

SN74ACT16373Q-EP

16-BIT D-TYPE TRANSPARENT LATCH

WITH 3-STATE OUTPUTS

SCAS678B – MAY 2002 – REVISED JULY 2002

- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of**
–40°C to 125°C
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree[†]**
- **Member of the Texas Instruments Widebus™ Family**
- **Inputs Are TTL-Voltage Compatible**
- **3-State Bus Driving True Outputs**
- **Full Parallel Access for Loading**
- **Distributed V_{CC} and GND Pins Minimize High-Speed Switching Noise**

[†] 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.

description

The SN74ACT16373Q-EP is a 16-bit D-type transparent latch with 3-state outputs, designed specifically for driving highly capacitive or relatively low-impedance loads. It is particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

This device can be used as two 8-bit latches or one 16-bit latch. The Q outputs of the latches follow the data (D) inputs if the latch-enable (LE) input is taken high. When LE is taken low, the Q outputs are latched at the levels set up at the D inputs.

A buffered output-enable ($\overline{OE}$) input can be used to place the 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 the increased drive provide the capability to drive bus lines in a bus-organized system, 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.

DL PACKAGE
(TOP VIEW)

$\overline{1OE}$	1	48	1LE
1Q1	2	47	1D1
1Q2	3	46	1D2
GND	4	45	GND
1Q3	5	44	1D3
1Q4	6	43	1D4
V _{CC}	7	42	V _{CC}
1Q5	8	41	1D5
1Q6	9	40	1D6
GND	10	39	GND
1Q7	11	38	1D7
1Q8	12	37	1D8
2Q1	13	36	2D1
2Q2	14	35	2D2
GND	15	34	GND
2Q3	16	33	2D3
2Q4	17	32	2D4
V _{CC}	18	31	V _{CC}
2Q5	19	30	2D5
2Q6	20	29	2D6
GND	21	28	GND
2Q7	22	27	2D7
2Q8	23	26	2D8
$\overline{2OE}$	24	25	2LE



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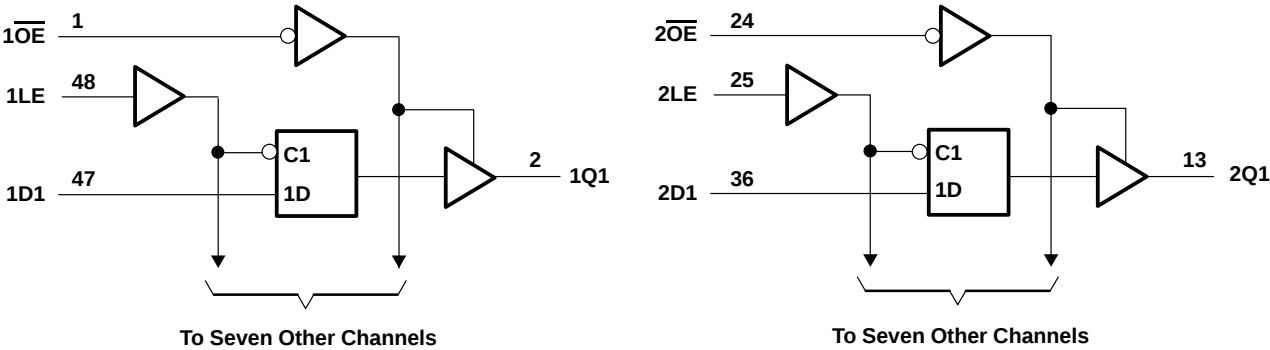
T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	SSOP – DL	Tape and reel	SN74ACT16373QDLREP	ACT16373QEP

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE
(each section)

INPUTS			OUTPUT Q
$\overline{OE}$	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})	±24 mA
Continuous output current, I _O (V _O = 0 to V _{CC})	±24 mA
Continuous current through V _{CC} or GND	±260 mA
Maximum power dissipation at T _A = 55°C (in still air) (see Note 2): DL package	1.2 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.

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recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
V _{CC}	Supply voltage (see Note 4)	4.5	5.5	V
V _{IH}	High-level input voltage	2		V
V _{IL}	Low-level input voltage		0.8	V
V _I	Input voltage	0	V _{CC}	V
V _O	Output voltage	0	V _{CC}	V
I _{OH}	High-level output current		–16	mA
I _{OL}	Low-level output current		16	mA
Δt/Δv	Input transition rise or fall rate	0	10	ns/V
T _A	Operating free-air temperature	–40	125	°C

- NOTES: 3. Unused inputs should be tied to V_{CC} through a pullup resistor of approximately 5 kΩ or greater to prevent them from floating. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
4. All V_{CC} and GND pins must be connected to the proper-voltage power supply.

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V _{OH}	I _{OH} = –50 μA	4.5 V	4.4			4.4		V
		5.5 V	5.4			5.4		
	I _{OH} = –16 mA	4.5 V	3.94			3.7		
		5.5 V	4.94			4.7		
	I _{OH} = –24 mA†	5.5 V				3.85		
V _{OL}	I _{OL} = 50 μA	4.5 V			0.1		0.1	V
		5.5 V			0.1		0.1	
	I _{OL} = 16 mA	4.5 V			0.36		0.5	
		5.5 V			0.36		0.5	
	I _{OL} = 24 mA†	5.5 V					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			±0.5		±10	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			8		160	μA
ΔI _{CC} ‡	One input at 3.4 V, Other inputs at GND or V _{CC}	5.5 V			0.9		1	mA
C _i	V _I = V _{CC} or GND	5 V		4.5				pF
C _o	V _I = V _{CC} or GND	5 V		12				pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

‡ This is the increase in supply current for each input that is at one of the specified TTL-voltage levels rather than 0 V to V_{CC}.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

		T _A = 25°C		MIN	MAX	UNIT
		MIN	MAX			
t _W	Pulse duration, LE high	4		4		ns
t _{su}	Setup time, data before LE↓	1		1		ns
t _h	Hold time, data after LE↓	5		5		ns



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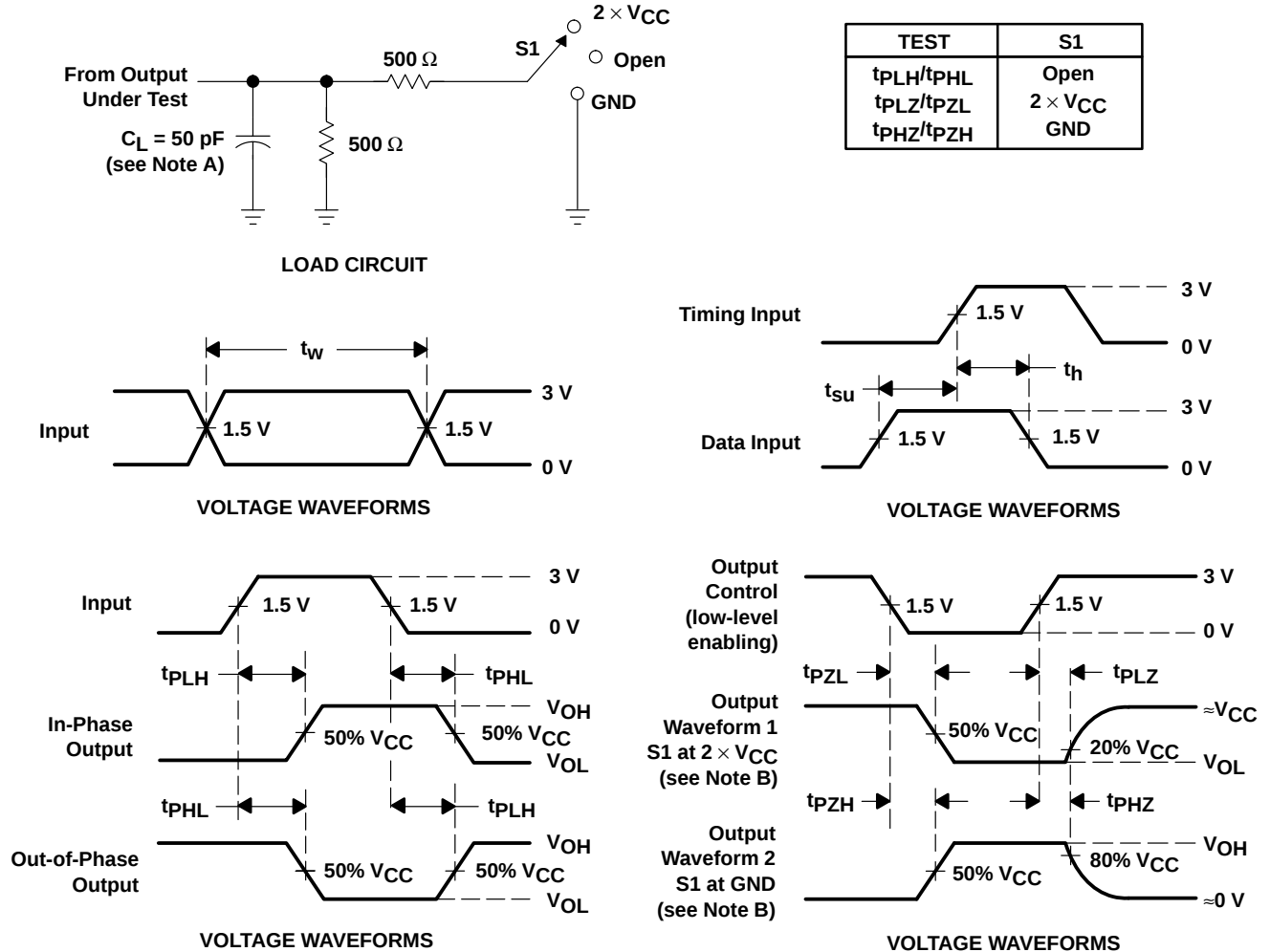
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t _{PLH}	D	Q	3.8	7.9	9.4	3.8	11.8	ns
t _{PHL}			3.1	8.2	9.7	3.1	13	
t _{PLH}	LE	Q	4.6	9.3	10.8	4.6	13.7	ns
t _{PHL}			4.5	9.1	10.5	4.5	13	
t _{PZH}	$\overline{OE}$	Q	3.1	8	9.5	3.1	13	ns
t _{PZL}			3.8	9.4	11.1	3.8	15.1	
t _{PHZ}	$\overline{OE}$	Q	5.3	8.6	9.9	5.3	11	ns
t _{PLZ}			4.3	7.4	8.7	4.3	9.8	

