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TYPES SN54LS257A, SN54LS258A, SN54S257, SN54S258, SN74LS257A, SN74LS258A, SN74S257, SN74S258 QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

BULLETIN NO. DL-S 7711734, OCTOBER 1976—REVISED AUGUST 1977

- Three-State Outputs Interface Directly with System Bus
- 'LS257A and 'LS258A Offer Three Times the Sink-Current Capability of the Original 'LS257 and 'LS258
- Same Pin Assignments as SN54LS157, SN74LS157, SN54S157, SN74S157, and SN54LS158, SN74LS158, SN54S158, SN74S158
- Provides Bus Interface from Multiple Sources in High-Performance Systems

	AVERAGE PROPAGATION DELAY FROM DATA INPUT	TYPICAL POWER DISSIPATION [◊]
'LS257A	12 ns	60 mW
'LS258A	12 ns	60 mW
'S257	4.8 ns	320 mW
'S258	4 ns	280 mW

[◊]Off state (worst case)

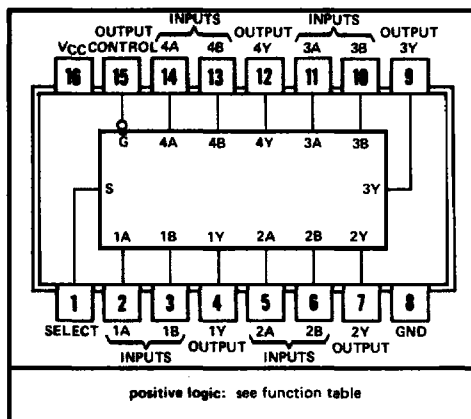
description

These Schottky-clamped high-performance multiplexers feature three-state outputs that can interface directly with and drive data lines of bus-organized systems. With all but one of the common outputs disabled (at a high-impedance state) the low impedance of the single enabled output will drive the bus line to a high or low logic level. To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output-enable circuitry is designed such that the output disable times are shorter than the output enable times.

This three-state output feature means that n-bit (paralleled) data selectors with up to 258 sources can be implemented for data buses. It also permits the use of standard TTL registers for data retention throughout the system.

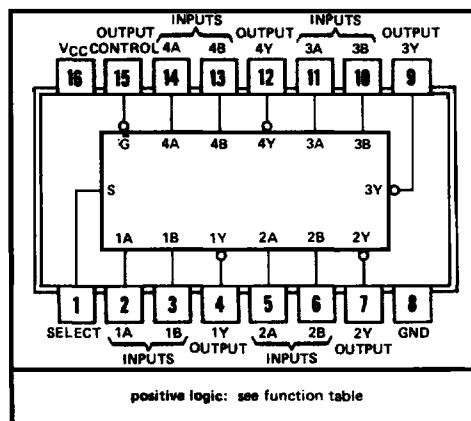
Series 54LS and 54S are characterized for operation over the full military temperature range of -55°C to 125°C; Series 74LS and 74S are characterized for operation from 0°C to 70°C.

SN54LS257A, SN54S257 . . . J OR W PACKAGE
SN74LS257A, SN74S257 . . . J OR N PACKAGE
(TOP VIEW)



positive logic: see function table

SN54LS258A, SN54S258 . . . J OR W PACKAGE
SN74LS258A, SN74S258 . . . J OR N PACKAGE
(TOP VIEW)



