HD74LS247 ●BCD-to-Seven-Segment Decoders/Drivers (with 15V outputs)

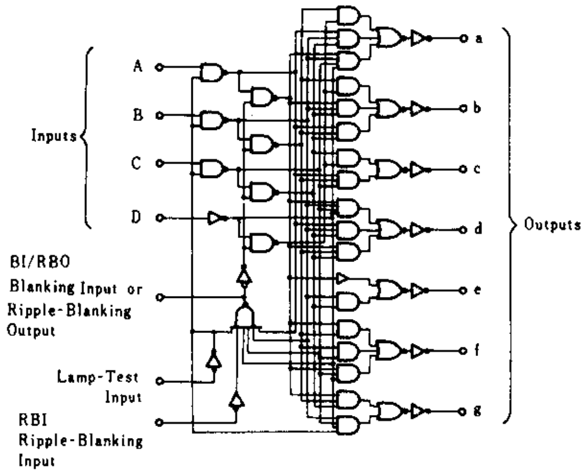
The HD74LS247 is electrically and functionally identical to the HD74LS47, respectively, and has the same pin assignments as its equivalents.

It can be used interchangeably in present or future designs to offer designers a choice between two indicator fonts. The HD74LS47 composes the 6 and the 9 without tails and the HD74LS247 composes the 6 and the 9 with tails. Composition of all other characters, including display patterns for BCD inputs above nine, is identical. The HD74LS247 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.

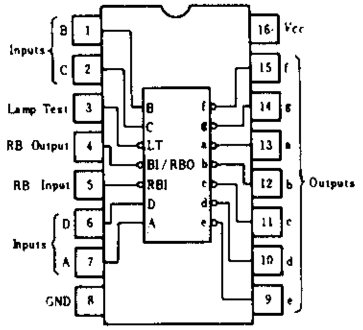
Segment identification and resultant displays are shown below. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions. This circuit incorporates automatic leading and/or trailing-edge zero-blanking control (RBI and RBO). Lamp test (LT) of this type may be performed 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.

■BLOCK DIAGRAM



■PIN ARRANGEMENT



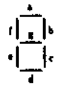
(Top View)

■ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7.0	V
Input voltage	V_{IN}	7.0	V
Output current ($t_w \leq 1$ms, duty cycle$\leq 10\%$)	$I_{O(peak)}$	200	mA
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	$V_{O(off)}$	–	–	15	V
Output current	a～g	$I_{O(on)}$	–	–	24	mA
	BI/RBO	I_{OH}	–	–	−50	μA
	BI/RBO	I_{OL}	–	–	3.2	mA



■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	ON	ON	ON	ON	ON	ON	OFF	1
1	H	×	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	×	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	×	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	×	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	×	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	×	L	H	H	L	H	ON	OFF	ON	ON	ON	ON	ON	
7	H	×	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	×	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	×	H	L	L	H	H	ON	ON	ON	ON	OFF	ON	ON	
10	H	×	H	L	H	L	H	OFF	OFF	OFF	ON	ON	OFF	ON	
11	H	×	H	L	H	H	H	OFF	OFF	ON	ON	OFF	OFF	ON	
12	H	×	H	H	L	L	H	OFF	ON	OFF	OFF	OFF	ON	ON	
13	H	×	H	H	L	H	H	ON	OFF	OFF	ON	OFF	ON	ON	
14	H	×	H	H	H	L	H	OFF	OFF	OFF	ON	ON	ON	ON	
15	H	×	H	H	H	H	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
BI	×	×	×	×	×	×	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
RBI	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
LT	L	×	×	×	×	×	H	ON	ON	ON	ON	ON	ON	ON	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. The ripple-blanking input (RBI) must be open or high if blanking of a decimal zero is not desired.
2. When a low logic level is applied directly to the blanking input (BI), all segment outputs are off regardless of the level of any other input.
3. When ripple-blanking input (RBI) and inputs A, B C, and D are a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output (RBO) goes to a low level (response condition).
4. When a blanking input ripple blanking input (BI/RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.

■ELECTRICAL CHARACTERISTICS ($Ta = -20 \sim +75$℃)

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
	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	
Output current	a~g	$I_{O(off)}$	$V_{CC}=5.25V$, $V_{IH}=2V$, $V_{IL}=0.8V$, $V_{O(off)}=15V$		–	–	250	μA
Output voltage	a~g	$V_{O(on)}$	$V_{CC}=5.25V$, $V_{IH}=2V$ $V_{IL}=0.8V$	$I_{O(on)}=12mA$	–	–	0.4	V
				$I_{O(on)}=24mA$	–	–	0.5	
Input current		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	
		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}	$V_{CC}=5.25V$		–	7	13	mA
Input clamp voltage		V_{IK}	$V_{CC}=4.75V$, $I_{IN}=-18mA$		–	–	−1.5	V

* $V_{CC}=5V$, $Ta=25$°C

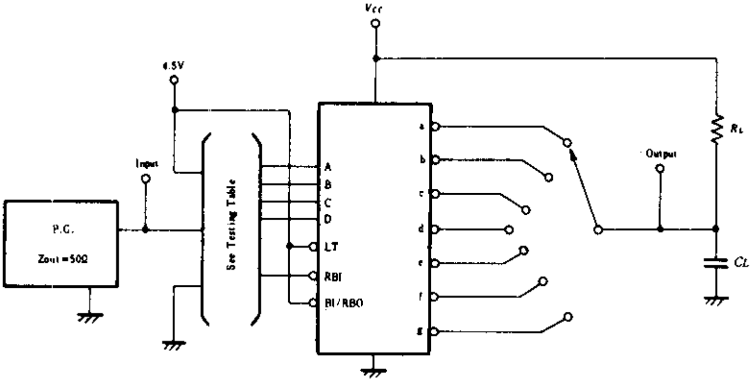
** I_{CC} is measured with all outputs open and all inputs at 4.5V.

■SWITCHING CHARACTERISTICS ($V_{CC}=5V$, $Ta=25°C$)

Item	Symbol	Input	Test Conditions	min	typ	max	Unit
Turn-on time	t_{on}	A	$C_L=15pF$, $R_L=665\Omega$	–	–	100	ns
		RBI		–	–	100	
Turn-off time	t_{off}	A		–	–	100	ns
		RBI		–	–	100	

