

# HD74LS249 ● BCD-to-Seven-Segment Decoders/Drivers (with open collector outputs)

The HD74LS249 is 16-pin versions of the HD74LS49, respectively. Included in the HD74LS249 circuits is the full functional capability for lamp test and ripple blanking, which is not available in the HD74LS circuits. The HD74LS49 composes the  $\overline{L}$  and  $\overline{S}$  without tails and the HD74LS249 composes the  $\overline{L}$  and  $\overline{S}$  with tails. Composition of all other characters, including display patterns for BCD inputs above nine, is identical. The HD74LS249 features active-low outputs designed for driving indicators directly. All of the circuits have full ripple-blanking input/output controls and a lamp test input. Segment identification and resultant displays are shown below. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions. This circuit incorporates automatic leading and/or trailing-edge zero-blanking control (RBI and RBO).

Lamp test (LT) of this type may be performed at any time when the BI/RBO node is at a high level. This type contains an overriding blanking input (BI) which can be used to control the lamp intensity by pulsing or to inhibit the outputs.

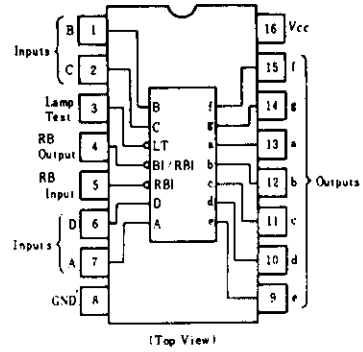
## ■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	7.0	V
Input voltage	$V_{IN}$	7.0	V
Output current (off-state)	$I_{O(off)}$	1	mA
Operating temperature range	$T_{opr}$	-20 ~ +75	°C
Storage temperature range	$T_{stg}$	-65 ~ +150	°C

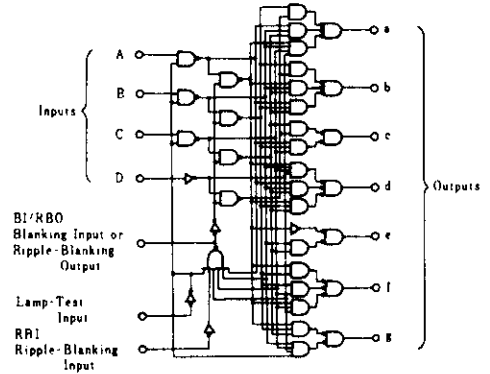
## ■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Output voltage	a~g	-	-	5.5	V
	BI/RBO	-	-	-50	$\mu$ A
Output current	a~g	-	-	8	mA
	BI/RBO	-	-	3.2	

## ■ PIN ARRANGEMENT



## ■ BLOCK DIAGRAM



## FUNCTION TABLE

Decimal or Function	Inputs						BI/RBO	Outputs							Note
	LT	RBI	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	H	H	H	H	H	H	L	
1	H	X	L	L	L	H	H	L	H	H	L	L	L	L	
2	H	X	L	L	H	L	H	H	H	L	H	H	L	H	
3	H	X	L	L	H	H	H	H	H	H	H	L	L	H	
4	H	X	L	H	L	L	H	L	H	H	L	L	H	H	
5	H	X	L	H	L	H	H	H	L	H	H	L	H	H	
6	H	X	L	H	H	L	H	H	L	H	H	H	H	H	
7	H	X	L	H	H	H	H	H	H	H	L	L	L	L	
8	H	X	H	L	L	L	H	H	H	H	H	H	H	H	
9	H	X	H	L	L	H	H	H	H	H	H	L	H	H	
10	H	X	H	L	H	L	H	L	L	L	H	H	L	H	
11	H	X	H	L	H	H	H	L	L	H	H	L	L	H	
12	H	X	H	H	L	L	H	L	H	L	L	L	H	H	
13	H	X	H	H	L	H	H	H	L	L	H	L	H	H	
14	H	X	H	H	H	L	H	L	L	L	H	H	H	H	
15	H	X	H	H	H	H	H	L	L	L	L	L	L	L	
BI	X	X	X	X	X	X	L	L	L	L	L	L	L	L	2
RBI	H	L	L	L	L	L	L	L	L	L	L	L	L	L	3
LT	L	X	X	X	X	X	H	H	H	H	H	H	H	H	4

H; high level, L; low level, X; irrelevant

- Notes: 1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired.  
 2. When a low logic level is applied directly to blanking input (BI), all segment outputs are low regardless of the level of any other input.

3. When ripple-blanking input (RBI) and inputs A, B, C, and D are at a low level with the lamp-test input high, all segment outputs go low and the ripple-blanking output (RBO) goes to a low level (response condition).  
 4. When a blanking input/ripple blanking output (BI/RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are high.

## ELECTRICAL CHARACTERISTICS ( $T_a = -20 \sim +75^\circ\text{C}$ )

Item	Symbol	Test Conditions	min	typ*	max	Unit	
Input voltage	$V_{IH}$		2.0	—	—	V	
	$V_{IL}$		—	—	0.8	V	
Output voltage	BI/RBO	$V_{OH}$ $V_{CC}=4.75\text{V}$ , $V_{IH}=2\text{V}$ , $V_{IL}=0.8\text{V}$ , $I_{OH}=-50\mu\text{A}$	2.4	—	—	V	
Output current	a~g	$I_{OH}$ $V_{CC}=4.75\text{V}$ , $V_{IH}=2\text{V}$ , $V_{IL}=0.8\text{V}$ , $V_{OH}=5.5\text{V}$	—	—	250	$\mu\text{A}$	
Output voltage	BI/RBO	$V_{OL}$ $V_{CC}=4.75\text{V}$ , $V_{IH}=2\text{V}$ , $V_{IL}=0.8\text{V}$	$I_{OL}=1.6\text{mA}$	—	—	0.4	V
			$I_{OL}=3.2\text{mA}$	—	—	0.5	
	a~g	$V_{CC}=4.75\text{V}$ , $V_{IH}=2\text{V}$ , $V_{IL}=0.8\text{V}$	$I_{OL}=4\text{mA}$	—	—	0.4	
			$I_{OL}=8\text{mA}$	—	—	0.5	
Input current	except BI/RBO	$I_{IH}$ $V_{CC}=5.25\text{V}$ , $V_i=2.7\text{V}$	—	—	20	$\mu\text{A}$	
	except BI/RBO	$I_{IL}$ $V_{CC}=5.25\text{V}$ , $V_i=0.4\text{V}$	—	—	-0.4	mA	
	BI/RBO		—	—	-1.2		
	except BI/RBO	$I_i$ $V_{CC}=5.25\text{V}$ , $V_i=7\text{V}$	—	—	0.1	mA	
Short-circuit output current	BI/RBO	$I_{OS}$ $V_{CC}=5.25\text{V}$	-0.3	—	-2	mA	
Supply current**	$I_{CC}$	$V_{CC}=5.25\text{V}$	—	8	15	mA	
Input clamp voltage	$V_{IK}$	$V_{CC}=4.75\text{V}$ , $I_{IN}=-18\text{mA}$	—	—	-1.5	V	

\*  $V_{CC}=5\text{V}$ ,  $T_a=25^\circ\text{C}$

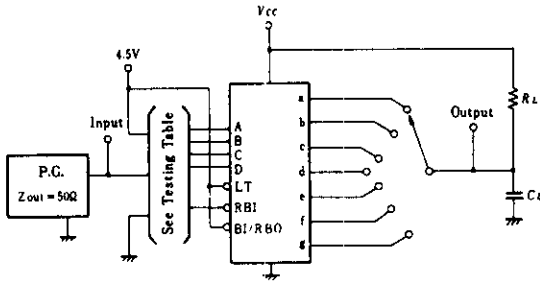
\*\*  $I_{CC}$  is measured with all outputs open and all inputs at 4.5V.

## ■ SWITCHING CHARACTERISTICS ( $V_{CC}=5V, T_a=25^{\circ}C$ )

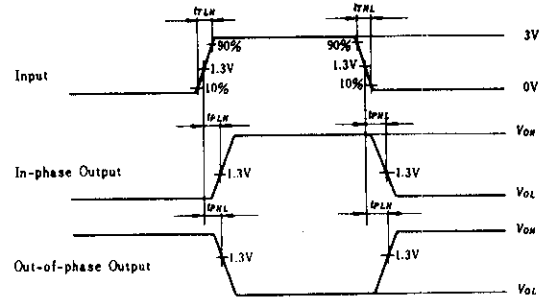
Item	Symbol	Input	Test Conditions	min	typ	max	Unit
Propagation delay time	$t_{PLH}$	A	$C_L=15pF$	—	—	100	ns
	$t_{PHL}$		$R_L=2k\Omega$	—	—	100	
	$t_{PLH}$	RBI	$C_L=15pF$	—	—	100	ns
	$t_{PHL}$		$R_L=6k\Omega$	—	—	100	

