

# SN74ALS992

## 9-BIT D-TYPE TRANSPARENT READ-BACK LATCH WITH 3-STATE OUTPUTS

SDAS028B – APRIL 1984 – REVISED JANUARY 1995

- 3-State I/O-Type Read-Back Inputs
- Bus-Structured Pinout
- True Logic Outputs
- Designed With Nine Bits for Parity Applications
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (NT) 300-mil DIPs

### description

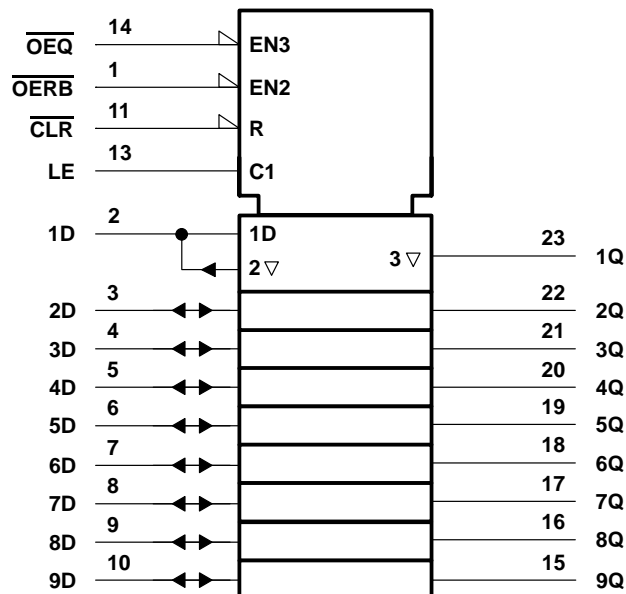
This 9-bit latch is designed specifically for storing the contents of the input data bus and providing the capability of reading back the stored data onto the input data bus. In addition, this device provides a 3-state buffer-type output and is easily implemented in parity applications.

The nine latches are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. The Q outputs are in the 3-state condition when the output-enable ( $\overline{OEQ}$ ) input is high.

Read back is provided through the output-enable ( $\overline{OERB}$ ) input. When  $\overline{OERB}$  is taken low, the data present at the output of the data latches is allowed to pass back onto the input data bus. When  $\overline{OERB}$  is taken high, the output of the data latches is isolated from the D inputs.  $\overline{OERB}$  does not affect the internal operation of the latches; however, precautions should be taken not to create a bus conflict.

The SN74ALS992 is characterized for operation from 0°C to 70°C.

### logic symbol†



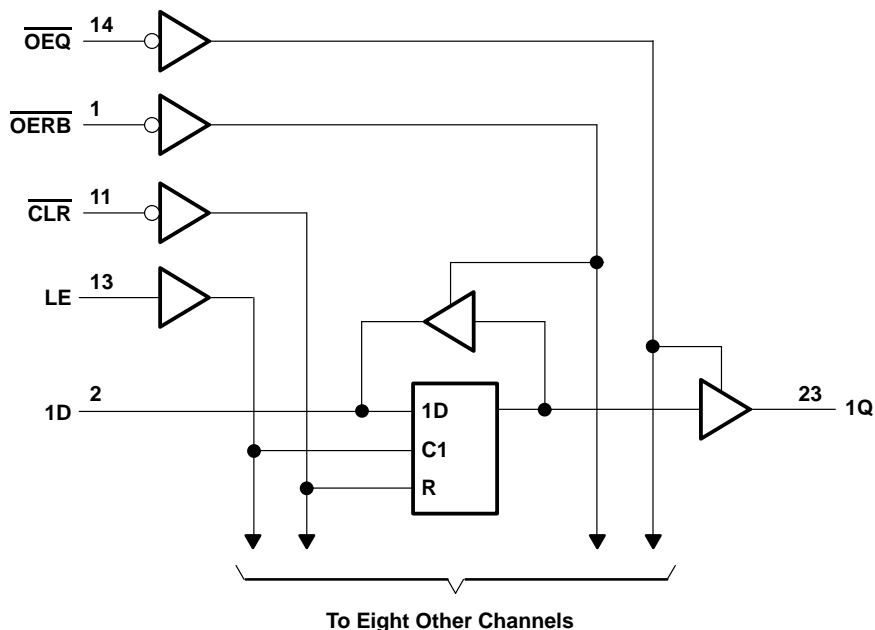
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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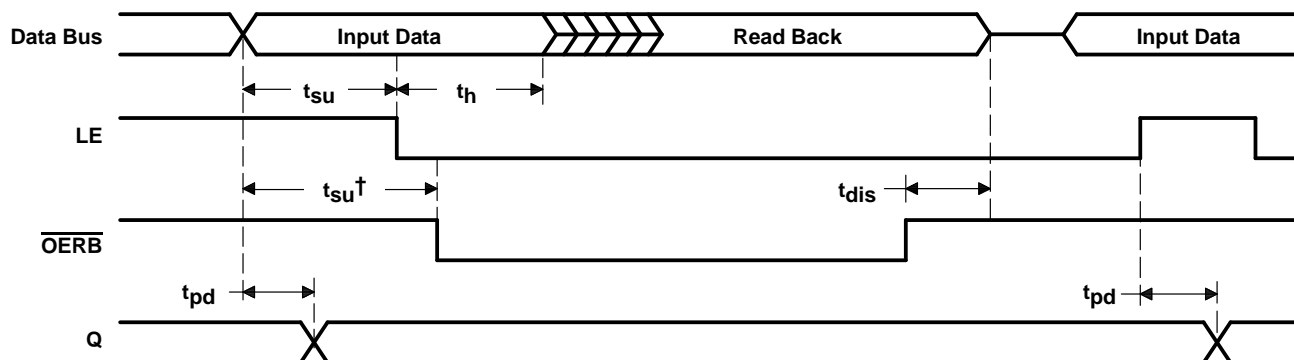
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### logic diagram (positive logic)



