

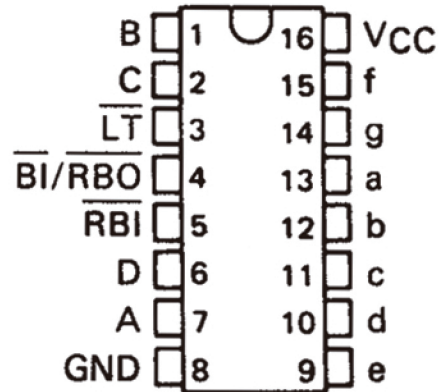
**74LS47**

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

**74LS48**

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

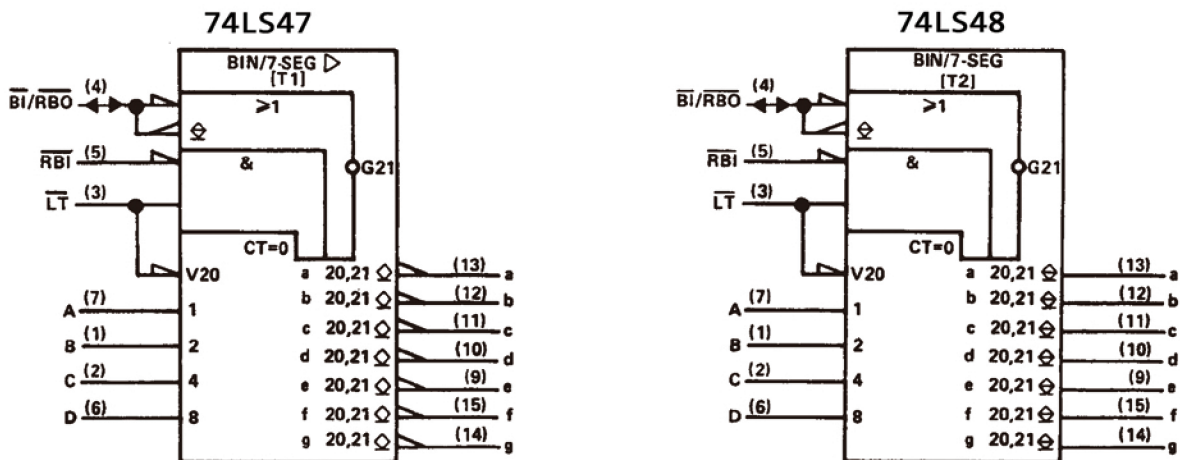
**74LS47 74LS48**



- **All Circuit Types Feature Lamp Intensity Modulation Capability**

TYPE	DRIVER OUTPUTS				TYPICAL POWER DISSIPATION	PACKAGES
	ACTIVE LEVEL	OUTPUT CONFIGURATION	SINK CURRENT	MAX VOLTAGE		
74LS47	low	open-collector	24 mA	15 V	35 mW	J, N
74LS48	high	2-kΩ pull-up	6 mA	5.5 V	125 mW	J, N

logic symbols†



# XD74LS47 DIP-16 XD74LS48 DIP-16

## description

74LS47 feature active-low outputs designed for driving common-anode LEDs or Incandetcent indicators dir^niy. 74LS48 feature active-hioh outputs for driving lamp buffers or conwnon-cathode LEDs. All of the circuits incorporates a direct blanking input. Segment identification and resultant displays V9 shown below. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions. 74LS47 and 74LS48 circuits incorporate automatic leading and/or trailing-edge zero-blanking control (RBI and RBOh Lamp test (tT> 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 logicoutputs.



### 74LS47

DECIMAL OR FUNCTION	INPUTS						$\overline{BI}/\overline{RBO} \dagger$	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	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

H . Mfh tov«l. L . low IM. X ■ irreKvairt  
NOTfS: 1. Th\* btenklR\* put (ffi) mutt ba opM or hetd M . M«h logic Iwel fen output hmctiom 0 throwfh 1» ••» H The Input (ffH) muM ba open or Mfh \*f Manlig of • decimal Nf0 Ml no\* <Mv«d.  
2.WW • low lo- (\*•! appttdad dirwtlv to th\* blank' input 画.«Noutputs ar\* •«, .♦■• •\* «\*• K •< \*V other l«\*0wt.  
3.When ripplt-btenklnt input (0l) end inpuu A . • C, an« 0 M« M • low M« with the lamp MM Input tWgh, alloutput\* 00 oH »nd th\* rippte-M«nkinf output (WTO) to a towome condhkon).  
4.When ttw blanklno input/ripplt« btonking output (TT/WI3) li open of held high and • low to applttd to th\*Input, all Nfment owtpuu «r« on.  
^/RBO h wk\* ANO io«4c wrvinv m btonttin\* input (BT) and/or rlppte-btonkktg output (fflB).

# XD74LS47 DIP-16 XD74LS48 DIP-16

74LS48

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

H ■ high L ■ low level. X ■ Irrelevant

NOTES: 1. The blanking input (LT) must be open or held at high logic level when output function 1 through 15 is used. The ripple-blanking input must be open or high, if blanking of decimal digits is not desired.

