

SN54251, SN54LS251 SN54S251,
SN74251, SN74LS251, (TIM9905), SN74S251
DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

- Three-State Versions of '151, 'LS151, 'S151
- Three-State Outputs Interface Directly with System Bus
- Perform Parallel-to-Serial Conversion
- Permit Multiplexing from N-lines to One Line
- Complementary Outputs Provide True and Inverted Data
- Fully Compatible with Most TTL Circuits

TYPE	MAX NO. OF COMMON OUTPUTS	TYPICAL AVG PROP	TYPICAL
		DELAY TIME (D TO Y)	POWER DISSIPATION
SN54251	49	17 ns	250 mW
SN74251	129	17 ns	250 mW
SN54LS251	49	17 ns	35 mW
SN74LS251	129	17 ns	35 mW
SN54S251	39	8 ns	275 mW
SN74S251	129	8 ns	275 mW

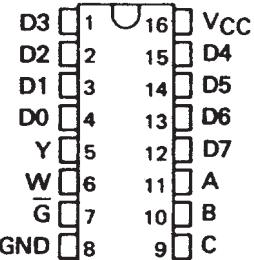
description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select one-of-eight data sources and feature a strobe-controlled three-state output. The strobe must be at a low logic level to enable these devices. The three-state outputs permit a number of outputs to be connected to a common bus. When the strobe input is high, both outputs are in a high-impedance state in which both the upper and lower transistors of each totem-pole output are off, and the output neither drives nor loads the bus significantly. When the strobe is low, the outputs are activated and operate as standard TTL totem-pole outputs.

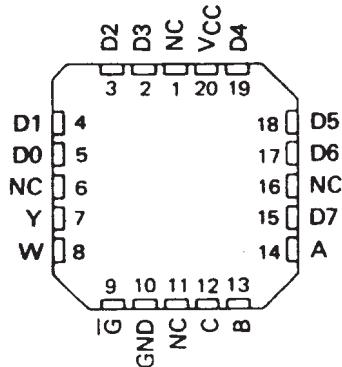
To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output control circuitry is designed so that the average output disable time is shorter than the average output enable time. The SN54251 and SN74251 have output clamp diodes to attenuate reflections on the bus line.

SN54251, SN54LS251, SN54S251 . . . J OR W PACKAGE
SN74251 . . . N PACKAGE
SN74LS251, SN74S251 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS251, SN54S251 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

INPUTS				OUTPUTS	
SELECT	ENABLE	\bar{G}		Y	W
C	B	A			
X	X	X	H	Z	Z
L	L	L	L	D0	$\bar{D}0$
L	L	H	L	D1	$\bar{D}1$
L	H	L	L	D2	$\bar{D}2$
L	H	H	L	D3	$\bar{D}3$
H	L	L	L	D4	$\bar{D}4$
H	L	H	L	D5	$\bar{D}5$
H	H	L	L	D6	$\bar{D}6$
H	H	H	L	D7	$\bar{D}7$

H = high logic level, L = low logic level

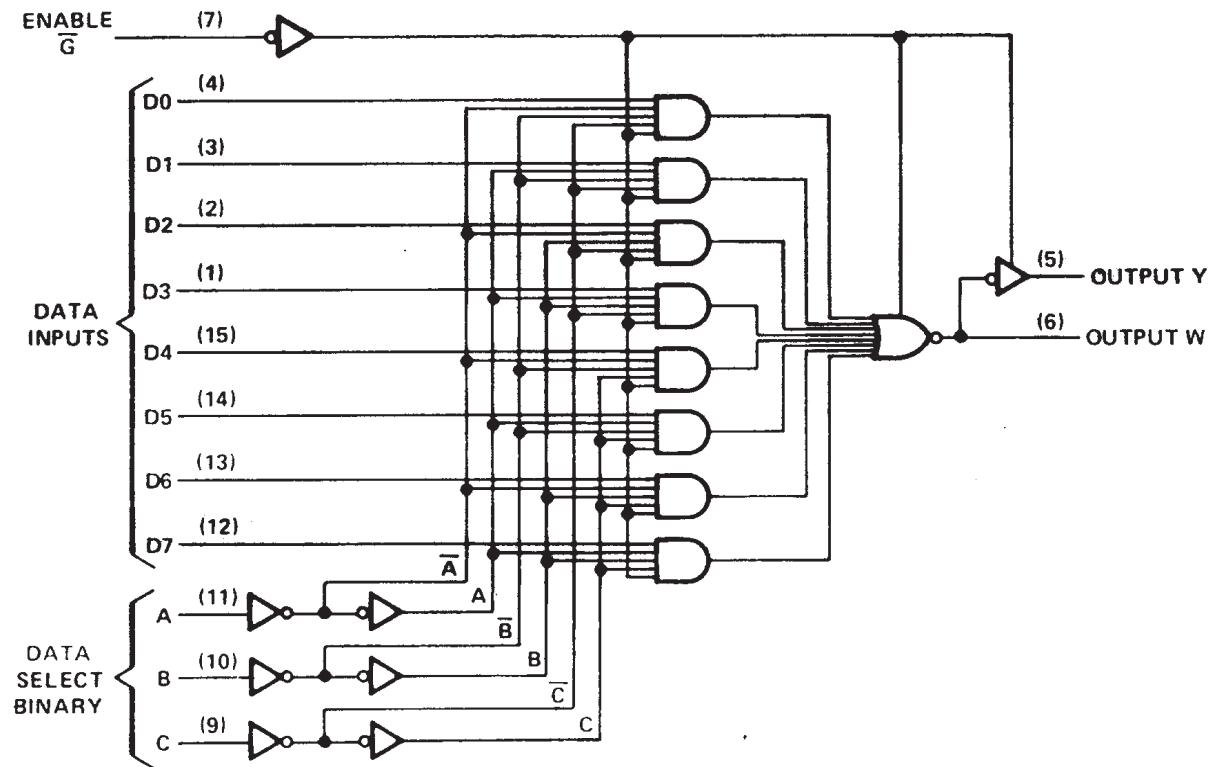
X = irrelevant, Z = high impedance (off)

D0, D1 . . . D7 = the level of the respective D input

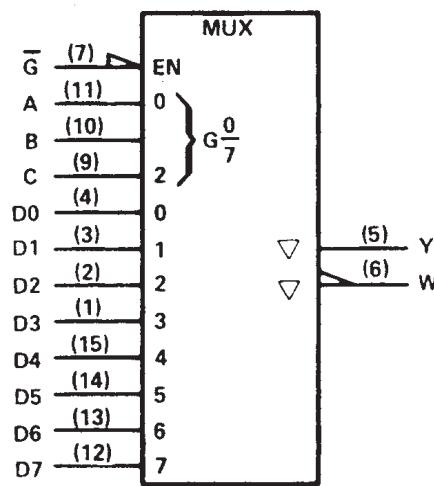
**SN54251, SN54LS251 SN54S251,
SN74251, SN74LS251, (TIM9905), SN74S251
DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS**

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

logic diagram (positive logic)



logic symbol[†]



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

SN54251 SN74251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

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

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

recommended operating conditions

	SN54251			SN74251			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			-5.2	mA
Low-level output current, I_{OL}			16			16	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 [†]		MIN	TYP [‡]	MAX	UNIT	
V _{IH}	High-level input voltage			2		V		
V _{IL}	Low-level input voltage			0.8		V		
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = -12 mA		-1.5		V		
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = MAX		2.4	3.2	V		
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 16 mA		0.2		0.4	V	
I _{OZ}	Off-state (high-impedance-state) output current	V _{CC} = MAX,		V _O = 2.4 V	40		μ A	
		V _{IH} = 2 V		V _O = 0.4 V	-40			
V _O	Output clamp voltage	V _{CC} = MAX,		I _O = -12 mA	-1.5		V	
		V _{IH} = 4.5 V		I _O = 12 mA	V _{CC} +1.5			
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 5.5 V		1		mA		
I _{IH}	High-level input current	V _{CC} = MAX, V _I = 2.4 V		40		μ A		
I _{IL}	Low-level input current	V _{CC} = MAX, V _I = 0.4 V		-1.6		mA		
I _{OS}	Short-circuit output current [§]	V _{CC} = MAX		-18	-55	mA		
I _{CC}	Supply current	V _{CC} = MAX, All inputs at 4.5 V, All outputs open		38		62	mA	

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

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

§ Not more than one output should be shorted at a time.

