

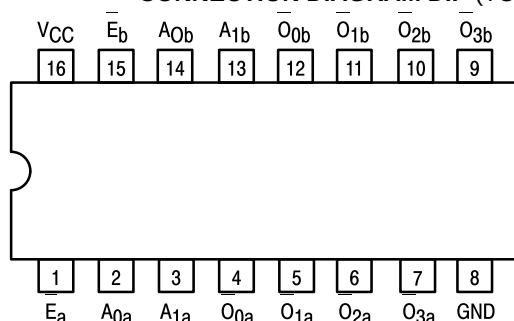


DUAL 1-OF-4 DECODER/ DEMULTIPLEXER

The LSTTL/MSI SN54/74LS139 is a high speed Dual 1-of-4 Decoder/De-multiplexer. The device has two independent decoders, each accepting two inputs and providing four mutually exclusive active LOW Outputs. Each decoder has an active LOW Enable input which can be used as a data input for a 4-output demultiplexer. Each half of the LS139 can be used as a function generator providing all four minterms of two variables. The LS139 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

- Schottky Process for High Speed
- Multifunction Capability
- Two Completely Independent 1-of-4 Decoders
- Active Low Mutually Exclusive Outputs
- Input Clamp Diodes Limit High Speed Termination Effects
- ESD > 3500 Volts

CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE:
The Flatpak version
has the same pinouts
(Connection Diagram) as
the Dual In-Line Package.

PIN NAMES

A₀, A₁ Address Inputs
E Enable (Active LOW) Input
O₀–O₃ Active LOW Outputs (Note b)

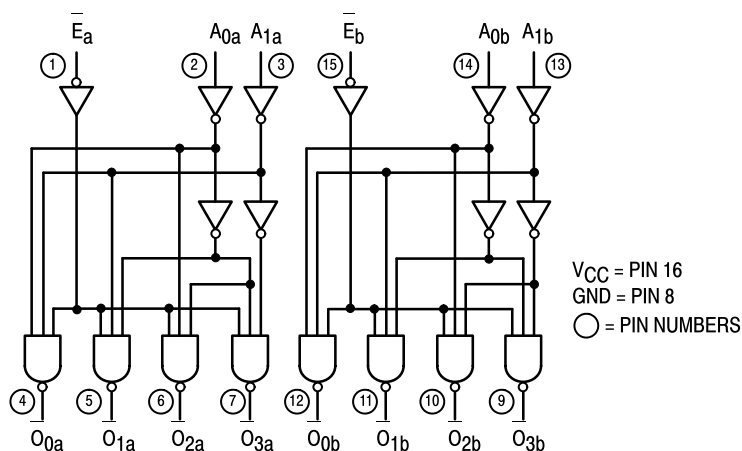
LOADING (Note a)

HIGH	LOW
0.5 U.L.	0.25 U.L.
0.5 U.L.	0.25 U.L.
10 U.L.	5 (2.5) U.L.

NOTES:

- a) 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.
b) The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

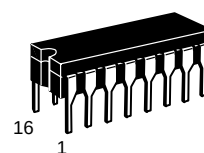
LOGIC DIAGRAM



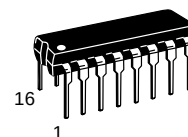
SN54/74LS139

DUAL 1-OF-4 DECODER/ DEMULTIPLEXER

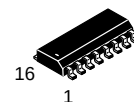
LOW POWER SCHOTTKY



J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08

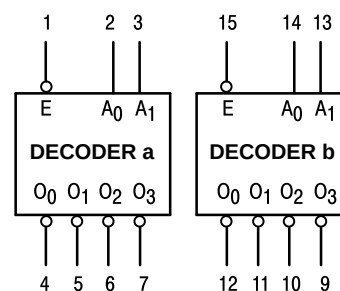


D SUFFIX
SOIC
CASE 751B-03

ORDERING INFORMATION

SN54LSXXXJ Ceramic
SN74LSXXXN Plastic
SN74LSXXXD SOIC

LOGIC SYMBOL



VCC = PIN 16
GND = PIN 8

SN54/74LS139

FUNCTIONAL DESCRIPTION

The LS139 is a high speed dual 1-of-4 decoder/demultiplexer fabricated with the Schottky barrier diode process. The device has two independent decoders, each of which accept two binary weighted inputs (A_0, A_1) and provide four mutually exclusive active LOW outputs (O_0-O_3). Each decoder has an active LOW Enable (E). When E is HIGH all outputs are forced HIGH. The enable can be used as the data input for a 4-output

demultiplexer application.

