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

HEF4938B

Dual precision monostable
multivibrator

Preliminary specification
File under Integrated Circuits, IC04

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Philips
Semiconductors

PHILIPS

Dual precision monostable multivibrator   HEF4938B

FEATURES

- **Separate reset inputs**
- **Triggering from leading or trailing edge**
- **I_{CC} category: MSI**

DESCRIPTION

The HEF4938B 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 ($\overline{C}_D$), an output (O) and its complement ($\overline{O}$), and two pins (C_{TC} and RC_{TC}) for connecting the external timing components C_t and R_t. Typical pulse width variation over temperature range is ±0.2%. The HEF4938B 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 μs 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 LOCMOS guarantee precise control of the output pulse width. A LOW level at $\overline{C}_D$ terminates the output pulse immediately. Schmitt-trigger action in the inputs makes the circuit highly tolerant for slower rise and fall times.

FUNCTION TABLE

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

Notes

1. H = HIGH voltage level
2. L = LOW voltage level

ORDERING AND PACKAGE INFORMATION

TYPE NUMBER	PACKAGES			
	PINS	PIN POSITION	MATERIAL	CODE
HEF4938B	16	DIL	plastic	SOT38Z

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 15	$C_{TC\,A}$, $C_{TC\,B}$	external capacitor connections
2, 14	$RC_{TC\,A}$, $RC_{TC\,B}$	external capacitor/resistor connections
3, 13	$\overline{C}_{DA}$, $\overline{C}_{DB}$	direct reset input (active LOW)
4, 12	I_{1A}, I_{1B}	input (LOW-to-HIGH triggered)
5, 11	$\bar{I}_{0A}$, $\bar{I}_{0B}$	input (HIGH-to-LOW triggered)
6, 10	O_A, O_B	output
7, 9	$\overline{O}_A$, $\overline{O}_B$	complementary output (active LOW)
8	V_{SS}	ground (0 V)
16	V_{DD}	positive supply voltage
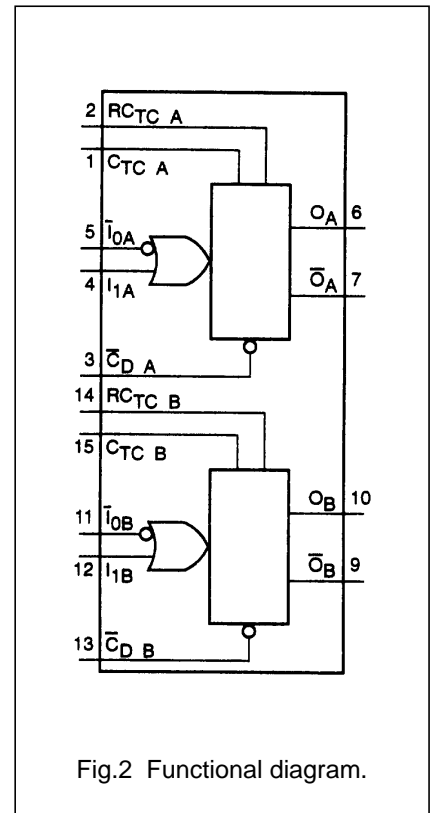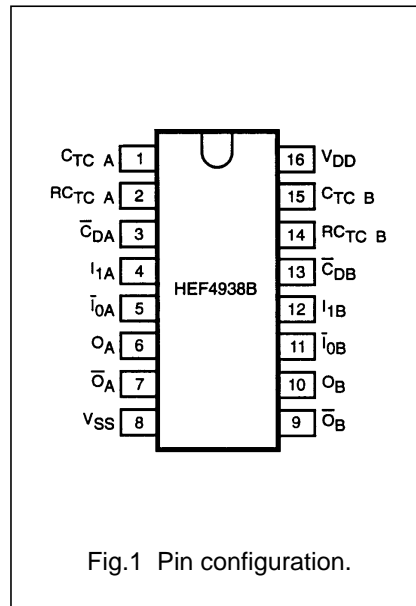
Fig.1 Pin configuration.

