

# SN54ALS153, SN74ALS153, SN74AS153 DUAL 1-OF-4 DATA SELECTORS/MULTIPLEXERS

SDAS206A – APRIL 1982 – REVISED DECEMBER 1994

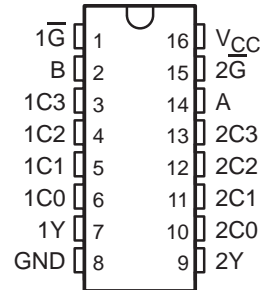
- Permit Multiplexing From n Lines to One Line
- Perform Parallel-to-Serial Conversion
- Strobe (Enable) Line Provided for Cascading (n Lines to n Lines)
- 'ALS253 and SN74AS253A Are 3-State Versions of These Parts
- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

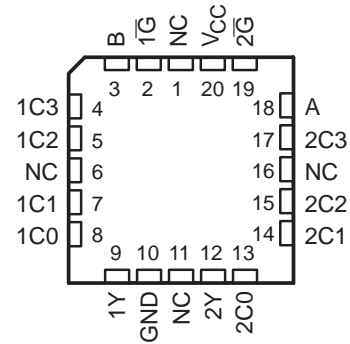
These dual 1-of-4 data selectors/multiplexers contain inverters and drivers to supply full binary decoding data selection to the AND-OR gates. Separate strobe ( $\overline{G}$ ) inputs are provided for each of the two 4-line sections.

The SN54ALS153 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS153 and SN74AS153 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS153 . . . J PACKAGE  
SN74ALS153, SN74AS153 . . . D OR N PACKAGE  
(TOP VIEW)



SN54ALS153 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

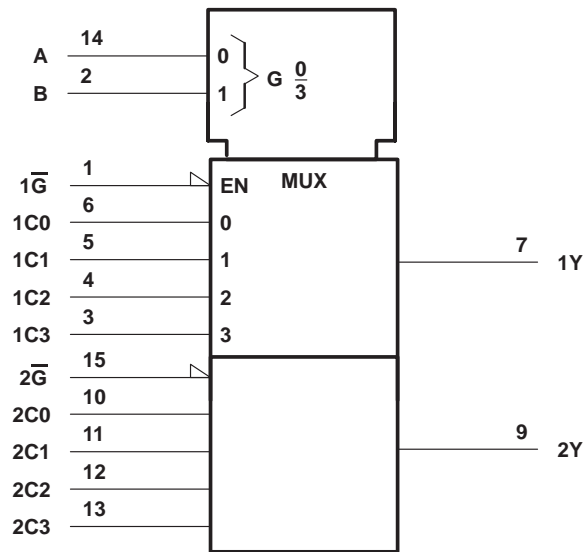
SELECT		DATA				STROBE $\overline{G}$	OUTPUT Y
B	A	C0	C1	C2	C3		
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

Select inputs A and B are common to both sections.

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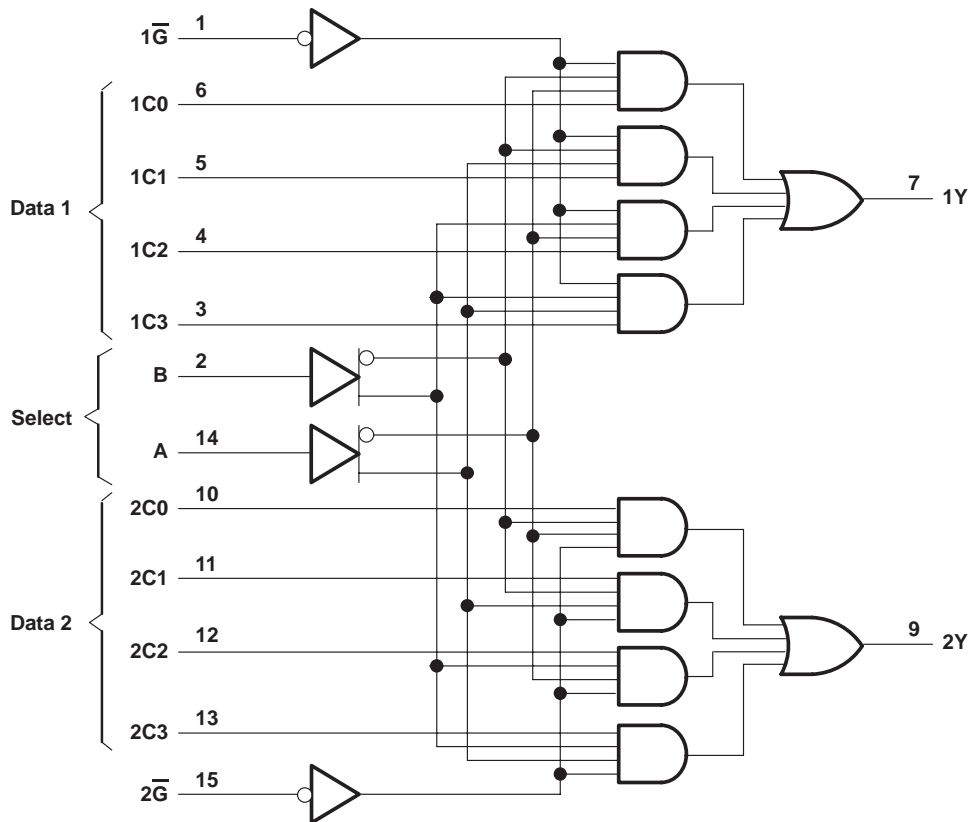
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## logic symbol†



