

# SN74LS147, SN74LS148

## 10-Line-to-4-Line and 8-Line-to-3-Line Priority Encoders

The SN74LS147 and the SN74LS148 are Priority Encoders. They provide priority decoding of the inputs to ensure that only the highest order data line is encoded. Both devices have data inputs and outputs which are active at the low logic level.

The LS147 encodes nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition does not require an input condition because zero is encoded when all nine data lines are at a high logic level.

The LS148 encodes eight data lines to three-line (4-2-1) binary (octal). By providing cascading circuitry (Enable Input EI and Enable Output EO) octal expansion is allowed without needing external circuitry.

### GUARANTEED OPERATING RANGES

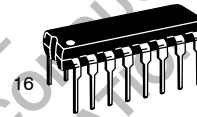
Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	4.75	5.0	5.25	V
T <sub>A</sub>	Operating Ambient Temperature Range	0	25	70	°C
I <sub>OH</sub>	Output Current - High			-0.4	mA
I <sub>OL</sub>	Output Current - Low			8.0	mA



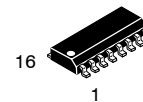
ON Semiconductor™

<http://onsemi.com>

LOW  
POWER  
SCHOTTKY



PLASTIC  
N SUFFIX  
CASE 648



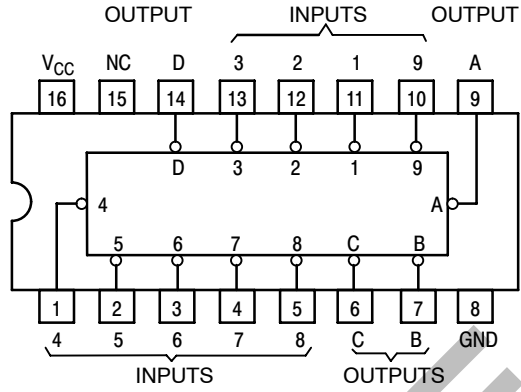
SOIC  
D SUFFIX  
CASE 751B

### ORDERING INFORMATION

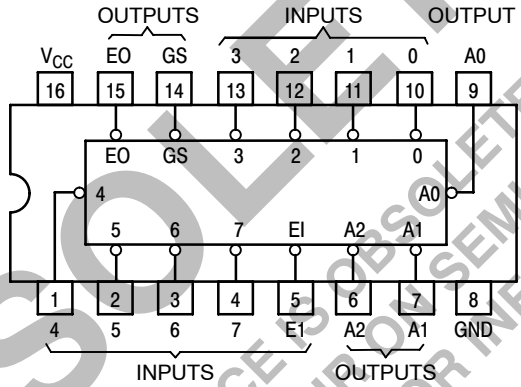
Device	Package	Shipping
SN74LS147N	16 Pin DIP	2000 Units/Box
SN74LS147D	SOIC-16	38 Units/Rail
SN74LS147DR2	SOIC-16	2500/Tape & Reel
SN74LS148N	16 Pin DIP	2000 Units/Box
SN74LS148D	SOIC-16	38 Units/Rail
SN74LS148DR2	SOIC-16	2500/Tape & Reel

