

Am25LS139 • Am54LS/74LS139

Dual 2-Line To 4-Line Decoder/Demultiplexer

DISTINCTIVE CHARACTERISTICS

- Two independent decoders/demultiplexers
- Am25LS devices offer the following improvements over Am54/74LS
 - Higher speed
 - 50mV lower V_{OL}
 - Twice the fan-out over military range
 - 440 μ A source current
- 100% product assurance screening to MIL-STD-883 requirements

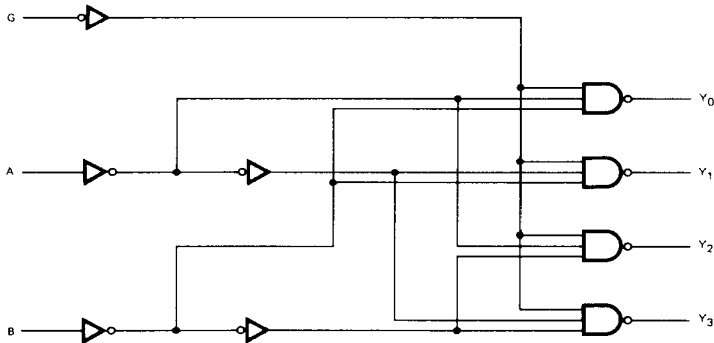
FUNCTIONAL DESCRIPTION

The Am25LS139 is a dual 2-line to 4-line decoder/demultiplexer unit fabricated using advanced Low-Power Schottky technology. Each decoder has two buffered select inputs A and B which are decoded to one of four Y outputs.

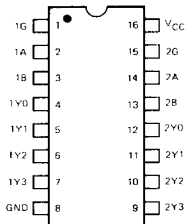
An active LOW enable can be used for gating or can be used as a data input for demultiplexing applications. When the enable is HIGH, all four Y outputs are HIGH, regardless of the A and B inputs.

The Am54LS/74LS139 is a standard performance version of the Am25LS139. See appropriate electrical characteristics tables for detailed Am25LS improvements.

LOGIC DIAGRAM
(One Decoder Shown)

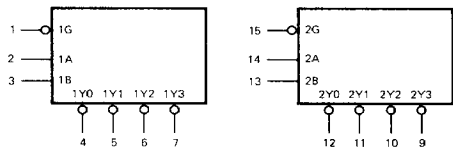


CONNECTION DIAGRAM
Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

3

Am25LS/54LS/74LS139

Am25LS139

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	$V_{CC} = \text{MIN.}, I_{OH} = -440\mu\text{A}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	MIL	2.5	3.4		Volts
			COM'L	2.7	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 4\text{mA}$			0.4	Volts
			$I_{OL} = 8\text{mA}$			0.45	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs	2.0			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	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$			-0.36	mA	
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$			20	μA	
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$			0.1	mA	
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)		6.8	11	mA	

- 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°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 enabled and open.

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_{CC} max.
DC Input Voltage	-0.5V to +7.0V
DC Output Current, Into Outputs	30 mA
DC Input Current	-30 mA to +5.0 mA

Am54LS/74LS139

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	$V_{CC} = \text{MIN.}, I_{OH} = -400\mu\text{A}$ $V_{IN} = V_{IH}$ or V_{IL}	MIL	2.5	3.4	
			COM'L	2.7	3.4	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH}$ or V_{IL}	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	2.0			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	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$			-0.36	mA
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$			20	μA
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$			0.1	mA
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)		6.8	11	mA

- 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°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 enabled and open.

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}	Select to Output, 2 Levels of Delay		8	12		13	20	ns	$C_L = 15\text{pF}$ $R_L = 2.0\text{k}\Omega$
t_{PHL}			12	18		22	33		
t_{PLH}	Select to Output, 3 Levels of Delay		13	20		18	29	ns	
t_{PHL}			14	21		25	38		
t_{PLH}	Enable to Output, 2 Levels of Delay		8	12		16	24	ns	
t_{PHL}			12	18		21	32		

Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
t_{PLH}	Select to Output 2 Levels of Delay	$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$		ns	$C_L = 50\text{pF}$ $R_L = 2.0\text{k}\Omega$
			20		23		
t_{PHL}	Select to Output 3 Levels of Delay		27		32	ns	
t_{PLH}			30		35		
t_{PHL}	Enable to Output 2 Levels of Delay		31		36	ns	
t_{PLH}			20		23		
t_{PHL}			27		32		

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

DEFINITION OF FUNCTIONAL TERMS

A, B Select. The two select inputs to the decoder.

G Enable. The enable input to the decoder. A HIGH input forces all four Y outputs HIGH regardless of the A and B inputs.

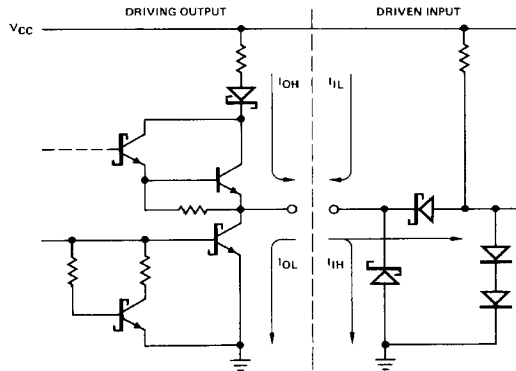
Y₀, Y₁, Y₂, Y₃ The four decoder outputs.

FUNCTION TABLE

INPUTS			OUTPUTS			
ENABLE G	SELECT B A		Y ₀	Y ₁	Y ₂	Y ₃
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

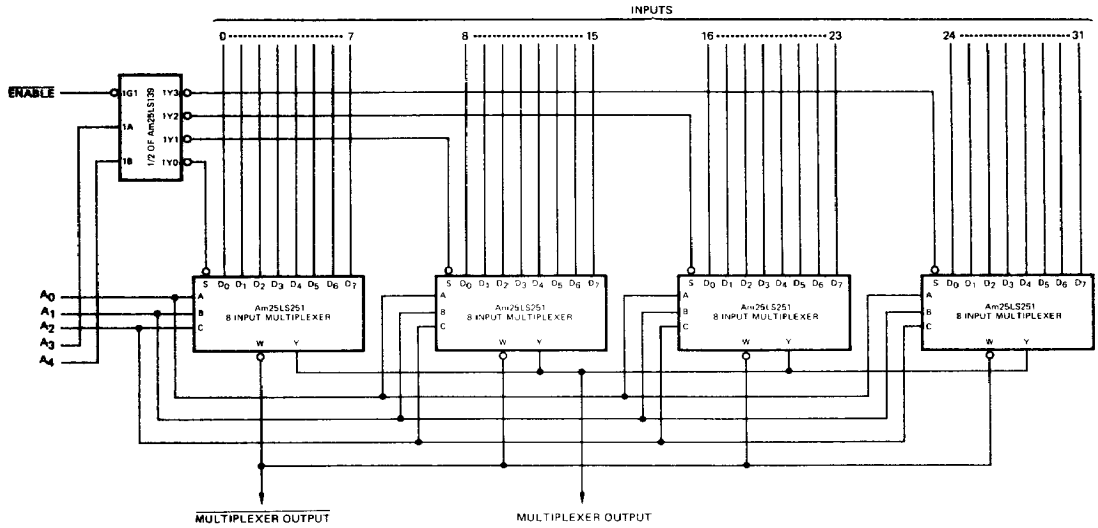
H = HIGH L = LOW X = Don't care

**Am25LS • Am54LS/74LS
LOW-POWER SCHOTTKY INPUT/OUTPUT
CURRENT INTERFACE CONDITIONS**

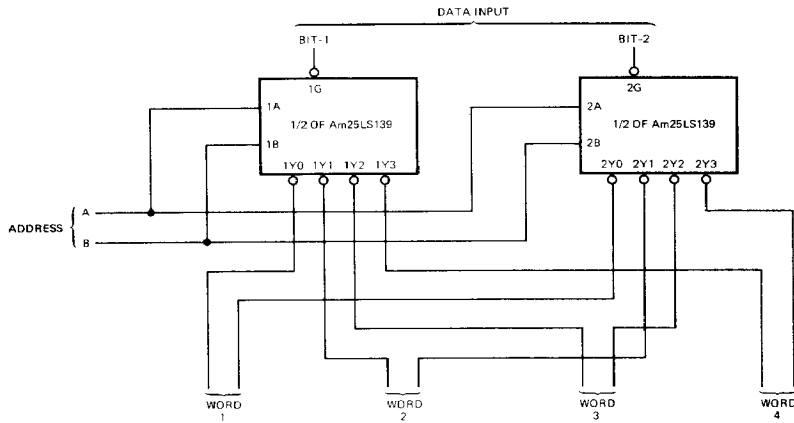


Note: Actual current flow direction shown.

APPLICATIONS

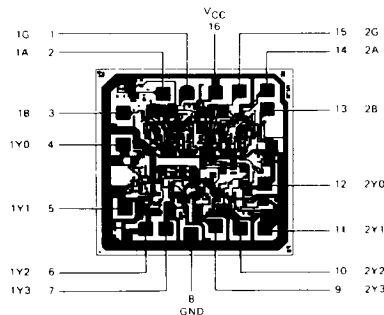


32-INPUT DEMULTIPLEXER



DATA ROUTING USING ONE Am25LS139 AS A DEMULTIPLEXER FOR TWO BITS

Metallization and Pad Layout



DIE SIZE 0.065" X 0.065"