

HD14022B

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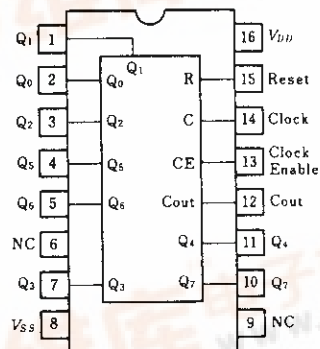
Octal Counter/Divider

The HD14022B is a four-stage Johnson octal counter with built-in code converter. High speed operation and spike-free outputs are obtained 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

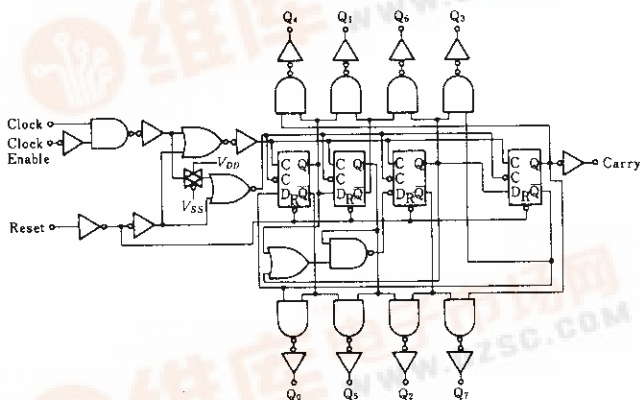
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4022B and HD14022B

PIN ARRANGEMENT



(Top View)

LOGIC DIAGRAM

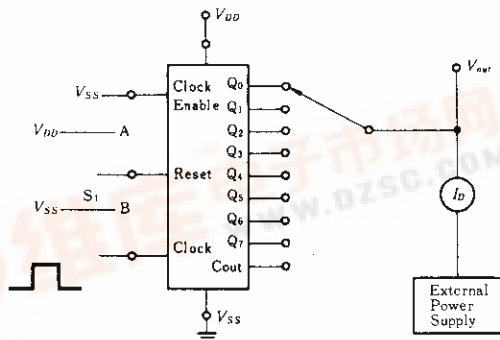


TRUTH TABLE

Clock	Clock Enable	Reset	Output n
L	x	L	n
x	H	L	n
↗	L	L	n+1
↘	x	L	n
H	↗	L	n+1
x	↘	L	n
x	x	H	Q ₀

x : 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 → A)	Clock to desired Output (S ₁ to B)
Carry	Clock to Q ₅ thru Q ₇ (S ₁ to B)	S ₁ → A
V _{CS}	V _{DD}	-V _{DD}
V _{DS}	V _{out}	V _{out} - V _{DD}

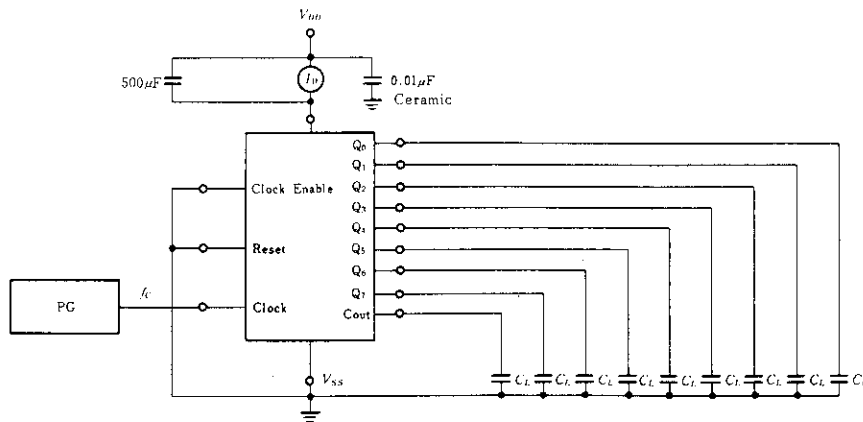
ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	$V_{DD}(V)$	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
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	$V_{OH} = 2.5V$	-1.0	—	-0.8	-1.7	—	-0.6	—	mA
		5.0	$V_{OH} = 4.6V$	-0.2	—	-0.16	-0.36	—	-0.12	—	
		10	$V_{OH} = 9.5V$	-0.5	—	-0.4	-0.9	—	-0.3	—	
		15	$V_{OH} = 13.5V$	-1.4	—	-1.2	-3.5	—	-1.0	—	
	I_{OL}	5.0	$V_{OL} = 0.4V$	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL} = 0.5V$	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL} = 1.5V$	3.6	—	3.0	8.8	—	2.4	—	
Input Current	I_{in}	15		—	± 0.3	—	± 0.0001	± 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 $\pm I_{DD}$, per Gate, $C_L = 50pF$, $f = 1kHz$	—	—	—	0.28	—	—	—	μA
		10		—	—	—	0.56	—	—	—	
		15		—	—	—	0.85	—	—	—	

* To calculate total supply current at frequency other than 1kHz.

