

## 1. DESCRIPTION

The 74LS47 feature active-low outputs designed for driving common-anode LEDs or incandescent indicators directly. The 74LS48 feature active-high outputs for driving lamp buffers or common-cathode LEDs.

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.

The  $\overline{74LS47}$  and  $\overline{74LS48}$  circuits incorporate automatic leading and/or trailing-edge zero-blanking control (RBI and RBO). Lamp test (LT)

of these types may be performed at any time when the BI/RBO node is at a high level.

All types contain an overriding blanking input (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.

## 2. FEATURES

### 74LS47

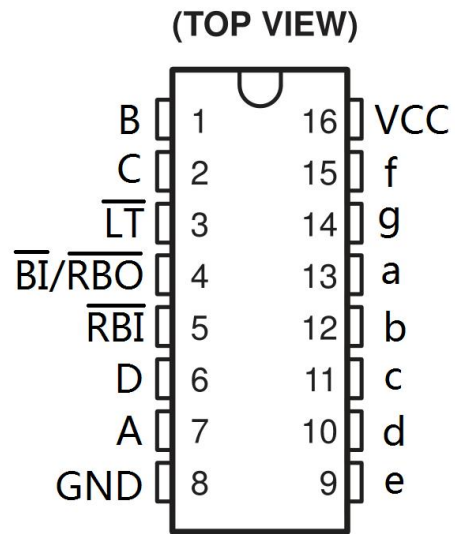
- Open-Collector Outputs Drive Indicators Directly
- Lamp-Test Provision
- Leading/Trailing Zero

### 74LS48

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

### 3. PIN CONFIGURATIONS

'LS47 and 'LS48



**74LS47**

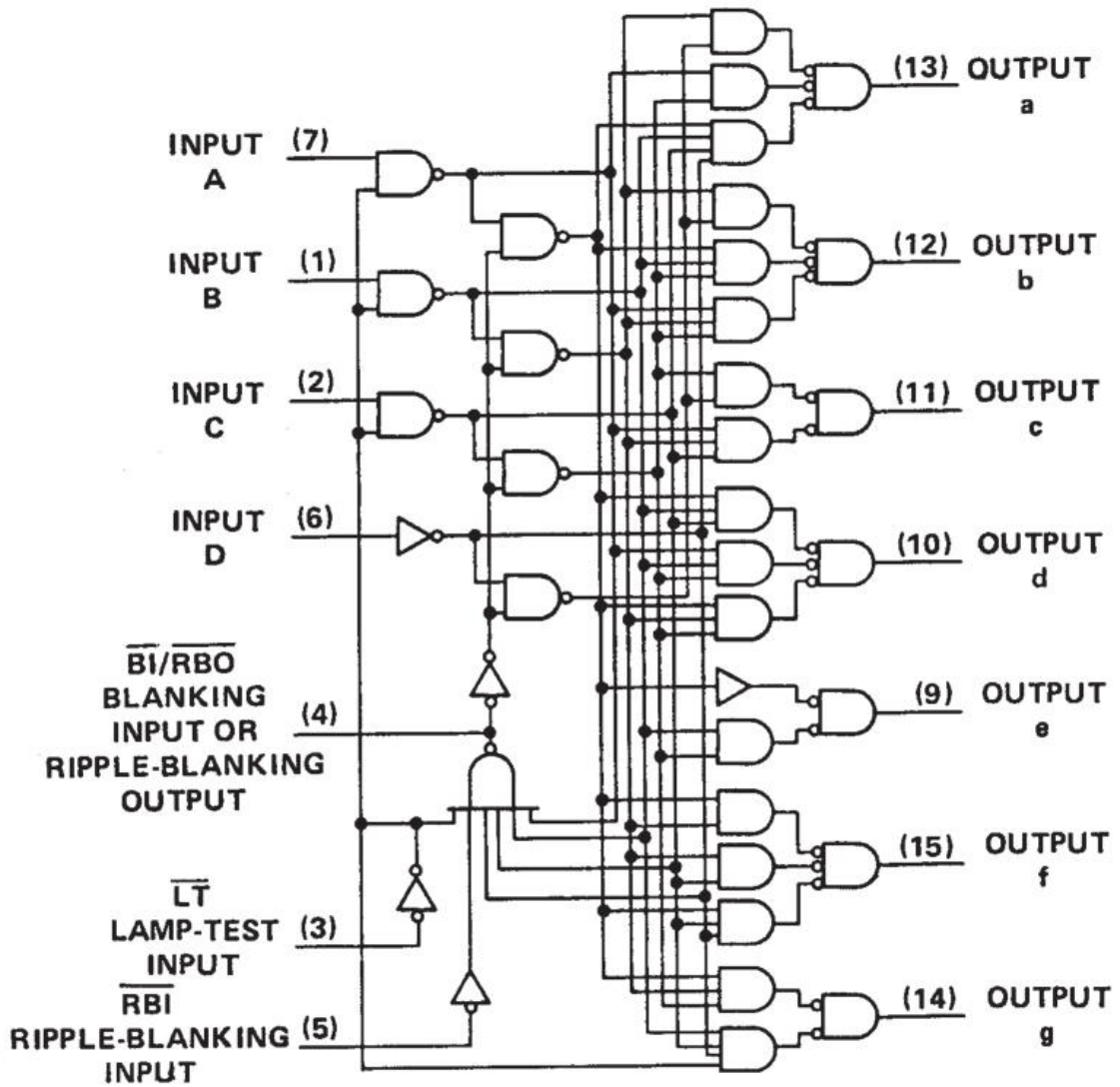
DECIMAL OR FUNCTION	INPUTS						$\overline{\text{BI/RBO}}\uparrow$	OUTPUTS							NOTE
	$\overline{\text{LT}}$	$\overline{\text{RBI}}$	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON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

