

# SN54150, SN54151A, SN54LS151, SN54S151, SN74150, SN74151A, SN74LS151, SN74S151 DATA SELECTORS/MULTIPLEXERS

DECEMBER 1972—REVISED MARCH 1988

- '150 Selects One-of-Sixteen Data Sources
- Others Select One-of-Eight Data Sources
- All Perform Parallel-to-Serial Conversion
- All Permit Multiplexing from N Lines to One Line
- Also For Use as Boolean Function Generator
- Input-Clamping Diodes Simplify System Design
- Fully Compatible with Most TTL Circuits

TYPE	TYPICAL AVERAGE	TYPICAL
	PROPAGATION DELAY TIME DATA INPUT TO W OUTPUT	POWER DISSIPATION
'150	13 ns	200 mW
'151A	8 ns	145 mW
'LS151	13 ns	30 mW
'S151	4.5 ns	225 mW

## description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select the desired data source. The '150 selects one-of-sixteen data sources; the '151A, 'LS151, and 'S151 select one-of-eight data sources. The '150, '151A, 'LS151, and 'S151 have a strobe input which must be at a low logic level to enable these devices. A high level at the strobe forces the W output high, and the Y output (as applicable) low.

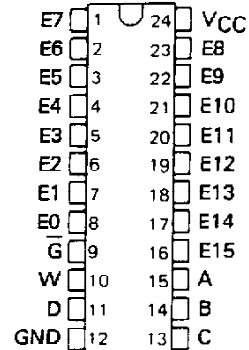
The '150 has only an inverted W output; the '151A, 'LS151, and 'S151 feature complementary W and Y outputs.

The '151A and '152A incorporate address buffers that have symmetrical propagation delay times through the complementary paths. This reduces the possibility of transients occurring at the output(s) due to changes made at the select inputs, even when the '151A outputs are enabled (i.e., strobe low).

### SN54150 . . . J OR W PACKAGE

#### SN74150 . . . N PACKAGE

(TOP VIEW)

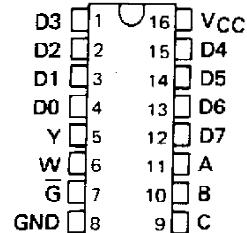


### SN54151A, SN54LS151, SN54S151 . . . J OR W PACKAGE

#### SN74151A . . . N PACKAGE

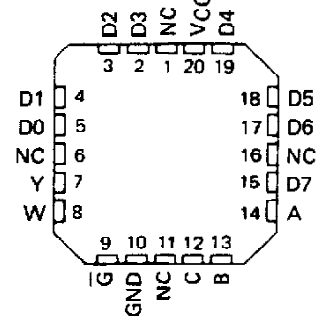
#### SN74LS151, SN74S151 . . . D OR N PACKAGE

(TOP VIEW)



### SN54LS151, SN54S151 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

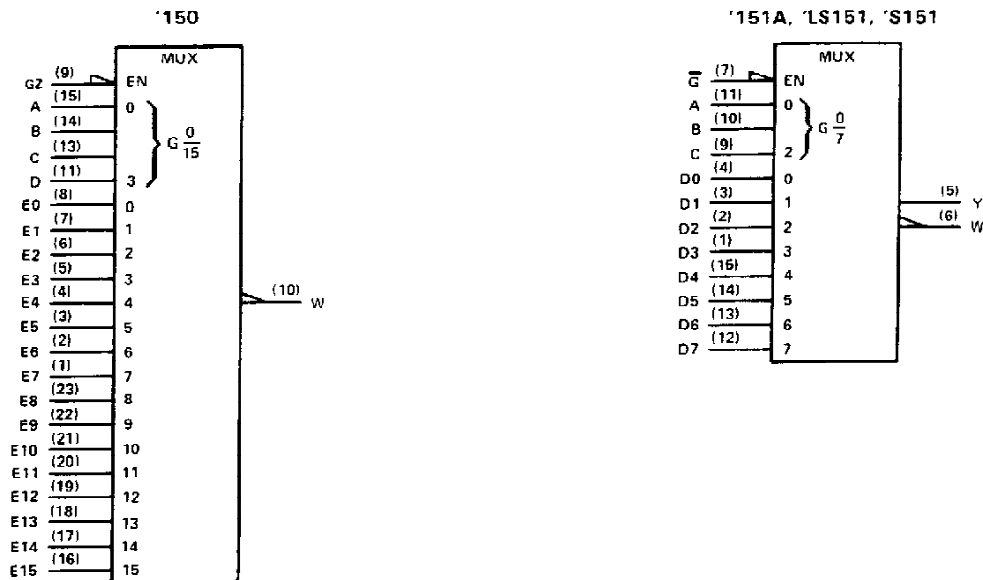
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**SN54150, SN54151A, SN54LS151, SN54S151,  
SN74150, SN74151A, SN74LS151, SN74S151  
DATA SELECTORS/MULTIPLEXERS**

