

# 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

## **HEF4538B**

### **MSI**

## Dual precision monostable multivibrator

Product specification  
File under Integrated Circuits, IC04

January 1995

# Dual precision monostable multivibrator

# HEF4538B MSI

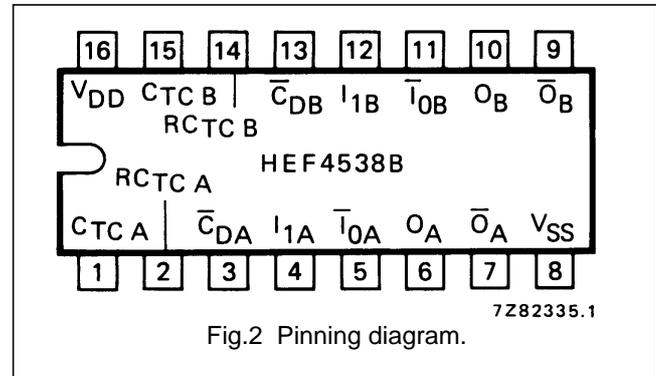
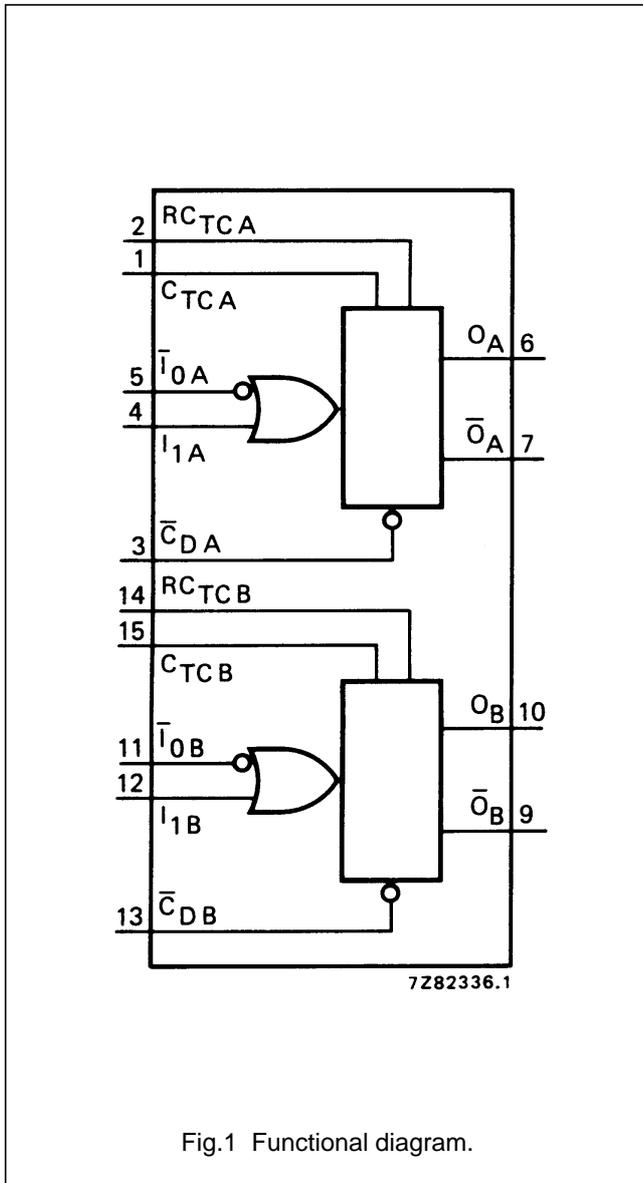
### DESCRIPTION

The HEF4538B is a dual retriggerable-resettable monostable multivibrator. Each multivibrator has an active LOW trigger/retrigger input ( $\bar{I}_0$ ), an active HIGH trigger/retrigger input ( $I_1$ ), an overriding active LOW direct reset input ( $\bar{C}_D$ ), an output (O) and its complement ( $\bar{O}$ ), and two pins ( $C_{TC}$ ,<sup>(1)</sup>  $R_{TC}$ ) for connecting the external timing components  $C_t$  and  $R_t$ . Typical pulse width variation over temperature range is  $\pm 0,2\%$ .

The HEF4538B may be triggered by either the positive or the negative edges of the input pulse and will produce an

accurate output pulse with a pulse width range of 10  $\mu$ s to infinity. The duration and accuracy of the output pulse are determined by the external timing components  $C_t$  and  $R_t$ . The output pulse width (T) is equal to  $R_t \times C_t$ . The linear design techniques in LOC MOS guarantee precise control of the output pulse width.

A LOW level at  $\bar{C}_D$  terminates the output pulse immediately. Schmitt-trigger action in the trigger inputs makes the circuit highly tolerant to slower rise and fall times.



- HEF4538BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4538BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4538BT(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)
- $\bar{C}_{DA}, \bar{C}_{DB}$  direct reset 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<sup>(1)</sup>
- $R_{TC A}, R_{TC B}$  external capacitor/ resistor connections

### Note

1. Always connected to ground.

### FAMILY DATA, I<sub>DD</sub> LIMITS category MSI

See Family specifications.

# Dual precision monostable multivibrator

HEF4538B  
MSI

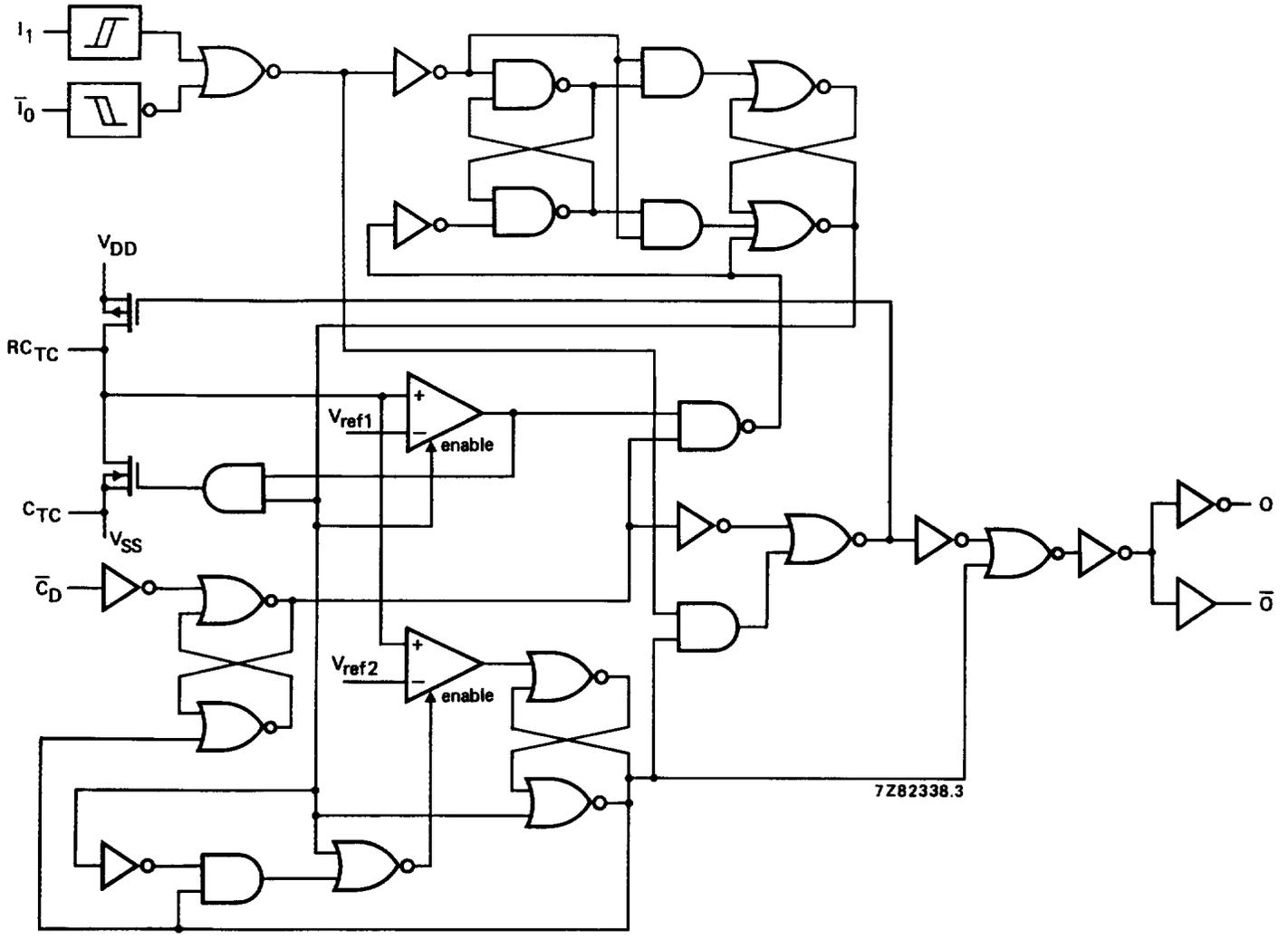


Fig.3 Logic diagram.

Dual precision monostable multivibrator

HEF4538B  
MSI

FUNCTION TABLE

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

Notes

- 1. H = HIGH state (the more positive voltage)
- L = LOW state (the less positive voltage)
- X = state is immaterial
- $\sqcap$  = positive output pulse
- $\sqcup$  = negative output pulse
- $\swarrow$  = positive-going transition
- $\searrow$  = negative-going transition

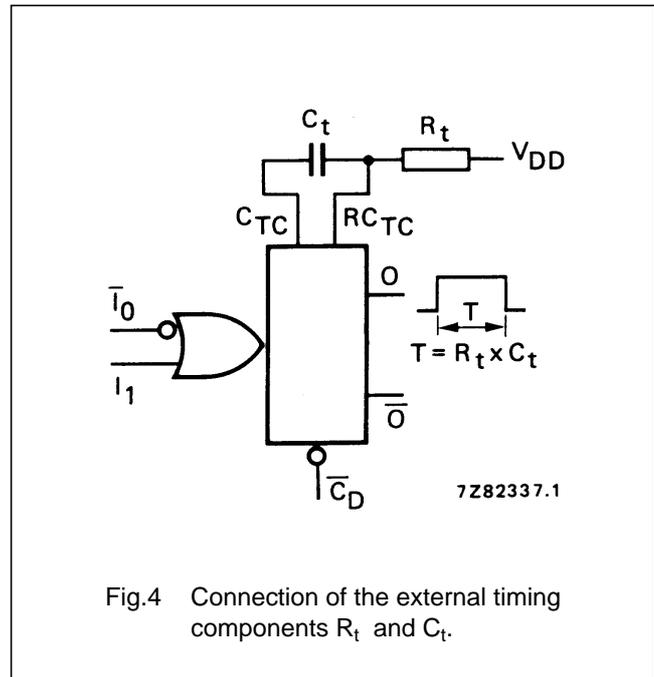


Fig.4 Connection of the external timing components  $R_t$  and  $C_t$ .

DC CHARACTERISTICS

$V_{SS} = 0\text{ V}$

	$V_{DD}$ V	SYMBOL	$T_{amb} (\text{°C})$					
			- 40		+ 25		+ 85	
			TYP.	MAX.	TYP.	MAX.	TYP.	MAX.
Supply current	5							
active state	10	$I_D$			55			$\mu\text{A}$
(see note)	15				150			$\mu\text{A}$
Input leakage					220			$\mu\text{A}$
current	15	$\pm I_{IN}$			300		1000	nA
(pins 2 and 14)								

Note

- 1. Only one monostable is switching: current present during output pulse (output O is HIGH).

## Dual precision monostable multivibrator

HEF4538B  
MSI

## AC CHARACTERISTICS

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

	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA				
Propagation delays $\bar{I}_0, I_1 \rightarrow O$ HIGH to LOW $\bar{I}_0, I_1 \rightarrow \bar{O}$ LOW to HIGH $\bar{C}_D \rightarrow O$ HIGH to LOW $\bar{C}_D \rightarrow \bar{O}$ LOW to HIGH	5	$t_{PHL}$		200	460 ns	$173 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ $79 \text{ ns} + (0,23 \text{ ns/pF}) C_L$ $52 \text{ ns} + (0,16 \text{ ns/pF}) C_L$ $193 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ $74 \text{ ns} + (0,23 \text{ ns/pF}) C_L$ $52 \text{ ns} + (0,16 \text{ ns/pF}) C_L$ $98 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ $44 \text{ ns} + (0,23 \text{ ns/pF}) C_L$ $32 \text{ ns} + (0,16 \text{ ns/pF}) C_L$ $98 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ $44 \text{ ns} + (0,23 \text{ ns/pF}) C_L$ $32 \text{ ns} + (0,16 \text{ ns/pF}) C_L$				
							10			
								15		
	5		$t_{PLH}$		220				440 ns	
							10			
								15		
	5		$t_{PHL}$		125				250 ns	
							10			
								15		
5	$t_{PLH}$		125	250 ns						
					10					
						15				
Recovery times $\bar{C}_D \rightarrow \bar{I}_0, I_1$	5	$t_{RCD}$		20			40 ns			
					10				10	20 ns
						15				
Retrigger times $O, \bar{O} \rightarrow \bar{I}_0, I_1$	5	$t_{RO}$	0		ns					
							10	0	ns	
										15
Minimum $\bar{I}_0$ pulse width; LOW	5	$t_{WI0L}$	90	45	ns					
							10	30	15	ns
Minimum $I_1$ pulse width; HIGH	5	$t_{WI1H}$	50	25	ns					
							10	24	12	ns
Minimum $\bar{C}_D$ pulse width; LOW	5	$t_{WCDL}$	55	25	ns					
							10	25	12	ns
Output O or $\bar{O}$ pulse width	5	$t_{WO}$	218	230	242 $\mu$ s	$R_t = 100 \text{ k}\Omega$ $C_t = 0,002 \text{ }\mu\text{F}$				
							10	213	224	235 $\mu$ s
Output O or $\bar{O}$ pulse width	5	$t_{WO}$	10,3	10,8	11,3 ms	$R_t = 100 \text{ k}\Omega$ $C_t = 0,1 \text{ }\mu\text{F}$				
							10	10,2	10,7	11,2 ms
Output O or $\bar{O}$ pulse width	5	$t_{WO}$	1,01	1,09	1,11 s	$R_t = 100 \text{ k}\Omega$ $C_t = 10 \text{ }\mu\text{F}$				
							10	0,99	1,04	1,09 s

## Dual precision monostable multivibrator

HEF4538B  
MSI**AC CHARACTERISTICS** $V_{SS} = 0$  V;  $T_{amb} = 25$  °C;  $C_L = 50$  pF; input transition times  $\leq 20$  ns

	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	
Change in output O pulse width over temperature ( $T_{amb}$ )	5	$\Delta t_{WO}$		$\pm 0,2$		%
	10			$\pm 0,2$		%
	15			$\pm 0,2$		%
Change in output O pulse width over $V_{DD}$ range 5 to 15 V		$\Delta t_{WO}$		$\pm 1,5$		%
Pulse width variation between circuits in same package	5	$\Delta t_{WO}$		$\pm 1$		%
	10			$\pm 1$		%
	15			$\pm 1$		%
External timing resistor		$R_t$	5	–	(1)	k $\Omega$
External timing capacitor		$C_t$	2000	–	no limits	pF
Input capacitance (pin 2 or 14)		$C_{IN}$		15		pF

**Note**

1. The maximum permissible resistance  $R_t$ , which holds the specified accuracy of  $t_{WO}$ , depends on the leakage current of the capacitor  $C_t$  and the leakage of the HEF4538B.

Dual precision monostable multivibrator

HEF4538B  
MSI

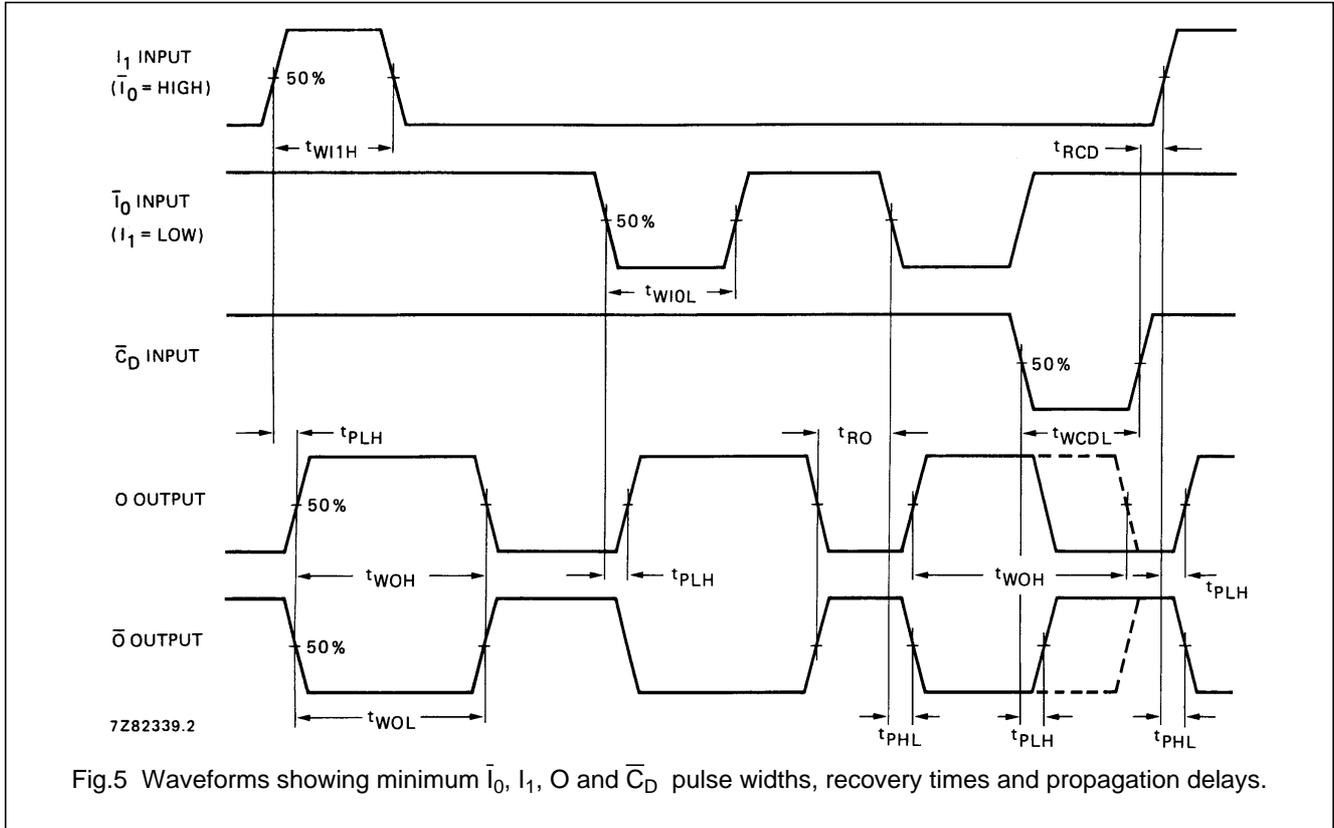
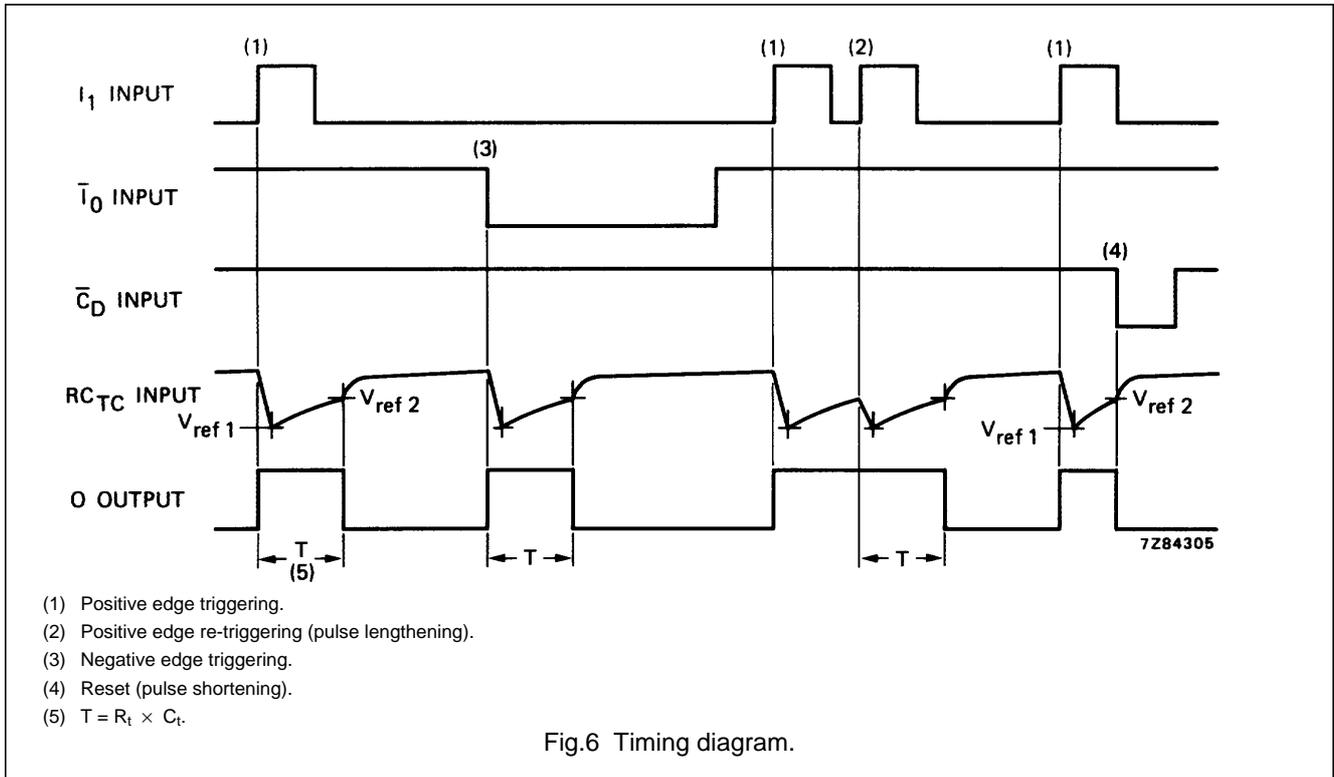


Fig.5 Waveforms showing minimum  $\bar{I}_0$ ,  $I_1$ , O and  $\bar{C}_D$  pulse widths, recovery times and propagation delays.



- (1) Positive edge triggering.
- (2) Positive edge re-triggering (pulse lengthening).
- (3) Negative edge triggering.
- (4) Reset (pulse shortening).
- (5)  $T = R_t \times C_t$ .

Fig.6 Timing diagram.

Dual precision monostable multivibrator

HEF4538B  
MSI