**74LS48**

DECIMAL OR FUNCTION	INPUTS						$\overline{\text{BI}}/\text{RBO}\uparrow$	OUTPUTS							NOTE
	$\overline{\text{LT}}$	$\overline{\text{RBI}}$	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	L	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	L	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

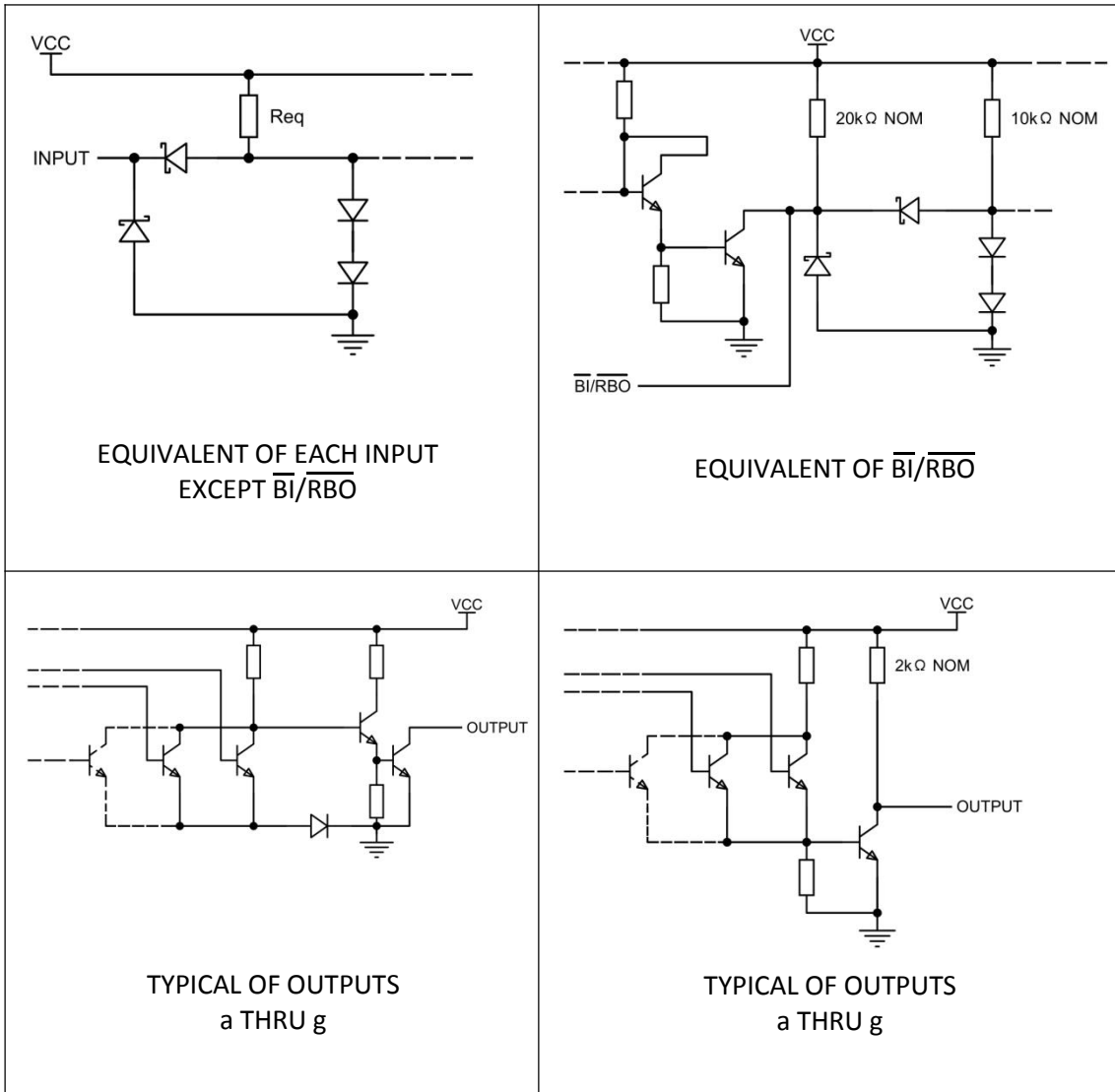
4. LOGIC DIAGRAM

74LS47 and 74LS48



**5. SCHEMATICS OF INPUTS AND OUTPUTS**

**74LS47 and 74LS48**



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

Supply voltage, $V_{CC}$ (see Note 1).....	7V
Input voltage, $V_I$ : 74LS47, 74LS48.....	7V
Operating free-air temperature range: DIP package.....	0°C to 70°C
Storage temperature range, $T_{stg}$ .....	-65°C to 150°C

- NOTES: 1. Voltage values, except inter-emitter voltage, are with respect to the network ground terminal.  
2. This is the voltage between two emitters of a multiple-emitter transistor.

## 7. RECOMMENDED OPERATING CONDITIONS

### 'LS47

		74LS47			UNIT
		MIN	NOM	MAX	
Supply voltage, $V_{CC}$		4.75	5	5.25	V
Off-state output voltage, $V_o(\text{off})$	a thru g	15			V
On-state output current, $I_o(\text{on})$	a thru g	24			mA
High-level output current, $I_{OH}$	$\overline{BI}/\overline{RBO}$	-50			$\mu\text{A}$
Low-level output current, $I_{OL}$	$\overline{BI}/\overline{RBO}$	3.2			mA
Operating free-air temperature, $T_A$		0	70		°C

### 'LS48

		74LS48			UNIT
		MIN	NOM	MAX	
Supply voltage, $V_{CC}$		4.75	5	5.25	V
High-level output current, $I_{OH}$	a thru g	-100			$\mu\text{A}$
	$\overline{BI}/\overline{RBO}$	-500			
Low-level output current, $I_{OL}$	a thru g	6			mA
	$\overline{BI}/\overline{RBO}$	3.2			
Operating free-air temperature, $T_A$		0	70		°C

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

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

PARAMETER		TEST CONDITIONS <sup>†</sup>	74LS48			UNIT
			MIN	TYP <sup>‡</sup>	MAX	
V <sub>IH</sub>	High-level input voltage		2			V
V <sub>IL</sub>	Low-level input voltage		0.8			V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA	-1.5			V
V <sub>OH</sub>	High-level output voltage	$\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = -400 μA	2.4	4.2		V
I <sub>O</sub>	Output current	a thru g and $\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MIN, V <sub>O</sub> = 0.85V Input conditions as for V <sub>OH</sub>	-1.3	-2		
V <sub>OL</sub>	Low-level output voltage	a thru g V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> MAX	I <sub>OL</sub> = 2 mA	0.25	0.4	V
			I <sub>OL</sub> = 6 mA	0.35	0.5	
		$\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> MAX	I <sub>OL</sub> = 1.6 mA	0.25	0.4	
			I <sub>OL</sub> = 3.2 mA	0.35	0.5	
I <sub>I</sub>	Input current at maximum input voltage	Any input Except $\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V	0.1			mA
I <sub>IH</sub>	High-level input current	Any input Except $\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V	20			μA
I <sub>IL</sub>	Low-level input current	Any input Except $\overline{\text{BI}}/\overline{\text{RBO}}$	-0.4			mA
		$\overline{\text{BI}}/\overline{\text{RBO}}$	-1.2			
I <sub>OS</sub>	Short-circuit output current <sup>§</sup>	$\overline{\text{BI}}/\overline{\text{RBO}}$ V <sub>CC</sub> = MAX	-0.3	-2		mA
I <sub>CC</sub>	Supply current	V <sub>CC</sub> = MAX	25	38		mA



† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§ Not more than one output should be shorted at a time.

## 9. SWITCHING CHARACTERISTICS, $V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$

### 'LS47

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

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

### 'LS48

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PHL}$	Propagation delay time, high-to-low-level output from A input	$C_L=15\text{ pF}$ , $R_L=4\text{ k}\Omega$ , See Note 3			100	ns
$t_{PLH}$	Propagation delay time, low-to-high-level output from A input				100	
$t_{PHL}$	Propagation delay time, high-to-low-level output (a-f only) from $\overline{\text{RBI}}$ input	$C_L=15\text{ pF}$ , $R_L=6\text{ k}\Omega$ , See Note 3			100	ns
$t_{PLH}$	Propagation delay time, low-to-high-level output (a-f only) from $\overline{\text{RBI}}$ input				100	

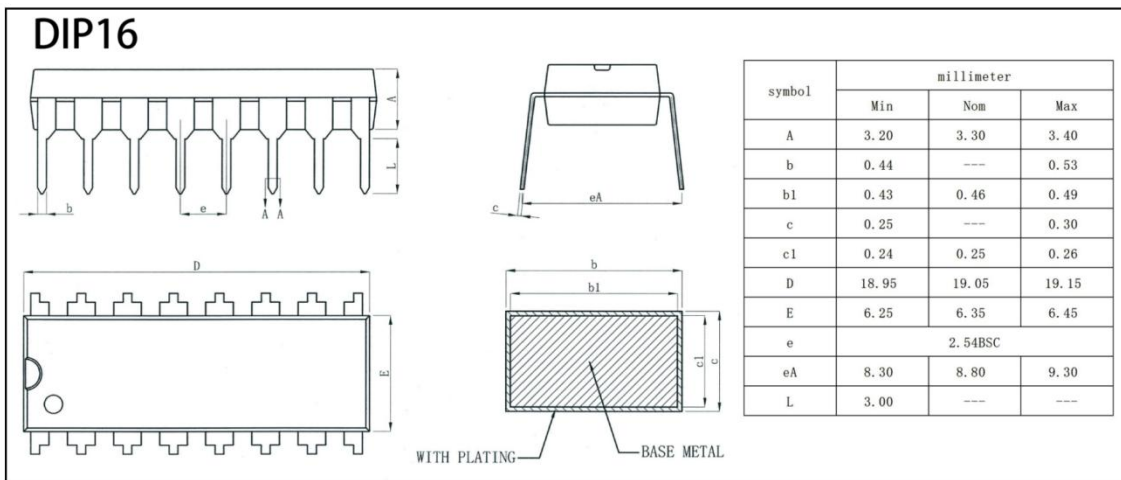
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## 10. ORDERING INFORMATION

Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XD74LS47	XD74LS47	DIP16	19.05 * 6.35	-0 to 70	MSL3	Tube 25	1000
XD74LS48	XD74LS48	DIP16	19.05 * 6.35	-0 to 70	MSL3	Tube 25	1000

## 11. DIMENSIONAL DRAWINGS



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