SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDAS124C – APRIL 1982 – REVISED AUGUST 1996

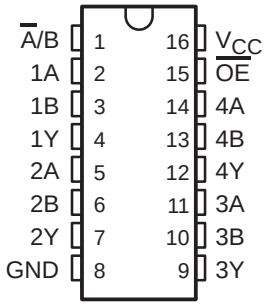
- **3-State Outputs Interface Directly With System Bus**
- **Provide Bus Interface From Multiple Sources in High-Performance Systems**
- **Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

description

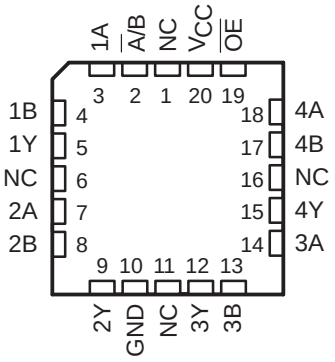
These data selectors/multiplexers are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems. The 3-state outputs do not load the data lines when the output-enable ($\overline{OE}$) input is at a high logic level.

The SN54ALS257A and SN54ALS258A are characterized for operation over the full military temperature range of –55°C to 125°C. The SN74ALS257A, SN74ALS258A, SN74AS257, and SN74AS258 are characterized for operation from 0°C to 70°C.

SN54ALS257A, SN54ALS258A . . . J PACKAGE
SN74ALS257A, SN74ALS258A, SN74AS257,
SN74AS258 . . . D OR N PACKAGE
(TOP VIEW)



SN54ALS257A, SN54ALS258A . . . FK PACKAGE
(TOP VIEW)



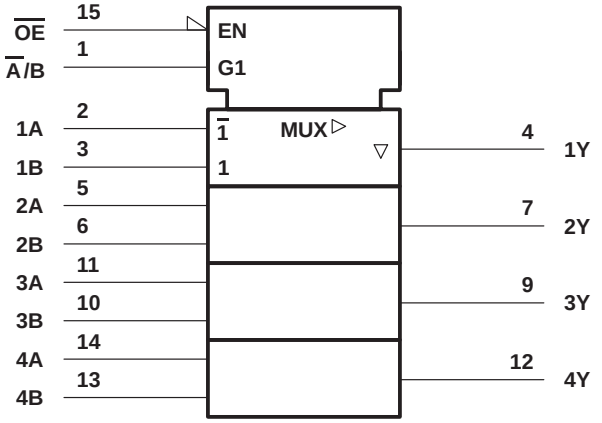
NC – No internal connection

FUNCTION TABLE

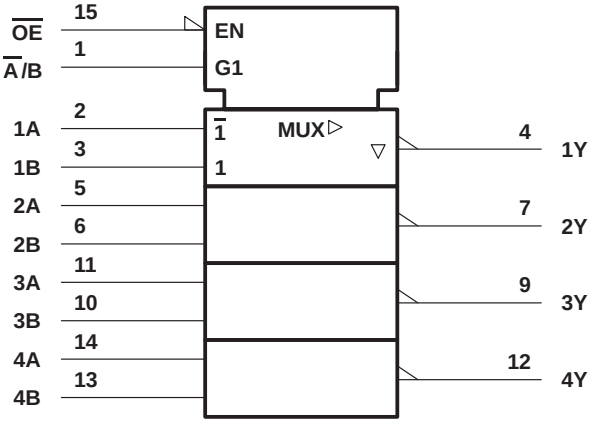
INPUTS				OUTPUT Y	
$\overline{OE}$	$\overline{A}$/B	DATA A	DATA B	SN54ALS257A SN74ALS257A SN74AS257	SN54ALS258A SN74ALS258A SN74AS258
H	X	X	X	Z	Z
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

