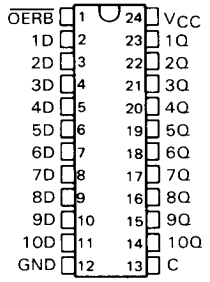
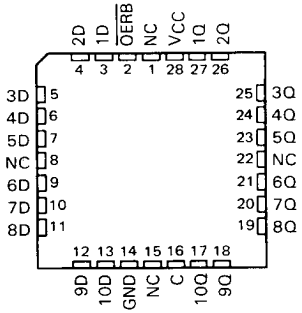
D2856, OCTOBER 1984 – REVISED JANUARY 1986

- **3-State I/O-Type Read-Back Inputs**
- **Bus-Structured Pinout**
- **Choice of True or Inverting Logic**
  'ALS994 . . . True Outputs
  'ALS995 . . . Inverting Outputs
- **Package Options Include Plastic "Small Outline" Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

SN74ALS994 . . . DW OR NT PACKAGE
(TOP VIEW)



SN74ALS994 . . . FN PACKAGE
(TOP VIEW)



NC – No internal connection.

description

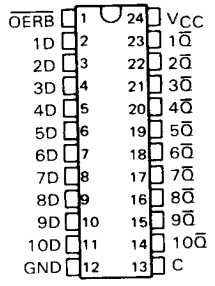
These 10-bit latches are designed specifically for storing the contents of the input data bus plus providing the capability of reading-back the stored data onto the input data bus.

The ten latches of the 'ALS994 and 'ALS995 are transparent D-type. While the enable (C) is high, the Q outputs of the 'ALS994 will follow the data (D) inputs. For the 'ALS995, the Q outputs will provide the inverse of what is applied to its data (D) inputs.

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

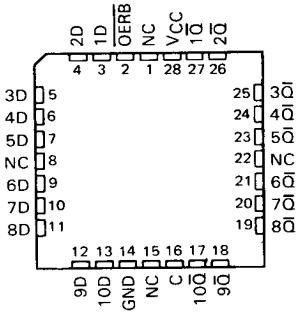
The SN74ALS994 and SN74ALS995 are characterized for operation from 0°C to 70°C.

SN74ALS995 . . . DW OR NT PACKAGE
(TOP VIEW)



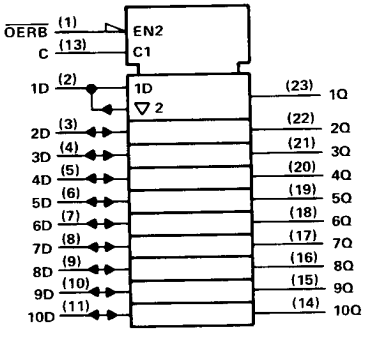
NC – No internal connection

SN74ALS995 . . . FN PACKAGE
(TOP VIEW)