## ■ TESTING METHOD

### 1) Test Circuit



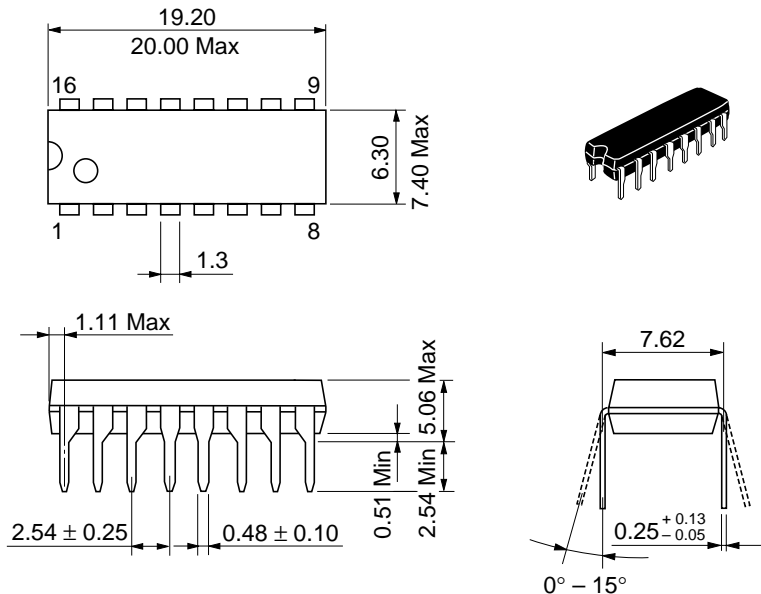
### Waveform



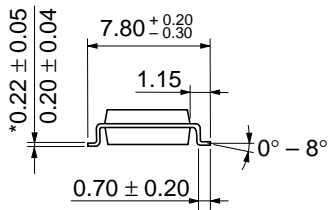
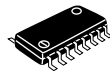
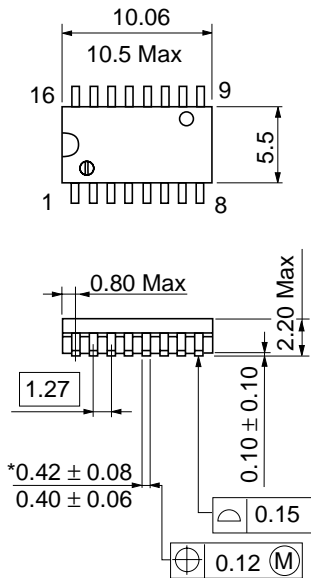
### 2) Testing Table

Item	Inputs					Outputs						
	RBI	D	C	B	A	a	b	c	d	e	f	g
$t_{PLH}$	4.5V	GND	GND	GND	IN	OUT	—	—	OUT	OUT	OUT	—
	4.5V	GND	GND	4.5V	IN	—	—	OUT	—	OUT	—	—
$t_{PHL}$	4.5V	GND	4.5V	4.5V	IN	—	OUT	—	OUT	OUT	OUT	OUT
	IN	GND	GND	GND	GND	OUT	OUT	OUT	OUT	OUT	OUT	—

- Notes) 1. Input pulse:  $t_{TLH} \leq 15ns, t_{THL} \leq 6ns, PRR=1MHz,$   
duty cycle=50%.  
2.  $C_L$  includes probe and jig capacitance.

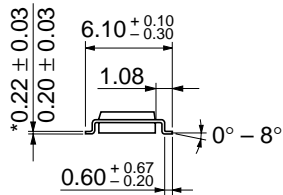
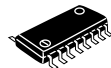
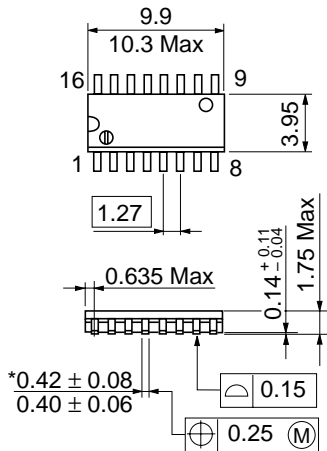


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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# HITACHI

## Hitachi, Ltd.

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      North America      : <http://semiconductor.hitachi.com/>  
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## For further information write to:

Hitachi Semiconductor  
(America) Inc.  
179 East Tasman Drive,  
San Jose, CA 95134  
Tel: <1> (408) 433-1990  
Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
Electronic components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
Electronic Components Group.  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.  
16 Collyer Quay #20-00  
Hitachi Tower  
Singapore 049318  
Tel: 535-2100  
Fax: 535-1533

Hitachi Asia Ltd.  
Taipei Branch Office  
3F, Hung Kuo Building, No.167,  
Tun-Hwa North Road, Taipei (105)  
Tel: <886> (2) 2718-3666  
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon, Hong Kong  
Tel: <852> (2) 735 9218  
Fax: <852> (2) 730 0281  
Telex: 40815 HITEC HX

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