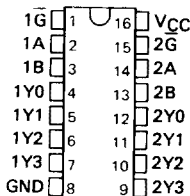


TYPES SN54LS139A, SN54S139, SN74LS139A, SN74S139 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

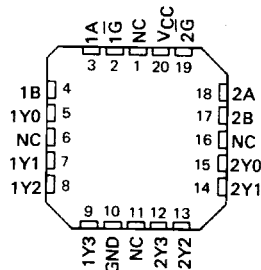
REVISED APRIL 1985

- **Designed Specifically for High-Speed: Memory Decoders Data Transmission Systems**
- **Two Fully Independent 2-to-4-Line Decoders/Demultiplexers**
- **Schottky Clamped for High Performance**

SN54LS139A, SN54S139 ... J OR W PACKAGE
SN74LS139A, SN74S139 ... D, J OR N PACKAGE
(TOP VIEW)



SN54LS139A, SN54S139 ... FK PACKAGE
SN74LS139A, SN74S139 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection

description

These Schottky-clamped TTL MSI circuits are designed to be used in high-performance memory decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit the delay times of these decoders and the enable time of the memory are usually less than the typical access time of the memory. This means that the effective system delay introduced by the Schottky-clamped system decoder is negligible.

The circuit comprises two individual two-line to four-line decoders in a single package. The active-low enable input can be used as a data line in demultiplexing applications.

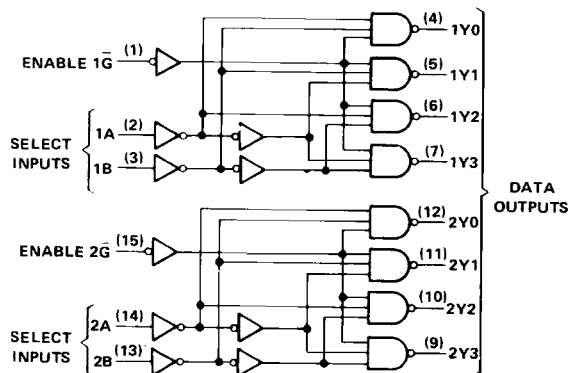
All of these decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit. All inputs are clamped with high-performance Schottky diodes to suppress line-ringing and to simplify system design. The SN54LS139A and SN54S139 are characterized for operation range of -55°C to 125°C. The SN74LS139A and SN74S139 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

INPUTS		OUTPUTS			
ENABLE G	SELECT B A	Y0	Y1	Y2	Y3
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 level, L = low level, X = irrelevant

logic diagram



Pin numbers shown on logic notation are for D, J or N packages.

PRODUCTION DATA

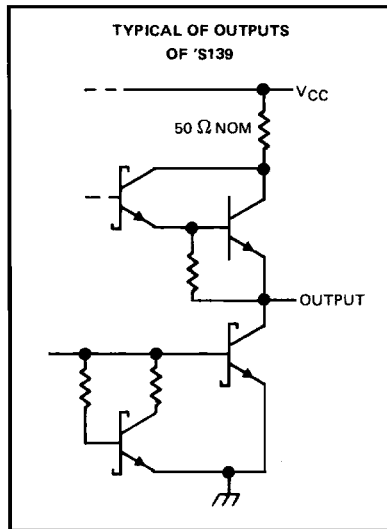
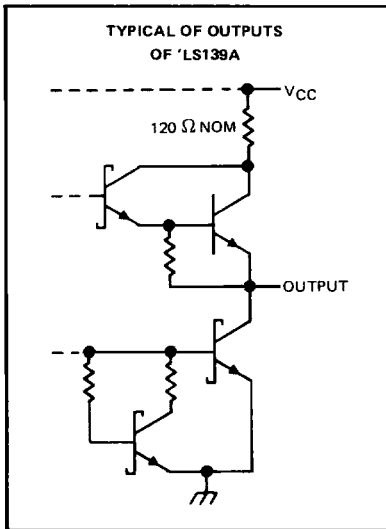
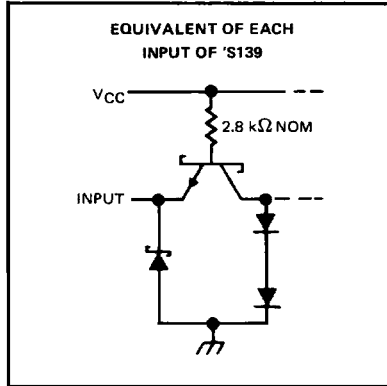
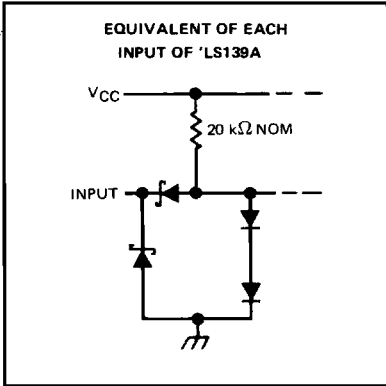
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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TYPES SN54LS139A, SN54S139, SN74LS139A, SN74S139 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: 'LS139A, 'LS139	7 V
'S139	5.5 V
Operating free-air temperature range: SN54LS139A, SN54S139	-55°C to 125°C
SN74LS139A, SN54S139	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

