

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4538BP, TC4538BF

TC4538BP/TC4538BF DUAL PRECISION
RETRIGGERABLE / RESETTABLE MONOSTABLE MULTIVIBRATOR

The TC4538BP/BF is the retriggerable / resettable monostable multivibrator and the trigger operation can be made at either the leading or trailing edge by 2 inputs of A and B. Since the output monostable pulse width is decided by time constant of the external reistor (R_X) and the external capacitor (C_X), it becomes possible to set a broad range of output pulse widths.

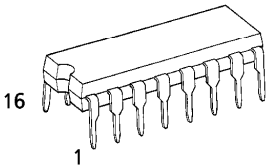
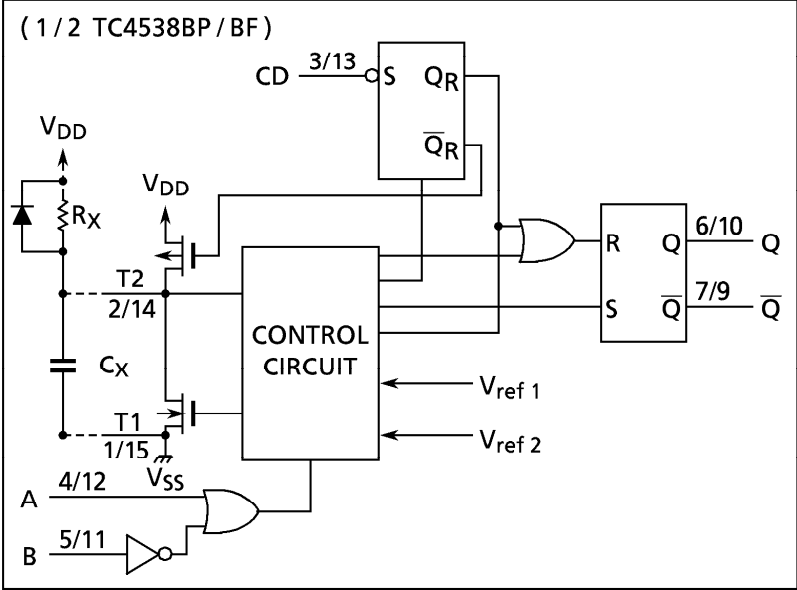
FEATURE :

- t_{wOUT} = 10ms ± 5% (at R_X = 100kΩ , C_X = 0.1μF , V_{DD} = 10V)

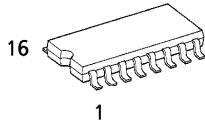
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V _{DD}	V _{SS} - 0.5 ~ V _{SS} + 20	V
Input Voltage	V _{IN}	V _{SS} - 0.5 ~ V _{DD} + 0.5	V
Output Voltage	V _{OUT}	V _{SS} - 0.5 ~ V _{DD} + 0.5	V
DC Input Current	I _{IN}	± 10	mA
Power Dissipation	P _D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T _{opr}	- 40 ~ 85	°C
Storage Temperature Range	T _{stg}	- 65 ~ 150	°C

LOGIC DIAGRAM

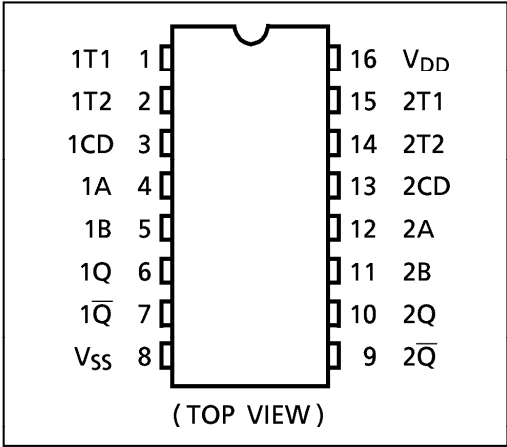


P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)



F (SOIC16-P-300-1.27)
Weight : 0.18g (Typ.)

