

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

HEF4528B

MSI

Dual monostable multivibrator

Product specification
File under Integrated Circuits, IC04

January 1995

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DESCRIPTION

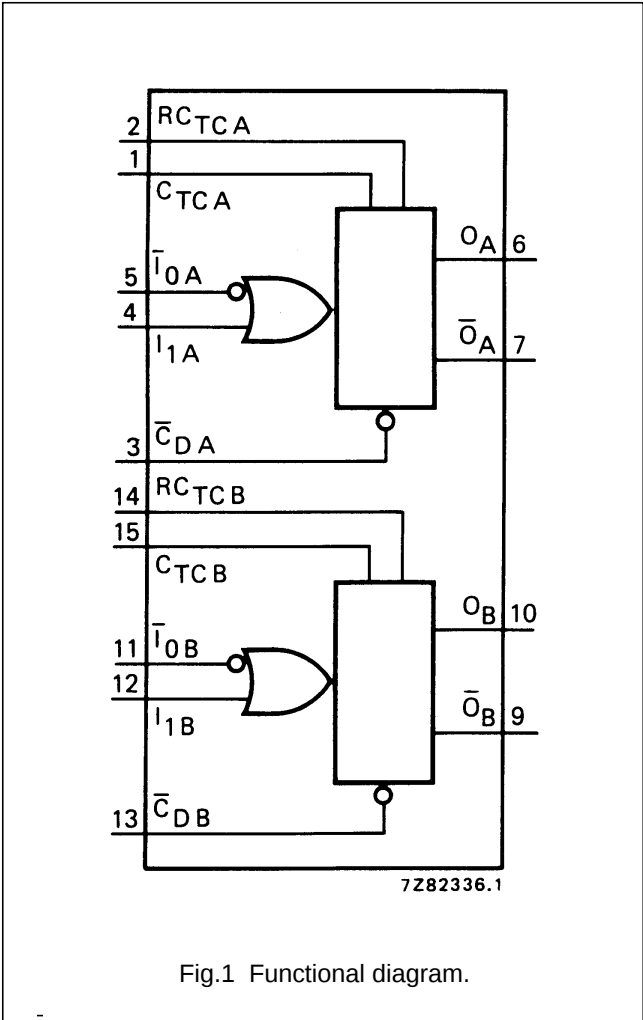
The HEF4528B is a dual retriggerable-resettable monostable multivibrator. Each multivibrator has an active LOW input ($\bar{I}_0$), and active HIGH input (I_1), an active LOW clear direct input ($\bar{C}_D$), an output (O) and its complement ($\bar{O}$), and two pins for connecting the external timing components ($C_{TC}^{(1)}$, RC_{TC}).

An external timing capacitor (C_t) must be connected between C_{TC} and RC_{TC} and an external resistor (R_t) must be connected between RC_{TC} and V_{DD} . The duration of the

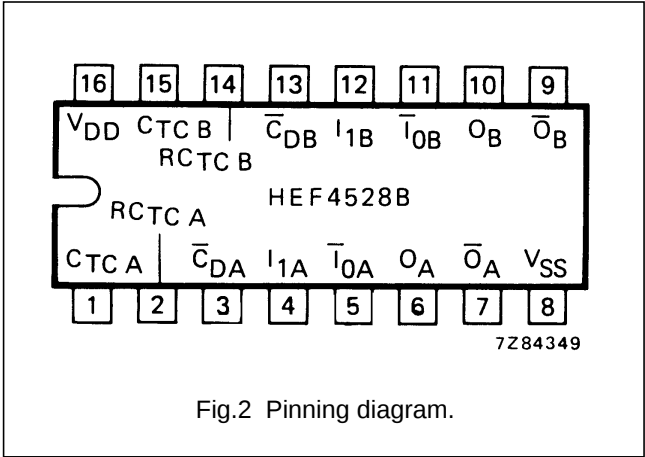
output pulse is determined by the external timing components C_t and R_t .

A HIGH to LOW transition on $\bar{I}_0$ when I_1 is LOW or a LOW to HIGH transition on I_1 when $\bar{I}_0$ is HIGH produces a positive pulse (LOW-HIGH-LOW) and O and a negative pulse (HIGH-LOW-HIGH) on $\bar{O}$ if the $\bar{C}_D$ is HIGH. A LOW

(1) Always connected to ground.



on $\bar{C}_D$ forces O LOW, O HIGH and inhibits any further pulses until $\bar{C}_D$ is HIGH.



