

# Am25LS153 • Am54LS/74LS153

# Am25LS253 • Am54LS/74LS253

## Dual 4-Line To 1-Line Data Selectors/Multiplexers

### DISTINCTIVE CHARACTERISTICS

- Performs serial to parallel conversion
- Standard, 'LS153, and three-state, 'LS253, output versions
- Am25LS devices offer the following improvements over Am54/74LS
  - Higher speed
  - 50mV lower  $V_{OL}$
  - Twice the fan-out over military range
  - 440 $\mu$ A source current
- 100% product assurance screening to MIL-STD-883 requirements

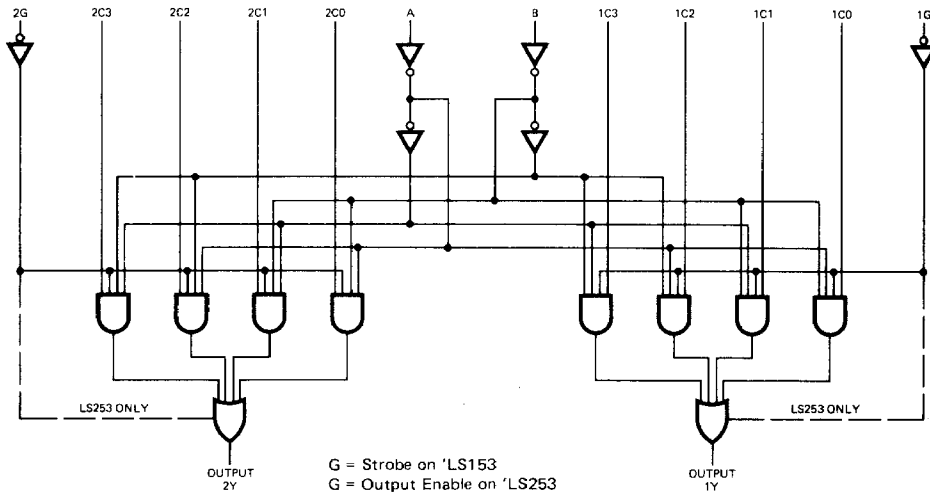
### FUNCTIONAL DESCRIPTION

These dual four-input multiplexers provide the digital equivalent of a two-pole, four position switch with the position of both switches set by the logic levels supplied to the select inputs A and B. Each section of the Am25LS153 has a separate active-LOW enable (strobe) input that forces the output of that section LOW when a HIGH level is applied regardless of the other inputs.

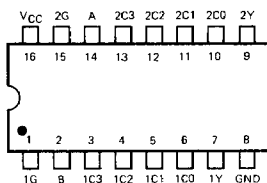
The Am25LS253 features a three-state output to interface with bus-organized systems. Each section of the Am25LS253 has a separate active-LOW output control that disables the output driver (high-impedance state) of that section when a HIGH logic level is applied regardless of the other inputs.

The Am54LS/74LS153 and 253 are standard performance versions of the Am25LS153 and 253. See appropriate electrical characteristic tables for detailed Am25LS improvements.

### LOGIC DIAGRAM

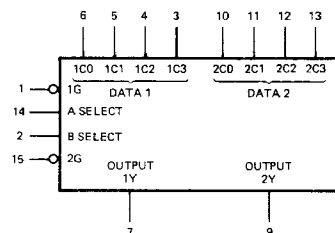


### CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

### LOGIC SYMBOL



VCC = Pin 16  
GND = Pin 8

# Am25LS/54LS/74LS153/253

## Am25LS153 • Am25LS253

### ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L  $T_A = 0^\circ\text{C to } +70^\circ\text{C}$   $V_{CC} = 5.0\text{V} \pm 5\%$  (MIN. = 4.75V MAX. = 5.25V)  
 MIL  $T_A = -55^\circ\text{C to } +125^\circ\text{C}$   $V_{CC} = 5.0\text{V} \pm 10\%$  (MIN. = 4.50V MAX. = 5.50V)

### DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)	Min.	Typ.(Note 2)	Max.	Units	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -440\mu\text{A}$	2.5	3.4		Volts
			$I_{OH} = -1\text{mA}$	2.7	3.4		
			$I_{OH} = -2.6\text{mA}$	2.4	3.4		
			$I_{OL} = 4\text{mA}$				
$V_{OL}$	Output LOW Voltage		$I_{OL} = 8\text{mA}$			0.4	Volts
						0.45	
$V_{IH}$	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs	2			Volts	
$V_{IL}$	Input LOW Level	Guaranteed input logical LOW voltage for all inputs			0.7 0.8	Volts	
$V_I$	Input Clamp Voltage	$V_{CC} = \text{MIN.}$ , $I_{IN} = -18\text{mA}$			-1.5	Volts	
$I_{IL}$	Input LOW Current	$V_{CC} = \text{MAX.}$ , $V_{IN} = 0.4\text{V}$			-0.36	mA	
$I_{IH}$	Input HIGH Current	$V_{CC} = \text{MAX.}$ , $V_{IN} = 2.7\text{V}$			20	$\mu\text{A}$	
$I_I$	Input HIGH Current	$V_{CC} = \text{MAX.}$ , $V_{IN} = 7.0\text{V}$			0.1	mA	
$I_{OZ}$	Off-State (HIGH Impedance) Output Current Am25LS253 Only	$V_{CC} = \text{MAX.}$	$V_O = 2.4\text{V}$			20	$\mu\text{A}$
			$V_O = 0.4\text{V}$			-20	
$I_{SC}$	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$	-15		-85	mA	
$I_{CC}$	Power Supply Current	$V_{CC} = \text{MAX.}$ (Note 4)	LS153		6.2	10	mA
			LS253		7	12	

- Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.  
 2. Typical limits are at  $V_{CC} = 5.0\text{V}$ ,  $25^\circ\text{C}$  ambient and maximum loading.  
 3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.  
 4.  $I_{CC}$  is measured with all outputs open and all inputs grounded.

### MAXIMUM RATINGS (Above which the useful life may be impaired)

Storage Temperature	-65°C to +150°C
Temperature (Ambient) Under Bias	-55°C to +125°C
Supply Voltage to Ground Potential (Pin 16 to Pin 8) Continuous	-0.5 V to +7.0 V
DC Voltage Applied to Outputs for HIGH Output State	-0.5 V to + $V_{CC}$ max.
DC Input Voltage	-0.5 V to +7.0 V
DC Output Current, Into Outputs	30 mA
DC Input Current	-30 mA to +5.0 mA

### DEFINITION OF FUNCTIONAL TERMS

**1C<sub>i</sub>, 2C<sub>i</sub>** Data Inputs. The four data inputs to each multiplexer;  $i = 0, 1, 2,$  and  $3$ .

**1Y, 2Y** Multiplexer Outputs. The output of each four-input multiplexer.

**A, B** Select Inputs. The inputs used to determine which of the four data inputs are selected for the output.

**G** (Am25LS153) Strobe. An active-LOW strobe used to enable the output. A HIGH level input forces the output LOW regardless of the other inputs.

**G** (Am25LS253) Output Control. An active-LOW three-state control used to enable the output. A HIGH level input forces the output to the high-impedance (off) state.

### FUNCTION TABLE

		INPUTS					OUTPUTS		
Select	Data	LS153 Strobe	LS253 Output Control	LS153 Output	LS253 Output				
						B	A	C <sub>0</sub>	C <sub>1</sub>
X	X	X	X	X	X	H	H	L	Z
L	L	L	X	X	X	L	L	L	L
L	L	H	X	X	X	L	L	H	H
L	H	X	L	X	X	L	L	L	L
L	H	X	H	X	X	L	L	H	H
H	L	X	X	L	X	L	L	L	L
H	L	X	X	H	X	L	L	H	H
H	H	X	X	X	L	L	L	L	L
H	H	X	X	X	H	L	L	H	H

H = HIGH L = LOW X = Don't Care Z = High Impedance  
 Note: A & B are common to both 4 input multiplexers.

## Am54LS/74LS153 • Am54LS/74LS253

## ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L  $T_A = 0^\circ\text{C to } +70^\circ\text{C}$   $V_{CC} = 5.0\text{V} \pm 5\%$  (MIN. = 4.75V MAX. = 5.25V)MIL  $T_A = -55^\circ\text{C to } +125^\circ\text{C}$   $V_{CC} = 5.0\text{V} \pm 10\%$  (MIN. = 4.50V MAX. = 5.50V)

## DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)		Min.	Typ. (Note 2)	Max.	Units
$V_{OH}$	Output HIGH Voltage	54LS153	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -400\mu\text{A}$	2.5	3.4	Volts
		74LS153			2.7	3.4	
		54LS253		$I_{OH} = -1\text{mA}$	2.4	3.4	
		74LS253		$I_{OH} = -2.6\text{mA}$	2.4	3.2	
$V_{OL}$	Output LOW Voltage			All, $I_{OL} = 4\text{mA}$		0.4	Volts
				74LS only, $I_{OL} = 8\text{mA}$		0.5	
$V_{IH}$	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs		2			Volts
$V_{IL}$	Input LOW Level	Guaranteed input logical LOW voltage for all inputs		54LS		0.7	Volts
				74LS		0.8	
$V_I$	Input Clamp Voltage	$V_{CC} = \text{MIN.}, V_{IN} = -18\text{mA}$				-1.5	Volts
$I_{IL}$	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$				-0.36	mA
$I_{IH}$	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$				20	$\mu\text{A}$
$I_I$	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$				0.1	mA
$I_{OZ}$	Off-State (HIGH Impedance) Output Current Am54LS/74LS253 Only	$V_{CC} = \text{MAX.}$		$V_O = 2.4\text{V}$		20	$\mu\text{A}$
				$V_O = 0.4\text{V}$		-20	
$I_{SC}$	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$		-15		-100	mA
$I_{CC}$	Power Supply Current	$V_{CC} = \text{MAX.}$ (Note 4)		LS153	6.2	10	mA
				LS253	7	12	

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical limits are at  $V_{CC} = 5.0\text{V}$ ,  $25^\circ\text{C}$  ambient and maximum loading.

3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

4.  $I_{CC}$  is measured with all outputs open and all inputs grounded.

## Am25LS153/54LS153

## SWITCHING CHARACTERISTICS

 $(T_A = +25^\circ\text{C}, V_{CC} = 5.0\text{V})$ 

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
$t_{PLH}$	Data to Output		10	15		10	15	ns	$C_L = 15\text{pF}$ $R_L = 2.0\text{k}\Omega$
$t_{PHL}$			10	16		17	26		
$t_{PLH}$	Select to Output		19	29		19	29		
$t_{PHL}$			15	23		25	38		
$t_{PLH}$	Strobe to Output		16	24		16	24		
$t_{PHL}$			12	18		21	32		

Am25LS153 ONLY  
SWITCHING CHARACTERISTICS  
OVER OPERATING RANGE\*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
$t_{PLH}$	Data to Output	$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$		ns	$C_L = 50\text{pF}$ $R_L = 2.0\text{k}\Omega$
			24		27		
$t_{PHL}$	Select to Output		25		29	ns	
			42		48		
$t_{PLH}$	Strobe to Output		34		39	ns	
			35		41		
$t_{PHL}$			28		32		

\*AC performance over the operating temperature range, is guaranteed by testing defined in Group A, Subgroup 9.

**Am25LS/54LS/74LS153/253**

**Am25LS253/54LS253**

**SWITCHING CHARACTERISTICS**

( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ )

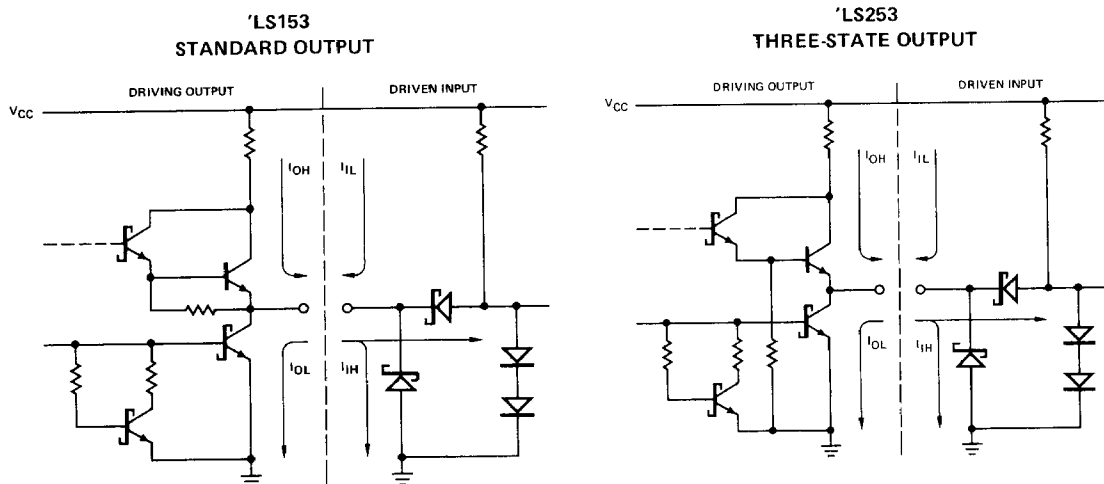
Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions	
		Min.	Typ.	Max.	Min.	Typ.	Max.			
$t_{PLH}$	Data to Output		10	15		17	25	ns	$C_L = 15\text{pF}$ $R_L = 2.0\text{k}\Omega$	
$t_{PHL}$			7	12		13	20			
$t_{PLH}$	Select to Output		20	30		30	45			ns
$t_{PHL}$			15	23		21	32			
$t_{ZH}$	Output Control to Output		17	25		15	28	ns		
$t_{ZL}$			12	18		15	23			
$t_{HZ}$	Output Control to Output		12	18		27	42	ns	$C_L = 5.0\text{pF}$ $R_L = 2.0\text{k}\Omega$	
$t_{LZ}$			13	18		18	27			

**Am25LS253 ONLY**  
**SWITCHING CHARACTERISTICS**  
**OVER OPERATING RANGE\***

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$			
$t_{PLH}$	Data to Output		24		27	ns	$C_L = 50\text{pF}$ $R_L = 2.0\text{k}\Omega$
$t_{PHL}$				20			
$t_{PLH}$	Select to Output		43		50	ns	
$t_{PHL}$				34			
$t_{ZH}$	Output Control to Output		37		42	ns	
$t_{ZL}$				28			
$t_{HZ}$	Output Control to Output		28		32	ns	$C_L = 5.0\text{pF}$ $R_L = 2.0\text{k}\Omega$
$t_{LZ}$				28			

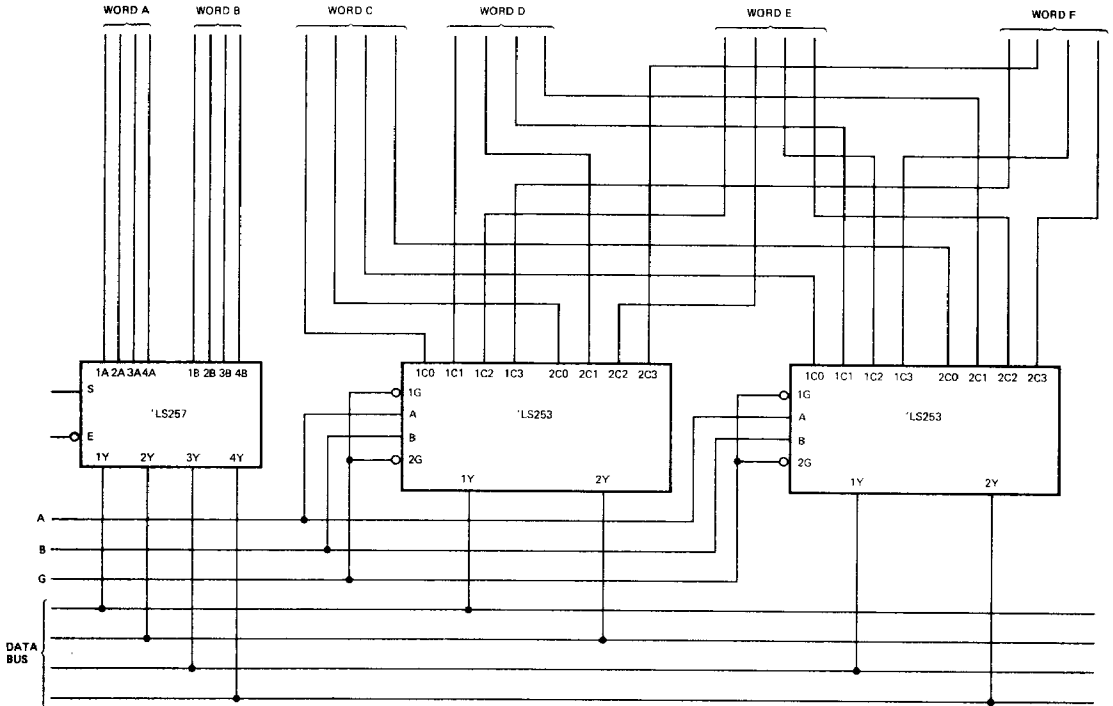
\*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

**Am25LS • 54LS/74LS**  
**LOW-POWER SCHOTTKY INPUT/OUTPUT**  
**CURRENT INTERFACE CONDITIONS**



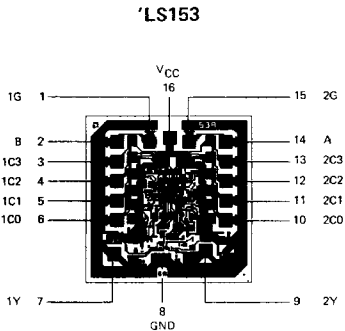
Note: Actual current flow direction shown.

### APPLICATIONS

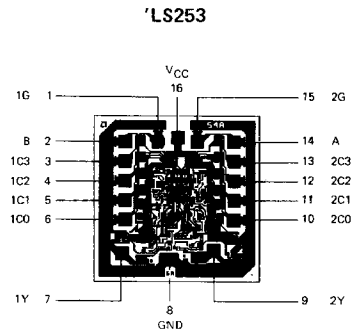


'LS253 DUAL 4-INPUT MULTIPLEXER IN A BUS-ORGANIZED SYSTEM

### Metallization and Pad Layout



DIE SIZE 0.055" X 0.055"



DIE SIZE 0.055" X 0.055"

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