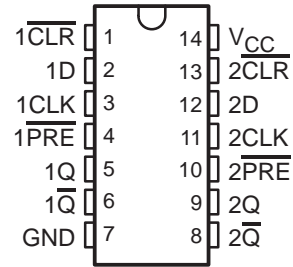


SN54HCT74, SN74HCT74 DUAL D-TYPE POSITIVE-EDGE-TRIGGERED FLIP-FLOPS WITH CLEAR AND PRESET

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- Operating Voltage Range of 4.5 V to 5.5 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 40- μ A Max I_{CC}
- Typical $t_{pd} = 17$ ns
- ± 4 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max
- Inputs Are TTL-Voltage Compatible

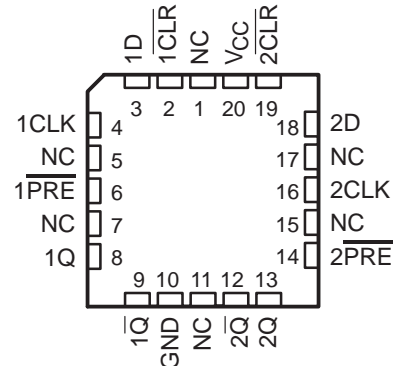
SN54HCT74 . . . J OR W PACKAGE
SN74HCT74 . . . D, DB, N, NS, OR PW PACKAGE
(TOP VIEW)



description/ordering information

The 'HCT74 devices contain two independent D-type positive-edge-triggered flip-flops. A low level at the preset (\overline{PRE}) or clear (\overline{CLR}) inputs sets or resets the outputs, regardless of the levels of the other inputs. When \overline{PRE} and \overline{CLR} are inactive (high), data at the data (D) input meeting the setup time requirements are transferred to the outputs on the positive-going edge of the clock (CLK) pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of CLK. Following the hold-time interval, data at the D input may be changed without affecting the levels at the outputs.

SN54HCT74 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube of 25	SN74HCT74N	SN74HCT74N
	SOIC – D	Tube of 50	SN74HCT74D	HCT74
		Reel of 2500	SN74HCT74DR	
		Reel of 250	SN74HCT74DT	
	SOP – NS	Reel of 2000	SN74HCT74NSR	HCT74
	SSOP – DB	Reel of 2000	SN74HCT74DBR	HT74
	TSSOP – PW	Tube of 90	SN74HCT74PW	HT74
Reel of 2000		SN74HCT74PWR		
Reel of 250		SN74HCT74PWT		
-55°C to 125°C	CDIP – J	Tube of 25	SNJ54HCT74J	SNJ54HCT74J
	CFP – W	Tube of 150	SNJ54HCT74W	SNJ54HCT74W
	LCCC – FK	Tube of 55	SNJ54HCT74FK	SNJ54HCT74FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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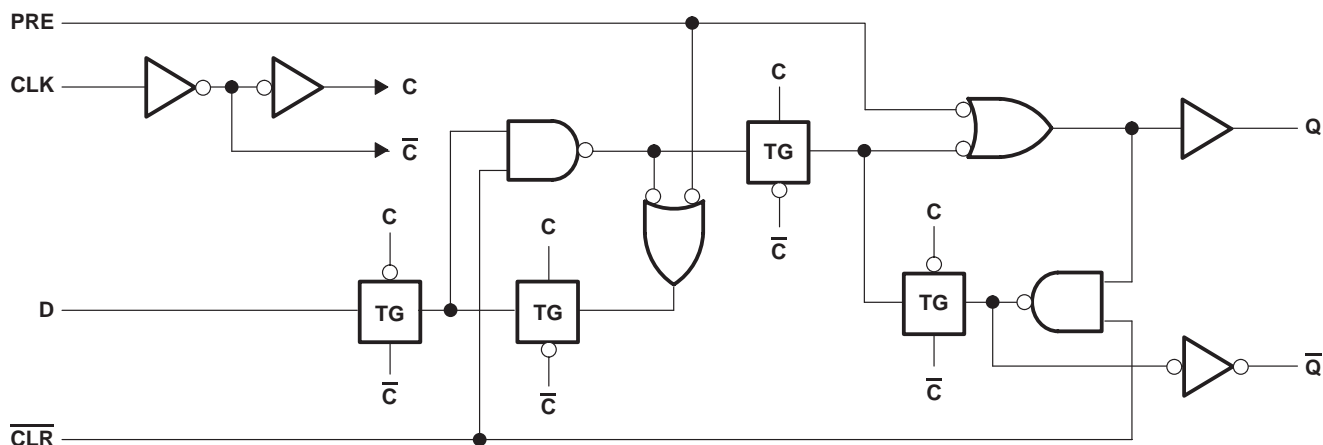
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FUNCTION TABLE

