- **Three-State Outputs Interface Directly with System Bus**

- **'LS257B and 'LS258B 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[†]
'LS257B	9 ns	55 mW
'LS258B	9 ns	55 mW
'S257	4.8 ns	320 mW
'S258	4 ns	280 mW

[†]Off state (worst case)

description

These devices are designed to multiplex signals from four-bit data sources to four-output data lines in bus-organized systems. The 3-state outputs will not load the data lines when the output control pin ($\overline{G}$) is at a high-logic level.

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 $70°C$.

SN54LS257B, SN54S257,
SN54LS258B, SN54S258 . . . J OR W PACKAGE
SN74LS257B, SN74S257,
SN74LS258B, SN74S258 . . . D OR N PACKAGE
(TOP VIEW)

SN54LS257B, SN54S257,
SN54LS258B, SN54S258 . . . FK PACKAGE
(TOP VIEW)

NC–No internal connection.

FUNCTION TABLE

INPUTS				OUTPUT Y	
OUTPUT CONTROL	SELECT	A	B	'LS257B 'S257	'LS258B '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)

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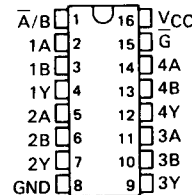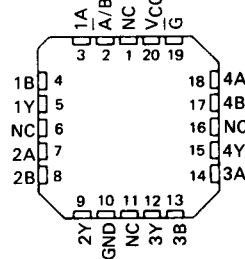INSTRUMENTS
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SN54LS257B, SN54LS258B, SN54S257, SN54S258, SN74LS257B, SN74LS258B, SN74S257, SN74S258
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

logic diagrams (positive logic)

'LS257B, 'S257   'LS258B, 'S258
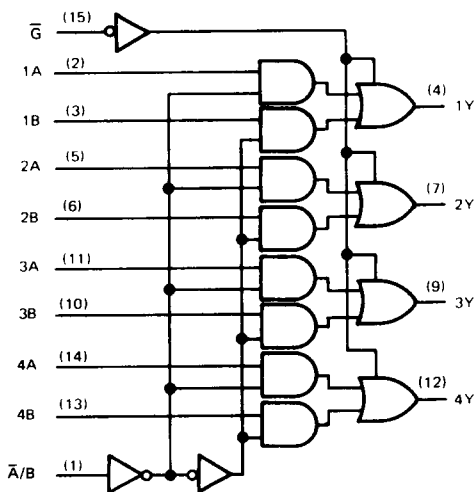
logic symbols†

'LS257B   'LS258B

'S257   'S258

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

schematics of inputs and outputs

'LS257B, 'LS258B

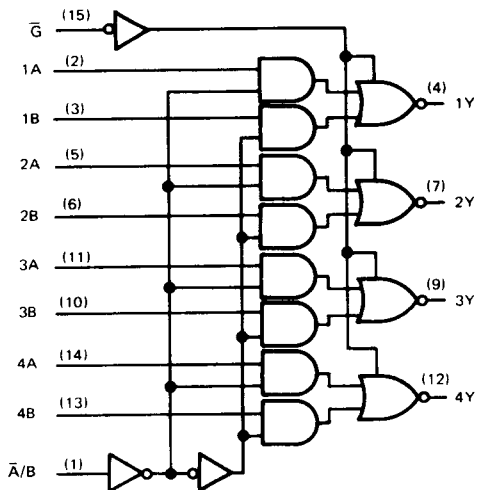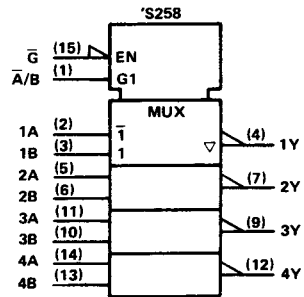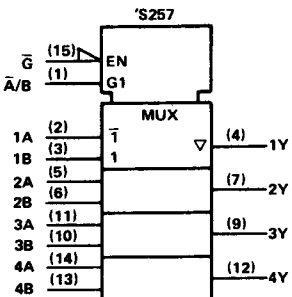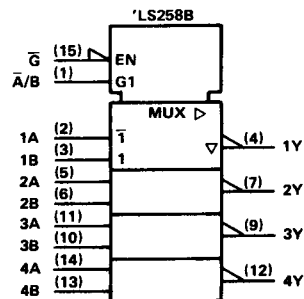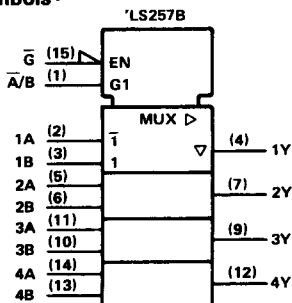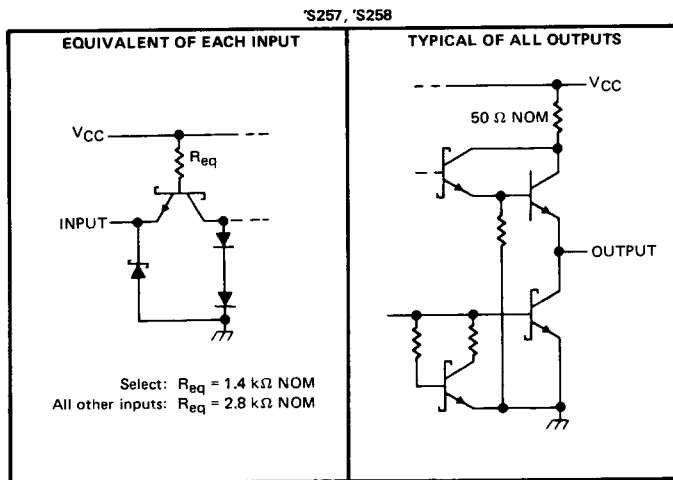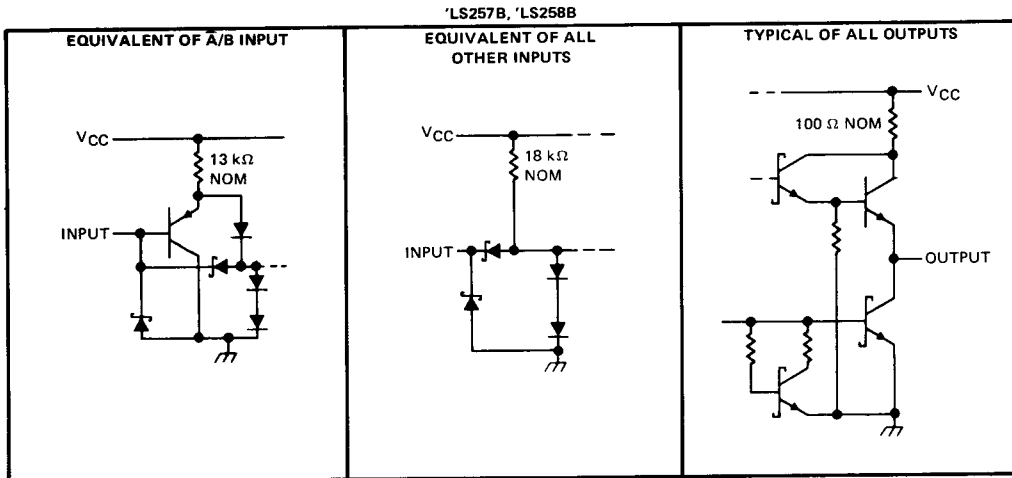| EQUIVALENT OF A/B INPUT	EQUIVALENT OF ALL OTHER INPUTS	TYPICAL OF ALL OUTPUTS

'S257, 'S258

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS

Select: R_{eq} = 1.4 kΩ NOM
All other inputs: R_{eq} = 2.8 kΩ NOM

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

Supply voltage, V_{CC} (see Note 1) . . . . 7 V
Input voltage: 'LS257B, 'LS258B 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.