logic symbols†



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

**'150  
FUNCTION TABLE**

INPUTS				STROBE $\bar{G}$	OUTPUT W
D	C	B	A		
X	X	X	X	H	H
L	L	L	L	L	$\bar{E}_0$
L	L	L	H	L	$\bar{E}_1$
L	L	H	L	L	$\bar{E}_2$
L	L	H	H	L	$\bar{E}_3$
L	H	L	L	L	$\bar{E}_4$
L	H	L	H	L	$\bar{E}_5$
L	H	H	L	L	$\bar{E}_6$
L	H	H	H	L	$\bar{E}_7$
H	L	L	L	L	$\bar{E}_8$
H	L	L	H	L	$\bar{E}_9$
H	L	H	L	L	$\bar{E}_{10}$
H	L	H	H	L	$\bar{E}_{11}$
H	H	L	L	L	$\bar{E}_{12}$
H	H	L	H	L	$\bar{E}_{13}$
H	H	H	L	L	$\bar{E}_{14}$
H	H	H	H	L	$\bar{E}_{15}$

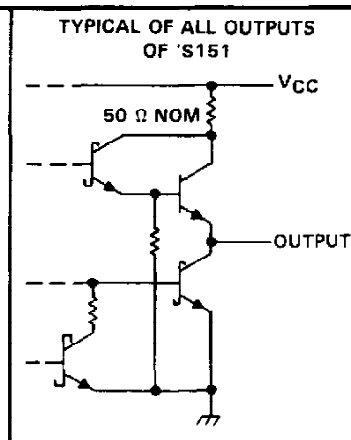
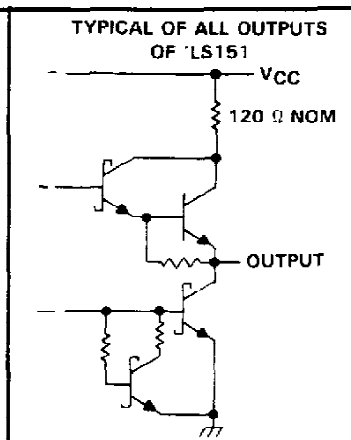
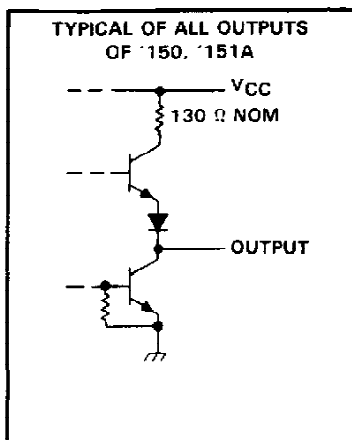
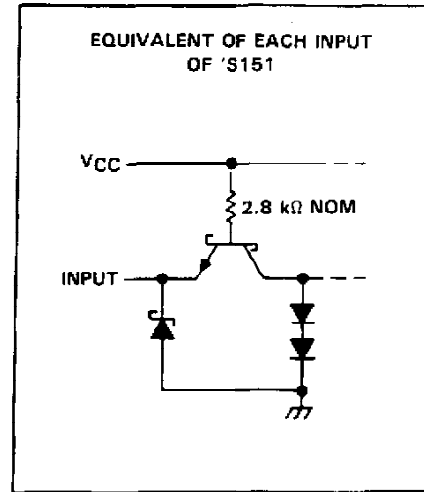
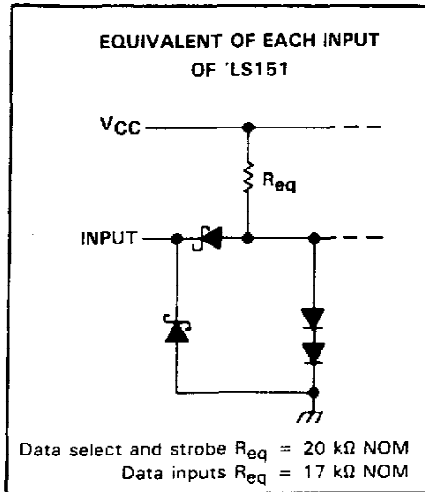
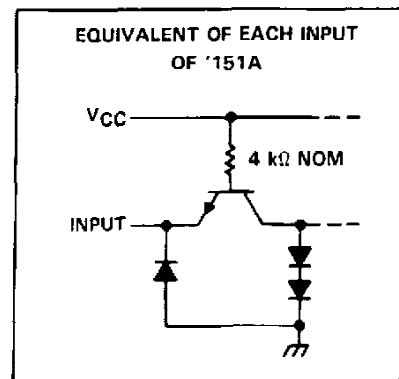
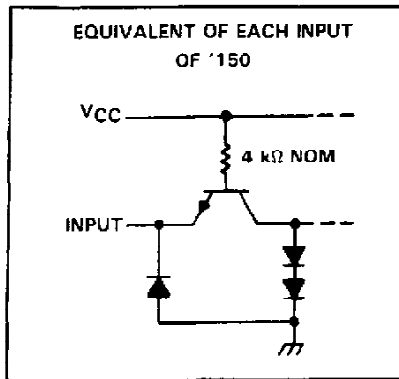
**'151A, 'LS151, 'S151  
FUNCTION TABLE**

INPUTS				OUTPUTS	
C	B	A	$\bar{G}$	Y	W
X	X	X	H	L	H
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 level, L = low level, X = irrelevant  
 $\bar{E}_0, \bar{E}_1, \dots, \bar{E}_{15}$  = the complement of the level of the respective E input  
 $D_0, D_1, \dots, D_7$  = the level of the D respective input

**SN54150, SN54151A, SN54LS151, SN54S151  
SN74150, SN74151A, SN74LS151, SN74S151  
DATA SELECTORS/MULTIPLEXERS**

schematics of inputs and outputs



# SN54150, SN54151A, SN74150, SN74151A DATA SELECTORS/MULTIPLEXERS

## recommended operating conditions

	SN54'			SN74'			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, $I_{OH}$			-800			-800	$\mu$ A
Low-level output current, $I_{OL}$			16			16	mA
Operating free-air temperature, $T_A$	-55		125	0		70	$^{\circ}$ C

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

PARAMETER	TEST CONDITIONS <sup>†</sup>	'150			'151A			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	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	$V_{CC} = \text{MIN}$ , $I_I = -8 \text{ mA}$			-1.5			-1.5	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -800 \mu\text{A}$	2.4	3.4		2.4	3.4		V
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V
$I_I$ 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	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$			40			40	$\mu$ A
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
$I_{OS}$ Short-circuit output current <sup>§</sup>	$V_{CC} = \text{MAX}$	SN54'	-20	-55	-20	-55		mA
		SN74'	-18	-55	-18	-55		
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$ , See Note 3		40	68		29	48	mA

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

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

<sup>§</sup> Not more than one output of the '151A should be shorted at a time.

NOTE 3:  $I_{CC}$  is measured with the strobe and data select inputs at 4.5 V, all other inputs and outputs open.

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

PARAMETER <sup>¶</sup>	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'150			'151A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$	A, B, or C (4 levels)	Y	$C_L = 15 \text{ pF}$ , $R_L = 400 \Omega$ , See Note 4 i				25	38		ns
$t_{PHL}$							25	38		
$t_{PLH}$	A, B, C, or D (3 levels)	W		23	35		17	26		ns
$t_{PHL}$				22	33		19	30		
$t_{PLH}$	Strobe $\bar{G}$	Y					21	33		ns
$t_{PHL}$							22	33		
$t_{PLH}$	Strobe $\bar{G}$	W		15.5	24		14	21		ns
$t_{PHL}$				21	30		15	23		
$t_{PLH}$	D0 thru D7	Y					13	20		ns
$t_{PHL}$							18	27		
$t_{PLH}$	E0 thru E15, or D0 thru D7	W	8.5	14		8	14		ns	
$t_{PHL}$			13	20		8	14			

<sup>¶</sup>  $t_{PLH}$  = propagation delay time, low-to-high-level output

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

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

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# SN54LS151, SN74LS151 DATA SELECTORS/MULTIPLEXERS

## recommended operating conditions

	SN54LS151			SN74LS151			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, $I_{OH}$			-400			-400	$\mu A$
Low-level output current, $I_{OL}$			4			8	mA
Operating free-air temperature, $T_A$	-55		125	0		70	$^{\circ}C$

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

PARAMETER	TEST CONDITIONS†	SN54LS151			SN74LS151			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	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL\text{max}}, I_{OH} = -400 \mu A$	2.5	3.4		2.7	3.4		V	
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL\text{max}}$			$I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$	0.25	0.4	0.25	0.4	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA	
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	$\mu A$	
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA	
$I_{OS}$ Short-circuit output current§	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA	
$I_{CC}$ Supply current	$V_{CC} = \text{MAX},$ Outputs open, All inputs at 4.5 V		6.0	10		6.0	10	mA	

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

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

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

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

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 4		27	43	ns
$t_{PHL}$					18	30	
$t_{PLH}$	A, B, or C (3 levels)	W			14	23	ns
$t_{PHL}$					20	32	
$t_{PLH}$	Strobe $\bar{G}$	Y			26	42	ns
$t_{PHL}$					20	32	
$t_{PLH}$	Strobe $\bar{G}$	W			15	24	ns
$t_{PHL}$					18	30	
$t_{PLH}$	Any D	Y			20	32	ns
$t_{PHL}$					16	26	
$t_{PLH}$	Any D	W		13	21	ns	
$t_{PHL}$				12	20		

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

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

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

  
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# SN54S151, SN74S151 DATA SELECTORS/MULTIPLEXERS

## recommended operating conditions

	SN54S151			SN74S151			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			-1	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	$V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$			-1.2	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -1 \text{ mA}$	SN54S151	2.5	3.4	V
		SN74S151	2.7	3.4	
$V_{OL}$ 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	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.7 \text{ V}$			50	µA
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.5 \text{ V}$			-2	mA
$I_{OS}$ Short-circuit output current §	$V_{CC} = \text{MAX}$	-40		-100	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$ , All inputs at 4.5 V, All outputs open		45	70	mA

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

‡ 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.

## 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	$C_L = 15 \text{ pF}$ , $R_L = 280 \text{ k}\Omega$ , See Note 4	12	18	ns	
$t_{PHL}$				12	18		
$t_{PLH}$	A, B, or C (3 levels)	W		10	15	ns	
$t_{PHL}$				9	13.5		
$t_{PLH}$	Any D	Y		8	12	ns	
$t_{PHL}$				8	12		
$t_{PLH}$	Any D	W		4.5	7	ns	
$t_{PHL}$				4.5	7		
$t_{PLH}$	Strobe $\bar{G}$	Y		11	16.5	ns	
$t_{PHL}$				12	18		
$t_{PLH}$	Strobe $\bar{G}$	W		9	13	ns	
$t_{PHL}$				8.5	12		

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

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

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

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