

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

Dual monostable multivibrator

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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.

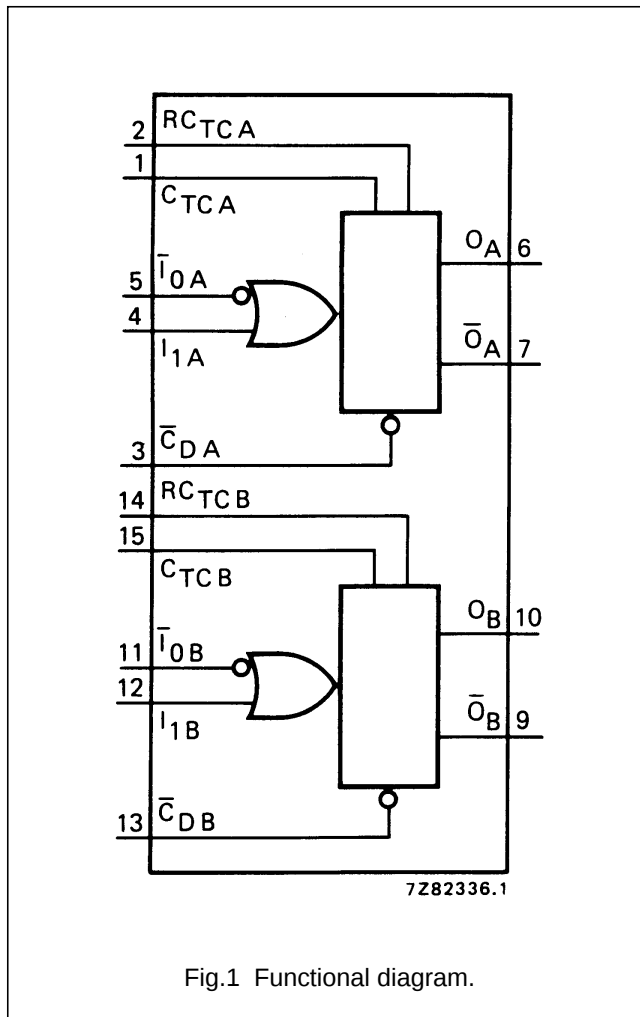


Fig.1 Functional diagram.

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

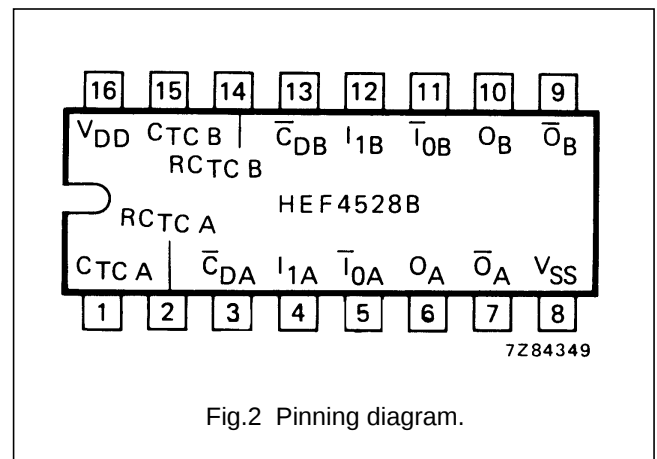


Fig.2 Pinning diagram.

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

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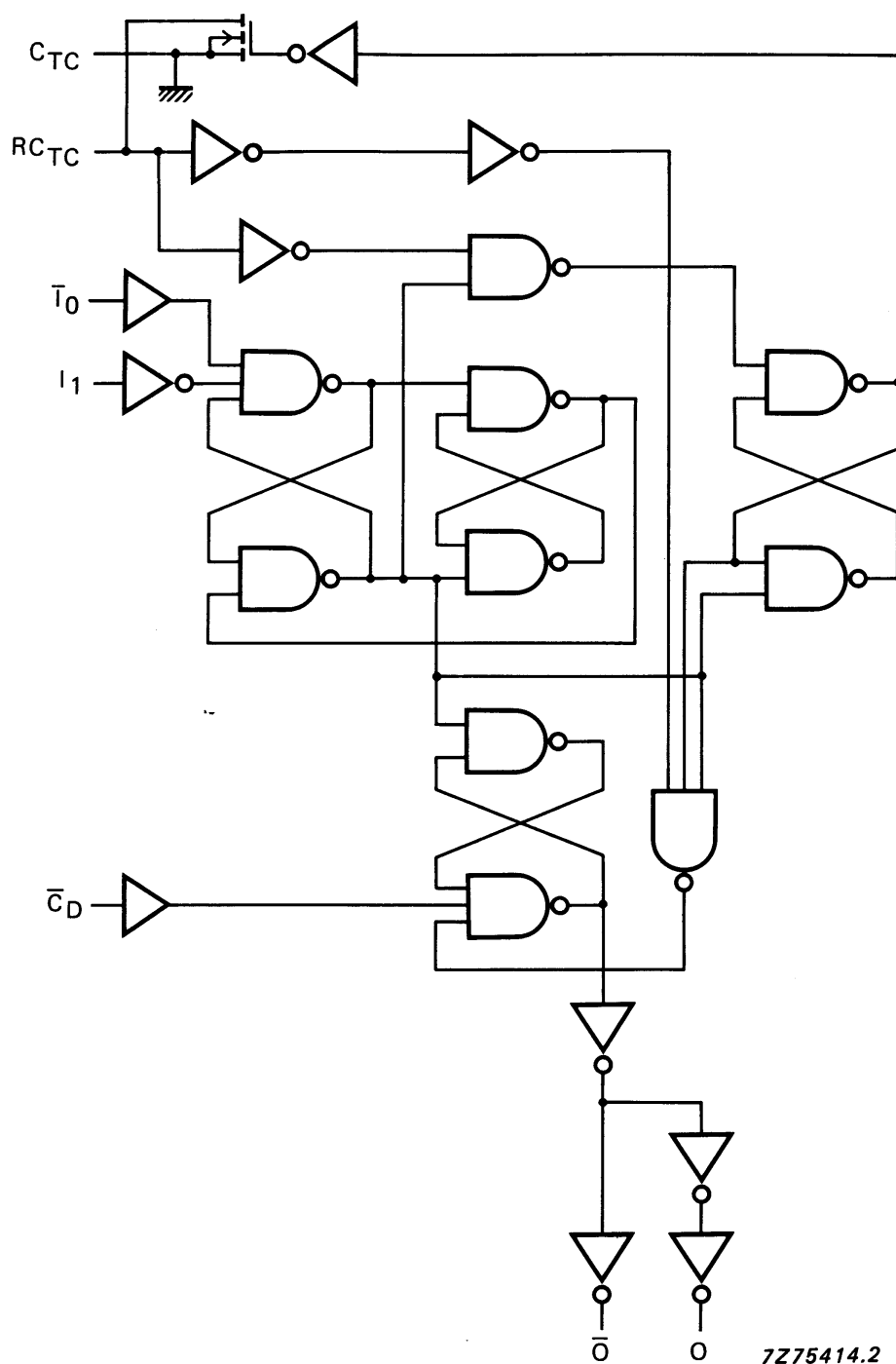


Fig.3 Logic diagram (one monostable multivibrator).

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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							
$\bar{I}_0, I_1 \rightarrow \bar{O}$	5	t _{PHL}		140	280	ns	113 ns + (0,55 ns/pF) C _L
HIGH to LOW	10			50	100	ns	39 ns + (0,23 ns/pF) C _L
	15			35	70	ns	27 ns + (0,16 ns/pF) C _L
$\bar{I}_0, I_1 \rightarrow O$	5	t _{PLH}		155	305	ns	128 ns + (0,55 ns/pF) C _L
LOW to HIGH	10			60	115	ns	49 ns + (0,23 ns/pF) C _L
	15			40	80	ns	32 ns + (0,16 ns/pF) C _L
$\bar{C}_D \rightarrow O$	5	t _{PHL}		105	210	ns	78 ns + (0,55 ns/pF) C _L
HIGH to LOW	10			40	85	ns	29 ns + (0,23 ns/pF) C _L
	15			30	60	ns	22 ns + (0,16 ns/pF) C _L
$\bar{C}_D \rightarrow \bar{O}$	5	t _{PLH}		120	240	ns	93 ns + (0,55 ns/pF) C _L
LOW to HIGH	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	5	t _{THL}		60	120	ns	10 ns + (1,0 ns/pF) C _L
times	10			30	60	ns	9 ns + (0,42 ns/pF) C _L
HIGH to LOW	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
LOW to HIGH	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

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input transition times $\leq 20\text{ ns}$; $R_t = 5\text{ k}\Omega$; $C_t = 15\text{ pF}$

	V_{DD} V	TYPICAL FORMULA FOR P (μW)	
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

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 50\text{ pF}$; input transition times $\leq 20\text{ ns}$; see also waveforms Fig.5.

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

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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

- 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.
- 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.R_t.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
- T_{amb} = –40 to +85 °C; Δt_{WO} is referenced to t_{WO} at T_{amb} = 25 °C.

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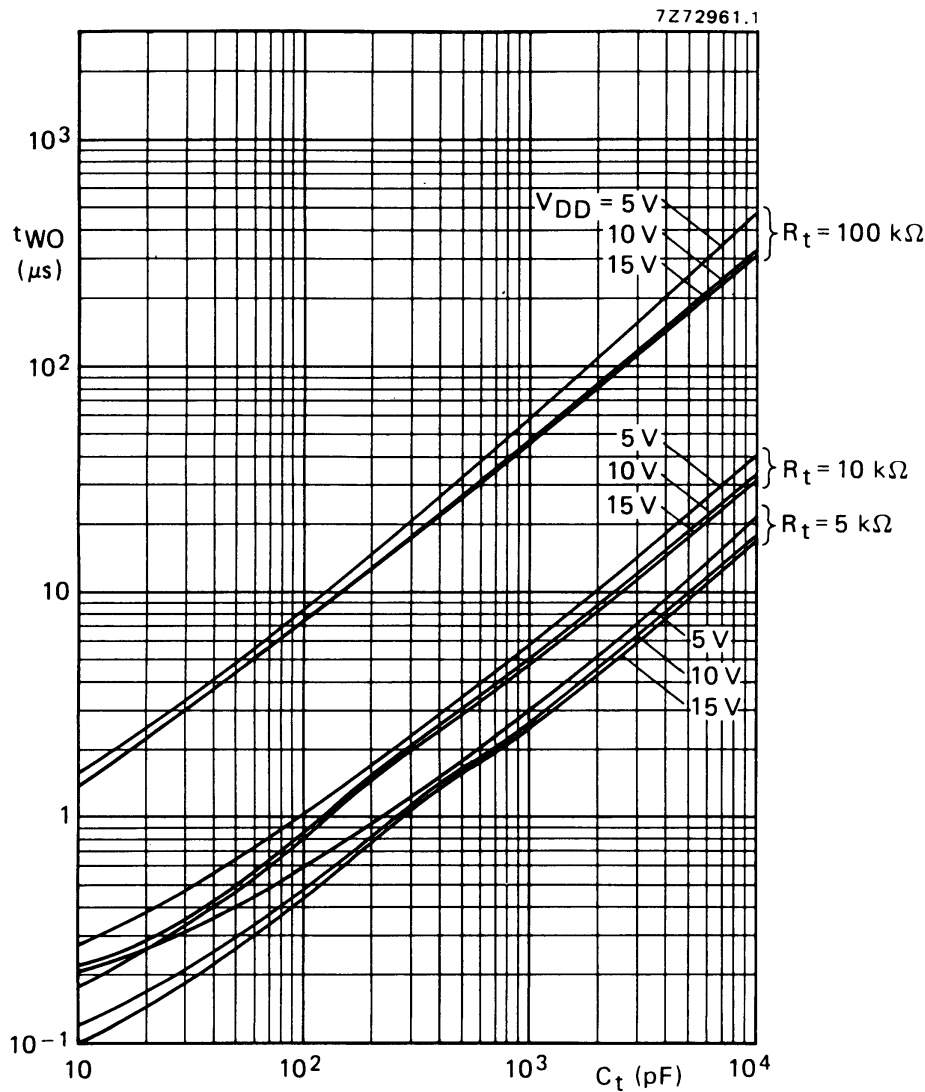


Fig.4 Output pulse width (t_{WO}) as a function of external timing capacitor (C_t).

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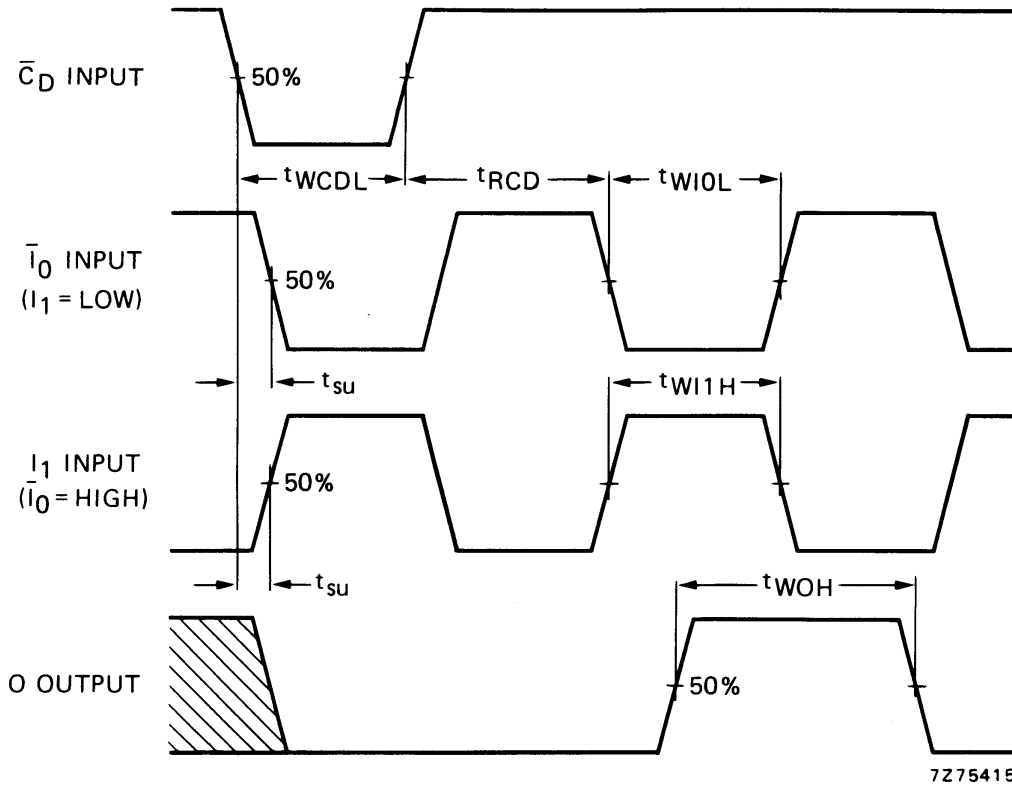


Fig.5 Waveforms showing minimum $\bar{I}_0$, I_1 and O pulse widths, set-up and recovery times. Set-up and recovery times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

An example of an application for the HEF4528B is:

- Non-retriggerable monostable multivibrator

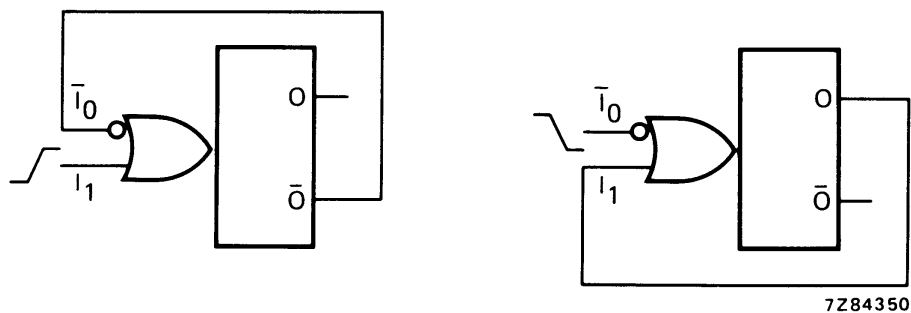


Fig.6 Two examples for a non-retriggerable monostable multivibrator using half of HEF4528B (LOW to HIGH and HIGH to LOW triggered).