positive logic: see function table

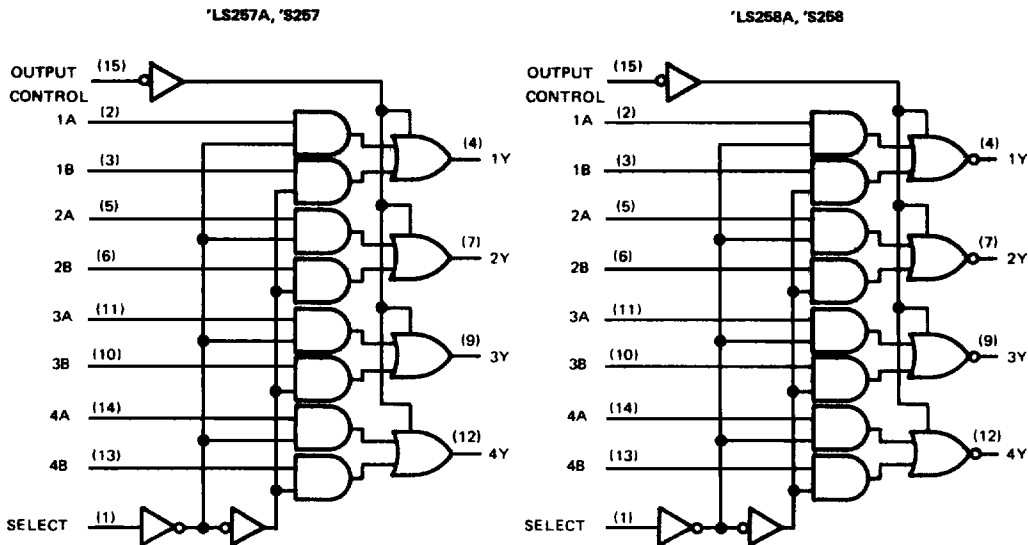
FUNCTION TABLE

OUTPUT CONTROL	INPUTS		OUTPUT Y		
	SELECT	A	B	'LS257A 'S257	'LS258A 'S258
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

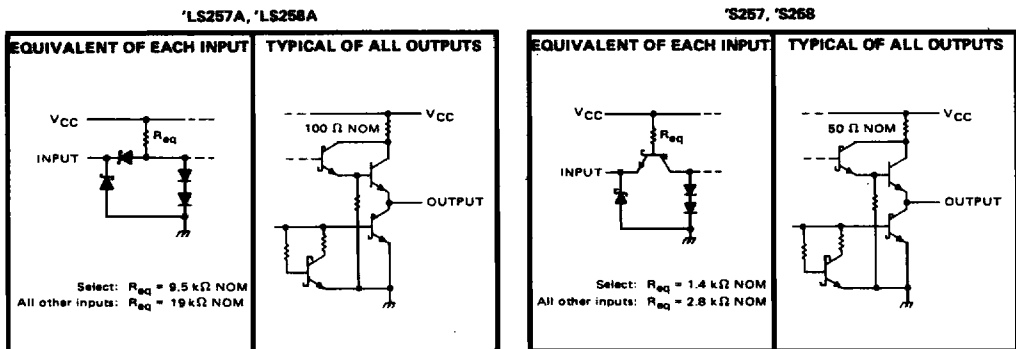
H = high level, L = low level, X = irrelevant, Z = high impedance (off)

TYPES SN54LS257A, SN54LS258A, SN54S257, SN54S258, SN74LS257A, SN74LS258A, SN74S257, SN74S258 QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

functional block diagrams



schematics of inputs and outputs



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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: 'LS257A, 'LS258A Circuits	7 V
'S257, 'S258 Circuits	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS', SN54S' Circuits	-55°C to 125°C
SN74LS', SN74S' Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

TYPES SN54LS257A, SN54LS258A, SN74LS257A, SN74LS258A QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

REVISED AUGUST 1977

recommended operating conditions

	SN54LS*			SN74LS*			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-1			-2.6	mA
Low-level output current, I_{OL}			12			24	mA
Operating free-air temperature, T_A	-55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS†	SN54LS*			SN74LS*			UNIT	
			MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{IH}	High-level input voltage		2			2			V	
V_{IL}	Low-level input voltage				0.7			0.8	V	
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN.}$, $I_I = -18 \text{ mA}$			-1.5			-1.5	V	
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = V_{IL \text{ max}}$, $I_{OH} = \text{MAX}$	2.4	3.4		2.4	3.1		V	
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 12 \text{ mA}$		0.25	0.4	0.25	0.4	V	
			$I_{OL} = 24 \text{ mA}$				0.35	0.5		
I_{OZH}	Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX.}$, $V_{IH} = 2 \text{ V}$, $V_O = 2.7 \text{ V}$			20			20	µA	
I_{OZL}	Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX.}$, $V_{IH} = 2 \text{ V}$, $V_O = 0.4 \text{ V}$			-20			-20	µA	
I_I	Input current at maximum input voltage	S input	$V_{CC} = \text{MAX.}$, $V_I = 7 \text{ V}$		0.2		0.2		mA	
		Any other								0.1
I_{IH}	High-level input current	S input	$V_{CC} = \text{MAX.}$, $V_I = 2.7 \text{ V}$		40		40		µA	
		Any other								20
I_{IL}	Low-level input current	S input	$V_{CC} = \text{MAX.}$, $V_I = 0.4 \text{ V}$		-0.8		-0.8		mA	
		Any other								-0.4
I_{OS}	Short-circuit output current§	$V_{CC} = \text{MAX}$	-30	-130	-30	-130			mA	
I_{CC}	Supply current	All outputs high	$V_{CC} = \text{MAX.}$, See Note 2		6.2		10		mA	
		All outputs low								
		All outputs off			12		19			
		All outputs high			4.		7			
		All outputs low			8.8		14			
		All outputs off			12		19			

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

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

§Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTE 2: I_{CC} is measured with all outputs open and all possible inputs grounded while achieving the stated output conditions.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 667 \Omega$

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS257A			'LS258A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Data	Any	$C_L = 45 \text{ pF}$, See Note 3	12	18		12	18	ns	
t_{PHL}				12	18		12	18		
t_{PLH}	Select	Any		14	21		14	21		
t_{PHL}				14	21		14	21		
t_{PZH}	Output	Any		20	30		20	30		ns
t_{PZL}				20	30		20	30		
t_{PHZ}	Output	Any	$C_L = 5 \text{ pF}$, See Note 3	18	30		18	30	ns	
t_{PLZ}				Control	Any	16	25			16

¶ t_{PLH} = propagation delay time, low-to-high-level output

¶ t_{PHL} = propagation delay time, high-to-low-level output

¶ t_{PZH} = output enable time to high level

¶ t_{PZL} = output enable time to low level

¶ t_{PHZ} = output disable time from high level

¶ t_{PLZ} = output disable time from low level

NOTE 3: Load circuit and waveforms are shown on page 3-11.

DESIGN GOAL

This page provides tentative information on a product in the developmental stage. Texas Instruments reserves the right to change or discontinue this product without notice.

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TYPES SN54S257, SN54S258, SN74S257, SN74S258

QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

REVISED AUGUST 1977

recommended operating conditions

	SN54S'			SN74S'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-2			-6.5	mA
Low-level output current, I_{OL}			20			20	mA
Operating free-air temperature, T_A	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†	'S257			'S258			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage				0.8			0.8	V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.2			-1.2	V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -1 \text{ mA}$	SN74S'	2.7		2.7		V	
		SN54S'	2.4	3.4	2.4	3.4		
	$V_{IL} = 0.8 \text{ V}, I_{OH} = \text{MAX}$	SN74S'	2.4		2.4			
		SN54S'	2.4	3.2	2.4	3.2		
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 20 \text{ mA}$			0.5			0.5	V
I_{OZH} Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V}, V_O = 2.4 \text{ V}$			0.5			0.5	μA
I_{OZL} Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V}, V_O = 0.5 \text{ V}$			-50			-50	μA
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
I_{IH} High-level input current	S input			100			100	μA
	Any other			50			50	
I_{IL} Low-level input current	S input			-4			-4	mA
	Any other			-2			-2	
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-40		-100	-40		-100	mA
I_{CC} Supply current	All outputs high		44	68		36	56	mA
	All outputs low		60	93		52	81	
	All outputs off		64	99		58	87	

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

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

§Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTE 2: I_{CC} is measured with all outputs open and all possible inputs grounded while achieving the stated output conditions.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}, R_L = 280 \Omega$

PARAMETER †	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'S257			'S258			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Data	Any	$C_L = 15 \text{ pF},$ See Note 4	5	7.5		4	6	ns	
t_{PHL}				4.5	6.5		4	6		
t_{PLH}	Select	Any		8.5	15		8	12	ns	
t_{PHL}				8.5	15		7.5	12		
t_{PZH}	Output Control	Any		13	19.5		13	19.5	ns	
t_{PZL}				14	21		14	21		
t_{PHZ}	Output Control	Any	$C_L = 5 \text{ pF},$ See Note 4	5.5	8.5		5.5	8.5	ns	
t_{PLZ}				9	14		9	14		

† t_{PLH} ≡ propagation delay time, low-to-high-level output

t_{PHL} ≡ propagation delay time, high-to-low-level output

t_{PZH} ≡ output enable time to high level

NOTE 4: Load circuit and waveforms are shown on pages 3-10.

t_{PZL} ≡ output enable time to low level

t_{PHZ} ≡ output disable time from high level

t_{PLZ} ≡ output disable time from low level