Fig.2 Functional diagram.

3. X = state is immaterial
4. ↑ = positive-going transition
5. ↓ = negative-going transition
6. ↗ = positive output pulse
7. ↘ = negative output pulse

Fig.3 Logic diagram.

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FUNCTION TABLE

| INPUTS			OUTPUTS	
$\bar{I}_0$	I_1	$\overline{C}_D$	O	$\overline{O}$
$\searchdownarrow$	L	H	$\sqcap$	$\sqcup$
H	$\nearrow$	H	$\sqcap$	$\sqcup$
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. $\nearrow$ = positive-going transition

5. $\searchdownarrow$ = negative-going transition

6. $\sqcap$ = positive output pulse

7. $\sqcup$ = negative output pulse

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

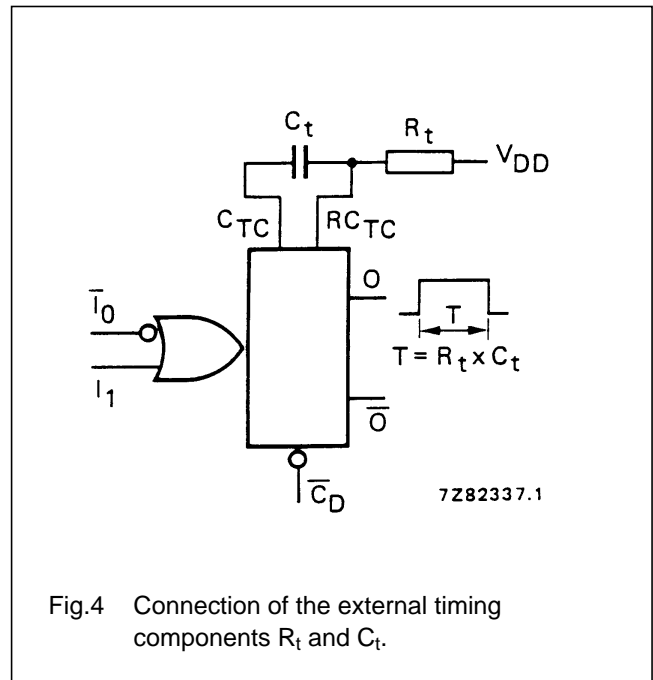### DC CHARACTERISTICS

V_{SS} = 0 V

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

Note

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

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AC CHARACTERISTICS

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

PARAMETER	V_{DD} (V)	SYMBOL	MIN.	TYP.	MAX.	UNIT	TYPICAL EXTRAPOLATION FORMULA
Propagation delay $\bar{I}_0$, I_1 to O HIGH to LOW	5 10 15	t_{PHL}	– – –	200 90 60	460 180 120	ns	173 ns + (0.55 ns/pF) C_L 79 ns + (0.23 ns/pF) C_L 52 ns + (0.16 ns/pF) C_L
Propagation delay $\bar{I}_0$, I_1 to $\overline{O}$ LOW to HIGH	5 10 15	t_{PLH}	– – –	220 85 60	440 190 120	ns	193 ns + (0.55 ns/pF) C_L 74 ns + (0.23 ns/pF) C_L 52 ns + (0.16 ns/pF) C_L
Propagation delay $\overline{C}_D$ to O HIGH to LOW	5 10 15	t_{PHL}	– – –	125 55 40	250 110 80	ns	98 ns + (0.55 ns/pF) C_L 44 ns + (0.23 ns/pF) C_L 32 ns + (0.16 ns/pF) C_L
Propagation delay $\overline{C}_D$ to O LOW to HIGH	5 10 15	t_{PLH}	– – –	125 55 40	250 110 80	ns	98 ns + (0.55 ns/pF) C_L 44 ns + (0.23 ns/pF) C_L 32 ns + (0.16 ns/pF) C_L
Recovery times $\overline{C}_D$ to $\bar{I}_0$, I_1	5 10 15	t_{RCD}	– – –	20 10 5	40 20 10	ns	
Retrigger times O, $\overline{O}$ to $\bar{I}_0$, I_1 LOW to OFF	5 10 15	t_{RO}	0 0 0	– – –	– – –	ns	
Minimum output pulse width LOW $\bar{I}_0$	5 10 15	t_{WIOL}	90 30 24	45 15 12	– – –	ns	
Minimum output pulse width LOW I_1	5 10 15	t_{WI1H}	50 24 20	25 12 10	– – –	ns	
Output pulse width O, $\overline{O}$	5 10 15	t_{WO}	9.3 9.2 9.1	10.0 9.9 9.8	10.6 10.5 10.4	ms	$R_t = 100$ kΩ; $C_t = 100$ nF

