

# 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

## HEF4000B

### gates

## Dual 3-input NOR gate and inverter

Product specification  
File under Integrated Circuits, IC04

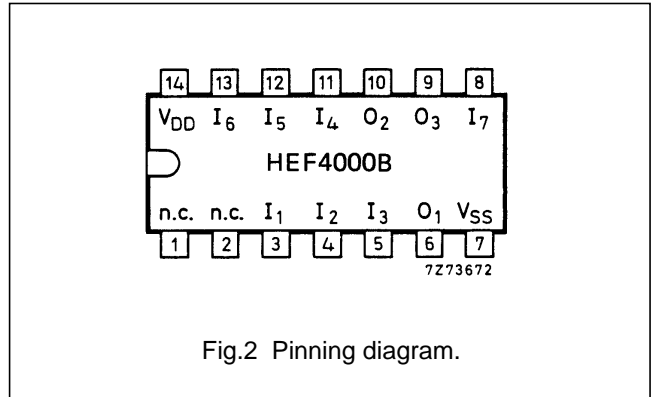
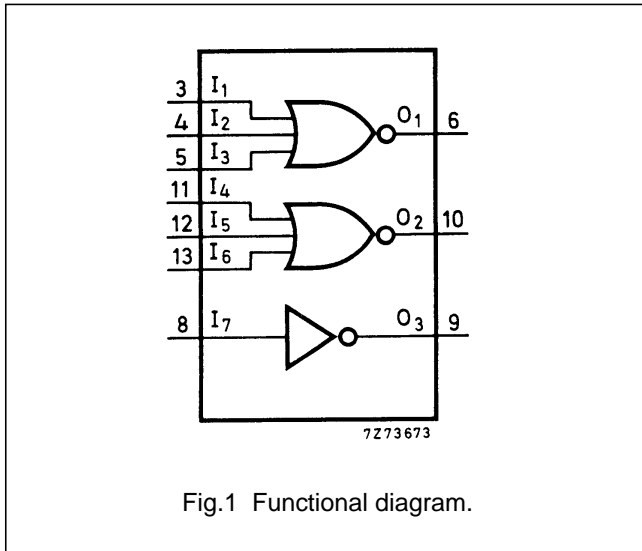
January 1995

# Dual 3-input NOR gate and inverter

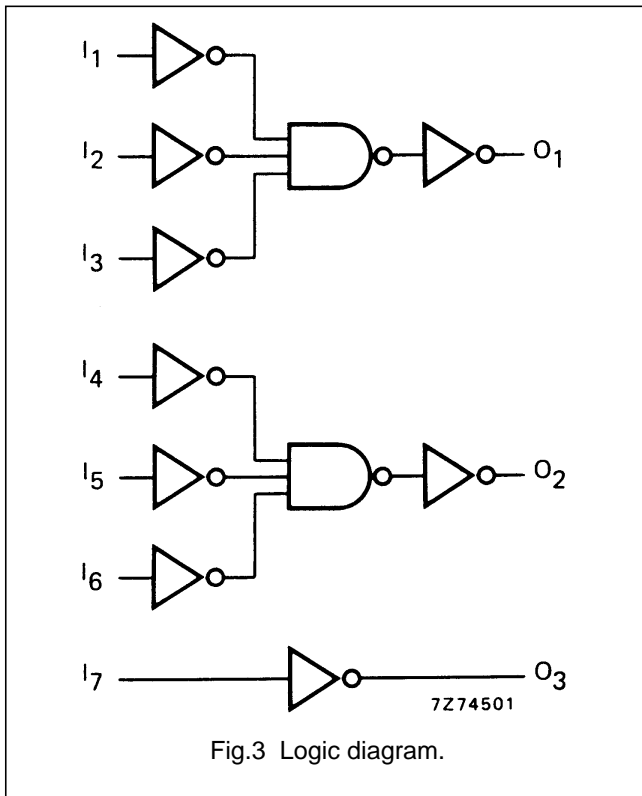
# HEF4000B gates

**DESCRIPTION**

The HEF4000B provides the positive dual 3-input NOR function. A single stage inverting function with standard output performance is also accomplished. The outputs are fully buffered for highest noise immunity and pattern insensitivity of output impedance.



- HEF4000BP(N): 14-lead DIL; plastic (SOT27-1)
- HEF4000BD(F): 14-lead DIL; ceramic (cerdip) (SOT73)
- HEF4000BT(D): 14-lead SO; plastic (SOT108-1)
- ( ): Package Designator North America



**FAMILY DATA, I<sub>DD</sub> LIMITS category GATES**

See Family Specifications

## Dual 3-input NOR gate and inverter

HEF4000B  
gates**DC CHARACTERISTICS**

For the single inverter stage ( $I_7/O_3$ ):

see Family Specifications for input voltages HIGH and LOW (unbuffered stages only).

**AC CHARACTERISTICS**

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

	$V_{DD}$ V	SYMBOL	TYP.	MAX.		TYPICAL EXTRAPOLATION FORMULA
Propagation delays $I_1$ to $I_6 \rightarrow O_1, O_2$	5	$t_{PHL}; t_{PLH}$	70	140	ns	$43 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
	10		35	70	ns	$24 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
	15		30	55	ns	$22 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
$I_7 \rightarrow O_3$ (unbuffered output)	5	$t_{PHL}; t_{PLH}$	45	90	ns	$18 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
	10		25	50	ns	$14 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
	15		20	40	ns	$12 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
Output transition times HIGH to LOW	5	$t_{THL}$	60	120	ns	$10 \text{ ns} + (1,0 \text{ ns/pF}) C_L$
	10		30	60	ns	$9 \text{ ns} + (0,42 \text{ ns/pF}) C_L$
	15		20	40	ns	$6 \text{ ns} + (0,28 \text{ ns/pF}) C_L$
LOW to HIGH	5	$t_{TLH}$	60	120	ns	$10 \text{ ns} + (1,0 \text{ ns/pF}) C_L$
	10		30	60	ns	$9 \text{ ns} + (0,42 \text{ ns/pF}) C_L$
	15		20	40	ns	$6 \text{ ns} + (0,28 \text{ ns/pF}) C_L$

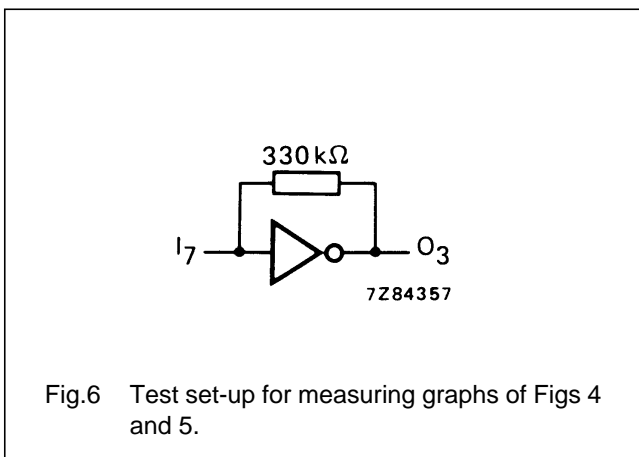
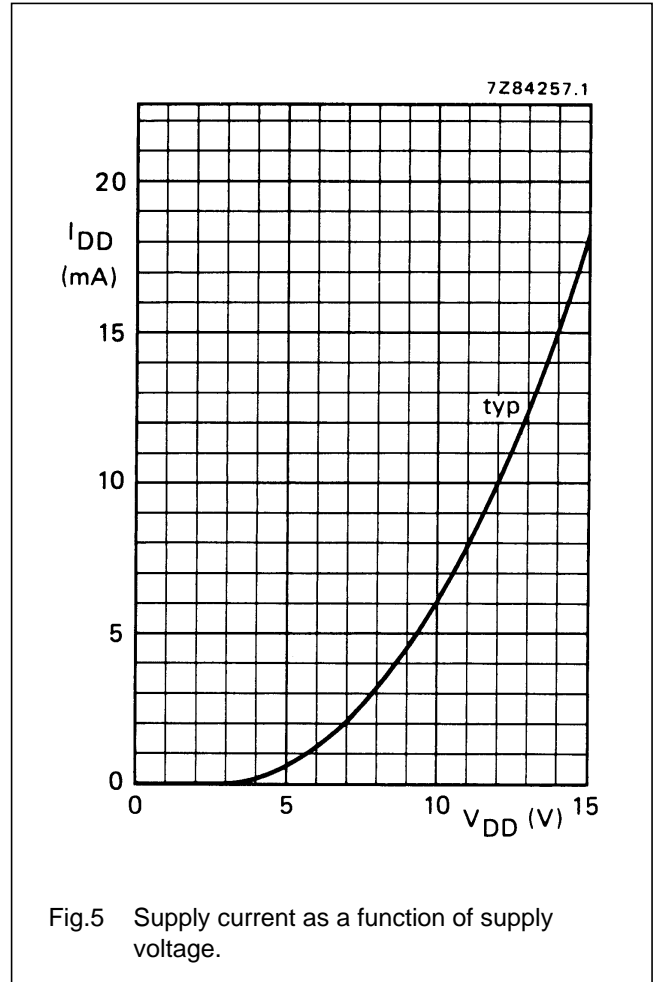
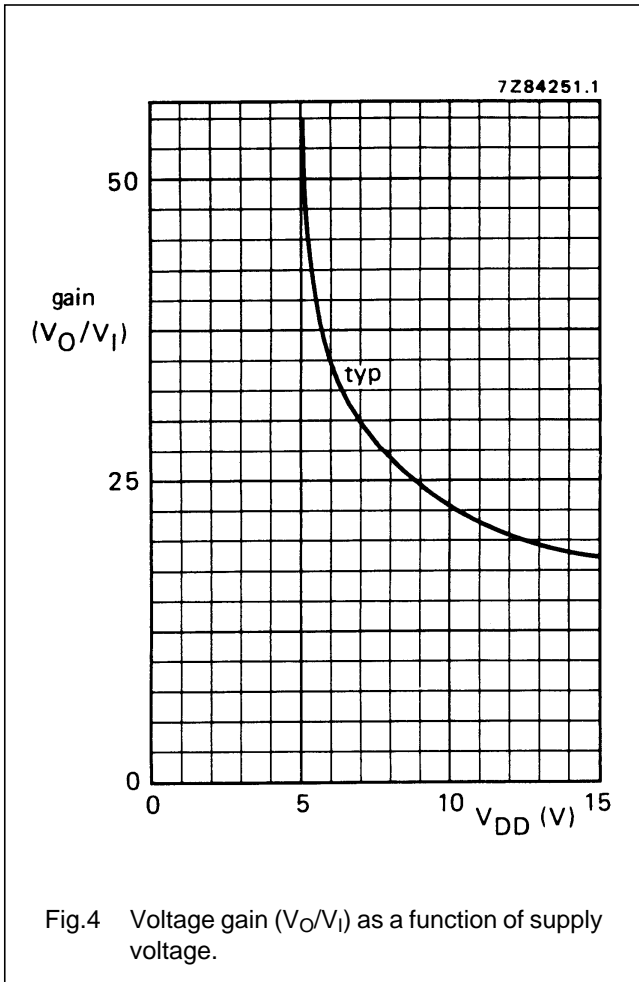
	$V_{DD}$ V	TYPICAL FORMULA FOR P ( $\mu$ W)	
Dynamic power dissipation per package (P)	5	$1\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	where $f_i$ = input freq. (MHz) $f_o$ = output freq. (MHz) $C_L$ = load capacitance (pF) $\sum (f_o C_L)$ = sum of outputs $V_{DD}$ = supply voltage (V)
	10	$7\,700 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$28\,700 f_i + \sum (f_o C_L) \times V_{DD}^2$	

