HD14518B, HD14520B

Dual BCD Up Counter HD14518B
Dual Binary Up Counter HD14520B

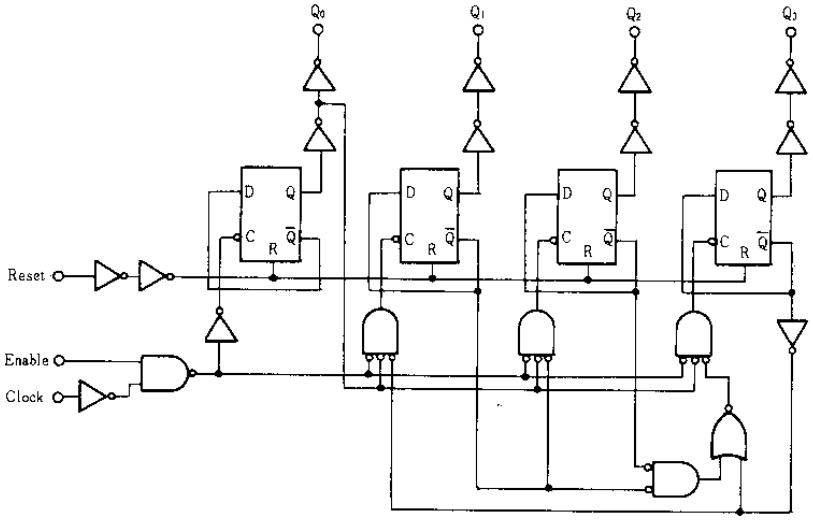
The HD14518B dual BCD counter and the HD14520B dual binary counter consist of two identical, independent, internally synchronous 4-stage counters. The counter stages are type D flip-flops, with interchangeable Clock and Enable lines for incrementing on either the positive-going or negative-going transition as required when cascading multiple stages. Each counter can be cleared by applying a high level on the Reset line. In addition, the HD14518B will count out of all undefined states within two clock periods. These complementary MOS up counters find primary use in multi-stage synchronous or ripple counting applications requiring low power dissipation and/or high noise immunity.

FEATURES

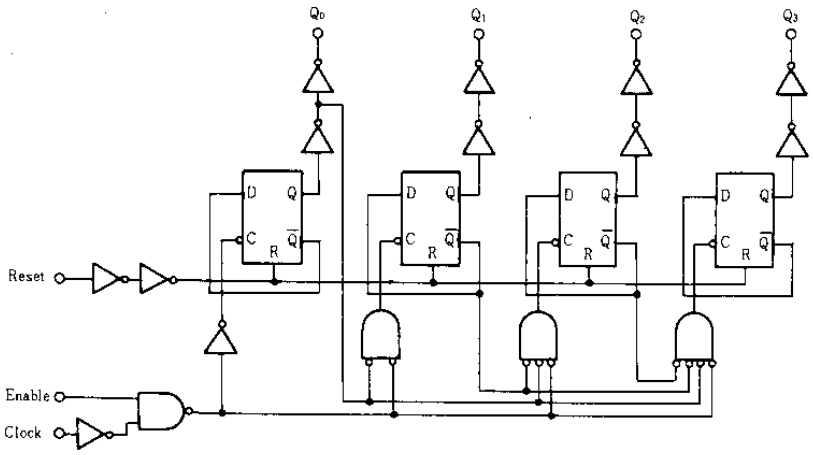
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Internally Synchronous for High Internal and External Speeds
- Logic Edge-clocked Design ... Incremented on Positive Transition of Clock or Negative Transition of Enable
- 6MHz Counting Rate
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

LOGIC DIAGRAM

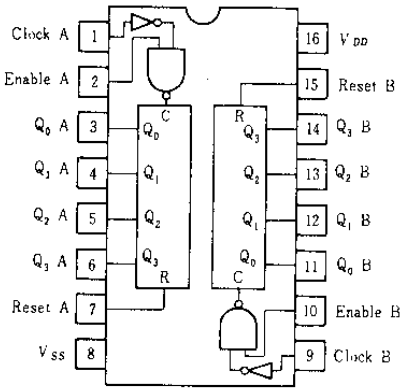
● HD14518B (1/2)



● HD14520B (1/2)



PIN ARRANGEMENT



(Top View)

TRUTH TABLE

Clock	Enable	Reset	Action
⌐	1	0	Increment Counter
0	¬	0	Increment Counter
¬	×	0	No Change
×	⌐	0	No Change
⌐	0	0	No Change
1	¬	0	No Change
×	×	1	$Q_0 \sim Q_3 = 0$

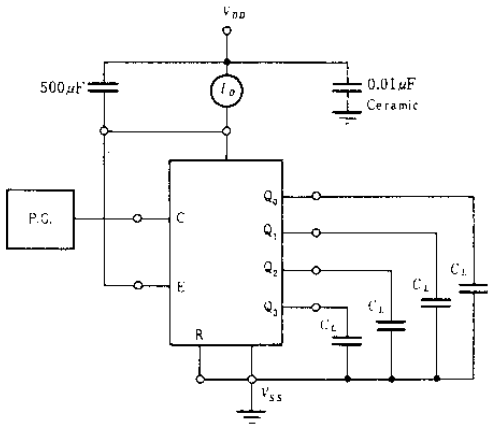
x = Don't Care

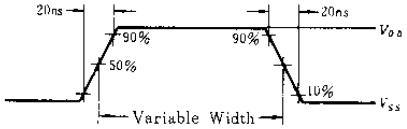
■ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
Output Voltage 圧	V_{OL}	5.0	$V_{in}=V_{DD}$ or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V_{OH}	5.0	$V_{in}=0$ or V_{DD}	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	V_{IL}	5.0	$V_{out}=4.5$ or 0.5V	—	1.5	—	2.25	1.5	—	1.5	V
		10	$V_{out}=9.0$ or 1.0V	—	3.0	—	4.50	3.0	—	3.0	
		15	$V_{out}=13.5$V or 1.5V	—	4.0	—	6.75	4.0	—	4.0	
	V_{IH}	5.0	$V_{out}=0.5$ or 4.5V	3.5	—	3.5	2.75	—	3.5	—	V
		10	$V_{out}=1.0$ or 9.0V	7.0	—	7.0	5.50	—	7.0	—	
		15	$V_{out}=1.5$ or 13.5V	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current	I_{OH}	5.0	$V_{OH}=2.5$V	−1.0	—	−0.8	−1.7	—	−0.6	—	mA
		5.0	$V_{OH}=4.6$V	−0.2	—	−0.16	−0.36	—	−0.12	—	
		10	$V_{OH}=9.5$V	−0.5	—	−0.4	−0.9	—	−0.3	—	
		15	$V_{OH}=13.5$V	−1.4	—	−1.2	−3.5	—	−1.0	—	
	I_{OL}	5.0	$V_{OL}=0.4$V	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL}=0.5$V	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL}=1.5$V	3.6	—	3.0	8.8	—	2.4	—	
Input Current	I_{in}	15		—	±0.3	—	±0.00001	±0.3	—	±1.0	μA
Input Capacitance	C_{in}		$V_{in}=0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I_{DD}	5.0	Zero Signal, per Package	—	20	—	0.005	20	—	150	μA
		10		—	40	—	0.010	40	—	300	
		15		—	80	—	0.015	80	—	600	
Total Supply Current*	I_T	5.0	Dynamic+I_{DD}, per Gate $C_L=50$pF, $f=1$kHz	—	—	—	0.6	—	—	—	μA
		10		—	—	—	1.2	—	—	—	
		15		—	—	—	1.7	—	—	—	

* To calculate total supply current at frequency other than 1kHz.
@ $V_{DD}=5.0$V $I_T=(0.6\mu A/kHz)f+I_{DD}$. @ $V_{DD}=10$V $I_T=(1.2\mu A/kHz)f+I_{DD}$. @ $V_{DD}=15$V $I_T=(1.7\mu A/kHz)f+I_{DD}$

■POWER DISSIPATION TEST CIRCUIT AND WAVEFORM

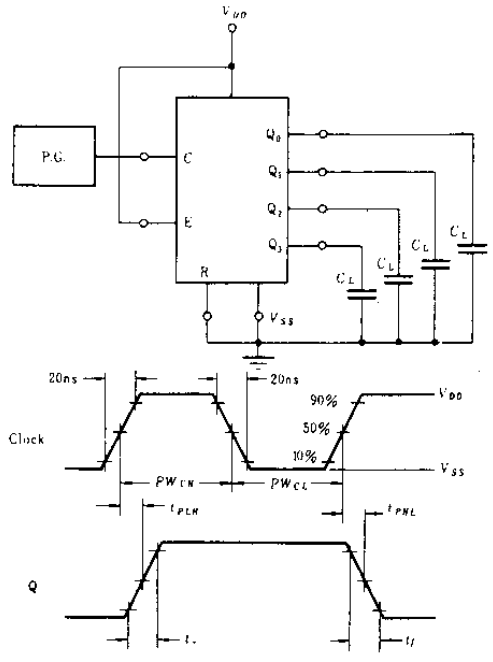




■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25°C)

