HD74HC390

Dual Decade Counters

REJ03D0624-0200
(Previous ADE-205-503)
Rev.2.00
Mar 30, 2006

Description

The HD74HC390 incorporate dual decade counters, each composed of a divide-by-two and a divide-by-five counter. The divide-by-two and divide-by-five counters can be cascaded to form dual decade, dual bi-quinary, or various combinations up to a single divide-by-100 counter.

The HD74HC390 is incremented on the high to low transition (negative edge) of the clock input, and each has an independent clear input. When clear is set high all four bits of each counter are set to a low level. This enables count truncation and allows the implementation of divide-by-N counter configurations.

Features

- High Speed Operation: t_{pd} (Clock A to Q_A) = 11 ns typ (C_L = 50 pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: V_{CC} = 2 to 6 V
- Low Input Current: 1 µA max
- Low Quiescent Supply Current: I_{CC} (static) = 4 µA max (Ta = 25°C)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC390P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC390FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)

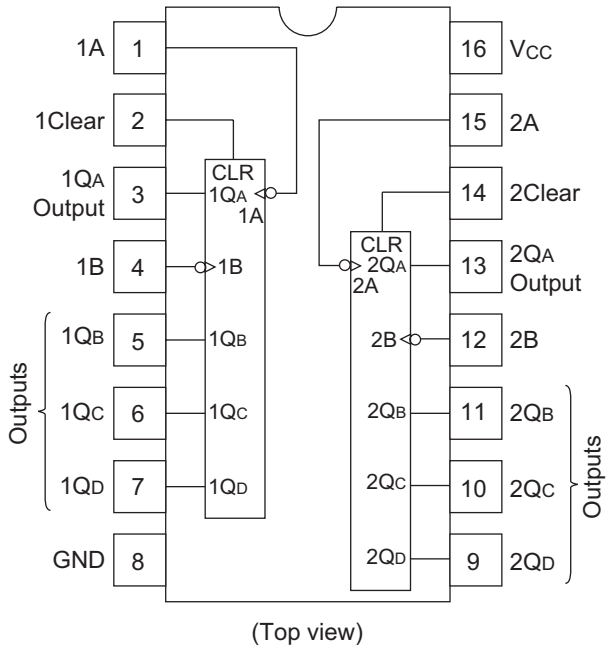
Note: Please consult the sales office for the above package availability.

Function Table

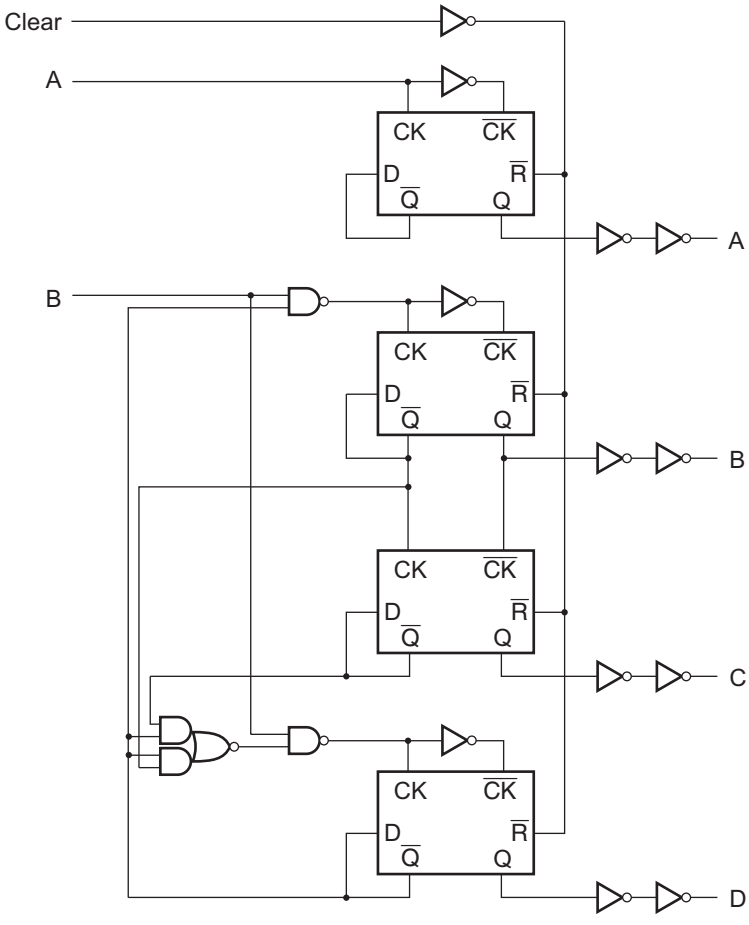
Clock		Clear	Operation
A	B		
X	X	H	Clear ÷2 and ÷5
↓	X	L	Increment ÷2
X	↓	L	Increment ÷5

