

SN74LS139

Dual 1-of-4 Decoder/ Demultiplexer

The LSTTL/MSI SN74LS139 is a high speed Dual 1-of-4 Decoder/Demultiplexer. 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 ON Semiconductor 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

GUARANTEED OPERATING RANGES

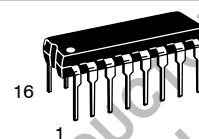
Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	4.75	5.0	5.25	V
T _A	Operating Ambient Temperature Range	0	25	70	°C
I _{OH}	Output Current – High			–0.4	mA
I _{OL}	Output Current – Low			8.0	mA



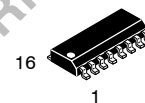
ON Semiconductor™

<http://onsemi.com>

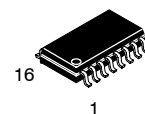
LOW POWER SCHOTTKY



PLASTIC
N SUFFIX
CASE 648



SOIC
D SUFFIX
CASE 751B



SOEIAJ
M SUFFIX
CASE 966

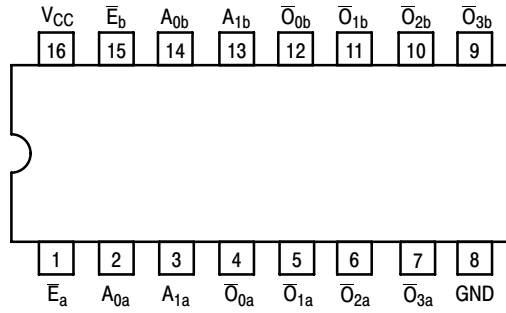
ORDERING INFORMATION

Device	Package	Shipping
SN74LS139N	16 Pin DIP	2000 Units/Box
SN74LS139D	SOIC–16	38 Units/Rail
SN74LS139DR2	SOIC–16	2500/Tape & Reel
SN74LS139M	SOEIAJ–16	See Note 1
SN74LS139MEL	SOEIAJ–16	See Note 1

1. For ordering information on the EIAJ version of the SOIC package, please contact your local ON Semiconductor representative.

SN74LS139

CONNECTION DIAGRAM DIP (TOP VIEW)



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

PIN NAMES

A_0, A_1 Address Inputs
E Enable (Active LOW) Input
 $\bar{O}_0 - \bar{O}_3$ Active LOW Outputs

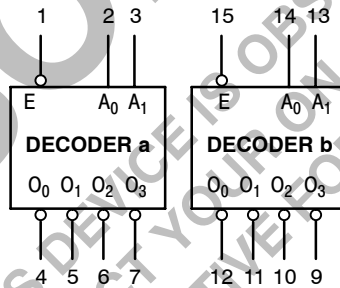
LOADING (Note a)

HIGH	LOW
0.5 U.L.	0.25 U.L.
0.5 U.L.	0.25 U.L.
10 U.L.	5 U.L.

NOTES:

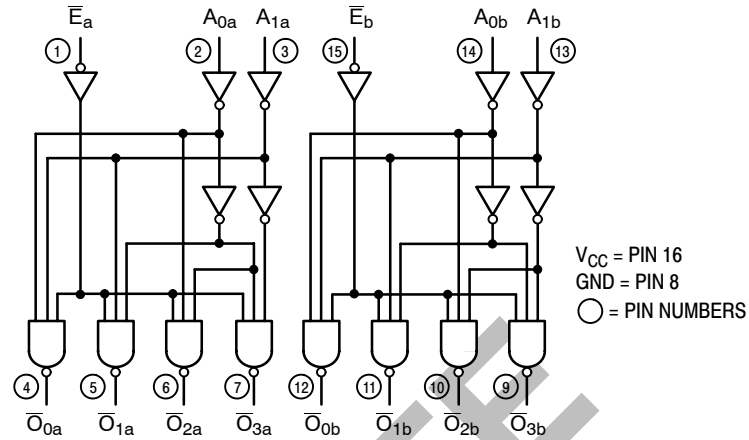
a) 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.

LOGIC SYMBOL



V_{CC} = PIN 16
GND = PIN 8

LOGIC DIAGRAM



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 ($\bar{O}_0$ – $\bar{O}_3$). Each decoder has an active LOW Enable ($\bar{E}$). 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			
$\bar{E}$	A_0	A_1	$\bar{O}_0$	$\bar{O}_1$	$\bar{O}_2$	$\bar{O}_3$
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

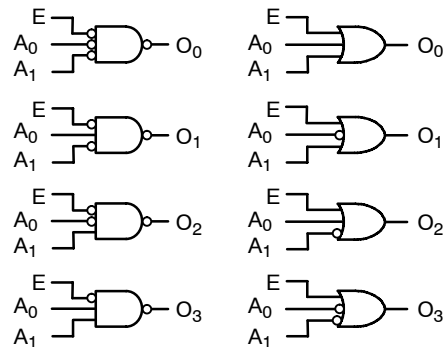


Figure a

SN74LS139

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			0.8	V	Guaranteed Input LOW Voltage for All Inputs
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	2.7	3.5		V	$V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table
V_{OL}	Output LOW Voltage		0.25	0.4	V	$I_{OL} = 4.0 \text{ mA}$
			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 2)	-20		-100	mA	$V_{CC} = \text{MAX}$
I_{CC}	Power Supply Current			11	mA	$V_{CC} = \text{MAX}$

2. 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} t_{PHL}	Propagation Delay Address to Output	2 2		13 22	20 33	ns	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$
t_{PLH} t_{PHL}	Propagation Delay Address to Output	3 3		18 25	29 38	ns	
t_{PLH} t_{PHL}	Propagation Delay Enable to Output	2 2		16 21	24 32	ns	

AC WAVEFORMS

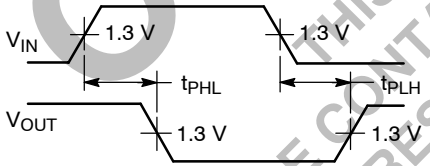


Figure 1.

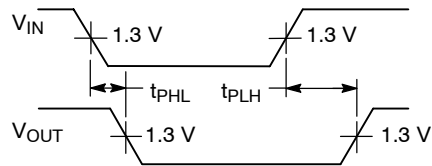
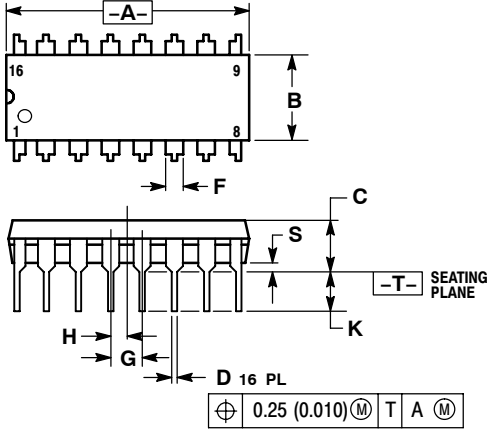


Figure 2.

SN74LS139

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 648-08
ISSUE R



NOTES:

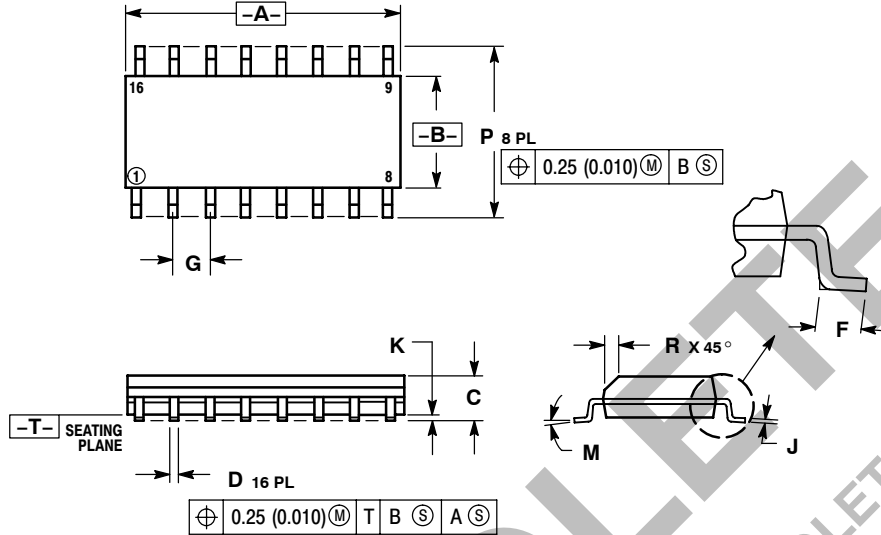
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

SN74LS139

PACKAGE DIMENSIONS

D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



NOTES:

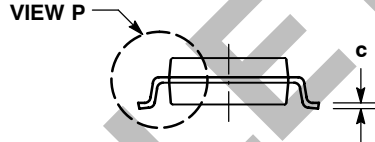
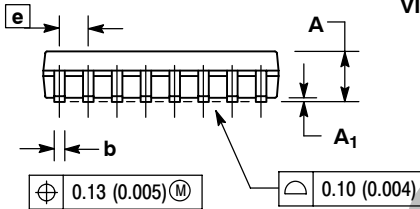
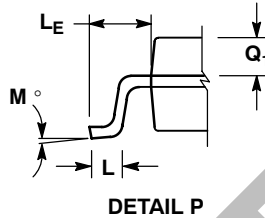
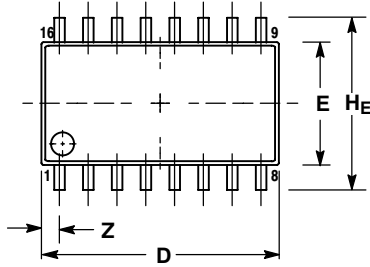
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

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

SN74LS139

PACKAGE DIMENSIONS

M SUFFIX SOEIAJ PACKAGE CASE 966-01 ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q ₁	0.70	0.90	0.028	0.035
Z	---	0.78	---	0.031

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative