DUAL MONOSTABLE MULTIVIBRATOR

The HEF4528B is a dual retriggerable-resettable monostable multivibrator. Each multivibrator has an active LOW input ($\overline{I}_0$), and active HIGH input (I_1), an active LOW clear direct input ($\overline{C}_D$), an output (O) and its complement ($\overline{O}$), and two pins for connecting the external timing components (C_{TC},* 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 $\overline{I}_0$ when I_1 is LOW or a LOW to HIGH transition on I_1 when $\overline{I}_0$ is HIGH produces a positive pulse (LOW-HIGH-LOW) on O and a negative pulse (HIGH-LOW-HIGH) on $\overline{O}$ if the $\overline{C}_D$ is HIGH. A LOW on $\overline{C}_D$ forces O LOW, $\overline{O}$ HIGH and inhibits any further pulses until $\overline{C}_D$ is HIGH.

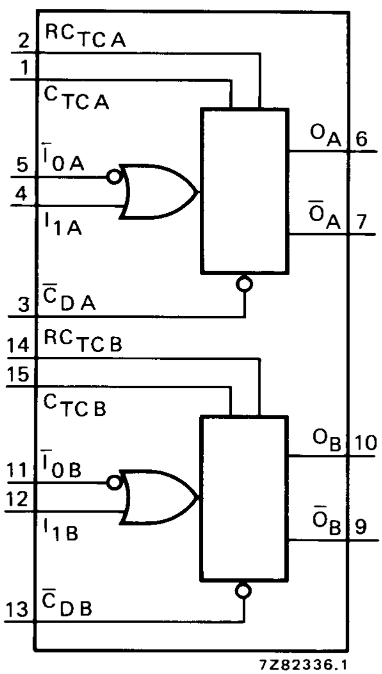

Fig. 1 Functional diagram.

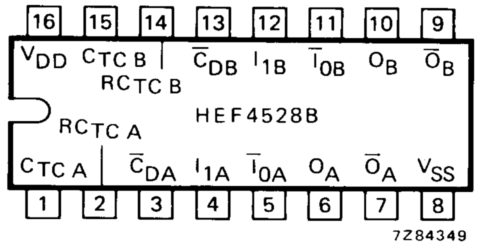

Fig. 2 Pinning diagram.

HEF4528BP : 16-lead DIL; plastic (SOT-38Z).
HEF4528BD: 16-lead DIL; ceramic (cerdip) (SOT-74).
HEF4528BT : 16-lead mini-pack; plastic (SO-16; SOT-109A).

PINNING

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

* Always connected to ground.

FAMILY DATA
I_{DD} LIMITS category MSI
} see Family Specifications

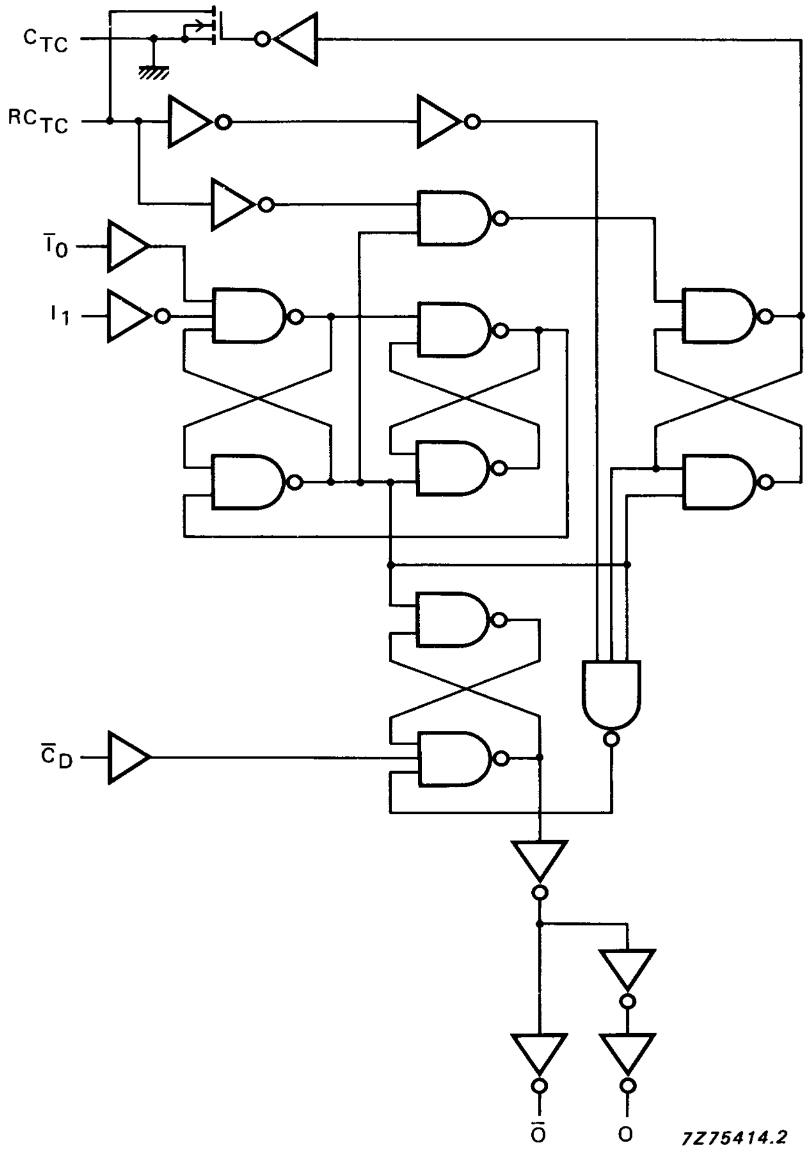

Fig. 3 Logic diagram (one monostable multivibrator).

FUNCTION TABLE

inputs			outputs	
$\overline{I}_0$	I_1	$\overline{C}_D$	O	$\overline{O}$
↓	L	H	⊓	⊔
H	↑	H	⊓	⊔
X	X	L	L	H

H = HIGH state (the more positive voltage)
L = LOW state (the less positive voltage)
X = state is immaterial
↑ = positive-going transition
↓ = negative-going transition
⊓ ⊔ = positive or negative output pulse; width is determined by C_t and R_t

A.C. CHARACTERISTICS

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

	V_{DD} V	symbol	min.	typ.	max.		typical extrapolation formula
Propagation delays							
$\overline{I}_0, I_1 \rightarrow \overline{O}$	5			140	280	ns	113 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		50	100	ns	39 ns + (0,23 ns/pF) C_L
	15			35	70	ns	27 ns + (0,16 ns/pF) C_L
$\overline{I}_0, I_1 \rightarrow O$	5			155	305	ns	128 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		60	115	ns	49 ns + (0,23 ns/pF) C_L
	15			40	80	ns	32 ns + (0,16 ns/pF) C_L
$\overline{C}_D \rightarrow O$	5			105	210	ns	78 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		40	85	ns	29 ns + (0,23 ns/pF) C_L
	15			30	60	ns	22 ns + (0,16 ns/pF) C_L
$\overline{C}_D \rightarrow \overline{O}$	5			120	240	ns	93 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		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	5			60	120	ns	10 ns + (1,0 ns/pF) C_L
	10	t_{THL}		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			60	120	ns	10 ns + (1,0 ns/pF) C_L
LOW to HIGH	10	t_{TLH}		30	60	ns	9 ns + (0,42 ns/pF) C_L
	15			20	40	ns	6 ns + (0,28 ns/pF) C_L

A.C. CHARACTERISTICS

V_{SS} = 0 V; T_{amb} = 25 °C; input transition times ⩽ 20 ns; R_t = 5 kΩ; C_t = 15 pF

	V_{DD} V	typical formula for P (μW)	where
Dynamic power dissipation per package (P)	5	$4000\ f_i + \Sigma(f_oC_L) \times V_{DD}^2$	f_i = input freq. (MHz); f_o = output freq. (MHz); C_L = load capacitance (pF)
	10	$20\,000\ f_i + \Sigma(f_oC_L) \times V_{DD}^2$	$\Sigma(f_oC_L)$ = sum of outputs
	15	$59\,000\ f_i + \Sigma(f_oC_L) \times V_{DD}^2$	V_{DD} = supply voltage (V)

A.C. 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		0	−75		ns	
	10	t_{RCD}	0	−30		ns	
	15		0	−25		ns	
Minimum $\overline{I}_0$ pulse width; LOW	5		50	25		ns	
	10	t_{WI0L}	30	15		ns	
	15		20	10		ns	
Minimum I_1 pulse width; HIGH	5		50	25		ns	
	10	t_{WI1H}	30	15		ns	
	15		20	10		ns	
Minimum $\overline{C}_D$ pulse width; LOW	5		60	30		ns	
	10	t_{WCDL}	35	15		ns	
	15		25	10		ns	
Set-up time $\overline{C}_D$ → $\overline{I}_0$ or I_1	5		0	−105		ns	to avoid change in output
	10	t_{su}	0	−40		ns	
	15		0	−25		ns	
Output O pulse width; HIGH	5		−	235		ns	note 1
	10	t_{WOH}	−	155		ns	
	15		−	140		ns	
Output O pulse width; HIGH	5		−	5,45		μs	note 2
	10	t_{WOH}	−	4,95		μs	
	15		−	4,85		μs	
Change in output O pulse width over temperature	5		−	±3		%	note 3
	10	Δt_{WO}	−	±2		%	
	15		−	±2		%	
Change in output O pulse width over V_{DD}	5		−	±2		%	V_{DD} ± 5%
	10	Δt_{WO}	−	±1		%	
	15		−	±1		%	
External timing resistor	5		5	−	2000	kΩ	
	10	R_t	5	−	2000	kΩ	
	15		5	−	2000	kΩ	
External timing capacitor	5			no limits			
	10	C_t		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 $t_{WO} = K.R_t.C_t$.

   where: t_{WO} = output pulse width (s) — K = 0,42 for V_{DD} = 5 V
   R_t = external timing resistor (Ω) — K = 0,32 for V_{DD} = 10 V
   C_t = external timing capacitor (F) — 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.

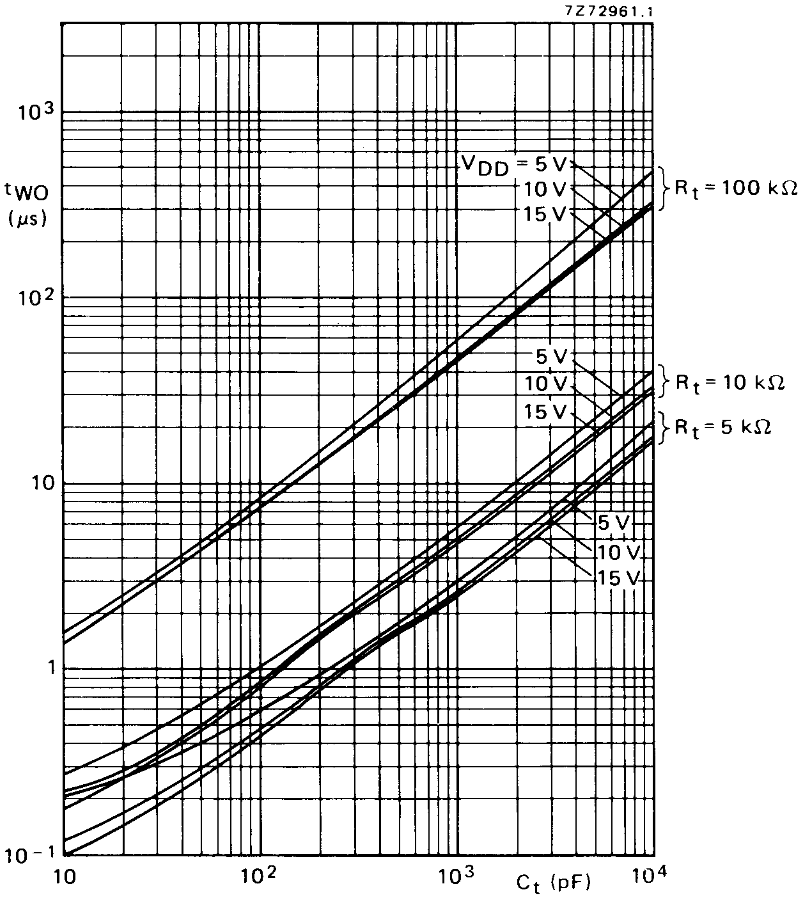

Fig. 4 Output pulse width (t_{WO}) as a function of external timing capacitor (C_t).

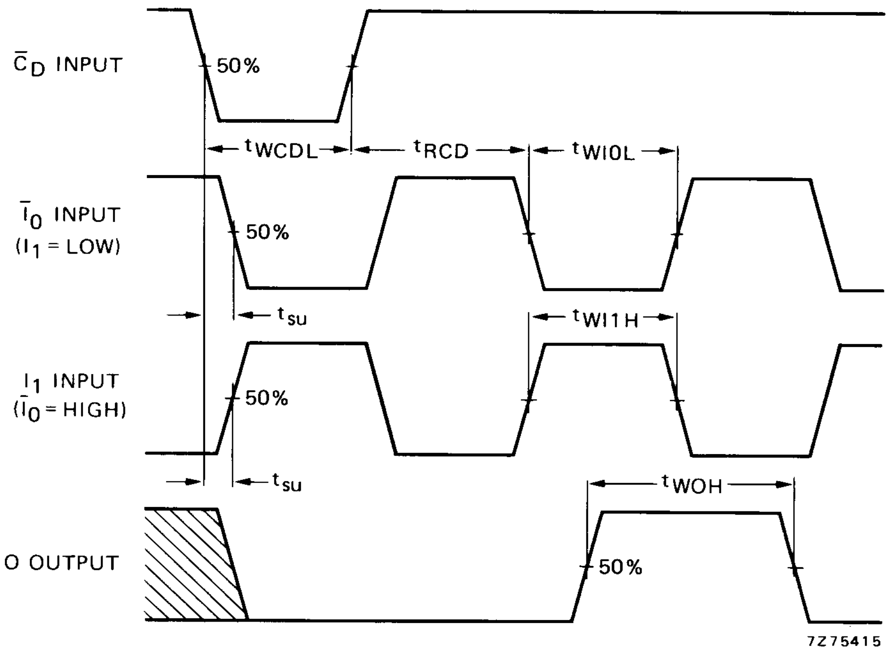

Fig. 5 Waveforms showing minimum $\overline{I}_0$, I_1 and O pulse widths, set-up and recovery times. Set-up and recovery times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

An example of an application for the HEF4528B is:

- Non-retriggerable monostable multivibrator

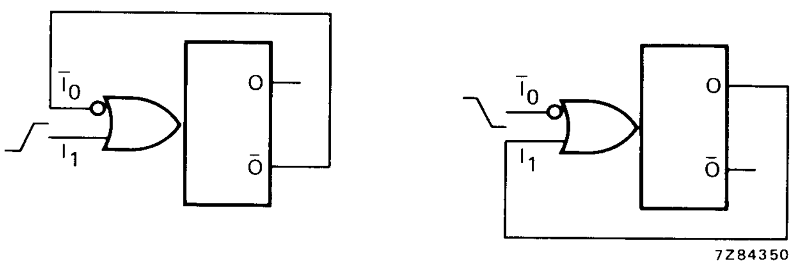

Fig. 6 Two examples for a non-retriggerable monostable multivibrator using half of HEF4528B (LOW to HIGH and HIGH to LOW triggered).