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance per latch	Outputs enabled	C _L = 50 pF, f = 1 MHz	43	pF
	Outputs disabled		4.5	

PARAMETER MEASUREMENT INFORMATION



- 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: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r = 3 \text{ ns}$, $t_f = 3 \text{ ns}$.
 - 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⁾
SN74ACT16373QDLREP	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/03602-01XE	ACTIVE	SSOP	DL	48	1000	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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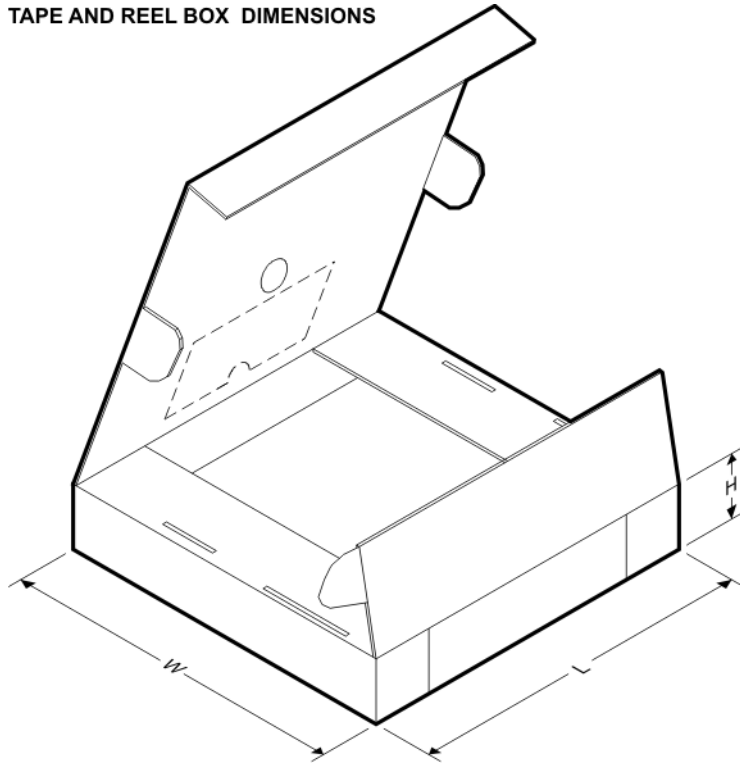
TAPE AND REEL INFORMATION



*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
SN74ACT16373QDLREP	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

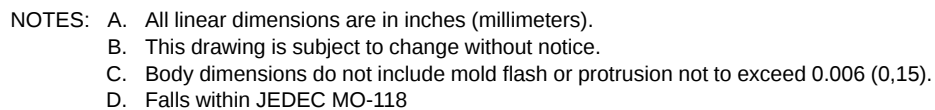
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ACT16373QDLREP	SSOP	DL	48	1000	346.0	346.0	49.0

48 PINS SHOWN



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