- HEF4528BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4528BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4528BT(D): 16-lead SO; plastic (SOT109-1)
- (): Package Designator North America

PINNING

- $\bar{I}_{0A}, \bar{I}_{0B}$ input (HIGH to LOW triggered)
- I_{1A}, I_{1B} input (LOW to HIGH triggered)
- $\bar{C}_{DA}, \bar{C}_{DB}$ clear direct input (active LOW)
- O_A, O_B output
- $\bar{O}_A, \bar{O}_B$ complementary output (active LOW)
- $C_{TC A}, C_{TC B}$ external capacitor connections ⁽¹⁾
- $RC_{TC A}, RC_{TC B}$ external capacitor/ resistor connections

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

Dual monostable multivibrator

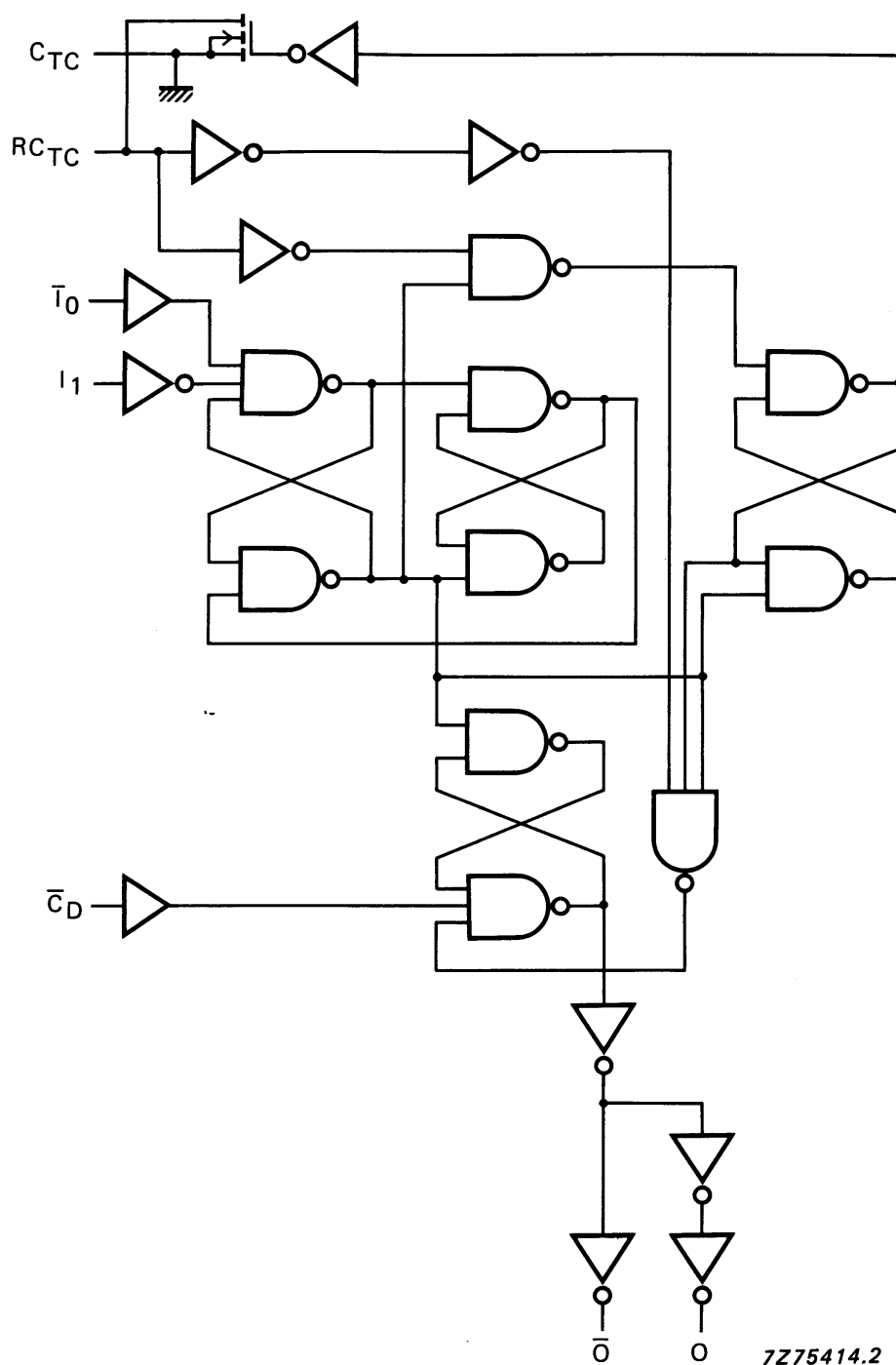
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Fig.3 Logic diagram (one monostable multivibrator).