logic symbols†

SN54ALS257A, SN74ALS257A, SN74AS257



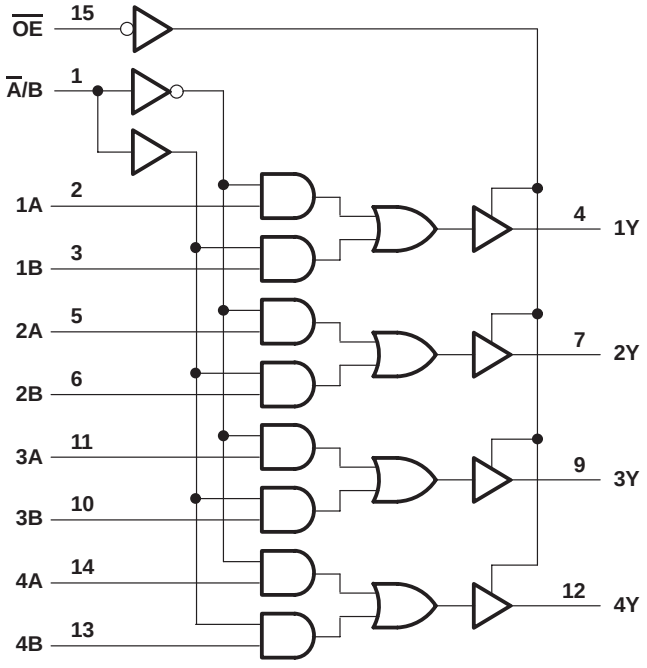
SN54ALS258A, SN74ALS258A, SN74AS258



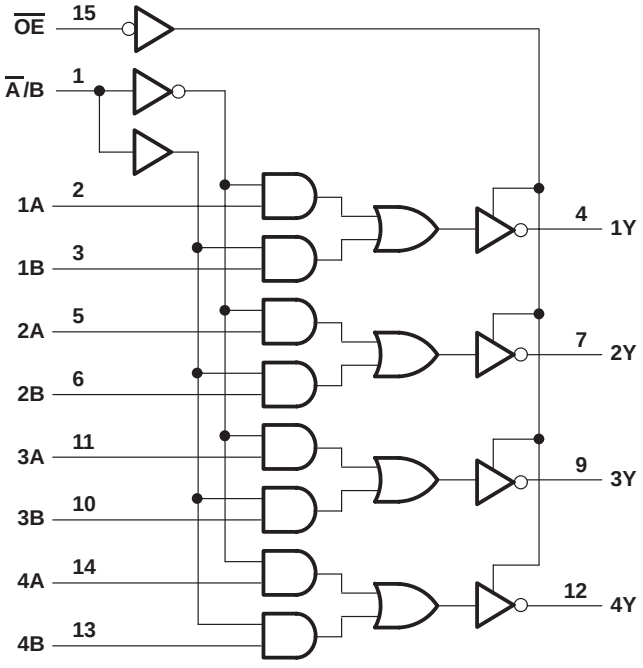
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, and N packages.

logic diagrams (positive logic)

SN54ALS257A, SN74ALS257A, SN74AS257



SN54ALS258A, SN74ALS258A, SN74AS258



Pin numbers shown are for the D, J, and N packages.

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage, V_I . . . . . 7 V
Voltage applied to a disabled 3-state output . . . . . 5.5 V
Maximum power dissipation at T_A = 55°C (in still air) (see Note 1): D package . . . . . 1.3 W
N package . . . . . 1.1 W
Operating free-air temperature range, T_A: SN54ALS257A, SN54ALS258A . . . . . –55°C to 125°C
SN74ALS257A, SN74ALS258A . . . . . 0°C to 70°C
Storage temperature range, T_{stg} . . . . . –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.

NOTE 1: The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions

		SN54ALS257A SN54ALS258A			SN74ALS257A SN74ALS258A			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			–1			–2.6	mA
I_{OL}	Low-level output current			12			24	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		SN54ALS257A SN54ALS258A			SN74ALS257A SN74ALS258A			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = –18 mA			–1.5			–1.5	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = –0.4 mA	V_{CC}–2			V_{CC}–2			V
		V_{CC} = 4.5 V	I_{OH} = –1 mA	2.4	3.3					
			I_{OH} = –2.6 mA				2.4	3.2		
V_{OH}		V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
I_{OZH}		V_{CC} = 5.5 V,	V_O = 2.7 V			20			20	µA
I_{OZL}		V_{CC} = 5.5 V,	V_O = 0.4 V			–20			–20	µA
I_I		V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
I_{IH}		V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
I_{IL}		V_{CC} = 5.5 V,	V_I = 0.4 V			–0.1			–0.1	mA
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	–20		–112	–30		–112	mA
I_{CC}	SN54ALS257A, SN74ALS257A	V_{CC} = 5.5 V	Outputs high		3	8		3	6	mA
			Outputs low		8	12		8	12	
			Outputs disabled		9	14		9	14	
	SN54ALS258A, SN74ALS258A	V_{CC} = 5.5 V	Outputs high		2.5	5		2.5	4	
			Outputs low		7	11		7	11	
			Outputs disabled		8	13		8	13	

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ 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, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX§				UNIT
			SN54ALS257A		SN74ALS257A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	Any Y	2	12	2	10	ns
t_{PHL}			2	14	2	12	
t_{PLH}	$\overline{A}$/B	Any Y	4	21	6	18	ns
t_{PHL}			6	25	6	22	
t_{PZH}	$\overline{OE}$	Any Y	3	20	4	16	ns
t_{PZL}			4	22	5	18	
t_{PHZ}	$\overline{OE}$	Any Y	2	12	2	10	ns
t_{PLZ}			2	35	4	15	

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

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			SN54ALS258A		SN74ALS258A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	Any Y	1	12	2	8	ns
t_{PHL}			2	9	2	7	
t_{PLH}	$\overline{A}$/B	Any Y	4	28	5	25	ns
t_{PHL}			5	25	6	20	
t_{PZH}	$\overline{OE}$	Any Y	3	20	4	18	ns
t_{PZL}			5	21	5	18	
t_{PHZ}	$\overline{OE}$	Any Y	2	12	2	10	ns
t_{PLZ}			3	37	4	18	

† For conditions shown 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_{CC} . . . . . 7 V
Input voltage, V_I . . . . . 7 V
Voltage applied to a disabled 3-state output . . . . . 5.5 V
Maximum power dissipation at T_A = 55°C (in still air) (see Note 1): D package . . . . . 1.3 W
N package . . . . . 1.1 W
Operating free-air temperature range, T_A: SN74AS257, SN74AS258 . . . . . 0°C to 70°C
Storage temperature range, T_{stg} . . . . . –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.

NOTE 1: The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions

		SN74AS257 SN74AS258			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			48	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		SN74AS257 SN74AS258			UNIT
				MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = –18 mA			–1.2	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = –2 mA	V_{CC}–2			V
		V_{CC} = 4.5 V,	I_{OH} = –15 mA	2.4	3.2		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.35	0.5	V
I_{OZH}		V_{CC} = 5.5 V,	V_O = 2.7 V			50	µA
I_{OZL}		V_{CC} = 5.5 V,	V_O = 0.4 V			–50	µA
I_I	A, B, or $\overline{OE}$	V_{CC} = 5.5 V,	V_I = 7 V			0.1	mA
	$\overline{A}$/B					0.2	
I_{IH}	A, B, or $\overline{OE}$	V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
	$\overline{A}$/B					40	
I_{IL}	A, B, or $\overline{OE}$	V_{CC} = 5.5 V,	V_I = 0.4 V			–0.5	mA
	$\overline{A}$/B					–1	
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	–30		–112	mA
I_{CC}	SN74AS257	V_{CC} = 5.5 V	Outputs high		12.1	19.7	mA
			Outputs low		19	30.6	
			Outputs disabled		19.7	31.9	
	SN74AS258	V_{CC} = 5.5 V	Outputs high		8.4	13.5	
			Outputs low		15.2	24.6	
			Outputs disabled		15.5	25.2	

