

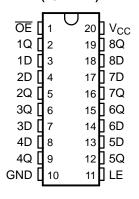
SN74LV373AT



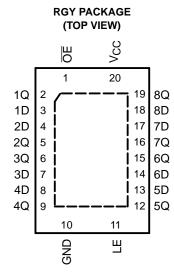
#### **FEATURES**

- Inputs Are TTL-Voltage Compatible
- 4.5-V to 5.5-V V<sub>CC</sub> Operation
- Typical t<sub>pd</sub> of 5.1 ns at 5 V
- Typical V<sub>OLP</sub> (Output Ground Bounce) <0.8 V at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot) >2.3 V at  $V_{CC}$  = 5 V,  $T_A$  = 25°C
- **Supports Mixed-Mode Voltage Operation on All Ports**

DB, DW, NS, OR PW PACKAGE (TOP VIEW)



- I<sub>off</sub> Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per **JESD 17**
- **ESD Protection Exceeds JESD 22** 
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)



#### **DESCRIPTION/ORDERING INFORMATION**

The SN74LV373AT is an octal transparent D-type latch. While 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.

#### ORDERING INFORMATION

T <sub>A</sub>	PACKA	GE <sup>(1)</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	QFN – RGY	Reel of 1000	SN74LV373ATRGYR	VV373
	SOIC - DW	Tube of 25	SN74LV373ATDW	LV373AT
	SOIC - DW	Reel of 2500	SN74LV373ATDWR	LV3/3AT
–40°C to 125°C	SOP - NS	Reel of 2000	SN74LV373ATNSR	74LV373AT
-40 C to 125 C	SSOP – DB	Reel of 2000	SN74LV373ATDBR	LV373AT
		Tube of 70	SN74LV373ATPW	
	TSSOP - PW	Reel of 2000	SN74LV373ATPWR	LV373AT
		Reel of 250	SN74LV373ATPWT	

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



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## **DESCRIPTION/ORDERING INFORMATION (CONTINUED)**

A buffered output-enable  $(\overline{OE})$  input can be used to place the eight outputs in either a normal logic state (high or low) 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 without need for interface or pullup components.

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.

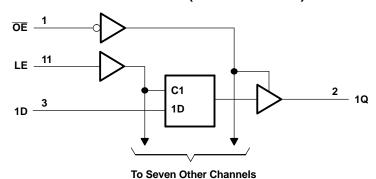
To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

# FUNCTION TABLE (EACH LATCH)

	INPUTS		OUTPUT					
ŌĒ	OE LE D							
1	Н	Н	Н					
L	Н	L	L					
L	L	X	$Q_0$					
Н	X	Χ	Z					

#### **LOGIC DIAGRAM (POSITIVE LOGIC)**





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## Absolute Maximum Ratings<sup>(1)</sup>

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

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage range		-0.5	7	V
VI	Input voltage range <sup>(2)</sup>		-0.5	7	V
Vo	Voltage range applied to any output in th	e high-impedance or power-off state <sup>(2)</sup>	-0.5	7	V
Vo	Output voltage range <sup>(2)(3)</sup>		-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>1</sub> < 0		-20	mA
I <sub>OK</sub>	Output clamp current	$V_O < 0$ or $V_O > V_{CC}$		±50	mA
Io	Continuous output current	$V_O < 0 \text{ or } V_O > V_{CC}$ $V_O = 0 \text{ to } V_{CC}$		±35	mA
	Continuous current through V <sub>CC</sub> or GND			±70	mA
		DB package <sup>(4)</sup>		70	
		DW package <sup>(4)</sup>		58	
$\theta_{JA}$	Package thermal impedance	NS package (4)		60	°C/W
		PW package <sup>(4)</sup>		83	
		RGY package <sup>(5)</sup>		37	
T <sub>stg</sub>	Storage temperature range		-65	150	°C

- (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 input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- 3) This value is limited to 5.5 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.
- (5) The package thermal impedance is calculated in accordance with JESD 51-5.

## Recommended Operating Conditions<sup>(1)</sup>

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage		4.5	5.5	V
$V_{IH}$	High-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2		V
$V_{IL}$	Low-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V		0.8	V
$V_{I}$	Input voltage		0	5.5	V
\/	Output voltage	High or low state	0	$V_{CC}$	V
Vo	Output voltage	3-state	0	5.5	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 4.5 V to 5.5 V		-16	mA
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 4.5 V to 5.5 V		16	mA
Δt/Δν	Input transition rise or fall rate	V <sub>CC</sub> = 4.5 V to 5.5 V		20	ns/V
T <sub>A</sub>	Operating free-air temperature		-40	125	°C

<sup>(1)</sup> 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.

## SN74LV373AT OCTAL TRANSPARENT D-TYPE LATCH WITH 3-STATE OUTPUTS

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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			T <sub>A</sub> = -		T <sub>A</sub> = -		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V	$I_{OH} = -50 \mu A$	4.5 V	4.4	4.5		4.4		4.4		V
V <sub>OH</sub>	I <sub>OH</sub> = -16 mA	4.5 V	3.8			3.8		3.8		V
V/	I <sub>OL</sub> = 100 μA	4.5 V		0	0.1		0.1		0.1	V
V <sub>OL</sub>	I <sub>OL</sub> = 16 mA	4.5 V			0.55		0.55		0.55	V
I <sub>I</sub>	$V_I = 5.5$ or GND	0 to 5.5 V			±0.1		±1		±1	μΑ
I <sub>OZ</sub>	$V_O = V_{CC}$ or GND	5.5 V			±0.25		±2.5		±2.5	μΑ
I <sub>CC</sub>	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20		20	μΑ
ΔI <sub>CC</sub> <sup>(1)</sup>	One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	5.5 V			40		50		50	μΑ
I <sub>off</sub>	$V_I$ or $V_O = 0$ to 5.5 V	0			0.5		5		5	μΑ
C <sub>i</sub>	$V_I = V_{CC}$ or GND			4	10		10		10	pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND			7.5						pF

<sup>(1)</sup> This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V<sub>CC</sub>.

## **Timing Requirements**

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

			T <sub>A</sub> = 2	25°C	T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -	UNIT	
			MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration, LE high		6.5		8.5		8.5		ns
t <sub>su</sub>	Setup time, data before LE↓	High or low	1.5		1.5		1.5		ns
t <sub>h</sub>	Hold time, data after LE $\downarrow$	High or low	3.5		3.5		3.5		ns

## **Switching Characteristics**

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

PARAMETER	FROM (INPUT)	TO (OUTBUT)	LOAD CAPACITANCE	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40°C to 85°C		T <sub>A</sub> = -	UNIT		
	(INPUT)	(OUTPUT)	CAPACITANCE	MIN	TYP	MAX	MIN	MAX	MIN	MAX	
4	D	Q		2.9	5.1	8.5	1	9.5	1	10	
t <sub>pd</sub>	LE	Q	C - 15 pF	3.5	7.7	12.3	1	13.5	1	14	ns
t <sub>en</sub>	ŌĒ	Q	$C_L = 15 pF$	3.5	6.3	10.9	1	12.5	1	13	115
t <sub>dis</sub>	ŌĒ	Q		1.7	3.3	7.2	1	8.5	1	9	
4	D	Q		4.4	5.9	9.5	1	10.5	1	11	
t <sub>pd</sub>	LE	Q		4.8	8.5	13.3	1	14.5	1	15	
t <sub>en</sub>	ŌĒ	Q	$C_{L} = 50 \text{ pF}$	5	7.1	11.9	1	13.5	1	14	ns
t <sub>dis</sub>	ŌĒ	Q		3	8.8	11.2	1	12	1	12.5	
t <sub>sk(o)</sub>	·							1		1	





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

 $V_{CC}$  = 5 V,  $C_L$  = 50 pF,  $T_A$  = 25°C

	PARAMETER	MIN	TYP	MAX	UNIT
$V_{OL(P)}$	Quiet output, maximum dynamic V <sub>OL</sub>		0.8	1	V
V <sub>OL(V)</sub>	Quiet output, minimum dynamic V <sub>OL</sub>		-0.6	-0.8	V
V <sub>OH(V)</sub>	Quiet output, minimum dynamic V <sub>OH</sub>		2.9		V
$V_{IH(D)I}$	High-level dymanic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

<sup>(1)</sup> Characteristics are for surface-mount packages only.

