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

January 1995

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 ($\overline{I}_0$), 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	
$\overline{I}_0$	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
3. X = state is immaterial
4. ↑ = positive-going transition
5. ↓ = negative-going transition
6. ↗ = positive output pulse
7. ↘ = negative output pulse

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	$\overline{I}_{0A}$, $\overline{I}_{0B}$	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

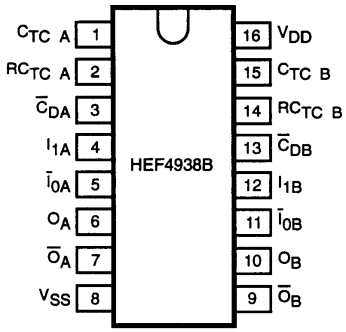

Fig.1 Pin configuration.

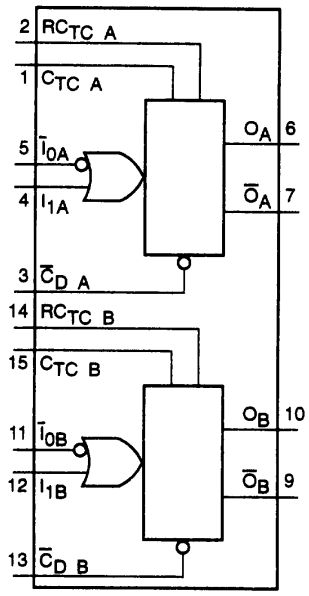

Fig.2 Functional diagram.

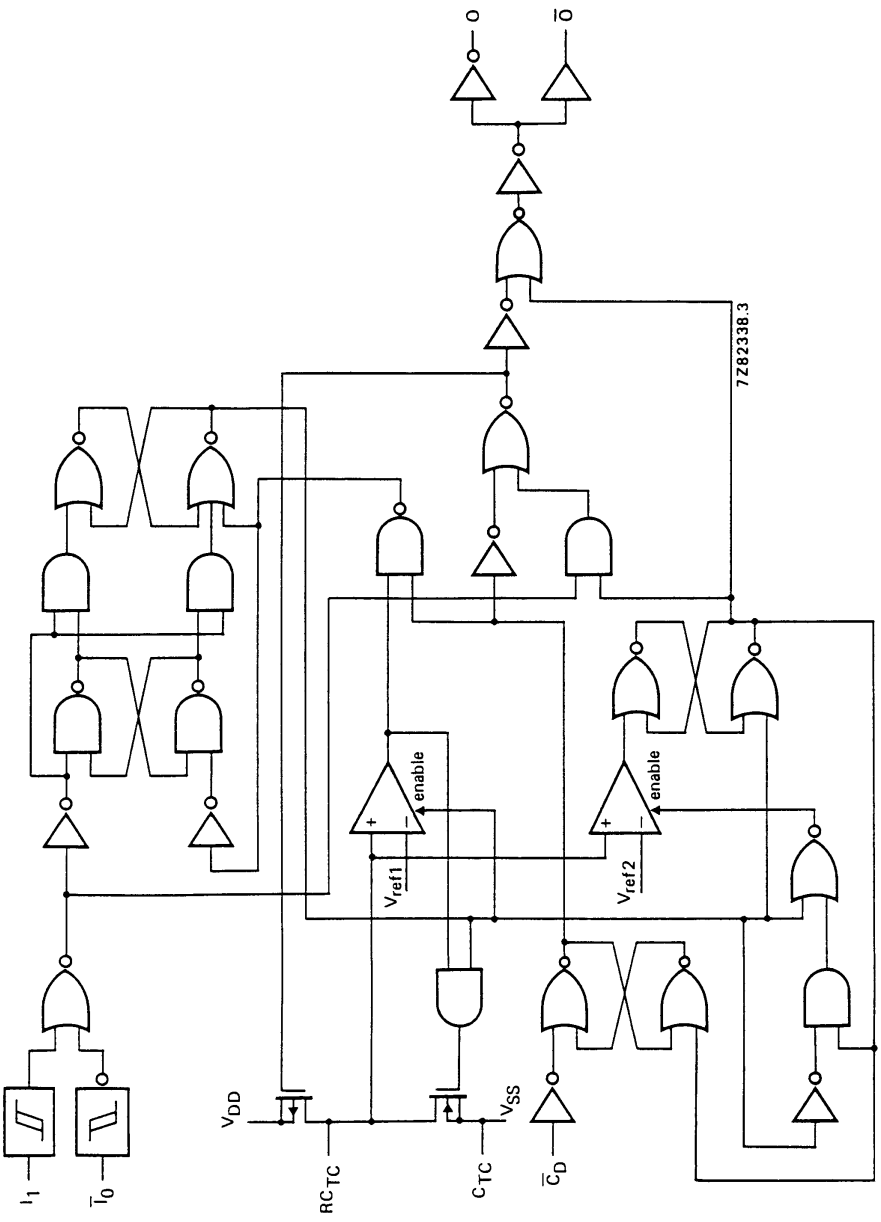

Fig.3 Logic diagram.

FUNCTION TABLE

INPUTS			OUTPUTS	
$\overline{I}_0$	I_1	$\overline{C}_D$	O	$\overline{O}$
↘	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 output pulse
7. ⎎ = negative output pulse

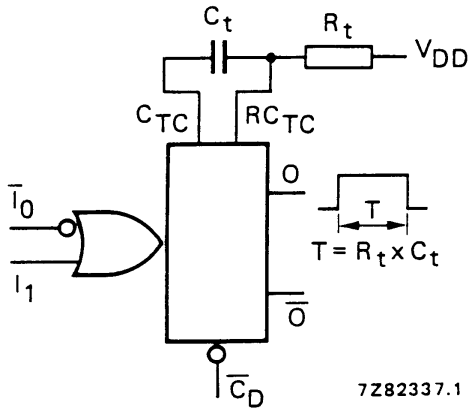

Fig.4 Connection of the external timing components R_t and C_t.

DC CHARACTERISTICS

V_{SS} = 0 V

	V_{DD} V	SYMBOL	T_{amb} (°C)						
			−40		+ 25		+ 85		
			TYP.	MAX.	TYP.	MAX.	TYP.	MAX.	
Supply current	5				55				µA
active state	10	I_D			150				µA
(see note)	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).

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

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	Δt_{WO}		± 0,2		%	
	10			± 0,2		%	
	15			± 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	Δt_{WO}		± 1		%	R_t = 100 kΩ C_t = 2 nF to 10 µF
	10			± 1		%	
	15			± 1		%	
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.

