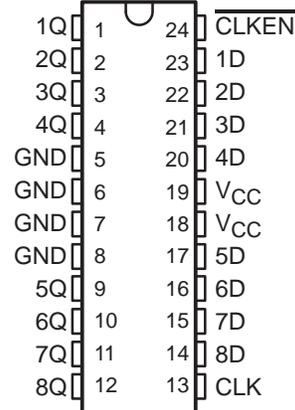


# 74ACT11377 OCTAL D-TYPE FLIP-FLOP WITH CLOCK ENABLE

SCAS129 – D3450, MARCH 1990 – REVISED APRIL 1993

- Inputs Are TTL-Voltage Compatible
- Contains Eight D-Type Flip-Flops
- Clock Enable Latched to Avoid False Clocking
- Applications Include:
  - Buffer/Storage Registers
  - Shift Registers
  - Pattern Generators
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND 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, Plastic Shrink Small-Outline Packages and Standard Plastic 300-mil DIPs

DB, DW OR NT PACKAGE  
(TOP VIEW)



## description

These circuits are positive-edge-triggered D-type flip-flops with a clock enable input.

Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if  $\overline{CLKEN}$  is low. 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 circuits are designed to prevent false clocking by transitions at the  $\overline{CLKEN}$  input.

The 74ACT11377 is characterized for operation from – 40°C to 85°C.

FUNCTION TABLE  
(each flip-flop)

INPUTS			OUTPUT
$\overline{CLKEN}$	CLK	D	Q
H	X	X	$Q_0$
L	↑	H	H
L	↑	L	L
X	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.



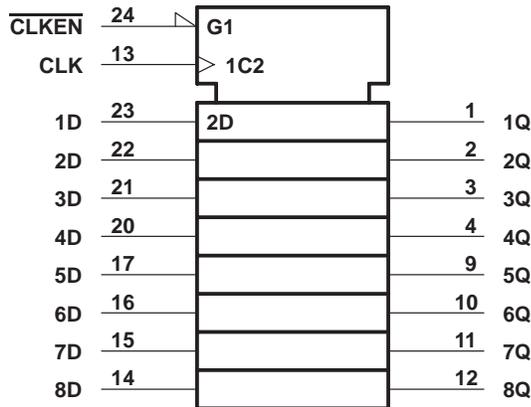
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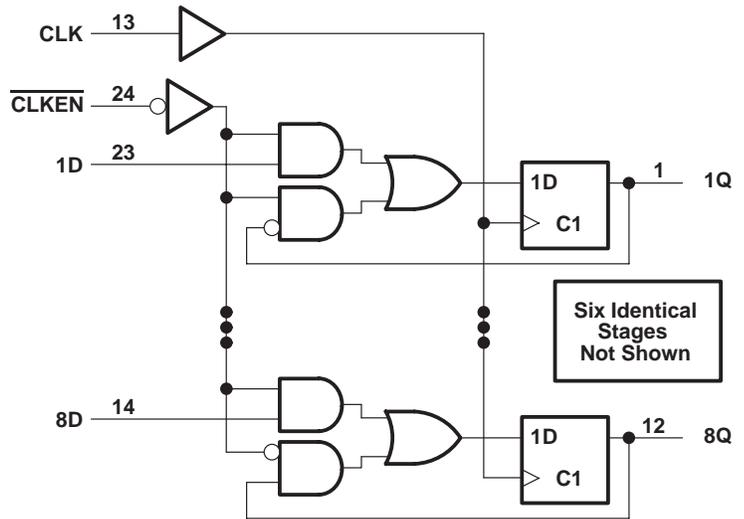
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## logic symbol†



† 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)‡

Input voltage range, $V_I$ (see Note 1) .....	$-0.5\text{ V to }V_{CC} + 0.5\text{ V}$
Output voltage range, $V_O$ (see Note 1) .....	$-0.5\text{ V to }V_{CC} + 0.5\text{ V}$
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20\text{ mA}$
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 50\text{ mA}$
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50\text{ mA}$
Continuous current through $V_{CC}$ or GND .....	$\pm 200\text{ mA}$
Storage temperature range .....	$-65^\circ\text{C to }150^\circ\text{C}$

‡ 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	$^\circ\text{C}$

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			MIN	MAX	UNIT	
			MIN	TYP	MAX				
V <sub>OH</sub>	I <sub>OH</sub> = – 50 μA	4.5 V	4.4			4.4		V	
		5.5 V	5.4			5.4			
	I <sub>OH</sub> = – 24 mA	4.5 V	3.94			3.8			
		5.5 V	4.94			4.8			
	I <sub>OH</sub> = – 75 mA <sup>†</sup>	5.5 V				3.85			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	4.5 V				0.1		V	
		5.5 V				0.1			
	I <sub>OL</sub> = 24 mA	4.5 V				0.36			
		5.5 V				0.36			
	I <sub>OL</sub> = 75 mA <sup>†</sup>	5.5 V				1.65			
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V				± 0.1		μA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V				8		80	μA
ΔI <sub>CC</sub> <sup>‡</sup>	One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>	5.5 V				0.9		1	mA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> 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.

