MN4538B/MN4538BS

Dual Precision Monostable Multivibrator

■ Outline

The MN4538B/S is a monostable multivibrator having a retrigger function and a reset function.
This multivibrator can be triggered either at the fall or the rise of the input pulse, and it is possible to obtain a wide range of accurate output pulse width because the output pulse width and the accuracy are decided by the time constants of the external condenser C_t and the external resistor R_t.
The linear CMOS technique introduced in MN4538B/S assures more precise control of the output pulse width than before. The relation of $t_{wo}=R_t \cdot C_t$ holds good throughout the source voltage range, and it includes no other coefficient.
This monostable multivibrator is equivalent to Motorola's MC14538B.

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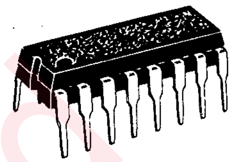
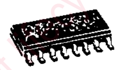


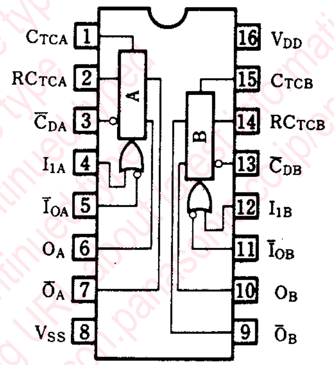
16-pin plastic DIL package

P-4



16-pin PANAFLAT package (SO-16D)

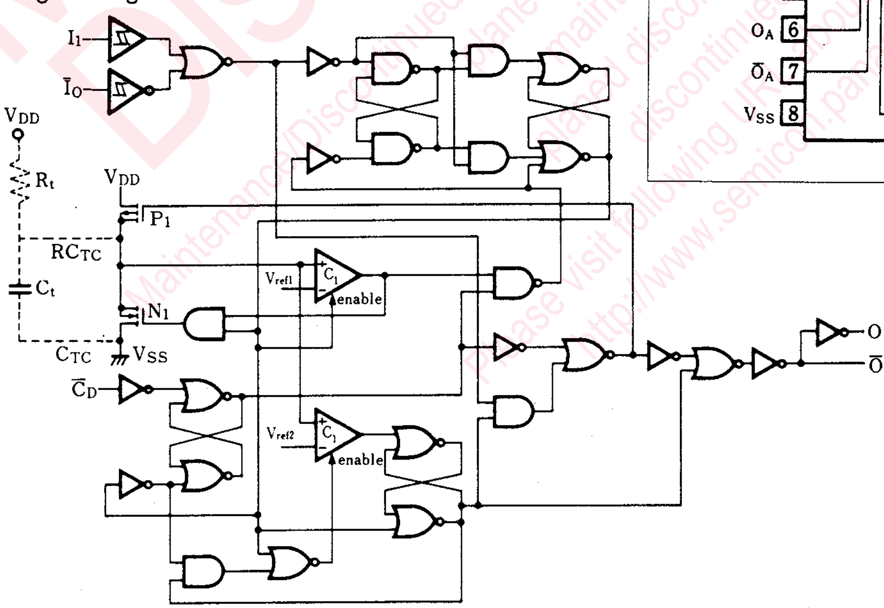
Pin Configuration



■ Truth Table

Input			Output	
$\bar{I}_0$	I_1	$\bar{C}_D$	O	$\bar{O}$
⌝_ (fall)	L	H	⎍	⊔
H	_⌐ (rise)	H	⎍	⊔
×	×	L	L	H

■ Logic Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Item		Symbol	Rating	Unit
Supply voltage		V_{DD}	−0.5~+18	V
Input voltage		V_I	−0.5~V_{DD}+0.5*	V
Output pin voltage		V_O	−0.5~V_{DD}+0.5*	V
Peak input · output pin current		$\pm I_I$	max. 10	mA
Power dissipation (per package)	Ta=−40~+60°C	P_D	max. 400	mW
	Ta=+60~+80°C		Decrease to 200mW at the rate of 8mW/°C	
Power dissipation (per output pin)		P_D	max. 100	mW
Operating ambient temperature		T_{opr}	−40~+85	°C
Storage temperature		T_{stg}	−65~+150	°C

* V_{DD}+0.5V should be lower than 18V.

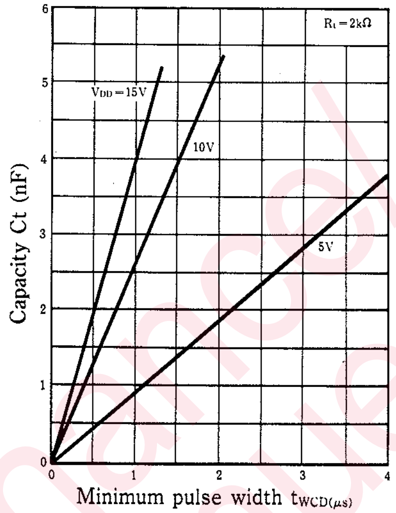
■ DC Characteristics (V_{SS}=0V)

