

# Am25LS151 • Am54LS/74LS151

# Am25LS251 • Am54LS/74LS251

## Eight-Input Multiplexers

### DISTINCTIVE CHARACTERISTICS

- Switches one-of-eight inputs to two complementary outputs
- Standard, 'LS151 and three-state, 'LS251 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

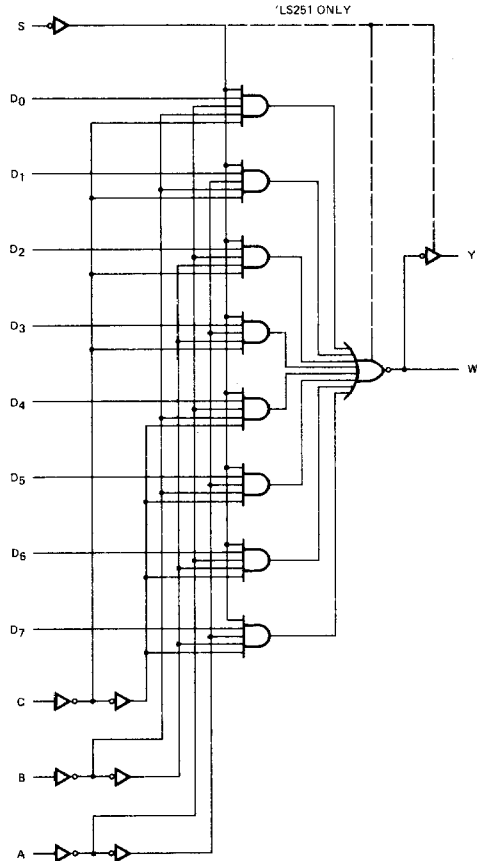
The Am25LS151 and the Am25LS251 are eight-input multiplexers that switch one of eight inputs onto the inverting and non-inverting outputs under the control of a three-bit select code. The inverting output W is one gate delay faster than the non-inverting output Y.

The Am25LS151 provides an active-LOW strobe. When the strobe is HIGH, the inverting output (W) is HIGH and the non-inverting output (Y) is LOW.

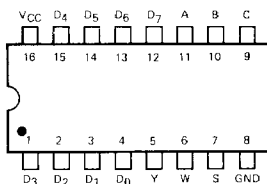
The Am25LS251 features a three-state output for data bus organization. The active-LOW strobe, or "output control" applies to both the inverting and non-inverting output. When the output control is HIGH, the outputs are in the high-impedance state. When the output control is LOW, the active pull-up output is enabled.

The Am54LS/74LS151 is a standard performance version of the Am25LS151. See appropriate electrical characteristic tables for detailed Am25LS improvements.

### LOGIC DIAGRAM

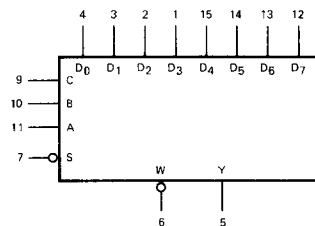


### CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

### LOGIC SYMBOL



VCC = Pin 16  
GND = Pin 8

## Am25LS/54LS/74LS151/251

### Am25LS151 • Am25LS251

#### 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	LS151XM	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -440\mu\text{A}$	2.5	3.4	Volts	
		LS151XC			2.7	3.4		
		LS251XM			2.4	3.4		
		LS251XC			2.4	3.2		
$V_{OL}$	Output LOW Voltage			$I_{OL} = 4\text{mA}$		0.4	Volts	
				$I_{OL} = 8\text{mA}$		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		MIL		0.7	Volts	
				COM'L		0.8		
$V_I$	Input Clamp Voltage	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$				-1.5	Volts	
$I_{IL}$	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$				-0.4	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 (LS251 only)	$V_{CC} = \text{MAX.}$		$V_O = 2.4\text{V}$		20	$\mu\text{A}$	
		$V_{IN} = V_{IH} \text{ or } V_{IL}$		$V_O = 0.4\text{V}$		-20		
$I_{SC}$	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$		-15		-85	mA	
$I_{CC}$	Power Supply Current	$V_{CC} = \text{MAX.}$		LS151 (Note 4)		6.0	10	mA
				LS251 (Note 5)	A	6.1	10	
					B	7.1	12	

## Am54LS/74LS151 • Am54LS/74LS251

#### 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	54LS151	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -400\mu\text{A}$	2.5	3.4	Volts	
		74LS151			2.7	3.4		
		54LS251			2.4	3.4		
		74LS251			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	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$				-1.5	Volts	
$I_{IL}$	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$				-0.4	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 (LS251 only)	$V_{CC} = \text{MAX.}$		$V_O = 2.4\text{V}$		20	$\mu\text{A}$	
		$V_{IN} = V_{IH} \text{ or } V_{IL}$		$V_O = 0.4\text{V}$		-20		
$I_{SC}$	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$		-15		-100	mA	
$I_{CC}$	Power Supply Current	$V_{CC} = \text{MAX.}$		LS151 (Note 4)		6.0	10	mA
				LS251 (Note 5)	A	6.1	10	
					B	7.1	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  $V_{CC} = 5.0\text{V}$ ,  $25^\circ\text{C}$  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 at 4.5V.

5.  $I_{CC}$  is measured with all outputs open and all data and select inputs at 4.5V under conditions:

A) Strobe grounded.

B) Strobe at 4.5V.

**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	-0.5V to +7.0V
DC Voltage Applied to Outputs for HIGH Output State	-0.5V to +V <sub>CC</sub> max.
DC Input Voltage	-0.5V to +7.0V
DC Output Current, Into Output	30mA
DC Input Current	-30mA to +5.0mA

**Am25LS151 • Am54LS/74LS151**  
**SWITCHING CHARACTERISTICS**  
 (T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V)

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t <sub>PLH</sub>	A, B, or C to Y; 4 Levels of Delay		27	41		27	43	ns	C <sub>L</sub> = 15pF R <sub>L</sub> = 2.0kΩ
t <sub>PHL</sub>			20	30		18	30		
t <sub>PLH</sub>	A, B, or C to W; 3 Levels of Delay		16	23		14	23	ns	
t <sub>PHL</sub>			22	32		20	32		
t <sub>PLH</sub>	Any D to Y		16	24		20	32	ns	
t <sub>PHL</sub>			11	17		16	26		
t <sub>PLH</sub>	Any D to W		7	12		13	21	ns	
t <sub>PHL</sub>			10	15		12	20		
t <sub>PLH</sub>	Strobe to Y		22	33		26	42	ns	
t <sub>PHL</sub>			15	23		20	32		
t <sub>PLH</sub>	Strobe to W		11	17		15	24	ns	
t <sub>PHL</sub>			16	24		18	30		

**Am25LS151 ONLY**  
**SWITCHING CHARACTERISTICS**  
**OVER OPERATING RANGE\***

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
t <sub>PLH</sub>	A, B or C to Y; 4 Levels of Delay	T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = 5.0V ±5%		T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = 5.0V ±10%		ns	C <sub>L</sub> = 50pF R <sub>L</sub> = 2.0kΩ
t <sub>PHL</sub>			57		66		
t <sub>PLH</sub>	A, B or C to W; 3 Levels of Delay		43		50	ns	
t <sub>PHL</sub>			34		39		
t <sub>PLH</sub>	Any D to Y		46		53	ns	
t <sub>PHL</sub>			35		41		
t <sub>PLH</sub>	Any D to W		26		30	ns	
t <sub>PHL</sub>			20		23		
t <sub>PLH</sub>	Strobe to Y		24		27	ns	
t <sub>PHL</sub>			47		54		
t <sub>PLH</sub>	Strobe to W		34		39	ns	
t <sub>PHL</sub>			26		30		
t <sub>PHL</sub>			35		41	ns	

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

Am25LS/54LS/74LS151/251

Am25LS251 • Am54LS/74LS251

SWITCHING CHARACTERISTICS

(T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V)

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t <sub>PLH</sub>	A, B, or C to Y; 4 Levels of Delay		29	44		29	45	ns	C <sub>L</sub> = 15pF R <sub>L</sub> = 2.0kΩ
t <sub>PHL</sub>			20	30		28	45		
t <sub>PLH</sub>	A, B, or C to W; 3 Levels of Delay		16	24		20	33	ns	
t <sub>PHL</sub>			21	32		21	33		
t <sub>PLH</sub>	Any D to Y		16	24		17	28	ns	
t <sub>PHL</sub>			11	17		18	28		
t <sub>PLH</sub>	Any D to W		8	12		10	15	ns	
t <sub>PHL</sub>			9	14		9	15		
t <sub>ZH</sub>	Output Enable to Y		8	12		17	45	ns	
t <sub>ZL</sub>			13	19		26	40		
t <sub>ZH</sub>	Output Enable to W		10	15		17	27	ns	
t <sub>ZL</sub>			11	18		24	40		
t <sub>HZ</sub>	Output Enable to Y		18	27		30	45	ns	C <sub>L</sub> = 5.0pF R <sub>L</sub> = 2.0kΩ
t <sub>LZ</sub>			12	18		15	25		
t <sub>HZ</sub>	Output Enable to W		19	29		30	55	ns	
t <sub>LZ</sub>			12	18		15	25		

Am25LS251 ONLY  
SWITCHING CHARACTERISTICS  
OVER OPERATING RANGE\*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = 5.0V ±5%		T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = 5.0V ±10%			
t <sub>PLH</sub>	A, B or C to Y; 4 Levels of Delay		61		71	ns	C <sub>L</sub> = 50pF R <sub>L</sub> = 2.0kΩ
t <sub>PHL</sub>			43		50		
t <sub>PLH</sub>	A, B or C to W; 3 Levels of Delay		35		41	ns	
t <sub>PHL</sub>			46		53		
t <sub>PLH</sub>	Any D to Y		35		41	ns	
t <sub>PHL</sub>			26		30		
t <sub>PLH</sub>	Any D to W		20		23	ns	
t <sub>PHL</sub>			22		26		
t <sub>ZH</sub>	Output Enable to Y		20		23	ns	
t <sub>ZL</sub>			29		33		
t <sub>ZH</sub>	Output Enable to W		24		27	ns	
t <sub>ZL</sub>			27		32		
t <sub>HZ</sub>	Output Enable to Y		35		41	ns	C <sub>L</sub> = 5.0pF R <sub>L</sub> = 2.0kΩ
t <sub>LZ</sub>			24		27		
t <sub>HZ</sub>	Output Enable to W		38		44	ns	
t <sub>LZ</sub>			24		27		

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

## FUNCTION TABLE

INPUTS				OUTPUTS				
SELECT			LS151	LS251	LS151		LS251	
C	B	A	Strobe S	Output Control S	Y	W	Y	W
X	X	X	H	H	L	H	Z	Z
L	L	L	L	L	D <sub>0</sub>	$\bar{D}_0$	D <sub>0</sub>	$\bar{D}_0$
L	L	H	L	L	D <sub>1</sub>	$\bar{D}_1$	D <sub>1</sub>	$\bar{D}_1$
L	H	L	L	L	D <sub>2</sub>	$\bar{D}_2$	D <sub>2</sub>	$\bar{D}_2$
L	H	H	L	L	D <sub>3</sub>	$\bar{D}_3$	D <sub>3</sub>	$\bar{D}_3$
H	L	L	L	L	D <sub>4</sub>	$\bar{D}_4$	D <sub>4</sub>	$\bar{D}_4$
H	L	H	L	L	D <sub>5</sub>	$\bar{D}_5$	D <sub>5</sub>	$\bar{D}_5$
H	H	L	L	L	D <sub>6</sub>	$\bar{D}_6$	D <sub>6</sub>	$\bar{D}_6$
H	H	H	L	L	D <sub>7</sub>	$\bar{D}_7$	D <sub>7</sub>	$\bar{D}_7$

H = HIGH

X = Don't Care

L = LOW

Z = High Impedance

D<sub>0</sub>-D<sub>7</sub> = The output will follow the HIGH-level or LOW-level of the selected input.

$\bar{D}_0$ - $\bar{D}_7$  = The output will follow the complement of the HIGH-level or LOW-level of the selected input.

## DEFINITION OF FUNCTIONAL TERMS

A, B, C The three select inputs of the multiplexer.

D<sub>0</sub>, D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub>.

D<sub>4</sub>, D<sub>5</sub>, D<sub>6</sub>, D<sub>7</sub> The eight data inputs of the multiplexer.

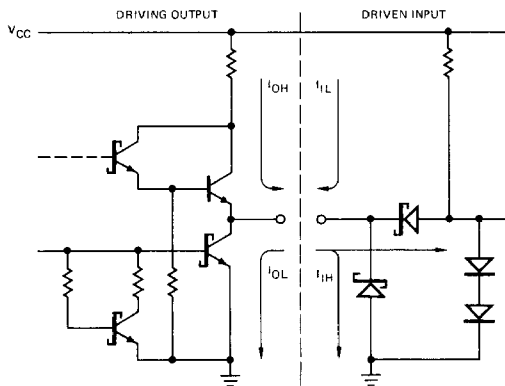
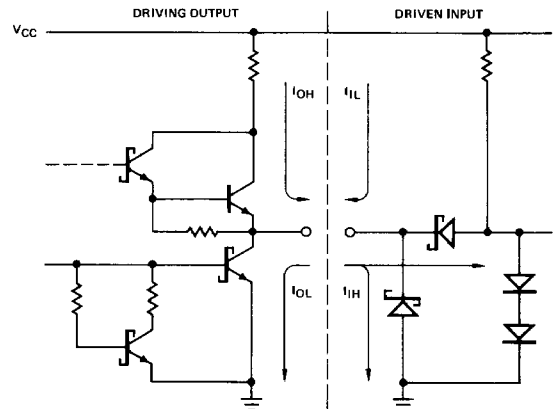
Y The true multiplexer output.

W The complement multiplexer output.

S Strobe. On the Am25LS151, a HIGH on the strobe forces the Y output LOW and the W output HIGH.

S Output Control. On the Am25LS251, a HIGH on the output control (or strobe) forces both the W and Y outputs to the high-impedance (off) state.

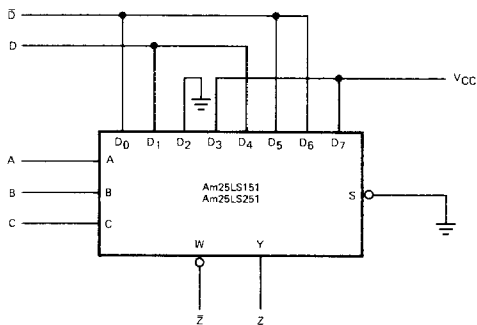
## Am25LS • Am54LS/74LS

LOW-POWER SCHOTTKY INPUT/OUTPUT  
CURRENT INTERFACE CONDITIONS'LS251  
THREE-STATE OUTPUT'LS151  
STANDARD OUTPUT

Note: Actual current flow direction shown.

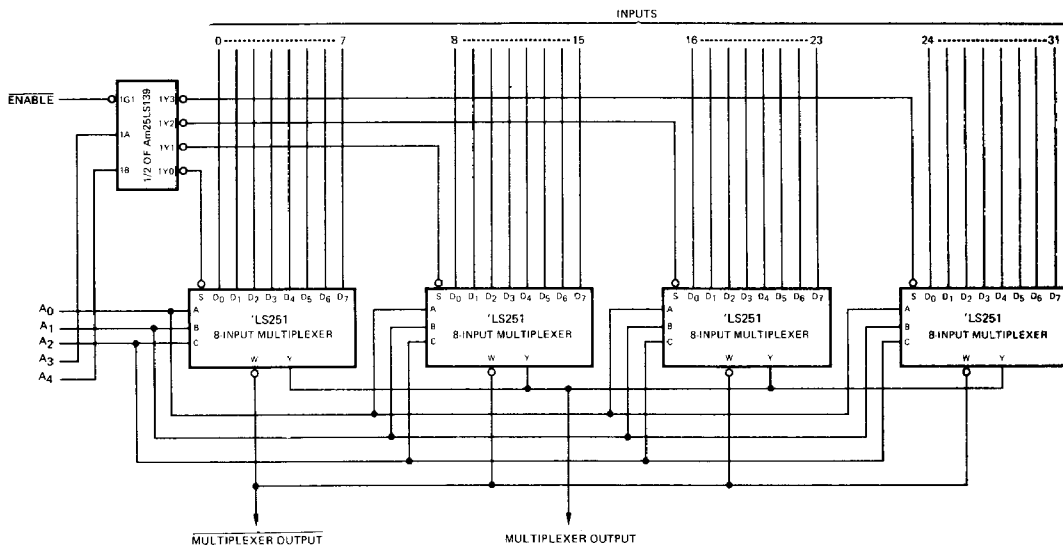
### APPLICATIONS

#### LOGIC FUNCTION GENERATION

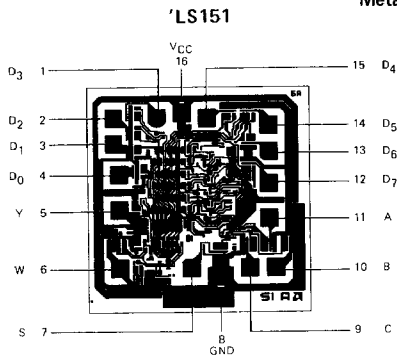


$$Z = \overline{A}BCD + \overline{A}BC\overline{D} + A\overline{C}D + AB + A\overline{C}\overline{D} + BC\overline{D}$$

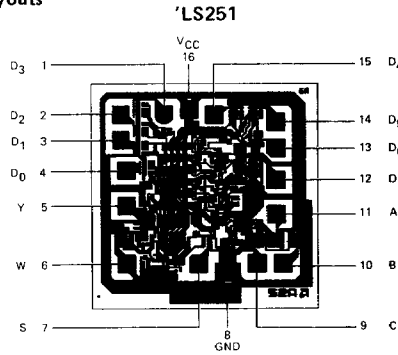
#### 32-INPUT MULTIPLEXER



#### Metallization and Pad Layouts



DIE SIZE 0.057" X 0.057"



DIE SIZE 0.057" X 0.057"