MN4047B/MN4047BS

Monostable/Astable Multivibrator

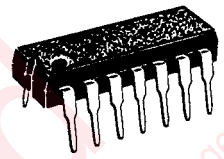
■ Outline

The MN4047B/S is a multivibrator having both the astable function and the monostable function, and also provides trigger operations. The pulse width is adjustable by the externally connected capacitor and resistor.

As the input pins, it has +TRIGGER, −TRIGER, ASTABLE, $\overline{\text{ASTABLE}}$,, RETRIGGER, and MR (Master Reset), and has the buffer type output pins, of O, $\overline{O}$, and OSCILLATOR OUT. In every operation state, the external capacitor (Ct) must be kept connected between C_{TC} and RC_{TC}, and the external resistor (Rt) must be kept connected between R_{TC} and RC_{TC}.

For the performance, see the Truth Table.

P-1

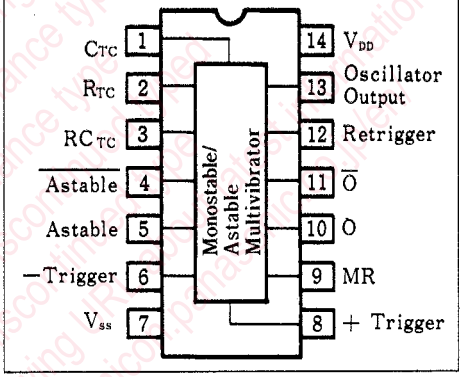


14-pin plastic DIL package

P-2

14-pin PANAFLAT package (SO-14D)

Pin Configuration



■ 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.

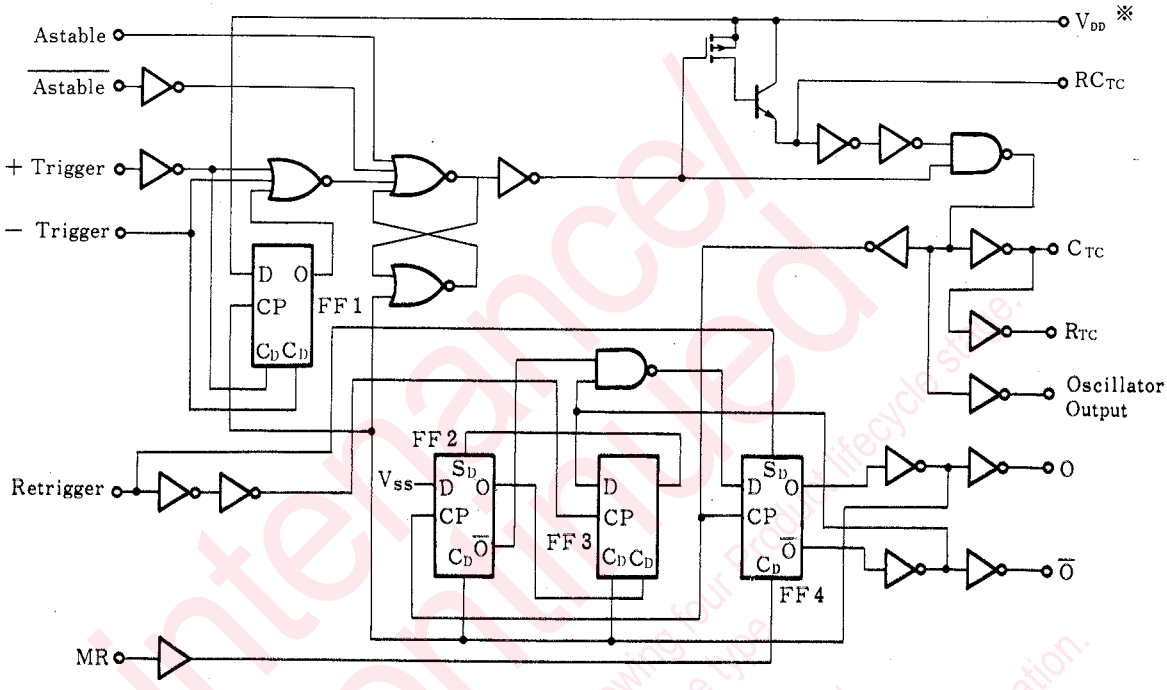
■ DC Characteristics (V_{SS}=0V)

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} $\lvert I_O\rvert$<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} $\lvert I_O\rvert$<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}	$\lvert I_O\rvert$<1μA, V_O=0.5V or 4.5V	—	1.5	—	1.5	—	1.5	V
	10		$\lvert I_O\rvert$<1μA, V_O=1V or 9V	—	3	—	3	—	3	
	15		$\lvert I_O\rvert$<1μA, V_O=1.5V or 13.5V	—	4	—	4	—	4	
Input voltage high level	5	V_{IH}	$\lvert I_O\rvert$<1μA, V_O=0.5V or 4.5V	3.5	—	3.5	—	3.5	—	V
	10		$\lvert I_O\rvert$<1μA, V_O=1V or 9V	7	—	7	—	7	—	
	15		$\lvert I_O\rvert$<1μA, 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	120	ns
	10		—	30	60	
	15		—	20	40	
Output fall time	5	t_{THL}	—	60	120	ns
	10		—	30	60	
	15		—	20	40	
Propagation time ASTABLE, $\overline{\text{ASTABLE}}$→OSC, OUTPUT (L→H)	5	t_{PLH}	—	85	170	ns
	10		—	40	80	
	15		—	30	60	
Propagation time ASTABLE, $\overline{\text{ASTABLE}}$→OSC, OUTPUT (H→L)	5	t_{PHL}	—	95	190	ns
	10		—	45	90	
	15		—	30	60	
Propagation time ASTABLE, $\overline{\text{ASTABLE}}$→O, $\overline{\text{O}}$ (L→H)	5	t_{PLH}	—	130	260	ns
	10		—	60	120	
	15		—	45	90	
Propagation time ASTABLE, $\overline{\text{ASTABLE}}$→O, $\overline{\text{O}}$ (H→L)	5	t_{PHL}	—	150	300	ns
	10		—	65	130	
	15		—	50	100	
Propagation time ±TRIGGER→O, $\overline{\text{O}}$ (L→H)	5	t_{PLH}	—	155	310	ns
	10		—	65	130	
	15		—	50	100	
Propagation time ±TRIGGER→O, $\overline{\text{O}}$, (H→L)	5	t_{PHL}	—	160	320	ns
	10		—	65	130	
	15		—	50	100	
Propagation time +TRIGGER, RETRIGGER→O (L→H)	5	t_{PLH}	—	95	190	ns
	10		—	40	80	
	15		—	30	60	
Propagation time +TRIGGER, RETRIGGER→$\overline{\text{O}}$ (H→L)	5	t_{PHL}	—	65	130	ns
	10		—	30	60	
	15		—	25	50	
Propagation time MR→O (L→H)	5	t_{PLH}	—	100	200	ns
	10		—	45	90	
	15		—	35	70	
Propagation time MR→$\overline{\text{O}}$ (H→L)	5	t_{PHL}	—	100	200	ns
	10		—	45	90	
	15		—	35	70	
Minimum MR pulse width	5	t_{WMRH}	60	30	—	ns
	10		30	15	—	
	15		35	70	—	
Minimum input pulse width (Without MR)	5	t_w	220	110	—	ns
	10		100	50	—	
	15		70	35	—	
Input capacitance		C_I	—	—	7.5	pF

■ Logic Diagram



※Special input protection that allows operating input voltages outside the supply voltage lines. Compared to the standard input protection pin 3 is more sensitive to static discharge; extra handling precautions are recommended.

■ Truth Table

function	pins connected to V_{DD}	pins connected to V_{SS}	input pulse	output pulse from pins	output period or pulse width
Astable multivibrator					
free running	4, 5, 6, 14	7, 8, 9, 12	—	10, 11, 13	at pins 10, 11 :
true gating	4, 6, 14	7, 8, 9, 12	5	10, 11, 13	$t_A = 4.44 R_t C_t$
complement gating	6, 14	5, 7, 8, 9, 12	4	10, 11, 13	at pin 13 : $t_A = 2.20 R_t C_t$
Monostable multivibrator					
pos. edge-triggering	4, 14	5, 6, 7, 9, 12	8	10, 11	
neg. edge-triggering	4, 8, 14	5, 7, 9, 12	6	10, 11	at pins 10, 11 :
retriggerable	4, 14	5, 6, 7, 9	8, 12	10, 11	$t_M = 2.48 R_t C_t$
external count down*	14	5, 6, 7, 8, 9, 12	—	10, 11	

*Input pulse to RESET of external counting chip; external counting chip output to pin 4.

Note

In all cases, external resistor between pins 2 and 3, external capacitor between pins 1 and 3.

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