	I <sub>7</sub>	I <sub>6</sub>	I <sub>5</sub>	I <sub>4</sub>	I <sub>3</sub>	I <sub>2</sub>	I <sub>1</sub>	I <sub>0</sub>	GS	O <sub>2</sub>	O <sub>1</sub>	O <sub>0</sub>	E <sub>out</sub>
L	X	X	X	X	X	X	X	X	L	L	L	L	L
H	L	L	L	L	L	L	L	L	L	L	L	L	H
H	H	X	X	X	X	X	X	X	H	H	H	H	L
H	L	H	X	X	X	X	X	X	H	H	H	L	L
H	L	L	H	X	X	X	X	X	H	H	L	H	L
H	L	L	L	H	X	X	X	X	H	H	L	L	L
H	L	L	L	L	H	X	X	X	H	L	H	H	L
H	L	L	L	L	L	H	X	X	H	L	H	L	L
H	L	L	L	L	L	L	H	X	H	L	L	H	L
H	L	L	L	L	L	L	L	H	H	L	L	L	L

## Notes

1. H = HIGH state (the more positive voltage)
2. L = LOW state (the less positive voltage)
3. X = state is immaterial

## LOGIC EQUATIONS

$$O_2 = E_{in} \cdot (I_4 + I_5 + I_6 + I_7)$$

$$O_1 = E_{in} \cdot (I_2 \cdot \bar{I}_4 \cdot \bar{I}_5 + I_3 \cdot \bar{I}_4 \cdot \bar{I}_5 + I_6 + I_7)$$

$$O_0 = E_{in} \cdot (I_1 \cdot \bar{I}_2 \cdot \bar{I}_4 \cdot \bar{I}_6 + I_3 \cdot \bar{I}_4 \cdot \bar{I}_6 + I_5 \cdot \bar{I}_6 + I_7)$$

$$E_{out} = E_{in} \cdot \bar{I}_0 \cdot \bar{I}_1 \cdot \bar{I}_2 \cdot \bar{I}_3 \cdot \bar{I}_4 \cdot \bar{I}_5 \cdot \bar{I}_6 \cdot \bar{I}_7$$

$$GS = E_{in} \cdot (I_0 + I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7)$$

## AC CHARACTERISTICS

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

	V <sub>DD</sub> V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5 10 15	1 620 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup> 6 600 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup> 15 970 f <sub>i</sub> + ∑ (f <sub>o</sub> C <sub>L</sub> ) × V <sub>DD</sub> <sup>2</sup>	where f <sub>i</sub> = input freq. (MHz) f <sub>o</sub> = output freq. (MHz) C <sub>L</sub> = load capacitance (pF) ∑ (f <sub>o</sub> C <sub>L</sub> ) = sum of outputs V <sub>DD</sub> = supply voltage (V)

## 8-input priority encoder

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MSI**AC CHARACTERISTICS** $V_{SS} = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $C_L = 50\text{ pF}$ ; input transition times  $\leq 20\text{ ns}$ ; see also waveforms Fig.4

	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays							
$E_{in} \rightarrow E_{out}$	5			95	190	ns	68 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10	$t_{PHL}$		45	90	ns	34 ns + (0,23 ns/pF) $C_L$
	15			35	70	ns	27 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		80	160	ns	53 ns + (0,55 ns/pF) $C_L$
	10			35	70	ns	24 ns + (0,23 ns/pF) $C_L$
	15			30	60	ns	22 ns + (0,16 ns/pF) $C_L$
$E_{in} \rightarrow GS$	5			85	170	ns	58 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10	$t_{PHL}$		45	90	ns	34 ns + (0,23 ns/pF) $C_L$
	15			35	70	ns	27 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		80	160	ns	53 ns + (0,55 ns/pF) $C_L$
	10			40	80	ns	29 ns + (0,23 ns/pF) $C_L$
	15			30	60	ns	22 ns + (0,16 ns/pF) $C_L$
$E_{in} \rightarrow O_n$	5			80	160	ns	53 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10	$t_{PHL}$		40	80	ns	29 ns + (0,23 ns/pF) $C_L$
	15			30	60	ns	22 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		85	170	ns	58 ns + (0,55 ns/pF) $C_L$
	10			40	80	ns	29 ns + (0,23 ns/pF) $C_L$
	15			30	60	ns	22 ns + (0,16 ns/pF) $C_L$
$I_n \rightarrow O_n$	5			115	230	ns	88 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10	$t_{PHL}$		50	100	ns	39 ns + (0,23 ns/pF) $C_L$
	15			35	70	ns	27 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		115	230	ns	88 ns + (0,55 ns/pF) $C_L$
	10			50	100	ns	39 ns + (0,23 ns/pF) $C_L$
	15			35	70	ns	27 ns + (0,16 ns/pF) $C_L$
$I_n \rightarrow GS$	5			115	230	ns	88 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10	$t_{PHL}$		50	100	ns	39 ns + (0,23 ns/pF) $C_L$
	15			40	80	ns	32 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		115	230	ns	88 ns + (0,55 ns/pF) $C_L$
	10			50	100	ns	39 ns + (0,23 ns/pF) $C_L$
	15			40	80	ns	32 ns + (0,16 ns/pF) $C_L$
Output transition times	5			60	120	ns	10 ns + (1,0 ns/pF) $C_L$
HIGH to LOW	10	$t_{THL}$		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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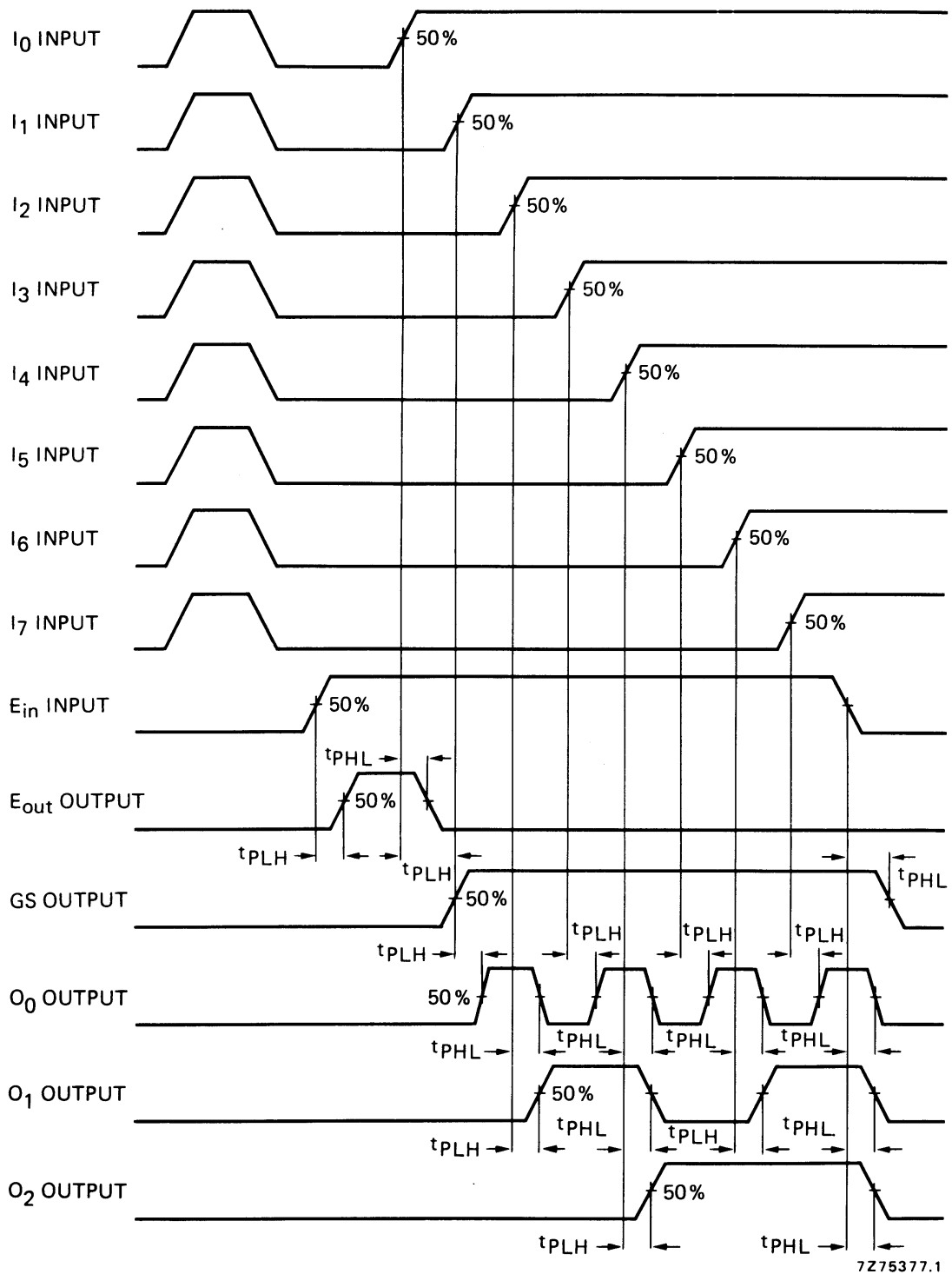


Fig.4 Waveforms showing propagation delays from inputs to outputs.

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APPLICATION INFORMATION

Some examples of applications for the HEF4532B are:

- Priority encoder
- Keyboard encoder

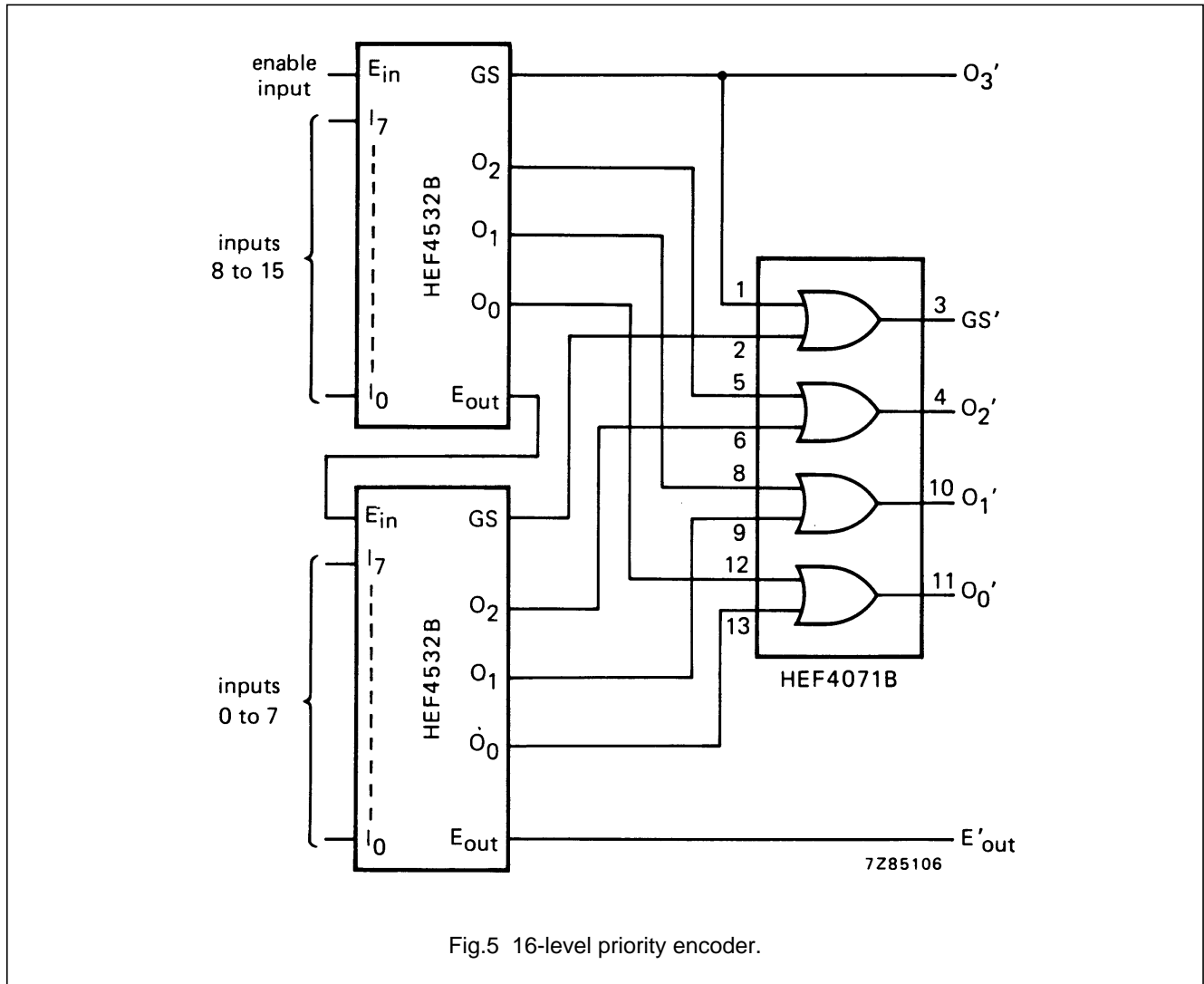


Fig.5 16-level priority encoder.