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

## logic diagram (positive logic)



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



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# SN54ALS153, SN74ALS153, SN74AS153 DUAL 1-OF-4 DATA SELECTORS/MULTIPLEXERS

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## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage, $V_{CC}$ .....	7 V
Input voltage, $V_I$ .....	7 V
Operating free-air temperature range, $T_A$ : SN54ALS153 .....	–55°C to 125°C
SN74ALS153 .....	0°C to 70°C
Storage temperature range .....	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

		SN54ALS153			SN74ALS153			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	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	SN54ALS153			SN74ALS153			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			–1.5			–1.5	V
$V_{OH}$	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -1\text{ mA}$	2.4	3.3					
	$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -2.6\text{ mA}$				2.4	3.2		
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 12\text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 24\text{ mA}$					0.35	0.5	
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			20			20	μA
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$			–0.1			–0.1	mA
$I_{O}^{\S}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	–20		–112	–30		–112	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$ , All inputs at 4.5 V		7.5	14		7.5	14	mA

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

<sup>§</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



# SN54ALS153, SN74ALS153, SN74AS153 DUAL 1-OF-4 DATA SELECTORS/MULTIPLEXERS

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## switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54ALS153		SN74ALS153		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	Y	5	29	5	21	ns
t <sub>PHL</sub>			5	27	5	21	
t <sub>PLH</sub>	Data (any C)	Y	3	15	3	10	ns
t <sub>PHL</sub>			2	18	4	15	
t <sub>PLH</sub>	$\bar{G}$	Y	5	27	5	18	ns
t <sub>PHL</sub>			3	22	5	18	

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

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

Supply voltage, V <sub>CC</sub> .....	7 V
Input voltage, V <sub>I</sub> .....	7 V
Operating free-air temperature range, T <sub>A</sub> : SN74AS153 .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

		SN74AS153			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>OH</sub>	High-level output current			-15	mA
I <sub>OL</sub>	Low-level output current			48	mA
T <sub>A</sub>	Operating free-air temperature	0		70	°C



# SN54ALS153, SN74ALS153, SN74AS153 DUAL 1-OF-4 DATA SELECTORS/MULTIPLEXERS

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

PARAMETER		TEST CONDITIONS		SN74AS153		UNIT
				MIN	TYP†	
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V,	I <sub>I</sub> = -18 mA			V
V <sub>OH</sub>		V <sub>CC</sub> = 4.5 V to 5.5 V,	I <sub>OH</sub> = -2 mA	V <sub>CC</sub> - 2		V
		V <sub>CC</sub> = 4.5 V,	I <sub>OH</sub> = -15 mA	2.4	3.2	
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V,	I <sub>OL</sub> = 48 mA	0.35	0.5	V
I <sub>I</sub>	A, B	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 7 V			mA
	All others			0.2	0.1	
I <sub>IH</sub>	A, B	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 2.7 V			μA
	All others			40	20	
I <sub>IL</sub>	A, B	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 0.4 V			mA
	All others			-1	-0.5	
I <sub>O</sub> ‡		V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.25 V	-30	-112	mA
I <sub>CCH</sub>		V <sub>CC</sub> = 5.5 V		16	26	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 5.5 V		21	33	mA

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

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

**switching characteristics (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX§		UNIT
			SN74AS153		
			MIN	MAX	
t <sub>PLH</sub>	A or B	Y	3	12.5	ns
t <sub>PHL</sub>			3	11	
t <sub>PLH</sub>	Data (any C)	Y	2	7	ns
t <sub>PHL</sub>			2	8	
t <sub>PLH</sub>	$\bar{G}$	Y	3	11.5	ns
t <sub>PHL</sub>			10	9	

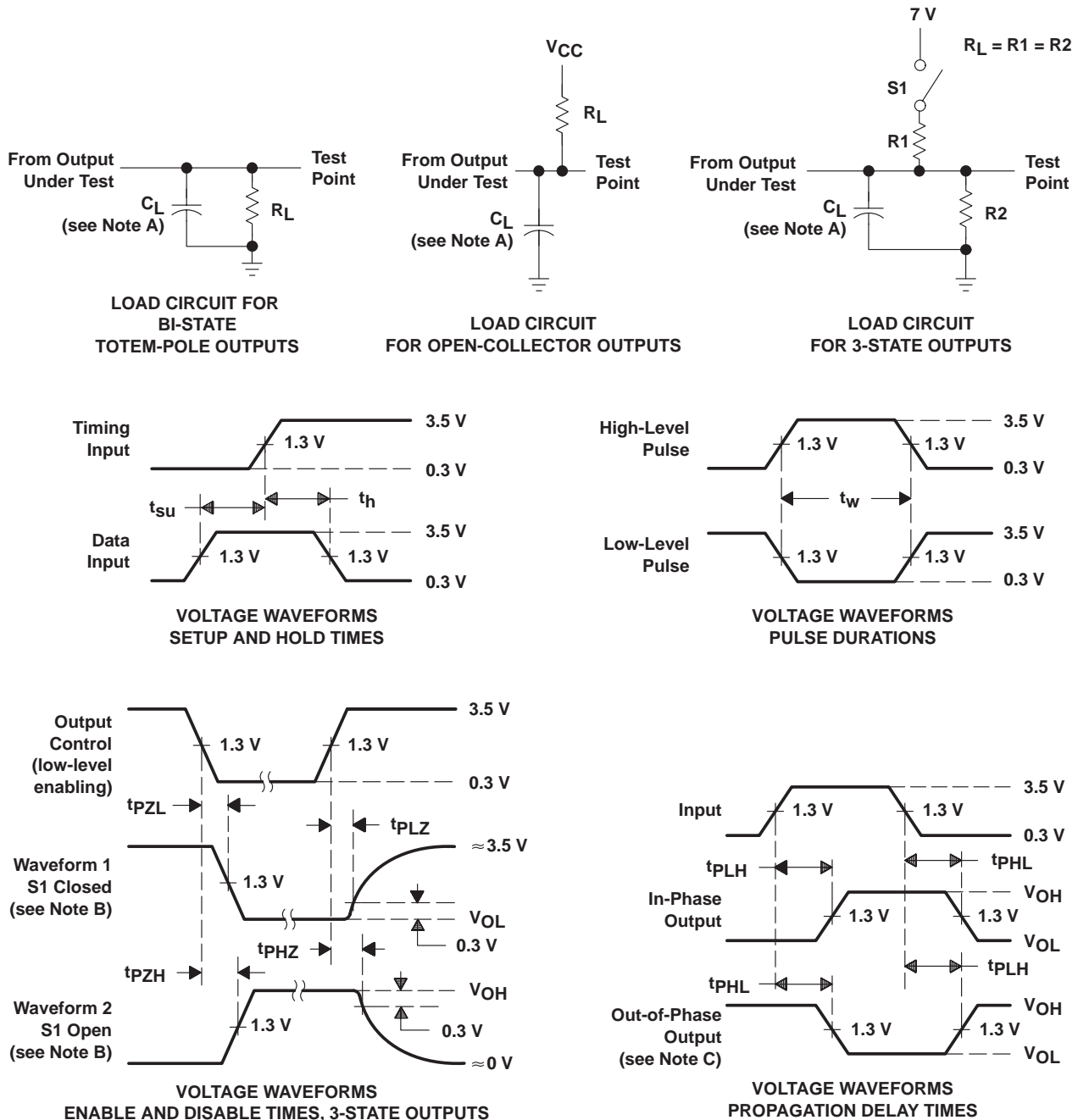
§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



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## PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms



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