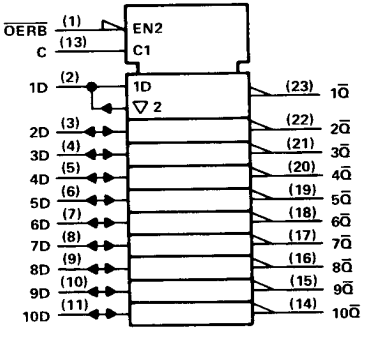


logic symbols†

'ALS994



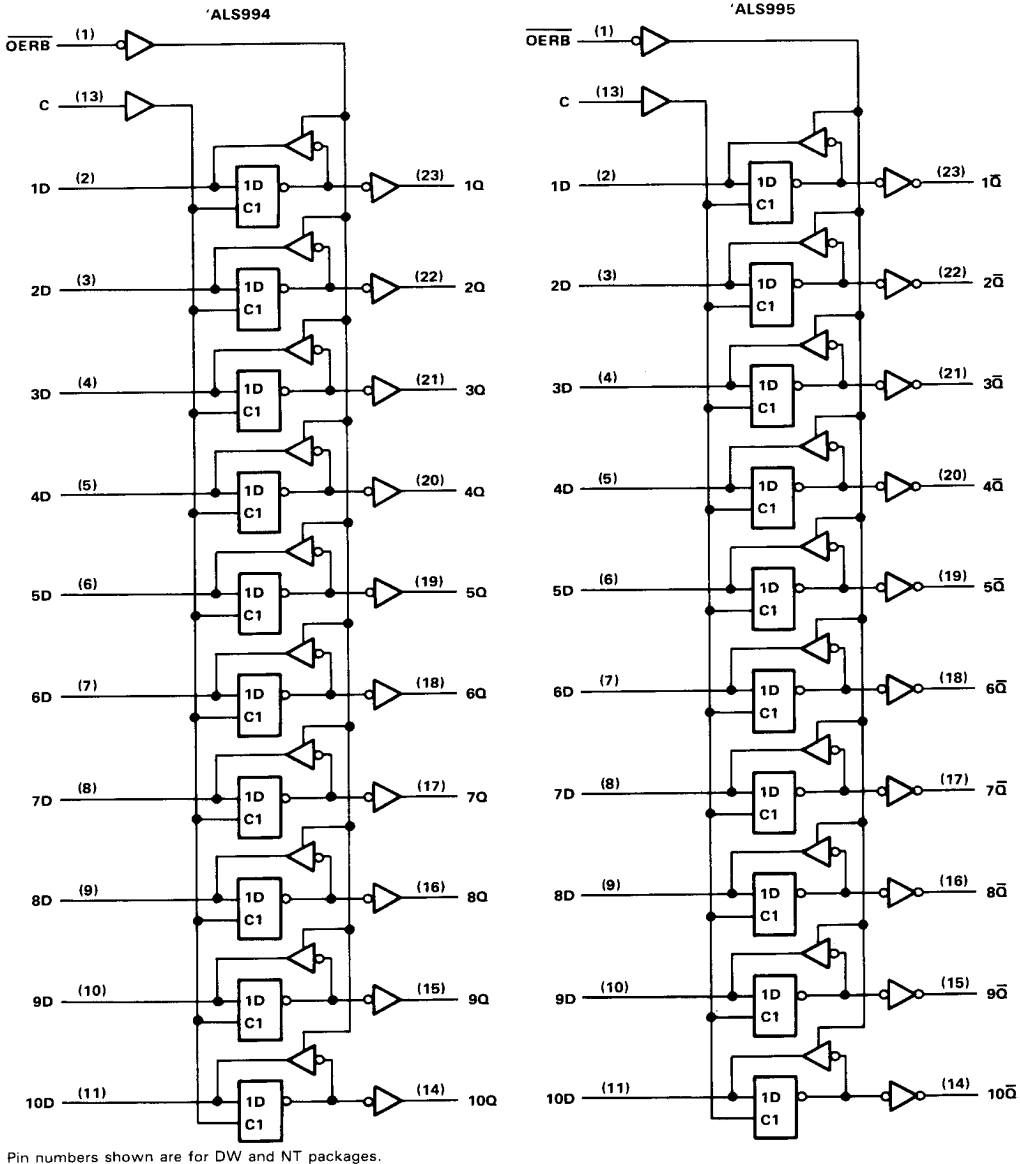
'ALS995



†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW and NT packages.

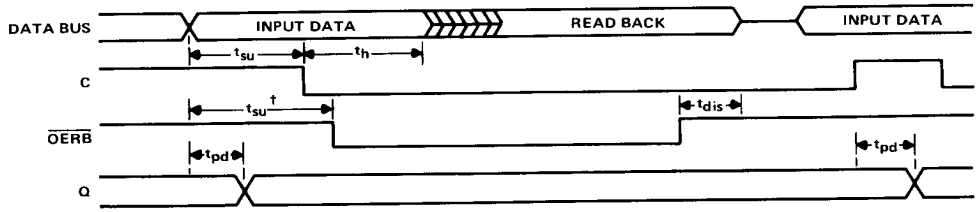
TEXAS INSTRUMENTS
POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

logic diagrams (positive logic)



Pin numbers shown are for DW and NT packages.

timing diagram



†This setup time ensures the readback circuit will not create a conflict on the input data bus.

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage ($\overline{OERB}$ and C) . . . . . 7 V
Voltage applied to D inputs . . . . . 5.5 V
Operating free-air temperature range . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

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	Q or $\overline{Q}$			−2.6	mA
		D			−0.4	
I_{OL}	Low-level output current	Q or $\overline{Q}$			24	mA
		D			8	
t_w	Pulse duration, enable C high		10			ns
t_{su}	Setup time	Data before C↓	10			ns
		Data before $\overline{OERB}$↓†	10			
t_h	Hold time	Input data after C↓	5			ns
T_A	Operating free-air temperature		0		70	°C

† This setup time ensures the readback circuit will not create a conflict on the input data bus.

TEXAS INSTRUMENTS
POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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 V,	I_I = −18 mA			−1.2	V
V_{OH}	All outputs	V_{CC} = 4.5 V to 5.5 V,	I_{OH} = −0.4 mA	V_{CC}−2			V
	Q or $\overline{Q}$	V_{CC} = 4.5 V,	I_{OH} = −2.6 mA	2.4	3.2		
V_{OL}	D	V_{CC} = 4.5 V,	I_{OL} = 4 mA		0.25	0.4	V
		V_{CC} = 4.5 V,	I_{OL} = 8 mA		0.35	0.5	
	Q or $\overline{Q}$	V_{CC} = 4.5 V,	I_{OL} = 12 mA		0.25	0.4	
		V_{CC} = 4.5 V,	I_{OL} = 24 mA		0.35	0.5	
I_I	$\overline{OERB}$, C	V_{CC} = 5.5 V,	V_I = 7 V			0.1	mA
	D inputs	V_{CC} = 5.5 V,	V_I = 5.5 V			0.1	
I_{IH}	$\overline{OERB}$, C	V_{CC} = 5.5 V,	V_I = 2.7 V			20	μA
	D inputs‡					20	
I_{IL}	$\overline{OERB}$, C	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.1	mA
	D inputs‡					−0.1	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	mA
I_{CC}	'ALS994	V_{CC} = 5.5 V, $\overline{OERB}$ high	Q outputs high		30	50	mA
			Q outputs low		52	82	
	'ALS995		$\overline{Q}$ outputs high		30	50	
			$\overline{Q}$ outputs low		55	85	

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ For I/O ports, 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 the true short-circuit output current, I_{OS}.

'ALS994 switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, T_A = 0°C to 70°C		UNIT
			MIN	TYP	MAX	MIN	MAX	
t_{PLH}	D	Q		7	10	3	14	ns
t_{PHL}				11	15	4	18	
t_{PLH}	C	Q		12	16	6	21	ns
t_{PHL}				16	21	8	27	
t_{en}	$\overline{OERB}$	D		11	17	4	21	ns
t_{dis}				9	13	2	16	

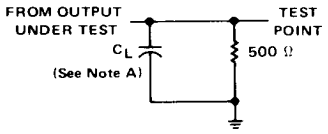
'ALS995 switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, T_A = 0°C to 70°C		UNIT
			MIN	TYP	MAX	MIN	MAX	
t_{PLH}	D	$\overline{Q}$		12	16	6	20	ns
t_{PHL}				9	12	4	15	
t_{PLH}	C	$\overline{Q}$		17	23	9	28	ns
t_{PHL}				14	19	7	22	
t_{en}	$\overline{OERB}$	D		12	18	4	21	ns
t_{dis}				8	12	2	15	

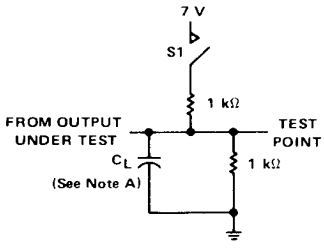
$t_{en} = t_{PZH}$ or t_{PZL}
$t_{dis} = t_{PHZ}$ or t_{PLZ}

TEXAS INSTRUMENTS
POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

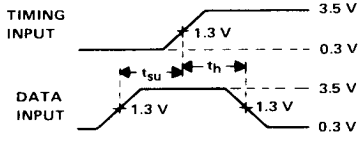
PARAMETER MEASUREMENT INFORMATION



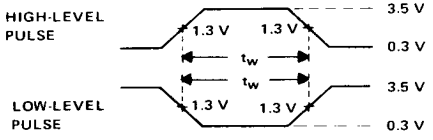
LOAD CIRCUIT FOR
Q OR $\overline{Q}$ OUTPUTS



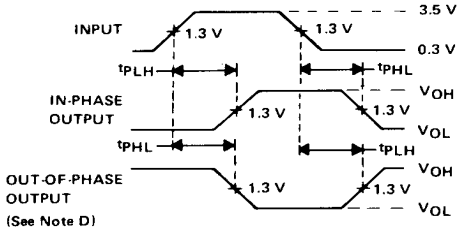
LOAD CIRCUIT FOR D OUTPUTS



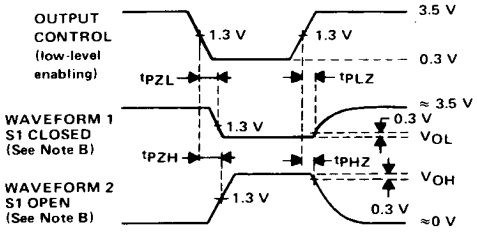
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE WIDTHS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS

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 have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
D. When measuring propagation delay times of 3-state outputs, switch S1 is open.

FIGURE 1