

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272 – NOVEMBER 1994

- 3-State Outputs Drive Bus Lines Directly
- pnp Inputs Reduce dc Loading
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

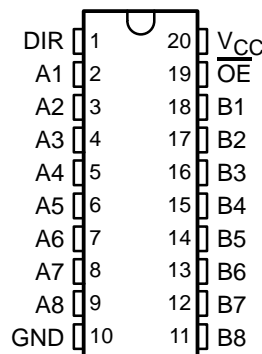
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The 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 level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

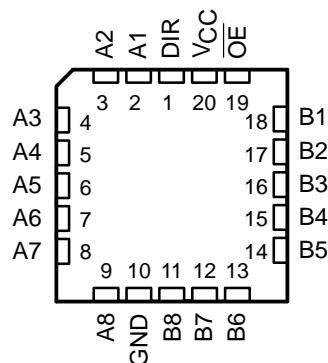
The -1 version of the SN74ALS245A is identical to the standard version, except that the recommended maximum  $I_{OL}$  is increased to 48 mA. There is no -1 version of the SN54ALS245A.

The SN54ALS245A and SN54AS245 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS245A and SN74AS245 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS245A, SN54AS245 . . . J PACKAGE  
SN74ALS245A, SN74AS245 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS245A, SN54AS245 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

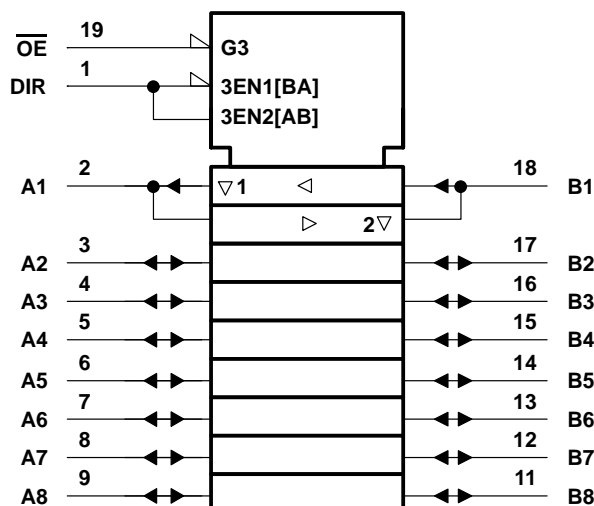
# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

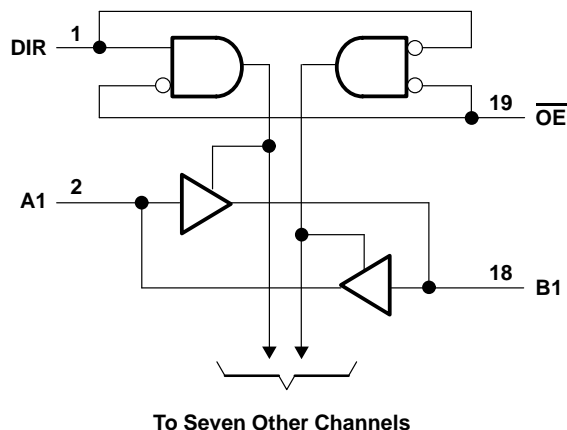
### WITH 3-STATE OUTPUTS

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#### logic symbol†



#### logic diagram (positive logic)



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

#### 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, $T_A$ : SN54ALS245A	–55°C to 125°C
SN74ALS245A	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

		SN54ALS245A			SN74ALS245A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.7			0.8	V
$I_{OH}$	High-level output current			–12			–15	mA
$I_{OL}$	Low-level output current			12			24	mA
							48§	
$T_A$	Operating free-air temperature	–55		125	0		70	°C

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS		SN54ALS245A		SN74ALS245A		UNIT
				MIN	TYP†	MAX	MIN	
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = −18 mA		−1.5		−1.5		V
V <sub>OH</sub>		V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = −0.4 mA		V <sub>CC</sub> − 2		V <sub>CC</sub> − 2		V
		V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = −3 mA	2.4	3.2	2.4	3.2	
			I <sub>OH</sub> = −12 mA	2				
			I <sub>OH</sub> = −15 mA			2		
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4	V
			I <sub>OL</sub> = 24 mA			0.35	0.5	
			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		0.1		mA
	A or B ports		V <sub>I</sub> = 5.5 V	0.1		0.1		
I <sub>IH</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V		20		20		μA
	A or B ports§			20		20		
I <sub>IL</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V		−0.1		−0.1		mA
	A or B ports§			−0.1		−0.1		
I <sub>O</sub> ¶		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V		−20	−112	−30	−112	mA
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V	Outputs high	30	48	30	45	mA
			Outputs low	36	60	36	55	
			Outputs disabled	38	63	38	58	

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

‡ 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,  $I_{OS}$ .

### 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 <sup>#</sup>				UNIT
			SN54ALS245A		SN74ALS245A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	1	19	3	10	ns
t <sub>PHL</sub>			1	14	3	10	
t <sub>PZH</sub>	$\overline{OE}$	A or B	2	30	5	20	ns
t <sub>PZL</sub>			2	29	5	20	
t <sub>PHZ</sub>	$\overline{OE}$	A or B	2	14	2	10	ns
t <sub>PLZ</sub>			2	30	4	15	

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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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, $T_A$ : SN54AS245	–55°C to 125°C
SN74AS245	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

		SN54AS245			SN74AS245			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$I_{OH}$	High-level output current			–12			–15	mA
$I_{OL}$	Low-level output current			48			64	mA
$T_A$	Operating free-air temperature	–55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN54AS245			SN74AS245			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$				–1.2			–1.2	V
$V_{OH}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$		$V_{CC} - 2$			$V_{CC} - 2$			V
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -3\text{ mA}$		2.4	3.2		2.4	3.2		
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -12\text{ mA}$		2						
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -15\text{ mA}$					2			
$V_{OL}$		$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 48\text{ mA}$		0.3	0.55					V
		$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 64\text{ mA}$					0.35	0.55		
$I_I$	Control inputs	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$				0.1			0.1	mA
	A or B ports	$V_{CC} = 5.5\text{ V}$ , $V_I = 5.5\text{ V}$				0.1			0.1	
$I_{IH}$	Control inputs	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				50			20	$\mu\text{A}$
	A or B ports§	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				70			70	
$I_{IL}$	Control inputs	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.7\text{ V}$				–0.5			–0.5	mA
	A or B ports§	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.7\text{ V}$				–0.75			–0.75	
$I_{O\ddagger}$		$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$		–50		–150	–50		–150	mA
$I_{CC}$		$V_{CC} = 5.5\text{ V}$ , Outputs high		62	97		62	97		mA
		$V_{CC} = 5.5\text{ V}$ , Outputs low		95	143		95	143		
		$V_{CC} = 5.5\text{ V}$ , Outputs disabled		79	123		79	123		

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

§ 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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**OCTAL BUS TRANSCEIVERS**  
**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, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54AS245		SN74AS245		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	2	9.5	2	7.5	ns
t <sub>PHL</sub>			2	9	2	7	
t <sub>PZH</sub>	$\overline{OE}$	A or B	2	11	2	9	ns
t <sub>PZL</sub>			2	10.5	2	8.5	
t <sub>PHZ</sub>	$\overline{OE}$	A or B	2	7.5	2	5.5	ns
t <sub>PLZ</sub>			2	12	2	9.5	

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

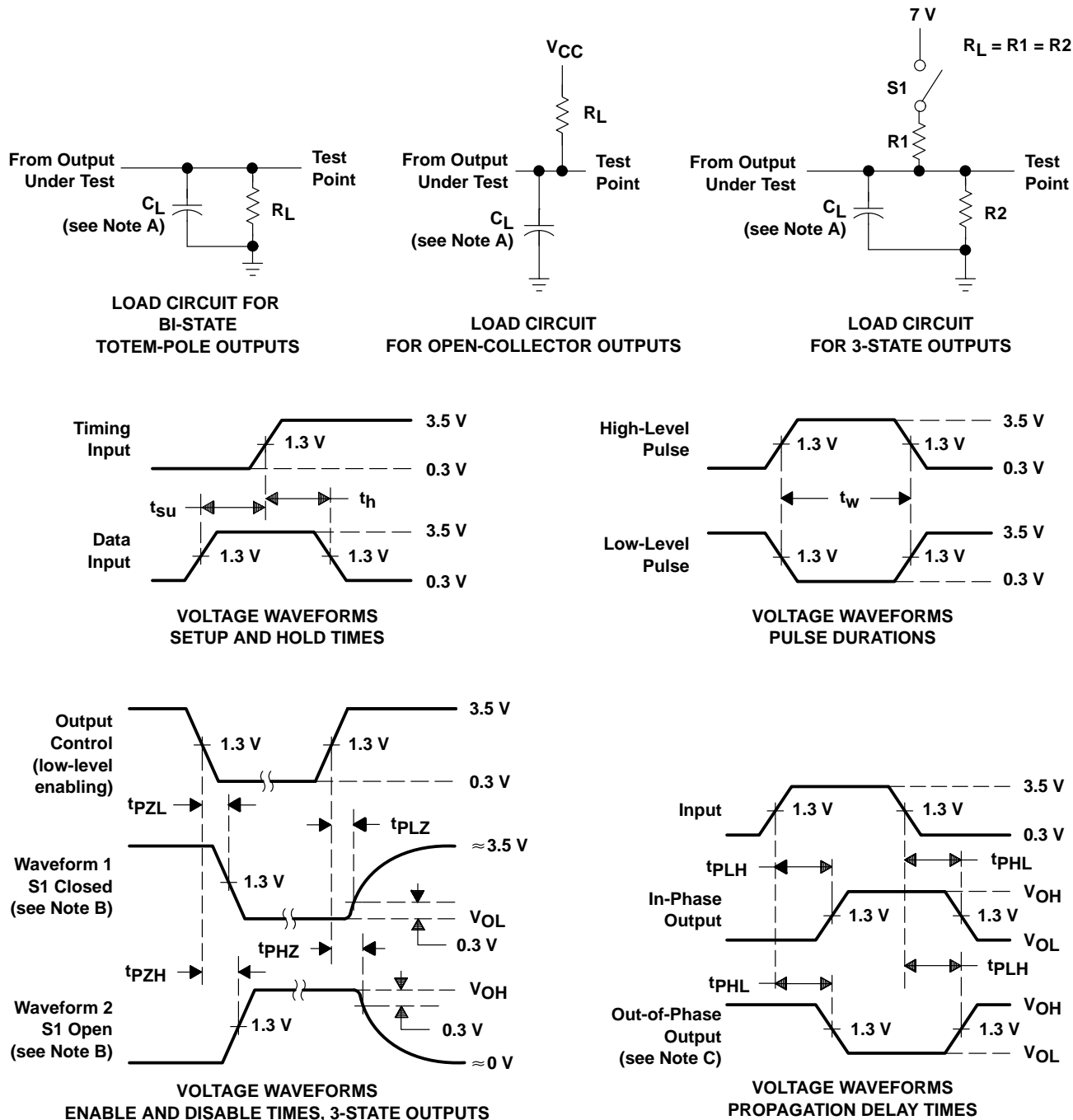
## OCTAL BUS TRANSCEIVERS

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#### 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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