Each half of the LS139 generates all four minterms of two variables. These four minterms are useful in some applications, replacing multiple gate functions as shown in Fig. a, and thereby reducing the number of packages required in a logic network.

TRUTH TABLE

INPUTS			OUTPUTS			
E	A_0	A_1	O_0	O_1	O_2	O_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
X = Don't Care

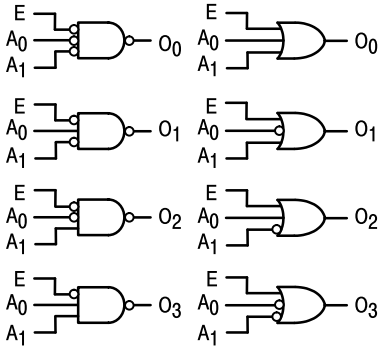


Figure a

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T_A	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
I_{OH}	Output Current — High	54, 74			-0.4	mA
I_{OL}	Output Current — Low	54 74			4.0 8.0	mA

SN54/74LS139

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits			Unit	Test Conditions
			Min	Typ	Max		
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs
		74			0.8		
V_{IK}	Input Clamp Diode Voltage			-0.65	-1.5	V	$V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$
V_{OH}	Output HIGH Voltage	54	2.5	3.5		V	$V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table
		74	2.7	3.5		V	
V_{OL}	Output LOW Voltage	54, 74		0.25	0.4	V	$I_{OL} = 4.0 \text{ mA}$ $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table
		74		0.35	0.5	V	$I_{OL} = 8.0 \text{ mA}$
I_{IH}	Input HIGH Current				20	μA	$V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$
					0.1	mA	$V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$
I_{IL}	Input LOW Current				-0.4	mA	$V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$
I_{OS}	Short Circuit Current (Note 1)		-20		-100	mA	$V_{CC} = \text{MAX}$
I_{CC}	Power Supply Current				11	mA	$V_{CC} = \text{MAX}$

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

Symbol	Parameter	Levels of Delay	Limits			Unit	Test Conditions
			Min	Typ	Max		
t_{PLH}	Propagation Delay Address to Output	2		13	20	ns	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$
t_{PHL}	Propagation Delay Address to Output	2		22	33	ns	
t_{PLH}	Propagation Delay Address to Output	3		18	29	ns	
t_{PHL}	Propagation Delay Address to Output	3		25	38	ns	
t_{PLH}	Propagation Delay Enable to Output	2		16	24	ns	
t_{PHL}	Propagation Delay Enable to Output	2		21	32	ns	

AC WAVEFORMS

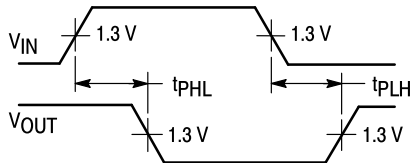


Figure 1

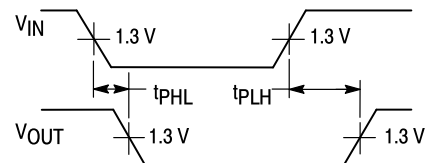
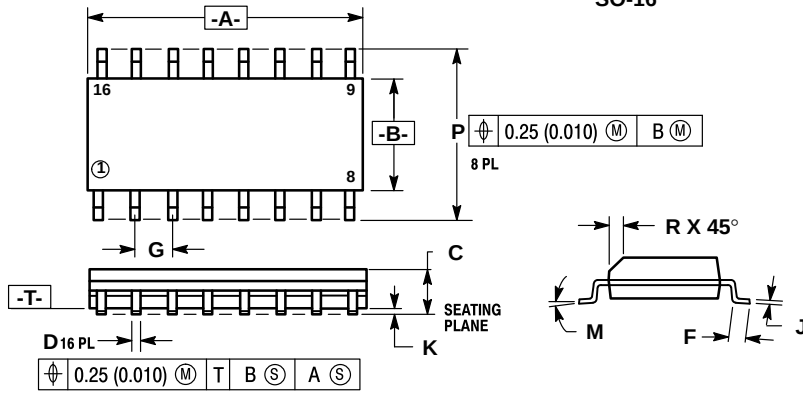