SN54251 SN74251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

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

PARAMETER [†]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A, B, or C (4 levels)	Y	$C_L = 50 \text{ pF}$, $R_L = 400 \Omega$, See Note 2	29	45		ns
t _{PHL}				28	45		
t _{PLH}				20	33		
t _{PHL}				21	33		
t _{PLH}				17	28		
t _{PHL}				18	28		
t _{PLH}				10	15		
t _{PHL}				9	15		
t _{PZH}				17	27		
t _{PZL}				26	40		
t _{PZH}	G	Y	$C_L = 5 \text{ pF}$, $R_L = 400 \Omega$, See Note 2	17	27		ns
t _{PZL}				24	40		
t _{PHZ}				5	8		ns
t _{PLZ}				15	23		
t _{PHZ}	G	W	$C_L = 5 \text{ pF}$, $R_L = 400 \Omega$, See Note 2	5	8		ns
t _{PLZ}				15	23		

[†]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

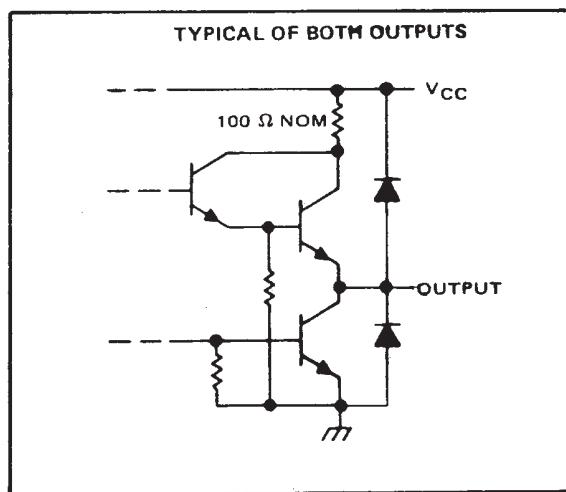
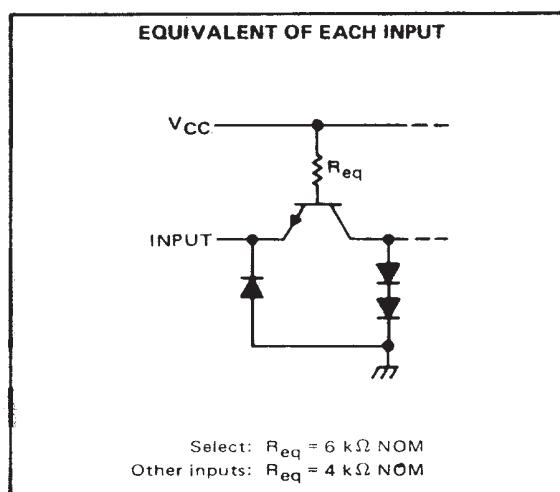
t_{PZL} = Output enable time to low level

t_{PHZ} = Output disable time from high level

t_{PLZ} = Output disable time from low level

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



SN54LS251 SN74LS251, DATA SELECTORS/MUXES WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

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

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

recommended operating conditions

			SN54LS251			SN74LS251			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				4			8	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 [†]			SN54LS251			SN74LS251			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} = 4 mA	0.25	0.4	0.25	0.4		V
				I _{OL} = 8 mA			0.35	0.5		
I _{OZ}	V _{CC} = MAX, V _{IH} = 2 V			V _O = 2.7 V	20		20			μA
				V _O = 0.4 V		-20			-20	
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}	Enable G All other	V _{CC} = MAX, V _I = 0.4			-0.2			-0.2		
		-0.4			-0.4			mA		
I _{OS\$}	V _{CC} = MAX			-30	-130		-30	-130		mA
I _{CC}	V _{CC} = MAX, See Note 3			Condition A	6.1	10	6.1	10		mA
				Condition B	7.1	12	7.1	12		

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

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

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

NOTE 3: Line-to-ground short circuit tests are measured with the outputs open and all data and select inputs at 4.5 V under the following conditions.

NOTE 3: I_{CC} is measured with the outputs open and all data and select inputs at 4.5 V under the following conditions:

A. Enable grounded.

B. Strobe at 4.5 V.



SN54LS251 SN74LS251, (TIM9905), DATA SELECTORS/MUXES WITH 3-STATE OUTPUTS

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

PARAMETER [†]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A, B, or C (4 levels)	Y	$C_L = 15 \text{ pF}$, $R_L = 2 \text{ k}\Omega$, See Note 2	29	45		ns
t_{PHL}				28	45		
t_{PLH}				20	33		
t_{PHL}				21	33		
t_{PLH}				17	28		
t_{PHL}				18	28		
t_{PLH}				10	15		
t_{PHL}				9	15		
t_{PZH}				30	45		
t_{PZL}				26	40		
t_{PZH}				17	27		
t_{PZL}				24	40		
t_{PHZ}	\bar{G}	Y	$C_L = 5 \text{ pF}$, $R_L = 2 \text{ k}\Omega$, See Note 2	30	45		
t_{PLZ}				15	25		
t_{PHZ}				37	55		
t_{PLZ}				15	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

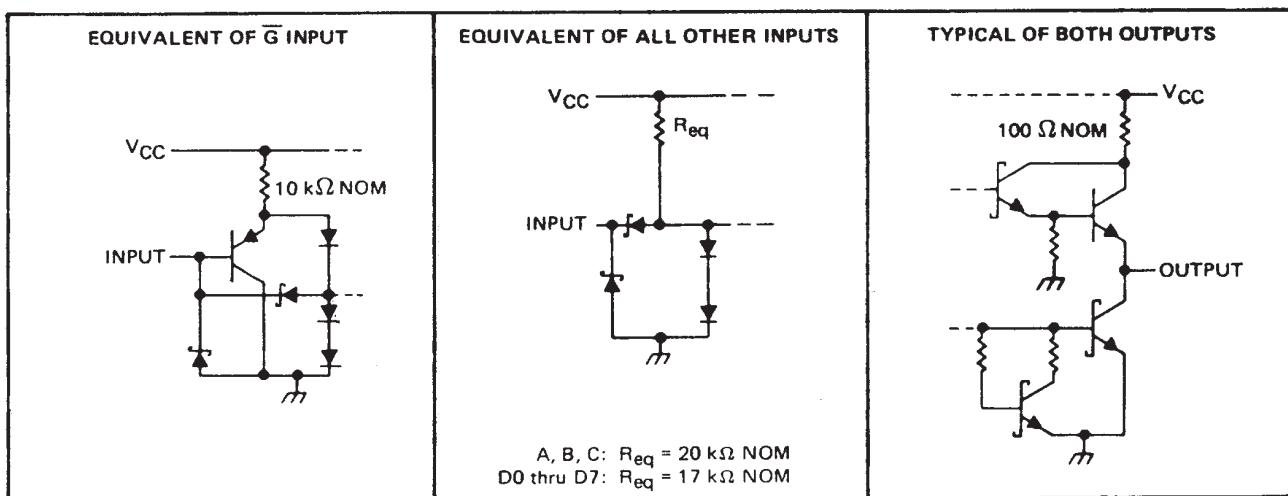
t_{PZL} = Output enable time to low level

t_{PHZ} = Output disable time from high level

t_{PLZ} = Output disable time from low level

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



SN54S251 SN74S251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

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

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

recommended operating conditions

	SN54S251			SN74S251			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 [†]			MIN	TYP [‡]	MAX	UNIT
V _{IH}	High-level input voltage				2			V
V _{IL}	Low-level input voltage						0.8	V
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = -18 mA					-1.2	V
V _{OH}	High-level output voltage	V _{CC} = MIN,	V _{IH} = 2 V,	SN54S'	2.4	3.4		V
		V _{IL} = 0.8 V,	I _{OH} = MAX		SN74S'	2.4	3.2	
V _{OL}	Low-level output voltage	V _{CC} = MIN,	V _{IH} = 2 V,	I _{OL} = 20 mA			0.5	V
		V _{IL} = 0.8 V,	I _{OL} = 20 mA					
I _{OZ}	Off-state (high-impedance-state) output current	V _{CC} = MAX,	V _O = 2.4 V	V _{IH} = 2 V			50	μA
		V _{CC} = MAX,	V _O = 0.5 V				-50	
I _I	Input current at maximum input voltage	V _{CC} = MAX,	V _I = 5.5 V				1	mA
I _{IH}	High-level input current	V _{CC} = MAX,	V _I = 2.7 V				50	μA
I _{IL}	Low-level input current	V _{CC} = MAX,	V _I = 0.5 V				-2	mA
I _{OS}	Short-circuit output current [§]	V _{CC} = MAX			-40		-100	mA
I _{CC}	Supply current	V _{CC} = MAX,	All inputs at 4.5 V,	All outputs open			55	mA
		All outputs open					85	

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

[‡]All typical values are at $V_{CC} = 5$ 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.



SN54S251 SN74S251, DATA SELECTORS/MUXES WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

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

PARAMETER [†]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A, B, or C (4 levels)	Y	$C_L = 15 \text{ pF}$, $R_L = 280 \Omega$, See Note 2	12	18		ns
t_{PHL}	A, B, or C (3 levels)	W		13	19.5		
t_{PLH}		Y		10	15		ns
t_{PHL}	Any D	Y		9	13.5		
t_{PLH}		W		8	12		ns
t_{PHL}	Any D	Y		8	12		
t_{PLH}		W		4.5	7		ns
t_{PHL}	\bar{G}	Y		4.5	7		
t_{PZH}		W		13	19.5		ns
t_{PZL}	\bar{G}	Y		14	21		
t_{PZH}		W		13	19.5		ns
t_{PZL}		Y		14	21		
t_{PHZ}	\bar{G}	Y	$C_L = 5 \text{ pF}$, $R_L = 280 \Omega$, See Note 2	5.5	8.5		ns
t_{PLZ}		W		9	14		
t_{PHZ}	\bar{G}	Y		5.5	8.5		ns
t_{PLZ}		W		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

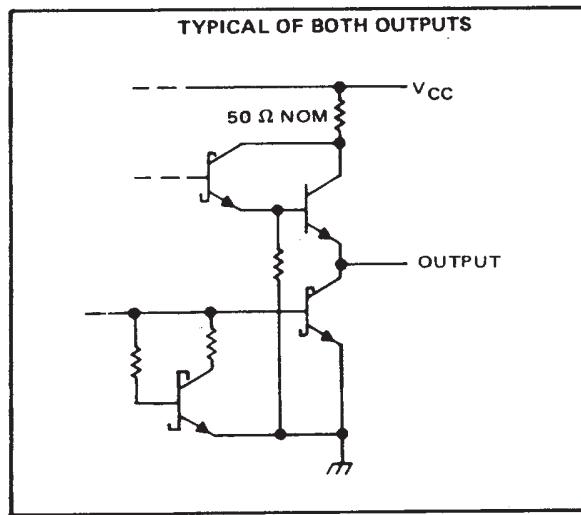
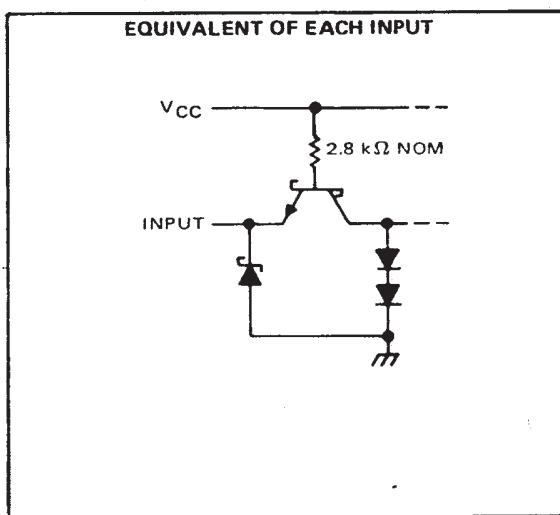
t_{PZL} = Output enable time to low level

t_{PHZ} = Output disable time from high level

t_{PLZ} = Output disable time from low level

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



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SN74LS251, 8-Line To 1-Line Data Selectors/Multiplexers With 3-State Outputs

