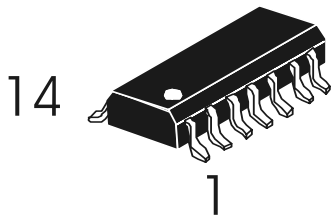
IN74VHCT74D

DUAL D FLIP-FLOP WITH SET AND RESET



IN74VHCT74D is high-speed logic IC made by CMOS technology and designed for use in high-performance calculating systems with a wide supply voltage range.

As for operation speed, IN74VHCT74D can be compared with equivalent bipolar ICs based on Schottky TTL and two times surpasses ICs of IN74HC series.

IN74VHCT74D tolerates operation under conditions when voltage on input & output is exceeded up to 7V without affecting characteristics and IC reliability. This possibility allows to use IN74VHCT74D in radio-electronic devices for interfacing with supply voltages 5V and 3V, eliminate IC failure under supply voltage source emergency outage.

Use of output edge shaping block in the microcircuit allows to reduce noise amplitude of noises when switching outputs into the same state simultaneously.

Input levels of IN74VHCT74D are compatible with TTL level and output levels with CMOS levels.

Features:

- Supply voltage range 4.5 to 5.5 V.
- Output current 8 mA.
- Low consumption current: 0.2 mkA (typical value) at Ta = 25 °C.
- Latchup current not less than 300 mA at Ta = 85 °C.
- Tolerable value of static potential not less than 2000 V as per human body model (HBM) and not less than 200 V as per machine model (MM).
- Ambient operation temperature minus 40 to plus 85 °C.
- Balanced signal propagation delay.
- Ensures voltage exceeding mode on input
- Low noise level at the simultaneous switching of outputs in the same state: V_{OLP} = 0.8 V (max).
- For pins and functions, compatible with IN74HCT74.

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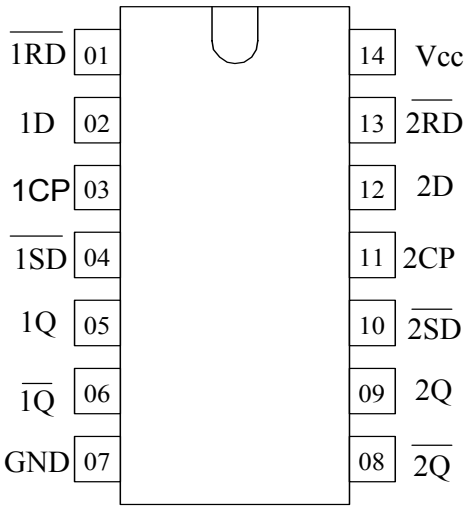
IN74VHCT74D truth table

Input				Output	
$\overline{nSD}$	$\overline{nRD}$	nCP	nD	nQ	$\overline{nQ}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	⌐	H	H	L
H	H	⌐	L	L	H
H	H	L	X	Qo	Qo
H	H	H	X	Qo	Qo
H	H	¬	X	Qo	Qo

Note – H - high voltage level;
L – low voltage level;
X - any voltage level (low or high);
Qo - storage of the previous state;
Z - output in the third
⌐ - transition from low into high level;
¬ - transition from high into low level

Pinout



Pins description in IN74VHCT74D

Pin No.	Symbol	Description
01	$\overline{1RD}$	Input of RESET signal
02	1D	Data input
03	***1CP***	Input of clock signal
04	$\overline{1SD}$	Input of SET signal
05	1Q	Data output
06	$\overline{1Q}$	Data output
07	GND	Common output
08	$\overline{2Q}$	Data output
09	2Q	Data output
10	$\overline{2SD}$	Input of SET signal
11	2CP	Input of clock signal
12	2D	Data input
13	$\overline{2RD}$	Input of RESET signal
14	V_{CC}	Supply output from voltage source

Absolute maximum conditions*

Parameter, unit	Symbol	Value	
		min	max
Supply voltage, V	V_{CC}	-0.5	7.0
Input voltage, V	Vin	-0.5	7.0
Output voltage, V	**Vout**	-0.5	V_{CC} + 0.5B
Output voltage, V	Vout1	-0.5	7.0
Input diode current, mA	Iik	-	-20
Current of common output and supply output, mA	Icc		±50
Output current, mA	Iout		±25
Output diode current, mA	Iok		±20
Dissipated power, mW	Pd		180

*Under absolute maximum conditions operation of microcircuit is not guaranteed. Operation is guaranteed under maximum conditions

