

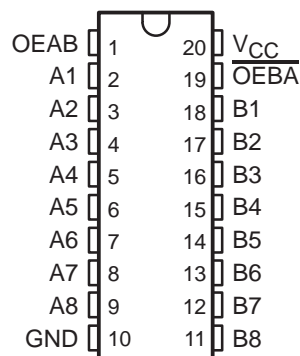
# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

SDAS226A – DECEMBER 1982 – REVISED JANUARY 1995

- Local Bus-Latch Capability
- Choice of True or Inverting Logic
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (N) 300-mil DIPs

DEVICE	OUTPUT	LOGIC
SN74ALS620A	3 state	Inverting
SN74ALS621A	Open collector	True
SN74ALS623A, SN74AS623	3 state	True

DW OR N PACKAGE  
(TOP VIEW)



## description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic levels at the output-enable (OEAB and  $\overline{\text{OEBA}}$ ) inputs.

The output-enable inputs disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability to store data by simultaneously enabling OEAB and  $\overline{\text{OEBA}}$ . Each output reinforces its input in this transceiver configuration. When both OEAB and  $\overline{\text{OEBA}}$  are enabled and all other data sources to the two sets of bus lines are in the high-impedance state, both sets of bus lines (16 total) remain at their last states. The 8-bit codes appearing on the two sets of buses are identical for the SN74ALS621A, SN74ALS623A, and SN74AS623 or complementary for the SN74ALS620A.

The -1 versions of the SN74ALS620A and SN74ALS621A are identical to the standard versions, except that the recommended maximum  $I_{OL}$  is increased to 48 mA in the -1 versions.

The SN74ALS620A, SN74ALS621A, SN74ALS623A, and SN74AS623 are characterized for operation from 0°C to 70°C.

