

# SN74ALS845

## 8-BIT BUS-INTERFACE D-TYPE LATCH WITH 3-STATE OUTPUTS

SDAS233A – DECEMBER 1983 – REVISED JANUARY 1995

- 3-State Buffer-Type Outputs Drive Bus Lines Directly
- Bus-Structured Pinout
- Provides Extra Bus-Driving Latches Necessary for Wider Address/Data Paths or Buses With Parity
- Buffered Control Inputs to Reduce dc Loading Effects
- Power-Up High-Impedance State
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (NT) 300-mil DIPs

### description

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

The eight latches are transparent D-type latches. The device has noninverting data (D) inputs and provides true data at its outputs.

Because the clear ( $\overline{\text{CLR}}$ ) and preset ( $\overline{\text{PRE}}$ ) inputs are independent of the clock (CLK) input, taking  $\overline{\text{CLR}}$  low causes the eight Q outputs to go low. Taking  $\overline{\text{PRE}}$  low causes the eight Q outputs to go high. When both  $\overline{\text{PRE}}$  and  $\overline{\text{CLR}}$  are taken low, the outputs follow the preset condition.

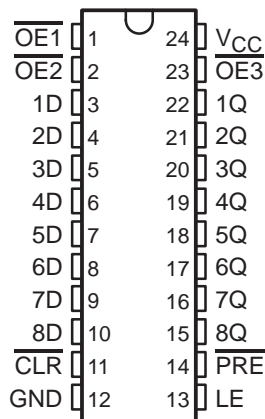
The buffered output-enable ( $\overline{\text{OE1}}$ ,  $\overline{\text{OE2}}$ , and  $\overline{\text{OE3}}$ ) inputs can be used to place the eight outputs in either a normal logic state (high or low levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

The output enables do not affect the internal operation of the latches. Previously stored data can be retained or new data can be entered while the outputs are in the high-impedance state.

The -1 version of the SN74ALS845 is identical to the standard version, except that the recommended maximum  $I_{OL}$  for the -1 version is increased to 48 mA.

The SN74ALS845 is characterized for operation from 0°C to 70°C.

DW OR NT PACKAGE  
(TOP VIEW)



FUNCTION TABLE

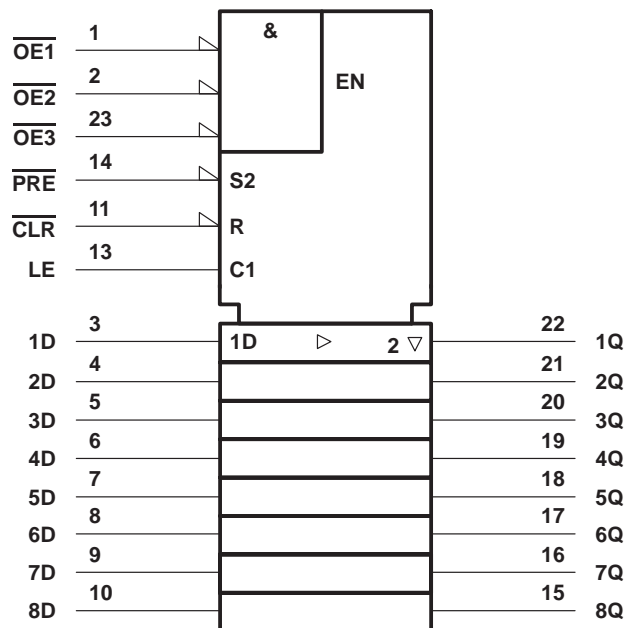
INPUTS							OUTPUT Q
$\overline{\text{PRE}}$	$\overline{\text{CLR}}$	$\overline{\text{OE1}}$	$\overline{\text{OE2}}$	$\overline{\text{OE3}}$	LE	D	
L	X	L	L	L	X	X	H
H	L	L	L	L	X	X	L
H	H	L	L	L	H	L	L
H	H	L	L	L	H	H	H
H	H	L	L	L	L	L	$Q_0$
X	X	X	X	H	X	X	Z
X	X	X	H	X	X	X	Z
X	X	H	X	X	X	X	Z

