HD14040B

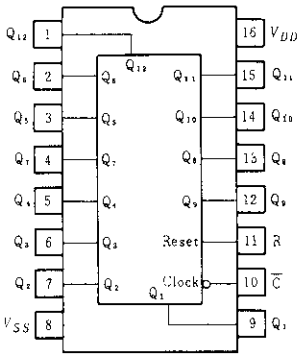
12-bit Binary Counter

The HD14040B 12-stages binary counter is designed with an input wave shaping circuit and 12-stages of ripple-carry binary counter. The device advances the count on the negative-going edge of the clock pulse. Applications include time delay circuits, counter controls, and frequency-dividing circuits.

■ FEATURES

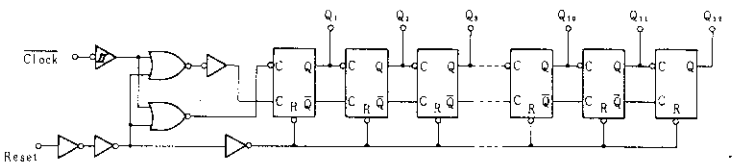
- Fully Static Operation
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Common Reset Line
- 13MHz Typical Counting Rate @15V
- Pin-for-Pin Replacement for CD4040B and MC14040B

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM

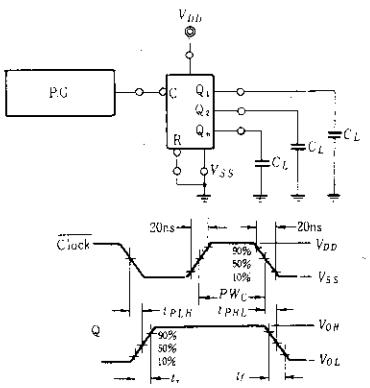


■ TRUTH TABLE

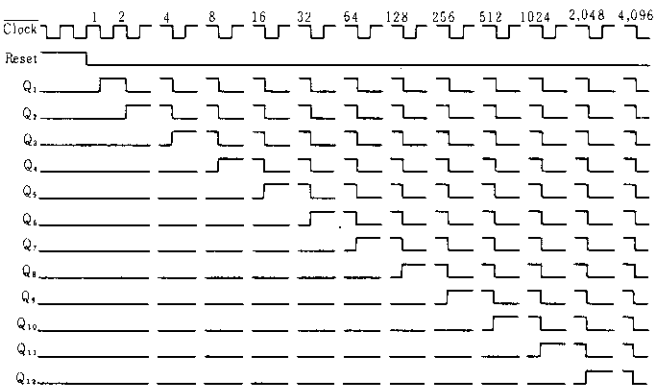
$\overline{C}$	Reset	Outputs State
↓	0	No Change
↑	0	Advance to next state
×	1	All Outputs are low

x = Don't Care

■ SWITCHING TIME TEST CIRCUIT



■ TIMING DIAGRM

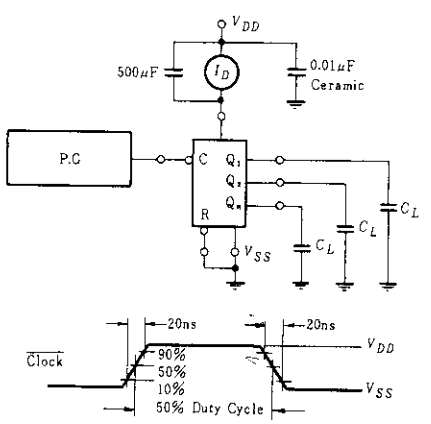


■ ELECTRICAL CHARACTERISTICS

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	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	–	±0.00001	±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}, C_L = 50pF f = 1kHz, per Gate	–	–	–	0.42	–	–	–	μA
		10		–	–	–	0.85	–	–	–	
		15		–	–	–	1.43	–	–	–	

* To calculate total supply current at frequency other than 1kHz.
@ V_{DD} = 5.0 V I_T = (0.42μA/kHz) f + I_{DD} @ V_{DD} = 10 V I_T = (0.85μA/kHz) f + I_{DD} @ V_{DD} = 15 V I_T = (1.43μA/kHz) f + I_{DD}

