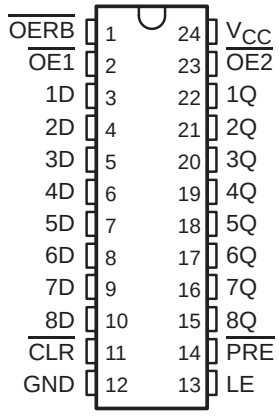
SN74ALS666, SN74ALS667
8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES WITH 3-STATE OUTPUTS

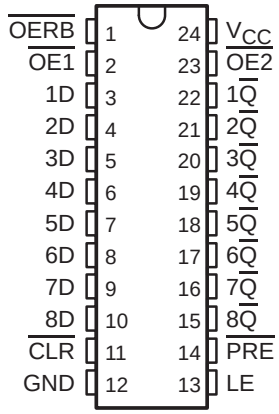
SDAS227A – JUNE 1984 – REVISED JANUARY 1995

- **3-State I/O-Type Read-Back Inputs**
- **Bus-Structured Pinout**
- **Choice of True or Inverting Logic**
  - **SN74ALS666 . . . True Outputs**
  - **SN74ALS667 . . . Inverted Outputs**
- **Preset and Clear Inputs**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (NT) 300-mil DIPs**

SN74ALS666 . . . DW OR NT PACKAGE
(TOP VIEW)



SN74ALS667 . . . DW OR NT PACKAGE
(TOP VIEW)



description

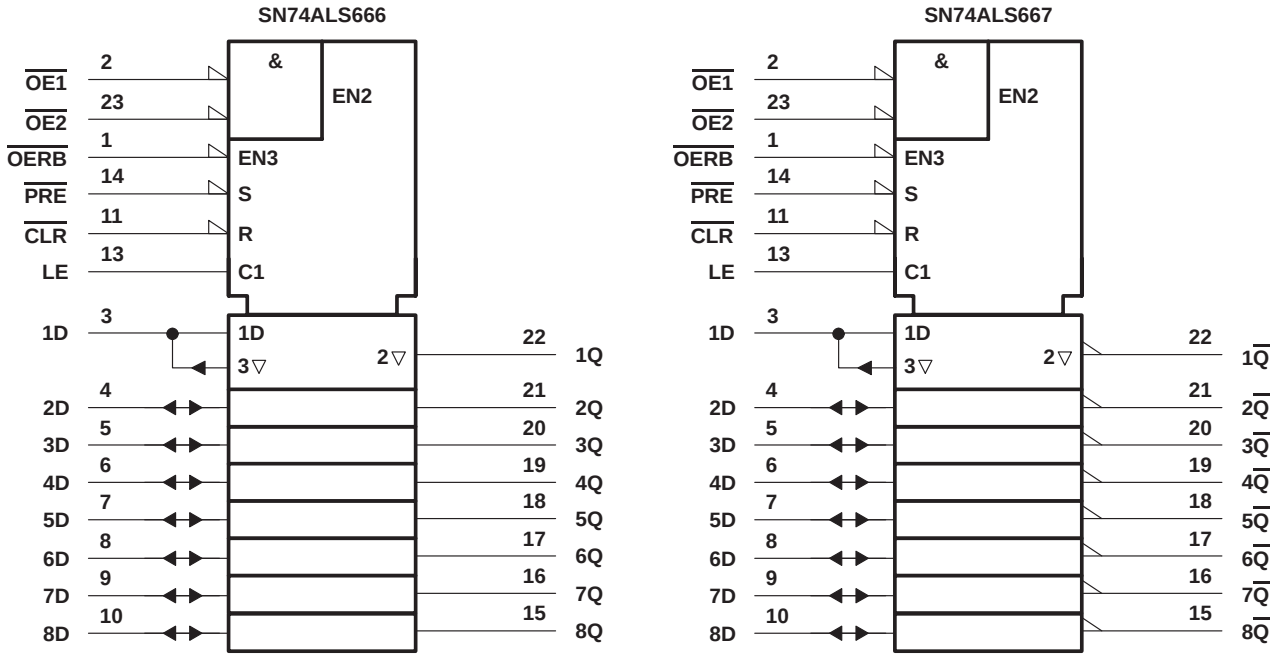
These 8-bit D-type transparent latches are designed specifically for storing the contents of the input data bus, plus reading back the stored data onto the input data bus. In addition, they provide a 3-state buffer-type output and are easily utilized in bus-structured applications.

While the latch enable (LE) is high, the Q outputs of the SN74ALS666 follow the data (D) inputs. The $\overline{Q}$ outputs of the SN74ALS667 provide the inverse of the data applied to its D inputs. The Q or $\overline{Q}$ output of both devices is in the high-impedance state if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is at a high logic level.

Read back is provided through the read-back control ($\overline{OERB}$) input. When $\overline{OERB}$ is taken low, the data present at the output of the data latches passes 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, caution should be exercised to avoid a bus conflict.

The SN74ALS666 and SN74ALS667 are characterized for operation from 0°C to 70°C.

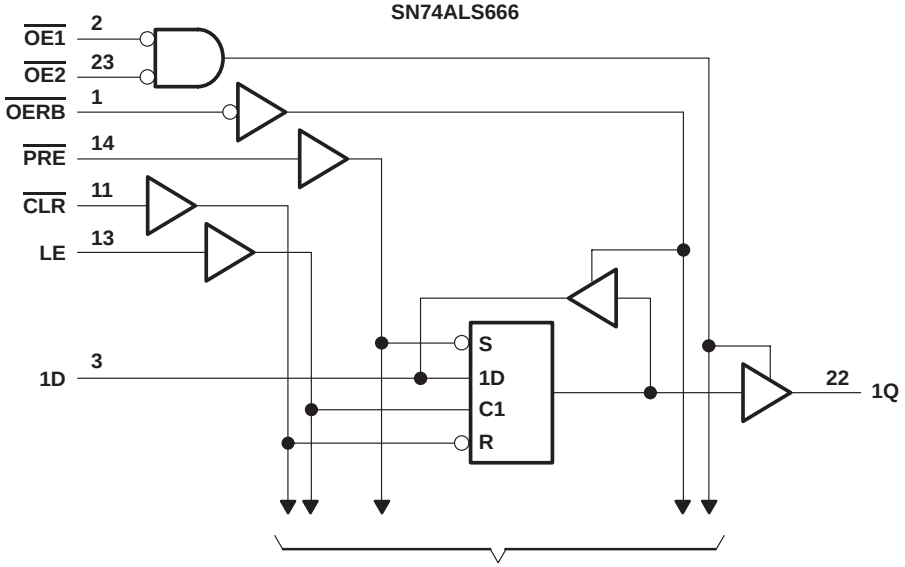
logic symbols†



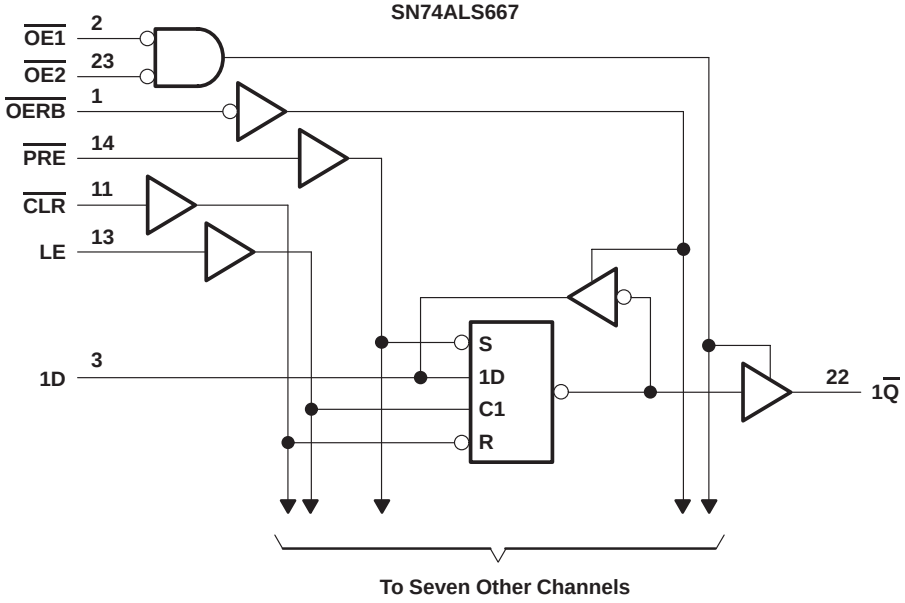
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)

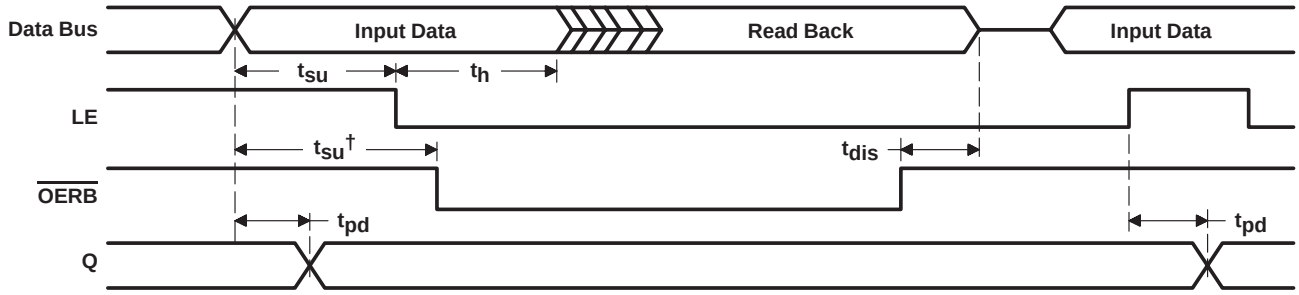
SN74ALS666



SN74ALS667



timing diagram



$\overline{CLR}$ = H, $\overline{PRE}$ = H, $\overline{OE1}$ = L, $\overline{OE2}$ = L.
† This setup time ensures the read-back circuit does 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, V_I (all inputs except D inputs) . . . . . 7 V
Voltage applied to D inputs and to disabled 3-state outputs . . . . . 5.5 V
Operating free-air temperature range, T_A: SN74ALS666, SN74ALS667 . . . . . 0°C to 70°C
Storage temperature range . . . . . –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.

recommended operating conditions

			SN74ALS666 SN74ALS667			UNIT
			MIN	NOM	MAX	
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			–2.6	mA
		D			–0.4	
I_{OL}	Low-level output current	Q			24	mA
		D			8	
t_w	Pulse duration	LE high	10			ns
		$\overline{CLR}$ low	10			
		$\overline{PRE}$ low	10			
t_{su}	Setup time	Data before LE↓	10			ns
		Data before $\overline{OERB}$↓	10			
t_h	Hold time, data after LE↓		5			ns
T_A	Operating free-air temperature		0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74ALS666 SN74ALS667			UNIT
				MIN	TYP†	MAX	
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 inputs	V_{CC} = 4.5 V	I_{OL} = 4 mA		0.25	0.4	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	
			I_{OL} = 24 mA		0.35	0.5	
I_{OZH}	Q or $\overline{Q}$	V_{CC} = 5.5 V,	V_O = 2.7 V			20	µA
I_{OZL}	Q or $\overline{Q}$	V_{CC} = 5.5 V,	V_O = 0.4 V			–20	µA
I_I	D inputs	V_{CC} = 5.5 V	V_I = 5.5 V			0.1	mA
	All others		V_I = 7 V			0.1	
I_{IH}	D inputs‡	V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
	All others					20	
I_{IL}	D inputs‡	V_{CC} = 5.5 V,	V_I = 0.4 V			–0.1	mA
	All others					–0.1	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	–30		–112	mA
I_{CC}	SN74ALS666	V_{CC} = 5.5 V, $\overline{OERB}$ high	Q outputs high		25	50	mA
			Q outputs low		40	73	
			Q outputs disabled		30	55	
	SN74ALS667	V_{CC} = 5.5 V, $\overline{OERB}$ high	$\overline{Q}$ outputs high		25	50	
			$\overline{Q}$ outputs low		45	79	
			$\overline{Q}$ outputs disabled		30	60	

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ For I/O ports (Q_A through 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}.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, T_A = MIN to MAX†		UNIT
			SN74ALS666		
			MIN	MAX	
t_{PLH}	D	Q	3	14	ns
t_{PHL}			4	18	
t_{PLH}	LE	Q	6	21	ns
t_{PHL}			8	27	
t_{PHL}	$\overline{CLR}$	Q	9	29	ns
		D	11	32	
t_{PLH}	$\overline{PRE}$	Q	7	22	ns
t_{PHL}		D	9	28	
t_{en}‡	$\overline{OERB}$	D	4	21	ns
	$\overline{OE1}$, $\overline{OE2}$	Q	4	21	
t_{dis}§	$\overline{OERB}$	D	1	14	ns
	$\overline{OE1}$, $\overline{OE2}$	Q	1	14	

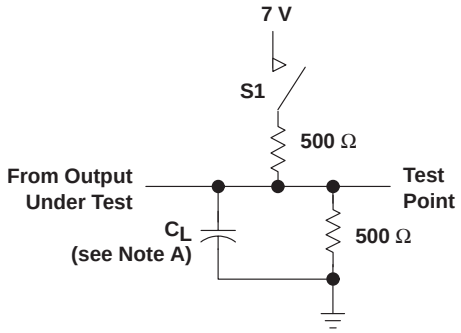
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ $t_{en} = t_{PZH}$ or t_{PZL}
§ $t_{dis} = t_{PHZ}$ or t_{PLZ}

switching characteristics (see Figure 1)

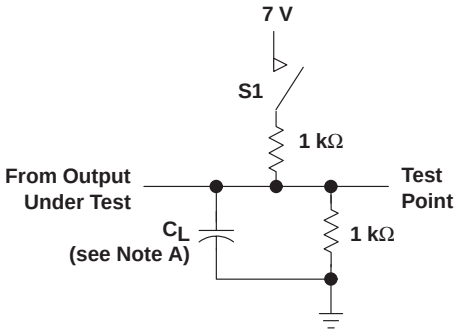
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, T_A = MIN to MAX†		UNIT
			SN74ALS667		
			MIN	MAX	
t_{PLH}	D	$\overline{Q}$	6	20	ns
t_{PHL}			4	15	
t_{PLH}	LE	$\overline{Q}$	9	28	ns
t_{PHL}			7	22	
t_{PHL}	$\overline{CLR}$	$\overline{Q}$	7	24	ns
		D	8	26	
t_{PLH}	$\overline{PRE}$	$\overline{Q}$	8	25	ns
t_{PHL}		D	9	28	
t_{en}‡	$\overline{OERB}$	D	4	21	ns
	$\overline{OE1}$, $\overline{OE2}$	$\overline{Q}$	4	21	
t_{dis}§	$\overline{OERB}$	D	1	14	ns
	$\overline{OE1}$, $\overline{OE2}$	$\overline{Q}$	1	14	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ $t_{en} = t_{PZH}$ or t_{PZL}
§ $t_{dis} = t_{PHZ}$ or t_{PLZ}

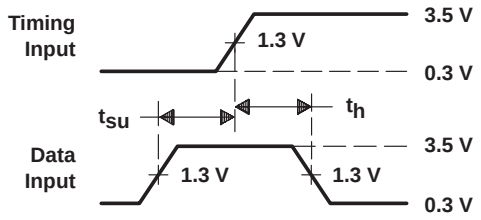
PARAMETER MEASUREMENT INFORMATION



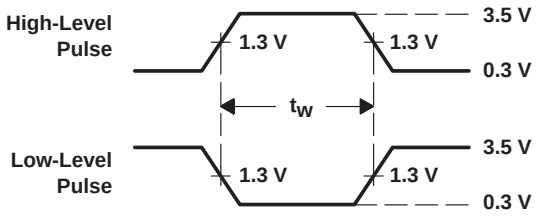
LOAD CIRCUIT FOR Q OR $\overline{Q}$ OUTPUTS



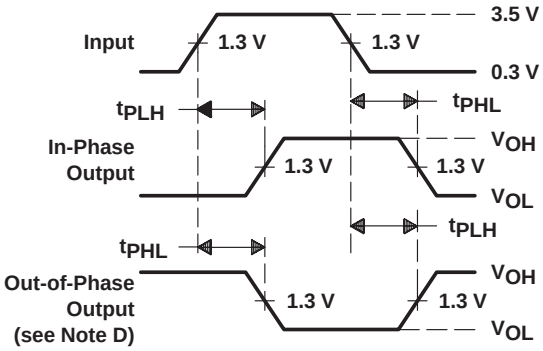
LOAD CIRCUIT FOR D OUTPUTS



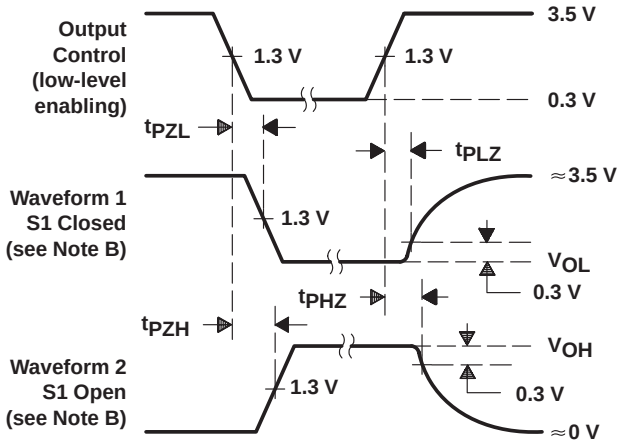
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE 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. 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. Load Circuits and Voltage Waveforms

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