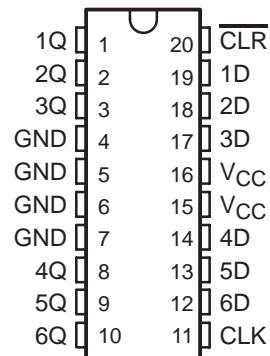


74AC11174 HEX D-TYPE FLIP-FLOP WITH CLEAR

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- μ 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
$\overline{\text{CLR}}$	CLK	D	Q
L	X	X	L
H	\uparrow	H	H
H	\uparrow	L	L
H	L	X	Q_0

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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.



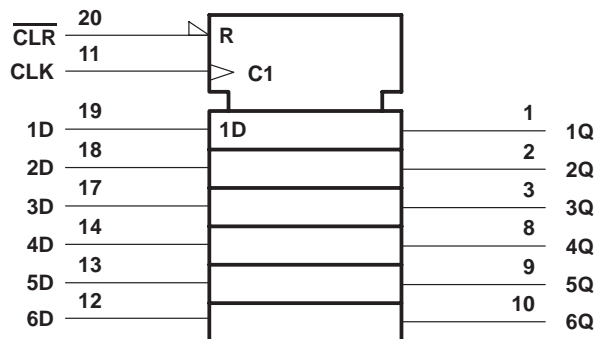
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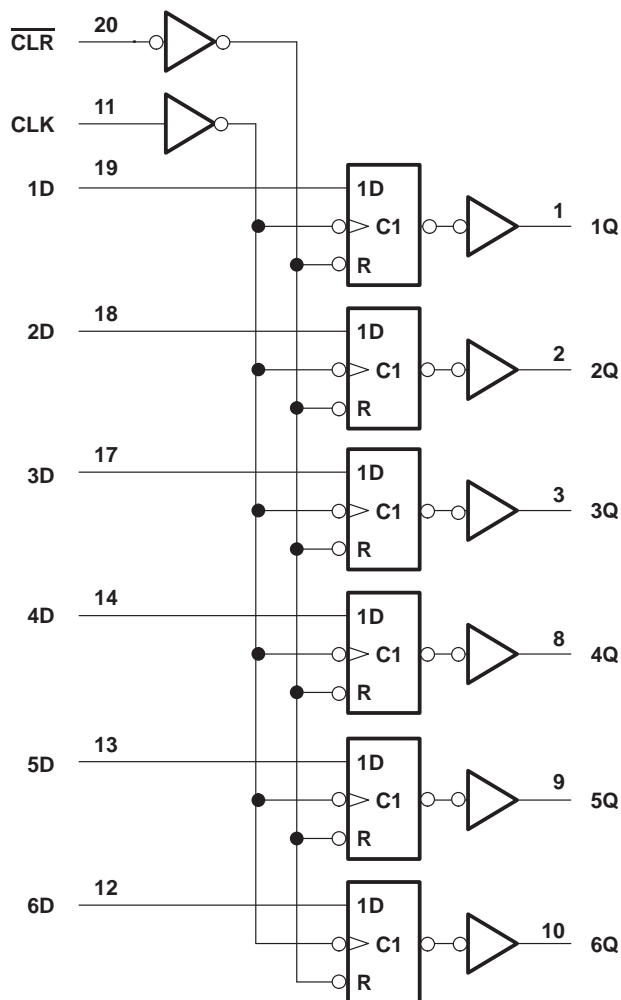
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logic symbol†



† 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.

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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}	$I_{OH} = -50\ \mu\text{A}$	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}	$I_{OL} = 50\ \mu\text{A}$	3 V			0.1		V	
		4.5 V			0.1			
		5.5 V			0.1			
	$I_{OL} = 12\text{ mA}$	3 V			0.36			
		4.5 V			0.36			
		5.5 V			0.36			
$I_{OL} = 75\text{ mA}^\dagger$	5.5 V			1.65				
I_I	$V_I = V_{CC}$ or GND	5.5 V			± 0.1		μA	
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			8		μA	
C_i	$V_I = V_{CC}$ or GND	5 V	4				pF	

† 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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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_{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_{su}	Setup time before CLK \uparrow	Data	7	7		ns
		$\overline{\text{CLR}}$ inactive	1.5	1.5		
t_h	Hold time after 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_{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_{su}	Setup time before CLK \uparrow	Data	4.5	4.5		ns
		$\overline{\text{CLR}}$ inactive	1.5	1.5		
t_h	Hold time after 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_{max}			80	105		80		MHz
t_{PHL}	$\overline{\text{CLR}}$	Any Q	3.9	10	13.5	3.9	14.8	ns
t_{PLH}	CLK	Any Q	2.4	7.5	9.2	2.4	10.8	ns
t_{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)

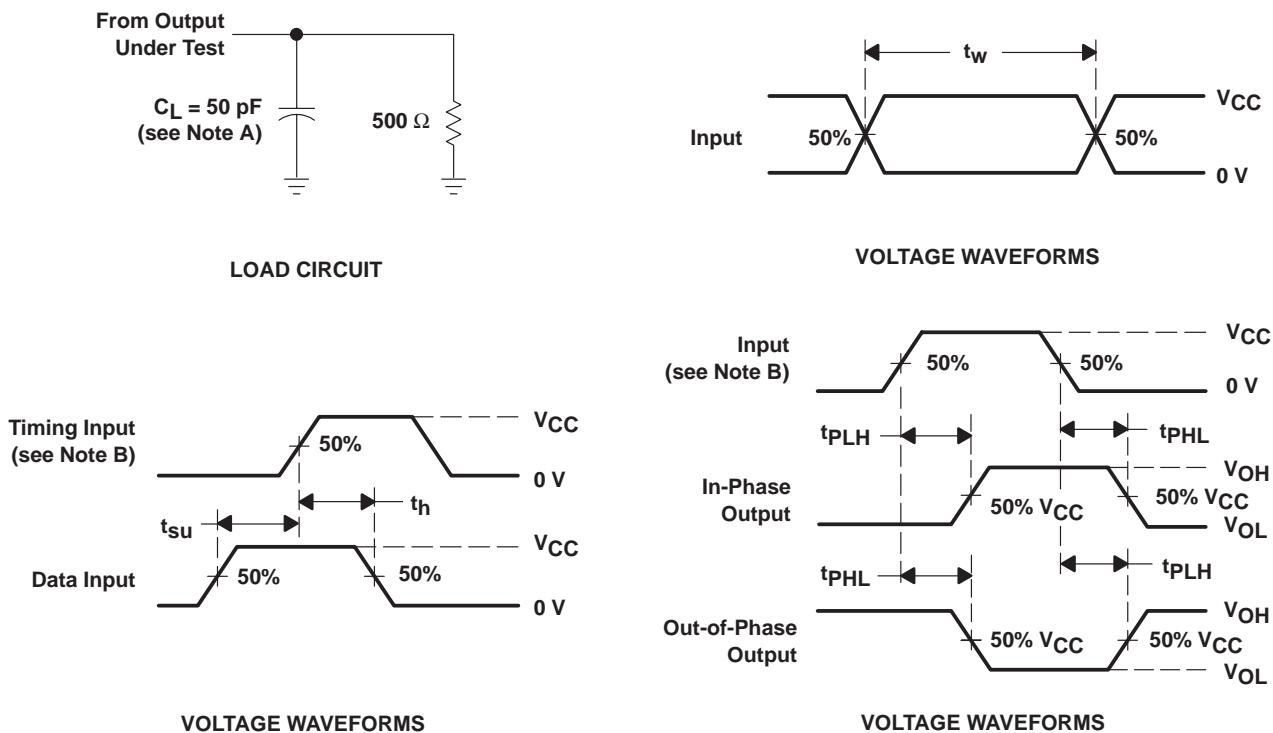
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{max}			100	125		100		MHz
t_{PHL}	$\overline{\text{CLR}}$	Any Q	2.9	6.5	9.8	2.9	10.7	ns
t_{PLH}	CLK	Any Q	2.1	4.9	6.8	2.1	7.6	ns
t_{PHL}			2.7	6.2	9.2	2.7	10.1	

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{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

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74AC11174DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
74AC11174N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
74AC11174N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
74AC11174N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI

⁽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 for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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