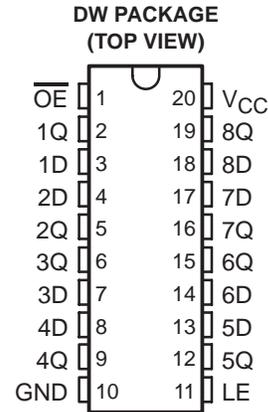


# SN74AC373-EP OCTAL D-TYPE TRANSPARENT LATCH WITH 3-STATE OUTPUTS

SCAS725 – OCTOBER 2003

- **Controlled Baseline**
  - One Assembly/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†**
- **2-V to 6-V  $V_{CC}$  Operation**
- **Inputs Accept Voltages to 6 V**
- **Max  $t_{pd}$  of 9.5 ns at 5 V**
- **3-State Noninverting Outputs Drive Bus Lines Directly**
- **Full Parallel Access for Loading**

† 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.



## description/ordering information

This 8-bit latch features 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. The device is particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight latches are D-type transparent latches. When the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is taken low, the Q outputs are latched at the logic levels set up at the D inputs.

A buffered output-enable ( $\overline{OE}$ ) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines in bus-organized systems without need for interface or pullup components.

$\overline{OE}$  does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

## ORDERING INFORMATION

$T_A$	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	SOIC – DW	Tape and reel	SN74AC373MDWREP	SAC373MEP

‡ 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).



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**TEXAS  
INSTRUMENTS**

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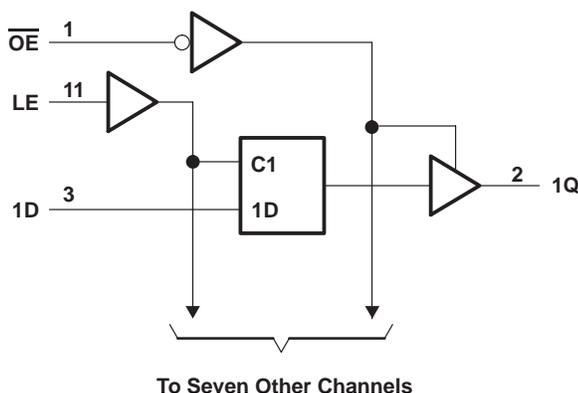
# SN74AC373-EP OCTAL D-TYPE TRANSPARENT LATCH WITH 3-STATE OUTPUTS

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FUNCTION TABLE  
(each latch)

INPUTS			OUTPUT
$\overline{OE}$	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	$Q_0$
H	X	X	Z

## 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 $V_I > V_{CC}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 200$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 2)	58°C/W
Storage temperature range, $T_{stg}$ (see Note 3)	-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 package thermal impedance is calculated in accordance with JESD 51-7.
  3. Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See [http://www.ti.com/ep\\_quality](http://www.ti.com/ep_quality) for additional information on enhanced plastic packaging.

# SN74AC373-EP OCTAL D-TYPE TRANSPARENT LATCH WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	2	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 3 V	2.1	V
		V <sub>CC</sub> = 4.5 V	3.15	
		V <sub>CC</sub> = 5.5 V	3.85	
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 3 V	0.9	V
		V <sub>CC</sub> = 4.5 V	1.35	
		V <sub>CC</sub> = 5.5 V	1.65	
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 3 V	-12	mA
		V <sub>CC</sub> = 4.5 V	-24	
		V <sub>CC</sub> = 5.5 V	-24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 3 V	12	mA
		V <sub>CC</sub> = 4.5 V	24	
		V <sub>CC</sub> = 5.5 V	24	
Δt/Δv	Input transition rise or fall rate		8	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	°C

NOTE 4: All unused inputs of the device must be held at V<sub>CC</sub> 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 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	3 V	2.9		2.9		V	
		4.5 V	4.4		4.4			
		5.5 V	5.4		5.4			
	I <sub>OH</sub> = -12 mA	3 V	2.56		2.4			
		4.5 V	3.86		3.7			
		5.5 V	4.86		4.7			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	3 V		0.1	0.1		V	
		4.5 V		0.1	0.1			
		5.5 V		0.1	0.1			
	I <sub>OL</sub> = 12 mA	3 V		0.36	0.5			
		4.5 V		0.36	0.5			
		5.5 V		0.36	0.5			
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V		±0.1	±1	μA		
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	5.5 V		±0.25	±5	μA		
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V		4	80	μA		
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		4.5		pF		

# SN74AC373-EP

## OCTAL D-TYPE TRANSPARENT LATCH

### WITH 3-STATE OUTPUTS

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timing requirements over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

		T <sub>A</sub> = 25°C		MIN	MAX	UNIT
		MIN	MAX			
t <sub>w</sub>	Pulse duration, LE high	5.5		6.5		ns
t <sub>su</sub>	Setup time, data before LE↓	5.5		6.5		ns
t <sub>h</sub>	Hold time, data after LE↓	1		1		ns

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

		T <sub>A</sub> = 25°C		MIN	MAX	UNIT
		MIN	MAX			
t <sub>w</sub>	Pulse duration, LE high	4		5		ns
t <sub>su</sub>	Setup time, data before LE↓	4		5		ns
t <sub>h</sub>	Hold time, data after LE↓	1		1		ns

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	TO (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t <sub>PLH</sub>	D	Q	1.5	10	13.5	1	16.5	ns
t <sub>PHL</sub>			1.5	9.5	13.0	1	16	
t <sub>PLH</sub>	LE	Q	1.5	10	13.5	1	16.5	ns
t <sub>PHL</sub>			1.5	9.5	12.5	1	15	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Q	1.5	9	11.5	1	14	ns
t <sub>PZL</sub>			1.5	8.5	11.5	1	13.5	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Q	1.5	10	12.5	1	16	ns
t <sub>PLZ</sub>			1.5	8	11.5	1	13	

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

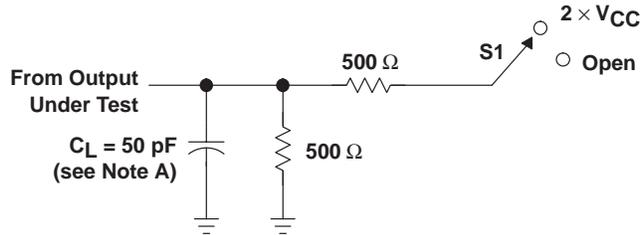
PARAMETER	TO (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t <sub>PLH</sub>	D	Q	1.5	7	9.5	1	11.5	ns
t <sub>PHL</sub>			1.5	7	9.5	1	11.5	
t <sub>PLH</sub>	LE	Q	1.5	7.5	9.5	1	12	ns
t <sub>PHL</sub>			1.5	7	9.5	1	11	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Q	1.5	7	8.5	1	10.5	ns
t <sub>PZL</sub>			1.5	6.5	8.5	1	10	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Q	1.5	8	11	1	13.5	ns
t <sub>PLZ</sub>			1.5	6.5	8.5	1	10.5	

operating characteristics,  $V_{CC} = 5\text{ V}$ , 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	40	pF

