

# 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

## **HEF4050B** **buffers** HEX non-inverting buffers

Product specification  
File under Integrated Circuits, IC04

January 1995

# HEX non-inverting buffers

# HEF4050B buffers

### DESCRIPTION

The HEF4050B provides six non-inverting buffers with high current output capability suitable for driving TTL or high capacitive loads. Since input voltages in excess of the buffers' supply voltage are permitted, the buffers may also be used to convert logic levels of up to 15 V to standard TTL levels. Their guaranteed fan-out into common bipolar logic elements is shown in the table below.

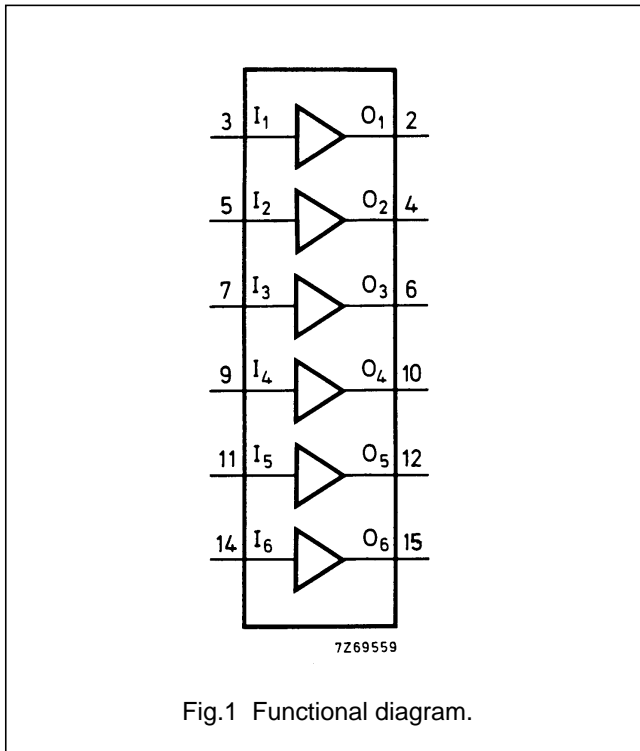


Fig.1 Functional diagram.

### Guaranteed fan-out in common logic families

DRIVEN ELEMENT	GUARANTEED FAN-OUT
standard TTL	2
74 LS	9
74 L	16

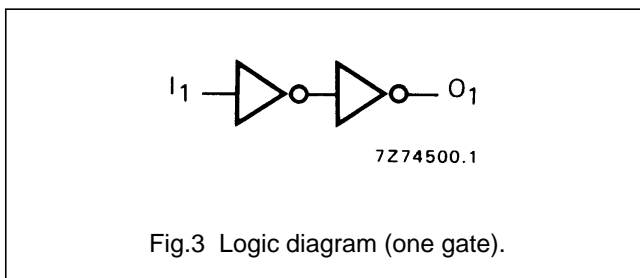


Fig.3 Logic diagram (one gate).

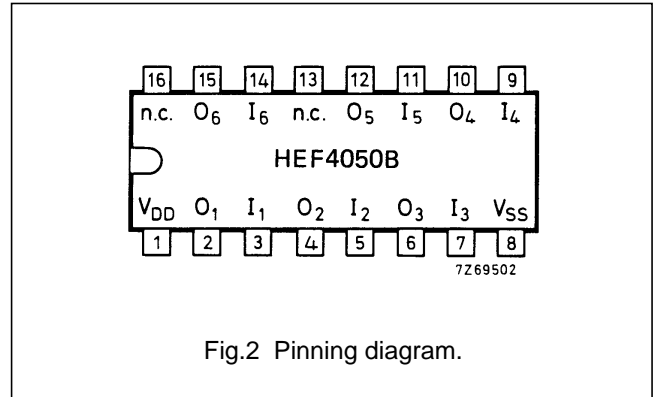


Fig.2 Pinning diagram.

- HEF4050BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4050BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4050BT(D): 16-lead SO; plastic (SOT109-1)
- ( ): Package Designator North America

### APPLICATION INFORMATION

Some examples of applications for the HEF4050B are:

- LOCMOS to DTL/TTL converter
- HIGH sink current for driving 2 TTL loads
- HIGH-to-LOW level logic conversion

### Input protection

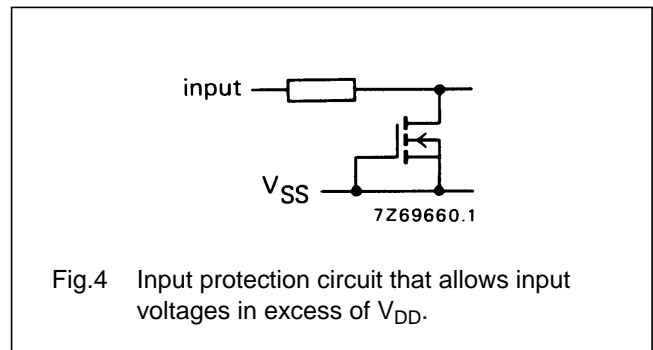


Fig.4 Input protection circuit that allows input voltages in excess of  $V_{DD}$ .

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

See Family Specifications

## HEX non-inverting buffers

HEF4050B  
buffers**DC CHARACTERISTICS** $V_{SS} = 0\text{ V}$ ;  $V_I = V_{SS}$  or  $V_{DD}$ 

HEF	$V_{DD}$ V	$V_O$ V	SYMBOL	$T_{amb}$ (°C)						
				-40		+25		+85		
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Output (sink) current LOW	4,75	0,4	$I_{OL}$	3,5	–	2,9	–	2,3	–	mA
	10	0,5		12,0	–	10,0	–	8,0	–	mA
	15	1,5		24,0	–	20,0	–	16,0	–	mA
Output (source) current HIGH	5	4,6	$-I_{OH}$	0,52	–	0,44	–	0,36	–	mA
	10	9,5		1,3	–	1,1	–	0,9	–	mA
	15	13,5		3,6	–	3,0	–	2,4	–	mA
Output (source) current HIGH	5	2,5	$-I_{OH}$	1,7	–	1,4	–	1,1	–	mA

HEC	$V_{DD}$ V	$V_O$ V	SYMBOL	$T_{amb}$ (°C)						
				-55		+25		+125		
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Output (sink) current LOW	4,75	0,4	$I_{OL}$	3,6	–	2,9	–	1,9	–	mA
	10	0,5		12,5	–	10,0	–	6,7	–	mA
	15	1,5		25,0	–	20,0	–	13,0	–	mA
Output (source) current HIGH	5	4,6	$-I_{OH}$	0,52	–	0,44	–	0,36	–	mA
	10	9,5		1,3	–	1,1	–	0,9	–	mA
	15	13,5		3,6	–	3,0	–	2,4	–	mA

HEX non-inverting buffers

HEF4050B  
buffers

**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	TYP.	MAX.		TYPICAL EXTRAPOLATION FORMULA
Propagation delays $I_n$ $O_n$ HIGH to LOW  LOW to HIGH	5	$t_{PHL}$	35	70	ns	$26\text{ ns} + (0,18\text{ ns/pF}) C_L$
	10		20	35	ns	$16\text{ ns} + (0,08\text{ ns/pF}) C_L$
	15		15	30	ns	$12\text{ ns} + (0,05\text{ ns/pF}) C_L$
	5	$t_{PLH}$	55	110	ns	$28\text{ ns} + (0,55\text{ ns/pF}) C_L$
	10		25	55	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  LOW to HIGH	5	$t_{THL}$	25	50	ns	$7\text{ ns} + (0,35\text{ ns/pF}) C_L$
	10		10	20	ns	$3\text{ ns} + (0,14\text{ ns/pF}) C_L$
	15		7	14	ns	$2\text{ ns} + (0,09\text{ ns/pF}) C_L$
	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 ( $\mu\text{W}$ )	
Dynamic power dissipation per package (P)	5	$3\ 800 f_i + \sum (f_o C_L) \times V_{DD}^2$	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)
	10	$11\ 600 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$65\ 900 f_i + \sum (f_o C_L) \times V_{DD}^2$	