

# **SN54153, SN54LS153, SN54S153 SN74153, SN74LS153, SN74S153** **DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS**

DECEMBER 1972 — REVISED MARCH 1988

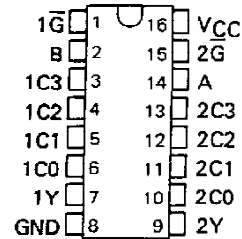
- Permits Multiplexing from N lines to 1 line
- Performs Parallel-to-Serial Conversion
- Strobe (Enable) Line Provided for Cascading (N lines to n lines)
- High-Fan-Out, Low-Impedance, Totem-Pole Outputs
- Fully Compatible with most TTL Circuits

SN54153, SN54LS153, SN54S153 . . . J OR W PACKAGE

SN74153 . . . N PACKAGE

SN74LS153, SN74S153 . . . D OR N PACKAGE

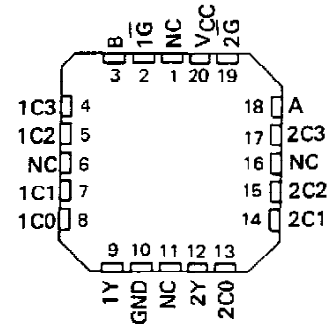
(TOP VIEW)



TYPE	TYPICAL AVERAGE PROPAGATION DELAY TIMES			TYPICAL POWER DISSIPATION
	FROM DATA	FROM STROBE	FROM SELECT	
'153	14 ns	17 ns	22 ns	180 mW
LS153	14 ns	19 ns	22 ns	31 mW
S153	6 ns	9.5 ns	12 ns	225 mW

SN54LS153, SN54S153 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

## **description**

Each of these monolithic, data selectors/multiplexers contains inverters and drivers to supply fully complementary, on-chip, binary decoding data selection to the AND-OR gates. Separate strobe inputs are provided for each of the two four-line sections.

FUNCTION TABLE

SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT
B	A	C0	C1	C2	C3		
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

Select inputs A and B are common to both sections.

H = high level, L = low level, X = irrelevant

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

Supply voltage, $V_{CC}$ (See Note 1)	7 V
Input voltage: '153, 'S153	5.5 V
LS153	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

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

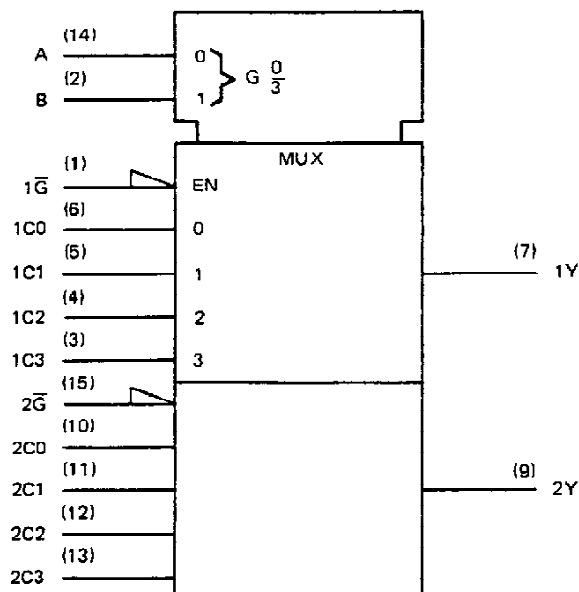
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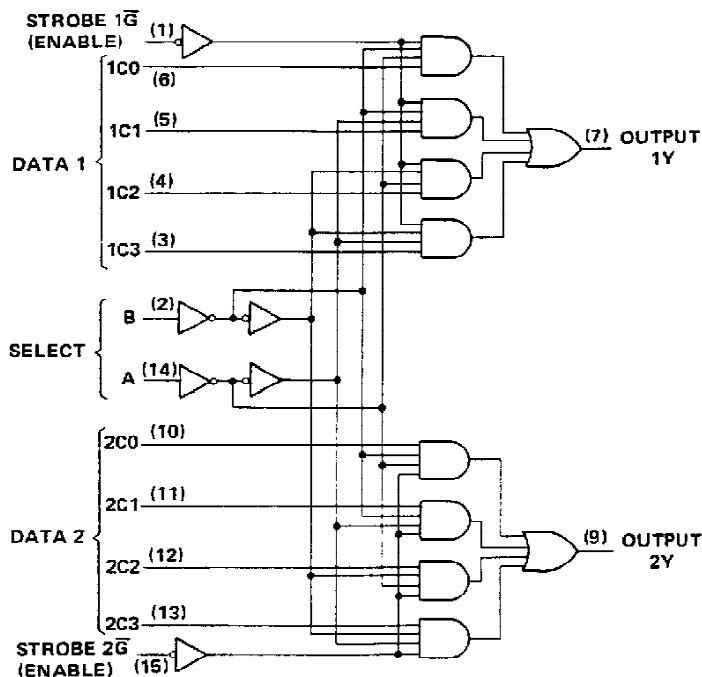
**SN54153, SN54LS153, SN54S153  
SN74153, SN74LS153, SN74S153  
DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS**

logic symbol†



†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)



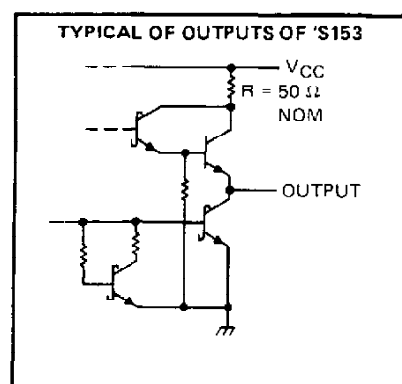
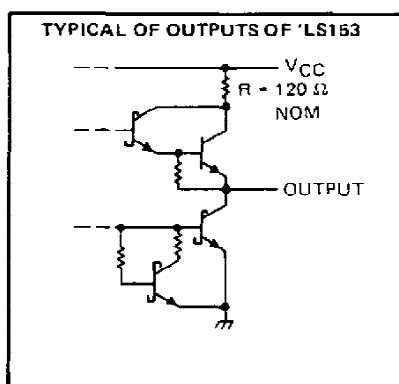
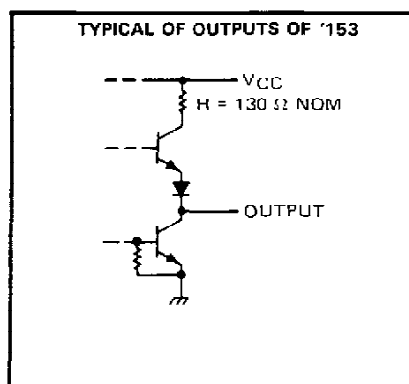
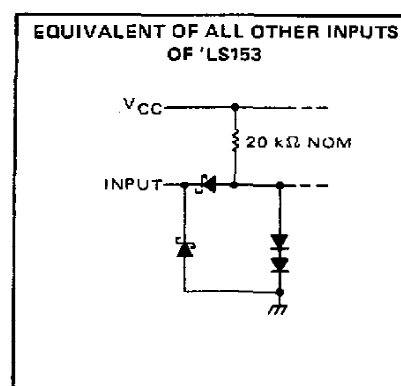
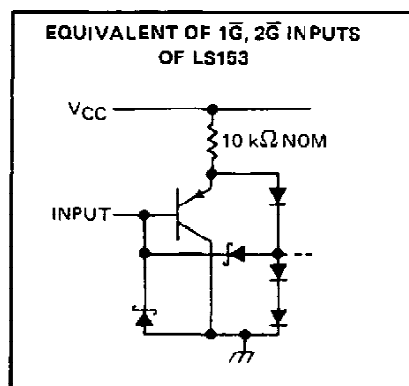
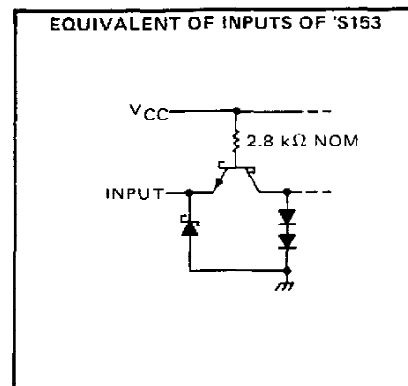
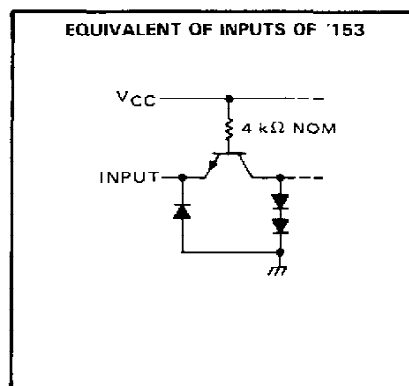
Pin numbers shown are for D, J, N, and W packages.

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**SN54153, SN54LS153, SN54S153  
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schematics of inputs and outputs



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# SN54153, SN74153

## DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### recommended operating conditions

	SN54153			SN74153			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†	SN54153			SN74153			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	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-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§	$V_{CC} = \text{MAX}$	-20		-55	-18		-57	mA
$I_{CCL}$ Supply current, output low	$V_{CC} = \text{MAX}, \text{ See Note 2}$		36	52		36	60	mA

†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.

NOTE 2:  $I_{CCL}$  is measured with the outputs open and all inputs grounded.

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

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	Data	Y	$C_L = 30 \text{ pF}, R_L = 400 \Omega,$ See Note 3		12	18	ns
$t_{PHL}$	Data	Y			15	23	ns
$t_{PLH}$	Select	Y			22	34	ns
$t_{PHL}$	Select	Y			22	34	ns
$t_{PLH}$	Strobe $\bar{G}$	Y			19	30	ns
$t_{PHL}$	Strobe $\bar{G}$	Y			15	23	ns

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

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

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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# SN54LS153, SN74LS153

## DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### recommended operating conditions

		SN54LS153			SN74LS153			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.7			0.8	V
I <sub>OH</sub>	High-level output current			-0.4			-0.4	mA
I <sub>OL</sub>	Low-level output current			4			8	mA
T <sub>A</sub>	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS †		SN54LS153			SN74LS153			UNIT
			MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = - 18 mA		- 1.5			- 1.5			V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX I <sub>OH</sub> = - 0.4 mA		2.5	3.4		2.7	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX,	I <sub>OL</sub> = 4 mA	0.25	0.4		0.25	0.4		V
		I <sub>OL</sub> = 8 mA				0.35	0.5		
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1			0.1			mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20			20			µA
I <sub>IL</sub>	1G, 2G	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V	- 0.2			- 0.2			mA
	All other		- 0.4			- 0.4			
I <sub>OS</sub> §	V <sub>CC</sub> = MAX		- 20	- 100		- 20	- 100		mA
I <sub>CCCL</sub>	V <sub>CC</sub> = MAX, See Note 2		6.2	10		6.2	10		mA

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

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

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

NOTE 2: I<sub>CCCL</sub> is measured with the outputs open and all inputs grounded.

### switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

PARAMETER †	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Data	Y	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ, See Note 3	10	15		ns
t <sub>PHL</sub>	Data	Y		17	26		ns
t <sub>PLH</sub>	Select	Y		19	29		ns
t <sub>PHL</sub>	Select	Y		25	38		ns
t <sub>PLH</sub>	Strobe $\overline{G}$	Y		16	24		ns
t <sub>PHL</sub>	Strobe $\overline{G}$	Y		21	32		ns

† t<sub>PLH</sub> = propagation delay time, low-to-high-level output

t<sub>PHL</sub> = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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# SN54S153, SN74S153

## DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### recommended operating conditions

	SN54S153			SN74S153			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	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OH} = -1 \text{ mA}$	Series 54S 2.5 Series 74S 2.7	3.4		V
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OL} = 20 \text{ mA}$			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
$I_{CCL}$ Supply current, low-level output	$V_{CC} = \text{MAX}, \text{ See Note 2}$		45	70	mA

†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 short-circuit should not exceed one second.

NOTE 2:  $I_{CCL}$  is measured with the outputs open and all inputs grounded.

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

PARAMETER <sup>¶</sup>	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Data	Y	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 280 Ω, See Note 3	6	9	ns	
t <sub>PHL</sub>	Data	Y		6	9	ns	
t <sub>PLH</sub>	Select	Y		11.5	18	ns	
t <sub>PHL</sub>	Select	Y		12	18	ns	
t <sub>PLH</sub>	Strobe $\overline{G}$	Y		10	15	ns	
t <sub>PHL</sub>	Strobe $\overline{G}$	Y		9	13.5	ns	

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

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

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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