PIN ASSIGNMENT



TRUTH TABLE

INPUTS			OUTPUTS		NOTE
A	B	CD	Q	Q̄	
	H	H			OUTPUT ENABLE
	L	H	L	H	INHIBIT
H		H	L	H	INHIBIT
L		H			OUTPUT ENABLE
*	*	L	L	H	INHIBIT

* Don't Care

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The diagram shows the timing of a monostable multivibrator. The signals are A, B, CD, Q, and $\bar{Q}$. The output Q is a pulse whose width is determined by the timing components. The pulse width is labeled t_{WOUT} . The diagram shows three trigger events (indicated by triangles) and one reset event (indicated by a triangle with a diagonal line). The first two triggers result in a pulse of width t_{WOUT} . The third trigger occurs while the pulse is still active, resulting in a shorter pulse width t_1 . The fourth trigger occurs after the pulse has ended, resulting in a pulse of width t_2 . The fifth trigger occurs while the pulse is still active, resulting in a shorter pulse width t_3 . The reset event occurs after the pulse has ended, resulting in a pulse of width t_{WOUT} .

Legend:

- ▲ : TRIGGER
- ▲▲ : RETRIGGER
- △ : RESET

Equations:

$$t_{WOUT} = C_X \cdot R_X$$

$$t_1 \cdot t_2 \cdot t_3 ; t_1 \cdot t_2 \cdot t_3 < t_{WOUT}$$

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RECOMMENDED OPERATING CONDITIONS ($V_{SS} = 0V$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V_{DD}		3	—	18	V
Input Voltage	V_{IN}		0	—	V_{DD}	V
External Resistance	R_X		5	—	1000	$k\Omega$
External Capacitance	C_X		No Limits			μF

STATIC ELECTRICAL CHARACTERISTICS ($V_{SS} = 0V$)

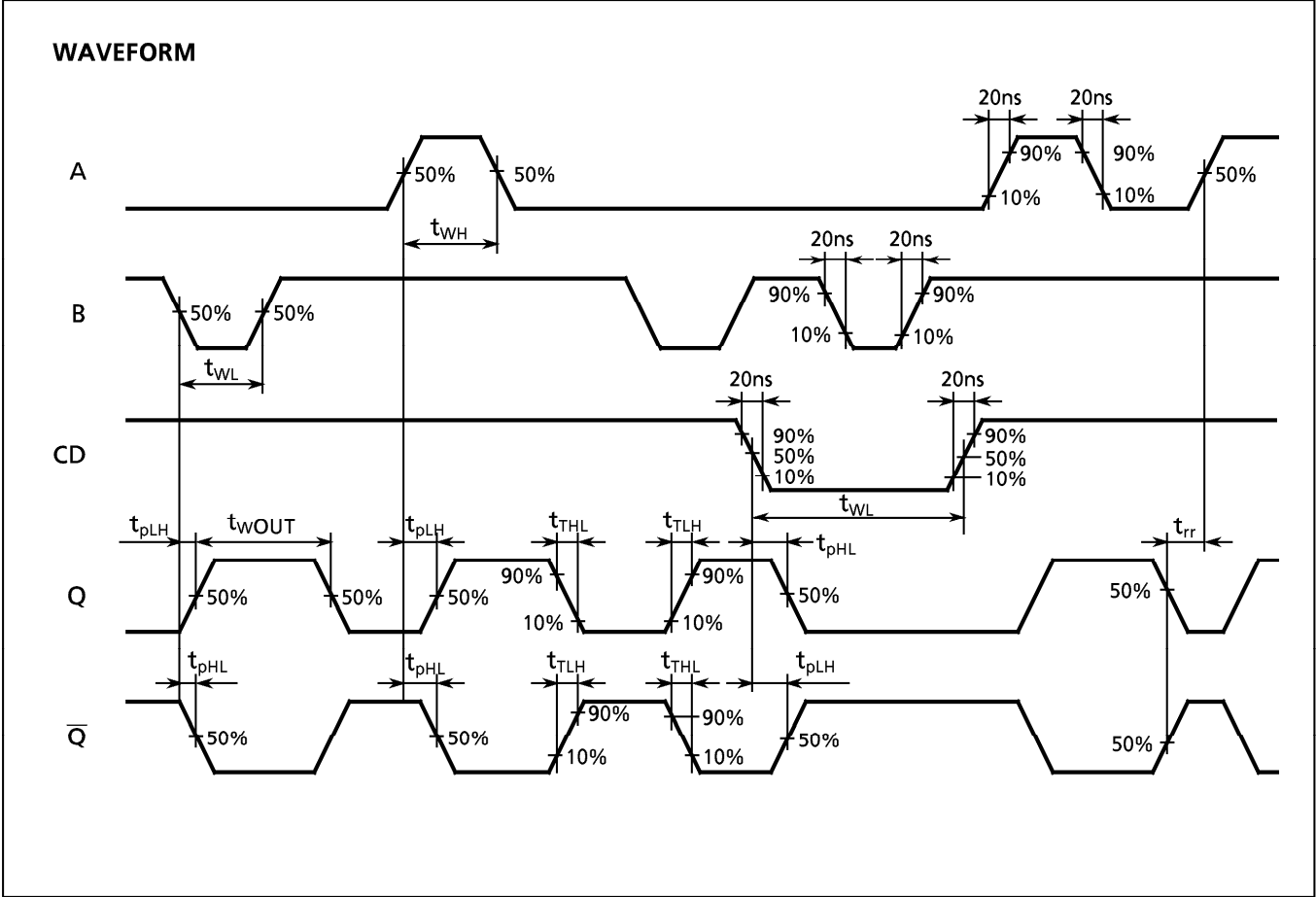
CHARACTERISTIC	SYM-BOL	TEST CONDITION	V_{DD} (V)	- 40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Output Voltage	V_{OH}	$ I_{OUT} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	4.95	—	4.95	5.00	—	4.95	—	V
			10	9.95	—	9.95	10.00	—	9.95	—	
			15	14.95	—	14.95	15.00	—	14.95	—	
Low-Level Output Voltage	V_{OL}	$ I_{OUT} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	—	0.05	—	0.00	0.05	—	0.05	V
			10	—	0.05	—	0.00	0.05	—	0.05	
			15	—	0.05	—	0.00	0.05	—	0.05	
Output High Current	I_{OH}	$V_{OH} = 4.6V$	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA
		$V_{OH} = 2.5V$	5	-2.50	—	-2.10	-4.0	—	-1.70	—	
		$V_{OH} = 9.5V$	10	-1.50	—	-1.30	-2.2	—	-1.10	—	
		$V_{OH} = 13.5V$	15	-4.00	—	-3.40	-9.0	—	-2.80	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Output Low Current	I_{OL}	$V_{OL} = 0.4V$	5	0.61	—	0.51	1.5	—	0.42	—	mA
		$V_{OL} = 0.5V$	10	1.50	—	1.30	3.8	—	1.10	—	
		$V_{OL} = 1.5V$	15	4.00	—	3.40	15.0	—	2.80	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Input High Voltage	V_{IH}	$V_{OUT} = 0.5V, 4.5V$	5	3.5	—	3.5	2.75	—	3.5	—	V
		$V_{OUT} = 1.0V, 9.0V$	10	7.0	—	7.0	5.50	—	7.0	—	
		$V_{OUT} = 1.5V, 13.5V$	15	11.0	—	11.0	8.25	—	11.0	—	
		$ I_{OUT} < 1\mu A$									
Input Low Voltage	V_{IL}	$V_{OUT} = 0.5V, 4.5V$	5	—	1.5	—	2.25	1.5	—	1.5	V
		$V_{OUT} = 1.0V, 9.0V$	10	—	3.0	—	4.50	3.0	—	3.0	
		$V_{OUT} = 1.5V, 13.5V$	15	—	4.0	—	6.75	4.0	—	4.0	
		$ I_{OUT} < 1\mu A$									
Input Current	"H" Level	I_{IH}	$V_{IH} = 18V$	18	—	0.1	—	10^{-5}	0.1	—	μA
	"L" Level	I_{IL}	$V_{IL} = 0V$	18	—	-0.1	—	-10^{-5}	-0.1	—	
Quiescent Supply Current	I_{DD}	$V_{IN} = V_{SS}, V_{DD} *$	5	—	5	—	0.005	5	—	150	μA
			10	—	10	—	0.010	10	—	300	
			15	—	20	—	0.015	20	—	600	

* All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)

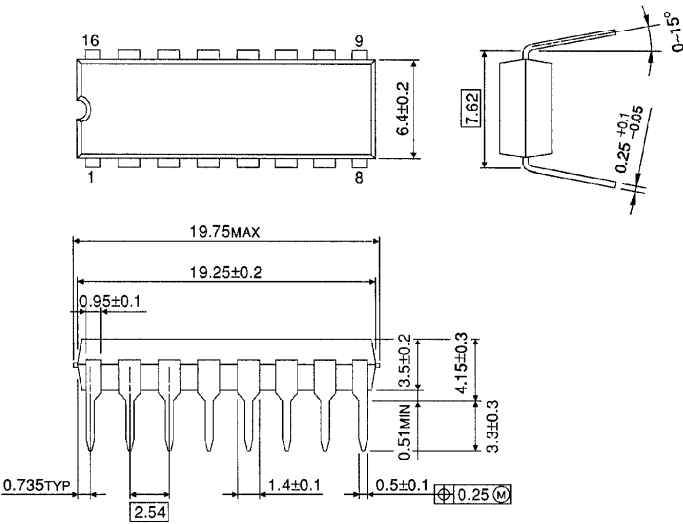
CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t _{TLH}		5 10 15	— — —	80 50 40	200 100 80	ns
Output Transition Time (High to Low)	t _{THL}		5 10 15	— — —	80 50 40	200 100 80	
Propagation Delay Time (A, B - Q, Q̄)	t _{pLH} t _{pHL}		5 10 15	— — —	380 150 100	760 300 220	ns
Propagation Delay Time (CD - Q,)	t _{pLH} t _{pHL}		5 10 15	— — —	280 110 75	560 250 190	
Min. Input Pulse Width (A, B)	t _{WH} t _{WL}		5 10 15	— — —	60 30 25	120 60 50	ns
Min. Pulse Width (CD)	t _{WL}		5 10 15	— — —	95 45 35	190 90 70	
Min. Retrigger Time	t _{rr}		5 10 15	— — —	0 0 0	— — —	ns
Output Pulse Width	t _{WOUT}	R _X = 100kΩ C _X = 0.002μF	5	—	206	—	μs
			10	—	204	—	
			15	—	205	—	
		R _X = 100kΩ C _X = 0.1μF	5	9.30	9.95	10.40	ms
			10	9.50	10.00	10.50	
			15	9.55	10.05	10.65	
		R _X = 100kΩ C _X = 10μF	5	—	0.98	—	s
			10	—	1.00	—	
			15	—	1.01	—	
Pulse Width Match between circuits in the same package	Δt _{WOUT}	$\frac{t_{WOUT}(Q2) - t_{WOUT}(Q1)}{t_{WOUT}(Q1)} \times 100$	5 10 15	— — —	± 1 ± 1 ± 1	— — —	%
Input Capacitance	C _{IN}			—	5	7.5	pF

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS



DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54)

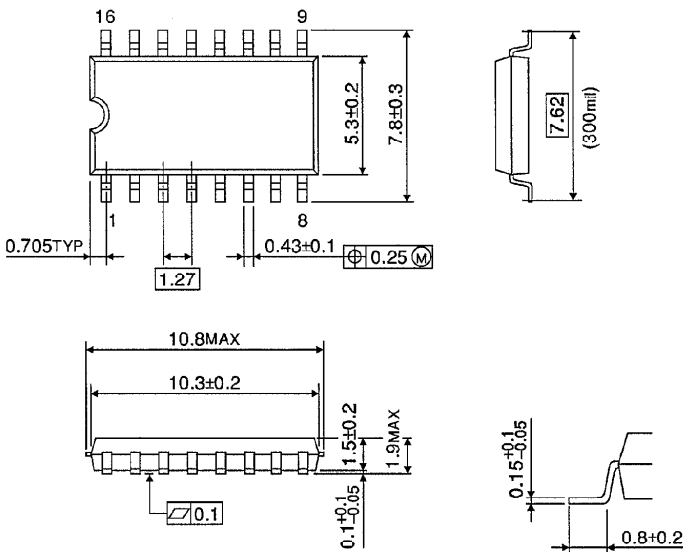
Unit in mm



Weight : 1.00g (Typ.)

SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

Unit in mm



Weight : 0.18g (Typ.)