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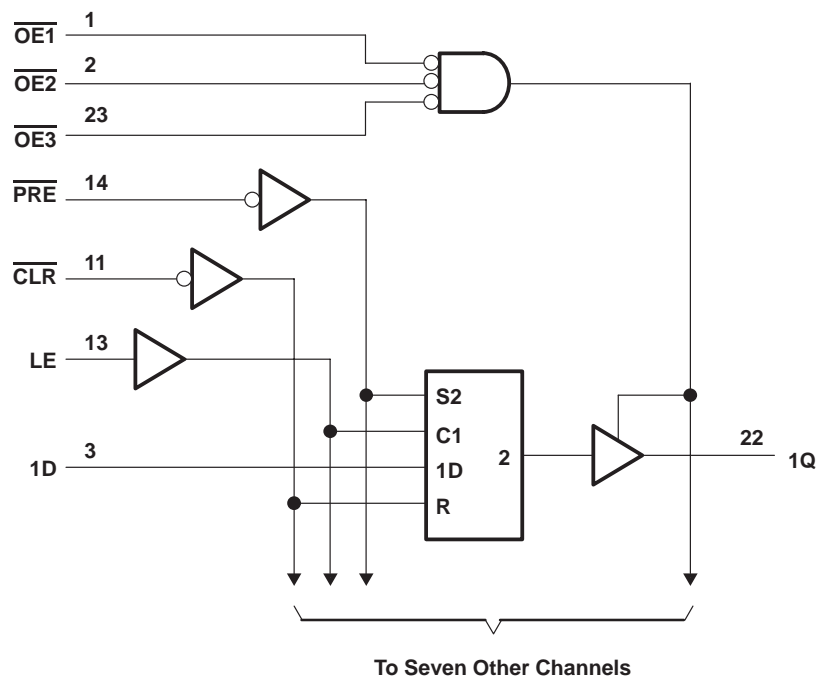
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### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

### logic diagram (positive logic)



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**WITH 3-STATE OUTPUTS**

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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, $T_A$	0°C to 70°C
Storage temperature range	–65°C to 150°C

<sup>†</sup> 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.

**recommended operating conditions**

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{OH}$	High-level output current			–2.6	mA
$I_{OL}$	Low-level output current			24	mA
				48 <sup>‡</sup>	
$t_w$	Pulse duration	CLR or PRE low		35	ns
		LE high		20	
$t_{su}$	Setup time, data before LE↓	10			ns
$t_h$	Hold time, data after LE↓	5			ns
$T_A$	Operating free-air temperature	0		70	°C

<sup>‡</sup> Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

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

PARAMETER	TEST CONDITIONS		MIN	TYP <sup>§</sup>	MAX	UNIT
$V_{IK}$	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			–1.2	V
$V_{OH}$	$V_{CC} = 4.5$ V to 5.5 V,	$I_{OH} = -0.4$ mA	$V_{CC} - 2$			V
	$V_{CC} = 4.5$ V,	$I_{OH} = -2.6$ mA	2.4	3.2		
$V_{OL}$	$V_{CC} = 4.5$ V	$I_{OL} = 12$ mA		0.25	0.4	V
		$I_{OL} = 24$ mA		0.35	0.5	
		$I_{OL} = 48$ mA <sup>‡</sup>		0.35	0.5	
$I_{OZH}$	$V_{CC} = 5.5$ V,	$V_O = 2.7$ V			20	μA
$I_{OZL}$	$V_{CC} = 5.5$ V,	$V_O = 0.4$ V			–20	μA
$I_I$	$V_{CC} = 5.5$ V,	$V_I = 7$ V			0.1	mA
$I_{IH}$	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20	μA
$I_{IL}$	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			–0.1	mA
$I_O^{\parallel}$	$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	–30		–112	mA
$I_{CC}$	$V_{CC} = 5.5$ V	Outputs high		21	36	mA
		Outputs low		41	67	
		Outputs disabled		25	42	

<sup>‡</sup> Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

<sup>§</sup> All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

<sup>||</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

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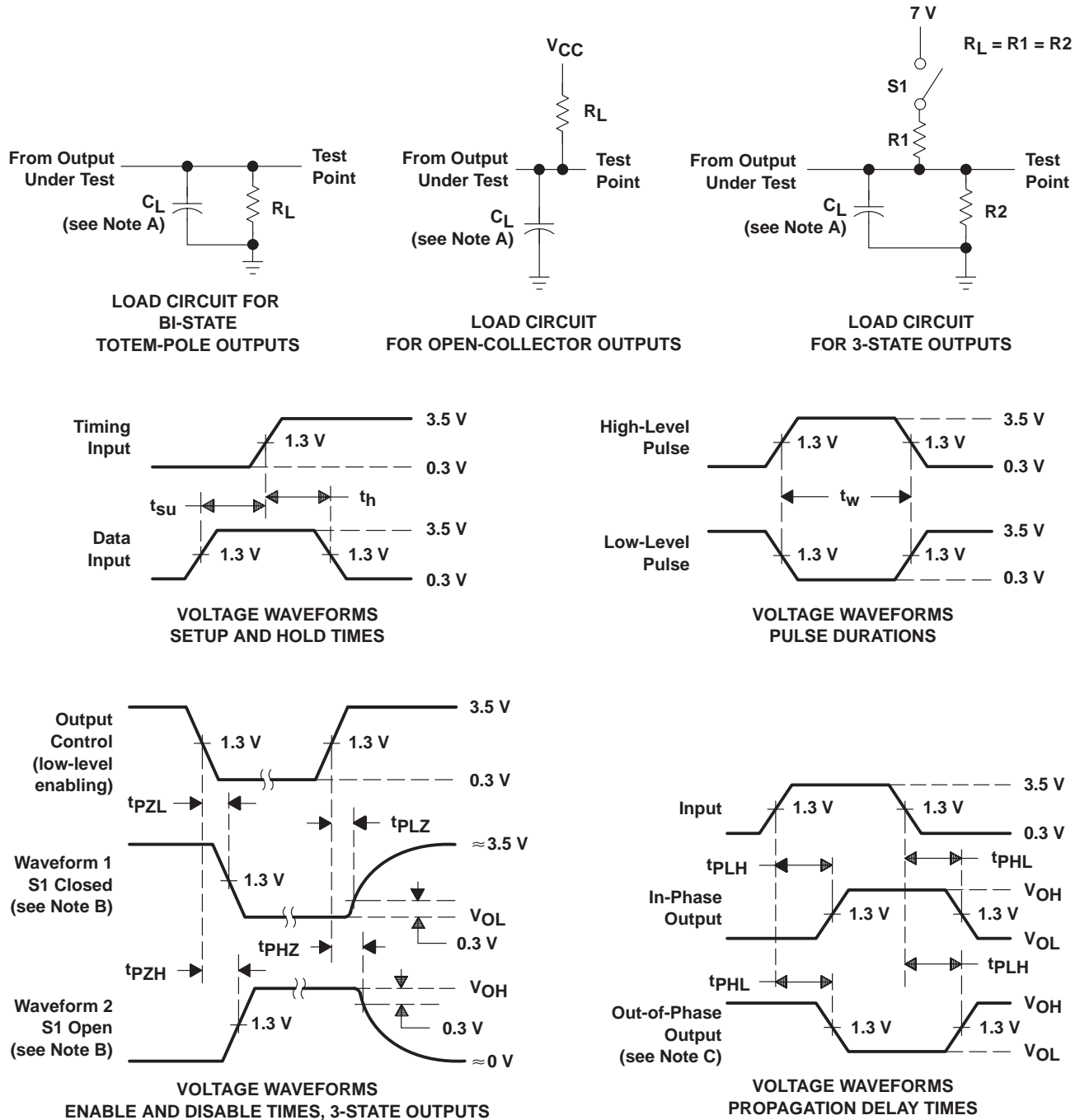
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### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX†		UNIT
			MIN	MAX	
t <sub>PLH</sub>	D	Q	2	13	ns
t <sub>PHL</sub>			4	18	
t <sub>PLH</sub>	LE	Q	5	21	ns
t <sub>PHL</sub>			8	26	
t <sub>PLH</sub>	$\overline{\text{PRE}}$	Q	6	22	ns
t <sub>PHL</sub>	$\overline{\text{CLR}}$		6	24	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Q	3	16	ns
t <sub>PZL</sub>			5	18	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Q	1	11	ns
t <sub>PLZ</sub>			2	12	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

**PARAMETER MEASUREMENT INFORMATION**  
**SERIES 54ALS/74ALS AND 54AS/74AS DEVICES**



- 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**

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