

TC4520BFN

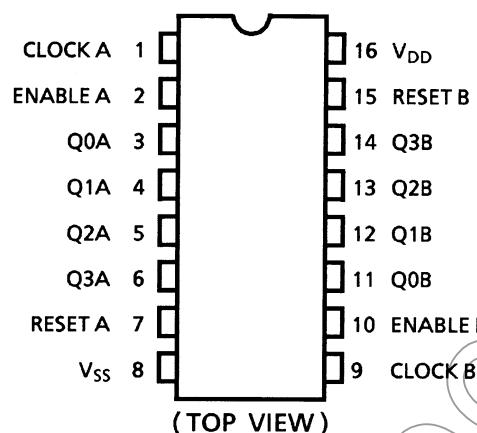
TC4520B Dual Binary Up Counter

TC4520B is up counters of 4 bit binary.

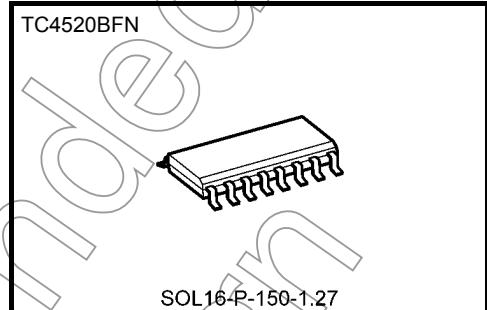
Since both of TC4520B contain two independent circuits of counters with the same functions in one package, counting or frequency division of eight binary bits can be achieved with one IC. The counters can be reset to "0" (Q0 to Q3 = "L") by giving "H" level signal to RESET input regardless of other inputs.

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".

Pin Assignment



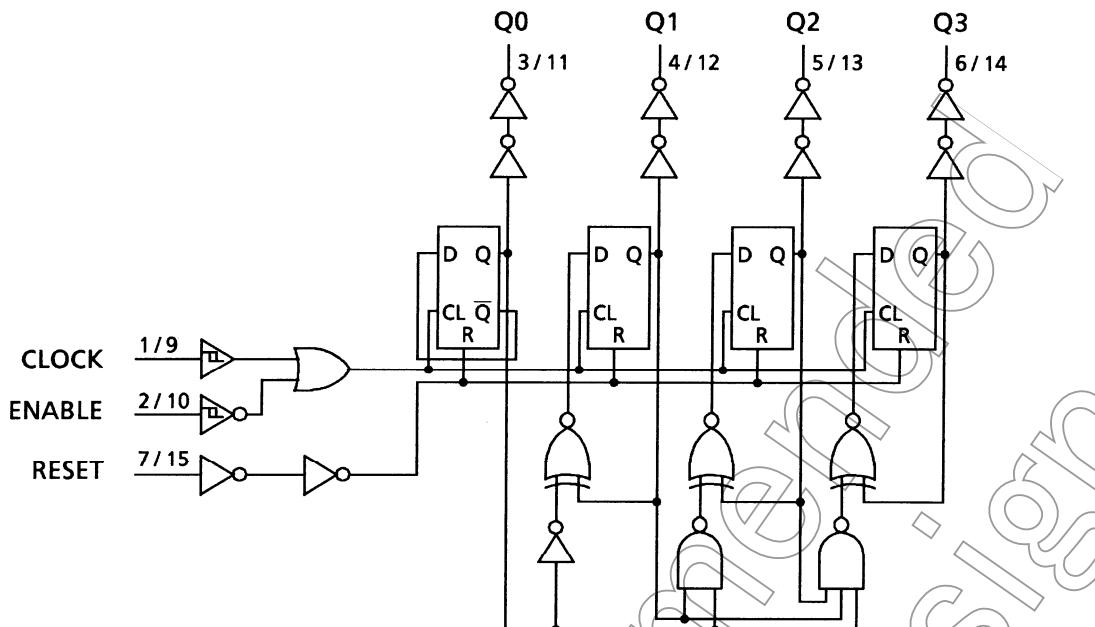
Note: xxxFN (JEDEC SOP) is not available in Japan.