Note: 1. H; High level, L; Low level, X; Irrelevant, Z; High impedance

Pin Arrangement



Logic Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage range	V_{CC}	–0.5 to 7.0	V
Input / Output voltage	V_{IN}, V_{OUT}	–0.5 to V_{CC} +0.5	V
Input / Output diode current	I_{IK}, I_{OK}	±20	mA
Output current	I_{OUT}	±25	mA
V_{CC}, GND current	I_{CC} or I_{GND}	±50	mA
Power dissipation	P_T	500	mW
Storage temperature	Tstg	–65 to +150	°C

Note: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	2 to 6	V	
Input / Output voltage	V_{IN}, V_{OUT}	0 to V_{CC}	V	
Operating temperature	Ta	–40 to 85	°C	
Input rise / fall time*1	t_r, t_f	0 to 1000	ns	V_{CC} = 2.0 V
		0 to 500		V_{CC} = 4.5 V
		0 to 400		V_{CC} = 6.0 V

Note: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

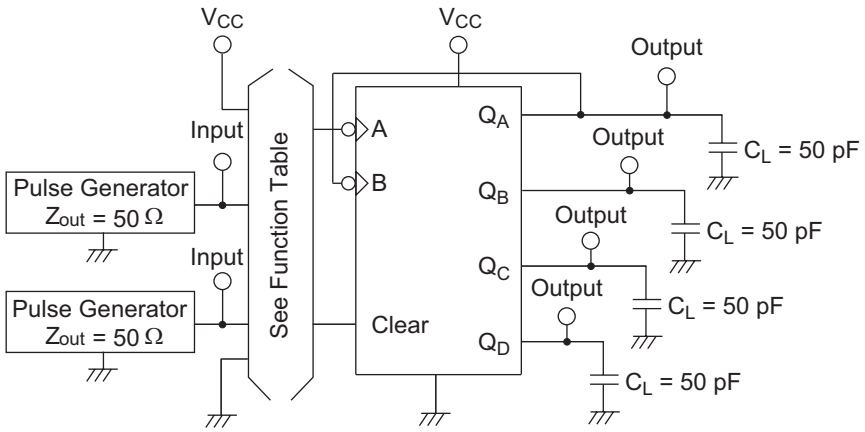
Electrical Characteristics

Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to+85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V_{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V_{OH}	2.0	1.9	2.0	—	1.9	—	V	Vin = V_{IH} or V_{IL}	I_{OH} = –20 µA
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—			I_{OH} = –4 mA
		6.0	5.68	—	—	5.63	—			I_{OH} = –5.2 mA
	V_{OL}	2.0	—	0.0	0.1	—	0.1	V	Vin = V_{IH} or V_{IL}	I_{OL} = 20 µA
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	—	0.26	—	0.33			I_{OH} = 4 mA
		6.0	—	—	0.26	—	0.33			I_{OH} = 5.2 mA
Input current	Iin	6.0	—	—	±0.1	—	±1.0	µA	Vin = V_{CC} or GND	
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	µA	Vin = V_{CC} or GND, Iout = 0 µA	

Switching Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns)

Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	f_{max}	2.0	—	—	5	—	4	MHz	
		4.5	—	—	27	—	21		
		6.0	—	—	32	—	25		
Propagation delay time	t_{PLH} t_{PHL}	2.0	—	—	120	—	150	ns	Clock A to Q_A
		4.5	—	11	24	—	30		
		6.0	—	—	20	—	26		
	t_{PLH} t_{PHL}	2.0	—	—	290	—	365	ns	Clock A to Q_C (Q_A connected to Clock B)
		4.5	—	32	58	—	73		
		6.0	—	—	49	—	62		
	t_{PLH} t_{PHL}	2.0	—	—	130	—	165	ns	Clock B to Q_B
		4.5	—	16	26	—	33		
		6.0	—	—	22	—	28		
	t_{PLH} t_{PHL}	2.0	—	—	185	—	230	ns	Clock B to Q_C
		4.5	—	20	37	—	46		
		6.0	—	—	31	—	39		
	t_{PLH} t_{PHL}	2.0	—	—	130	—	165	ns	Clock B to Q_D
		4.5	—	15	26	—	33		
		6.0	—	—	22	—	28		
	t_{PHL}	2.0	—	—	165	—	205	ns	Clear to Q_A, Q_B, Q_C, Q_D
		4.5	—	14	33	—	41		
		6.0	—	—	28	—	35		
Pulse width	t_w	2.0	80	—	—	100	—	ns	
		4.5	16	8	—	20	—		
		6.0	14	—	—	17	—		
Removal time	t_h	2.0	25	—	—	31	—	ns	
		4.5	5	1	—	6	—		
		6.0	4	—	—	5	—		
Output rise/fall time	t_{TLH} t_{THL}	2.0	—	—	75	—	95	ns	
		4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	Cin	—	—	—	5	10	—	10	pF	