DEVICE STATUS: ACTIVE

PARAMETER NAME	SN54LS251	SN74LS251
Voltage Nodes (V)	5	5
Vcc range (V)	4.5 to 5.5	4.75 to 5.25
Input Level	TTL	TTL
Output Level	TTL	TTL
Output Drive (mA)		-2.6/8
Output	3S	3S
From	8	8
To	1	1

FEATURES

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- Three-State Versions of '151, 'LS151, 'S151
- Three State Outputs Interface Directly with System Bus
- Perform Parallel-to-Serial Conversion
- Permit Multiplexing from N-Lines to One Line
- Complementary Outputs Provide True and Inverted Data
- Fully Compatible with Most TTL Circuits

DESCRIPTION

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These monolithic data selectors/multiplexers contain full on-chip binary decoding to select one-of-eight data sources and feature a strobe-controlled three-state output. The strobe must be at a low logic level to enable these devices. The three-state outputs permit a number of outputs to be connected to a common bus. When the strobe input is high, both outputs are in a high-impedance state in which both the upper and lower transistors of each totem-pole output are off, and the output neither drives nor loads the bus significantly. When the strobe is low, the outputs are activated and operate as standard TTL totem-pole outputs.

To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output control circuitry is designed so that the average output disable time is shorter than the average output enable time. The SN54251 and SN74251 have output clamp diodes to attenuate reflections on the bus line.

TECHNICAL DOCUMENTS

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DATASHEET

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Full datasheet in Acrobat PDF: [sn74ls251.pdf](#) (312 KB) (Updated: 03/01/1988)

View Application Notes for [Digital Logic](#)

- [Designing With Logic \(Rev. C\)](#) (SDYA009C - Updated: 06/01/1997)
- [Designing with the SN54/74LS123 \(Rev. A\)](#) (SDLA006A - Updated: 03/01/1997)
- [Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits](#) (SZZA026 - Updated: 06/20/2001)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)

RELATED DOCUMENTS

View Related Documentation for [Digital Logic](#)

- [Logic Reference Guide](#) (SCYB004, 1032 KB - Updated: 10/23/2001)
- [Logic Selection Guide Second Half 2002 \(Rev. R\)](#) (SDYU001R, 4274 KB - Updated: 07/19/2002)
- [Military Semiconductors Selection Guide 2002 \(Rev. B\)](#) (SGYC003B, 1648 KB - Updated: 04/22/2002)

PRICING/AVAILABILITY/PKG

DEVICE INFORMATION

ORDERABLE DEVICE	STATUS	PACKAGE TYPE PINS	TEMP (°C)	PRODUCT CONTENT	BUDGETARY PRICING QTY SUS	STD PACK QTY
SN74LS251D	ACTIVE	SOP (D) 16	0 TO 70	View Contents	1KU 0.32	40
SN74LS251DR	ACTIVE	SOP (D) 16	0 TO 70	View Contents	1KU 0.35	2500
SN74LS251N	ACTIVE	PDIP (N) 16	0 TO 70	View Contents	1KU 0.28	25
SN74LS251N3	OBsolete	PDIP (N) 16	0 TO 70	View Contents	1KU	
SN74LS251NSR	ACTIVE	SOP (NS) 16		View Contents	1KU 0.28	2000

TI INVENTORY STATUS
AS OF 3:00 PM GMT, 26 Sep 2002

IN STOCK	IN PROGRESS QTY DATE	LEAD TIME
2720	1114 03 Oct	4 WKS
	>10k 10 Oct	
N/A*	>10k 10 Oct	4 WKS
	1370 15 Oct	
N/A*	2500 24 Sep	4 WKS
	>10k 02 Oct	
	>10k 04 Oct	
N/A*		Not Available
N/A*	>10k 04 Oct	4 WKS

REPORTED DISTRIBUTOR INVENTORY
AS OF 3:00 PM GMT, 26 Sep 2002

DISTRIBUTOR COMPANY REGION	IN STOCK	PURCHASE
Avnet AMERICA	>1k	BUY NOW

Table Data Updated on: 9/26/2002