Maximum conditions

Parameter, unit	Symbol	Value	
		min	max
Supply voltage, V	V_{CC}	4.5	5.5
Input voltage,V	Vin	0	V_{CC}
Output voltage, V	Vout	0	V_{CC}
Output voltage, V	Vout1	0	5.5*
Output current, mA	Iout	-	±8.0
Input rise and fall time, ns/V	t_{LH}, t_{HL}	0	20
* - Vcc = 0V			

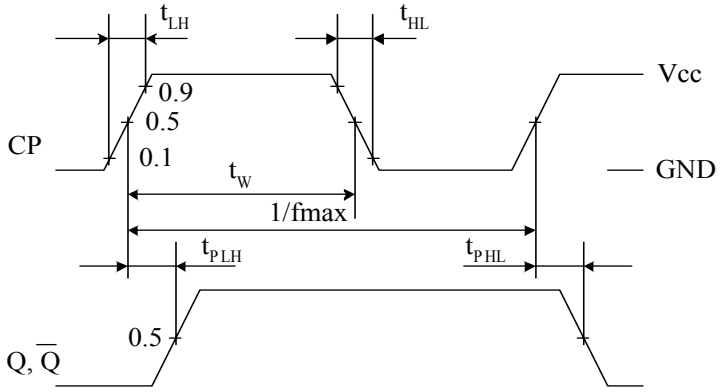
DC electrical characteristics

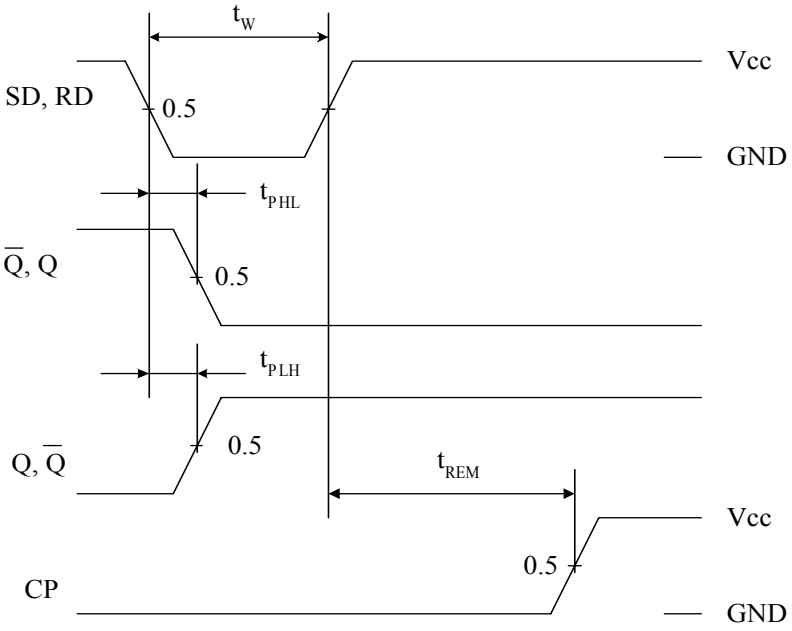
Symbol	Parameter	Test conditions	V_{CC}, V	Value				Unit
				25 °C		–40 to 85 °C		
				min	max	min	max	
V_{IH}	High input voltage	$V_O \le 0.1$ V or $V_O \ge V_{CC}$ –0.1	4.5 – 5.5	2.0 2.0	-	2.0 2.0	-	V
V_{IL}	Low input voltage	$V_O \le 0.1$ V or $V_O \ge V_{CC}$ –0.1	4.5 – 5.5	–	0.8 0.8	–	0.8 0.8	
V_{OH}	High output voltage	V_I = V_{IH} or V_{IL} I_O = -50 mkA	4.5	4.42	–	4.4	–	
			5.5	5.42	–	5.4	–	
		V_I = V_{IH} or V_{IL}; I_O = -8 mA	4.5	3.94	–	3.80	–	
V_{OL}	Low output voltage	V_I = V_{IH} or V_{IL} I_O = 50 mkA	4.5	–	0.09	–	0.1	
			5.5	–	0.09	–	0.1	
		V_I = V_{IH} or V_{IL} I_O = 8 mA	4.5	–	0.36	–	0.44	
I_I	Low level input current	V_I = 0 V	5.5		-0.1		-1.0	
I_{IH}	High level input current	V_I = V_{CC}	5.5	-	0.1	-	1.0	
I_{IH1}	High level input current	V_I = 5.5V	0	-	0.1	-	1.0	uA
I_{OPD}	Output bias current excess mode	V_I = 5.5V	0		0.5	-	5.0	
I_{CC}	Consumption current	V_I =V_{CC} or 0V	5.5	-	2.0	-	20.0	
I_{CCT}	TTL-input consumption current	V_I = 3.4 V	5.5	-	1.35	-	1.5	mA

