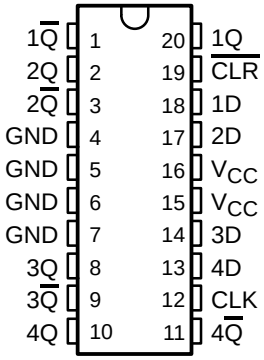
SCAS089 – D3385, DECEMBER 1989 – REVISED APRIL 1993

- **Inputs Are TTL-Voltage Compatible**
- **Buffered Clock and Direct Clear Inputs**
- **Applications Include: Buffer/Storage Registers, Shift Registers, Pattern Generators**
- **Fully-Buffered Outputs for Maximum Isolation From External Disturbances**
- **Flow-Through Architecture to Optimize PCB Layout**
- **Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise**
- ***EPIC***™ **(Enhanced-Performance Implanted CMOS) 1-μm 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 74AC11175 is characterized for operation from – 40°C to 85°C.

FUNCTION TABLE
(each flip-flop)

INPUTS			OUTPUTS	
$\overline{CLR}$	CLK	D	Q	$\overline{Q}$
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	$\overline{Q}_0$

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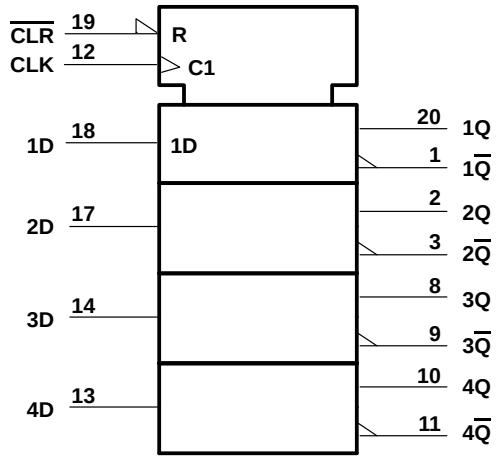
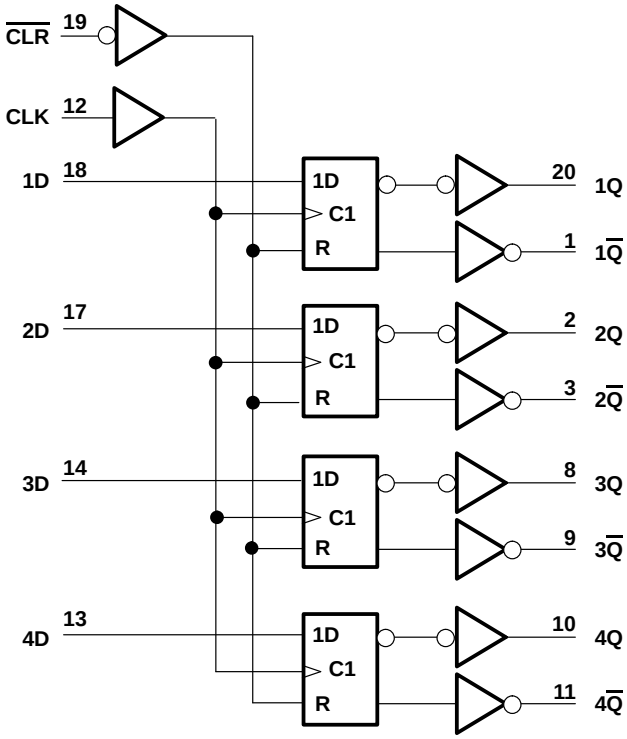
logic symbol†



† 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 . . . . . ± 200 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 current ratings are observed.

recommended operating conditions

		MIN	MAX	UNIT
V_{CC}	Supply voltage	4.5	5.5	V
V_{IH}	High-level input voltage	2		V
V_{IL}	Low-level input voltage		0.8	V
V_I	Input voltage	0	V_{CC}	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current		–24	mA
I_{OL}	Low-level output current		24	mA
$\Delta t/\Delta v$	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}	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{OH}	I_{OH} = – 50 μA	4.5 V	4.4			4.4		V
		5.5 V	5.4			5.4		
	I_{OH} = – 24 mA	4.5 V	3.94			3.8		
		5.5 V	4.94			4.8		
	I_{OH} = – 75 mA†	5.5 V				3.85		
V_{OL}	I_{OL} = 50 μA	4.5 V			0.1		0.1	V
		5.5 V			0.1		0.1	
	I_{OL} = 24 mA	4.5 V			0.36		0.44	
		5.5 V			0.36		0.44	
	I_{OL} = 75 mA†	5.5 V					1.65	
I_I	$V_I = V_{CC}$ or GND	5.5 V			± 0.1		± 1	μA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0	5.5 V			8		80	μA
ΔI_{CC}‡	One input at 3.4 V, Other inputs at GND or V_{CC}	5.5 V			0.9		1	mA
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.
‡ 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, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

			T_A = 25°C		MIN	MAX	UNIT
			MIN	MAX			
f_{clock}	Clock frequency		0	100	0	100	MHz
t_w	Pulse duration	$\overline{CLR}$ low	5		5		ns
		CLK high or low	5		5		
t_{su}	Setup time before CLK↑	Data	5		5		ns
		$\overline{CLR}$ inactive	5		5		
t_h	Hold time, data after CLK↑		0.5		0.5		ns

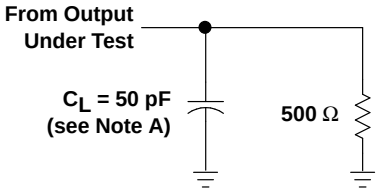
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{max}			100	130		100		MHz
t_{PLH}	$\overline{CLR}$	Any Q	2.5	5.4	7.4	2.5	8.1	ns
		Any $\overline{Q}$	2.5	5.4	7.4	2.5	8.1	
t_{PHL}	$\overline{CLR}$	Any Q	3.1	7.6	9.9	3.1	10.9	ns
		Any $\overline{Q}$	3.1	7.6	9.9	3.1	10.9	
t_{PLH}	CLK	Any Q	3	5.3	6.9	3	7.5	ns
		Any $\overline{Q}$	3	5.3	6.9	3	7.5	
t_{PHL}	CLK	Any Q	3.3	7.2	9.2	3.3	10.1	ns
		Any $\overline{Q}$	3.3	7.2	9.2	3.3	10.1	

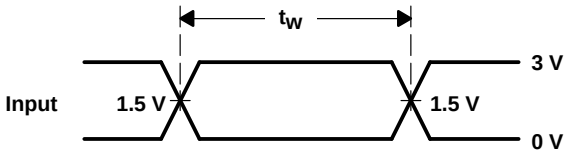
operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	C_L = 50 pF, f = 1 MHz	42	pF

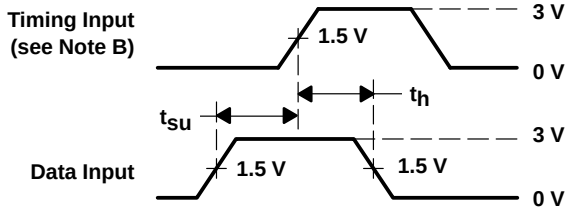
PARAMETER MEASUREMENT INFORMATION



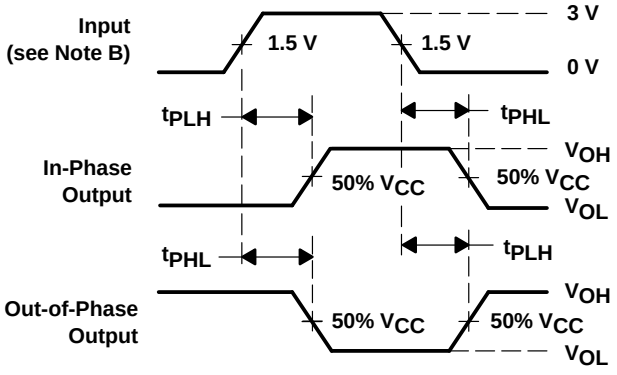
LOAD CIRCUIT



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r = 3 ns, t_f = 3 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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