

# 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

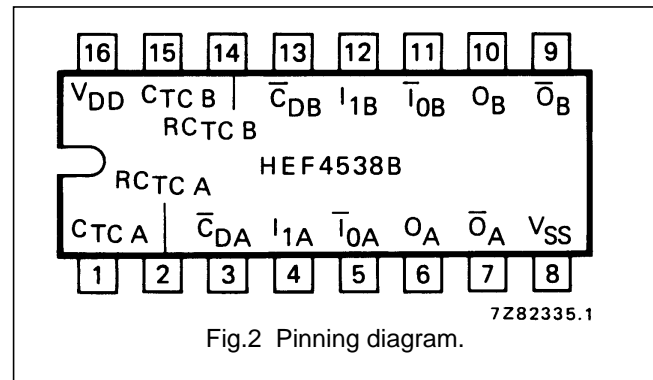
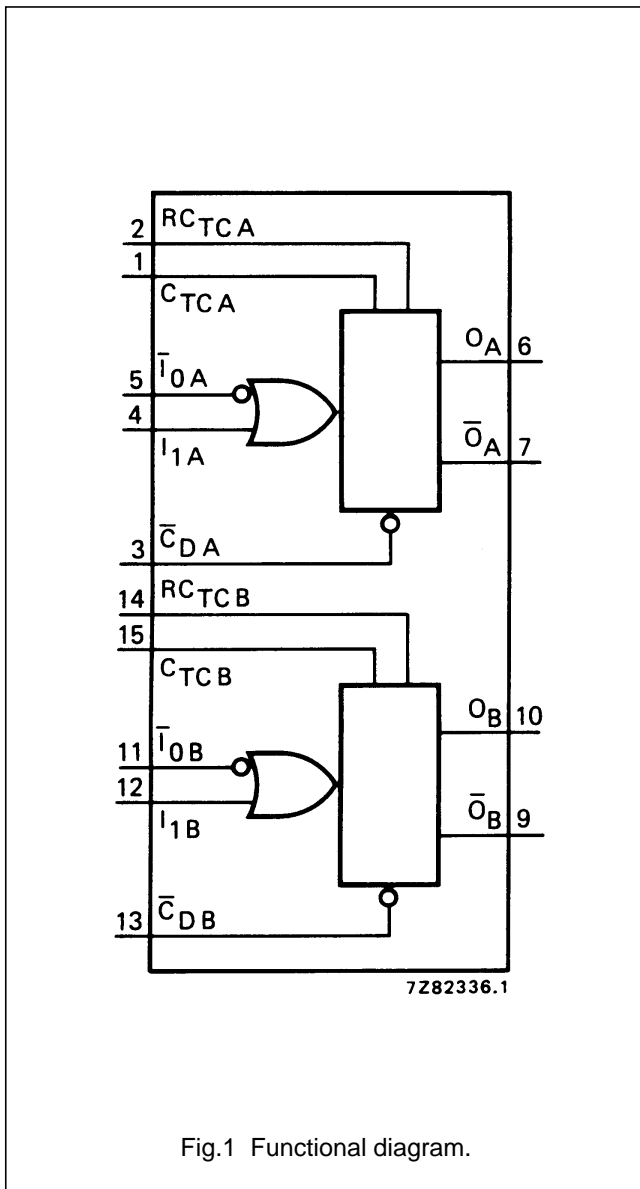
### DESCRIPTION

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.