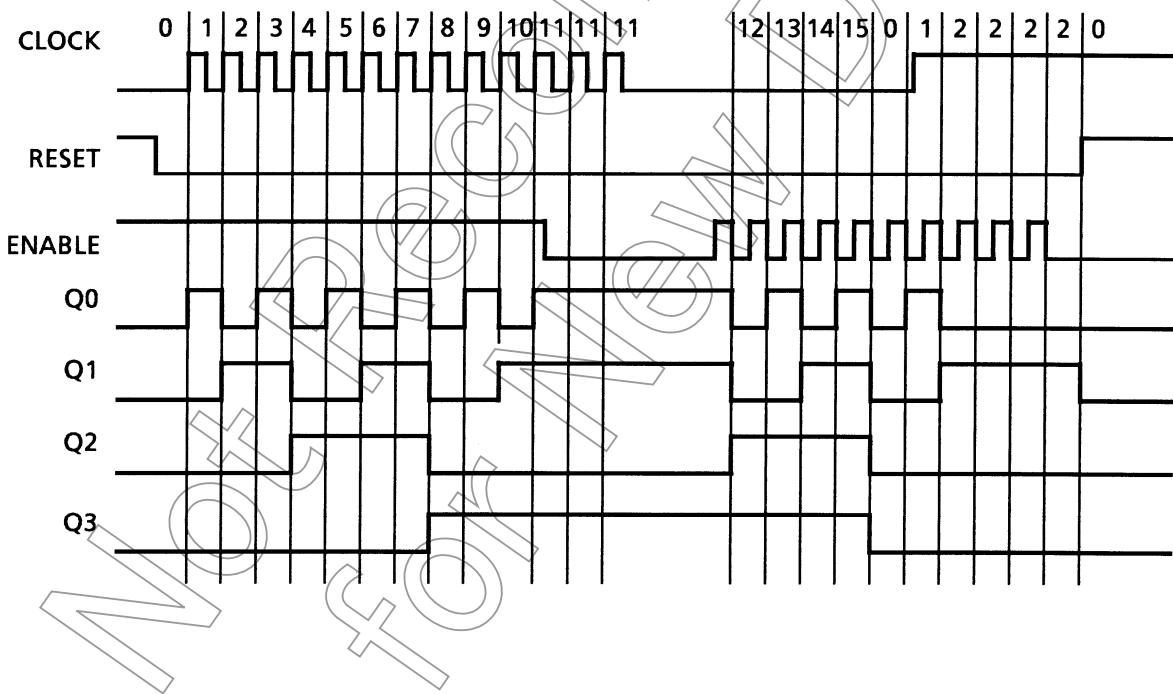
Weight
SOL16-P-150-1.27 : 0.13 g (typ.)

Logic Diagram

1/2 TC4520B



Timing Chart



Absolute Maximum Ratings (Note)

Characteristics	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	180	mW
Operating temperature range	T_{opr}	-40 to 85	°C
Storage temperature range	T_{stg}	-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Operating Ranges ($V_{SS} = 0$ V) (Note)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
DC supply voltage	V_{DD}		3	—	18	V
Input voltage	V_{IN}	—	0	—	V_{DD}	V

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{DD} or V_{SS} .

Static Electrical Characteristics (V_{SS} = 0 V)

