TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

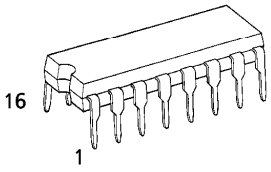
TC4538BP, TC4538BF

TC4538BP / TC4538BF DUAL PRECISION RETRIGGERABLE / RESETTABLE MONOSTABLE MULTIVIBRATOR

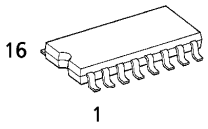
The TC4538BP / BF is the retriggerable / resettable monostable multivibrator and the trigger operation can be made at either the leading or trailing edge by 2 inputs of A and B. Since the output monostable pulse width is decided by time constant of the external reistor (R_X) and the external capacitor (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)



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



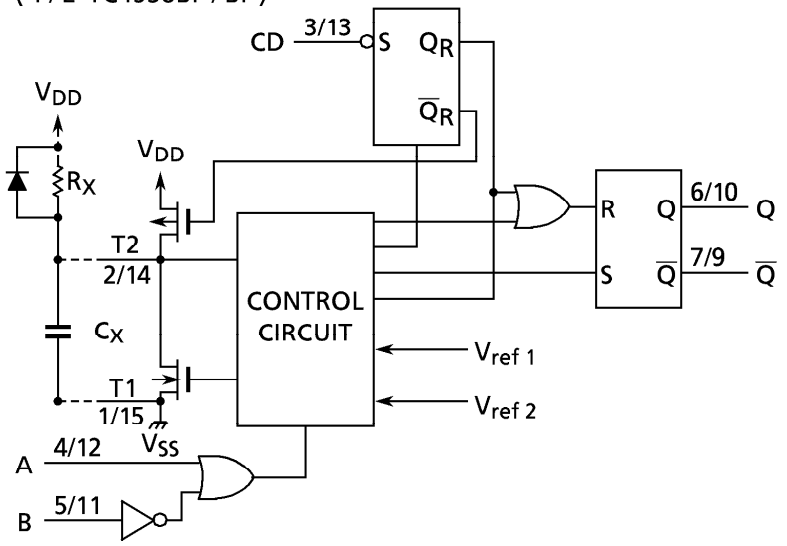
F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

MAXIMUM RATINGS

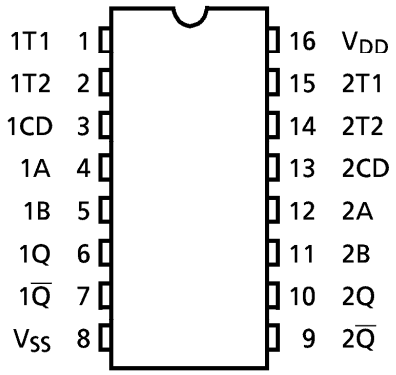
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	V_{SS} – 0.5 ~ V_{SS} + 20	V
Input Voltage	V_{IN}	V_{SS} – 0.5 ~ V_{DD} + 0.5	V
Output Voltage	V_{OUT}	V_{SS} – 0.5 ~ V_{DD} + 0.5	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T_{opr}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

LOGIC DIAGRAM

(1 / 2 TC4538BP / BF)



PIN ASSIGNMENT



(TOP VIEW)