# SN74LS147, SN74LS148

**SN74LS147**  
(TOP VIEW)



**SN74LS148**  
(TOP VIEW)



OBSOLETE  
THIS DEVICE IS OBSOLETE  
PLEASE CONTACT YOUR OBSOLETE SEMICONDUCTOR  
REPRESENTATIVE FOR INFORMATION

# SN74LS147, SN74LS148

**SN74LS147  
FUNCTION TABLE**

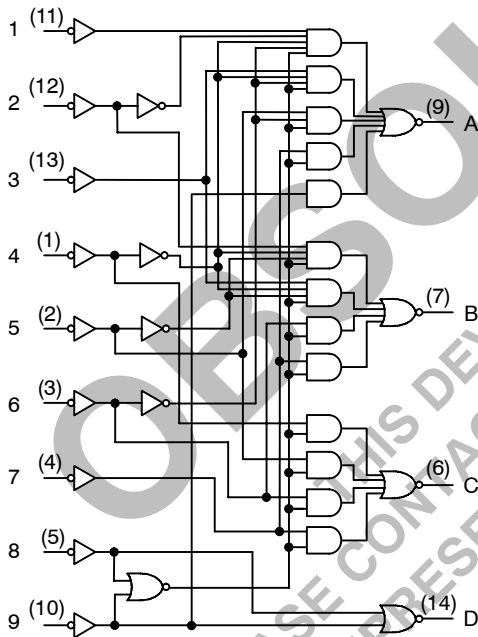
INPUTS									OUTPUTS			
1	2	3	4	5	6	7	8	9	D	C	B	A
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	L	H	H	H	H	H	L	L	H
X	X	X	L	H	H	H	H	H	H	L	H	L
X	X	L	H	H	H	H	H	H	H	H	L	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

H = HIGH Logic Level, L = LOW Logic Level, X = Irrelevant

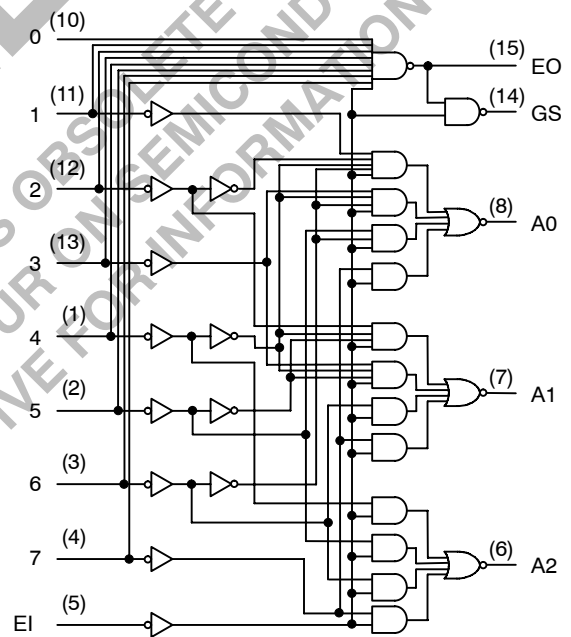
**SN74LS148  
FUNCTION TABLE**

INPUTS								OUTPUTS					
EI	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	X	L	H	L	L	H	L	H
L	X	X	X	X	L	H	H	L	H	H	L	L	H
L	X	X	X	L	H	H	H	H	L	H	H	L	H
L	X	X	L	H	H	H	H	H	H	L	L	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

## FUNCTIONAL BLOCK DIAGRAMS



**SN74LS147**



**SN74LS148**

## SN74LS147, SN74LS148

### DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
V <sub>IH</sub>	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage for All Inputs
V <sub>IL</sub>	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage for All Inputs
V <sub>IK</sub>	Input Clamp Diode Voltage		-0.65	-1.5	V	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	2.7	3.5		V	V <sub>CC</sub> = MIN, I <sub>OH</sub> = MAX, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table
V <sub>OL</sub>	Output LOW Voltage		0.25	0.4	V	I <sub>OL</sub> = 4.0 mA
			0.35	0.5	V	I <sub>OL</sub> = 8.0 mA
I <sub>IH</sub>	Input HIGH Current All Others Inputs 1-7 (LS148)			20 40	μA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V
	All Others Inputs 1-7 (LS148)			0.1 0.2	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V
I <sub>IL</sub>	Input LOW Current All Others Inputs 1-7 (LS148)			-0.4 -0.8	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V
I <sub>OS</sub>	Short Circuit Current (Note 1)	-20		-100	mA	V <sub>CC</sub> = MAX
I <sub>CCH</sub>	Power Supply Current Output HIGH			17	mA	V <sub>CC</sub> = MAX, All Inputs = 4.5 V
I <sub>CCL</sub>	Output LOW			20	mA	V <sub>CC</sub> = MAX, Inputs 7 & E1 = GND All Other Inputs = 4.5 V