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TTL DEVICES

TYPES SN54LS139A, SN74LS139A

DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

recommended operating conditions

	SN54LS139A			SN74LS139A			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage	0.7			0.8			V
I _{OH} High-level output current	-0.4			-0.4			mA
I _{OL} Low-level output current	4			8			mA
T _A Operating free-air temperature	-55 125			0 70			°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS †	SN54LS139A		SN74LS139A		UNIT
		MIN	TYP ‡	MAX	MIN	
V _{IK}	V _{CC} = MIN, I _I = -18 mA	-1.5		-1.5		V
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OH} = -0.4 mA	2.5	3.4	2.7	3.4	V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OL} = 4 mA	0.25	0.4	0.25	0.4	V
	I _{OL} = 8 mA			0.35	0.5	
I _I	V _{CC} = MAX, V _I = 7 V	0.1		0.1		mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V	20		20		μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V	-0.4		-0.4		mA
I _{OS} §	V _{CC} = MAX	-20	-100	-20	-100	mA
I _{CC}	V _{CC} = MAX, Outputs enabled and open	6.8	11	6.8	11	mA

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER †	FROM (INPUT)	TO (OUTPUT)	LEVELS OF DELAY	TEST CONDITIONS	SN54LS139A SN74LS139A			UNIT
					MIN	TYP	MAX	
t _{PLH}	Binary Select	Any	2	R _L = 2 kΩ, C _L = 15 pF	13	20	ns	
t _{PHL}					22	33	ns	
t _{PLH}			18		29	ns		
t _{PHL}	Enable	Any	3		25	38	ns	
t _{PLH}					16	24	ns	
t _{PHL}			21		32	ns		

† t_{PLH} = propagation delay time, low to high level output; t_{PHL} = propagation delay time, high-to-low level output.
NOTE 2: See General Information Section for load circuits and voltage waveforms.

TYPES SN54S139, SN74S139 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

recommended operating conditions

	SN54S139			SN74S139			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage				0.8			V
I _{OH} High-level output current				-1			mA
I _{OL} Low-level output current				20			mA
T _A Operating free-air temperature	-55			125			°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		SN54S139		UNIT	
			MIN	TYP‡		MAX
V _{IK}	V _{CC} = MIN, I _I = 18 mA				-1.2	
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = -1 mA	SN54S'	2.5	3.4	V	
		SN74S'	2.7	3.4	V	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 20 mA			0.5	V	
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			50	μA	
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			-2	mA	
I _{OS} §	V _{CC} = MAX			-40	-100	mA
I _{CC}	V _{CC} = MAX, Outputs enabled and open	SN54S'	60	74	mA	
		SN74S'	75	90		

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at V_{CC} = 5 V, T_A = 25°C.

§Not more than one output should be shorted at a time, and duration of the short circuit test should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	LEVELS OF DELAY	TEST CONDITIONS	SN54S139			UNIT
					MIN	TYP	MAX	
t _{PLH}	Binary Select	Any	2	R _L = 280 Ω, C _L = 15 pF	5	7.5	ns	
t _{PHL}					6.5	10	ns	
t _{PLH}			3		7	12	ns	
t _{PHL}					8	12	ns	
t _{PLH}	Enable	Any	2		5	8	ns	
t _{PHL}					6.5	10	ns	

† t_{PLH} = propagation delay time, low to high-level output

t_{PHL} = propagation delay time, high to low-level output

NOTE 2: See General Information Section for load circuits and voltage waveforms.

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