TRUTH TABLE

INPUTS			OUTPUTS		NOTE
A	B	CD	Q	Q	
↓	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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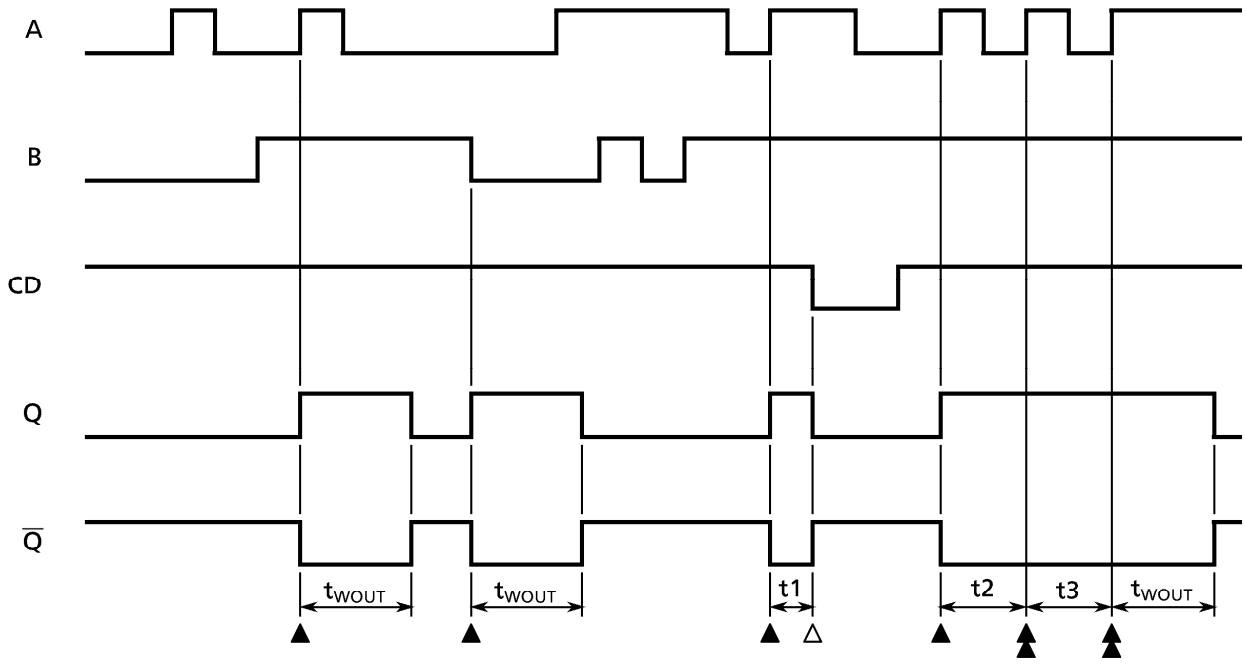
TIMING CHART



▲ : TRIGGER
▲▲ : RETRIGGER
△ : RESET

$t_{WOUT} = C_X \cdot R_X$

$t1 \cdot t2 \cdot t3$; $t1 \cdot t2 \cdot t3 < t_{WOUT}$

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	kΩ
External Capacitance	C_X		No Limits			μF

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD} (V)	−40°C MIN.	−40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNIT
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	
			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	—	
		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_{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	—	1.0	μA
Input Current "L" Level	I_{IL}	V_{IL} = 0V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	
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	

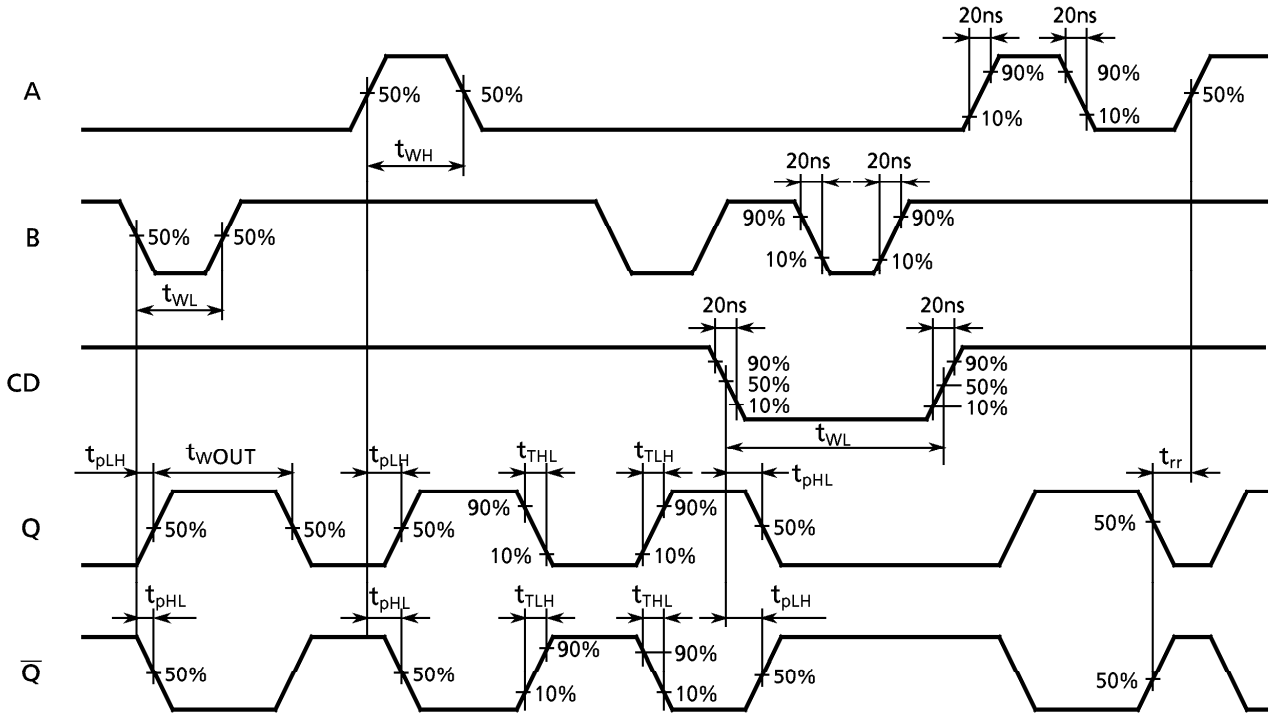
* All valid input combinations.