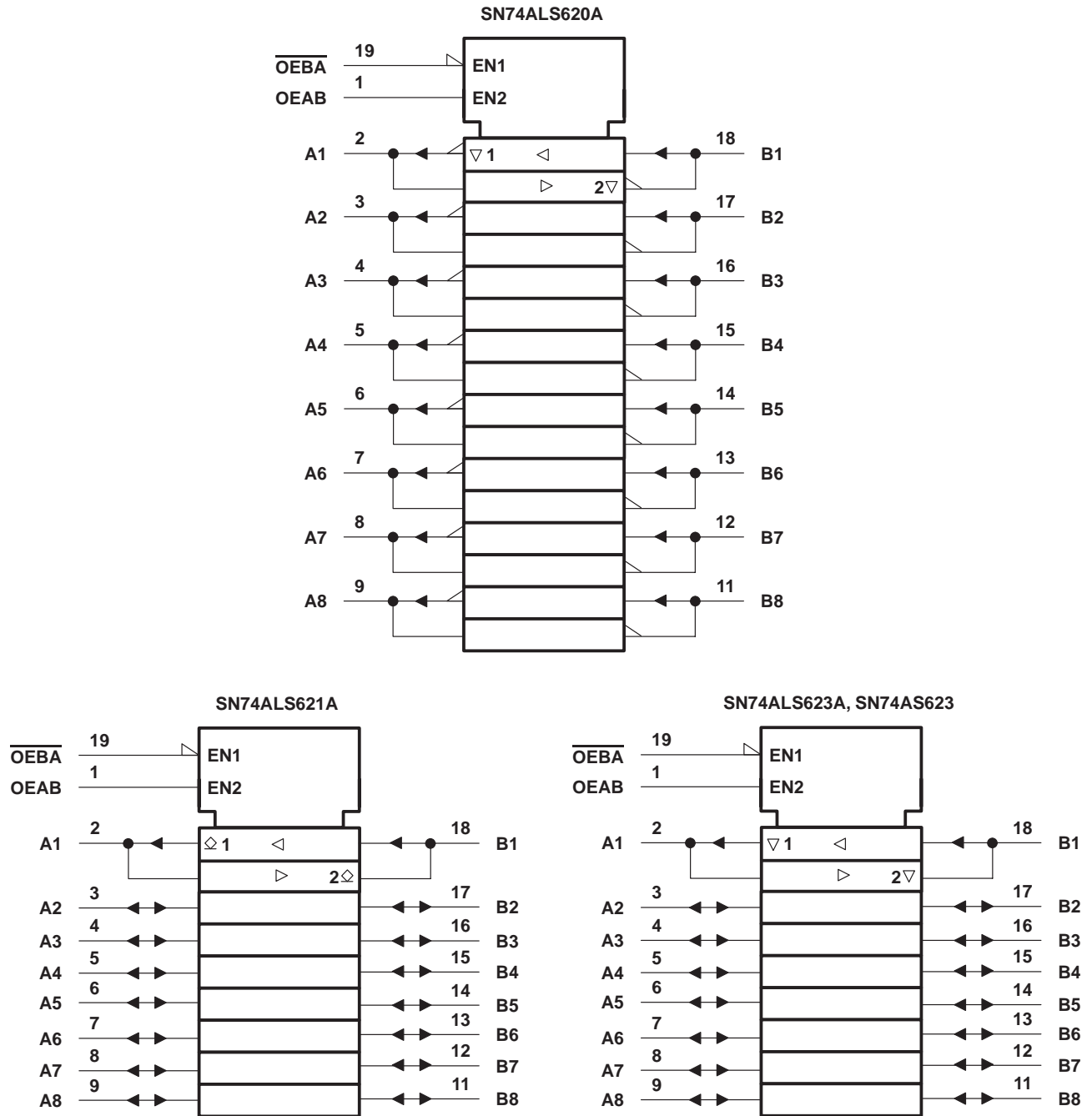
FUNCTION TABLE

INPUTS		OPERATION	
$\overline{\text{OEBA}}$	OEAB	SN74ALS620A	SN74ALS621A SN74ALS623A SN74AS623
L	L	$\overline{\text{B}}$ data to A bus	B data to A bus
H	H	$\overline{\text{A}}$ data to B bus	A data to B bus
H	L	Isolation	Isolation
L	H	$\overline{\text{B}}$ data to A bus, $\overline{\text{A}}$ data to B bus	B data to A bus, A data to B bus

# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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## logic symbols†

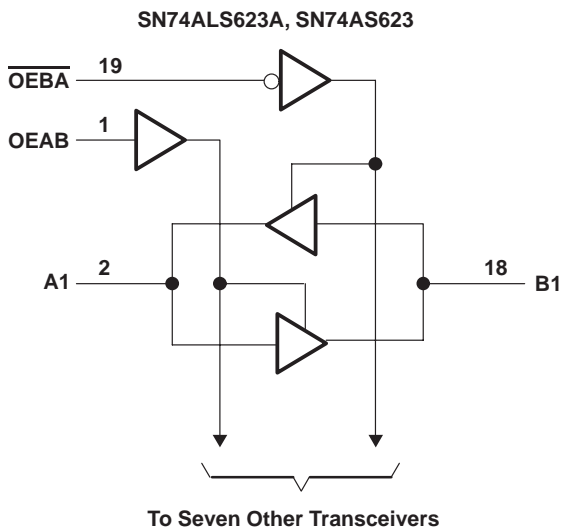
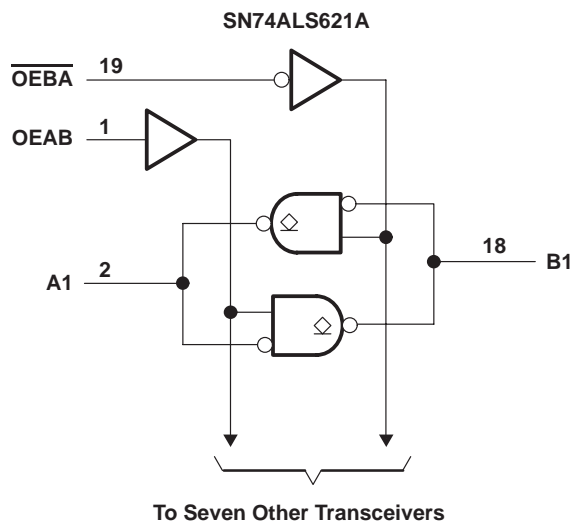
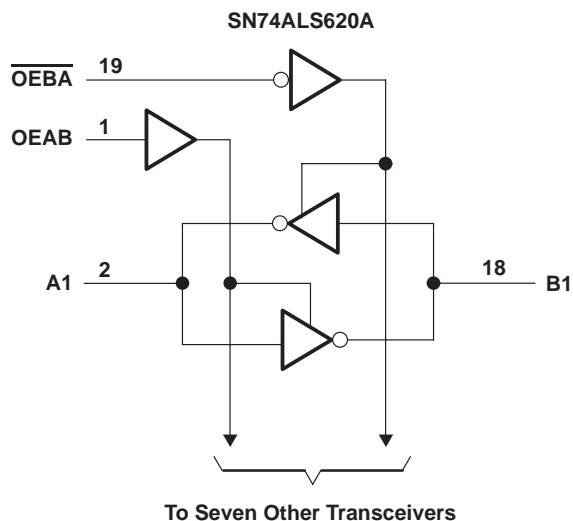


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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## logic diagrams (positive logic)



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

Supply voltage, $V_{CC}$ .....	7 V
Input voltage, $V_I$ : All inputs .....	7 V
I/O ports .....	5.5 V
Operating free-air temperature range, $T_A$ : SN74ALS620A, SN74ALS623A .....	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.

# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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## recommended operating conditions

		SN74ALS620A SN74ALS623A			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			-15	mA
$I_{OL}$	Low-level output current			24	mA
$T_A$	Operating free-air temperature	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74ALS620A SN74ALS623A		UNIT
				MIN	TYP†	
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$		-1.2	V
$V_{OH}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ,	$I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$		V
		$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.2	
			$I_{OH} = -15\text{ mA}$	2		
$V_{OL}$		$V_{CC} = 4.5\text{ V}$	$I_{OL} = 12\text{ mA}$	0.25	0.4	V
			$I_{OL} = 24\text{ mA}^\ddagger$	0.35	0.5	
$I_I$	Control inputs	$V_{CC} = 5.5\text{ V}$	$V_I = 7\text{ V}$	0.1		mA
	A or B ports		$V_I = 5.5\text{ V}$	0.1		
$I_{IH}$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$	20		$\mu\text{A}$
	A or B ports§			20		
$I_{IL}$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$	-0.1		mA
	A or B ports§			-0.1		
$I_{O}^\parallel$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.25\text{ V}$	-30	-112	mA
$I_{CC}$	SN74ALS620A	$V_{CC} = 5.5\text{ V}$	Outputs high	24	34	mA
			Outputs low	31	44	
			Outputs disabled	33	47	
	SN74ALS623A	$V_{CC} = 5.5\text{ V}$	Outputs high	32	43	
			Outputs low	39	50	
			Outputs disabled	42	55	

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

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

§ 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 of the true short-circuit output current,  $I_{OS}$ .

# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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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, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN74ALS620A		SN74ALS623A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	2	10	2	13	ns
t <sub>PHL</sub>			2	10	3	11	
t <sub>PLH</sub>	B	A	2	10	2	13	ns
t <sub>PHL</sub>			2	10	3	11	
t <sub>PZH</sub>	$\overline{\text{OEBA}}$	A	3	17	5	22	ns
t <sub>PZL</sub>			5	25	5	22	
t <sub>PHZ</sub>	$\overline{\text{OEBA}}$	A	2	12	2	16	ns
t <sub>PLZ</sub>			3	18	2	19	
t <sub>PZH</sub>	OEAB	B	3	18	5	22	ns
t <sub>PZL</sub>			5	25	5	22	
t <sub>PHZ</sub>	OEAB	B	2	12	2	16	ns
t <sub>PLZ</sub>			3	18	2	19	

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

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

Supply voltage, V <sub>CC</sub>	7 V
Input voltage, V <sub>I</sub> : All inputs and I/O ports	7 V
Operating free-air temperature range, T <sub>A</sub> : SN74ALS621A	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

		SN74ALS621A			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
V <sub>OH</sub>	High-level output voltage			5.5	V
I <sub>OL</sub>	Low-level output current			24	mA
				48§	mA
T <sub>A</sub>	Operating free-air temperature	0		70	°C

