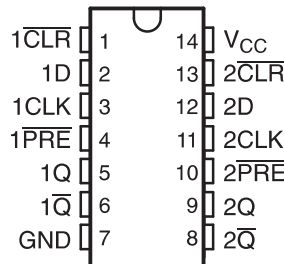


## FEATURES

- **Controlled Baseline**
  - One Assembly Site
  - One Test Site
  - One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree** <sup>(1)</sup>
- **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 mA Max**

(1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

**D OR PW PACKAGE  
(TOP VIEW)**



## 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<sup>(1)</sup>

$T_A$	PACKAGE <sup>(2)</sup>		ODERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	SOIC – D	Reel of 2500	SN74HC74MDREP	HC74MEP
	TSSOP – PW	Reel of 2000	SN74HC74MPWREP	HC74MEP

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).  
 (2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

### 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 <sup>(1)</sup>	H <sup>(1)</sup>
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	$Q_0$	$\overline{Q}_0$

- (1) 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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## SCLS710-MARCH 2008

The logic diagram illustrates a 2-bit ripple-carry adder implemented using three 74161 counters. The inputs are PRE (preset), CLK (clock), D (2-bit data), and  $\overline{CIN}$  (carry-in). The outputs are C (carry-out) and  $\overline{C}$  (carry-in). The circuit uses three 74161 counters, each with a clock input (CLK), a preset input (PRE), a data input (D), and a carry input ( $\overline{CIN}$ ). The counters are configured to perform a 2-bit addition. The first counter takes the least significant bits of D and the carry-in  $\overline{CIN}$  as inputs. Its carry output C is connected to the carry input of the second counter. The second counter takes the next two bits of D and the carry from the first counter as inputs. Its carry output C is connected to the carry input of the third counter. The third counter takes the most significant bits of D and the carry from the second counter as inputs. Its carry output C is the final carry-out of the adder. The sum outputs are taken from the data outputs of the counters. The carry-in  $\overline{C}$  is the complement of the carry-out C.

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

- (1) 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.
- (2) The package thermal impedance is calculated in accordance with JEDEC 51-7.

			MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage		2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5		V	
		V <sub>CC</sub> = 4.5 V	3.15			
		V <sub>CC</sub> = 6 V	4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5		V	
		V <sub>CC</sub> = 4.5 V	1.35			
		V <sub>CC</sub> = 6 V	1.8			
V <sub>I</sub>	Input voltage		0	V <sub>CC</sub>		V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>		V
ΔtΔv	Input transition rise/fall time	V <sub>CC</sub> = 2 V	1000		ns	
		V <sub>CC</sub> = 4.5 V	500			
		V <sub>CC</sub> = 6 V	400			
T <sub>A</sub>	Operating free-air temperature		−55	125		°C

(1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## ELECTRICAL CHARACTERISTICS

over 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		
		I <sub>OH</sub> = –5.2 mA	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	
		I <sub>OL</sub> = 5.2 mA	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

			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>	Setup time before CLK↑	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		

# SN74HC74-EP

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

SCLS710–MARCH 2008

### SWITCHING CHARACTERISTICS

over operating free-air temperature range  $C_L = 50$  pF, (unless otherwise noted)

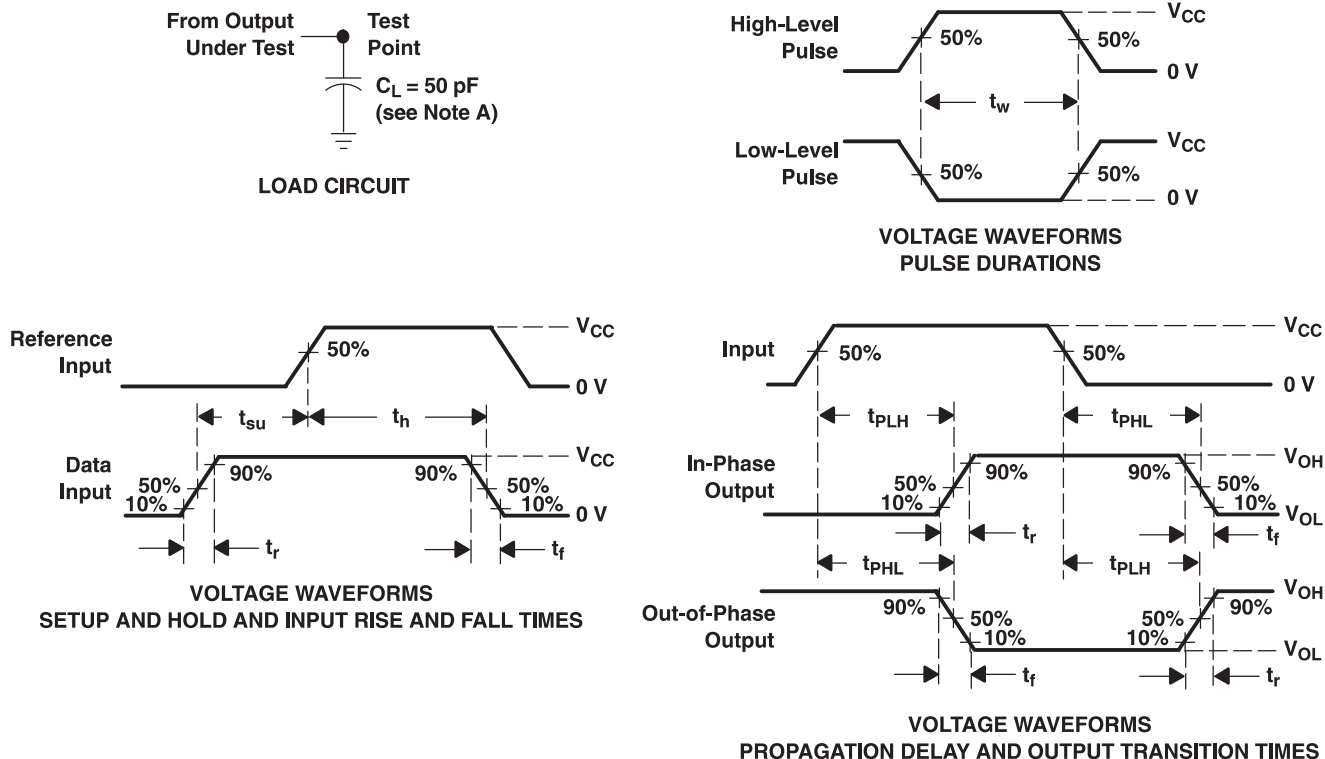
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
$f_{max}$			2 V	6	10		4.2		MHz
			4.5 V	31	50		21		
			6 V	36	60		25		
$t_{pd}$	$\overline{PRE}$ or $\overline{CLR}$	Q or $\overline{Q}$	2 V		70	230		345	ns
			4.5 V		20	46		69	
			6 V		15	39		59	
	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	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

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC74MPWREP	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC74MEP	<a href="#">Samples</a>
V62/08613-01XE	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC74MEP	<a href="#">Samples</a>

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF SN74HC74-EP :**

- Catalog: [SN74HC74](#)
- Automotive: [SN74HC74-Q1](#)
- Military: [SN54HC74](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC74MPWREP	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1



## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC74MPWREP	TSSOP	PW	14	2000	853.0	449.0	35.0

PW (R-PDSO-G14)

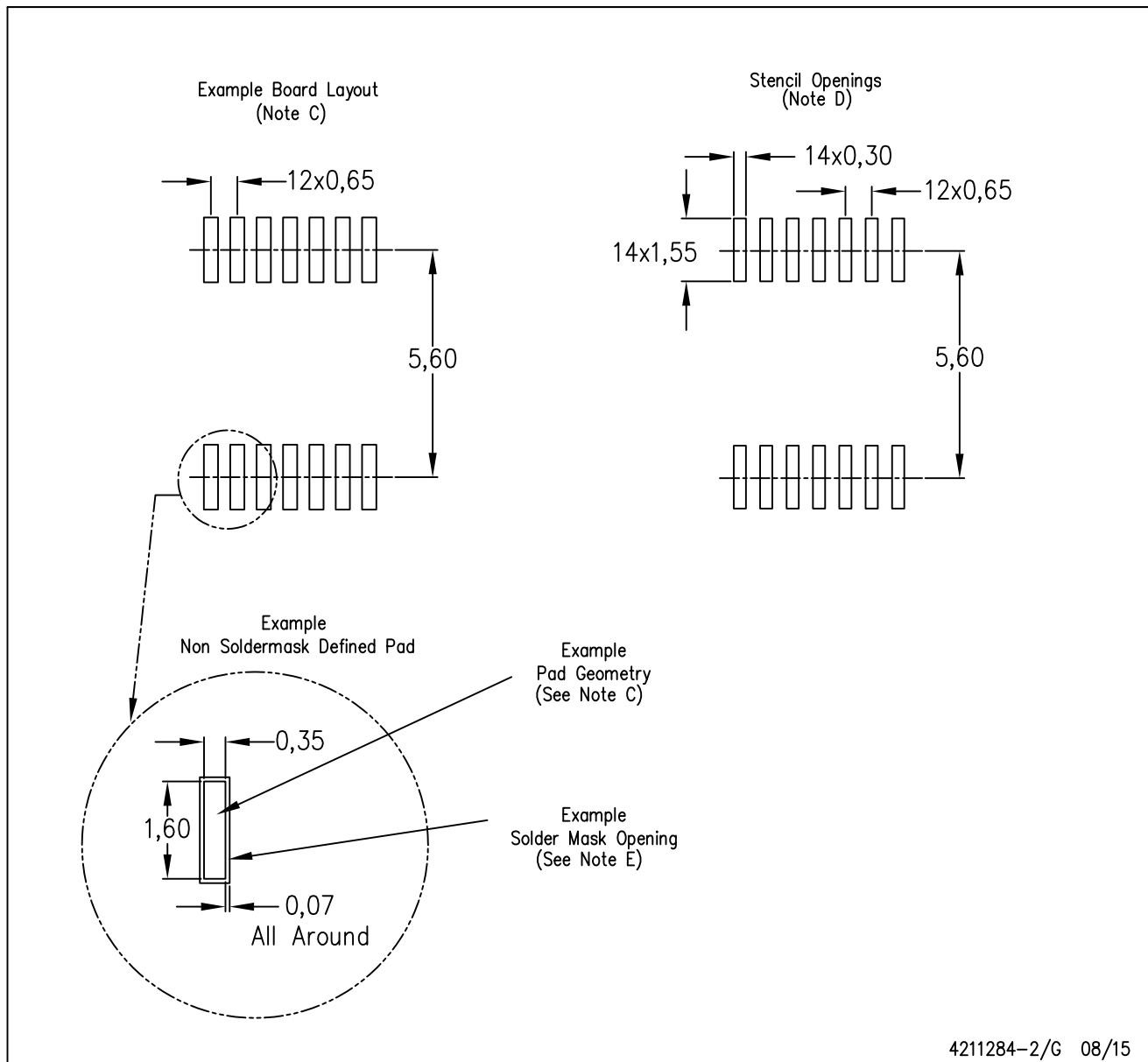
PLASTIC SMALL OUTLINE



4040064-3/G 02/11

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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