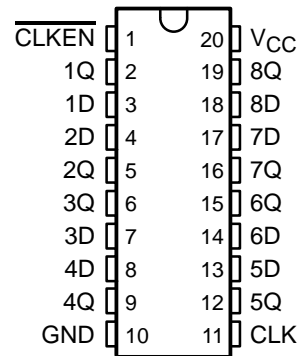


SN54HCT377, SN74HCT377 OCTAL D-TYPE FLIP-FLOPS WITH CLOCK ENABLE

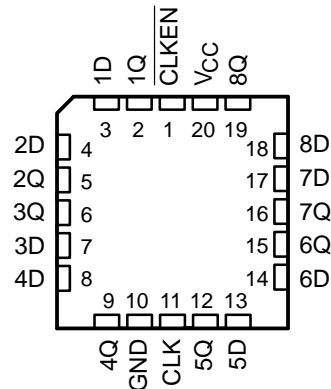
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- Inputs Are TTL-Voltage Compatible
- Contain Eight Flip-Flops With Single-Rail Outputs
- Clock Enable Latched to Avoid False Clocking
- Applications Include:
 - Buffer/Storage Registers
 - Shift Registers
 - Pattern Generators
- Package Options Include Plastic Small-Outline (DW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

SN54HCT377 . . . J OR W PACKAGE
SN74HCT377 . . . DW OR N PACKAGE
(TOP VIEW)



SN54HCT377 . . . FK PACKAGE
(TOP VIEW)



description

These devices are positive-edge-triggered D-type flip-flops. The 'HCT377 are similar to the 'HCT273 but feature a latched clock-enable ($\overline{\text{CLKEN}}$) input instead of a common clear.

Information at the data (D) inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock (CLK) pulse if $\overline{\text{CLKEN}}$ 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 CLK is at either the high or low level, the D input has no effect at the output. These devices are designed to prevent false clocking by transitions at $\overline{\text{CLKEN}}$.

The SN54HCT377 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT377 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE
(each flip-flop)

INPUTS			OUTPUT Q
$\overline{\text{CLKEN}}$	CLK	D	
H	X	X	Q_0
L	\uparrow	H	H
L	\uparrow	L	L
X	L	X	Q_0



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**TEXAS
INSTRUMENTS**

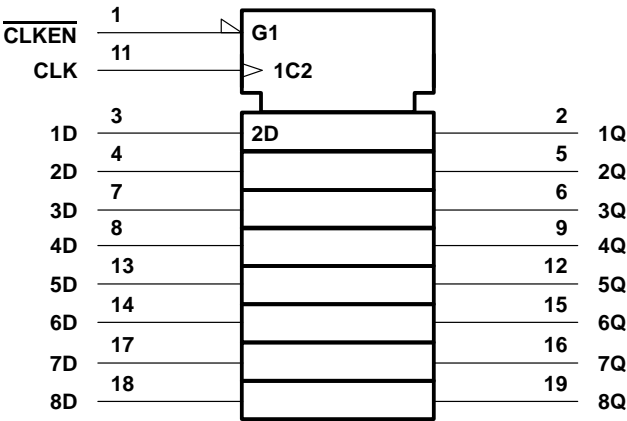
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WITH CLOCK ENABLE

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logic symbol†

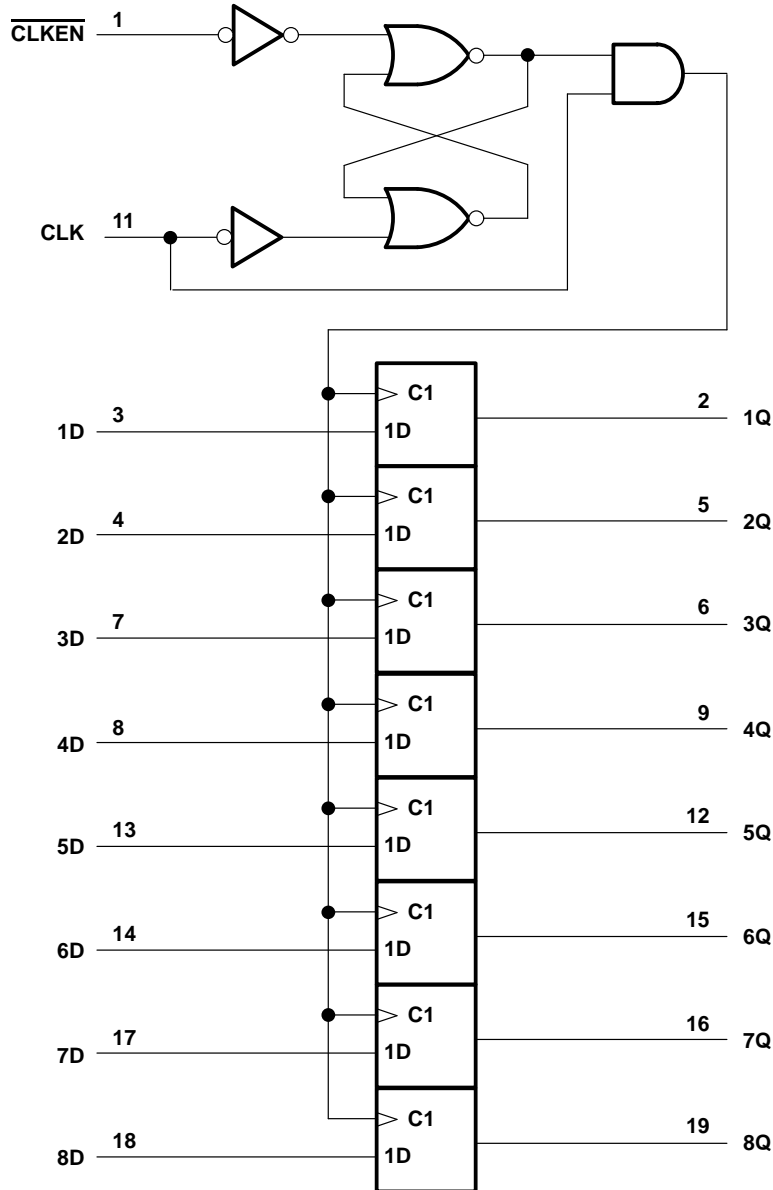


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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logic diagram (positive logic)



SN54HCT377, SN74HCT377

OCTAL D-TYPE FLIP-FLOPS

WITH CLOCK ENABLE

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absolute maximum ratings over operating free-air temperature range†

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
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): DW package	1.6 W
N package	1.3 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 maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions

		SN54HCT377			SN74HCT377			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	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$			2			V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$			0			V
V_I	Input voltage	0			V_{CC}			V
V_O	Output voltage	0			V_{CC}			V
t_t	Input transition (rise and fall) times	0			500			ns
T_A	Operating free-air temperature	–55			125			°C

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

PARAMETER	TEST CONDITIONS		V_{CC}	$T_A = 25^\circ\text{C}$			SN54HCT377		SN74HCT377		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	$I_{OH} = -20\text{ }\mu\text{A}$	4.5 V	4.4	4.499		4.4		4.4		V
		$I_{OH} = -4\text{ mA}$	4.5 V	3.98	4.30		3.7		3.84		
V_{OL}	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 20\text{ }\mu\text{A}$	4.5 V		0.001	0.1		0.1		0.1	V
		$I_{OL} = 4\text{ mA}$	4.5 V		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			8		160		80	μA
ΔI_{CC}^\ddagger	One input at 0.5 V or 2.4 V, Other inputs at GND 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

* On products compliant to MIL-STD-883, Class B, this parameter is not production tested.

‡ 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} .