§ Applies only to the -1 version and only if V<sub>CC</sub> is between 4.75 V and 5.25 V



# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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

PARAMETER		TEST CONDITIONS	SN74ALS621A		UNIT	
			MIN	TYP†		MAX
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA	-1.5		V	
I <sub>OH</sub>		V <sub>CC</sub> = 4.5 V, V <sub>OH</sub> = 5.5 V	0.1		mA	
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 24 mA	0.35	0.5	V
			I <sub>OL</sub> = 48 mA‡	0.35	0.5	
I <sub>I</sub>	Control inputs	V <sub>CC</sub> = 5.5 V	V <sub>I</sub> = 7 V	0.1		mA
	A or B ports		V <sub>I</sub> = 5.5 V	0.1		
I <sub>IH</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V	20		μA	
	A or B ports§		20			
I <sub>IL</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V	-0.1		mA	
	A or B ports§		-0.1			
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V	Outputs high	29	40	mA
			Outputs low	35	48	

† All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

‡ Applies only to the -1 version and only if V<sub>CC</sub> is between 4.75 V and 5.25 V

§ For I/O ports, the parameters I<sub>IH</sub> and I<sub>IL</sub> include the off-state output current.

## 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, R <sub>L</sub> = 680 Ω, T <sub>A</sub> = MIN to MAX††		UNIT
			SN74ALS621A		
			MIN	MAX	
t <sub>PLH</sub>	A	B	10	33	ns
t <sub>PHL</sub>			5	20	
t <sub>PLH</sub>	B	A	10	33	ns
t <sub>PHL</sub>			5	20	
t <sub>PLH</sub>	$\overline{\text{OEBA}}$	A	10	39	ns
t <sub>PHL</sub>			12	35	
t <sub>PLH</sub>	OEAB	B	10	39	ns
t <sub>PHL</sub>			12	35	

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



# SN74ALS620A, SN74ALS621A, SN74ALS623A, SN74AS623 OCTAL BUS TRANSCEIVERS

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

Supply voltage, $V_{CC}$ .....	7 V
Input voltage, $V_I$ : All inputs .....	7 V
I/O ports .....	5.5 V
Operating free-air temperature range, $T_A$ : SN74AS623 .....	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

		SN74AS623			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			–15	mA
$I_{OL}$	Low-level output current			64	mA
$T_A$	Operating free-air temperature	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74AS623		UNIT
				MIN	TYP‡	
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$		–1.2	V
$V_{OH}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$		$V_{CC} - 2$		V
		$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.2	
			$I_{OH} = -15\text{ mA}$	2		
$V_{OL}$		$V_{CC} = 4.5\text{ V}$ ,	$I_{OL} = 64\text{ mA}$	0.35	0.55	V
$I_I$	Control inputs	$V_{CC} = 5.5\text{ V}$	$V_I = 7\text{ V}$	0.1		mA
	A or B ports		$V_I = 5.5\text{ V}$	0.1		
$I_{IH}$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$	20		µA
	A or B ports§			70		
$I_{IL}$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$	–0.5		mA
	A or B ports§			–0.75		
$I_{O}^{\parallel}$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.25\text{ V}$	–30	–150	mA
$I_{CC}$		$V_{CC} = 5.5\text{ V}$	Outputs high	57	93	mA
			Outputs low	16	189	
			Outputs disabled	71	116	

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

§ 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 of the true short-circuit output current,  $I_{OS}$ .



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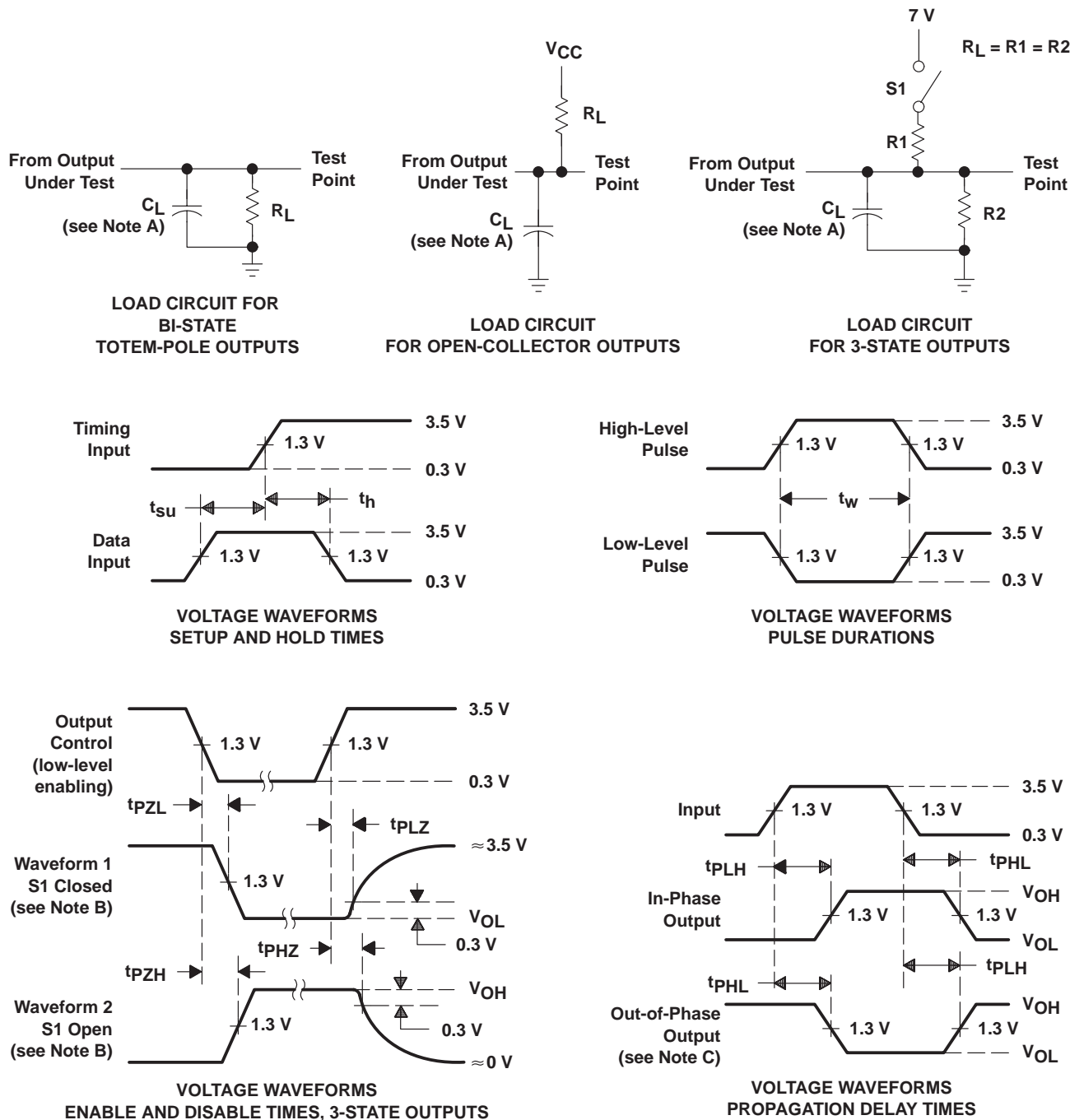
## switching characteristics (see Figure 1)

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
			SN74AS623		
			MIN	MAX	
t <sub>PLH</sub>	A	B	1	9	ns
t <sub>PHL</sub>			1	8	
t <sub>PLH</sub>	B	A	1	9	ns
t <sub>PHL</sub>			1	8.5	
t <sub>PZH</sub>	$\overline{\text{OEBA}}$	A	2	11	ns
t <sub>PZL</sub>			2	10	
t <sub>PHZ</sub>	$\overline{\text{OEBA}}$	A	1	7.5	ns
t <sub>PLZ</sub>			1	11.5	
t <sub>PZH</sub>	OEAB	B	2	11.5	ns
t <sub>PZL</sub>			2	11	
t <sub>PHZ</sub>	OEAB	B	1	7	ns
t <sub>PLZ</sub>			1	9	

† 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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