Dual 3-input NOR gate and inverter

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APPLICATION INFORMATION

The following information (Figs 4 to 7) is only for the single inverter stage (I<sub>7</sub>/O<sub>3</sub>).



This is also an example of an analogue amplifier using the single inverter stage (I<sub>7</sub>/O<sub>3</sub>) of the HEF4000B.

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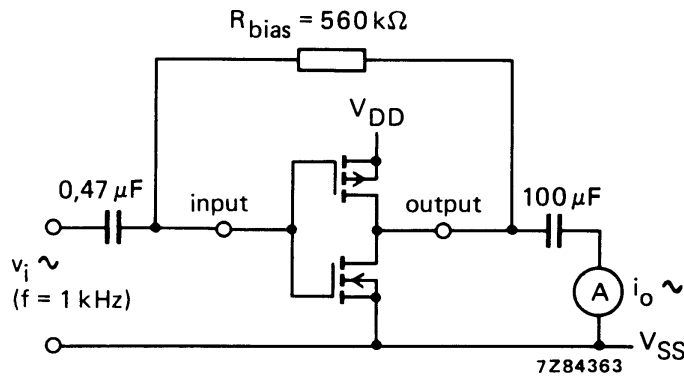
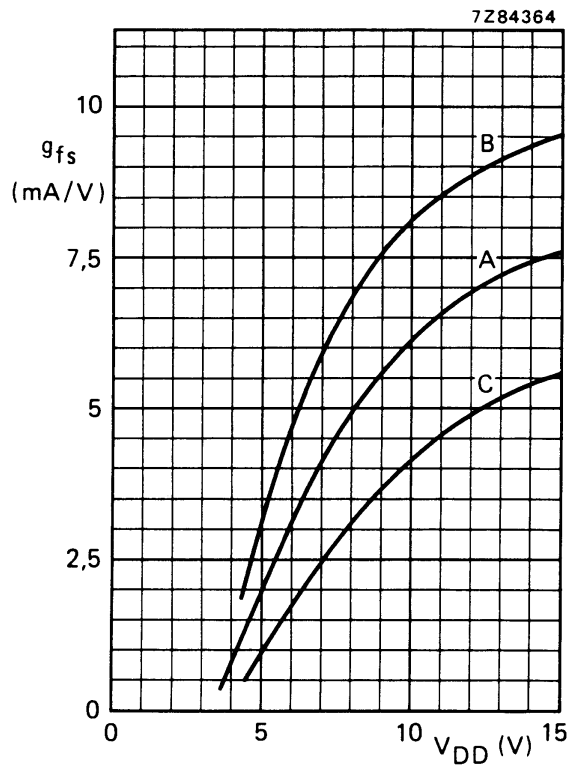


Fig.7 Test set-up for measuring forward transconductance  $g_{fs} = di_o/dv_i$  at  $v_o$  is constant (see also graph Fig.8).



A: average  
 B: average + 2 s,  
 C: average - 2 s, in where 's' is the observed standard deviation.

Fig.8 Typical forward transconductance  $g_{fs}$  as a function of the supply voltage at  $T_{amb} = 25\text{ }^\circ\text{C}$ .