TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4520BP, TC4520BF, TC4520BFN

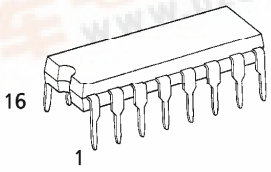
TC4520BP / BF / BFN DUAL BINARY UP COUNTER

TC4520B is up counters of 4 bit binary.

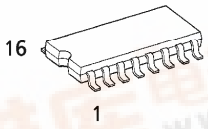
Since both of TC4520B contain two independent circuits of counters with the same functions in one package, counting or frequency division of two BCD digits or eight binary bits can be achived with one IC. The counters can be reset to "O" (Q0~Q3="L") by giving "H" level signal to RESET input regardless of other inputs.

The counting condition is changed by the rising edge of CLOCK input if ENABLE="H" or by the falling edge of ENABLE if CLOCK="L".

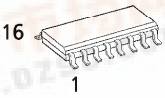
(Note) The JEDEC SOP (FN) is not available in Japan.



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



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

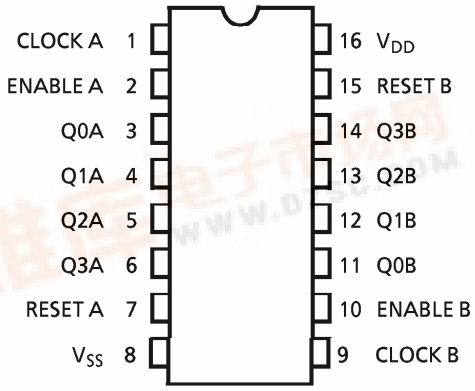


FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS}-0.5 \sim V_{SS}+20$	V
Input Voltage	V_{IN}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Voltage	V_{OUT}	$V_{SS}-0.5 \sim V_{DD}+0.5$	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

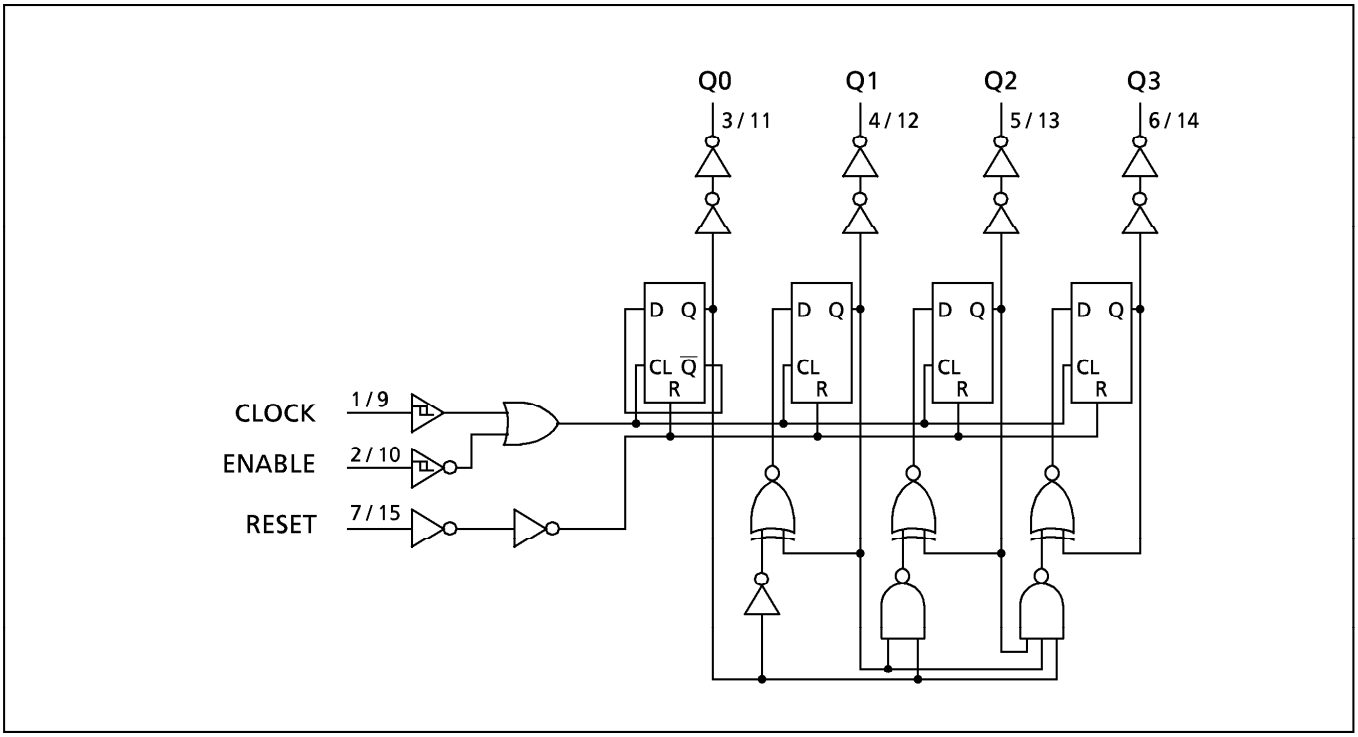
PIN ASSIGNMENT



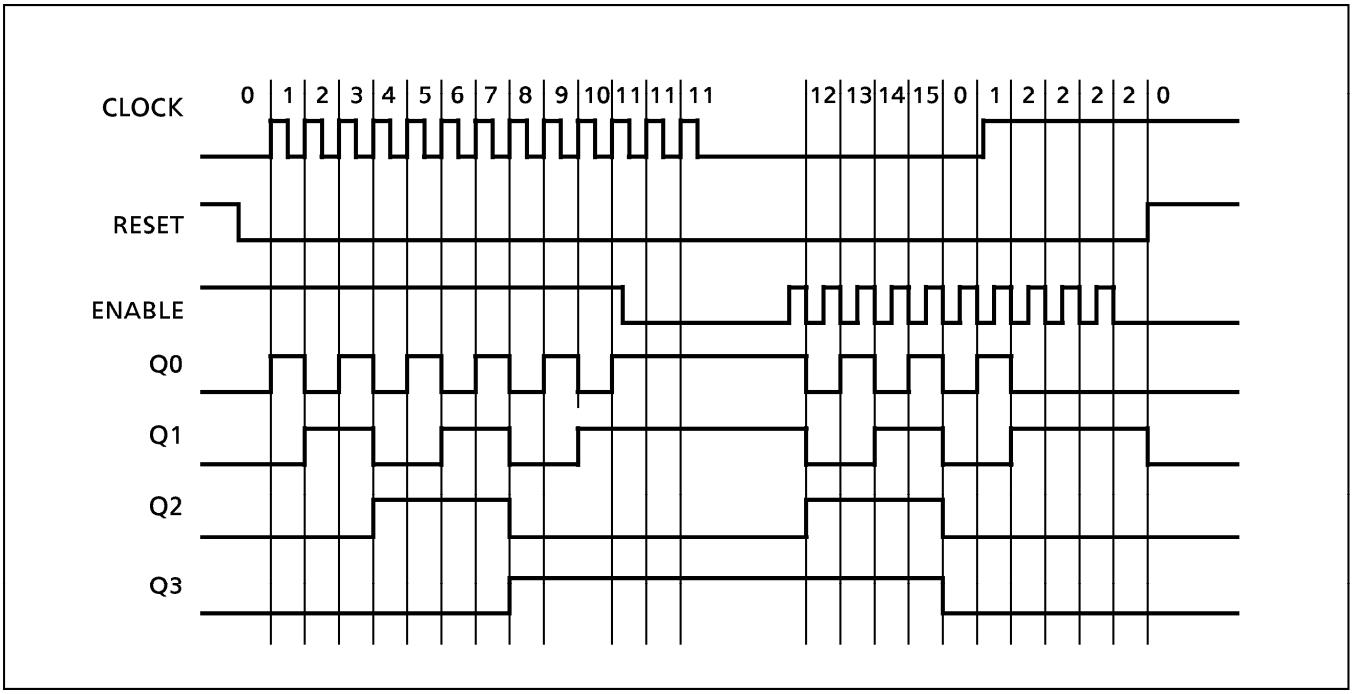
(TOP VIEW)

961001EBA2

LOGIC DIAGRAM



TIMING CHART



961001EBA2'

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
DC Supply Voltage	V_{DD}		3	—	18	V
Input Voltage	V_{IN}		0	—	V_{DD}	V