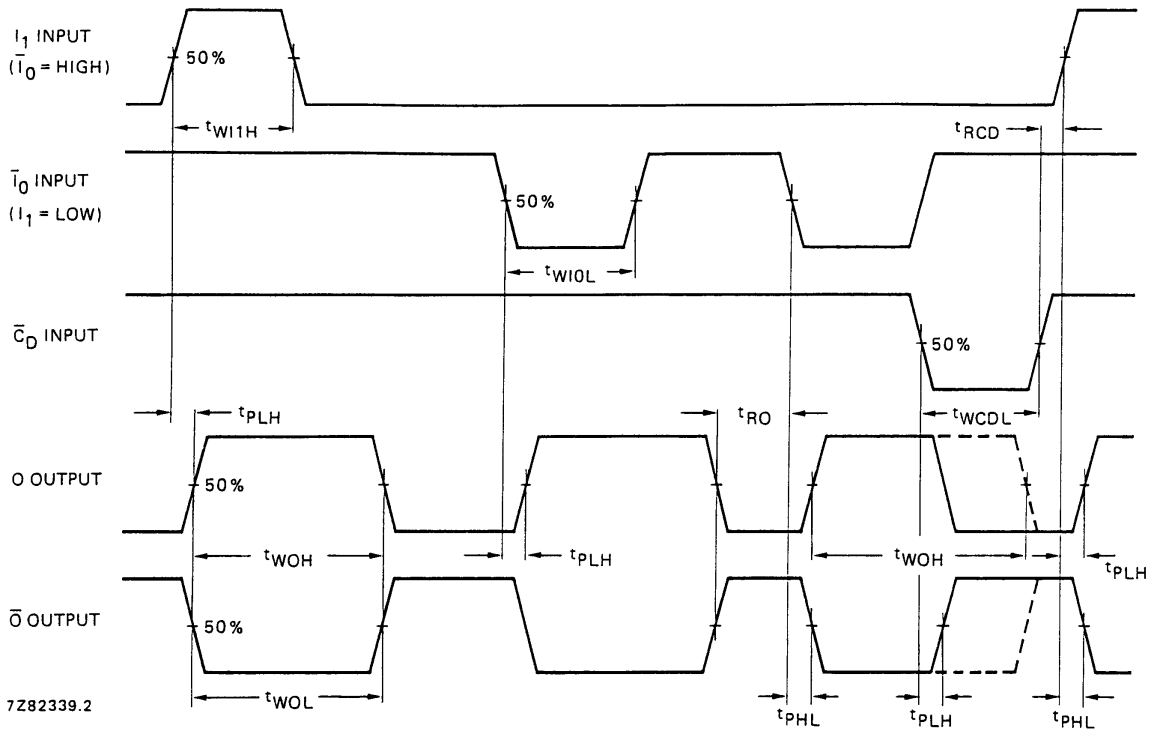

Fig.5 Waveforms showing minimum $\bar{I}_0$, I_1, O and $\overline{C}_D$ pulse widths, recovery times and propagation delays.

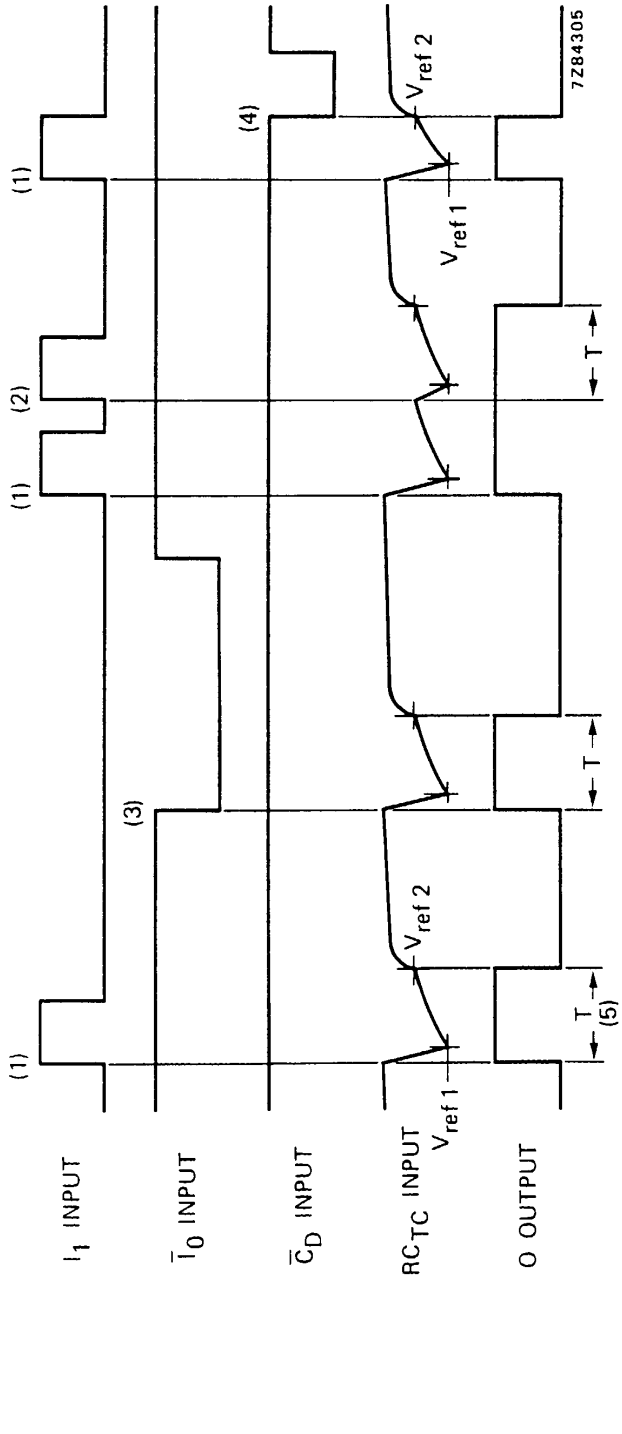

Fig.6 Timing diagram.

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