

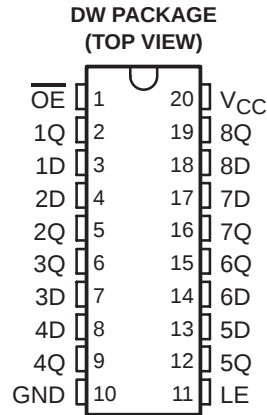
SN74AC373-EP

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.



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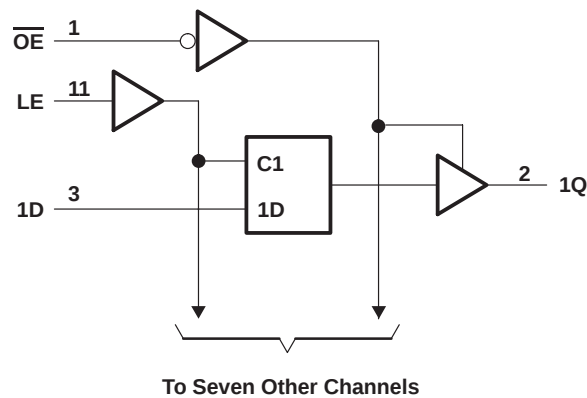
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FUNCTION TABLE
(each latch)

INPUTS			OUTPUT Q
$\overline{\text{OE}}$	LE	D	
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 $V_I > V_{CC}$)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±50 mA
Continuous current through V_{CC} or GND	±200 mA
Package thermal impedance, θ_{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 for additional information on enhanced plastic packaging.

recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2	6	V
V_{IH}	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1	V
		$V_{CC} = 4.5\text{ V}$	3.15	
		$V_{CC} = 5.5\text{ V}$	3.85	
V_{IL}	Low-level input voltage	$V_{CC} = 3\text{ V}$	0.9	V
		$V_{CC} = 4.5\text{ V}$	1.35	
		$V_{CC} = 5.5\text{ V}$	1.65	
V_I	Input voltage	0	V_{CC}	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 3\text{ V}$	-12	mA
		$V_{CC} = 4.5\text{ V}$	-24	
		$V_{CC} = 5.5\text{ V}$	-24	
I_{OL}	Low-level output current	$V_{CC} = 3\text{ V}$	12	mA
		$V_{CC} = 4.5\text{ V}$	24	
		$V_{CC} = 5.5\text{ V}$	24	
$\Delta t/\Delta v$	Input transition rise or fall rate		8	ns/V
T_A	Operating free-air temperature	-55	125	°C

NOTE 4: 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 recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{OH}	$I_{OH} = -50\text{ }\mu\text{A}$	3 V	2.9			2.9		V
		4.5 V	4.4			4.4		
		5.5 V	5.4			5.4		
	$I_{OH} = -12\text{ mA}$	3 V	2.56			2.4		
		4.5 V	3.86			3.7		
		5.5 V	4.86			4.7		
V_{OL}	$I_{OL} = 50\text{ }\mu\text{A}$	3 V			0.1		0.1	V
		4.5 V			0.1		0.1	
		5.5 V			0.1		0.1	
	$I_{OL} = 12\text{ mA}$	3 V			0.36		0.5	
		4.5 V			0.36		0.5	
		5.5 V			0.36		0.5	
I_I	$V_I = V_{CC}$ or GND	5.5 V			± 0.1		± 1	μA
I_{OZ}	$V_O = V_{CC}$ or GND	5.5 V			± 0.25		± 5	μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			4		80	μA
C_i	$V_I = V_{CC}$ or GND	5 V		4.5				pF

SN74AC373-EP

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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)

		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
t_W	Pulse duration, LE high	5.5		6.5		ns
t_{SU}	Setup time, data before LE↓	5.5		6.5		ns
t_H	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)

		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
t_W	Pulse duration, LE high	4		5		ns
t_{SU}	Setup time, data before LE↓	4		5		ns
t_H	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)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	D	Q	1.5	10	13.5	1	16.5	ns
t_{PHL}			1.5	9.5	13.0	1	16	
t_{PLH}	LE	Q	1.5	10	13.5	1	16.5	ns
t_{PHL}			1.5	9.5	12.5	1	15	
t_{PZH}	$\overline{OE}$	Q	1.5	9	11.5	1	14	ns
t_{PZL}			1.5	8.5	11.5	1	13.5	
t_{PHZ}	$\overline{OE}$	Q	1.5	10	12.5	1	16	ns
t_{PLZ}			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)

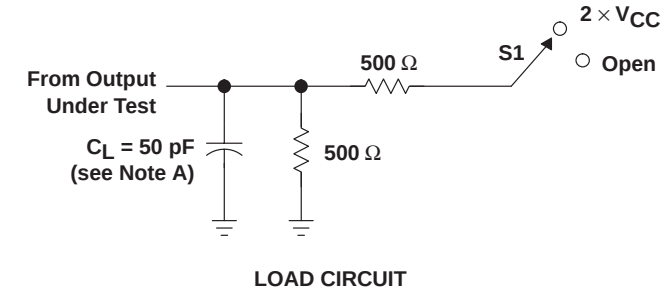
PARAMETER	TO (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	D	Q	1.5	7	9.5	1	11.5	ns
t_{PHL}			1.5	7	9.5	1	11.5	
t_{PLH}	LE	Q	1.5	7.5	9.5	1	12	ns
t_{PHL}			1.5	7	9.5	1	11	
t_{PZH}	$\overline{OE}$	Q	1.5	7	8.5	1	10.5	ns
t_{PZL}			1.5	6.5	8.5	1	10	
t_{PHZ}	$\overline{OE}$	Q	1.5	8	11	1	13.5	ns
t_{PLZ}			1.5	6.5	8.5	1	10.5	