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

## SN74LS147, SN74LS148

**AC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ )

### SN74LS147

Symbol	From (Input)	To (Output)	Waveform	Limits			Unit	Test Conditions
				Min	Typ	Max		
$t_{PLH}$	Any	Any	In-phase output		12	18	ns	$C_L = 15\text{ pF}$ , $R_L = 2.0\text{ k}\Omega$
$t_{PHL}$					12	18		
$t_{PLH}$	Any	Any	Out-of-phase output		21	33	ns	
$t_{PHL}$					15	23		

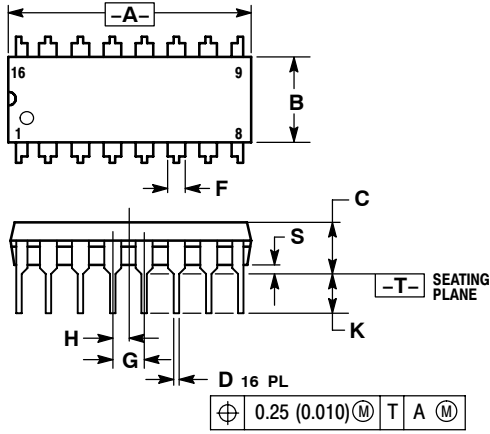
### SN74LS148

Symbol	From (Input)	To (Output)	Waveform	Limits			Unit	Test Conditions	
				Min	Typ	Max			
$t_{PLH}$	1 thru 7	A0, A1, or A2	In-phase output		14	18	ns	$C_L = 15\text{ pF}$ , $R_L = 2.0\text{ k}\Omega$	
$t_{PHL}$					15	25			
$t_{PLH}$	1 thru 7	A0, A1, or A2	Out-of-phase output		20	36	ns		
$t_{PHL}$					16	29			
$t_{PLH}$	0 thru 7	EO	Out-of-phase output		7.0	18	ns		
$t_{PHL}$					25	40			
$t_{PLH}$	0 thru 7	GS	In-phase output		35	55	ns		
$t_{PHL}$					9.0	21			
$t_{PLH}$	EI	A0, A1, or A2	In-phase output		16	25	ns		
$t_{PHL}$					12	25			
$t_{PLH}$	EI	GS	In-phase output		12	17	ns		
$t_{PHL}$					14	36			
$t_{PLH}$	EI	EO	In-phase output		12	21	ns		
$t_{PHL}$					28	40			
					30	45			(LS148)

# SN74LS147, SN74LS148

## 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

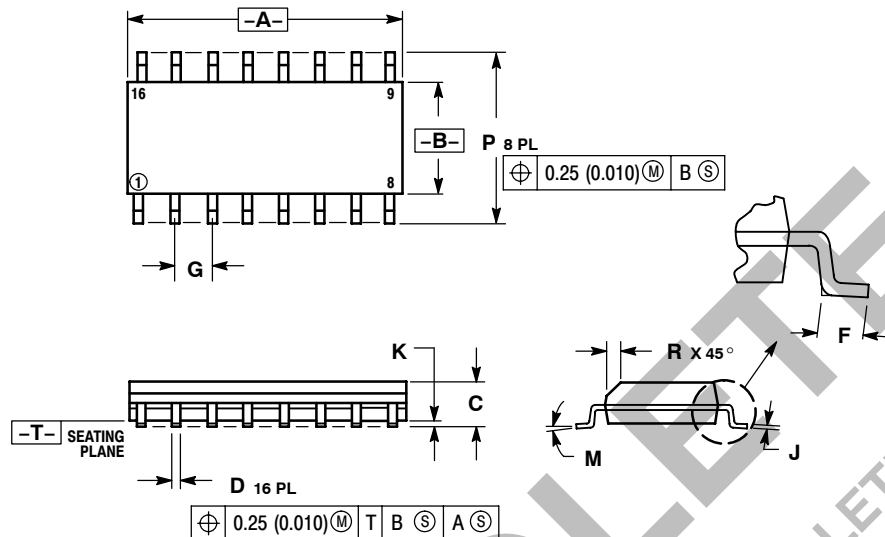
OBSOLETE

THIS DEVICE IS OBSOLETE  
 PLEASE CONTACT YOUR ON SEMICONDUCTOR  
 REPRESENTATIVE FOR INFORMATION

# SN74LS147, SN74LS148

## 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

**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](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

**SN74LS147/D**