INPUTS				OUTPUT	
PRE	CLR	CLK	D	Q	\bar{Q}
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	Q ₀	\bar{Q} ₀

† This configuration is nonstable; that is, it does not persist when PRE or CLR returns to its inactive (high) level.

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 25 mA
Continuous current through V_{CC} or GND	± 50 mA
Package thermal impedance, θ_{JA} (see Note 2):	
D package	86°C/W
DB package	96°C/W
N package	80°C/W
NS package	76°C/W
PW package	113°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

SN54HCT74, SN74HCT74 DUAL D-TYPE POSITIVE-EDGE-TRIGGERED FLIP-FLOPS WITH CLEAR AND PRESET

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recommended operating conditions (see Note 3)

		SN54HCT74			SN74HCT74			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 4.5 V to 5.5 V			2			V
V _{IL}	Low-level input voltage	V _{CC} = 4.5 V to 5.5 V			0.8			V
V _I	Input voltage	0	V _{CC}		0	V _{CC}		V
V _O	Output voltage	0	V _{CC}		0	V _{CC}		V
Δt/Δv	Input transition rise/fall time	500			500			ns
T _A	Operating free-air temperature	-55	125		-40	85		°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C		SN54HCT74		SN74HCT74		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	4.5 V	4.4	4.499	4.4	4.4	V		
		I _{OH} = -4 mA		3.98	4.3	3.7	3.84			
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	4.5 V	0.001	0.1	0.1	0.1	V		
		I _{OL} = 4 mA		0.17	0.26	0.4	0.33			
I _I	V _I = V _{CC} or 0		5.5 V	±0.1	±100	±1000	±1000	nA		
I _{CC}	V _I = V _{CC} or 0, I _O = 0		5.5 V	4		80	40	μA		
ΔI _{CC} †	One input at 0.5 V or 2.4 V, Other inputs at 0 or V _{CC}		5.5 V	1.4	2.4	3	2.9	mA		
C _i			4.5 V to 5.5 V	3	10	10	10	pF		

† This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

		V _{CC}	T _A = 25°C		SN54HCT74		SN74HCT74		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency	4.5 V	27		18		22		MHz
		5.5 V	30		20		24		
t _w	Pulse duration	4.5 V	PRE or CLR low		24	20		ns	
			CLK high or low		18	23			
		5.5 V	PRE or CLR low		21	18			
			CLK high or low		16	21			
t _{su}	Setup time before CLK↑	4.5 V	Data		18	15		ns	
			PRE or CLR inactive		11	14			
		5.5 V	Data		0	0			
			PRE or CLR inactive		0	0			
t _h	Hold time, data after CLK↑	4.5 V	0		0		0		ns
		5.5 V	0		0		0		

