HD74HC74

Dual D-type Flip-Flops (with Preset and Clear)

REJ03D0549-0200
(Previous ADE-205-421)
Rev.2.00
Oct 06, 2005

Description

The flip-flop has independent data, preset, clear, and clock inputs and Q and Q outputs. The logic level present at the data input is transferred to the output during the positive going transition to the clock pulse. Preset and clear are independent of the clock and accomplished by a low level at the appropriate input.

Features

- High Speed Operation: t_{pd} (Clock to Q or Q) = 14 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) = 2 µA max (Ta = 25°C)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC74P	DILP-14 pin	PRDP0014AB-B (DP-14AV)	P	—
HD74HC74FPEL	SOP-14 pin (JEITA)	PRSP0014DF-B (FP-14DAV)	FP	EL (2,000 pcs/reel)
HD74HC74TELL	TSSOP-14 pin	PTSP0014JA-B (TTP-14DV)	T	ELL (2,000 pcs/reel)

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

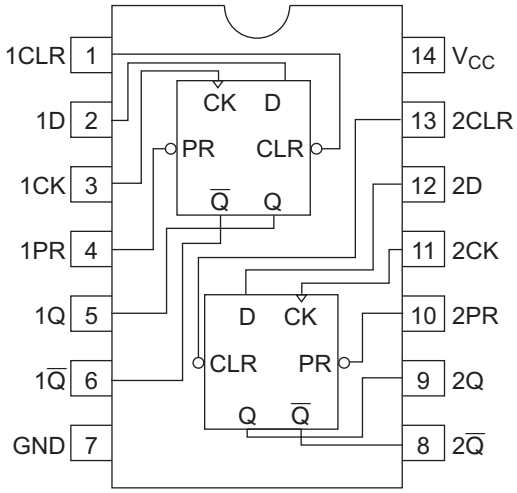
Function Table

Inputs				Outputs	
Preset	Clear	Clock	Data	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H[*1]	H[*1]
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	No change	
H	H	H	X	No change	
H	H	↓	X	No change	

H : High level
L : Low level
X : Irrelevant

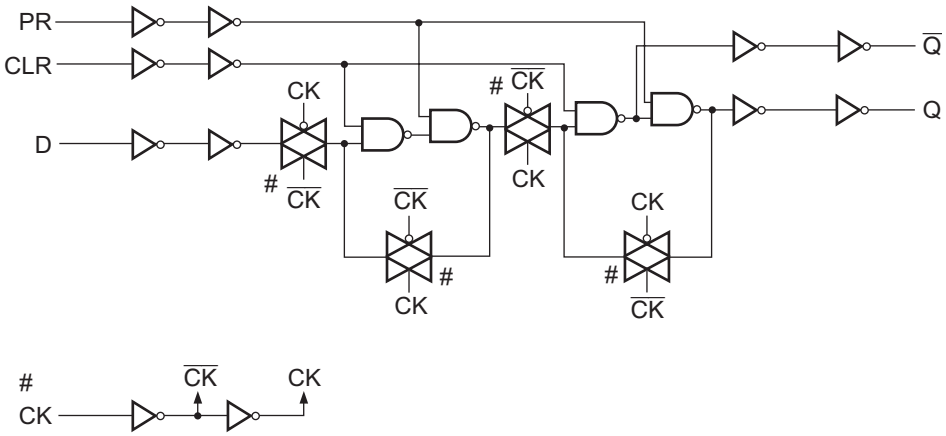
Note: 1. Q and $\overline{Q}$ will remain High as long as Preset and Clear are Low, but Q and $\overline{Q}$ are unpredictable, if Preset and Clear go High simultaneously.

Pin Arrangement



(Top view)

Logic Diagram (1/2)



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage range	V_{CC}	–0.5 to 7.0	V
Input / Output voltage	Vin, Vout	–0.5 to V_{CC} +0.5	V
Input / Output diode current	I_{IK}, I_{OK}	±20	mA
Output current	I_O	±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_{OL} = 4 mA
		6.0	—	—	0.26	—	0.33			I_{OL} = 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	—	—	2.0	—	20	µA	Vin = V_{CC} or GND, Iout = 0 µA	