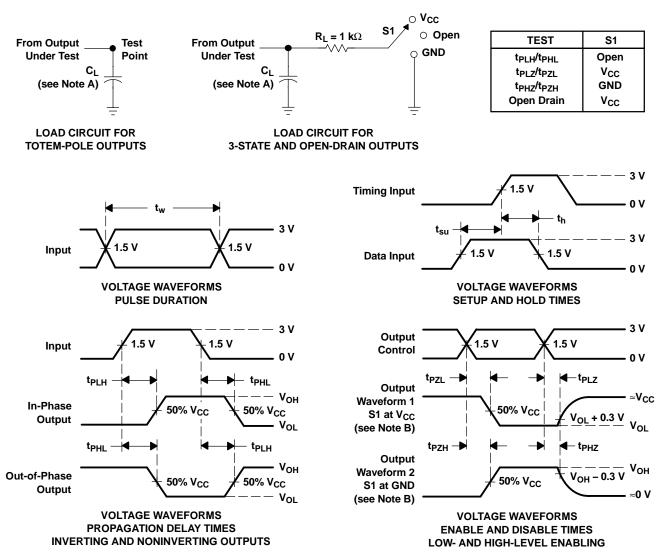
## **Operating Characteristics**

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

	PARAMETE		TEST CO	ONDITIONS	TYP	UNIT
$C_{pd}$	Power dissipation capacitance	Outputs enabled	$C_L = 50 \text{ pF},$	f = 10 MHz	15.5	pF



#### PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C<sub>L</sub> 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,  $Z_O = 50~\Omega$ ,  $t_f \leq$  3 ns,  $t_f \leq$  3 ns.
  - D. The outputs are measured one at a time, with one input transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G. t<sub>PHL</sub> and t<sub>PLH</sub> are the same as t<sub>pd</sub>.
  - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuits and Voltage Waveforms





10-Jun-2014

#### **PACKAGING INFORMATION**

Orderable Device	Status	Package Type	Package Drawing	Pins	U		Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)				Qty	(2)	(6)	(3)		(4/5)	
SN74LV373ATDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV373AT	Samples
SN74LV373ATDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV373AT	Samples
SN74LV373ATNSR	ACTIVE	so	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	74LV373AT	Samples
SN74LV373ATPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV373AT	Samples
SN74LV373ATPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV373AT	Samples
SN74LV373ATPWT	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV373AT	Samples

(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.

(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.



## **PACKAGE OPTION ADDENDUM**

10-Jun-2014

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

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PACKAGE MATERIALS INFORMATION

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## TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



#### \*All dimensions are nominal

Device		Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LV373ATDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74LV373ATDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LV373ATNSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74LV373ATPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74LV373ATPWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

**PACKAGE MATERIALS INFORMATION** 

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\*All dimensions are nominal

All difficultions are norminal							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV373ATDBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74LV373ATDWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74LV373ATNSR	SO	NS	20	2000	367.0	367.0	45.0
SN74LV373ATPWR	TSSOP	PW	20	2000	367.0	367.0	38.0
SN74LV373ATPWT	TSSOP	PW	20	250	367.0	367.0	38.0

DW (R-PDSO-G20)

## PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- D. Falls within JEDEC MS-013 variation AC.



## DW (R-PDSO-G20)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Refer to IPC7351 for alternate board design.
- D. 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
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G20)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



## PW (R-PDSO-G20)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate design.
- D. 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.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

#### **28 PINS SHOWN**



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-150

## **MECHANICAL DATA**

## NS (R-PDSO-G\*\*)

## 14-PINS SHOWN

#### PLASTIC SMALL-OUTLINE PACKAGE



- 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.



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DSP **Energy and Lighting** dsp.ti.com www.ti.com/energy Clocks and Timers www.ti.com/clocks Industrial www.ti.com/industrial Interface interface.ti.com Medical www.ti.com/medical logic.ti.com Logic Security www.ti.com/security

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Microcontrollers microcontroller.ti.com Video and Imaging www.ti.com/video

RFID www.ti-rfid.com

OMAP Applications Processors <a href="https://www.ti.com/omap">www.ti.com/omap</a> TI E2E Community <a href="https://example.com/omap">e2e.ti.com/omap</a>

Wireless Connectivity <u>www.ti.com/wirelessconnectivity</u>