

74LS139, S139

Decoders/Demultiplexers

Dual 1-of-4 Decoder/Demultiplexer
Product Specification

Logic Products

FEATURES

- Demultiplexing capability
- Two independent 1-of-4 decoders
- Multifunction capability
- Replaces 9321 and 93L21 for higher performance

DESCRIPTION

The '139 is a high-speed, dual 1-of-4 decoder/demultiplexer. This device has two independent decoders, each accepting two binary weighted inputs (A_0 , A_1) and providing four mutually exclusive active LOW outputs ($\bar{0}$ - $\bar{3}$). Each decoder has an active LOW Enable ($\bar{E}$). When $\bar{E}$ is HIGH, every output is forced HIGH. The Enable can be used as the Data input for a 1-of-4 demultiplexer application.

TYPE	TYPICAL PROPAGATION DELAY (ENABLE AT 2 LOGIC LEVELS)	TYPICAL SUPPLY CURRENT (TOTAL)
74LS139	19ns	6.8mA
74S139	6ns	60mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N74S139N, N74LS139N
Plastic SO	N74LS139D, N74S139D

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

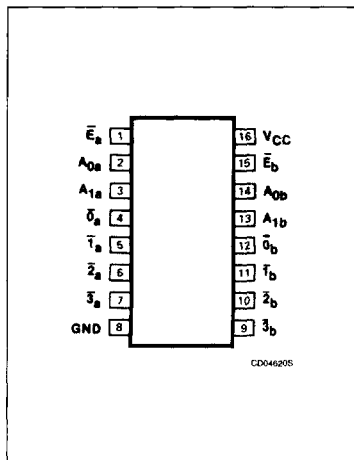
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74S	74LS
All	Inputs	1Sul	1LSul
All	Outputs	10Sul	10LSul

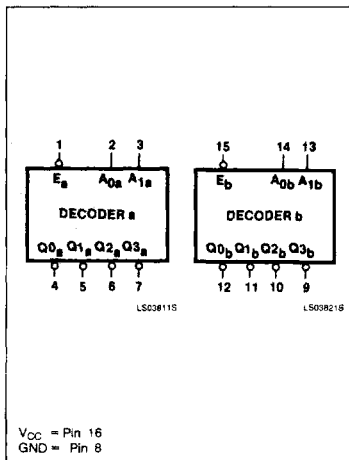
NOTE:

A 74S unit load (Sul) is $50\mu A$ I_{IH} and $\sim 2.0mA$ I_{IL} , and a 74LS unit load (LSul) is $20\mu A$ I_{IH} and $\sim 0.4mA$ I_{IL} .

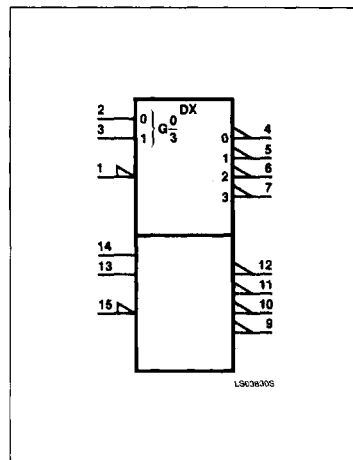
PIN CONFIGURATION



LOGIC SYMBOL



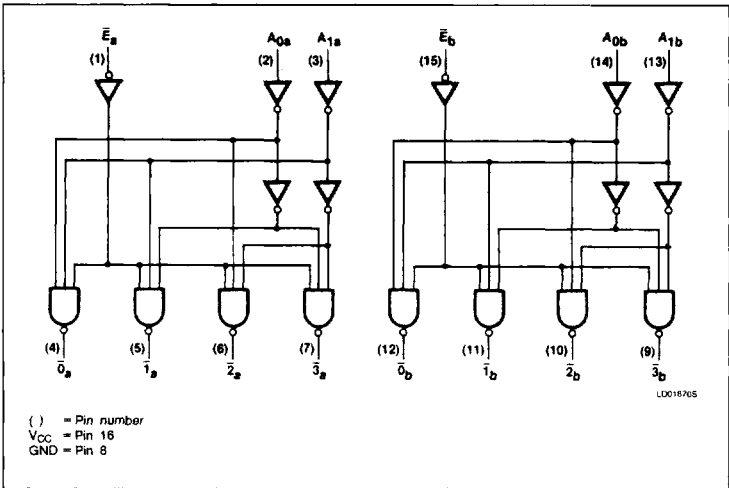
LOGIC SYMBOL (EEE/IEC)



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74LS139, S139

LOGIC DIAGRAM



FUNCTION TABLE

INPUTS			OUTPUTS			
$\bar{E}$	A_0	A_1	$\bar{0}$	$\bar{1}$	$\bar{2}$	$\bar{3}$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H = HIGH voltage level
L = LOW voltage level

ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74LS	74S	UNIT
V_{CC}	Supply voltage	7.0	7.0	V
V_{IN}	Input voltage	-0.5 to +7.0	-0.5 to +5.5	V
I_{IN}	Input current	-30 to +1	-30 to +5	mA
V_{OUT}	Voltage applied to output in HIGH output state	-0.5 to + V_{CC}	-0.5 to + V_{CC}	V
T_A	Operating free-air temperature range	0 to 70		°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER		74LS			74S			UNIT
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply voltage	4.75	5.0	5.25	4.75	5.0	5.25	V
V_{IH}	HIGH-level input voltage	2.0			2.0			V
V_{IL}	LOW-level input voltage			+0.8			+0.8	V
I_{IK}	Input clamp current			-18			-18	mA
I_{OH}	HIGH-level output current			-400			-1000	μA
I_{OL}	LOW-level output current			8			20	mA
T_A	Operating free-air temperature	0		70	0		70	°C

Decoders/Demultiplexers

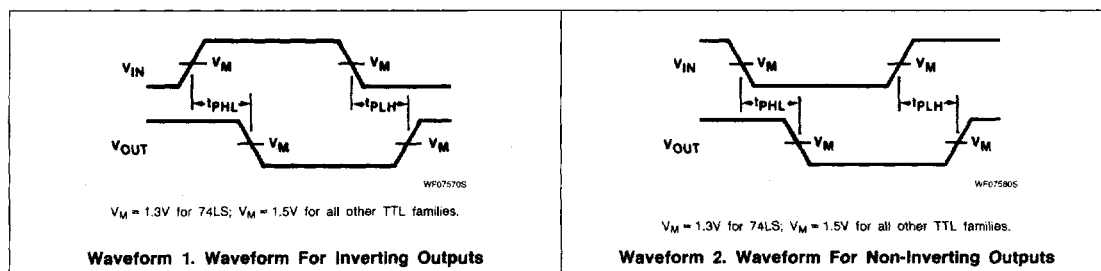
74LS139, S139

DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹	74LS139			74S139			UNIT
		Min	Typ ²	Max	Min	Typ ²	Max	
V _{OH} HIGH-level output voltage	V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OH} = MAX	2.7	3.4		2.7	3.4		V
V _{OL} LOW-level output voltage	V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OL} = MAX		0.35	0.5			0.5	V
	I _{OL} = 4mA (74LS)		0.25	0.4				V
V _{IK} Input clamp voltage	V _{CC} = MIN, I _I = I _{IK}			-1.5			-1.2	V
I _I Input current at maximum input voltage	V _{CC} = MAX						1.0	mA
								mA
I _{IH} HIGH-level input current	V _{CC} = MAX, V _I = 2.7V			20			50	μA
I _{IL} LOW-level input current	V _{CC} = MAX			-0.4				mA
							-2	mA
I _{OS} Short-circuit output current ³	V _{CC} = MAX	-15		-100	-40		-100	mA
I _{CC} Supply current ⁴ (total)	V _{CC} = MAX		6.8	11		60	90	mA

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_A = 25°C.
- I_{OS} is tested with V_{OUT} = +0.5V and V_{CC} = V_{CC} MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
- To measure I_{CC}, outputs must be enabled and open.

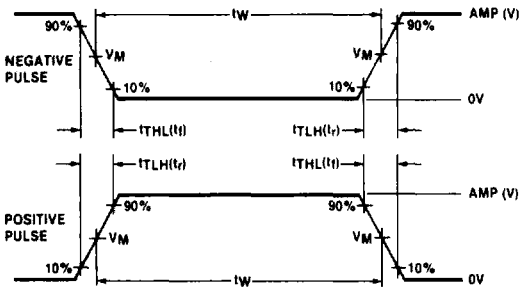
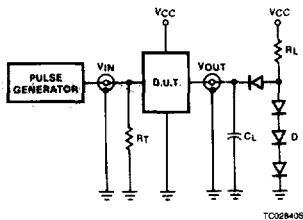
AC WAVEFORMS**AC ELECTRICAL CHARACTERISTICS** T_A = 25°C, V_{CC} = 5.0V

PARAMETER		TEST CONDITIONS	74LS		74S		UNIT
			C _L = 15pF, R _L = 2kΩ		C _L = 15pF, R _L = 280Ω		
			Min	Max	Min	Max	
t _{PLH}	Propagation delay	Waveform 2		20	7.5	ns	
t _{PHL}	Address to output	2 logic levels		33	10		
t _{PLH}	Propagation delay	Waveform 1		29	12	ns	
t _{PHL}	Address to output	3 logic levels		38	12		
t _{PLH}	Propagation delay	Waveform 2		24	8	ns	
t _{PHL}	Enable to output	2 logic levels		32	10		

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TEST CIRCUITS AND WAVEFORMS



VM = 1.3V for 74LS; VM = 1.5V for all other TTL families.

Test Circuit For 74 Totem-Pole Outputs

DEFINITIONS

RL = Load resistor to VCC; see AC CHARACTERISTICS for value.
CL = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
RT = Termination resistance should be equal to ZOUT of Pulse Generators.
D = Diodes are 1N916, 1N3064, or equivalent.
tTLH, tTHL Values should be less than or equal to the table entries.

Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	tTLH	tTHL
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns