

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

HEF4093B

gates

Quadruple 2-input NAND Schmitt trigger

Product specification
File under Integrated Circuits, IC04

January 1995

Quadruple 2-input NAND Schmitt trigger

HEF4093B gates

DESCRIPTION

The HEF4093B consists of four Schmitt-trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt-trigger action on both inputs. The gate switches at different points for positive and negative-going signals. The difference between the positive voltage (V_P) and the negative voltage (V_N) is defined as hysteresis voltage (V_H).

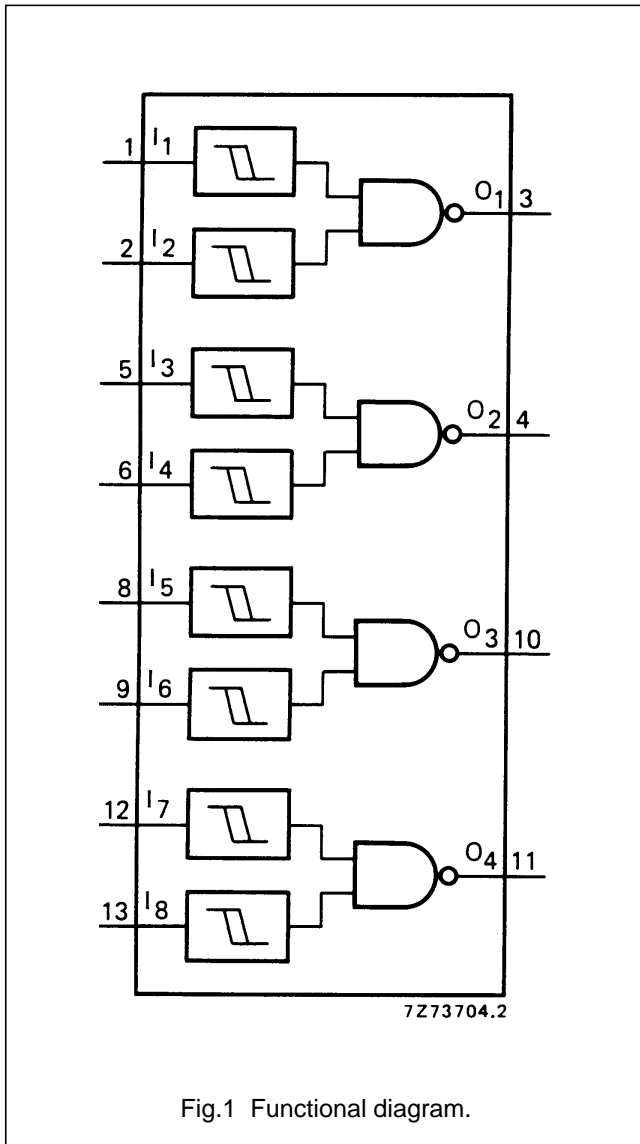


Fig.1 Functional diagram.

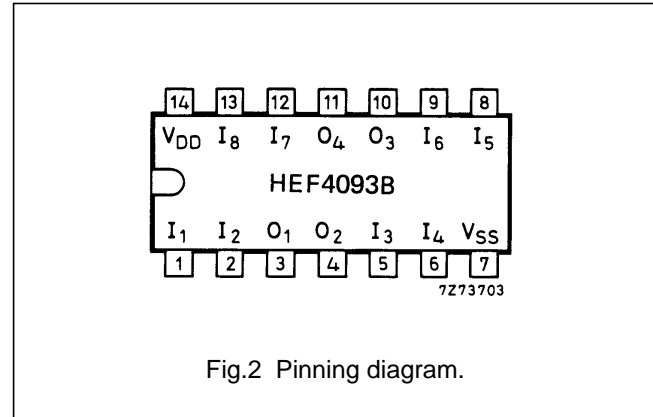


Fig.2 Pinning diagram.

- HEF4093BP(N): 14-lead DIL; plastic (SOT27-1)
- HEF4093BD(F): 14-lead DIL; ceramic (cerdip) (SOT73)
- HEF4093BT(D): 14-lead SO; plastic (SOT108-1)
- (): Package Designator North America

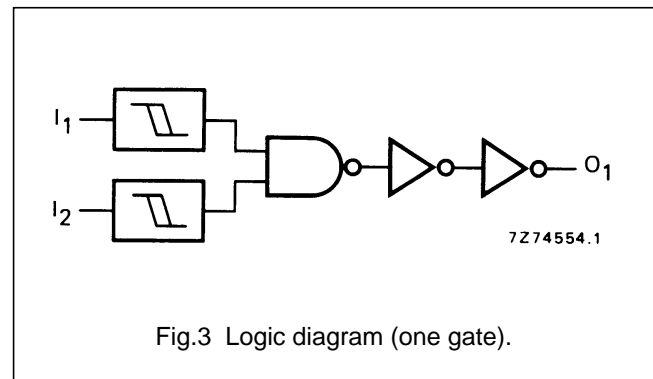


Fig.3 Logic diagram (one gate).

FAMILY DATA, I_{DD} LIMITS category GATES

See Family Specifications

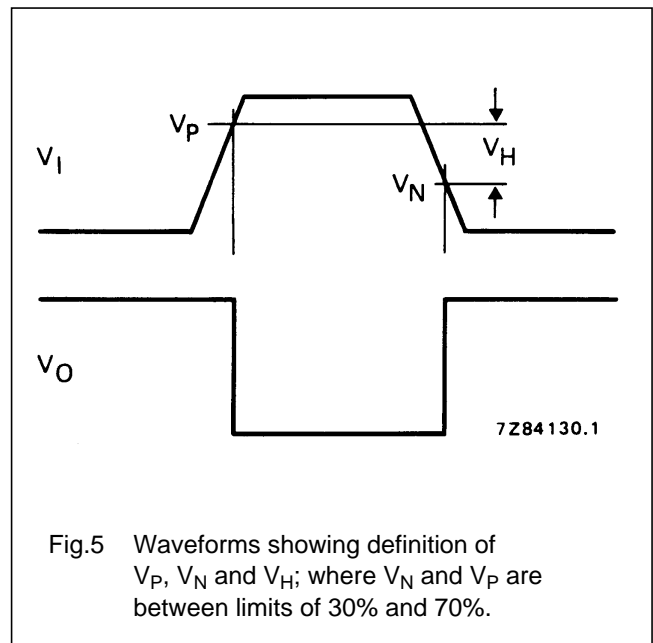
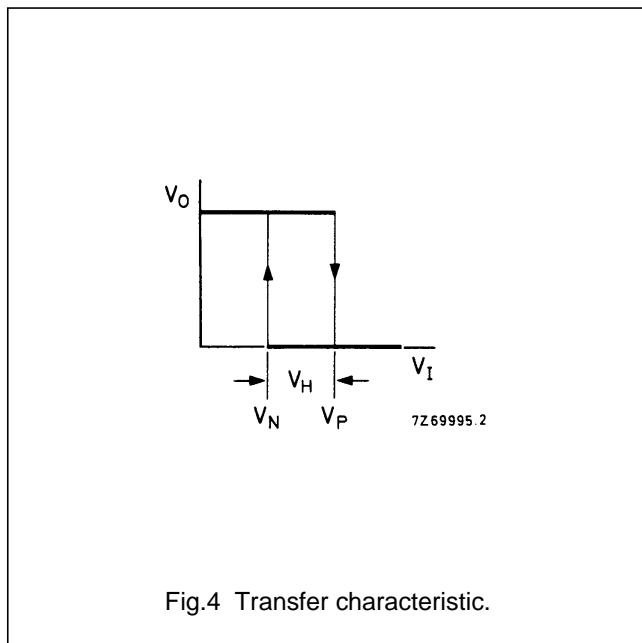
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DC CHARACTERISTICS

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.
Hysteresis voltage	5	V_H	0,4	0,7	–
	10		0,6	1,0	–
	15		0,7	1,3	–
Switching levels positive-going input voltage	5	V_P	1,9	2,9	3,5
	10		3,6	5,2	7
	15		4,7	7,3	11
Switching levels negative-going input voltage	5	V_N	1,5	2,2	3,1
	10		3	4,2	6,4
	15		4	6,0	10,3



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AC CHARACTERISTICS

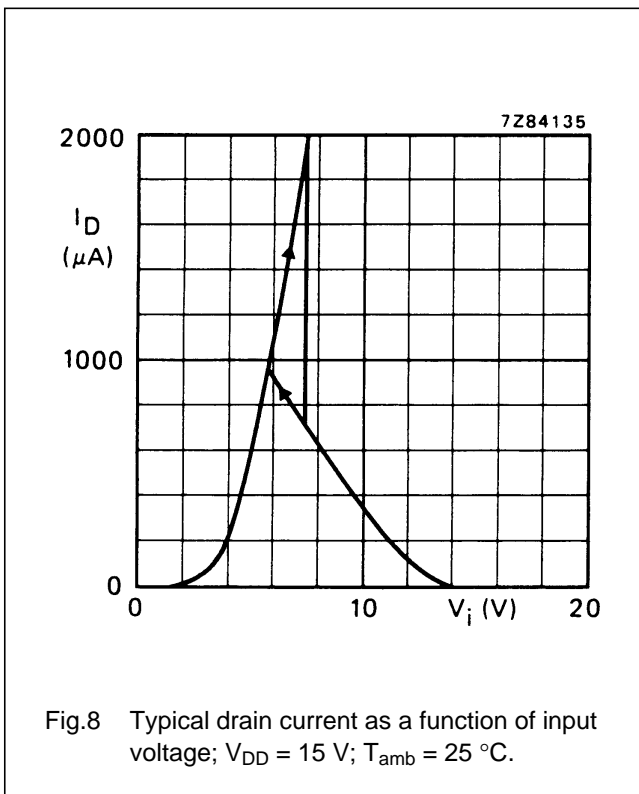
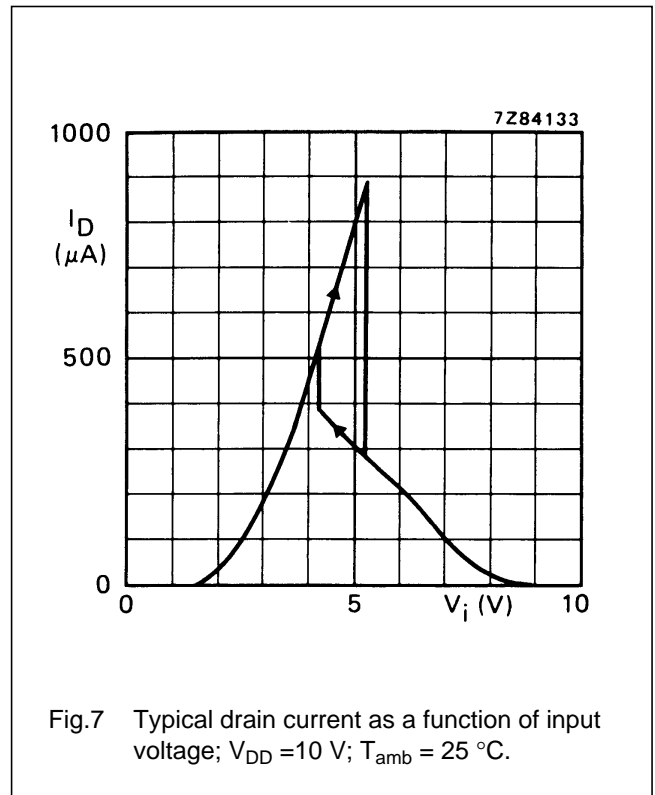
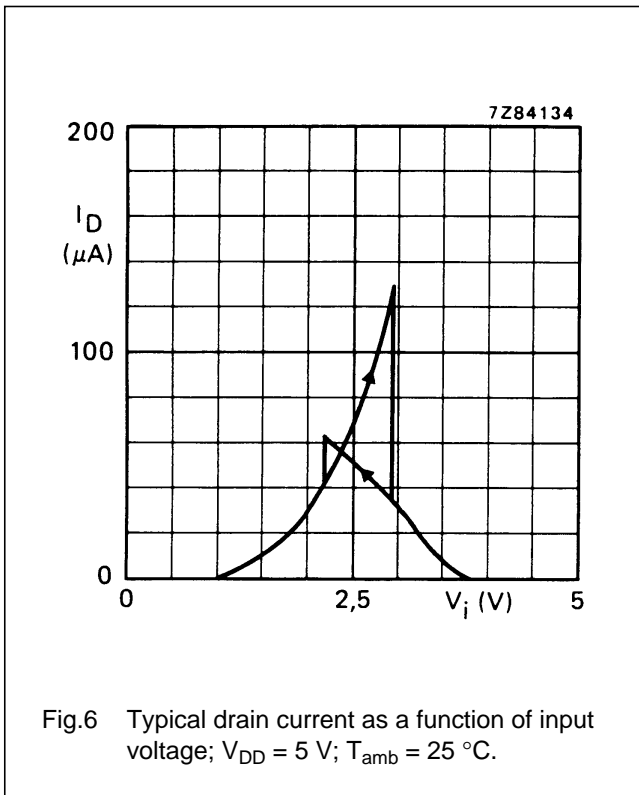
$V_{SS} = 0$ V; $T_{amb} = 25$ °C; $C_L = 50$ pF; input transition times ≤ 20 ns

	V_{DD} V	SYMBOL	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays $I_n \rightarrow O_n$ HIGH to LOW	5	t_{PHL}	90	185 ns	$63 \text{ ns} + (0,55 \text{ ns/pF}) C_L$	
	10		40	80 ns	$29 \text{ ns} + (0,23 \text{ ns/pF}) C_L$	
	15		30	60 ns	$22 \text{ ns} + (0,16 \text{ ns/pF}) C_L$	
	LOW to HIGH	5	t_{PLH}	85	170 ns	$58 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
		10		40	80 ns	$29 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
		15		30	60 ns	$22 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
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 (μ W)	
Dynamic power dissipation per package (P)	5	$1300 f_i + \sum(f_o C_L) \times V_{DD}^2$	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	$6400 f_i + \sum(f_o C_L) \times V_{DD}^2$	
	15	$18\,700 f_i + \sum(f_o C_L) \times V_{DD}^2$	

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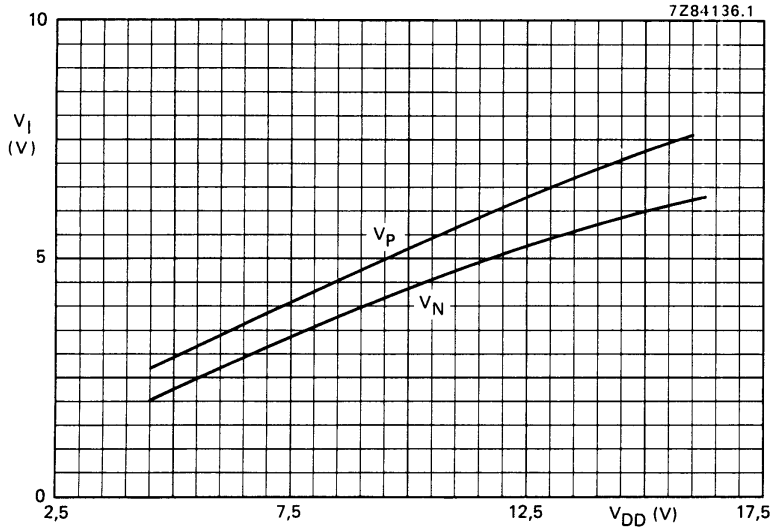


Fig.9 Typical switching levels as a function of supply voltage V_{DD}; T_{amb} = 25 °C.

APPLICATION INFORMATION

Some examples of applications for the HEF4093B are:

- Wave and pulse shapers
- Astable multivibrators
- Monostable multivibrators.

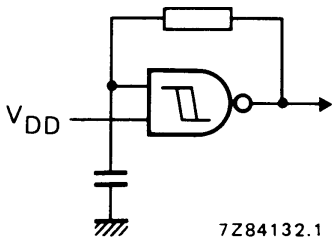


Fig.10 The HEF4093B used as a astable multivibrator.

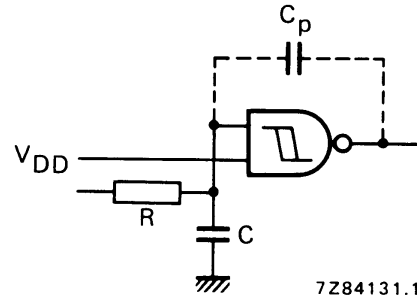


Fig.11 Schmitt trigger driven via a high impedance (R > 1 kΩ).

If a Schmitt trigger is driven via a high impedance (R > 1 kΩ) then it is necessary to incorporate a capacitor C of such value that:

$$\frac{C}{C_p} > \frac{V_{DD} - V_{SS}}{V_H}, \text{ otherwise oscillation can occur on the edges of a pulse.}$$

C_p is the external parasitic capacitance between inputs and output; the value depends on the circuit board layout.

Note

The two inputs may be connected together, but this will result in a larger through-current at the moment of switching.