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

CHARACTERISTIC		SYMBOL	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 10 15	4.95 9.95 14.95	— — —	4.95 9.95 14.95	5.00 10.00 15.00	— — —	4.95 9.95 14.95	— — —	V
Low-Level Output Voltage		V_{OL}	$\|I_{OUT}\| < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5 10 15	— — —	0.05 0.05 0.05	— — —	0.00 0.00 0.00	0.05 0.05 0.05	— — —	0.05 0.05 0.05	
Output High Current		I_{OH}	V_{OH} = 4.6V V_{OH} = 2.5V V_{OH} = 9.5V V_{OH} = 13.5V $V_{IN} = V_{SS}, V_{DD}$	5 5 10 15	−0.61 −2.5 −1.5 −4.0	— — — —	−0.51 −2.1 −1.3 −3.4	−1.0 −4.0 −2.2 −9.0	— — — —	−0.42 −1.7 −1.1 −2.8	— — — —	mA
Output Low Current		I_{OL}	V_{OL} = 0.4V V_{OL} = 0.5V V_{OL} = 1.5V $V_{IN} = V_{SS}, V_{DD}$	5 10 15	0.61 1.5 4.0	— — —	0.51 1.3 3.4	1.2 3.2 12.0	— — —	0.42 1.1 2.8	— — —	
Input High Voltage		V_{IH}	V_{OUT} = 0.5V, 4.5V V_{OUT} = 1.0V, 9.0V V_{OUT} = 1.5V, 13.5V $\|I_{OUT}\| < 1\mu A$	5 10 15	3.5 7.0 11.0	— — —	3.5 7.0 11.0	2.75 5.5 8.25	— — —	3.5 7.0 11.0	— — —	V
Input Low Voltage		V_{IL}	V_{OUT} = 0.5V, 4.5V V_{OUT} = 1.0V, 9.0V V_{OUT} = 1.5V, 13.5V $\|I_{OUT}\| < 1\mu A$	5 10 15	— — —	1.5 3.0 4.0	— — —	2.25 4.5 6.75	1.5 3.0 4.0	— — —	1.5 3.0 4.0	
Input Current	"H"Level	I_{IH}	V_{IH} = 18V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
	"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 10 15	— — —	5 10 20	— — —	0.005 0.010 0.015	5 10 20	— — —	150 300 600	

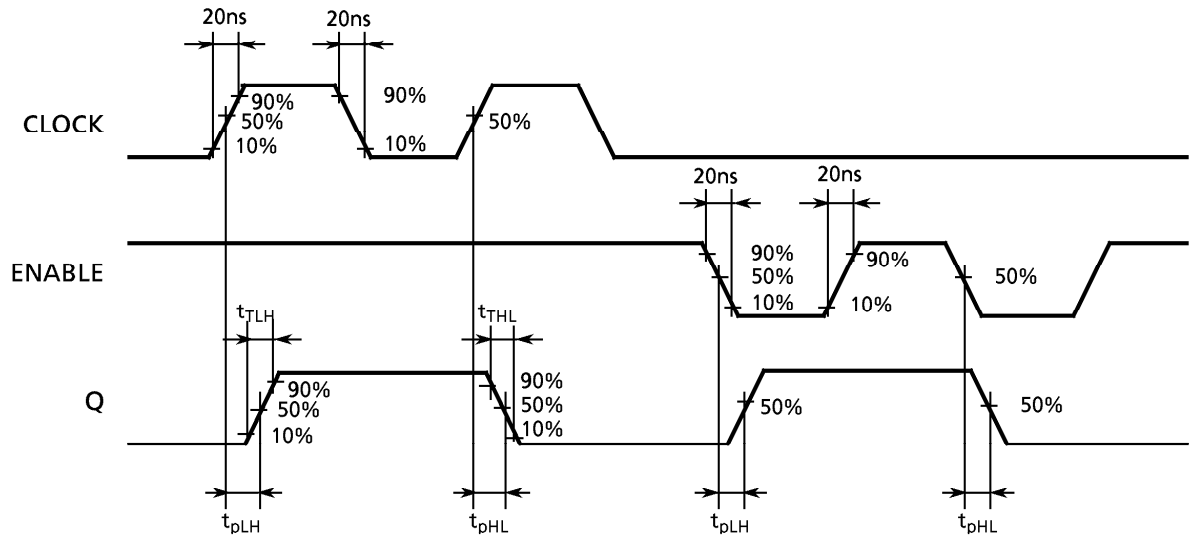
* All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{SS} = 0V, C_L = 50pF)

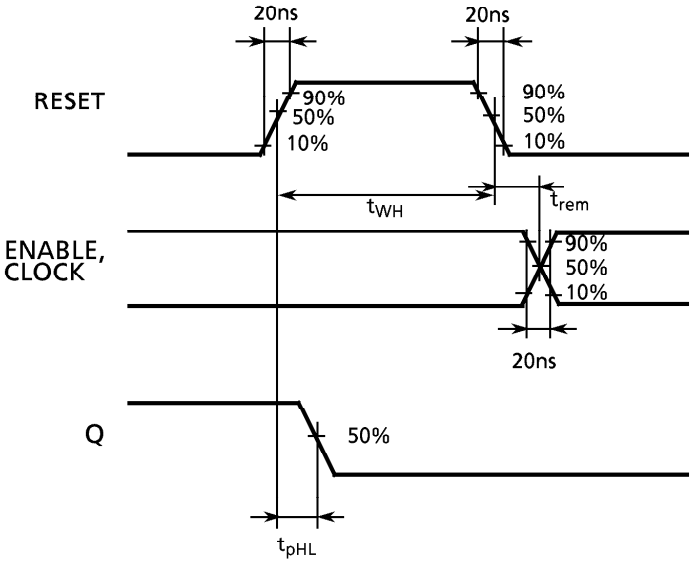
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time (High to Low)	t_{THL}		5	—	70	200	
			10	—	35	100	
			15	—	30	80	
Propagation Delay Time (CLOCK, ENABLE - Q)	t_{pLH} t_{pHL}		5	—	160	560	ns
			10	—	75	230	
			15	—	60	160	
Propagation Delay Time (RESET - Q)	t_{pHL}		5	—	110	560	ns
			10	—	55	230	
			15	—	40	160	
Max. Clock Frequency	t_{CL}		5	1.5	6	—	MHz
			10	3	14	—	
			15	4	18	—	
Max. Clock Input Rise / Fall Time	t_{rCL} t_{fCL}		5	No Limit			μs
			10				
			15				
Max. Input Rise / Fall Time (ENABLE)	t_r t_f		5	No Limit			
			10				
			15				
Min. Clock Pulse Width	t_W		5	—	30	200	ns
			10	—	15	100	
			15	—	10	70	
Min. Pulse Width (ENABLE)	t_W		5	—	35	250	
			10	—	20	110	
			15	—	15	80	
Min. Pulse Width (RESET)	t_{WH}		5	—	45	250	
			10	—	20	110	
			15	—	15	80	
Min. Removal Time (RESET - CLOCK, ENABLE)	t_{rem}		5	—	—	0	
			10	—	—	0	
			15	—	—	0	
Input Capacitance	C_{IN}			—	5	7.5	pF

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

WAVEFORM 1

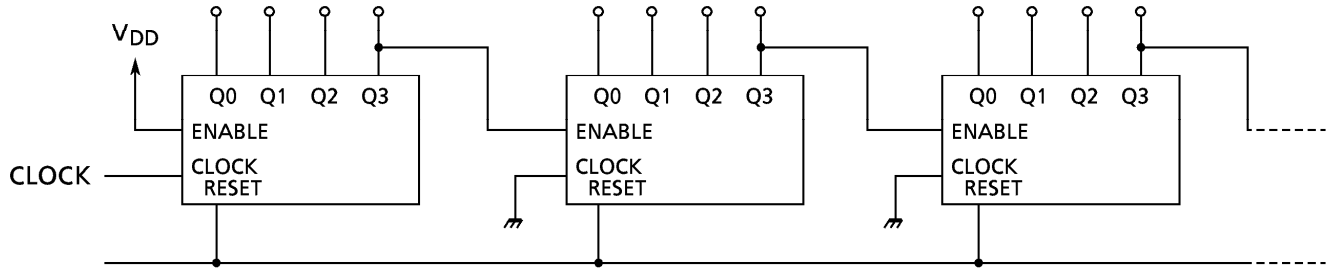


WAVEFORM 2

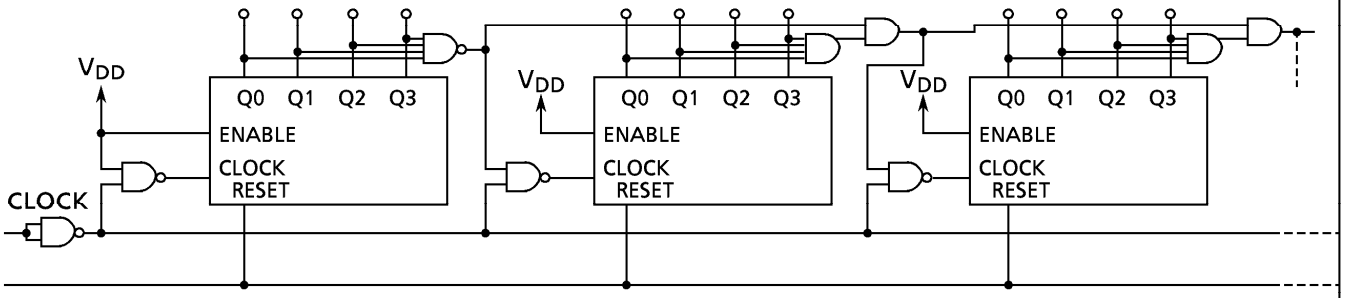


APPLICATION CIRCUIT

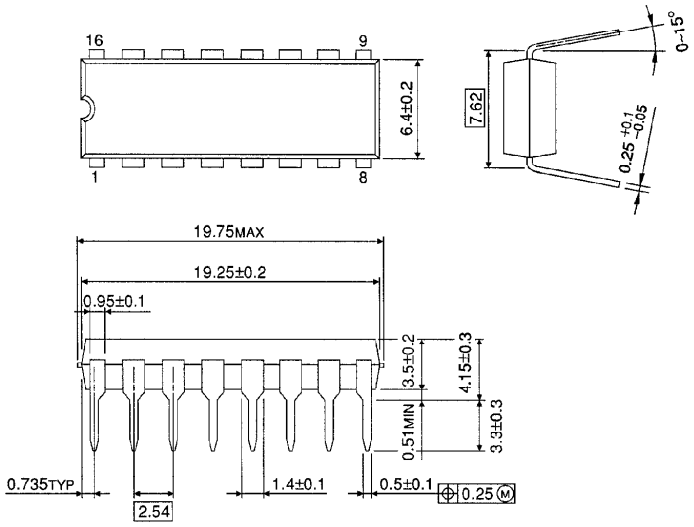
(1) RIPPLE CARRY COUNTER



(2) RIPPLE CARRY COUNTER

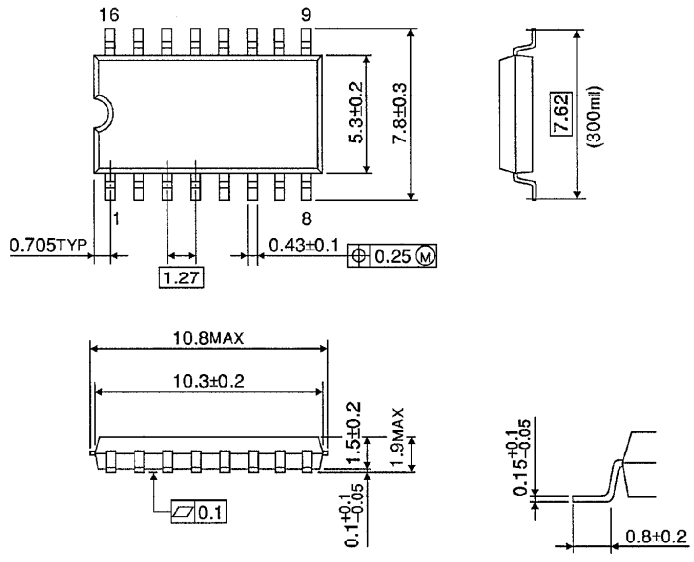


DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

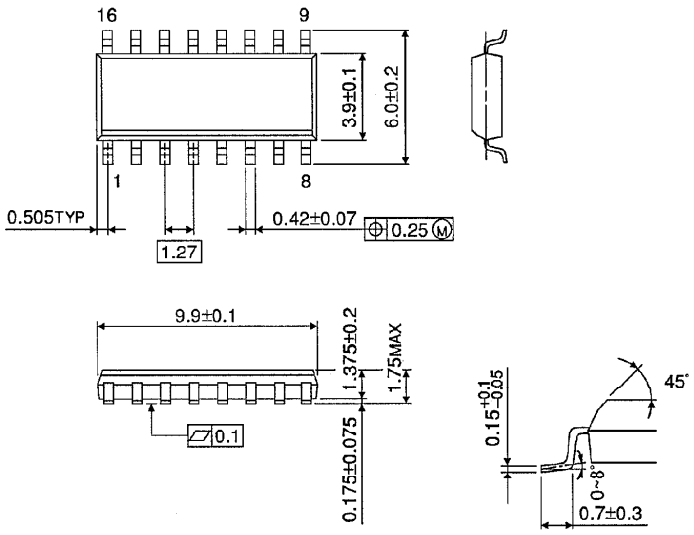
SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)