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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	MIN.	TYP.	MAX.		
Change in output O pulse width over temperature (T_{amb})	5 10 15	Δt_{WO}		± 0,2 ± 0,2 ± 0,2		% % %	
Change in output O pulse width over V_{DD} range 5 to 15 V		Δt_{WO}		± 1,5		%	
Pulse width variation between circuits in same package	5 10 15	Δt_{WO}		± 1 ± 1 ± 1		% % %	R_t = 100 kΩ C_t = 2 nF to 10 μF
External timing resistor		R_t	5	–	(1)	kΩ	
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.

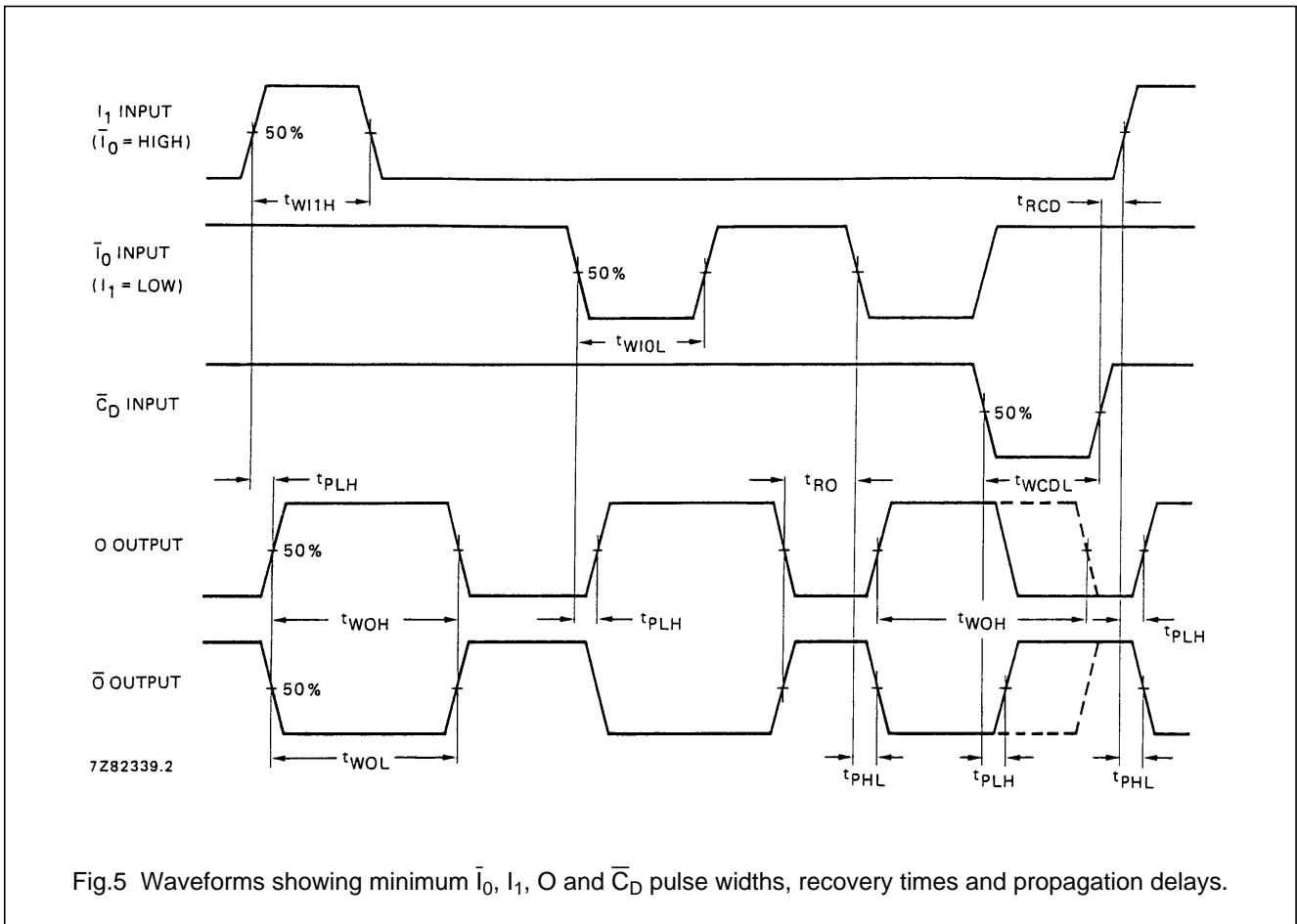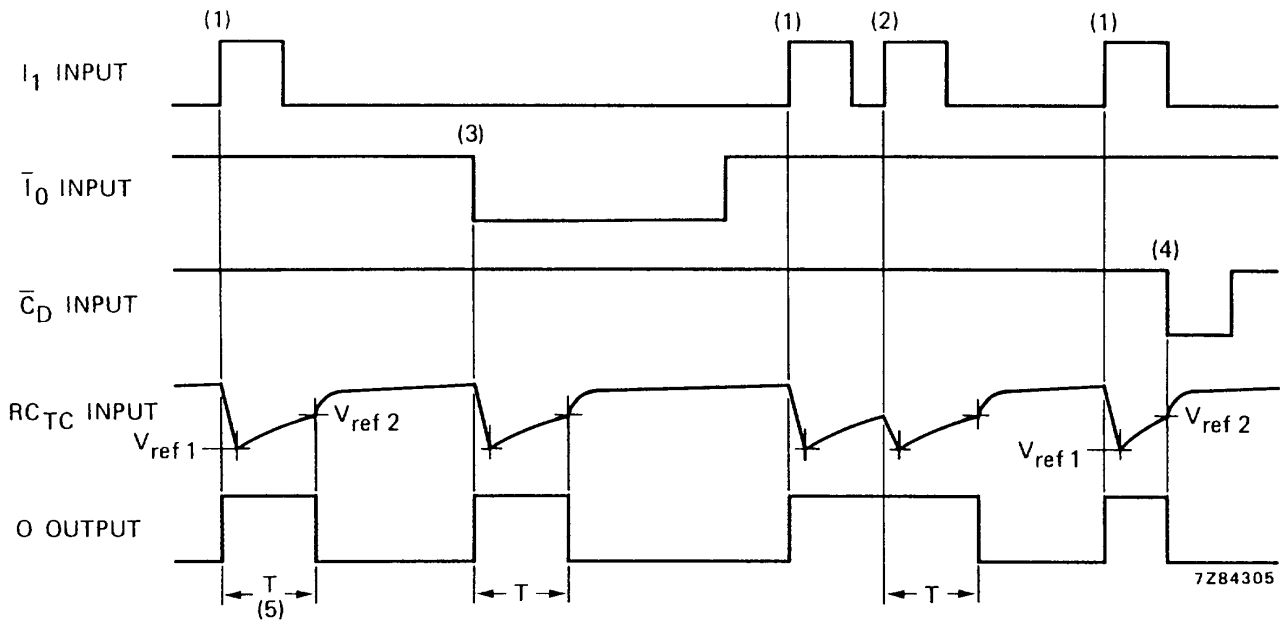## Dual precision monostable multivibrator

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

Fig.6 Timing diagram.

(1) Positive edge triggering.

(2) Positive edge re-triggering (pulse lengthening).

(3) Negative edge triggering.

(4) Reset (pulse shortening).

(5) $T = R_t \times C_t$.