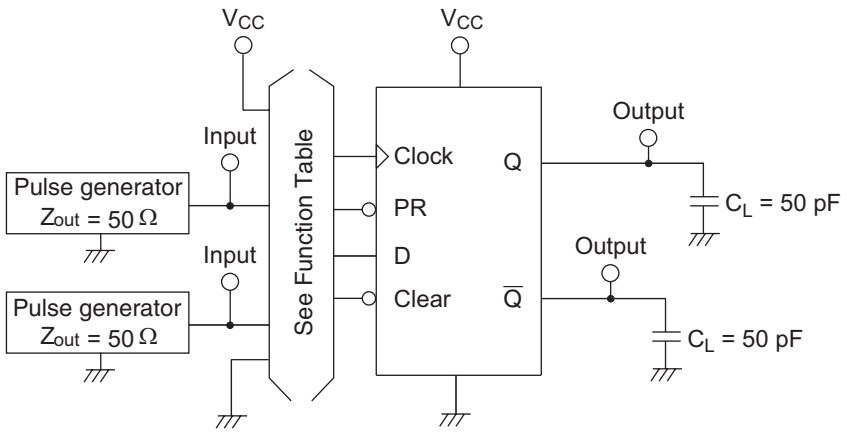
Switching Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns)

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	—	35	25	—	20		
		6.0	—	—	29	—	24		
Propagation delay time	t_{PLH}, t_{PHL}	2.0	—	—	160	—	200	ns	Clock to Q or $\overline{Q}$
		4.5	—	14	32	—	40		
		6.0	—	—	27	—	34		
		2.0	—	—	160	—	200	ns	Preset or Clear to Q or $\overline{Q}$
		4.5	—	13	32	—	40		
		6.0	—	—	27	—	34		
Setup time	t_{su}	2.0	100	—	—	125	—	ns	Data to Clock
		4.5	20	1	—	25	—		
		6.0	17	—	—	21	—		

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		
Hold time	t_h	2.0	5	—	—	5	—	ns	Clock to Data
		4.5	5	0	—	5	—		
		6.0	5	–5	—	5	—		
Removal time	t_{rem}	2.0	25	—	—	31	—	ns	Preset, Clear to Clock
		4.5	5	—	—	6	—		
		6.0	4	—	—	5	—		
Pulse width	t_w	2.0	80	—	—	100	—	ns	Clock, Preset, Clear
		4.5	16	8	—	20	—		
		6.0	14	—	—	17	—		
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	