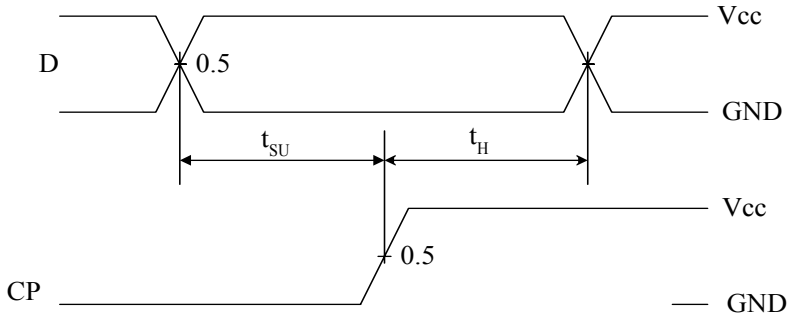
AC electrical characteristics (t_{LH} = t_{HL} = 3.0 ns)

Symbol	Parameter	Test conditions	V_{CC}, V	C_L, pF	Value				Unit
					25 °C		–40 to 85 °C		
					min	max	min	max	
t_{PHL}, t_{PLH}	Propagation delay time when switching "on", "off" from input CP to outputs Q, $\overline{Q}$	V_{IL} = 0 V, V_{IH}=3.0 V,	5.0 ± 0.5	15	–	7.8	–	9.0	ns
				50	–	8.8	–	10.0	
t_{PHL}, t_{PLH}	Propagation delay time when switching "on", "off" from inputs $\overline{SD}$, $\overline{RD}$ to outputs Q, $\overline{Q}$	V_{IL} = 0 V, V_{IH}=2.0 V,	5.0 ± 0.5	15	–	10.4	–	12.0	ns
				50	–	11.4	–	13.0	
fmax	Maximum Clock Frequency	V_{IL} = 0 V, V_{IH}=Vcc,	5.0 ± 0.5	15	–	100	–	80	MHz
				50	–	80	–	65	
t_{SU}	Time of setting signal D to CP	V_{IL} = 0 V, V_{IH}=Vcc,	5.0 ± 0.5	15	5.0	–	5.0	–	ns
				50	5.0	–	5.0	–	
t_H	Retention time, D signal to CP	V_{IL} = 0 V, V_{IH}=Vcc,	5.0 ± 0.5	15	0	–	0	–	
				50	0	–	0	–	
t_{REM}	Time of recovery of signal CP after signals $\overline{SD}$, $\overline{RD}$	V_{IL} = 0 V, V_{IH}=Vcc,	5.0 ± 0.5	15	3.5	–	3.5	–	
				50	3.5	–	3.5	–	
t_W	Pulse duration of CP, $\overline{SD}$, $\overline{RD}$ signals	V_{IL} = 0 V, V_{IH}=Vcc,	5.0 ± 0.5	15	5	–	5	–	
				50	5	–	5	–	
C_I	Input capacity	-	5.0			10			pF
C_{PD}	Dynamic capacity	V_I = 0 V or V_{CC}	5.0			48			

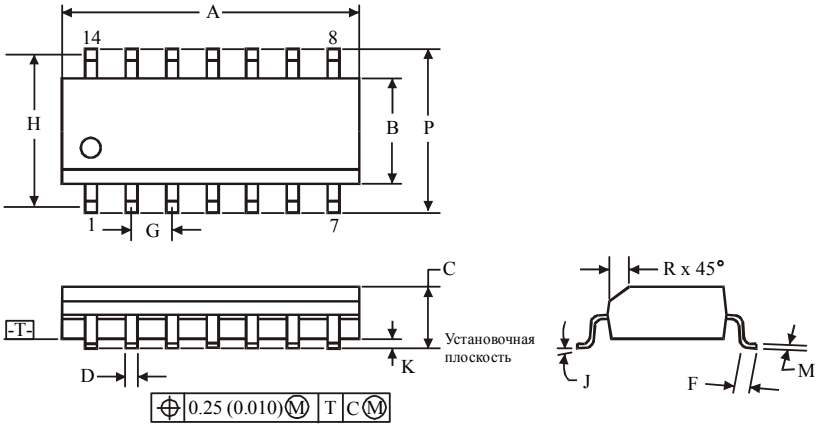
- Time diagram of input and output pulses







MS-012AB Package dimensions



	Dimensions, mm	
	min	max
A	8.55	8.75
B	3.80	4.00
C	1.35	1.75
D	0.33	0.51
F	0.40	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.10	0.25
M	0.19	0.25
P	5.80	6.20
R	0.25	0.50

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