HD14022B

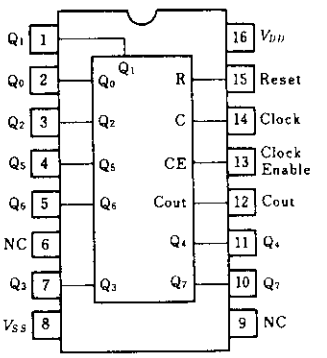
Octal Counter/Divider

The HD14022B is a four-stage Johnson octal counter with built-in code converter. High speed operation and spike-free outputs are obrained by use of a Johnson octal counter design. The eight decoded outputs are normally low, and go high only at their appropriate octal time period. The output changes occur on the positive-going edge of the clock pulse. This part can be used in frequency division applications as well as octal counter or octal decode display applications.

■ FEATURES

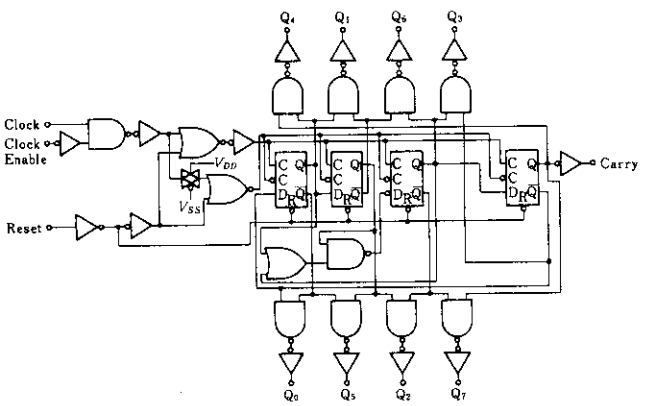
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4022B and HD14022B

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM

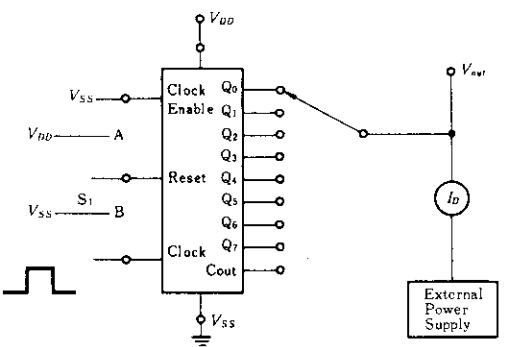


■ TRUTH TABLE

Clock	Clock Enable	Reset	Output n
L	×	L	n
×	H	L	n
⌐	L	L	n+1
¬	×	L	n
H	¬	L	n+1
×	⌐	L	n
×	×	H	Q_0

× : Don't Care
n ≤ 4 ··· Carry = H
n ≥ 4 ··· Carry = L

● Typical Output Source and Output Sink Characteristics Test Circuit



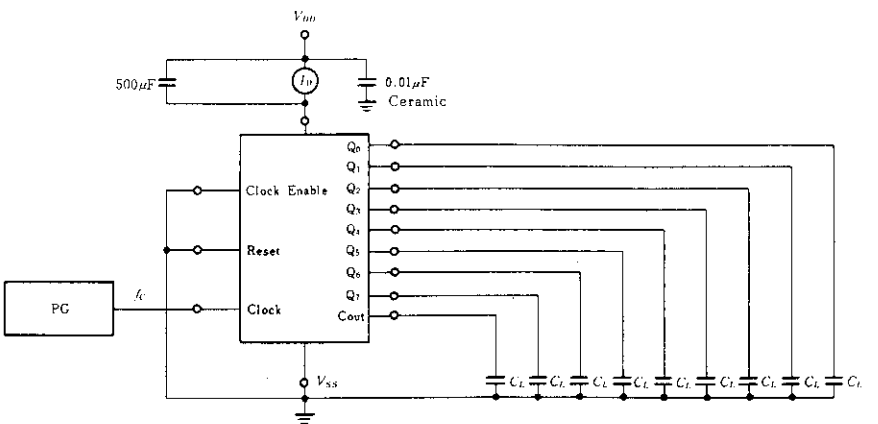
	I_{OL}	I_{OH}
Outputs	($S_1 \rightarrow A$)	Clock to desired Output (S_1 to B)
Carry	Clock to Q_5 thru Q_7 (S_1 to B)	$S_1 \rightarrow A$
V_{GS}	V_{DD}	$-V_{DD}$
V_{DS}	V_{out}	$V_{out} - V_{DD}$

■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40℃ min	−40℃ max	25℃ min	25℃ typ	25℃ max	85℃ min	85℃ max	Unit
Output Voltage	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	$V_{out}=13.5$ 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	—	—	—	0.28	—	—	—	μA
		10		—	—	—	0.56	—	—	—	
		15		—	—	—	0.85	—	—	—	

* To calculate total supply current at frequency other than 1kHz.
@ $V_{DD}=5.0$V $I_T=(0.28\mu A/kHz)f+I_{DD}$, @ $V_{DD}=10$V $I_T=(0.56\mu A/kHz)f+I_{DD}$, @ $V_{DD}=10$V $I_T=(0.85\mu A/kHz)f+I_{DD}$,

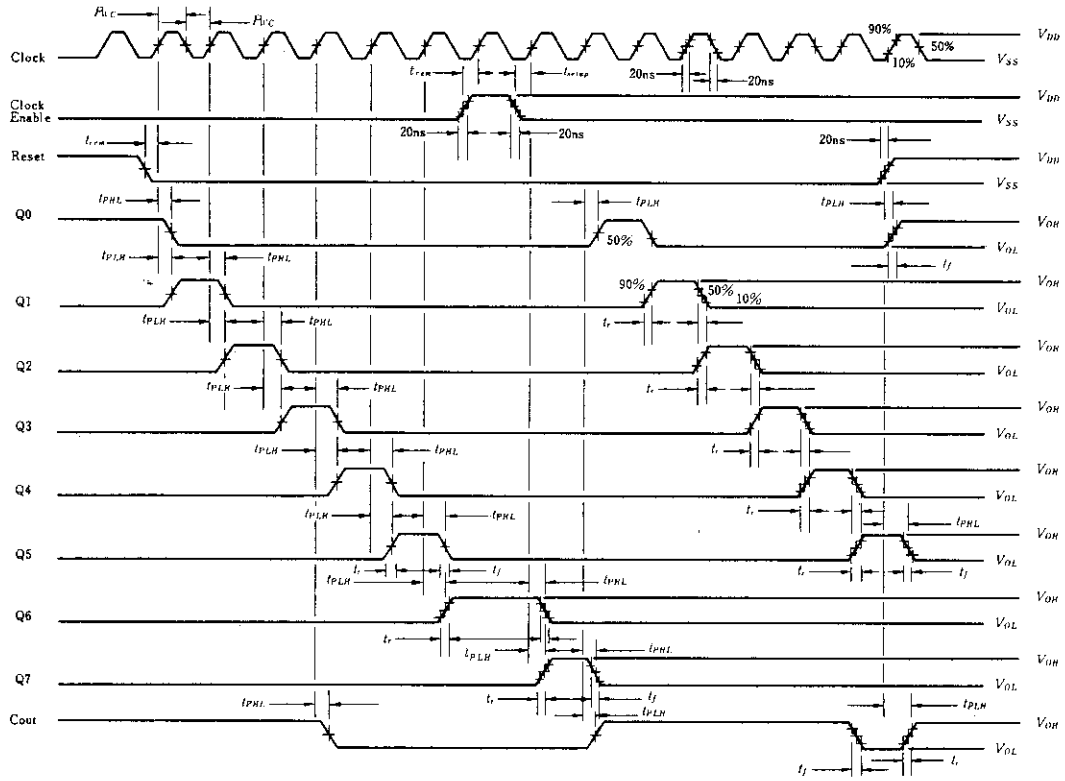
■ POWER DISSIPATION TEST CIRCUIT



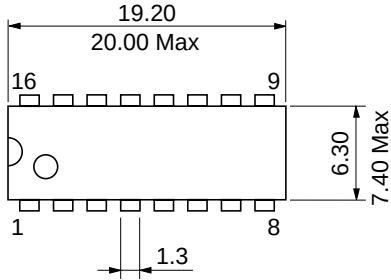
■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25°C)

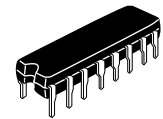
Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	Reset to Decode Out	t_{PLH}, t_{PHL}	5.0	—	500	1000	ns
			10	—	230	460	
			15	—	140	350	
	Clock to Cout		5.0	—	400	800	
			10	—	150	350	
			15	—	100	250	
	Clock to Decode Out		5.0	—	500	1000	
			10	—	230	460	
			15	—	140	350	
	Reset to Cout	t_{PLH}	5.0	—	400	800	
			10	—	150	350	
			15	—	100	250	
Clock Pulse Width		PW_C	5.0	250	100	—	ns
			10	100	42	—	
			15	75	30	—	
Clock Frequency		PRF	5.0	—	5.0	2.0	MHz
			10	—	12	5.0	
			15	—	16	6.7	
Reset Pulse Width		PW_R	5.0	500	200	—	ns
			10	250	100	—	
			15	190	75	—	
Reset Removal Time		t_{rem}	5.0	750	300	—	ns
			10	275	100	—	
			15	210	80	—	
Clock Pulse Rise and Fall Time		t_r, t_f	5.0	No Limit			
			10				
			15				
Clock Enable Setup Time		t_{setup}	5.0	700	175	—	ns
			10	300	75	—	
			15	225	52	—	
Clock Enable Removal Time		t_{rem}	5.0	700	260	—	ns
			10	300	100	—	
			15	225	70	—	

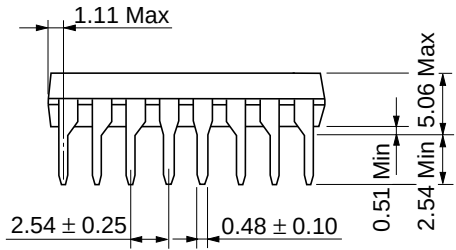
■DYNAMIC SIGNAL WAVEFORMS

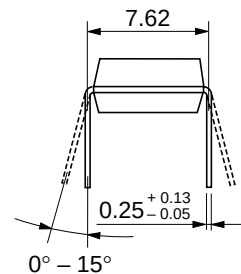


Unit: mm









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Weight (reference value)	1.07 g

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