### timing diagram



$\overline{\text{CLR}} = \text{H}, \overline{\text{OEQ}} = \text{L}$

<sup>†</sup> This setup time ensures that the read-back circuit will not create a conflict on the input data bus.

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

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$ ( $\overline{\text{OERB}}$ , $\overline{\text{OEQ}}$ , $\overline{\text{CLR}}$ , and LE)	7 V
Voltage applied to D inputs and to disabled 3-state outputs	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.

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### recommended operating conditions

			MIN	NOM	MAX	UNIT	
VCC	Supply voltage		4.5	5	5.5	V	
VIH	High-level input voltage		2			V	
VIL	Low-level input voltage		0.8			V	
IOH	High-level output current	Q	−2.6			mA	
		D	−0.4				
IOL	Low-level output current	Q	24			mA	
		D	8				
tw	Pulse duration	LE high	10			ns	
		CLR low	10				
tsu	Setup time	Data before LE↓	10			ns	
		Data before OERB↓	10				
th	Hold time, data after LE↓		5			ns	
TA	Operating free-air temperature		0			70	°C

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			–1.2	V
$V_{OH}$	All outputs	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ,	$I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			V
	Q	$V_{CC} = 4.5\text{ V}$ ,	$I_{OH} = -2.6\text{ mA}$	2.4	3.2		
$V_{OL}$	D	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 4\text{ mA}$	0.25		0.4	V
			$I_{OL} = 8\text{ mA}$	0.35		0.5	
	Q	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 12\text{ mA}$	0.25		0.4	
			$I_{OL} = 24\text{ mA}$	0.35		0.5	
$I_{OZH}$	Q	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.7\text{ V}$			20	μA
$I_{OZL}$	Q	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.4\text{ V}$			–20	μA
$I_I$	D inputs	$V_{CC} = 5.5\text{ V}$	$V_I = 5.5\text{ V}$			0.1	mA
	All others		$V_I = 7\text{ V}$			0.1	
$I_{IH}$	D inputs‡	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20	μA
	All others					20	
$I_{IL}$	D inputs‡	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$			–0.1	mA
	All others					–0.1	
$I_{OS}§$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.25\text{ V}$	–30		–112	mA
$I_{CC}$		$V_{CC} = 5.5\text{ V}$ , $\overline{OERB}$ high	Outputs high		30	50	mA
			Outputs low		50	80	
			Outputs disabled		35	55	

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ For I/O ports ( $Q_A$  thru  $Q_H$ ), the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ 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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### WITH 3-STATE OUTPUTS

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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, T <sub>A</sub> = MIN to MAX†		UNIT
			MIN	MAX	
t <sub>PLH</sub>	D	Q	3	14	ns
t <sub>PHL</sub>			4	16	
t <sub>PLH</sub>	LE	Q	6	20	ns
t <sub>PHL</sub>			8	25	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	Q	6	20	ns
		D	8	26	
t <sub>en</sub> ‡	$\overline{\text{OERB}}$	D	4	21	ns
t <sub>dis</sub> §			2	14	
t <sub>en</sub> ‡	$\overline{\text{OEQ}}$	Q	4	18	ns
t <sub>dis</sub> §			1	14	

