

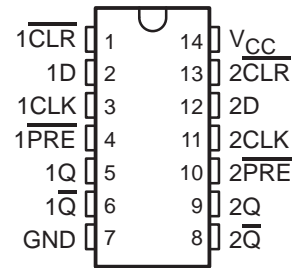
# SN74HC74-Q1

## DUAL D-TYPE POSITIVE-EDGE-TRIGGERED FLIP-FLOP WITH CLEAR AND PRESET

SCLS577 – MARCH 2004

- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 80- $\mu$ A Max  $I_{CC}$
- Typical  $t_{pd} = 15$  ns
- $\pm 4$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Max

D OR PW PACKAGE  
(TOP VIEW)



† Contact factory for details. Q100 qualification data available on request.

### description/ordering information

The SN74HC74 device contains two independent D-type positive-edge-triggered flip-flops. A low level at the preset ( $\overline{PRE}$ ) or clear ( $\overline{CLR}$ ) inputs sets or resets the outputs, regardless of the levels of the other inputs. When  $\overline{PRE}$  and  $\overline{CLR}$  are inactive (high), data at the data (D) input meeting the setup time requirements are transferred to the outputs on the positive-going edge of the clock (CLK) pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of CLK. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

### ORDERING INFORMATION

$T_A$	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	SOIC – D	Reel of 2500	SN74HC74QDRQ1	HC74Q
	TSSOP – PW	Reel of 2000	SN74HC74QPWRQ1	HC74Q

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

### FUNCTION TABLE

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

† This configuration is nonstable; that is, it does not persist when  $\overline{PRE}$  or  $\overline{CLR}$  returns to its inactive (high) level.



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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>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	2 V	1.9	1.998	1.9	V	
			4.5 V	4.4	4.499	4.4		
			6 V	5.9	5.999	5.9		
		I <sub>OH</sub> = -4 mA	4.5 V	3.98	4.3	3.7		
			6 V	5.48	5.8	5.2		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	2 V	0.002	0.1	0.1	V	
			4.5 V	0.001	0.1	0.1		
			6 V	0.001	0.1	0.1		
		I <sub>OL</sub> = 4 mA	4.5 V	0.17	0.26	0.4		
			6 V	0.15	0.26	0.4		
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0	6 V	±0.1	±100	±1000	nA		
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0	6 V		4	80	μA		
C <sub>i</sub>		2 V to 6 V		3	10	10	pF	

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

		V <sub>CC</sub>	T <sub>A</sub> = 25°C		MIN	MAX	UNIT
			MIN	MAX			
f <sub>clock</sub>	Clock frequency	2 V		6	4.2	MHz	
		4.5 V		31	21		
		6 V	0	36	0		25
t <sub>w</sub>	Pulse duration	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low	2 V	100	150	ns	
			4.5 V	20	30		
			6 V	17	25		
	CLK high or low	2 V	80	120			
		4.5 V	16	24			
		6 V	14	20			
t <sub>su</sub>	Data	2 V	100	150	ns		
		4.5 V	20	30			
		6 V	17	25			
	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ inactive	2 V	25	40			
		4.5 V	5	8			
		6 V	4	7			
t <sub>h</sub>	Hold time, data after CLK↑	2 V	0	0	ns		
		4.5 V	0	0			
		6 V	0	0			

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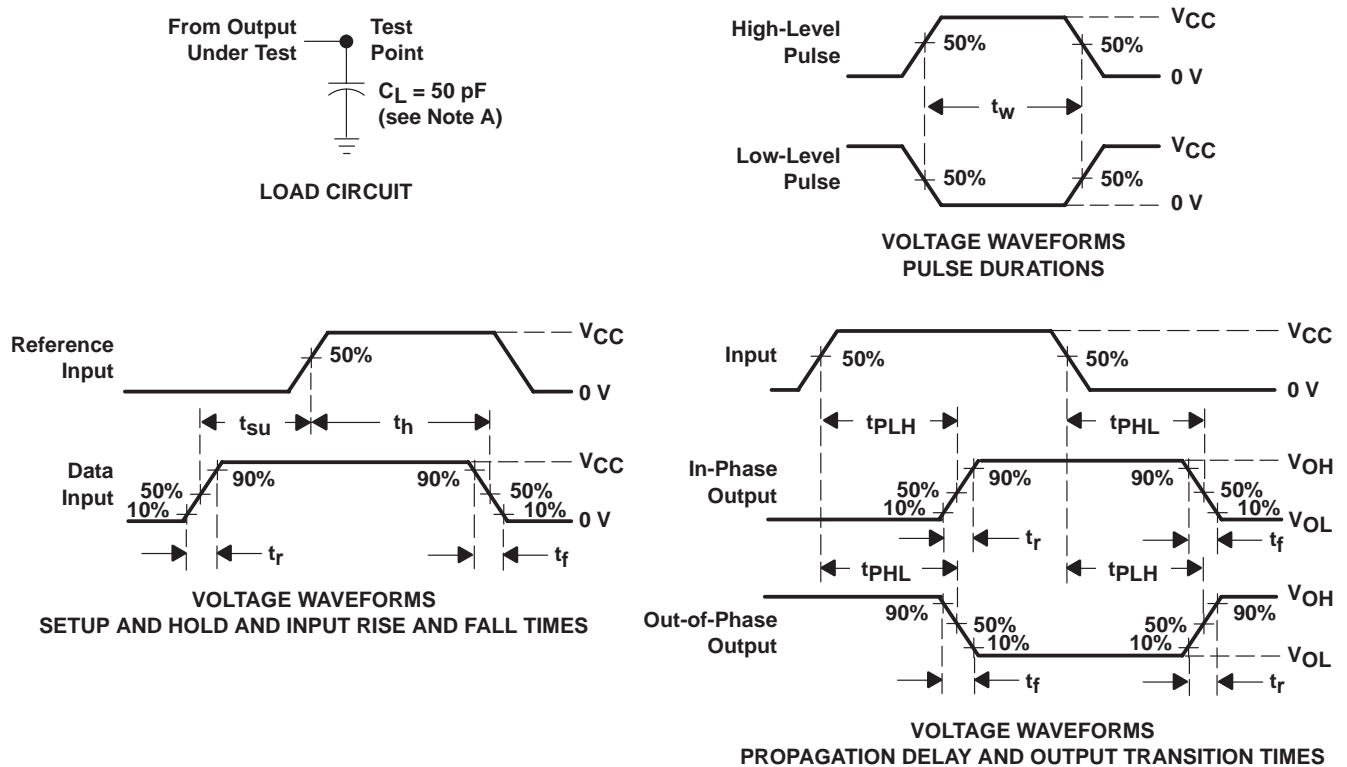
switching characteristics over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
$f_{max}$			2 V	6	10		4.2	MHz	
			4.5 V	31	50		21		
			6 V	36	60		25		
$t_{pd}$	$\overline{PRE}$ or $\overline{CLR}$	Q or $\overline{Q}$	2 V		70	230		345	ns
			4.5 V		20	46		69	
			6 V		15	39		59	
	CLK	Q or $\overline{Q}$	2 V		70	175		250	
			4.5 V		20	35		50	
			6 V		15	30		42	
$t_t$		Q or $\overline{Q}$	2 V		28	75		110	ns
			4.5 V		8	15		22	
			6 V		6	13		19	

operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per flip-flop	No load	35	pF

**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. For clock inputs,  $f_{max}$  is measured when the input duty cycle is 50%.
  - D. The outputs are measured one at a time, with one input transition per measurement.
  - E.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

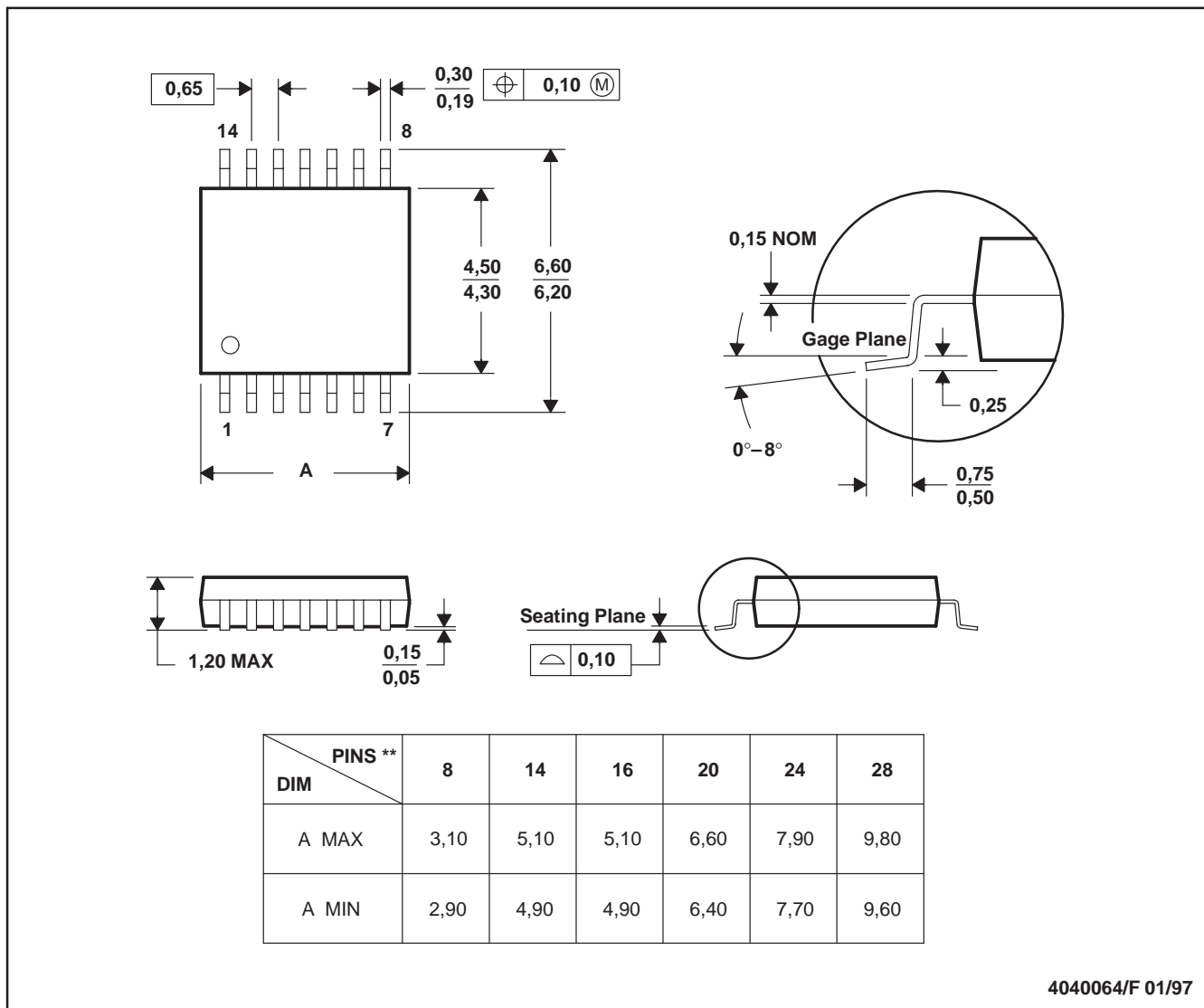
**Figure 1. Load Circuit and Voltage Waveforms**



PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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