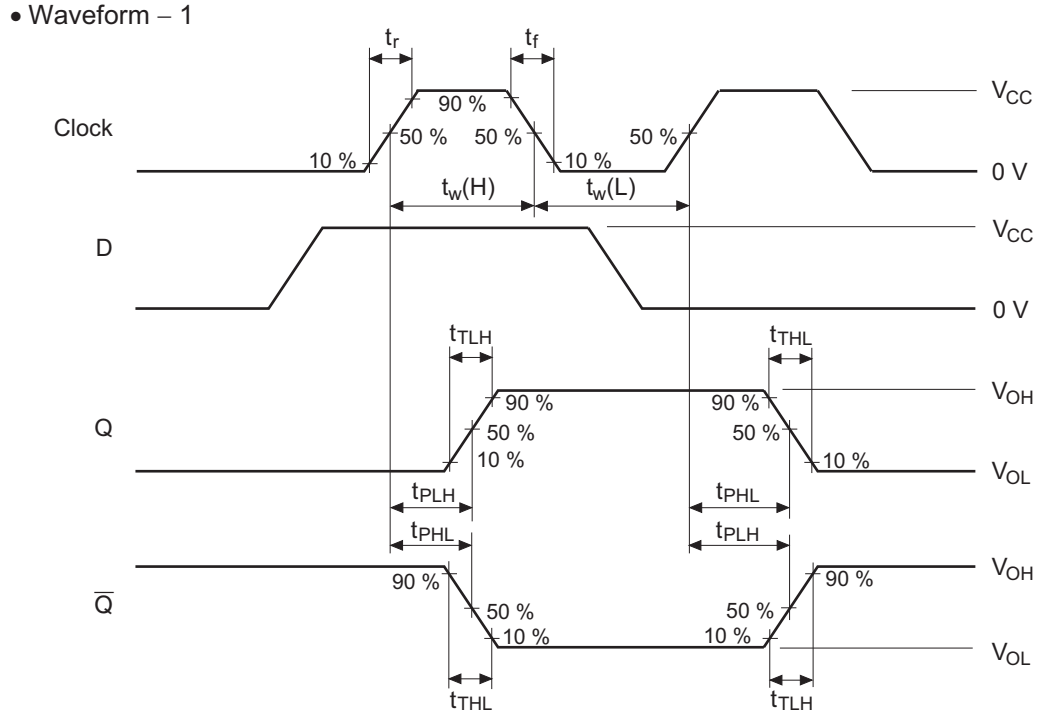
Test Circuit



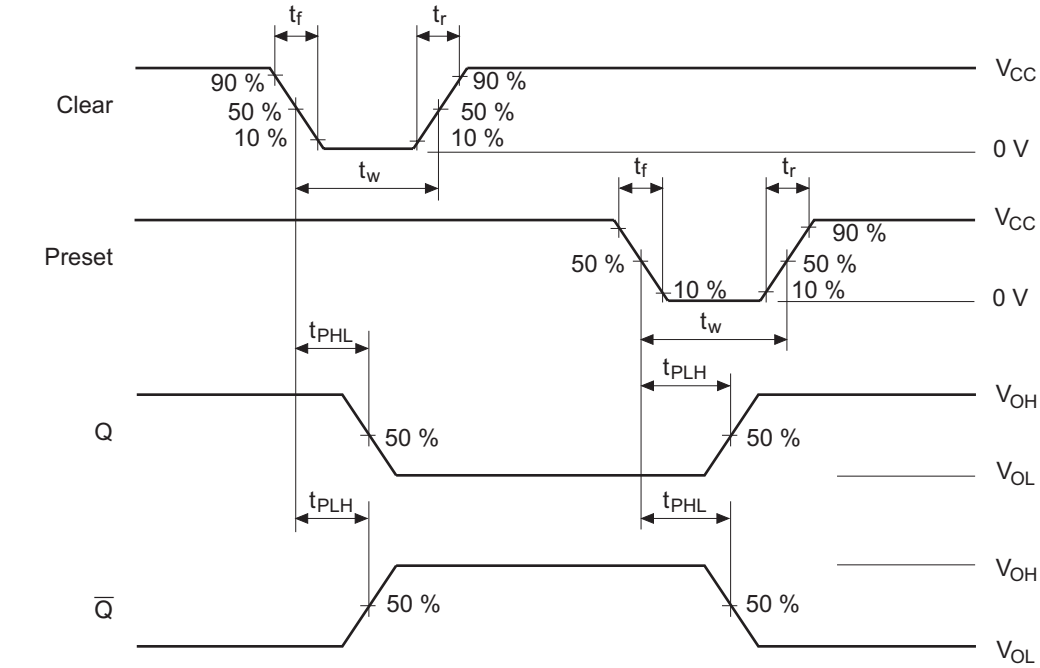
Note: C_L includes the probe and jig capacitance.

Waveforms

• Waveform – 1



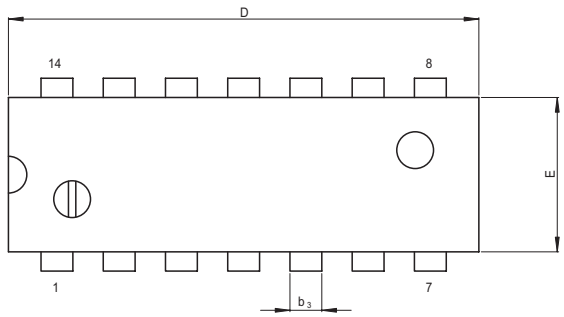
• Waveform – 2

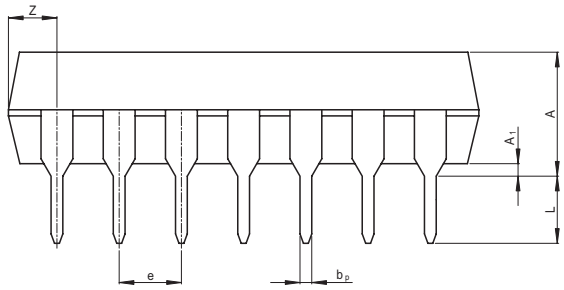


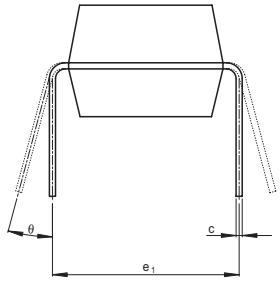
Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 ns
2. The output are measured one at a time with one transition per measurement.

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP14-6.3x19.2-2.54	PRDP0014AB-B	DP-14AV	0.97g



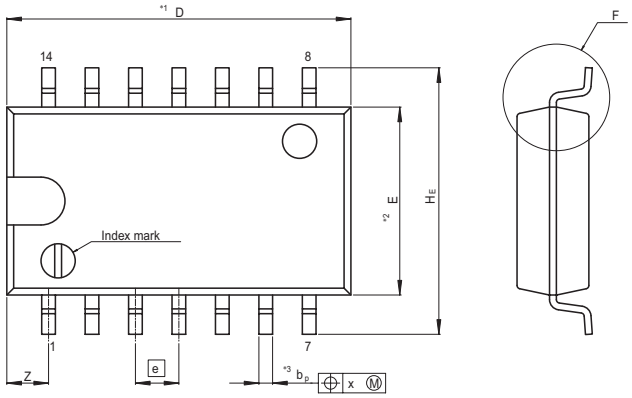


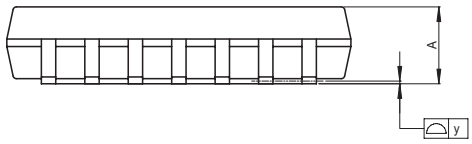


(Ni/Pd/Au plating)

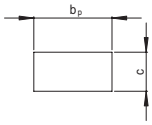
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	——	7.62	——
D	——	19.2	20.32
E	——	6.3	7.4
A	——	——	5.06
A_1	0.51	——	——
b_p	0.40	0.48	0.56
b_3	——	1.30	——
c	0.19	0.25	0.31
θ	0°	——	15°
e	2.29	2.54	2.79
Z	——	——	2.39
L	2.54	——	——

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-5.5x10.06-1.27	PRSP0014DF-B	FP-14DAV	0.23g

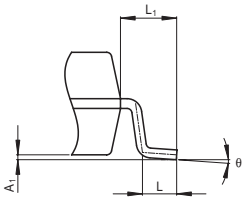




NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.



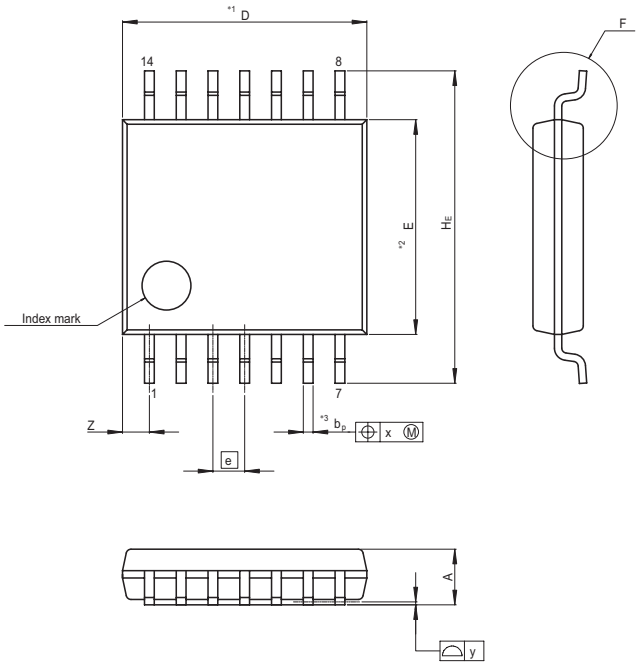
Terminal cross section
(Ni/Pd/Au plating)



Detail F

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	——	——	1.42
L	0.50	0.70	0.90
L_1	——	1.15	——

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP14-4.4x5-0.65	PTSP0014JA-B	TTP-14DV	0.05g



NOTE)
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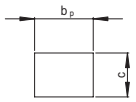
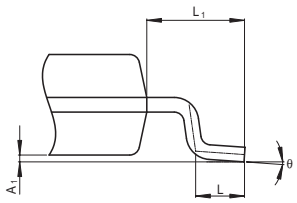
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.



Terminal cross section
(Ni/Pd/Au plating)



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	——	5.00	5.30
E	——	4.40	——
A_2	——	——	——
A_1	0.03	0.07	0.10
A	——	——	1.10
b_p	0.15	0.20	0.25
b_1	——	——	——
c	0.10	0.15	0.20
c_1	——	——	——
θ	0°	——	8°
H_E	6.20	6.40	6.60
e	——	0.65	——
x	——	——	0.13
y	——	——	0.10
Z	——	——	0.83
L	0.4	0.5	0.6
L_1	——	1.0	——

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