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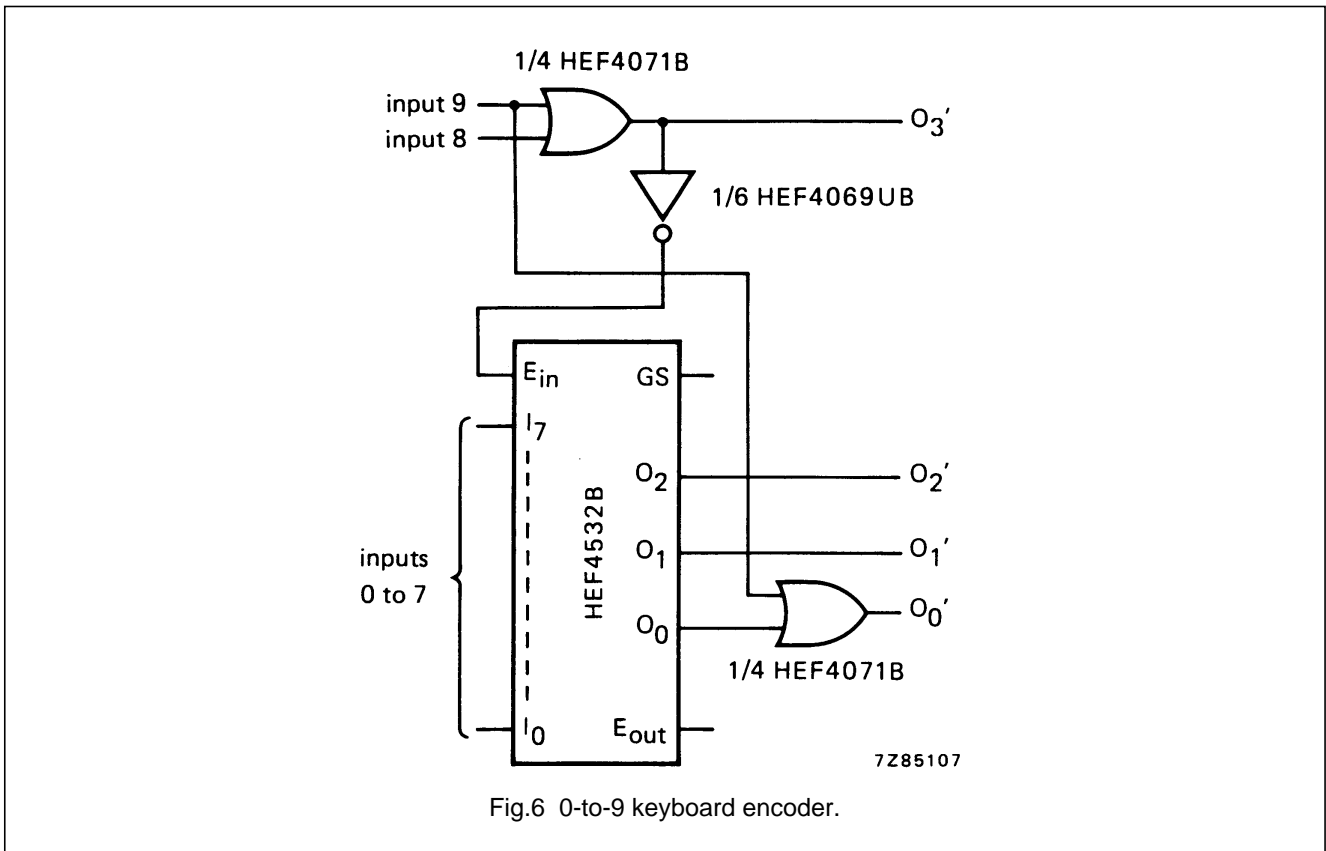


Fig.6 0-to-9 keyboard encoder.

TRUTH TABLE (for Fig.6)

INPUTS										OUTPUTS				
9	8	7	6	5	4	3	2	1	0	GS	O <sub>3</sub> '	O <sub>2</sub> '	O <sub>1</sub> '	O <sub>0</sub> '
H	X	X	X	X	X	X	X	X	X	L	H	L	L	H
L	H	X	X	X	X	X	X	X	X	L	H	L	L	L
L	L	H	X	X	X	X	X	X	X	H	L	H	H	H
L	L	L	H	X	X	X	X	X	X	H	L	H	H	L
L	L	L	L	H	X	X	X	X	X	H	L	H	L	H
L	L	L	L	L	H	X	X	X	X	H	L	H	L	L
L	L	L	L	L	L	H	X	X	X	H	L	L	H	H
L	L	L	L	L	L	L	H	X	X	H	L	L	H	L
L	L	L	L	L	L	L	L	H	X	H	L	L	L	H
L	L	L	L	L	L	L	L	L	H	H	L	L	L	L

Notes

1. H = HIGH state (the more positive voltage)
2. L = LOW state (the less positive voltage)
3. X = state is immaterial