Figure 2

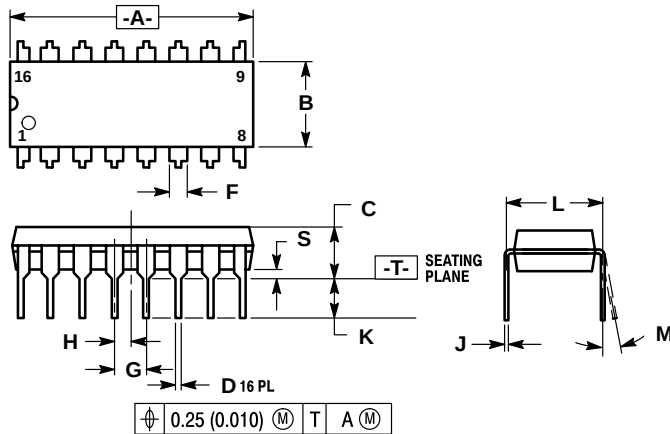
Case 751B-03 D Suffix
16-Pin Plastic
SO-16



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

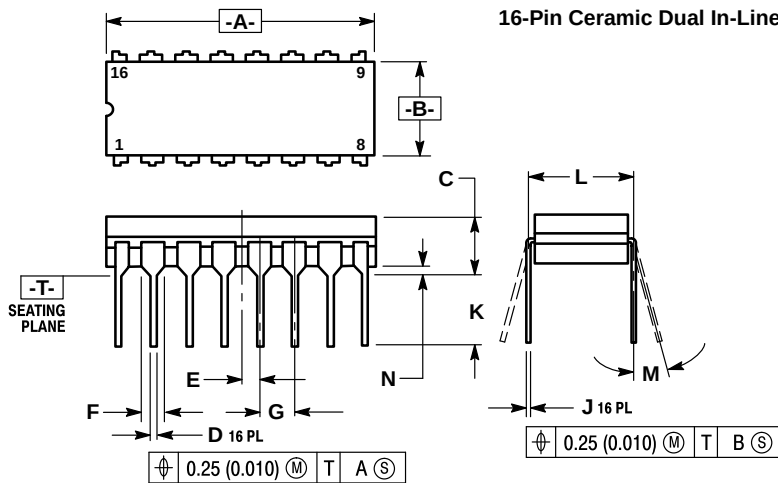
Case 648-08 N Suffix
16-Pin Plastic



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.
 6. 648-01 THRU -07 OBSOLETE, NEW STANDARD 648-08.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.80	19.55	0.740	0.770
B	6.35	6.85	0.250	0.270
C	3.69	4.44	0.145	0.175
D	0.39	0.53	0.015	0.021
F	1.02	1.77	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	1.27 BSC		0.050 BSC	
J	0.21	0.38	0.008	0.015
K	2.80	3.30	0.110	0.130
L	7.50	7.74	0.295	0.305
M	0°	10°	0°	10°
S	0.51	1.01	0.020	0.040

Case 620-09 J Suffix
16-Pin Ceramic Dual In-Line



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
 5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-09.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.05	19.55	0.750	0.770
B	6.10	7.36	0.240	0.290
C	—	4.19	—	0.165
D	0.39	0.53	0.015	0.021
E	1.27 BSC		0.050 BSC	
F	1.40	1.77	0.055	0.070
G	2.54 BSC		0.100 BSC	
J	0.23	0.27	0.009	0.011
K	—	5.08	—	0.200
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.39	0.88	0.015	0.035

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