1. DESCRIPTION

The ’LS247 and ’LS248 are electrically and functionally identical to the XD74LS47 and XD74LS48,respectively,and have the same pin assignments as their equivalents.They can be used interchangeably in present or future designs to offer designers a choice between two indicator fonts.The ’LS247 and ’LS248 compose the 6 and the 9 with tails.Composition of all other characters,including display patterns for BCD inputs above nine,is identical.The ’LS247 feature active-low outputs designed for driving indicators directly,and the ’LS248 features active-high outputs for driving lamp buffers.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.

All of these circuits incorporate automatic leading and/or trailing-edge zero-blanking control ($\overline{RBI}$ and $\overline{RBO}$).Lamp test ($\overline{LT}$) of these types may be performed at any time when the $\overline{BI}$/$\overline{RBO}$ node is at a high level.All types contain an overriding blanking input($\overline{BI}$) which can be used to control the lamp intensity by pulsing or to inhibit the outputs.Inputs and outputs are entirely compatible for use with TTL logic outputs.

Series 74LS devices are characterized for operation from 0℃ to 70℃.

2. FEATURES

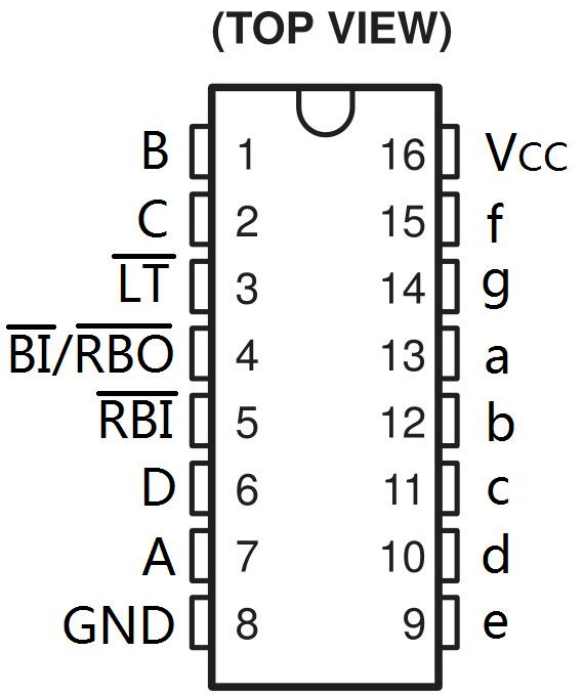
74LS247

- Open-Collector Outputs Drive Indicators Directly
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

74LS248

- Internal Pull-Ups Eliminate Need for External Resistors
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

3. PIN CONFIGURATIONS



’LS247

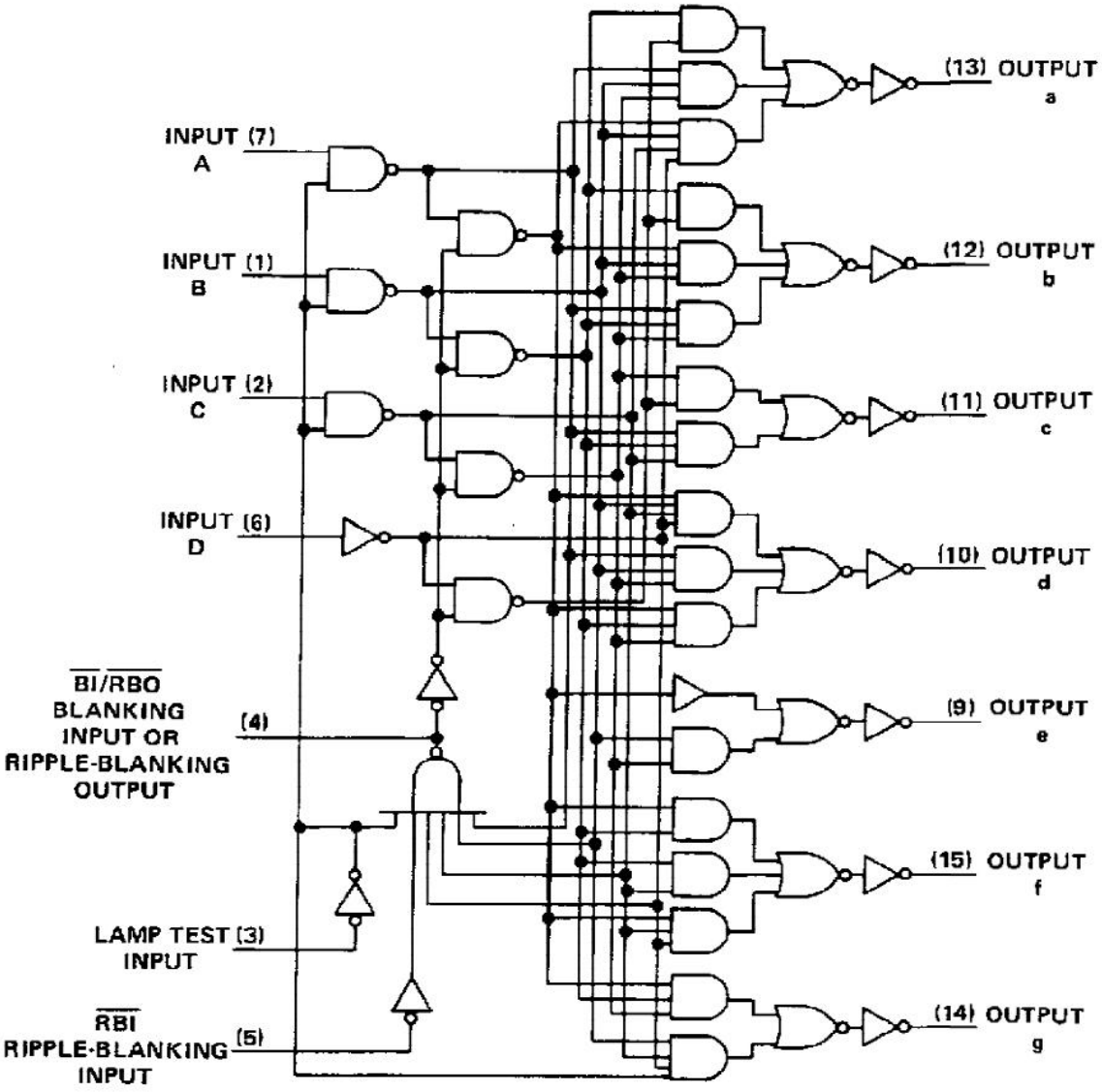
DECIMAL OR FUNCTION	INPUTS						$\overline{BI}/\overline{RBO}$	OUTPUTS							NOTE
	$\overline{LT}$	$\overline{RBI}$	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	X	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	X	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	X	L	H	H	L	H	ON	OFF	ON	ON	ON	ON	ON	
7	H	X	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	X	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	X	H	L	L	H	H	ON	ON	ON	ON	OFF	ON	ON	
10	H	X	H	L	H	L	H	OFF	OFF	OFF	ON	ON	OFF	ON	
11	H	X	H	L	H	H	H	OFF	OFF	ON	ON	OFF	OFF	ON	
12	H	X	H	H	L	L	H	OFF	ON	OFF	OFF	OFF	ON	ON	
13	H	X	H	H	L	H	H	ON	OFF	OFF	ON	OFF	ON	ON	
14	H	X	H	H	H	L	H	OFF	OFF	OFF	ON	ON	ON	ON	
15	H	X	H	H	H	H	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
$\overline{BI}$	X	X	X	X	X	X	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
$\overline{RBI}$	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
$\overline{LT}$	L	X	X	X	X	X	H	ON	ON	ON	ON	ON	ON	ON	4

’LS248

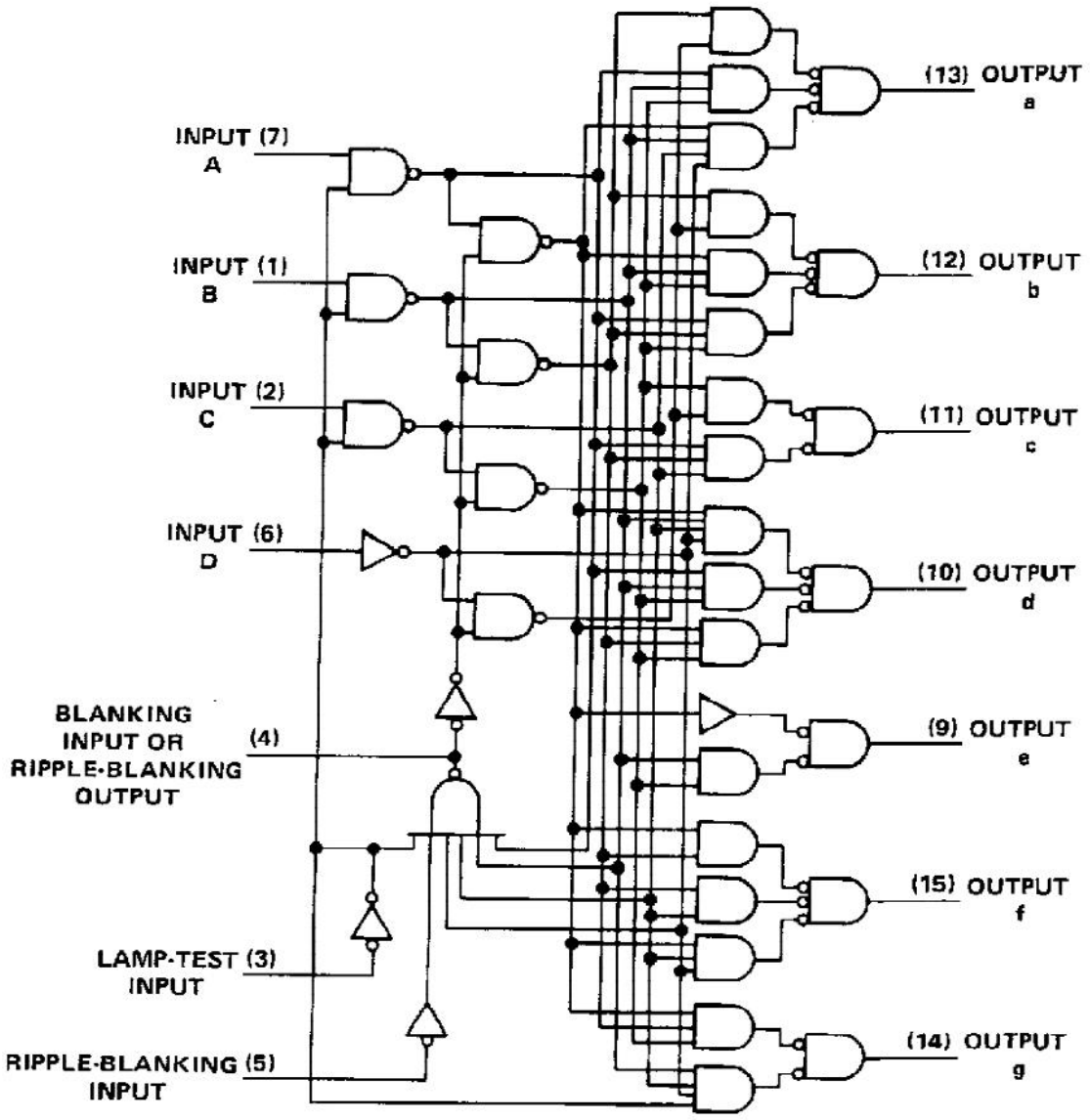
DECIMAL OR FUNCTION	INPUTS						$\overline{BI}/\overline{RBO}$	OUTPUTS							NOTE
	$\overline{LT}$	$\overline{RBI}$	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	H	H	H	H	H	H	L	1
1	H	X	L	L	L	H	H	L	H	H	L	L	L	L	
2	H	X	L	L	H	L	H	H	H	L	H	H	L	H	
3	H	X	L	L	H	H	H	H	H	H	H	L	L	H	
4	H	X	L	H	L	L	H	L	H	H	L	L	H	H	
5	H	X	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	
$\overline{BI}$	X	X	X	X	X	X	L	L	L	L	L	L	L	L	2
$\overline{RBI}$	H	L	L	L	L	L	L	L	L	L	L	L	L	L	3
$\overline{LT}$	L	X	X	X	X	X	H	H	H	H	H	H	H	H	4

4. LOGIC DIAGRAM

’LS247



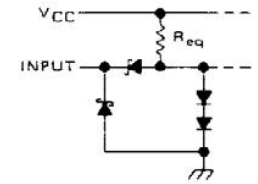
'LS248


INPUT (7)
A
INPUT (1)
B
INPUT (2)
C
INPUT (6)
D
BLANKING
INPUT OR
RIPPLE-BLANKING
OUTPUT
(4)
LAMP-TEST (3)
INPUT
RIPPLE-BLANKING (5)
INPUT
(13) OUTPUT
a
(12) OUTPUT
b
(11) OUTPUT
c
(10) OUTPUT
d
(9) OUTPUT
e
(15) OUTPUT
f
(14) OUTPUT
g

5. SCHEMATICS OF INPUTS AND OUTPUTS

'LS247, 'LS248

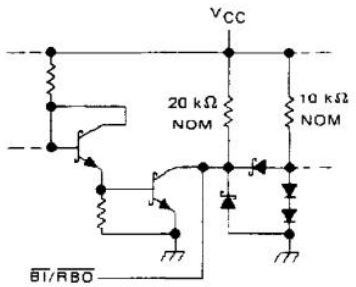
EQUIVALENT OF EACH INPUT EXCEPT $\overline{BI}/\overline{RBO}$



$\overline{LT}$ and $\overline{RBI}$: R_{eq} = 20 kΩ NOM
A, B, C, and D: R_{eq} = 25 kΩ NOM

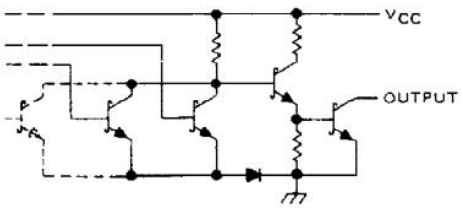
'LS247, 'LS248

EQUIVALENT OF $\overline{BI}/\overline{RBO}$



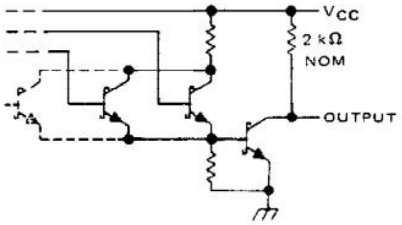
'LS247

TYPICAL OF OUTPUTS a THRU g



'LS248

TYPICAL OF OUTPUTS a THRU g



6. ABSOLUTE MAXIMUM RATINGS OVER OPERATING FREE-AIR TEMPERATURE RANGE (UNLESS OTHERWISE NOTES)

Supply voltage, V_{CC} 7V

Input voltage, VI: 74LS247..... 7V

Operating free-air temperature range: DIP package..... 0°C to 70°C

Storage temperature range, Tstg..... −65°C to 150°C

NOTES: 1. Voltage values are with respect to the network ground terminal.

7. RECOMMENDED OPERATING CONDITIONS

		74LS247			UNIT
		MIN	NOM	MAX	
Supply voltage, V_{CC}		4.75	5	5.25	V
Off-state output voltage, V_O(off)	a thru g			15	V
On-state output current, I_O(on)	a thru g			24	mA
High-level output current, I_{OH}	$\overline{BI}/\overline{RBO}$			−50	μA
Low-level output current, I_{OL}	$\overline{BI}/\overline{RBO}$			3.2	mA
Operating free-air temperature, T_A		0		70	°C

8. ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING FREE-AIR RANGE (UNLESS OTHERWISE NOTED)

PARAMETER			TEST CONDITIONS†		74LS47			UNIT
					MIN	TYP‡	MAX	
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage		V_{CC} = MIN,	I_I = −18 mA			−1.5	V
V_{OH}	High-level output voltage	$\overline{BI}/\overline{RBO}$	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, I_{OH} = −400 μA	2.4	4.2		V
V_{OL}	Low-level output voltage	$\overline{BI}/\overline{RBO}$	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} MAX	I_{OL} = 1.6 mA		0.25	0.4	V
				I_{OL} =3.2mA		0.35	0.5	
I_O(off)	Off-state output current	a thrug	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} MAX, V_O(off)=15V				250	μA
V_O(on)	On-state output voltage	a thrug	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} MAX	I_O(on)=12mA		0.25	0.4	V
				I_O(on)=24mA		0.35	0.5	
I_I	Input current at maximum input voltage		V_{CC} = MAX,	V_I = 7 V			0.1	mA
IIH	High-level input current		V_{CC} = MAX,	V_I = 2.7 V			20	μA
I_{IL}	Low-level input current	Any input Except $\overline{BI}/\overline{RBO}$	V_{CC} = MAX,	V_I = 0.4 V			−0.4	mA
		$\overline{BI}/\overline{RBO}$					−1.2	
I_{OS}	Short-circuit output current§	$\overline{BI}/\overline{RBO}$	V_{CC} = MAX		−0.3		−2	mA
I_{CC}	Supply current		V_{CC} = MAX			7	13	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ Not more than one output should be shorted at a time.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5V.

9. SWITCHING CHARACTERISTICS,VCC = 5 V, TA = 25℃

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{off}	Turn-off time from A input	C_L=15 pF,R_L=665Ω, See Note 3			100	ns
t_{on}	Turn-on time from A input				100	
t_{off}	Turn-off time from $\overline{RBI}$ input,outputs (a-f) only				100	ns
t_{on}	Turn-on time from $\overline{RBI}$ input,outputs (a-f) only				100	

† t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output

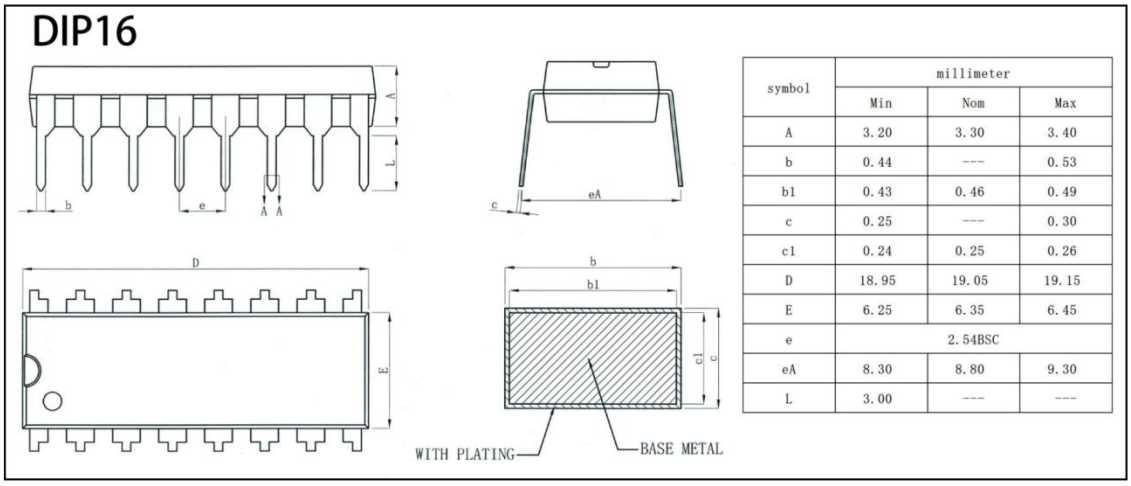
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

10. ORDERING INFORMATION

Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XD74LS247	XD74LS247	DIP16	19.05 * 6.35	-0 to 70	MSL3	Tube 25	1000
XD74LS248	XD74LS248	DIP16	19.05 * 6.35	-0 to 70	MSL3	Tube 25	1000

11. DIMENSIONAL DRAWINGS



symbol	millimeter		
	Min	Nom	Max
A	3.20	3.30	3.40
b	0.44	---	0.53
b1	0.43	0.46	0.49
c	0.25	---	0.30
c1	0.24	0.25	0.26
D	18.95	19.05	19.15
E	6.25	6.35	6.45
e	2.54BSC		
eA	8.30	8.80	9.30
L	3.00	---	---