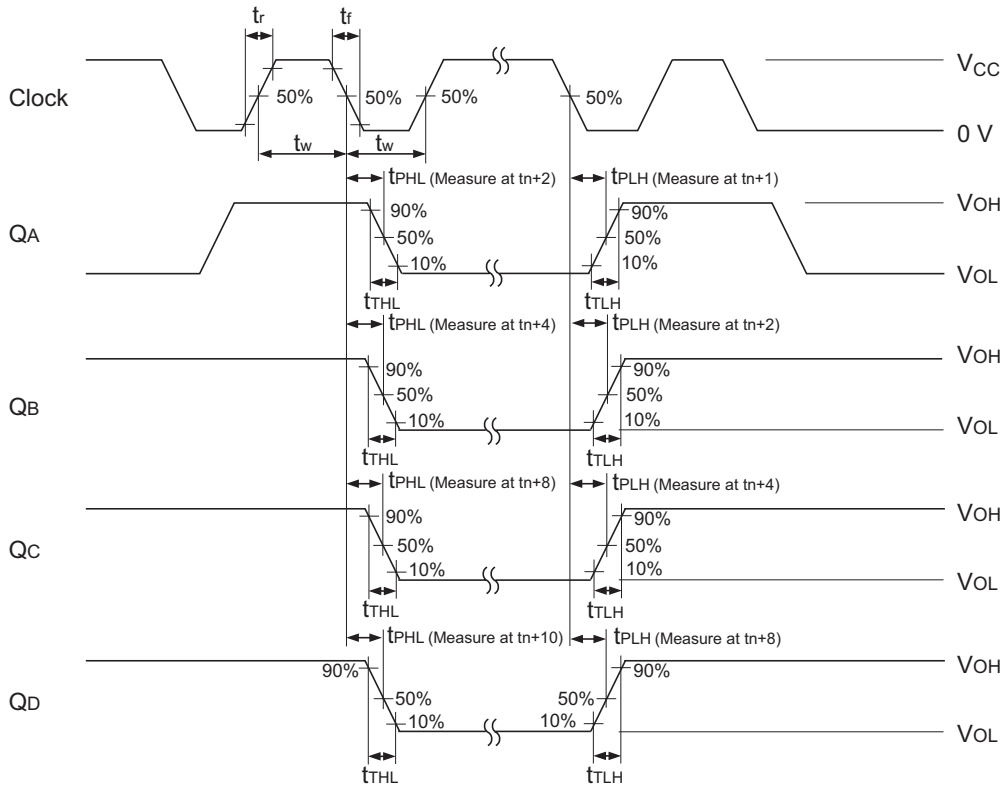
Test Circuit



Note : 1. C_L includes probe and jig capacitance.

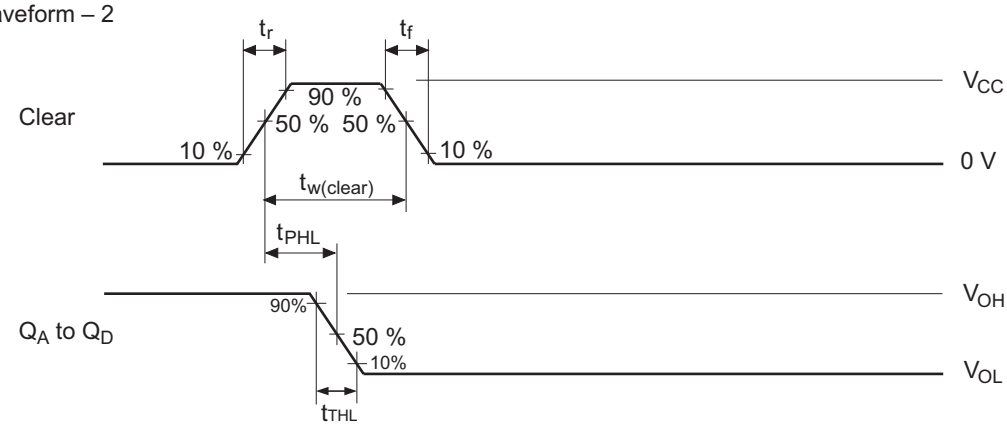
Waveforms

• Waveform – 1



Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 ns
2. tn is bit time with all outputs at low.