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

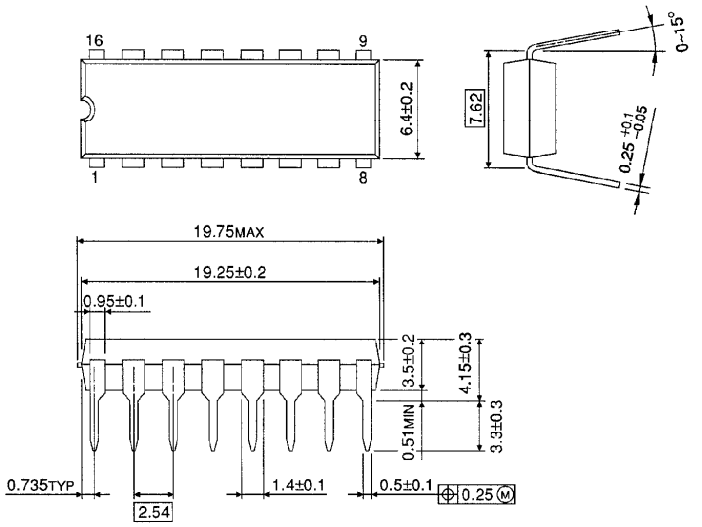
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}		5	—	80	200	ns
			10	—	50	100	
			15	—	40	80	
Output Transition Time (High to Low)	t_{THL}		5	—	80	200	
			10	—	50	100	
			15	—	40	80	
Propagation Delay Time (A, B - Q, $\overline{Q}$)	t_{pLH} t_{pHL}		5	—	380	760	ns
			10	—	150	300	
			15	—	100	220	
Propagation Delay Time (CD - Q,)	t_{pLH} t_{pHL}		5	—	280	560	
			10	—	110	250	
			15	—	75	190	
Min. Input Pulse Width (A, B)	t_{WH} t_{WL}		5	—	60	120	ns
			10	—	30	60	
			15	—	25	50	
Min. Pulse Width (CD)	t_{WL}		5	—	95	190	
			10	—	45	90	
			15	—	35	70	
Min. Retrigger Time	t_{rr}		5	—	0	—	ns
			10	—	0	—	
			15	—	0	—	
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	$\triangle t_{WOUT}$	$\frac{t_{WOUT}(Q2)-t_W(Q1)}{t_{WOUT}(Q1)} \times 100$	5	—	±1	—	%
			10	—	±1	—	
			15	—	±1	—	
Input Capacitance	C_{IN}			—	5	7.5	pF

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

WAVEFORM

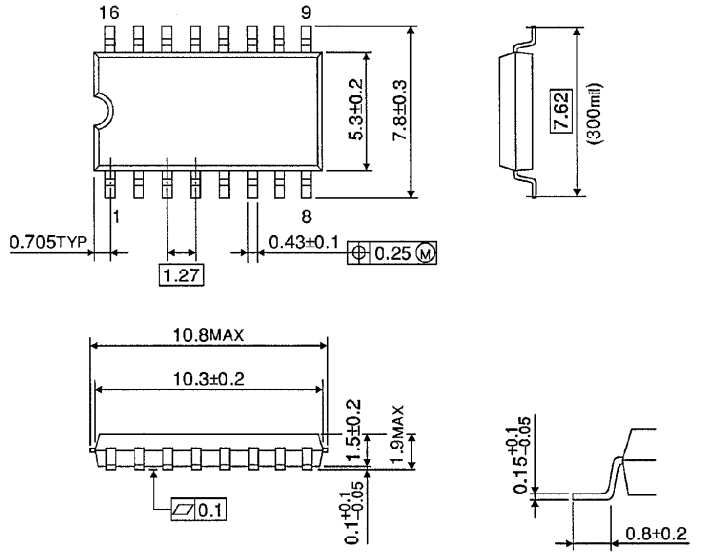


DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

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



Weight : 0.18g (Typ.)