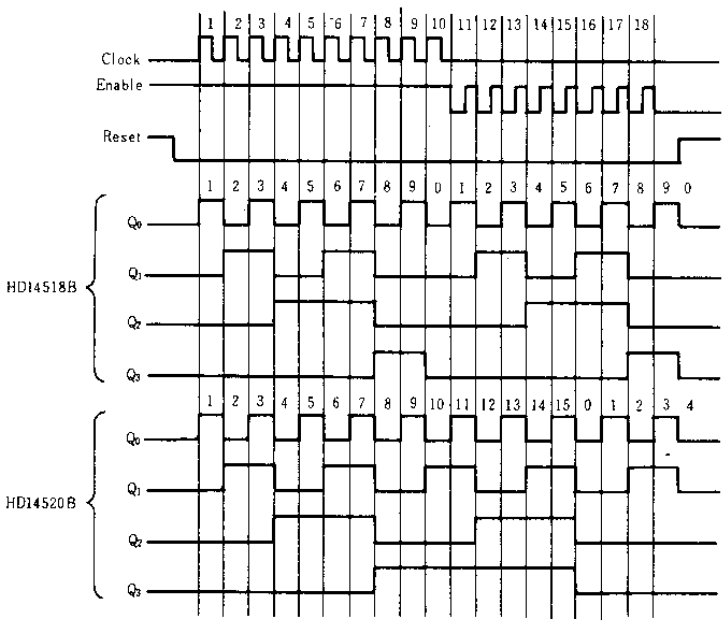
Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	360	ns
			10	—	90	180	
			15	—	65	130	
Output Fall Time.		t_f	5.0	—	130	250	ns
			10	—	50	100	
			15	—	40	80	
Propagation Delay Time	Clock	t_{PLH}, t_{PHL}	5.0	—	280	560	ns
			10	—	115	230	
			15	—	80	160	
	Reset		5.0	—	440	800	
			10	—	160	300	
			15	—	110	220	
Clock Pulse Width		PW_{CH}, PW_{CL}	5.0	200	100	—	ns
			10	100	50	—	
			15	70	35	—	
Clock Frequency		PRF	5.0	—	5.0	2.5	MHz
			10	—	10.0	5.0	
			15	—	15.0	7.5	
Clock Pulse or Enable Rise and Fall Time		t_r, t_f	5.0	—	—	15	μs
			10	—	—	15	
			15	—	—	15	
Enable Pulse Width		PW_E	5.0	440	220	—	ns
			10	200	100	—	
			15	140	70	—	
Reset Pulse Width		PW_R	5.0	250	125	—	ns
			10	110	55	—	
			15	80	40	—	

■SWITCHING TIME TEST CIRCUIT

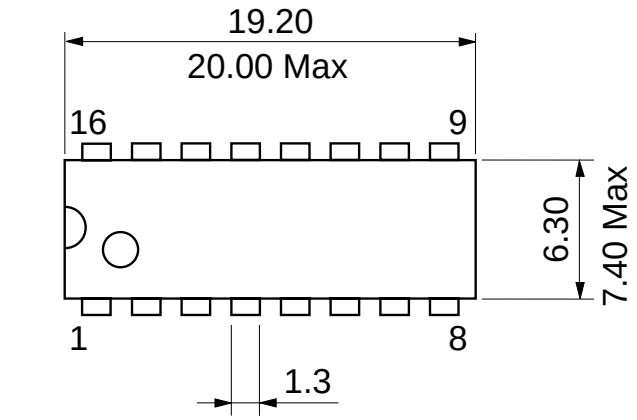


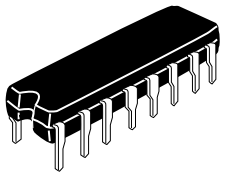
$PW_{CH}=PW_{CL}$=50% Duty Cycle

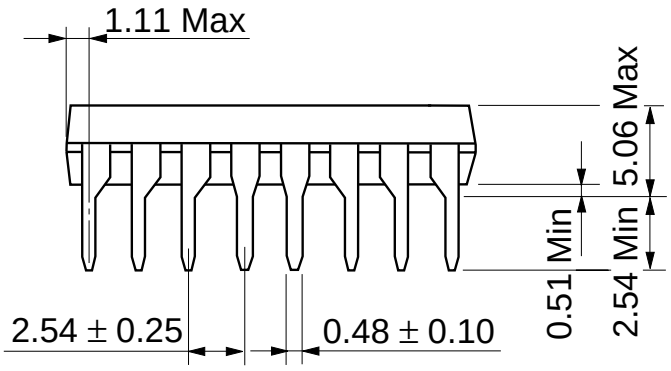
■TIMIG DIAGRAM

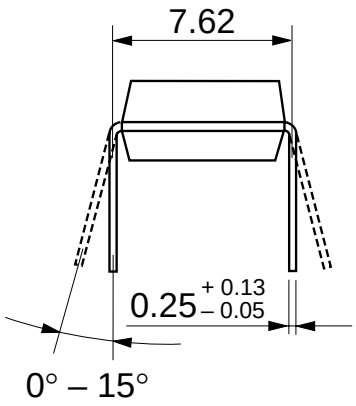


Unit: mm









Hitachi Code	DP-16
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Weight (reference value)	1.07 g

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