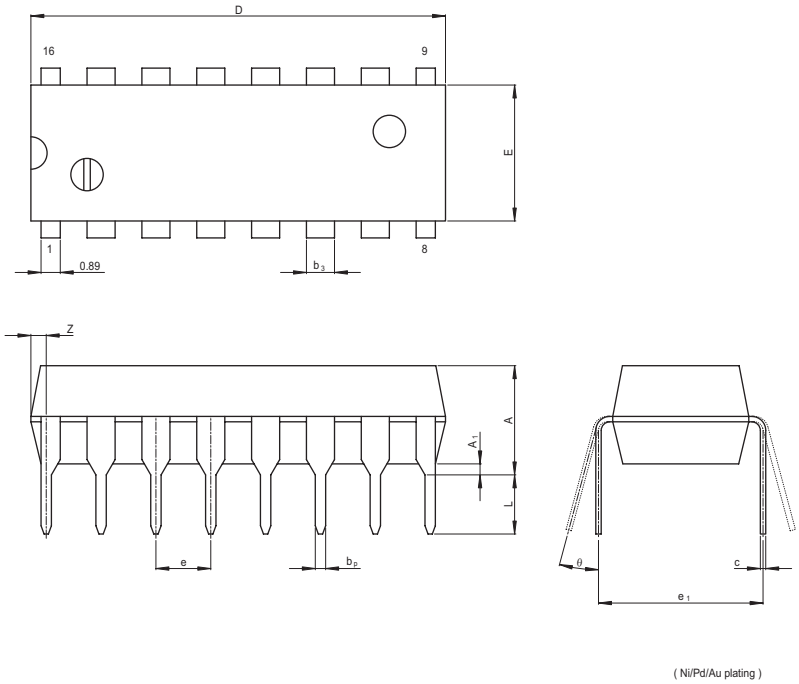
• Waveform – 2



Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 ns
2. The output are measured one at a time with one transition per measurement.

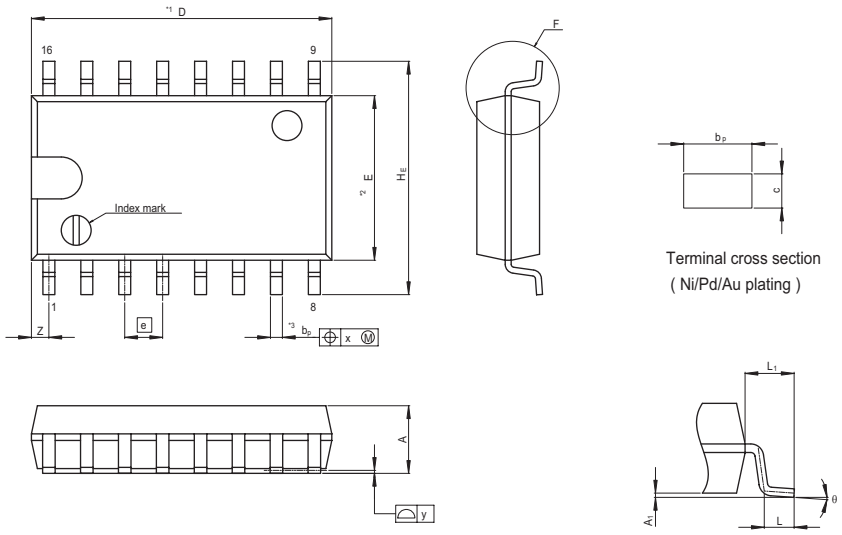
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP16-6.3x19.2-2.54	PRDP0016AE-B	DP-16FV	1.05g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	—	7.62	—
D	—	19.2	20.32
E	—	6.3	7.4
A	—	—	5.06
A_1	0.51	—	—
b_p	0.40	0.48	0.56
b_3	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.12
L	2.54	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g



NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A_2	—	—	—
A_1	0.00	0.10	0.20
A	—	—	2.20
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	7.50	7.80	8.00
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L_1	—	1.15	—

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