■TESTING METHOD

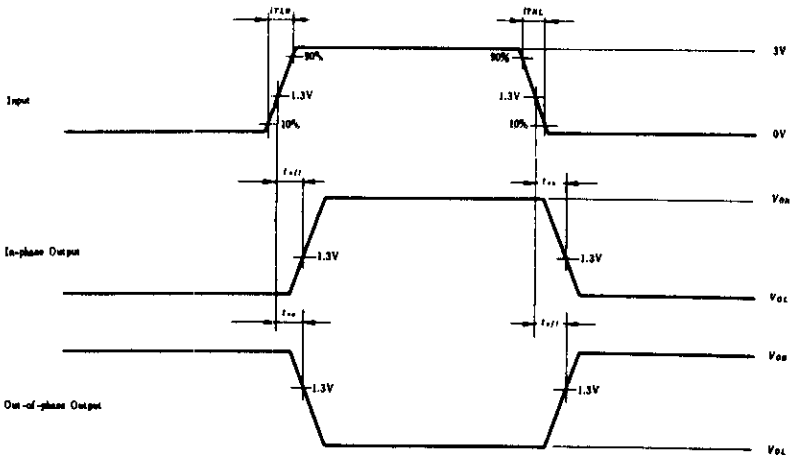
1) Test Circuit



2) Testing Table

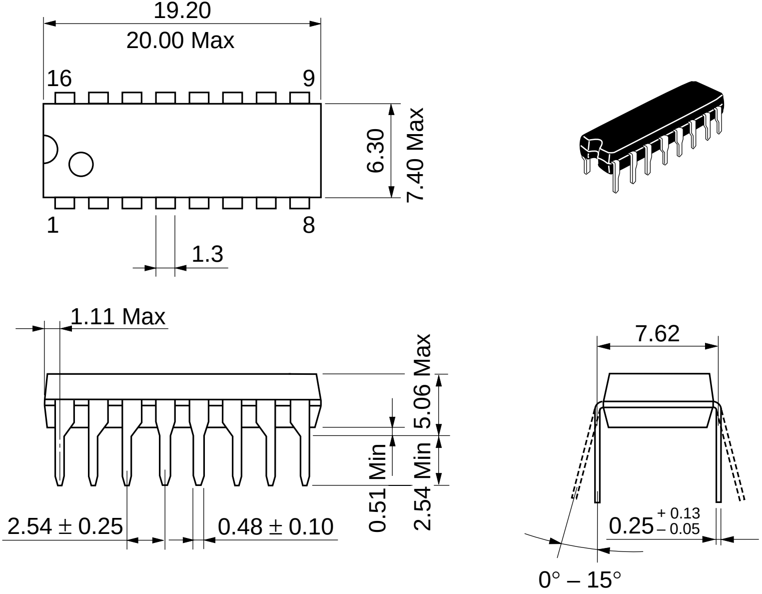
Item	Inputs					Outputs						
	RBI	D	C	B	A	a	b	c	d	e	f	g
t_{on} t_{off}	4.5V	GND	GND	GND	IN	OUT	–	–	OUT	OUT	OUT	–
	4.5V	GND	GND	4.5V	IN	–	–	OUT	–	OUT	–	–
	4.5V	GND	4.5V	4.5V	IN	–	OUT	–	OUT	OUT	OUT	OUT
	IN	GND	GND	GND	GND	OUT	OUT	OUT	OUT	OUT	OUT	–

Waveform



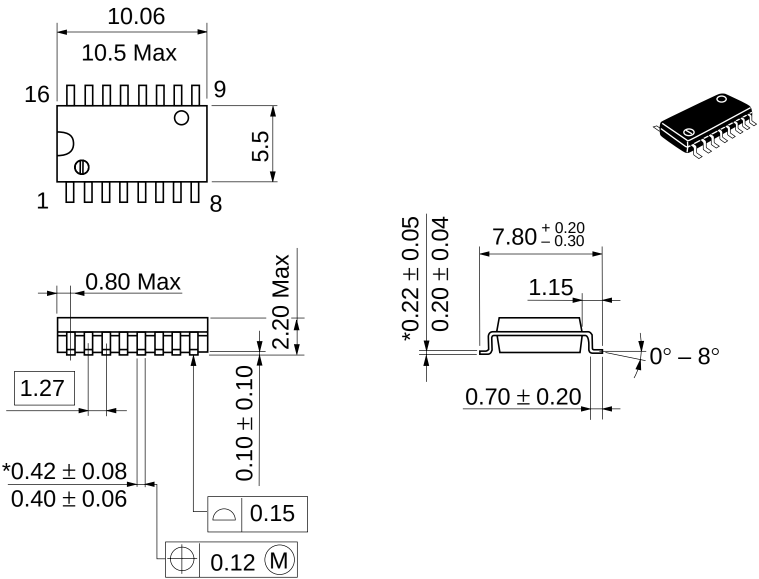
Notes) 1. Input pulse: $t_{TLH}\leq15ns$, $t_{THL}\leq6ns$, $PRR=1MHz$, duty cycle=50%.
2. C_L includes probe and jig capacitance.

Unit: mm



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

Unit: mm

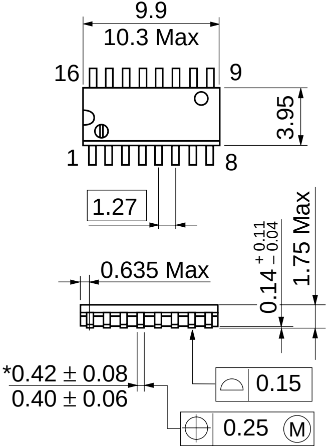


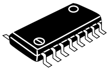
Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

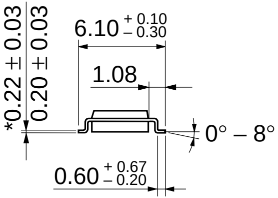
*Dimension including the plating thickness

Base material dimension

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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