Characteristics	Symbol	Test Condition	-40°C		25°C			85°C		Unit		
			V _{DD} (V)	Min	Max	Min	Typ.	Max	Min			
High-level output voltage	V _{OH}	I _{OUT} < 1 μA 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 μA 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} = 4.6 V	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA	
		V _{OH} = 2.5 V	5	-2.5	—	-2.1	-4.0	—	-1.7	—		
		V _{OH} = 9.5 V	10	-1.5	—	-1.3	-2.2	—	-1.1	—		
		V _{OH} = 13.5 V	15	-4.0	—	-3.4	-9.0	—	-2.8	—		
		V _{IN} = V _{SS} , V _{DD}										
Output low current	I _{OL}	V _{OL} = 0.4 V	5	0.61	—	0.51	1.2	—	0.42	—	mA	
		V _{OL} = 0.5 V	10	1.5	—	1.3	3.2	—	1.1	—		
		V _{OL} = 1.5 V	15	4.0	—	3.4	12.0	—	2.8	—		
		V _{IN} = V _{SS} , V _{DD}										
Input high voltage	V _{IH}	V _{OUT} = 0.5 V, 4.5 V	5	3.5	—	3.5	2.75	—	3.5	—	V	
		V _{OUT} = 1.0 V, 9.0 V	10	7.0	—	7.0	5.5	—	7.0	—		
		V _{OUT} = 1.5 V, 13.5 V	15	11.0	—	11.0	8.25	—	11.0	—		
		I _{OUT} < 1 μA										
Input low voltage	V _{IL}	V _{OUT} = 0.5 V, 4.5 V	5	—	1.5	—	2.25	1.5	—	1.5	V	
		V _{OUT} = 1.0 V, 9.0 V	10	—	3.0	—	4.5	3.0	—	3.0		
		V _{OUT} = 1.5 V, 13.5 V	15	—	4.0	—	6.75	4.0	—	4.0		
		I _{OUT} < 1 μA										
Input current	"H" level	I _{IH}	V _{IH} = 18 V	18	—	0.1	—	10 ⁻⁵	0.1	—	1.0	μA
	"L" level	I _{IL}	V _{IL} = 0 V	18	—	-0.1	—	-10 ⁻⁵	-0.1	—	-1.0	
Quiescent supply current	I _{DD}	V _{IN} = V _{SS} , V _{DD} (Note)	5	—	5	—	0.005	5	—	150	μA	
			10	—	10	—	0.010	10	—	300		
			15	—	20	—	0.015	20	—	600		

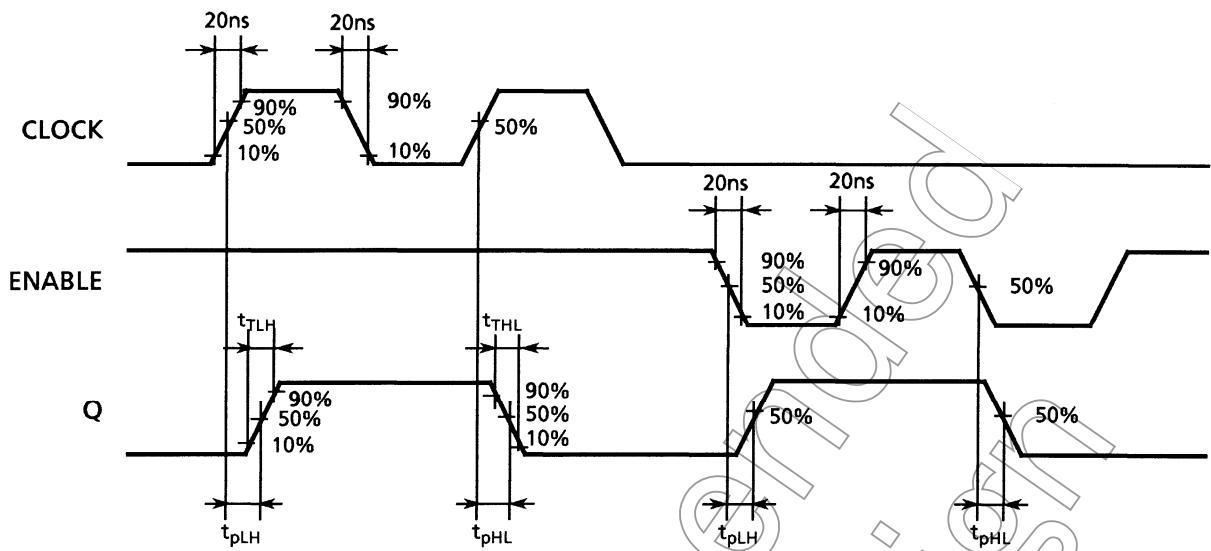
Note: All valid input combinations.

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

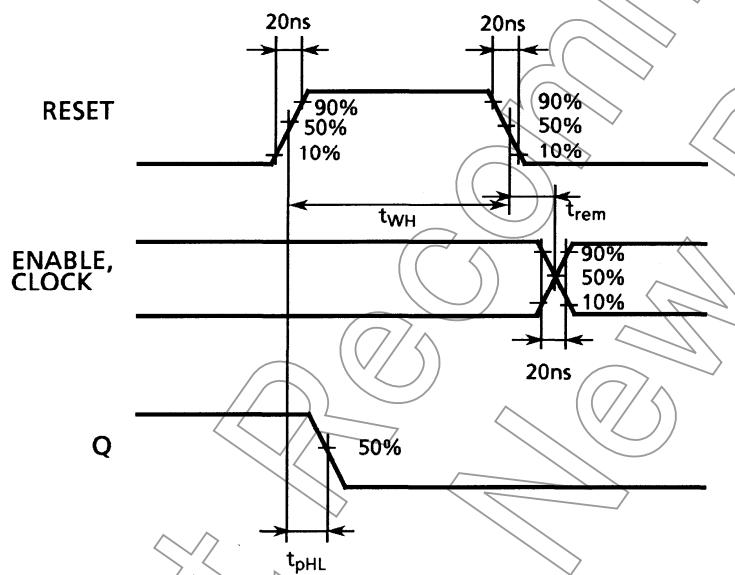
Characteristics	Symbol	Test Condition	V _{DD} (V)	Min	Typ.	Max	Unit
			5				
Output transition time (low to high)	t _{TLH}	—	10	—	35	100	ns
			15	—	30	80	ns
			—	—	—	—	ns
Output transition time (high to low)	t _{THL}	—	5	—	70	200	ns
			10	—	35	100	ns
			15	—	30	80	ns
Propagation delay time (CLOCK, ENABLE-Q)	t _{pLH}	—	5	—	160	560	ns
			10	—	75	230	ns
			15	—	60	160	ns
Propagation delay time (RESET-Q)	t _{pHL}	—	5	—	110	560	ns
			10	—	55	230	ns
			15	—	40	160	ns
Max clock frequency	t _{CL}	—	5	1.5	6	—	MHz
			10	3	14	—	MHz
			15	4	18	—	MHz
Max clock input rise/fall time	t _{rCL}	—	5	—	No limit		
			10	—	No limit		
			15	—	No limit		
Max input rise/fall time (ENABLE)	t _r	—	5	—	No limit		
			10	—	No limit		
			15	—	No limit		
Min clock pulse width	t _W	—	5	—	30	200	ns
			10	—	15	100	ns
			15	—	10	70	ns
Min pulse width (ENABLE)	t _W	—	5	—	35	250	ns
			10	—	20	110	ns
			15	—	15	80	ns
Min pulse width (RESET)	t _{WH}	—	5	—	45	250	ns
			10	—	20	110	ns
			15	—	15	80	ns
Min removal time (RESET-CLOCK, ENABLE)	t _{rem}	—	5	—	—	0	ns
			10	—	—	0	ns
			15	—	—	0	ns
Input capacitance	C _{IN}	—	—	—	5	7.5	pF

