

Am25LS138 • Am54LS/74LS138

3-Line To 8-Line Decoder/Demultiplexer

DISTINCTIVE CHARACTERISTICS

- Inverting and non-inverting enable inputs
- 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

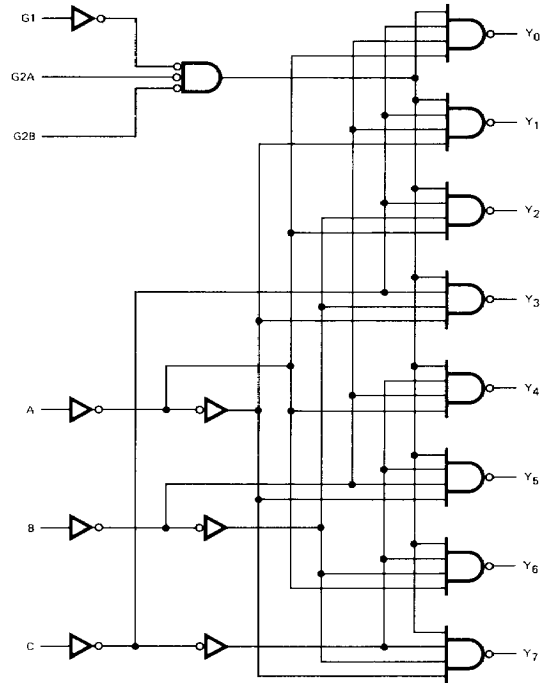
FUNCTIONAL DESCRIPTION

The Am25LS138 is a 3-line to 8-line decoder/demultiplexer fabricated using advanced Low-Power Schottky technology. The decoder has three buffered select inputs A, B and C that are decoded to one of eight Y outputs.

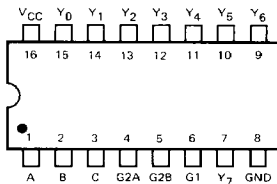
One active-HIGH and two active-LOW enables can be used for gating the decoder or can be used with incoming data for demultiplexing applications. When the enable input function is in the disable state, all eight Y outputs are HIGH regardless of the A, B and C select inputs.

The Am54LS/74LS138 is a standard performance version of the Am25LS138. See appropriate electrical characteristic tables for detailed Am25LS improvements.

LOGIC DIAGRAM

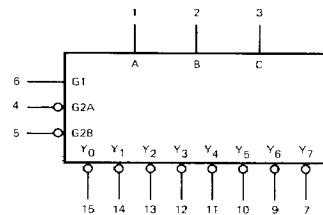


CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

Am25LS/54LS/74LS138

ELECTRICAL CHARACTERISTICS Am25LS138

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)		6.3	10	mA	

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			COM'L	2.7	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	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		-85	mA	
I_{CC}	Power Supply Current	$V_{CC} = \text{MAX.}$ (Note 4)		6.3	10	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. 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	30mA
DC Input Current	-30mA to +5.0mA

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}	Two Level Delay Select to Output		10	15		13	20	ns	C _L = 15pF R _L = 2.0kΩ
t _{PHL}			14	21		27	41		
t _{PLH}	Three Level Delay Select to Output		15	23		18	27		
t _{PHL}			18	27		26	39		
t _{PLH}	G2A or G2B to Output		10	15		12	18		
t _{PHL}			15	23		21	32		
t _{PLH}	G1 to Output		12	18		17	26		
t _{PHL}			18	27		25	38		

**Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE***

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$			
		$V_{CC} = 5.0\text{V} \pm 5\%$		$V_{CC} = 5.0\text{V} \pm 10\%$			
t _{PLH}	Two Level Delay Select to Output		24		27	ns	C _L = 50pF R _L = 2.0kΩ
t _{PHL}			31		36		
t _{PLH}	Three Level Delay Select to Output		34		39		
t _{PHL}			39		45		
t _{PLH}	G2A or G2B to Output		24		27		
t _{PHL}			34		39		
t _{PLH}	G1 to Output		27		32		
t _{PHL}			39		45		

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

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DEFINITION OF FUNCTIONAL TERMS

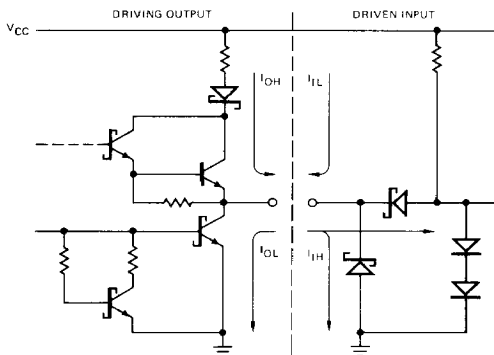
A, B, C Select. The three select inputs to the decoder.

G1 The active-HIGH enable input. A LOW on the G1 input forces all Y outputs HIGH regardless of any other inputs.

G2A, G2B The active-LOW enable input. A HIGH on either the G2A or G2B input forces all Y outputs HIGH regardless of any other inputs.

Y₀, Y₁, Y₂, Y₃, Y₄, Y₅, Y₆, Y₇ The eight decoder outputs.

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



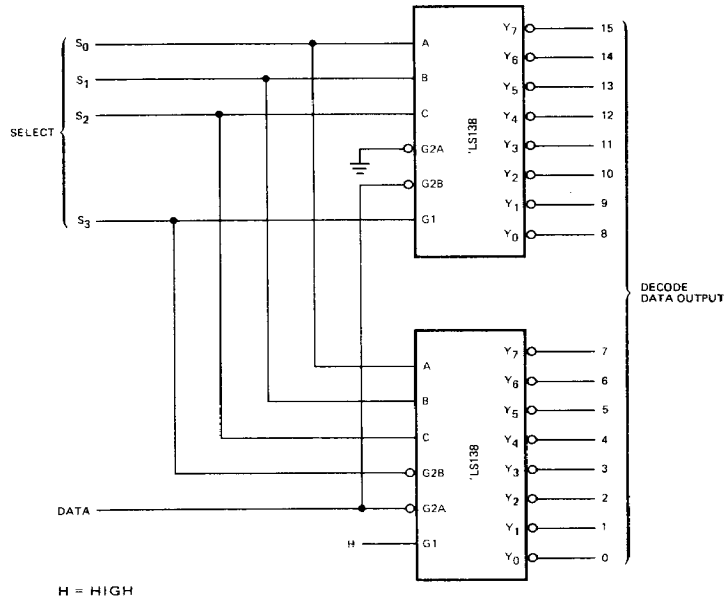
Note: Actual current flow direction shown.

FUNCTION TABLE

G1	Inputs		Outputs										
	Enable G2A	Select G2B	C	B	A	Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇
L	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	H	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	L	H	H	H	H	H
H	L	L	L	H	L	H	H	H	L	H	H	H	H
H	L	L	L	H	H	L	H	H	H	L	H	H	H
H	L	L	L	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H

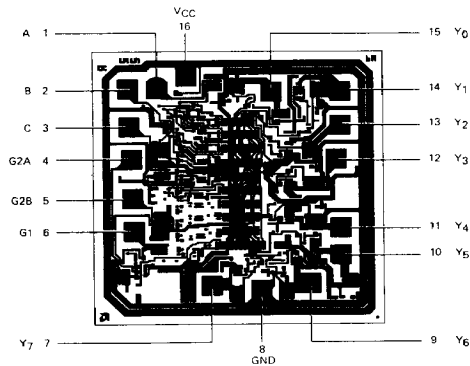
H = HIGH L = LOW X = Don't care

APPLICATION



ONE-OF-SIXTEEN DEMULTIPLEXER

Metallization and Pad Layout



DIE SIZE 0.065" X 0.065"