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

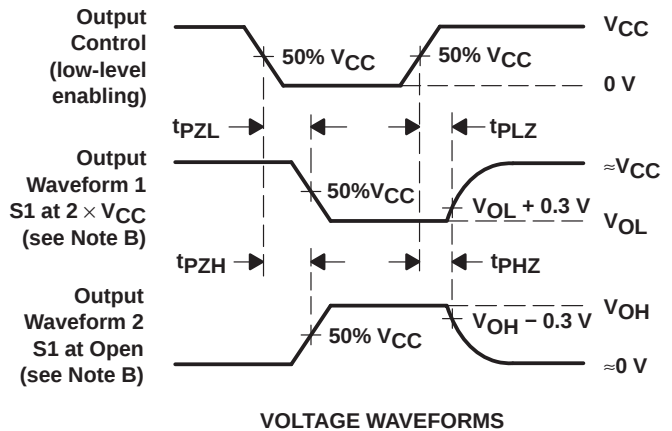
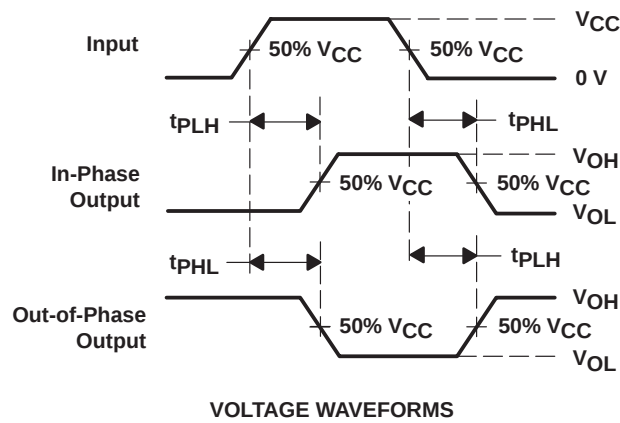
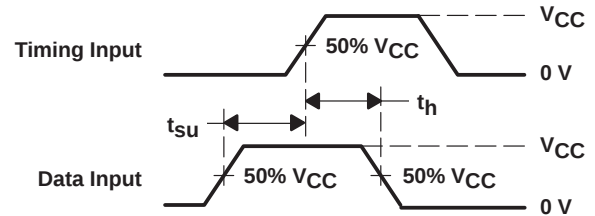
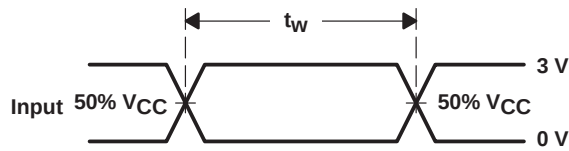
PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\text{ pF}$	$f = 1\text{ MHz}$	40	pF



PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	Open



- 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/Ball Finish	MSL Peak Temp ⁽³⁾
SN74AC373MDWREP	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04621-01XE	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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

NOTE: Qualified Version Definitions:

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

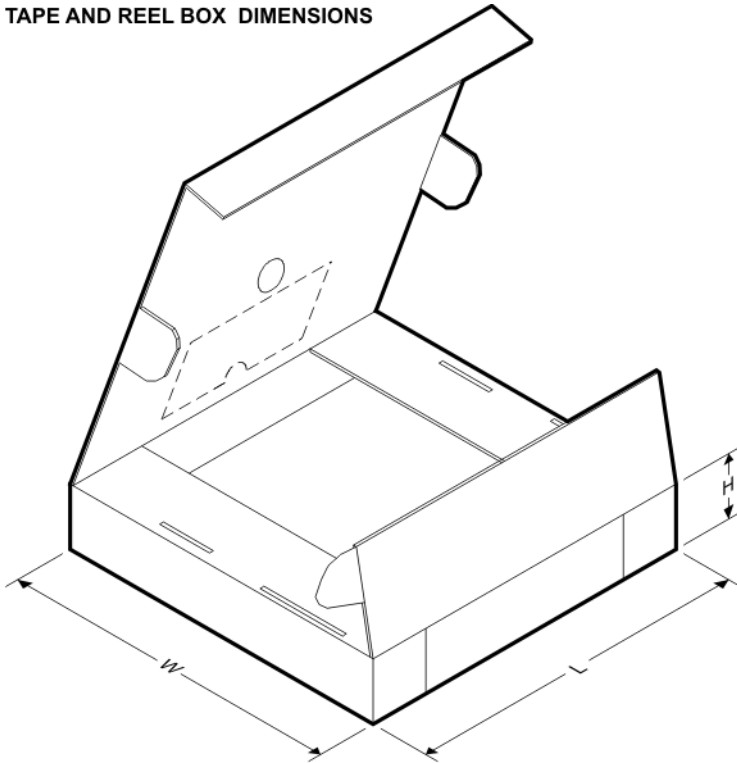
TAPE AND REEL INFORMATION



*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	13.0	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	346.0	346.0	41.0

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