Waveforms for Measurement of Dynamic Characteristics

Waveform 1

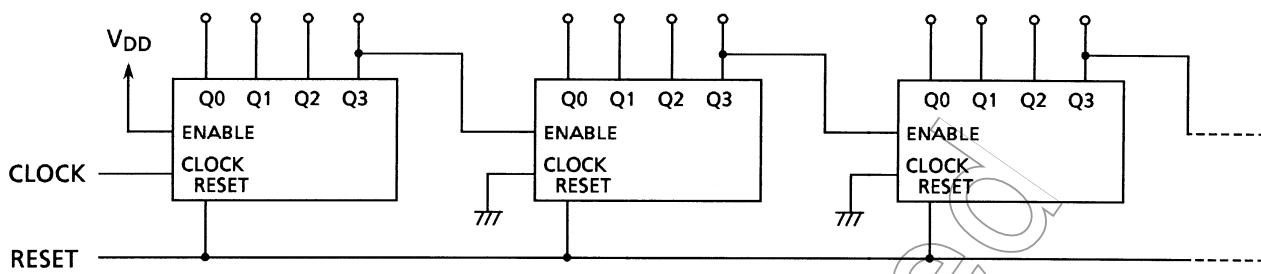


Waveform 2

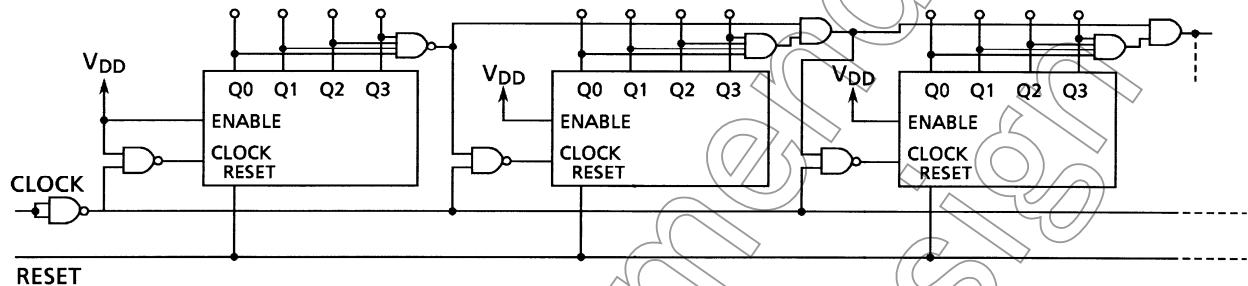


Application Circuit

Ripple carry counter



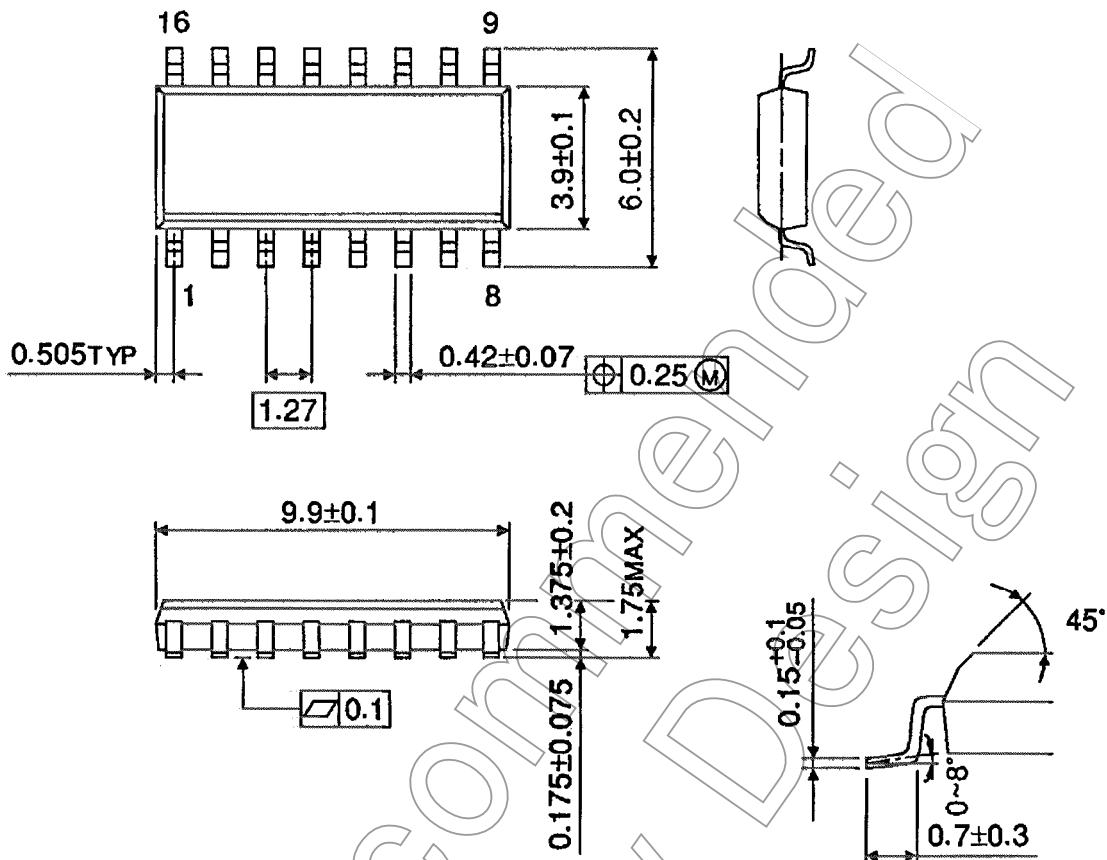
Ripple carry counter



Package Dimensions (Note)

SOL16-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.13 g (typ.)

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