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

			V _{CC}	T _A = 25°C		SN54HCT377		SN74HCT377		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency		4.5 V	0	25	0	17	0	20	MHz
			5.5 V	0	30	0	19	0	22	
t _w	Pulse duration	CLK high or low	4.5 V	20		30		25		ns
			5.5 V	18		28		23		
t _{su}	Setup time before CLK↑	Data	4.5 V	12		18		15		ns
			5.5 V	10		17		14		
		CLKEN high or low	4.5 V	12		18		15		
			5.5 V	10		17		14		
t _h	Hold time data after CLK↑	Data	4.5 V	3		3		3		ns
			5.5 V	3		3		3		
		CLKEN inactive or active	4.5 V	5		5		5		
			5.5 V	5		5		5		

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}	SN54HCT377				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
f _{max}			4.5 V	25	31		17	MHz	
			5.5 V	30	37		19		
t _{pd}	CLK	Any	4.5 V		15	30	45	ns	
			5.5 V		12	28	40		
t _t		Any	4.5 V		8	15	22	ns	
			5.5 V		6	14	21		

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}	SN74HCT377				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
f _{max}			4.5 V	25	31		20	MHz	
			5.5 V	30	37		22		
t _{pd}	CLK	Any	4.5 V		15	30	38	ns	
			5.5 V		12	28	35		
t _t		Any	4.5 V		8	15	19	ns	
			5.5 V		6	14	17		

operating characteristics, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance	No load	30	pF

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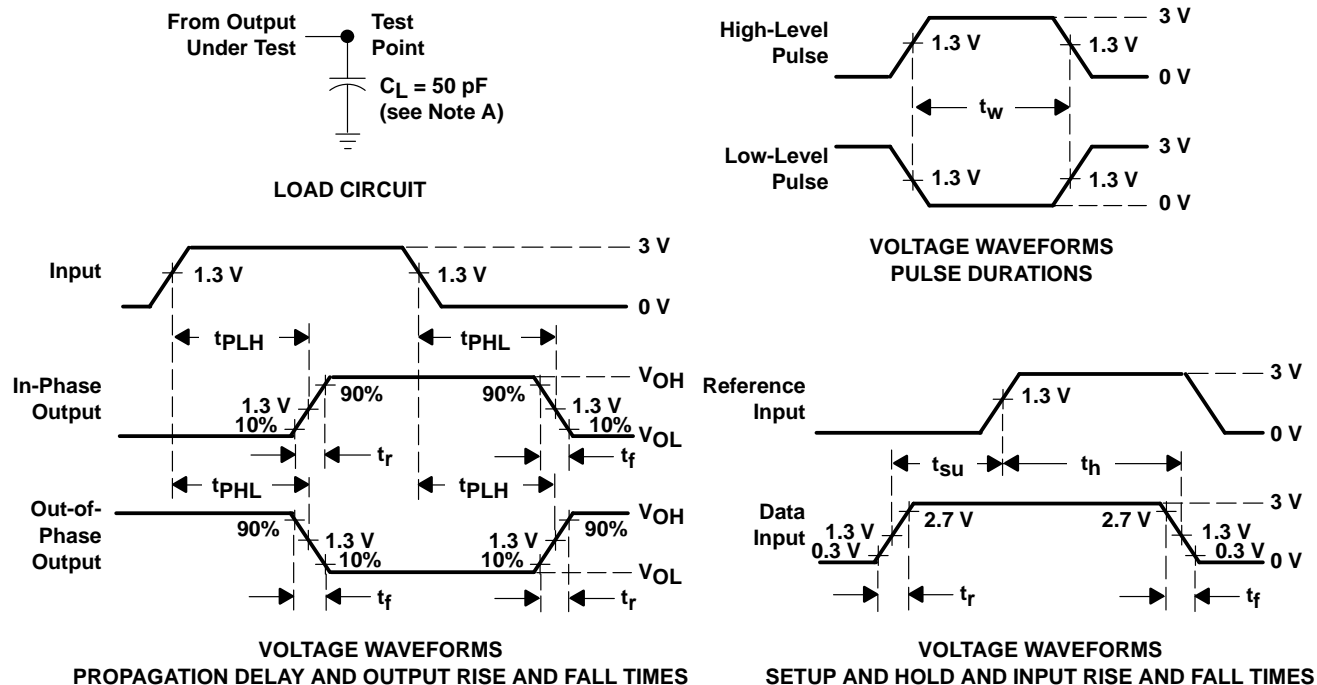


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PARAMETER MEASUREMENT INFORMATION



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

Figure 1. Load Circuit and Voltage Waveforms

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