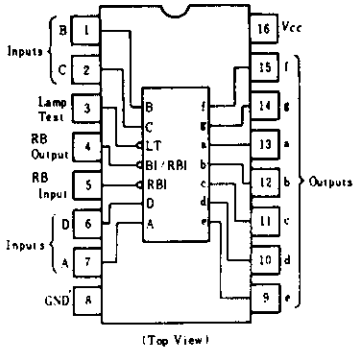
HD74LS249 ●BCD-to-Seven-Segment Decoders/Drivers (with open collector outputs)

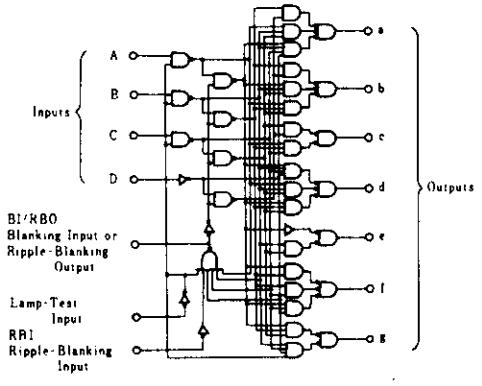
The HD74LS249 is 16-pin versions of the HD74LS49, respectively. Included in the HD74LS249 circuits is the full functional capability for lamp test and ripple blanking, which is not available in the HD74LS circuits. The HD74LS49 composes the 6 and 9 without tails and the HD74LS249 composes the 6 and 9 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 be pulsing or to inhibit the outputs.

■PIN ARRANGEMENT



■BLOCK DIAGRAM

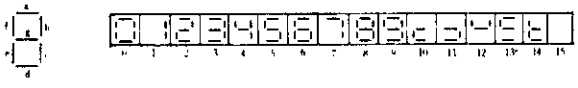


■ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	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	℃
Storage temperature range	T_{stg}	−65~+150	℃

■RECOMMENDED OPERATING CONDITIONS

Item		Symbol	min	typ	max	Unit
Output voltage	a~g	V_{OH}	–	–	5.5	V
Output current	BI/RBO	I_{OH}	–	–	−50	μA
	a~g	I_{OL}	–	–	8	mA
	BI/RBO		–	–	3.2	



■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
1	H	×	L	L	L	H	H	L	H	H	L	L	L	L	
2	H	×	L	L	H	L	H	H	H	L	H	H	L	H	
3	H	×	L	L	H	H	H	H	H	H	H	L	L	H	
4	H	×	L	H	L	L	H	L	H	H	L	L	H	H	
5	H	×	L	H	L	H	H	H	L	H	H	L	H	H	
6	H	×	L	H	H	L	H	H	L	H	H	H	H	H	
7	H	×	L	H	H	H	H	H	H	H	L	L	L	L	
8	H	×	H	L	L	L	H	H	H	H	H	H	H	H	
9	H	×	H	L	L	H	H	H	H	H	H	L	H	H	
10	H	×	H	L	H	L	H	L	L	L	H	H	L	H	
11	H	×	H	L	H	H	H	L	L	H	H	L	L	H	
12	H	×	H	H	L	L	H	L	H	L	L	L	H	H	
13	H	×	H	H	L	H	H	H	L	L	H	L	H	H	
14	H	×	H	H	H	L	H	L	L	L	H	H	H	H	
15	H	×	H	H	H	H	H	L	L	L	L	L	L	L	
BI	×	×	×	×	×	×	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	×	×	×	×	×	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 ($Ta = -20 \sim +75°C$)

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}	$V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$, $I_{OH}=-50\mu A$		2.4	–	–	V
Output current	a ~ g	I_{OH}	$V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$, $V_{OH}=5.5V$		–	–	250	μA
Output voltage	BI/RBO	V_{OL}	$V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$	$I_{OL}=1.6mA$	–	–	0.4	V
				$I_{OL}=3.2mA$	–	–	0.5	
	a ~ g		$V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$	$I_{OL}=4mA$	–	–	0.4	
				$I_{OL}=8mA$	–	–	0.5	
Input current	except BI/RBO	I_{IH}	$V_{CC}=5.25V$, $V_I=2.7V$		–	–	20	μA
	except BI/RBO	I_{IL}	$V_{CC}=5.25V$, $V_I=0.4V$		–	–	−0.4	mA
	BI/RBO				–	–	−1.2	
	except BI/RBO	I_I	$V_{CC}=5.25V$, $V_I=7V$		–	–	0.1	mA
Short-circuit output current	BI/RBO	I_{OS}	$V_{CC}=5.25V$		−0.3	–	−2	mA
Supply current**		I_{CC}	$V_{CC}=5.25V$		–	8	15	mA
Input clamp voltage		V_{IK}	$V_{CC}=4.75V$, $I_{IN}=-18mA$		–	–	−1.5	V

* $V_{CC}=5V$, $Ta=25°C$

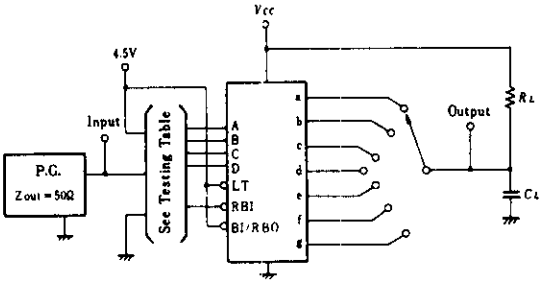
** I_{CC} is measured with all outputs open and all inputs at 4.5V.

■SWITCHING CHARACTERISTICS (V_{CC}=5V, Ta=25℃)

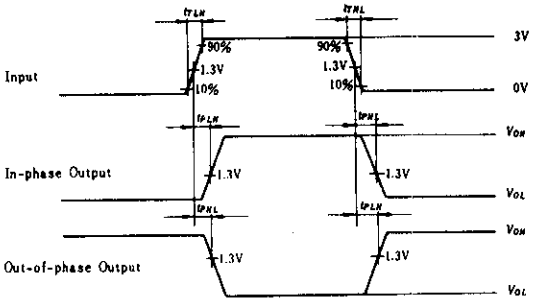
Item	Symbol	Input	Test Conditions	min	typ	max	Unit
Propagation delay time	t_{PLH}	A	C_L=15pF	–	–	100	ns
	t_{PHL}		R_L=2kΩ	–	–	100	
	t_{PLH}	RBI	C_L=15pF	–	–	100	ns
	t_{PHL}		R_L=6kΩ	–	–	100	

■TESTING METHOD

1) Test Circuit



Waveform

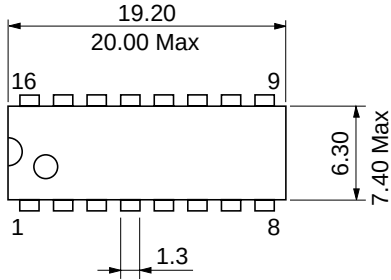


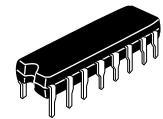
2) Testing Table

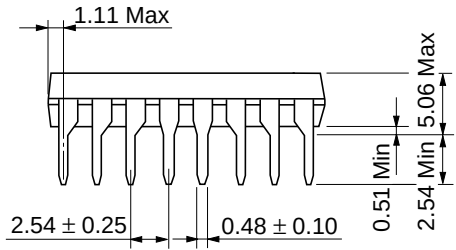
Item	Inputs					Outputs						
	RBI	D	C	B	A	a	b	c	d	e	f	g
	4.5V	GND	GND	GND	IN	OUT	–		OUT	OUT	OUT	
t_{PLH}	4.5V	GND	GND	4.5V	IN	–	–	OUT	–	OUT	–	–
t_{PHL}	4.5V	GND	4.5V	4.5V	IN	–	OUT	–	OUT	OUT	OUT	OUT
	IN	GND	GND	GND	GND	OUT	OUT	OUT	OUT	OUT	OUT	–

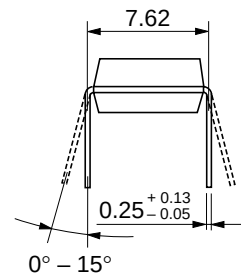
Notes) 1. Input pulse: $t_{TLH} \leqq 15$ns, $t_{THL} \leqq 6$ns, PRR=1MHz, duty cycle=50%.
2. C_L includes probe and jig capacitance.

Unit: mm



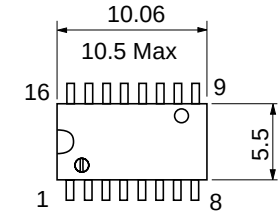


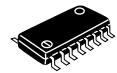


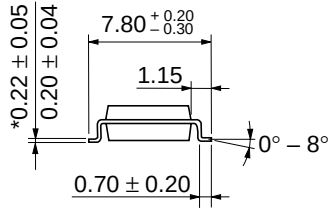


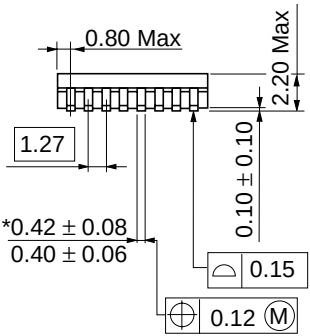
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm









*Dimension including the plating thickness
Base material dimension

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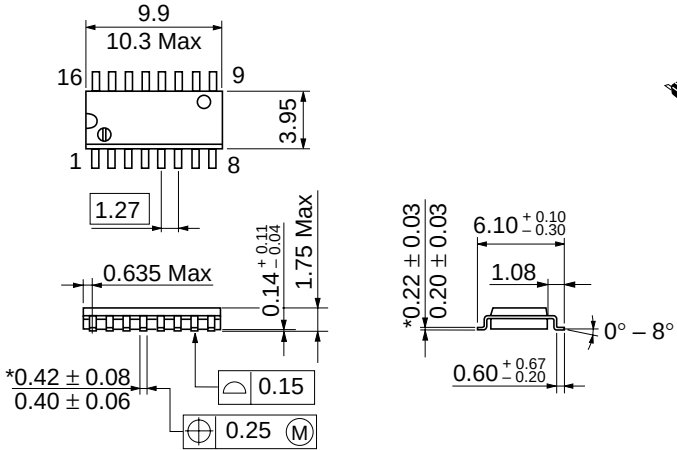
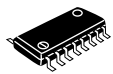
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

Unit: mm





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

*Dimension including the plating thickness
Base material dimension

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