

Am54S/74S139 • Am93S21

Dual 2-Line to 4-Line Decoder/Demultiplexer

Distinctive Characteristics

- Advanced Schottky technology
- 7.5ns typical propagation delay

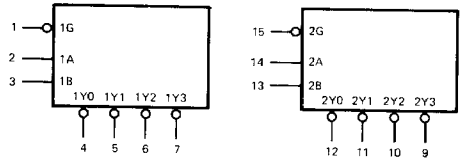
- Two independent decoders/demultiplexers
- 100% reliability assurance testing in compliance with MIL-STD-883.

FUNCTIONAL DESCRIPTION

The Am54S/74S139 and Am93S21 are dual 2-line to 4-line decoder/demultiplexer units fabricated using advanced Schottky technology. Each decoder has two buffered select inputs A and B which are decoded to one of four Y outputs.

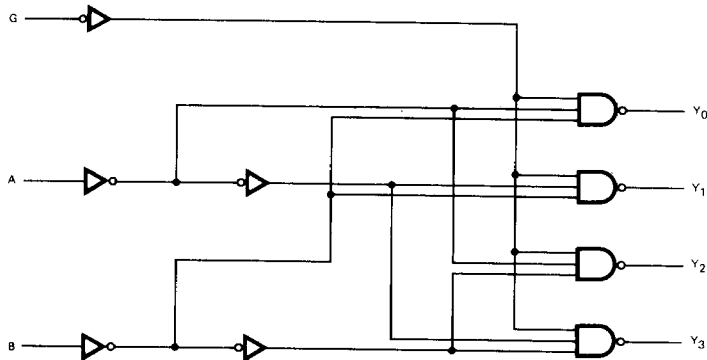
An active LOW enable can be used for gating or can be used as a data input for demultiplexing applications. When the enable is HIGH, all four Y outputs are HIGH, regardless of the A and B inputs.

LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

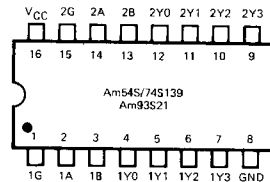
LOGIC DIAGRAM (One Decoder Shown)



ORDERING INFORMATION

Package Type	Temperature Range	Am54S/ 74S139 Order Number	Am93S21 Order Number
Molded DIP	0° C to +70° C	SN74S139N	93S21PC
Hermetic DIP	0° C to +70° C	SN74S139J	93S21DC
Dice	0° C to +70° C	SN74S139X	93S21XC
Hermetic DIP	-55° C to +125° C	SN54S139J	93S21DM
Hermetic Flat Pak	-55° C to +125° C	SN54S139W	93S21FM
Dice	-55° C to +125° C	SN54S139X	93S21XM

CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

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 V
DC Voltage Applied to Outputs for HIGH Output State	-5.0V to +V _{CC} max.
DC Input Voltage	-0.5 V to +5.5 V
DC Output Current, Into Outputs	30 mA
DC Input Current	-30 mA to +5.0 mA

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (Unless Otherwise Noted)

Am74S139, Am93S21XC	T _A = 0°C to +70°C	V _{CC} = 5.0V ± 5% (COM'L)	MIN. = 4.75V	MAX. = 5.25V
Am54S139, Am93S21XM	T _A = -55°C to +125°C	V _{CC} = 5.0V ± 10% (MIL)	MIN. = 4.5V	MAX. = 5.5V

Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units
V _{OH}	Output HIGH Voltage	V _{CC} = MIN., I _{OH} = -1mA V _{IN} = V _{IH} or V _{IL}	MIL 2.5 COM'L 2.7	3.4 3.4		Volts
V _{OL}	Output LOW Voltage	V _{CC} = MIN., I _{OL} = 20mA V _{IN} = V _{IH} or V _{IL}			0.5	Volts
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			0.8	Volts
V _I	Input Clamp Voltage	V _{CC} = MIN., I _I = -18mA			-1.2	Volts
I _{IL} (Note 3)	Unit Load Input LOW Current	V _{CC} = MAX., V _{IN} = 0.5 V			-2	mA
I _{IH} (Note 3)	Unit Load Input HIGH Current	V _{CC} = MAX., V _{IN} = 2.7 V			50	μA
I _I	Input HIGH Current	V _{CC} = MAX., V _{IN} = 5.5 V			1.0	mA
I _{SC}	Output Short Circuit Current (Note 4)	V _{CC} = MAX., V _{OUT} = 0.0 V	-40		-100	mA
I _{CC}	Power Supply Current	V _{CC} = MAX. (Note 5)		60	90	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} = 5.0V, 25°C ambient and maximum loading.
3. Actual input currents = Unit Load Current X Input Load Factor (See Loading Rules).
4. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.
5. I_{CC} is measured with all outputs enabled and open.

