

# 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

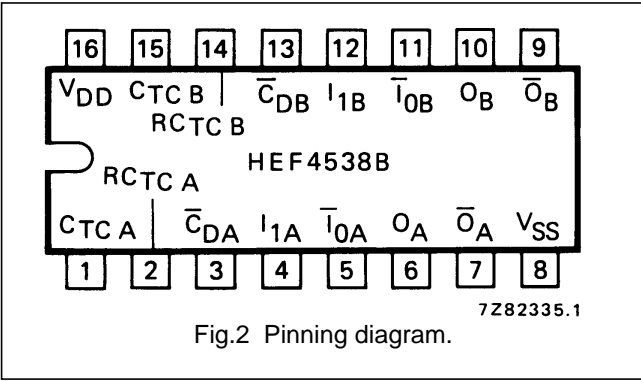
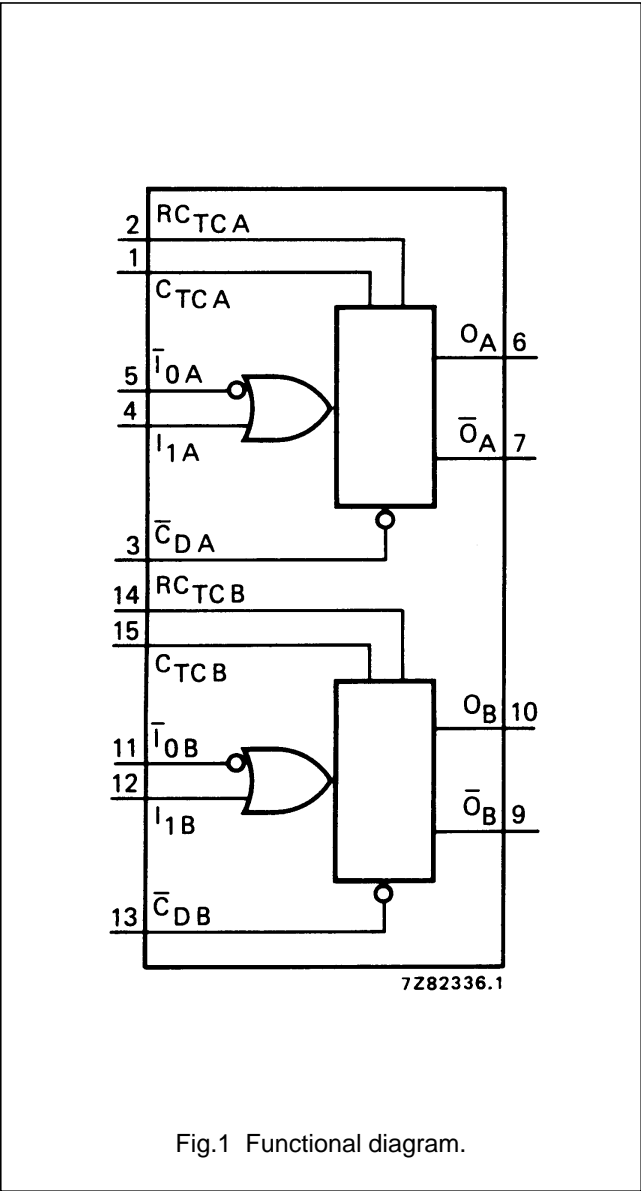
DESCRIPTION

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>  $RC_{TC}$ ) 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> |
| $RC_{TC A}, RC_{TC B}$       | external capacitor/ resistor connections      |

Note

1. Always connected to ground.

FAMILY DATA,  $I_{DD}$  LIMITS category MSI

See Family specifications.

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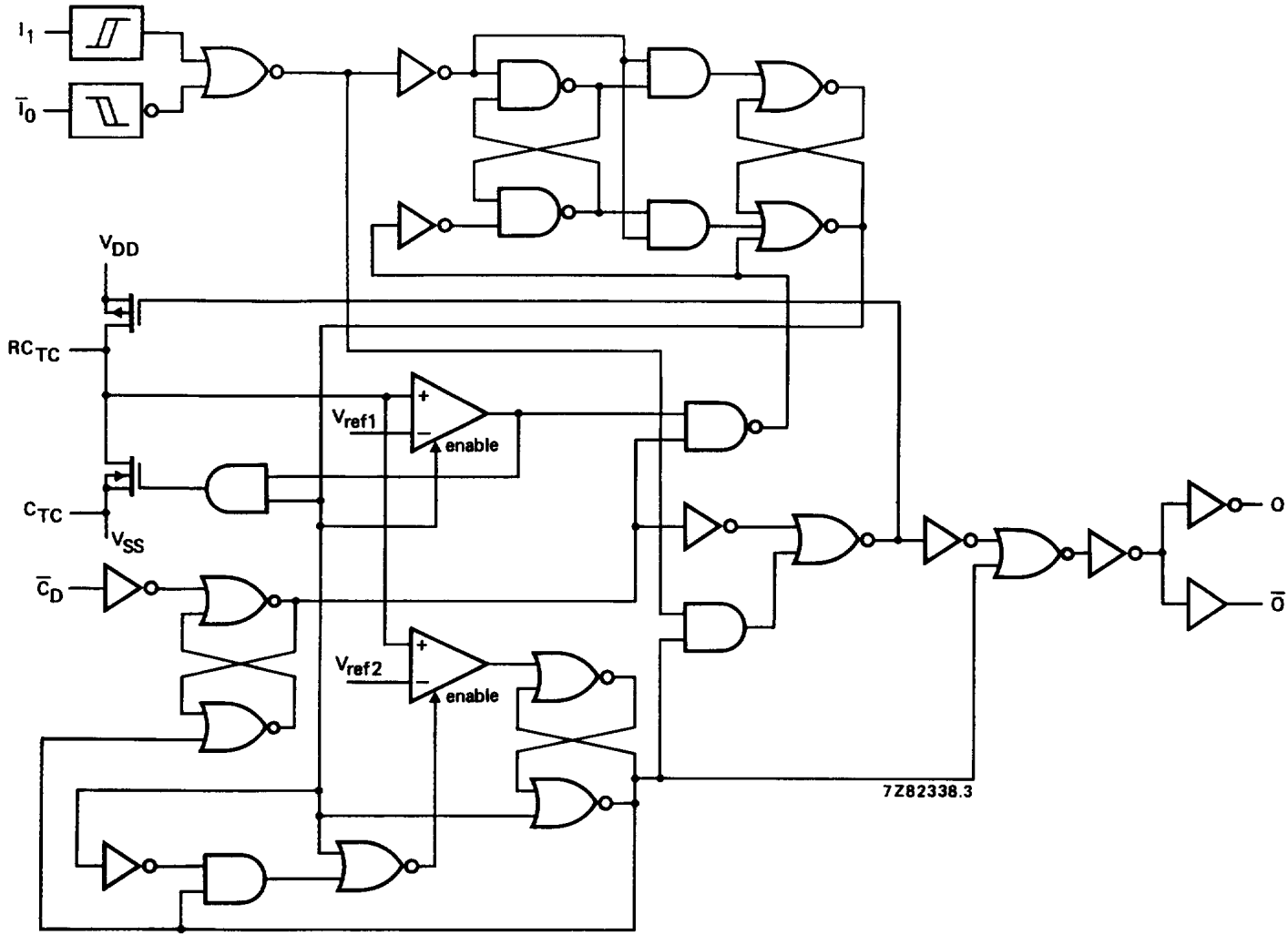








Fig.3 Logic diagram.





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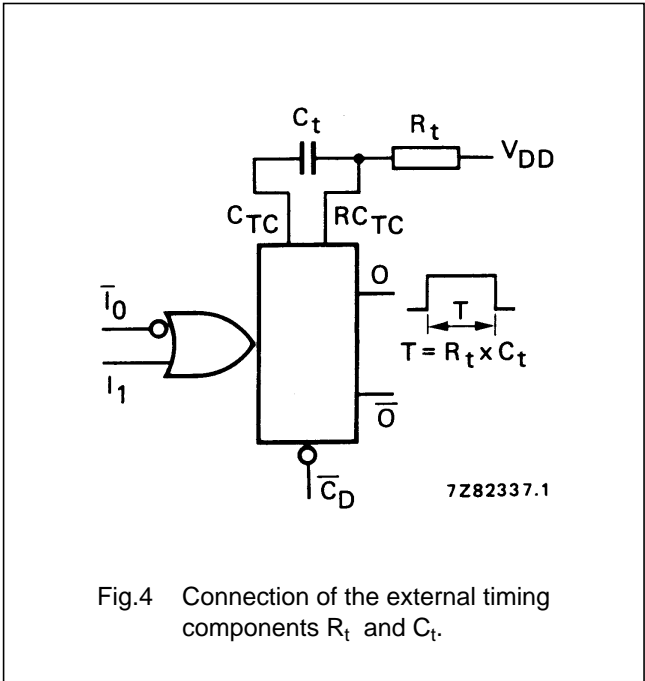
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FUNCTION TABLE

| 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)  
L = LOW state (the less positive voltage)  
X = state is immaterial  
 = positive output pulse  
 = negative output pulse  
 = positive-going transition  
 = negative-going transition



DC CHARACTERISTICS

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

|                 | $V_{DD}$<br>V | SYMBOL       | $T_{amb}\text{ (}^{\circ}\text{C)}$ |      |      |      |      |      |
|-----------------|---------------|--------------|-------------------------------------|------|------|------|------|------|
|                 |               |              | - 40                                |      | + 25 |      | + 85 |      |
|                 |               |              | TYP.                                | MAX. | TYP. | MAX. | TYP. | MAX. |
| Supply current  | 5             | $I_D$        |                                     |      | 55   |      |      |      |
| active state    | 10            |              |                                     |      | 150  |      |      |      |
| (see note)      | 15            |              |                                     |      | 220  |      |      |      |
| Input leakage   | 15            | $\pm I_{IN}$ |                                     |      |      |      |      |      |
| current         |               |              |                                     |      | 300  |      | 1000 |      |
| (pins 2 and 14) |               |              |                                     |      |      |      | 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  $\leq 20$  ns

|   | $V_{DD}$<br>V | SYMBOL     | MIN. | TYP. | MAX.        | TYPICAL EXTRAPOLATION<br>FORMULA            |
|---|---------------|------------|------|------|-------------|---|
| Propagation delays                      |               |            |      |      |             |   |
| $\bar{I}_0, I_1 \rightarrow O$          | 5             |            |      | 200  | 460 ns      | $173 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ |
| HIGH to LOW                             | 10            | $t_{PHL}$  |      | 90   | 180 ns      | $79 \text{ ns} + (0,23 \text{ ns/pF}) C_L$  |
|   | 15            |            |      | 60   | 120 ns      | $52 \text{ ns} + (0,16 \text{ ns/pF}) C_L$  |
| $\bar{I}_0, I_1 \rightarrow \bar{O}$    | 5             |            |      | 220  | 440 ns      | $193 \text{ ns} + (0,55 \text{ ns/pF}) C_L$ |
| LOW to HIGH                             | 10            | $t_{PLH}$  |      | 85   | 190 ns      | $74 \text{ ns} + (0,23 \text{ ns/pF}) C_L$  |
|   | 15            |            |      | 60   | 120 ns      | $52 \text{ ns} + (0,16 \text{ ns/pF}) C_L$  |
| $\bar{C}_D \rightarrow O$               | 5             |            |      | 125  | 250 ns      | $98 \text{ ns} + (0,55 \text{ ns/pF}) C_L$  |
| HIGH to LOW                             | 10            | $t_{PHL}$  |      | 55   | 110 ns      | $44 \text{ ns} + (0,23 \text{ ns/pF}) C_L$  |
|   | 15            |            |      | 40   | 80 ns       | $32 \text{ ns} + (0,16 \text{ ns/pF}) C_L$  |
| $\bar{C}_D \rightarrow \bar{O}$         | 5             |            |      | 125  | 250 ns      | $98 \text{ ns} + (0,55 \text{ ns/pF}) C_L$  |
| LOW to HIGH                             | 10            | $t_{PLH}$  |      | 55   | 110 ns      | $44 \text{ ns} + (0,23 \text{ ns/pF}) C_L$  |
|   | 15            |            |      | 40   | 80 ns       | $32 \text{ ns} + (0,16 \text{ ns/pF}) C_L$  |
| Recovery times                          | 5             |            |      | 20   | 40 ns       |   |
| $\bar{C}_D \rightarrow \bar{I}_0, I_1$  | 10            | $t_{RCD}$  |      | 10   | 20 ns       |   |
|   | 15            |            |      | 5    | 10 ns       |   |
| Retrigger times                         | 5             |            | 0    |      | ns          |   |
| $O, \bar{O} \rightarrow \bar{I}_0, I_1$ | 10            | $t_{RO}$   | 0    |      | ns          |   |
|   | 15            |            | 0    |      | ns          |   |
| Minimum $\bar{I}_0$                     | 5             |            | 90   | 45   | ns          |   |
| pulse width; LOW                        | 10            | $t_{WIOL}$ | 30   | 15   | ns          |   |
|   | 15            |            | 24   | 12   | ns          |   |
| Minimum $I_1$                           | 5             |            | 50   | 25   | ns          |   |
| pulse width; HIGH                       | 10            | $t_{WI1H}$ | 24   | 12   | ns          |   |
|   | 15            |            | 20   | 10   | ns          |   |
| Minimum $\bar{C}_D$                     | 5             |            | 55   | 25   | ns          |   |
| pulse width; LOW                        | 10            | $t_{WCDL}$ | 25   | 12   | ns          |   |
|   | 15            |            | 20   | 10   | ns          |   |
| Output O or $\bar{O}$                   | 5             |            | 218  | 230  | 242 $\mu$ s | $R_t = 100 \text{ k}\Omega$                 |
| pulse width                             | 10            | $t_{WO}$   | 213  | 224  | 235 $\mu$ s | $C_t = 0,002 \text{ }\mu\text{F}$           |
|   | 15            |            | 211  | 223  | 234 $\mu$ s |   |
| Output O or $\bar{O}$                   | 5             |            | 10,3 | 10,8 | 11,3 ms     | $R_t = 100 \text{ k}\Omega$                 |
| pulse width                             | 10            | $t_{WO}$   | 10,2 | 10,7 | 11,2 ms     | $C_t = 0,1 \text{ }\mu\text{F}$             |
|   | 15            |            | 10,1 | 10,6 | 11,1 ms     |   |
| Output O or $\bar{O}$                   | 5             |            | 1,01 | 1,09 | 1,11 s      | $R_t = 100 \text{ k}\Omega$                 |
| pulse width                             | 10            | $t_{WO}$   | 0,99 | 1,04 | 1,09 s      | $C_t = 10 \text{ }\mu\text{F}$              |
|   | 15            |            | 0,99 | 1,04 | 1,09 s      |   |

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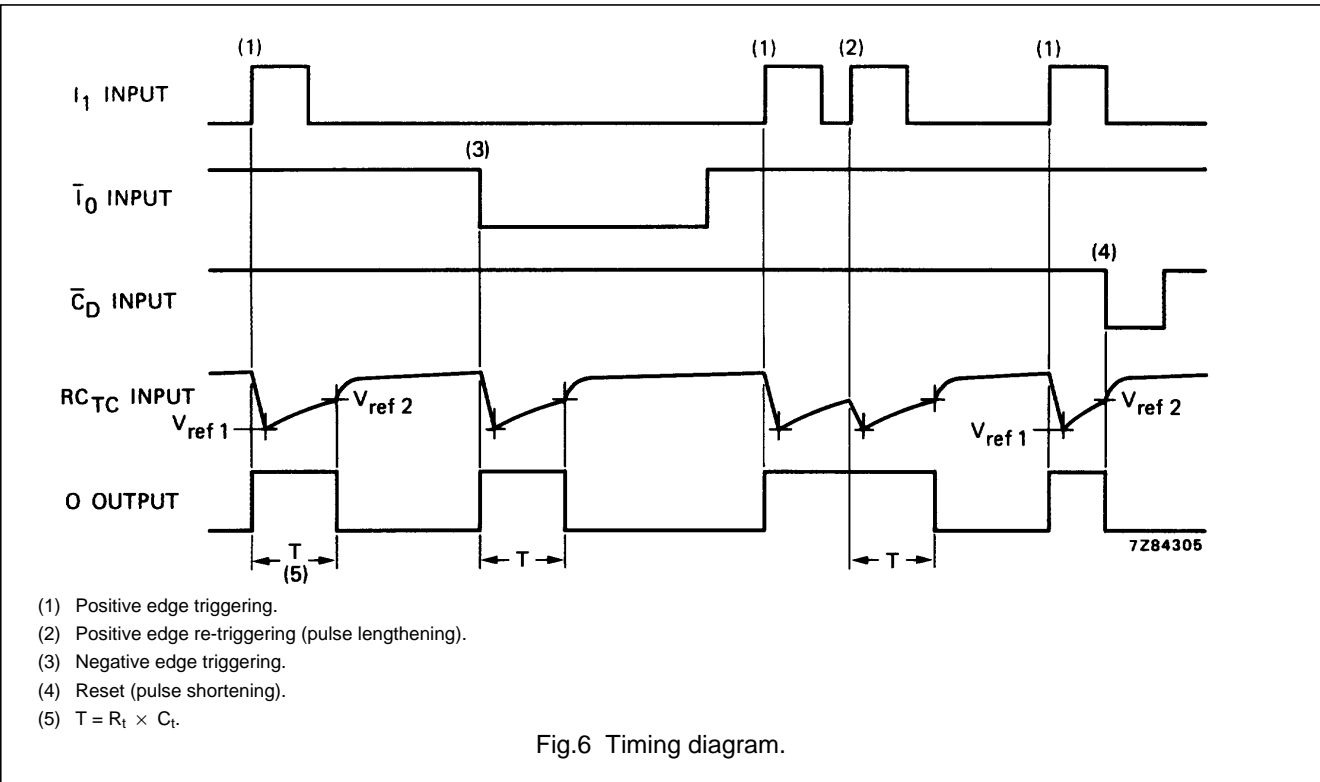
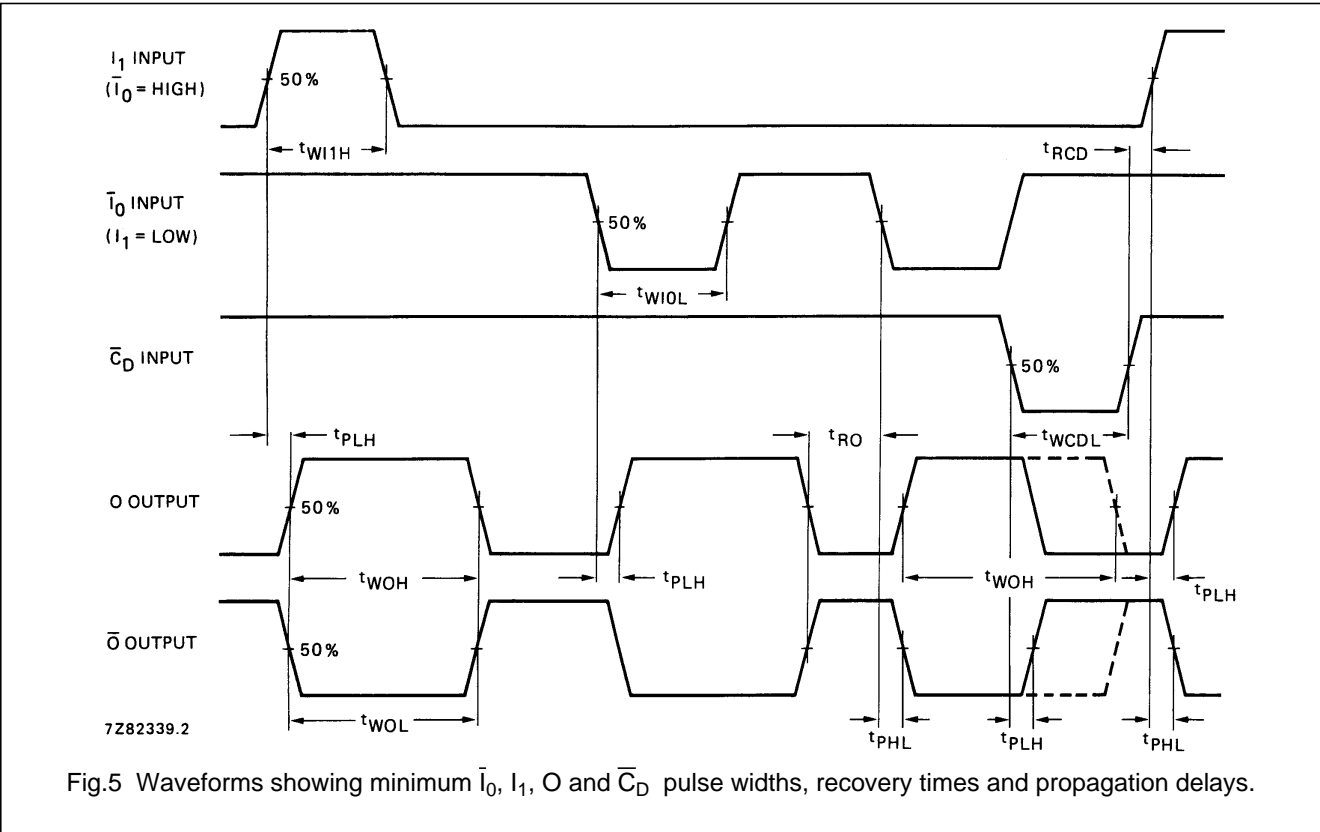
|   | $V_{DD}$<br>V | SYMBOL          | MIN. | TYP.                                | MAX.                  |   |
|---|---------------|-----------------|------|-------------------------------------|-----------------------|---|
| Change in output O<br>pulse width over<br>temperature ( $T_{amb}$ ) | 5<br>10<br>15 | $\Delta t_{WO}$ |      | $\pm 0,2$<br>$\pm 0,2$<br>$\pm 0,2$ | %<br>%<br>%           |   |
| Change in output O<br>pulse width over<br>$V_{DD}$ range 5 to 15 V  |               | $\Delta t_{WO}$ |      | $\pm 1,5$                           | %                     |   |
| Pulse width variation<br>between circuits<br>in same package        | 5<br>10<br>15 | $\Delta t_{WO}$ |      | $\pm 1$<br>$\pm 1$<br>$\pm 1$       | %<br>%<br>%           | $R_t = 100\text{ k}\Omega$<br>$C_t = 2\text{ nF to } 10\text{ }\mu\text{F}$ |
| External timing<br>resistor   |               | $R_t$           | 5    | —                                   | (1) $\text{k}\Omega$  |   |
| External timing<br>capacitor  |               | $C_t$           | 2000 | —                                   | no limits $\text{pF}$ |   |
| Input capacitance<br>(pin 2 or 14)                                  |               | $C_{IN}$        |      | 15                                  | $\text{pF}$           |   |

**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.

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