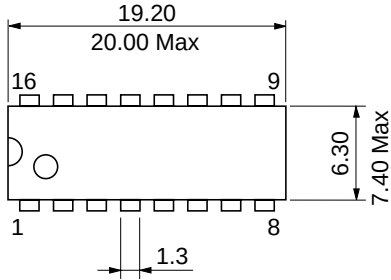
■ POWER DISSIPATION TEST CIRCUIT AND WAVEFORM

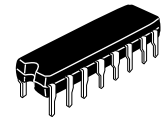


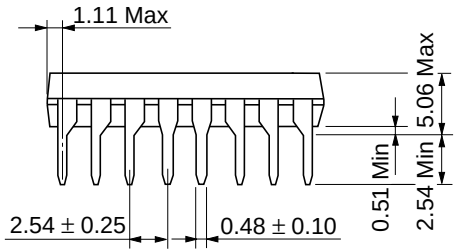
■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25℃)

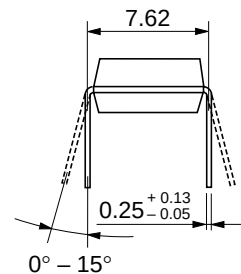
Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	$\overline{\text{Clock}}$-to-Q_1	t_{PLH}, t_{PHL}	5.0	—	400	1050	ns
			10	—	170	420	
			15	—	120	320	
	$\overline{\text{Clock}}$-to-Q_{12}		5.0	—	2.5	7.5	μs
			10	—	0.9	2.7	
			15	—	0.5	2.1	
	Reset-to-Qn	t_{PHL}	5.0	—	570	1620	ns
			10	—	215	600	
			15	—	170	450	
Clock Pulse Width		PW_C	5.0	385	140	—	ns
			10	150	55	—	
			15	115	38	—	
Clock Frequency		PRF	5.0	—	3.5	1.5	MHz
			10	—	9.0	3.5	
			15	—	13	4.5	
Clock Pulse Rise and Fall Time		t_r, t_f	5.0	No Limit			
			10				
			15				
Reset Pulse Width		PW_R	5.0	960	320	—	ns
			10	360	120	—	
			15	270	80	—	

Unit: mm



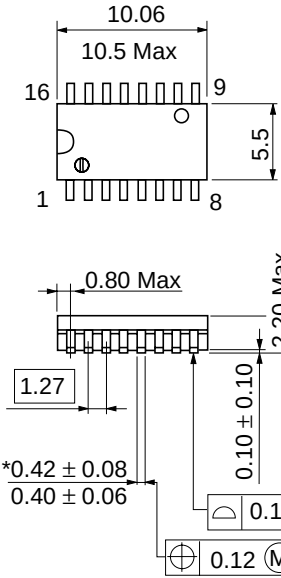


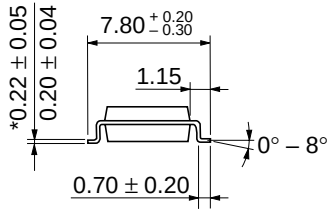


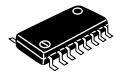


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm



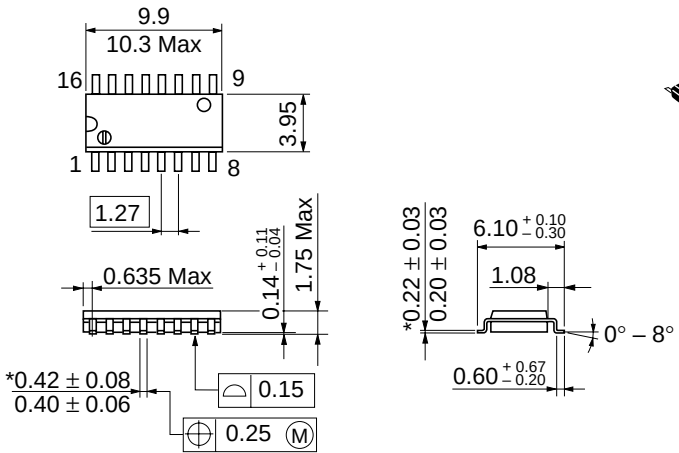




*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

Unit: mm



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EIAJ	Conforms
Weight (reference value)	0.15 g

*Dimension including the plating thickness
Base material dimension

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