Switching Characteristics (T_A = +25°C)

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t _{PLH}	Select to Output, 2 Levels of Delay	V _{CC} = 5.0V, R _L = 280Ω, C _L = 15pF		5	7.5	ns
t _{PHL}				6.5	10	
t _{PLH}	Select to Output, 3 Levels of Delay			7	12	ns
t _{PHL}				8	12	
t _{PLH}	Enable to Output, 2 Levels of Delay			5	8	ns
t _{PHL}				6.5	10	

FUNCTION TABLE

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

DEFINITION OF FUNCTIONAL TERMS

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

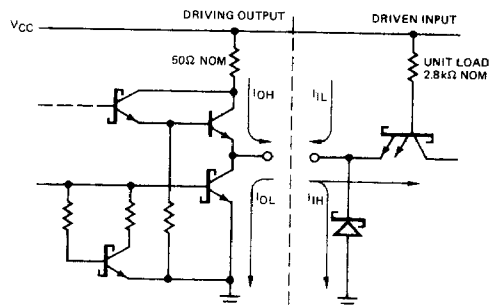
G Enable. The enable input to the decoder. A HIGH input forces all four Y outputs HIGH regardless of the A and B inputs.

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

LOADING RULES (In Unit Loads)

Input/Output	Pin No.'s	Unit Load	Fan-out	
			Output HIGH	Output LOW
1G	1	1	—	—
1A	2	1	—	—
1B	3	1	—	—
1Y0	4	—	20	10
1Y1	5	—	20	10
1Y2	6	—	20	10
1Y3	7	—	20	10
GND	8	—	—	—
2Y3	9	—	20	10
2Y2	10	—	20	10
2Y1	11	—	20	10
2Y0	12	—	20	10
2B	13	1	—	—
2A	14	1	—	—
2G	15	1	—	—
V _{CC}	16	—	—	—

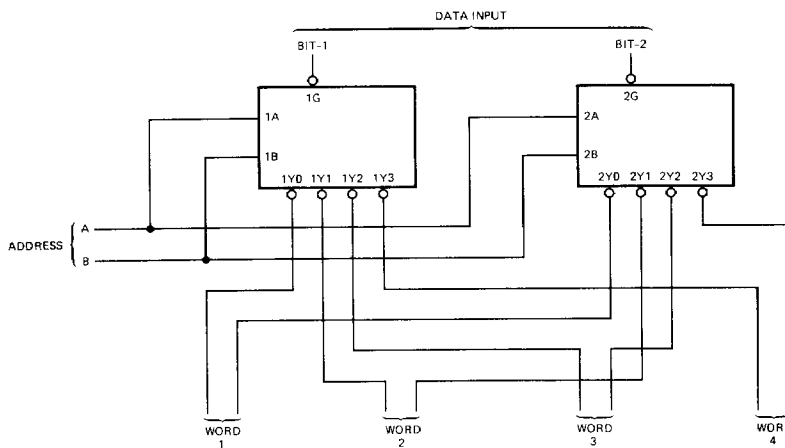
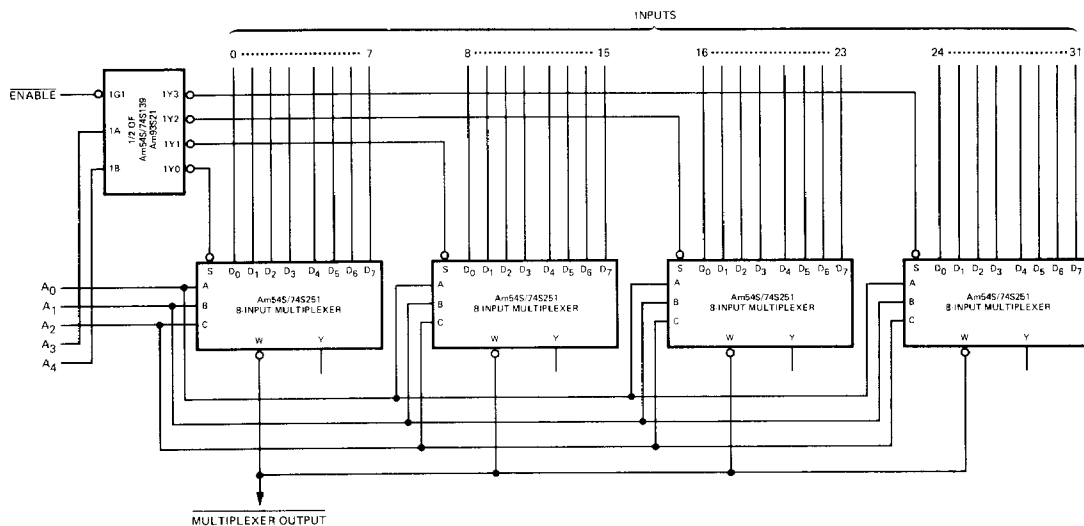
A Schottky TTL Unit Load is defined as 50μA measured at 2.7V HIGH and -2.0mA measured at 0.5V LOW.

SCHOTTKY INPUT/OUTPUT
CURRENT INTERFACE CONDITIONS

Note: Actual current flow direction shown.

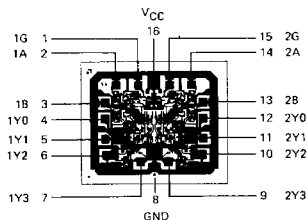
APPLICATIONS

32-Input Multiplexer



Data routing using one Am54S/74S139 as a demultiplexer for two bits.

Metallization and Pad Layout



DIE SIZE 0.073" X 0.060"