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

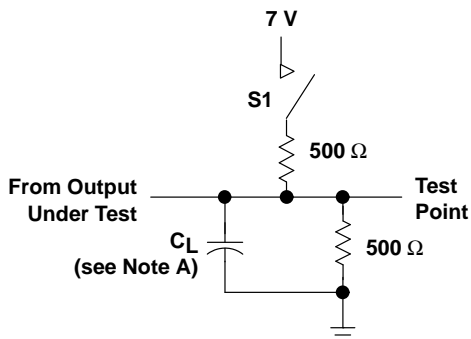
‡ t<sub>en</sub> = t<sub>PZH</sub> or t<sub>PZL</sub>

§ t<sub>dis</sub> = t<sub>PHZ</sub> or t<sub>PLZ</sub>

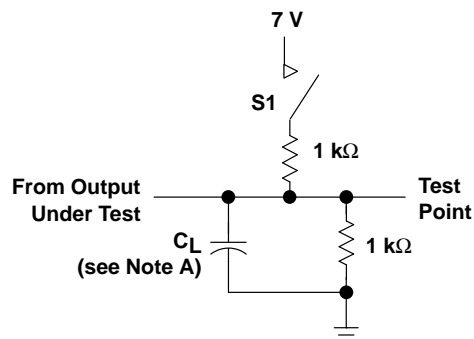
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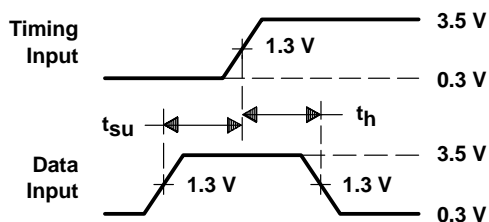
## PARAMETER MEASUREMENT INFORMATION



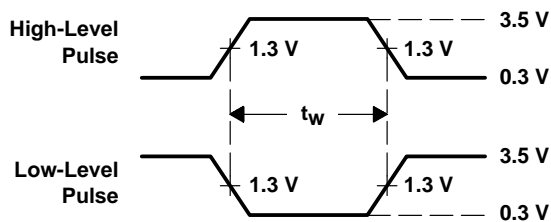
LOAD CIRCUIT FOR Q OUTPUTS



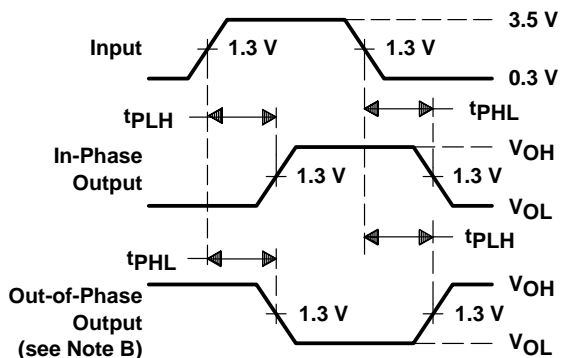
LOAD CIRCUIT FOR D OUTPUTS



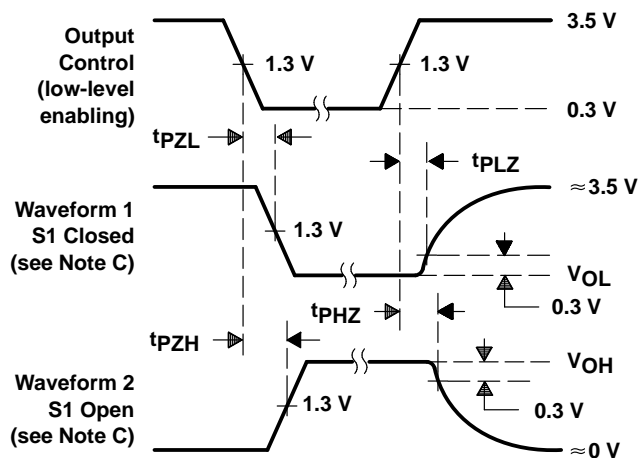
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PULSE DURATIONS



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. When measuring propagation delay times of 3-state outputs, switch S1 is open.

C. 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.

D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.

Figure 1. Load Circuits and Voltage Waveforms

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