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FUNCTION TABLE

INPUTS			OUTPUTS	
$\bar{I}_0$	I_1	$\bar{C}_D$	O	$\bar{O}$
	L	H		
H		H		
X	X	L	L	H

Notes

1. H = HIGH state (the more positive voltage)
2. L = LOW state (the less positive voltage)
3. X = state is immaterial
4.  = positive-going transition
5.  = negative-going transition
6.   = positive or negative output pulse; width is determined by C_t and R_t

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	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays $\bar{I}_0, I_1 \rightarrow \bar{O}$ HIGH to LOW $\bar{I}_0, I_1 \rightarrow O$ LOW to HIGH $\bar{C}_D \rightarrow O$ HIGH to LOW $\bar{C}_D \rightarrow \bar{O}$ LOW to HIGH	5	t _{PHL}		140	280	ns	113 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
	5	t _{PLH}		155	305	ns	128 ns + (0,55 ns/pF) C _L
	10			60	115	ns	49 ns + (0,23 ns/pF) C _L
	15			40	80	ns	32 ns + (0,16 ns/pF) C _L
	5	t _{PHL}		105	210	ns	78 ns + (0,55 ns/pF) C _L
	10			40	85	ns	29 ns + (0,23 ns/pF) C _L
	15			30	60	ns	22 ns + (0,16 ns/pF) C _L
	5	t _{PLH}		120	240	ns	93 ns + (0,55 ns/pF) C _L
	10			50	105	ns	39 ns + (0,23 ns/pF) C _L
	15			35	70	ns	27 ns + (0,16 ns/pF) C _L
Output transition times HIGH to LOW LOW to HIGH	5	t _{THL}		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
	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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AC CHARACTERISTICS

 $V_{SS} = 0$ V; $T_{amb} = 25$ °C; input transition times ≤ 20 ns; $R_t = 5$ k Ω ; $C_t = 15$ pF

	V_{DD} V	TYPICAL FORMULA FOR P (μ W)	
Dynamic power dissipation per package (P)	5 10 15	$4000 f_i + \sum (f_o C_L) \times V_{DD}^2$ $20\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$ $59\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	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)

AC CHARACTERISTICS

 $V_{SS} = 0$ V; $T_{amb} = 25$ °C; $C_L = 50$ pF; input transition times ≤ 20 ns; see also waveforms Fig.5.

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	
Recovery time for $\overline{C}_D$	5 10 15	t_{RCD}	0 0 0	–75 –30 –25	ns ns ns	
Minimum $\overline{I}_0$ pulse width; LOW	5 10 15	t_{WIOL}	50 30 20	25 15 10	ns ns ns	
Minimum I_1 pulse width; HIGH	5 10 15	t_{WI1H}	50 30 20	25 15 10	ns ns ns	
Minimum $\overline{C}_D$ pulse width; LOW	5 10 15	t_{WCDL}	60 35 25	30 15 10	ns ns ns	
Set-up time $\overline{C}_D \rightarrow \overline{I}_0$ or I_1	5 10 15	t_{su}	0 0 0	–105 –40 –25	ns ns ns	to avoid change in output
Output O pulse width; HIGH	5 10 15	t_{WOH}	– – –	235 155 140	ns ns ns	note 1
Output O pulse width; HIGH	5 10 15	t_{WOH}	– – –	5,45 4,95 4,85	μ s μ s μ s	note 2
Change in output O pulse width over temperature	5 10 15	Δt_{WO}	– – –	± 3 ± 2 ± 2	% % %	note 3
Change in output O pulse width over V_{DD}	5 10 15	Δt_{WO}	– – –	± 2 ± 1 ± 1	% % %	$V_{DD} \pm 5\%$

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	V _{DD} V	SYMBOL	MIN.	TYP.	MAX.	
External timing resistor	5	R _t	5	–	2000	kΩ
	10		5	–	2000	kΩ
	15		5	–	2000	kΩ
External timing capacitor	5	C _t	no limits			
	10		no limits			
	15		no limits			

Notes

1. R_t = 5 kΩ; C_t = 15 pF; for other R_t, C_t combinations and C_t < 0,01 μF see graph Fig.4.
2. R_t = 10 kΩ; C_t = 1000 pF; for other R_t, C_t combinations and C_t > 0,01 μF use formula $t_{WO} = K \cdot R_t \cdot C_t$.
 where: t_{WO} = output pulse width (s)
 R_t = external timing resistor (Ω)
 C_t = external timing capacitor (F)
 K = 0,42 for V_{DD} = 5 V
 K = 0,32 for V_{DD} = 10 V
 K = 0,30 for V_{DD} = 15 V
3. T_{amb} = –40 to +85 °C; Δt_{WO} is referenced to t_{WO} at T_{amb} = 25 °C.

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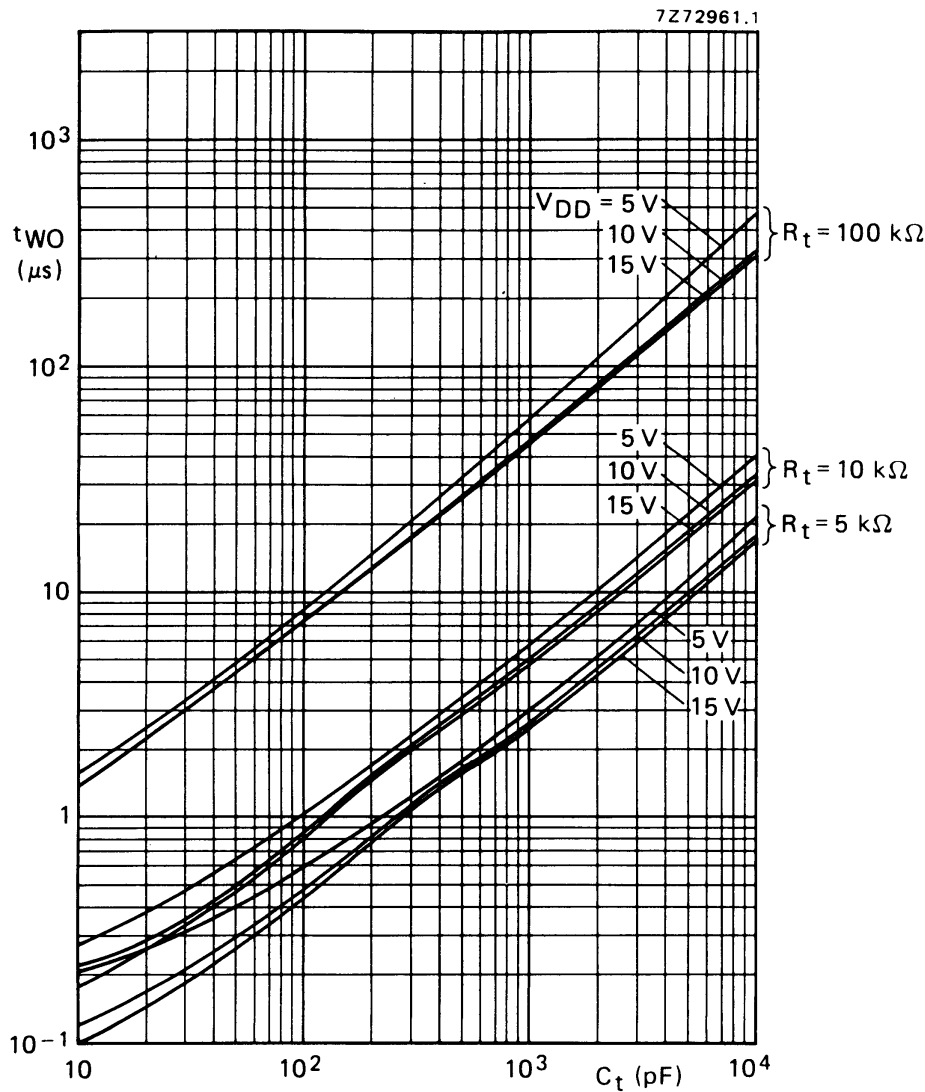


Fig.4 Output pulse width (t_{WO}) as a function of external timing capacitor (C_t).

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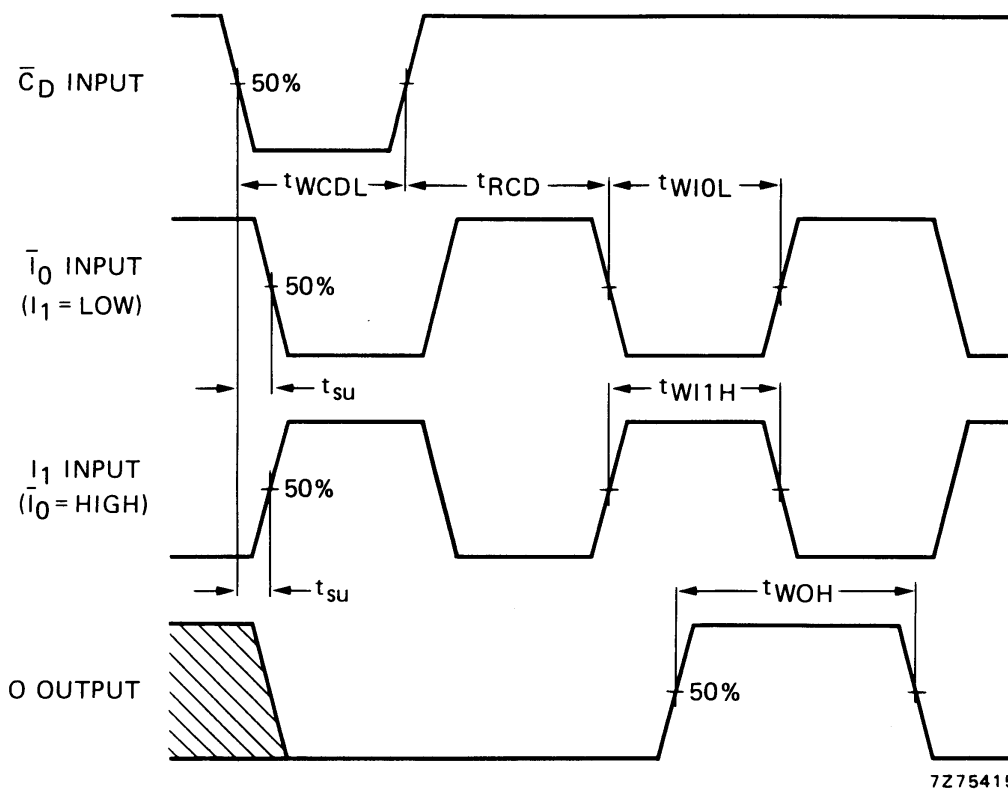
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Fig.5 Waveforms showing minimum $\bar{I}_0$, I_1 and O pulse widths, set-up and recovery times. Set-up and recovery times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

An example of an application for the HEF4528B is:

- Non-retriggerable monostable multivibrator

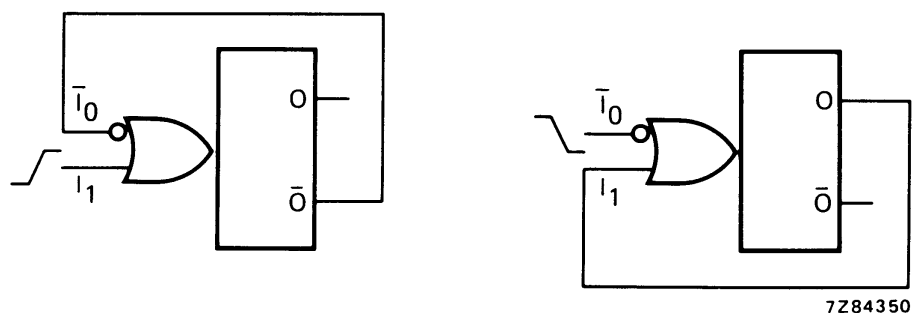


Fig.6 Two examples for a non-retriggerable monostable multivibrator using half of HEF4528B (LOW to HIGH and HIGH to LOW triggered).