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ 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)

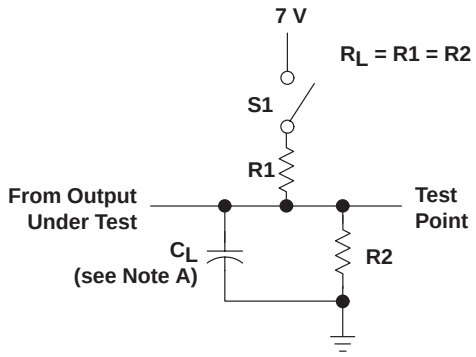
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†		UNIT
			SN74AS257		
			MIN	MAX	
t_{PLH}	A or B	Any Y	1	5.5	ns
t_{PHL}			1	6	
t_{PLH}	$\overline{A}$/B	Any Y	2	11	ns
t_{PHL}			2	10	
t_{PZH}	$\overline{OE}$	Any Y	2	7.5	ns
t_{PZL}			2	9.5	
t_{PHZ}	$\overline{OE}$	Any Y	1.5	6.5	ns
t_{PLZ}			2	7	

switching characteristics (see Figure 1)

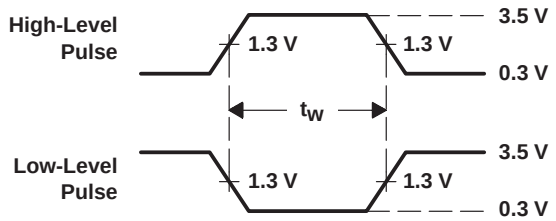
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†		UNIT
			SN74AS258		
			MIN	MAX	
t_{PLH}	A or B	Any Y	1	5	ns
t_{PHL}			1	4	
t_{PLH}	$\overline{A}$/B	Any Y	2	9.5	ns
t_{PHL}			2	10	
t_{PZH}	$\overline{OE}$	Any Y	2	8	ns
t_{PZL}			2	10	
t_{PHZ}	$\overline{OE}$	Any Y	1.5	6	ns
t_{PLZ}			2	6.5	

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

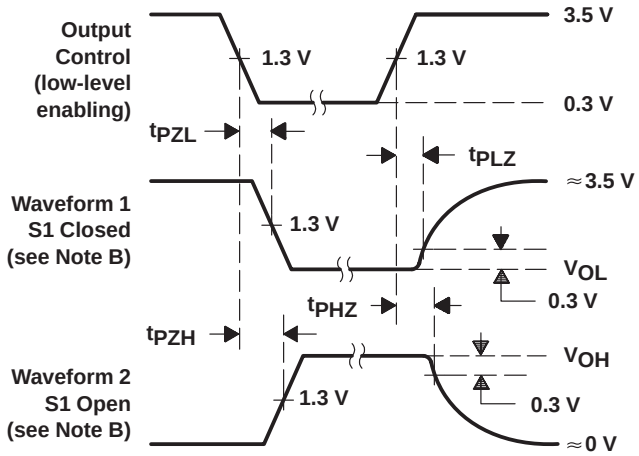
PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



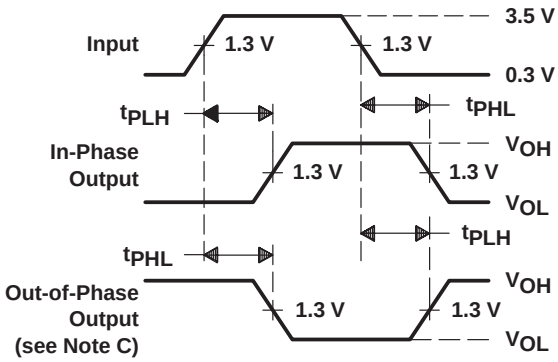
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

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 ≤ 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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