Item	V_{DD} (V)	Symbol	Condition	Ta=−40°C min.	Ta=−40°C max.	Ta=25°C min.	Ta=25°C max.	Ta=85°C min.	Ta=85°C max.	Unit
Static supply current	5	I_{DD}	V_I=V_{SS} or V_{DD}	—	20	—	20	—	150	μA
	10			—	40	—	40	—	300	
	15			—	80	—	80	—	600	
Output voltage low level	5	V_{OL}	V_I=V_{SS} or V_{DD} |I_O|<1μA	—	0.05	—	0.05	—	0.05	V
	10			—	0.05	—	0.05	—	0.05	
	15			—	0.05	—	0.05	—	0.05	
Output voltage high level	5	V_{OH}	V_I=V_{SS} or V_{DD} |I_O|<1μA	4.95	—	4.95	—	4.95	—	V
	10			9.95	—	9.95	—	9.95	—	
	15			14.95	—	14.95	—	14.95	—	
Input voltage low level	5	V_{IL}	|I_O|<1μA V_O=0.5V or 4.5V	—	1.5	—	1.5	—	1.5	V
	10		V_O=1V or 9V	—	3	—	3	—	3	
	15		V_O=1.5V or 13.5V	—	4	—	4	—	4	
Input voltage high level	5	V_{IH}	|I_O|<1μA V_O=0.5V or 4.5V	3.5	—	3.5	—	3.5	—	V
	10		V_O=1V or 9V	7	—	7	—	7	—	
	15		V_O=1.5V or 13.5V	11	—	11	—	11	—	
Output current low level	5	I_{OL}	V_O=0.4V, V_I=0 or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=0.5V, V_I=0 or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=1.5V, V_I=0 or 15V	3.6	—	3	—	2.4	—	
Output current high level	5	$-I_{OH}$	V_O=4.6V, V_I=0 or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=9.5V, V_I=0 or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=13.5V, V_I=0 or 15V	3.6	—	3	—	2.4	—	
Output current high level	5	$-I_{OH}$	V_O=2.5V, V_I=0 or 5V	1.7	—	1.4	—	1.1	—	mA
Input leakage current	15	$\pm I_I$	V_I=0 or 15V	—	0.3	—	0.3	—	1	μA

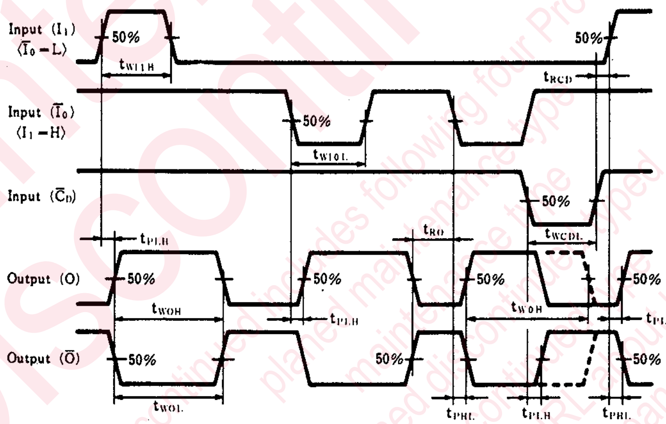
■ Switching Characteristics (Ta=25°C, V_{SS}=0V, C_L=50pF)

Item	V_{DD}(V)	Symbol	min.	typ.	max.	Unit
Output rise time	5	t_{TLH}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Output fall time	5	t_{THL}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Propagation time $\overline{I_0}$, $I_1 \rightarrow O$	5	t_{PHL}	—	150	450	ns
	10		—	70	210	
	15		—	40	120	
Propagation time $\overline{I_0}$, $I_1 \rightarrow \overline{O}$	5	t_{PLH}	—	150	450	ns
	10		—	70	210	
	15		—	40	120	
Propagation time $\overline{C_D} \rightarrow O$	5	t_{PHL}	—	150	450	ns
	10		—	70	210	
	15		—	40	120	
Propagation time $\overline{C_D} \rightarrow \overline{O}$	5	t_{PLH}	—	150	450	ns
	10		—	70	210	
	15		—	40	120	
Recovery time $\overline{C_D} \rightarrow \overline{I_0}$, I_1	5	t_{RCD}	—	0	—	ns
	10		—	0	—	
	15		—	0	—	
Recovery time O, $\overline{O} \rightarrow \overline{I_0}$, I_1	5	t_{RO}	—	0	—	ns
	10		—	0	—	
	15		—	0	—	
Minimum pulse width $\overline{I_0}$	5	t_{WI0L}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Minimum pulse width I_1	5	t_{WI1L}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Minimum pulse width $\overline{C_D}$ (Fig. 1)	5	t_{WCDL}	—	—	—	ns
	10		—	—	—	
	15		—	—	—	
Output pulse width (Rt=100kΩ, Ct=0.002μF)	5	t_{WO}	—	208	—	μs
	10		—	208	—	
	15		—	208	—	
Output pulse width (Rt=100kΩ, Ct=0.1μF)	5	t_{WO}	—	10.4	—	ms
	10		—	10.4	—	
	15		—	10.4	—	
Output pulse width (Rt=100kΩ, Ct=10μF)	5	t_{WO}	—	1.04	—	s
	10		—	1.04	—	
	15		—	1.04	—	
Input capacitance		C_I	—	—	7.5	pF
External timing resistance		Rt	5	—	1000	kΩ
External timing capacitance		Ct	2000	—	no limit	pF

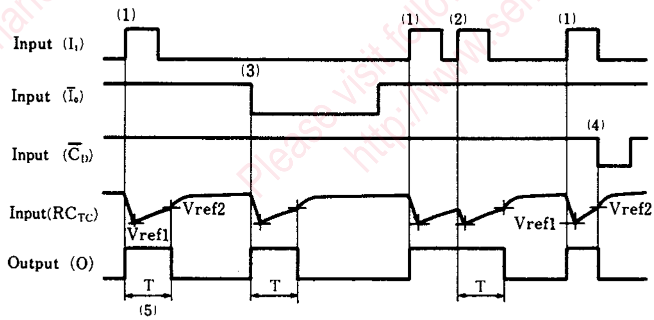
Fig. 1 Minimum reset pulse width



● Switching waveforms



■ Timing Diagram



(1)Positive edge triggering.

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

(3)Negative edge triggering.

(4)Reset(pulse shortening).

(5)T=Rt×Ct

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