HD14040B

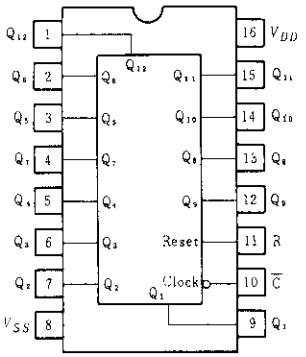
12-bit Binary Counter

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

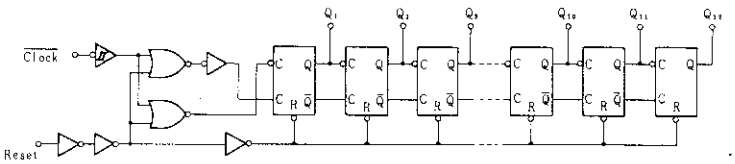
- Fully Static Operation
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Common Reset Line
- 13MHz Typical Counting Rate @15V
- Pin-for-Pin Replacement for CD4040B and MC14040B

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM

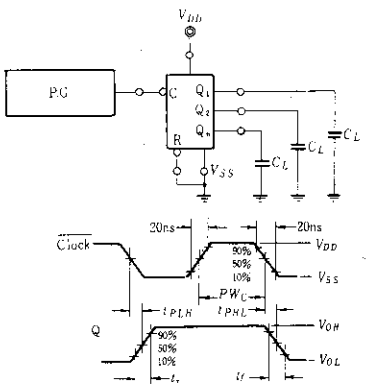


■ TRUTH TABLE

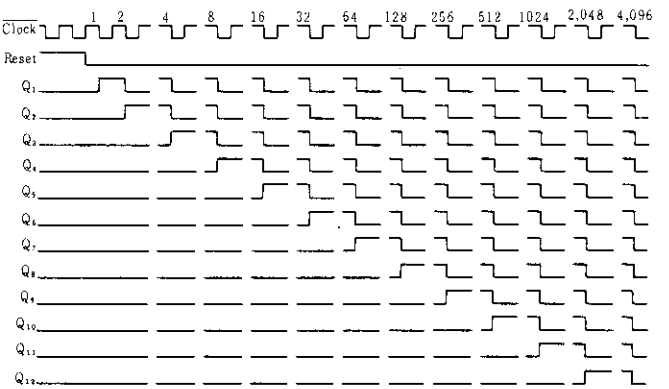
$\overline{C}$	Reset	Outputs State
⌐	0	No Change
¬	0	Advance to next state
×	1	All Outputs are low

x = Don't Care

■ SWITCHING TIME TEST CIRCUIT



■ TIMING DIAGRM

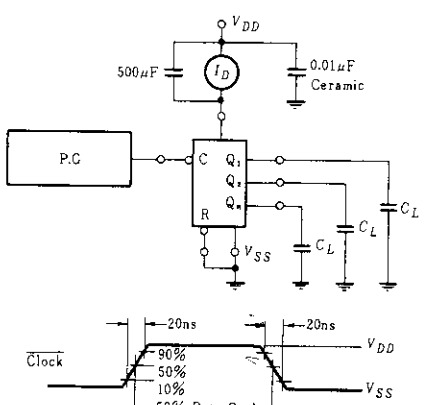


■ ELECTRICAL CHARACTERISTICS

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}

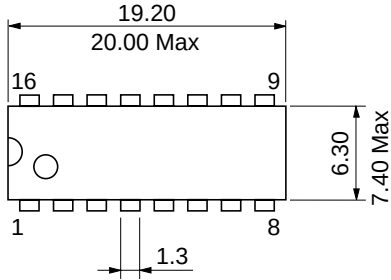
■ POWER DISSIPATION TEST CIRCUIT AND WAVEFORM

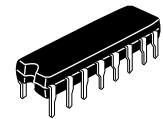


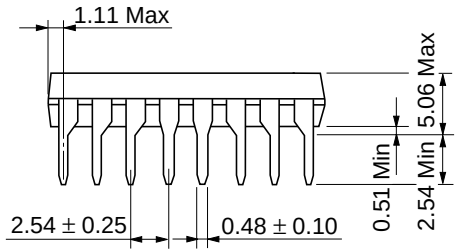
■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25℃)

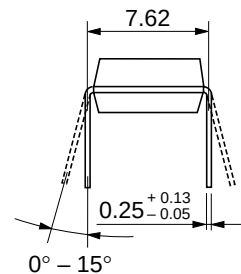
Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	$\overline{\text{Clock}}$-to-Q_1	t_{PLH}, t_{PHL}	5.0	—	400	1050	ns
			10	—	170	420	
			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



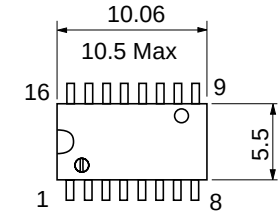


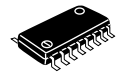


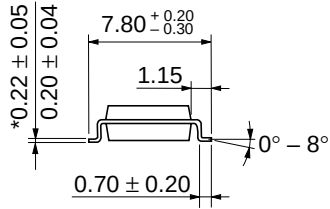


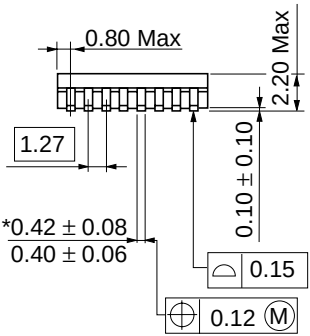
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm





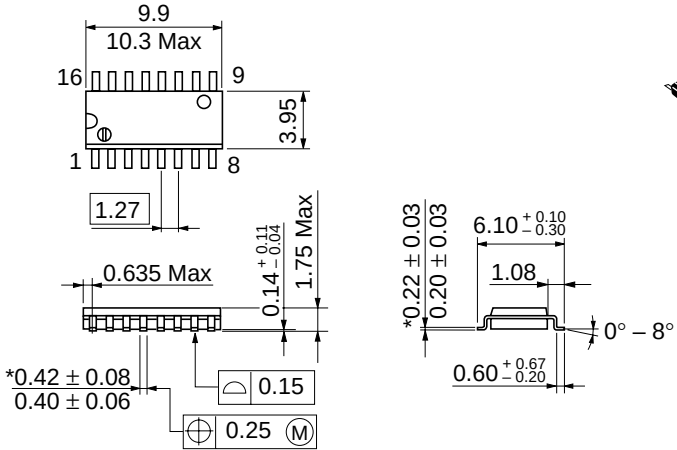


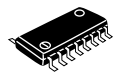


*Dimension including the plating thickness
Base material dimension

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

Unit: mm





Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

*Dimension including the plating thickness
Base material dimension

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