<sup>‡</sup> 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<sub>CC</sub>.

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

		T <sub>A</sub> = 25°C		MIN	MAX	UNIT
		MIN	MAX			
f <sub>clock</sub>	Clock frequency	0	100	0	100	MHz
t <sub>w</sub>	Pulse duration	CLK high	5	5		ns
		CLK low	5	5		
t <sub>su</sub>	Setup time before CLK↑	Data	4	4		ns
		CLKEN high	4	4		
		CLKEN low	5	5		
t <sub>h</sub>	Hold time after CLK↑	CLKEN high or low	0	0		ns
		Data high	1	1		
		Data low	0	0		

**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 <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
f <sub>max</sub>			100			100		MHz
t <sub>PLH</sub>	CLK	Any Q	4.5	9.1	12.2	4.5	13.8	ns
t <sub>PHL</sub>			4.8	9.6	12.7	4.8	14.2	

**operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

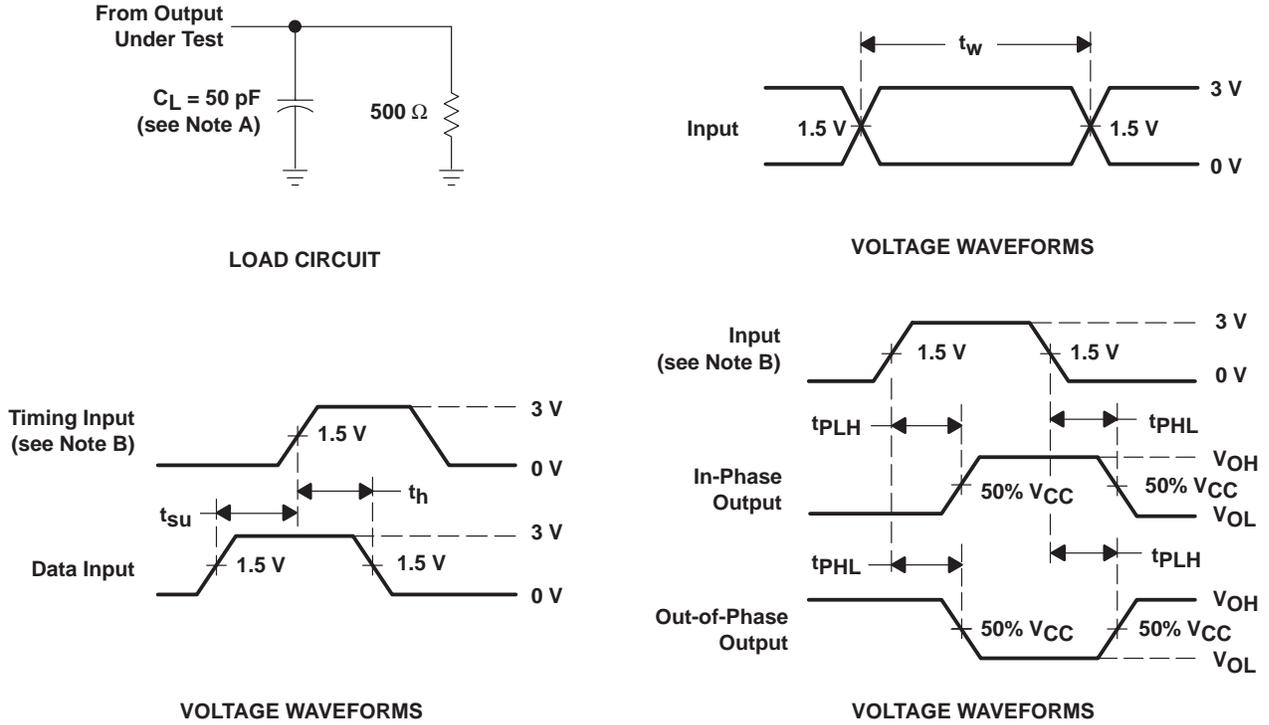
PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub> Power dissipation capacitance	C <sub>L</sub> = 50 pF, f = 1 MHz	68	pF



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**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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