@ $V_{DD} = 5.0V$ $I_T = (0.28\mu A/kHz)f + I_{DD}$, @ $V_{DD} = 10V$ $I_T = (0.56\mu A/kHz)f + I_{DD}$, @ $V_{DD} = 15V$ $I_T = (0.85\mu A/kHz)f + I_{DD}$.

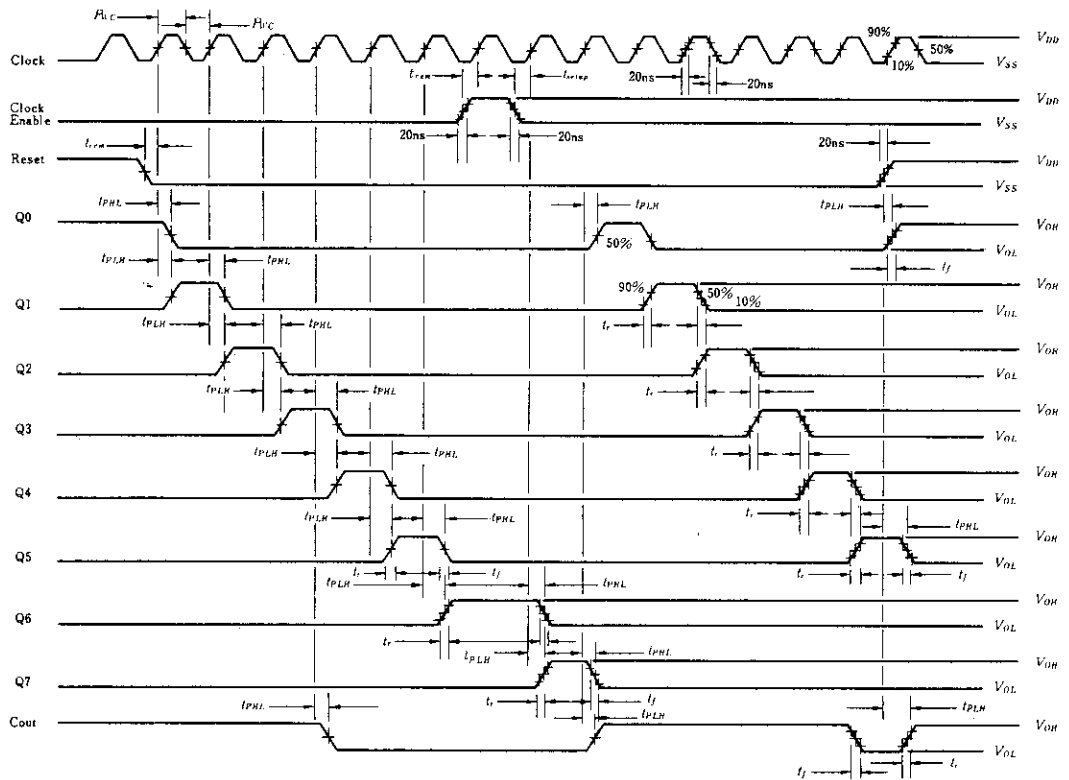
POWER DISSIPATION TEST CIRCUIT

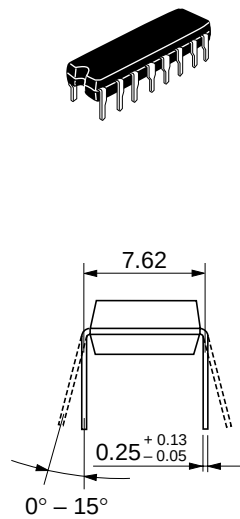
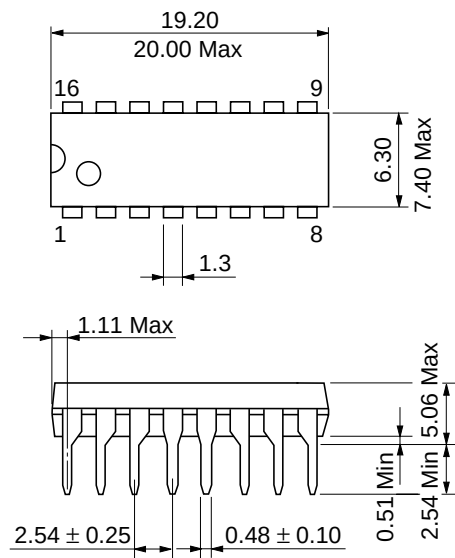


■ SWITCHING CHARACTERISTICS ($C_L = 50\text{pF}$, $T_a = 25^\circ\text{C}$)

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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