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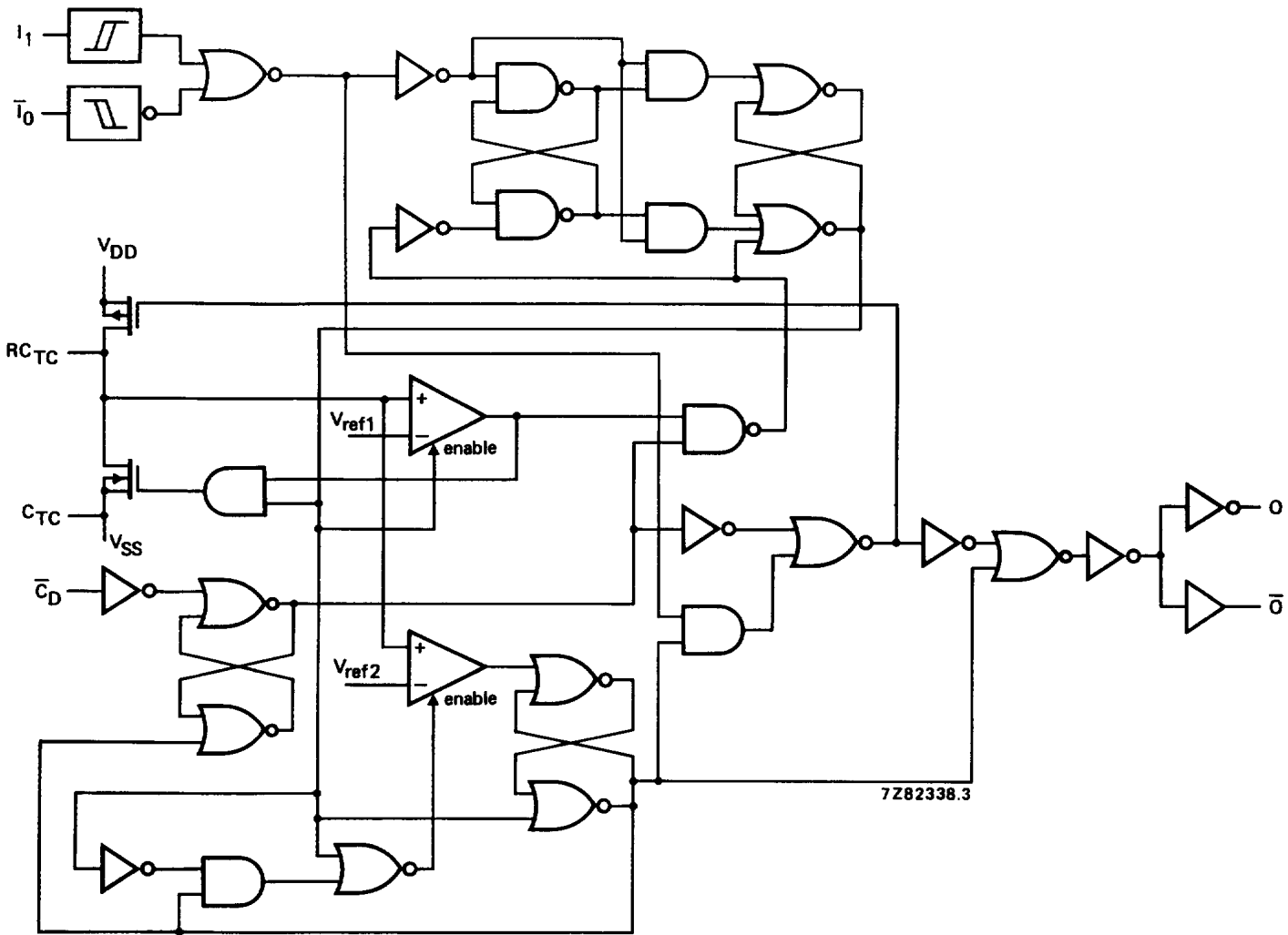


Fig.3 Logic diagram.

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FUNCTION TABLE

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

Notes

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

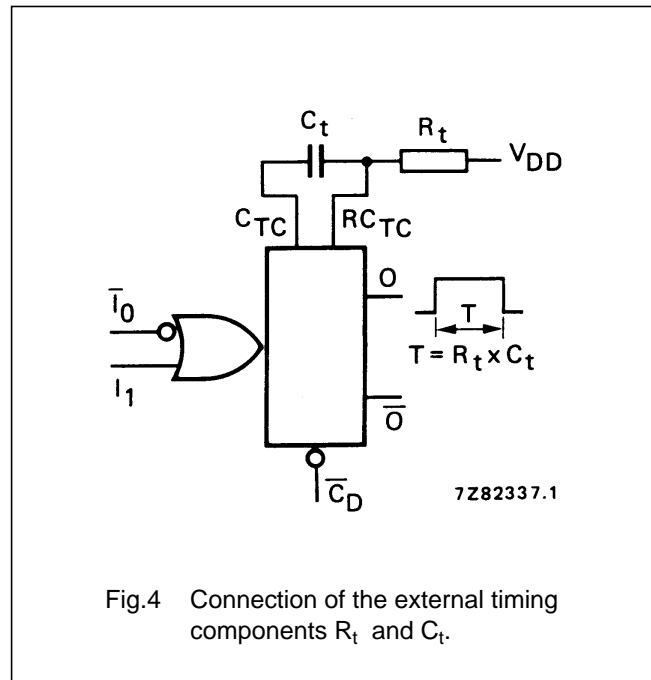


Fig.4 Connection of the external timing components  $R_t$  and  $C_t$ .

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

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

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## AC CHARACTERISTICS

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

	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Propagation delays	$\bar{I}_0, I_1 \rightarrow O$ HIGH to LOW	$t_{PHL}$		200	460 ns	$173\text{ ns} + (0,55\text{ ns/pF}) C_L$
				90	180 ns	$79\text{ ns} + (0,23\text{ ns/pF}) C_L$
				60	120 ns	$52\text{ ns} + (0,16\text{ ns/pF}) C_L$
	$\bar{I}_0, I_1 \rightarrow \bar{O}$ LOW to HIGH	$t_{PLH}$		220	440 ns	$193\text{ ns} + (0,55\text{ ns/pF}) C_L$
				85	190 ns	$74\text{ ns} + (0,23\text{ ns/pF}) C_L$
				60	120 ns	$52\text{ ns} + (0,16\text{ ns/pF}) C_L$
	$\bar{C}_D \rightarrow O$ HIGH to LOW	$t_{PHL}$		125	250 ns	$98\text{ ns} + (0,55\text{ ns/pF}) C_L$
				55	110 ns	$44\text{ ns} + (0,23\text{ ns/pF}) C_L$
				40	80 ns	$32\text{ ns} + (0,16\text{ ns/pF}) C_L$
$\bar{C}_D \rightarrow \bar{O}$ LOW to HIGH	$t_{PLH}$		125	250 ns	$98\text{ ns} + (0,55\text{ ns/pF}) C_L$	
			55	110 ns	$44\text{ ns} + (0,23\text{ ns/pF}) C_L$	
			40	80 ns	$32\text{ ns} + (0,16\text{ ns/pF}) C_L$	
Recovery times $\bar{C}_D \rightarrow \bar{I}_0, I_1$	$t_{RCD}$			20	40 ns	
				10	20 ns	
				5	10 ns	
Retrigger times $O, \bar{O} \rightarrow \bar{I}_0, I_1$	$t_{RO}$		0		ns	
			0		ns	
			0		ns	
Minimum $\bar{I}_0$ pulse width; LOW	$t_{WI0L}$		90	45	ns	
			30	15	ns	
			24	12	ns	
Minimum $I_1$ pulse width; HIGH	$t_{WI1H}$		50	25	ns	
			24	12	ns	
			20	10	ns	
Minimum $\bar{C}_D$ pulse width; LOW	$t_{WCDL}$		55	25	ns	
			25	12	ns	
			20	10	ns	
Output $O$ or $\bar{O}$ pulse width	$t_{WO}$		218	230	242 $\mu\text{s}$	$R_t = 100\text{ k}\Omega$ $C_t = 0,002\text{ }\mu\text{F}$
			213	224	235 $\mu\text{s}$	
			211	223	234 $\mu\text{s}$	
Output $O$ or $\bar{O}$ pulse width	$t_{WO}$		10,3	10,8	11,3 ms	$R_t = 100\text{ k}\Omega$ $C_t = 0,1\text{ }\mu\text{F}$
			10,2	10,7	11,2 ms	
			10,1	10,6	11,1 ms	
Output $O$ or $\bar{O}$ pulse width	$t_{WO}$		1,01	1,09	1,11 s	$R_t = 100\text{ k}\Omega$ $C_t = 10\text{ }\mu\text{F}$
			0,99	1,04	1,09 s	
			0,99	1,04	1,09 s	

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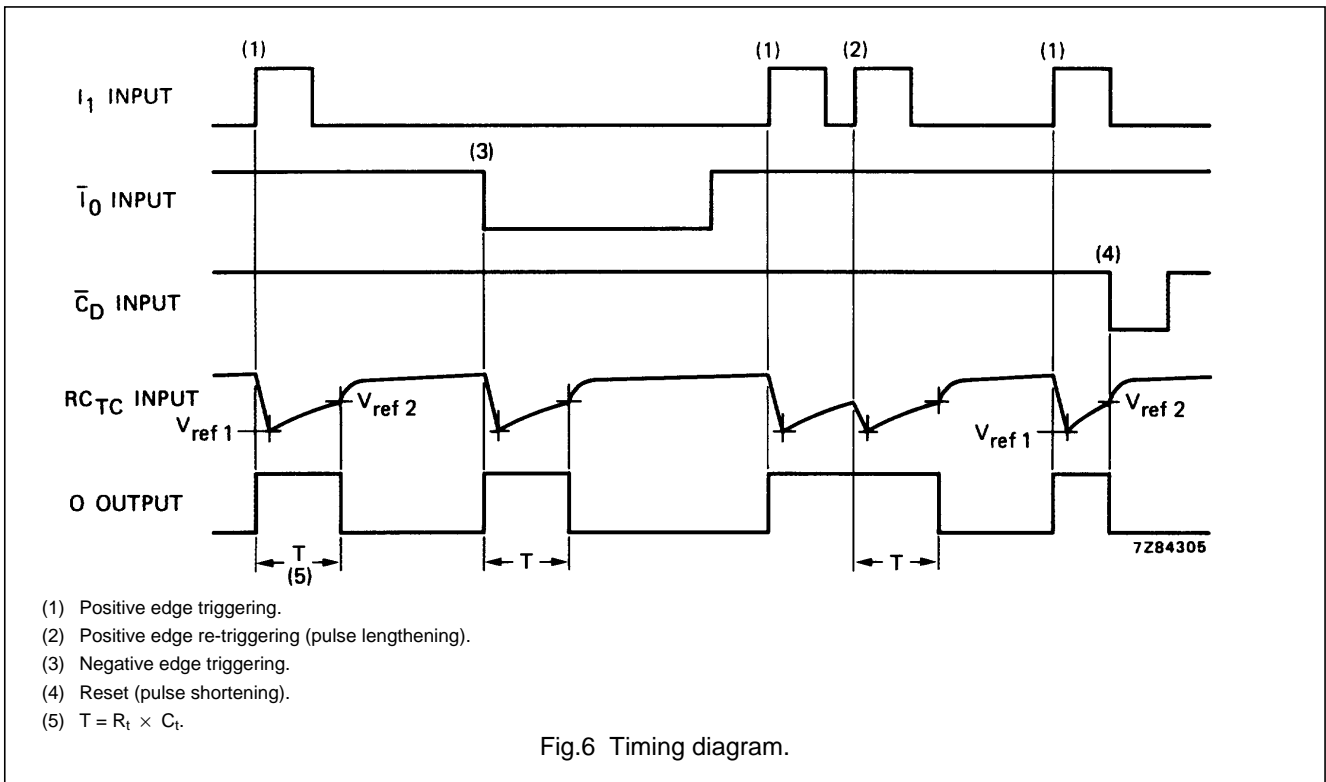
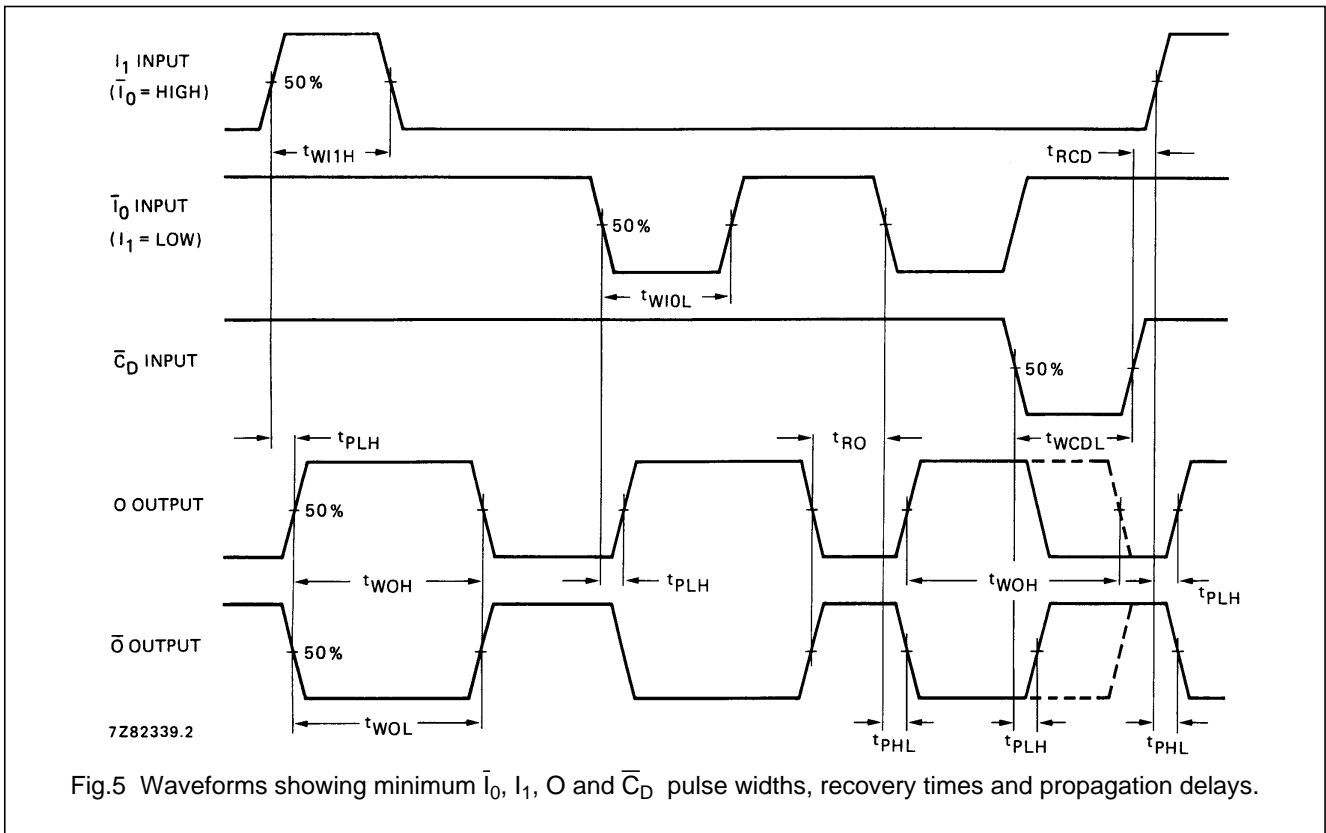
	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	
Change in output O pulse width over temperature ( $T_{amb}$ )	5	$\Delta t_{WO}$		$\pm 0,2$	%	
	10		$\pm 0,2$	%		
	15		$\pm 0,2$	%		
Change in output O pulse width over $V_{DD}$ range 5 to 15 V		$\Delta t_{WO}$		$\pm 1,5$	%	
Pulse width variation between circuits in same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