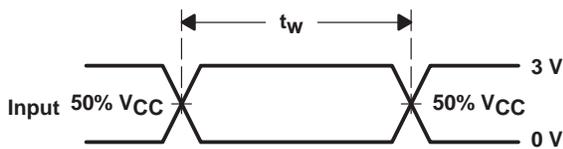


**PARAMETER MEASUREMENT INFORMATION**

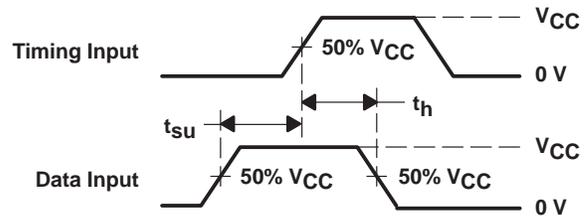


**LOAD CIRCUIT**

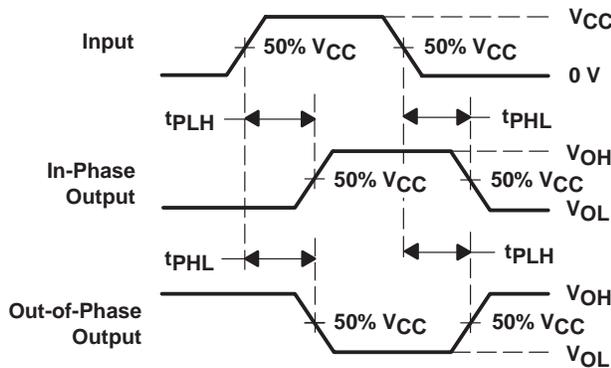
TEST	S1
t <sub>PLH</sub> /t <sub>PHL</sub>	Open
t <sub>PLZ</sub> /t <sub>PZL</sub>	2 × V <sub>CC</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	Open



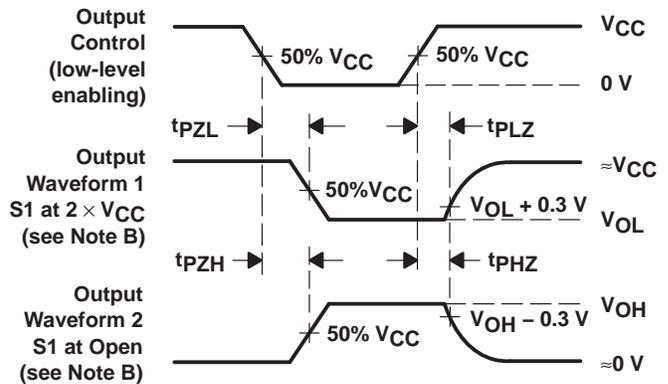
**VOLTAGE WAVEFORMS**



**VOLTAGE WAVEFORMS**



**VOLTAGE WAVEFORMS**



**VOLTAGE WAVEFORMS**

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.  
 D. The outputs are measured one at a time with one input transition per measurement.

**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
SN74AC373MDWREP	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	SAC373MEP	<a href="#">Samples</a>
V62/04621-01XE	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	SAC373MEP	<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 SN74AC373-EP :**

- Catalog: [SN74AC373](#)
- Military: [SN54AC373](#)

## NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## TAPE AND REEL INFORMATION



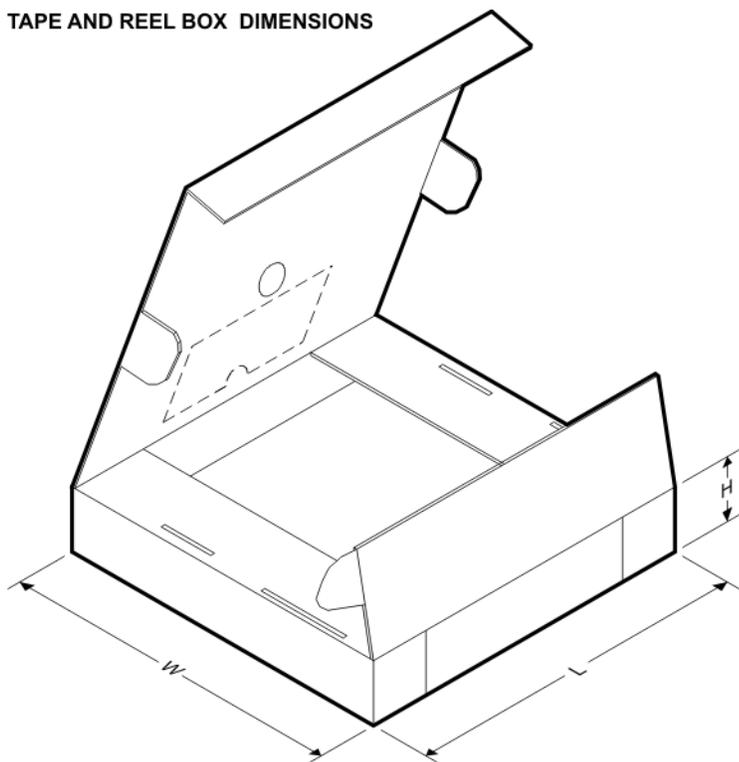
### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*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
SN74AC373MDWREP	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AC373MDWREP	SOIC	DW	20	2000	367.0	367.0	45.0

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