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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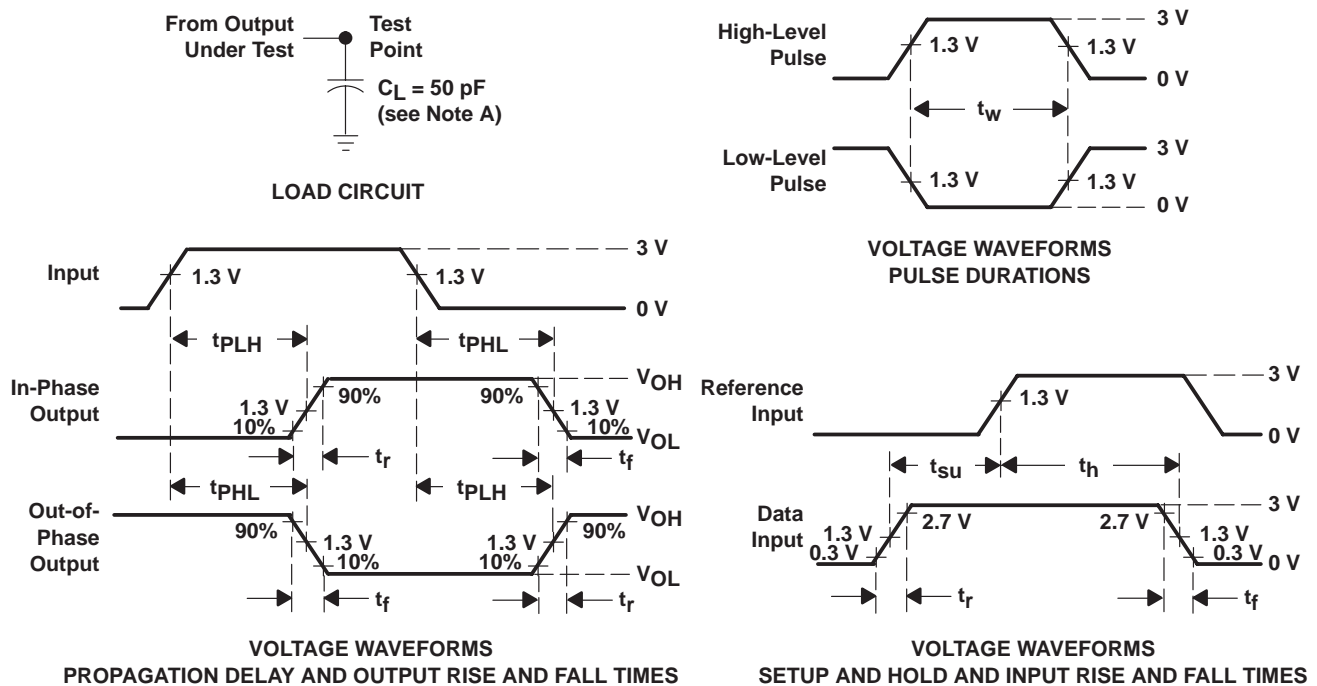
switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HCT74		SN74HCT74		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{\max}			4.5 V	27	40		18		22	MHz	
			5.5 V	30	46		20		24		
t_{pd}	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q or $\overline{\text{Q}}$	4.5 V		21	35		53		44	ns
			5.5 V		17	31		48		40	
	CLK	Q or $\overline{\text{Q}}$	4.5 V		20	28		42		35	
			5.5 V		18	25		38		31	
t_t		Q or $\overline{\text{Q}}$	4.5 V		8	15		22		19	ns
			5.5 V		7	14		20		17	

operating characteristics, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance per flip-flop	No load	35	pF

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- C_L includes probe and test-fixture capacitance.
 - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - For clock inputs, f_{\max} is measured when the input duty cycle is 50%.
 - The outputs are measured one at a time, with one input transition per measurement.
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
JM38510/65352B2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
JM38510/65352BCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/65352BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
SN74HCT74D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DBR	ACTIVE	SSOP	DB	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DBRE4	ACTIVE	SSOP	DB	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DR	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DRE4	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DT	ACTIVE	SOIC	D	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74DTE4	ACTIVE	SOIC	D	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74HCT74NSR	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74NSRE4	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HCT74PW	ACTIVE	TSSOP	PW	14	90	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HCT74PWE4	ACTIVE	TSSOP	PW	14	90	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HCT74PWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI
SN74HCT74PWR	ACTIVE	TSSOP	PW	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HCT74PWRE4	ACTIVE	TSSOP	PW	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HCT74PWT	ACTIVE	TSSOP	PW	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HCT74PWTE4	ACTIVE	TSSOP	PW	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements