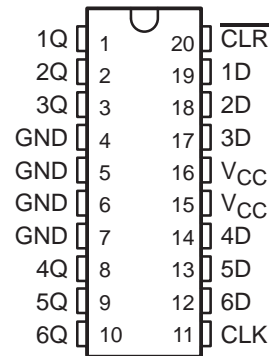


# 74AC11174 HEX D-TYPE FLIP-FLOP WITH CLEAR

SCAS146 – MARCH 1990 – REVISED APRIL 1993

- **Applications Include:** Buffer/Storage Registers, Shift Registers, Pattern Generators
- **Flow-Through Architecture Optimizes** PCB Layout
- **Center-Pin  $V_{CC}$  and GND Pin Configurations** Minimize High-Speed Switching Noise
- **EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process**
- **500-mA Typical Latch-Up Immunity at 125°C**
- **Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs**

DW OR N PACKAGE  
(TOP VIEW)



## description

This device contains six D-type flip-flops and is positive-edge-triggered with a direct clear input. Information at the D inputs meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output.

The 74AC11174 is characterized for operation from – 40°C to 85°C.

FUNCTION TABLE

INPUTS			OUTPUT Q
CLR	CLK	D	
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q <sub>O</sub>

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PRODUCTION DATA information is 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.



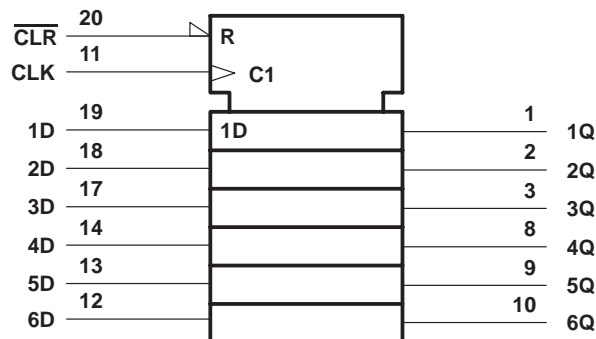
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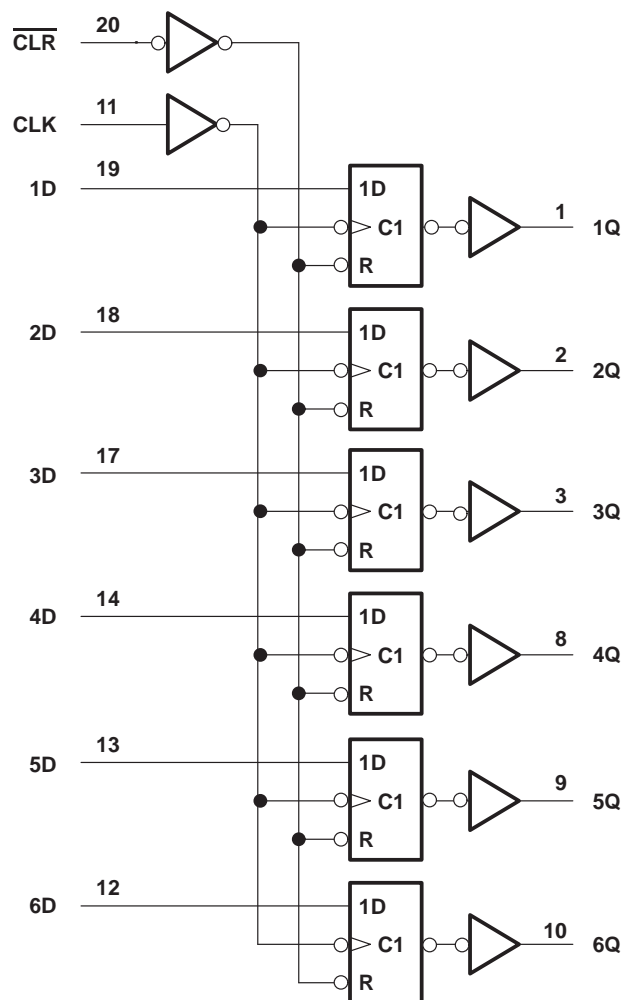
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## logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## 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 voltage range, $V_I$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	±50 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±50 mA
Continuous current through $V_{CC}$ or GND	±150 mA
Storage temperature range	–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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

**74AC11174**  
**HEX D-TYPE FLIP-FLOP WITH CLEAR**

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**recommended operating conditions**

			MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage		3	5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1			V
		$V_{CC} = 4.5\text{ V}$	3.15			
		$V_{CC} = 5.5\text{ V}$	3.85			
$V_{IL}$	Low-level input voltage	$V_{CC} = 3\text{ V}$			0.9	V
		$V_{CC} = 4.5\text{ V}$			1.35	
		$V_{CC} = 5.5\text{ V}$			1.65	
$V_I$	Input voltage		0		$V_{CC}$	V
$V_O$	Output voltage		0		$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 3\text{ V}$			-4	mA
		$V_{CC} = 4.5\text{ V}$			-24	
		$V_{CC} = 5.5\text{ V}$			-24	
$I_{OL}$	Low-level output current	$V_{CC} = 3\text{ V}$			12	mA
		$V_{CC} = 4.5\text{ V}$			24	
		$V_{CC} = 5.5\text{ V}$			24	
$\Delta t/\Delta v$	Input transition rise or fall rate		0		10	ns/V
$T_A$	Operating free-air temperature		-40		85	°C

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	TA = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
$V_{OH}$	$I_{OH} = -50\text{ }\mu\text{A}$	3 V	2.9			2.9		V
		4.5 V	4.4			4.4		
		5.5 V	5.4			5.4		
	$I_{OH} = -4\text{ mA}$	3 V	2.58			2.48		
		4.5 V	3.94			3.8		
		5.5 V	4.94			4.8		
	$I_{OH} = -75\text{ mA}^\dagger$	5.5 V				3.85		
$V_{OL}$	$I_{OL} = 50\text{ }\mu\text{A}$	3 V			0.1		0.1	V
		4.5 V			0.1		0.1	
		5.5 V			0.1		0.1	
	$I_{OL} = 12\text{ mA}$	3 V			0.36		0.44	
		4.5 V			0.36		0.44	
		5.5 V			0.36		0.44	
	$I_{OL} = 75\text{ mA}^\dagger$	5.5 V					1.65	
$I_I$	$V_I = V_{CC}$ or GND	5.5 V			$\pm 0.1$		$\pm 1$	$\mu\text{A}$
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			8		80	$\mu\text{A}$
$C_i$	$V_I = V_{CC}$ or GND	5 V		4				pF

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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## HEX D-TYPE FLIP-FLOP WITH CLEAR

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**timing requirements over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)**

			$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
			MIN	MAX			
$f_{\text{clock}}$	Clock frequency		0	80	0	80	MHz
$t_w$	Pulse duration	$\overline{\text{CLR}}$ low	4.5		4.5		ns
		CLK high or low	6		6		
$t_{\text{su}}$	Setup time before $\text{CLK}\uparrow$	Data	7		7		ns
		$\overline{\text{CLR}}$ inactive	1.5		1.5		
$t_h$	Hold time after $\text{CLK}\uparrow$		0		0		ns

**timing requirements over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)**

			$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
			MIN	MAX			
$f_{\text{clock}}$	Clock frequency		0	100	0	100	MHz
$t_w$	Pulse duration	$\overline{\text{CLR}}$ low	4		4		ns
		CLK high or low	5		5		
$t_{\text{su}}$	Setup time before $\text{CLK}\uparrow$	Data	4.5		4.5		ns
		$\overline{\text{CLR}}$ inactive	1.5		1.5		
$t_h$	Hold time after $\text{CLK}\uparrow$		0		0		ns

**switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$f_{\text{max}}$			80	105		80		MHz
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Any Q	3.9	10	13.5	3.9	14.8	ns
$t_{\text{PLH}}$	CLK	Any Q	2.4	7.5	9.2	2.4	10.8	ns
$t_{\text{PHL}}$			3.4	9.6	12.7	3.4	14	

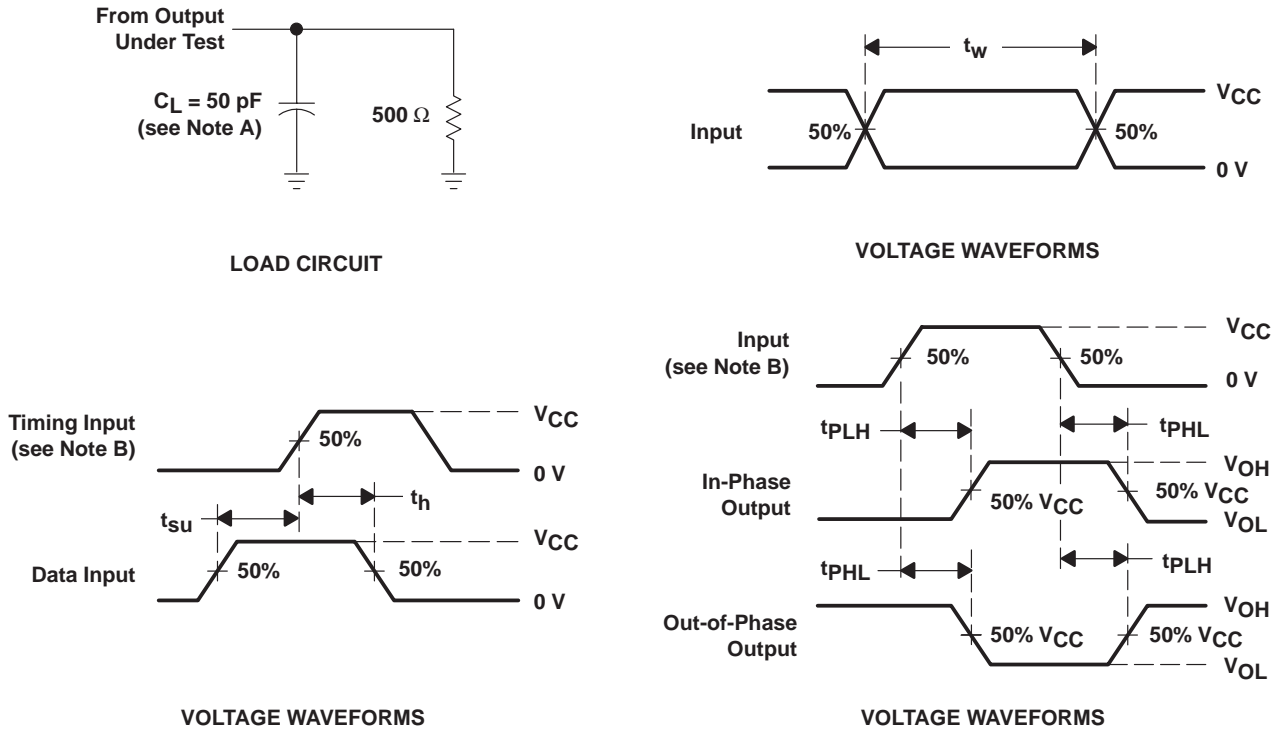
**switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$f_{\text{max}}$			100	125		100		MHz
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Any Q	2.9	6.5	9.8	2.9	10.7	ns
$t_{\text{PLH}}$	CLK	Any Q	2.1	4.9	6.8	2.1	7.6	ns
$t_{\text{PHL}}$			2.7	6.2	9.2	2.7	10.1	

**operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$**

PARAMETER		TEST CONDITIONS	TYP	UNIT
$C_{\text{pd}}$	Power dissipation capacitance	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	29	pF

## PARAMETER MEASUREMENT INFORMATION



NOTES: A.  $C_L$  includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .

C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms



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