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SN54LS257B, SN54LS258B, SN74LS257B, SN74LS258B
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

recommended operating conditions

		SN54LS'			SN74LS'			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	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[†]		SN54LS'			SN74LS'			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	$V_{CC} = MIN,$ $I_I = −18$ mA				−1.5			−1.5	V
V_{OH}	$V_{CC} = MIN,$ $V_{IH} = 2$ V, $V_{IL} = MAX,$ $I_{OH} = MAX$		2.4	3.4		2.4	3.1		V
V_{OL}	$V_{CC} = MIN,$ $V_{IH} = 2$ V, $V_{IL} = MAX,$	$I_{OL} = 12$ mA		0.25	0.4		0.25	0.4	V
		$I_{OL} = 24$ mA					0.35	0.5	
I_{OZH}	$V_{CC} = MAX,$ $V_{IH} = 2$ V, $V_O = 2.7$ V				20			20	μA
I_{OZL}	$V_{CC} = MAX,$ $V_{IH} = 2$ V, $V_O = 0.4$ V				−20			−20	μA
I_I	$V_{CC} = MAX,$ $V_I = 7$ V				0.1			0.1	mA
I_{IH}	$V_{CC} = MAX,$ $V_I = 2.7$ V				20			20	μA
I_{IL}	$V_{CC} = MAX,$ $V_I = 0.4$ V				−0.4			−0.4	mA
I_{OS} §	$V_{CC} = MAX,$		−30		−130	−30		−130	mA
I_{CC}	All outputs high	'LS257B		8	12		8	12	mA
	All outputs low			12	18		12	18	
	All outputs off			13	19		13	19	
	All outputs high	$V_{CC} = MAX,$ See Note 2	'LS258B		6	9		6	9	
	All outputs low			10	15		10	15	
	All outputs off			11	16		11	16	

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡]All typical values are at $V_{CC} = 5$ V, $T_A = 25°C.$
§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, $V_{CC} = 5$ V, $T_A = 25°C,$ $R_L = 667$ Ω

PARAMETER[¶]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS257B			'LS258B			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Data	Any			8	13		7	12	ns
t_{PHL}					10	15		11	17	
t_{PLH}	Select	Any	$C_L = 45$ pF, See Note 3		16	21		14	21	ns
t_{PHL}					17	24		19	24	
t_{PZH}	Output Control	Any			15	30		15	30	ns
t_{PZL}					19	30		20	30	
t_{PHZ}	Output Control	Any	$C_L = 5$ pF, See Note 3		18	30		18	30	ns
t_{PLZ}					16	25		16	25	

[¶]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 circuits and voltage waveforms are shown in Section 1.

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recommended operating conditions

	SN54S' MIN	NOM	MAX	SN74S' MIN	NOM	MAX	UNIT
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 MIN	TYP[‡]	MAX	'S258 MIN	TYP[‡]	MAX	UNIT
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} = MIN, I_I = −18 mA				−1.2			−1.2	V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OH} = −1 mA	SN74S'	2.7			2.7			V
		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OH} = MAX	SN54S'	2.4	3.4		2.4	3.4		
			SN74S'	2.4	3.2		2.4	3.2		
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OL} = 20 mA				0.5			0.5	V
I_{OZH}	Off-state output current, high-level voltage applied	V_{CC} = MAX, V_{IH} = 2 V, V_O = 2.4 V				50			50	µA
I_{OZL}	Off-state output current, low-level voltage applied	V_{CC} = MAX, V_{IH} = 2 V, V_O = 0.5 V				−50			−50	µA
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 5.5 V				1			1	mA
I_{IH}	High-level input current	S input	V_{CC} = MAX, V_I = 2.7 V			100			100	µA
		Any other				50			50	
I_{IL}	Low-level input current	S input	V_{CC} = MAX, V_I = 0.5 V			−4			−4	mA
		Any other				−2			−2	
I_{OS}	Short-circuit output current[§]	V_{CC} = MAX		−40		−100	−40		−100	mA
I_{CC}	Supply current	All outputs high	V_{CC} = MAX, See Note 2		44	68		36	56	mA
		All outputs low			60	93		52	81	
		All outputs off			64	99		56	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 V, T_A = 25°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 V, T_A = 25°C, R_L = 280 Ω

PARAMETER[¶]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'S257 MIN	TYP	MAX	'S258 MIN	TYP	MAX	UNIT
t_{PLH}	Data	Any			5	7.5		4	6	ns
t_{PHL}					4.5	6.5		4	6	
t_{PLH}	Select	Any	C_L = 15 pF, See Note 3		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 pF, See Note 3		5.5	8.5		5.5	8.5	ns
t_{PLZ}					9	14		9	14	

[¶]f_{max} = Maximum clock frequency
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 circuits and voltage waveforms are shown in Section 1.

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