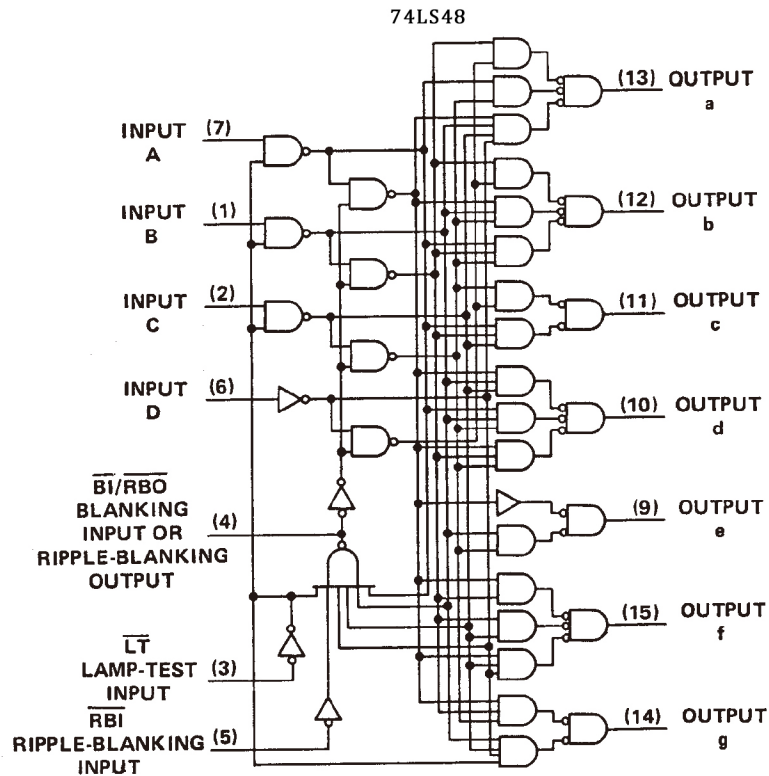
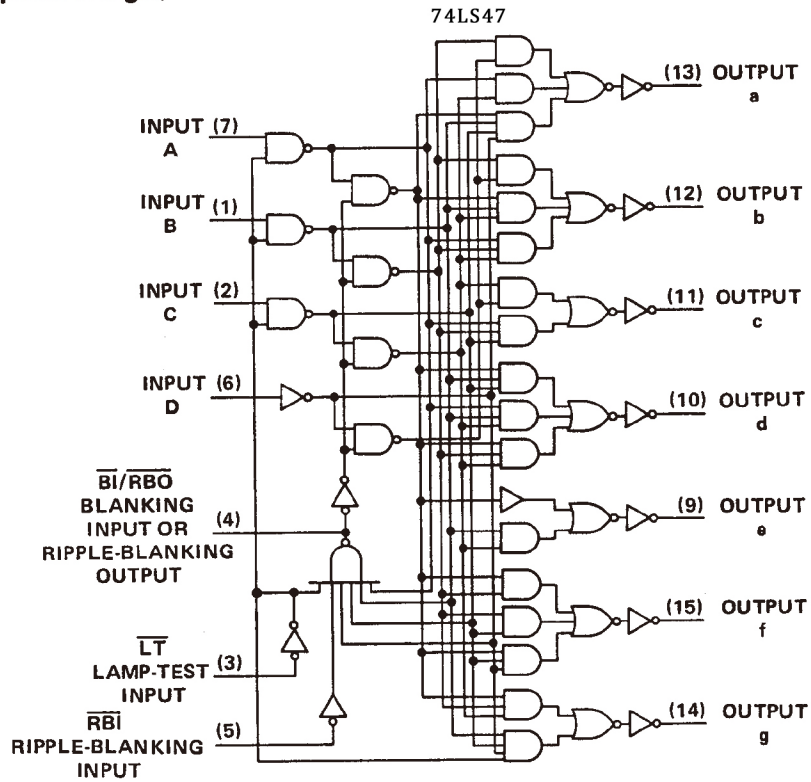
2. When a low level is applied to the blanking input, the output of the decoder will be low regardless of the total of any other input.

3. When ripple-blanking input and outputs A, B, C, and D are at a low level with the ripple-blanking input high, the output of the decoder will be high. The ripple-blanking output (RW) comes to a low level (ripple condition).

4. The blanking input (LT) or the blanking output (RBI) must be open or held high if a low level is applied to the blanking input. The outputs of the decoder will be high.

5. The blanking input (LT) and the blanking output (RBI) must be open or held high if a low level is applied to the blanking input. The outputs of the decoder will be high.

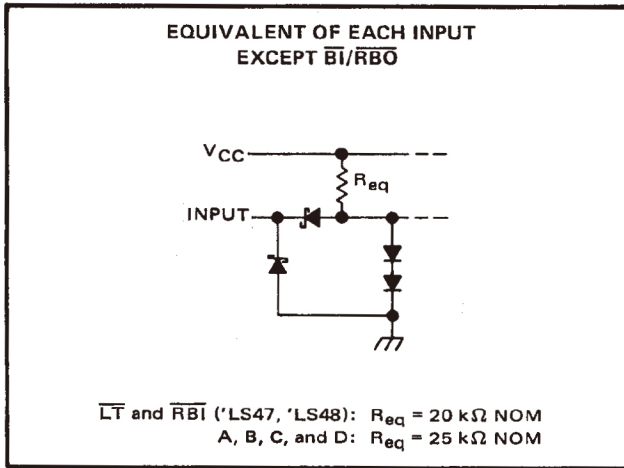
logic diagrams (positive logic)



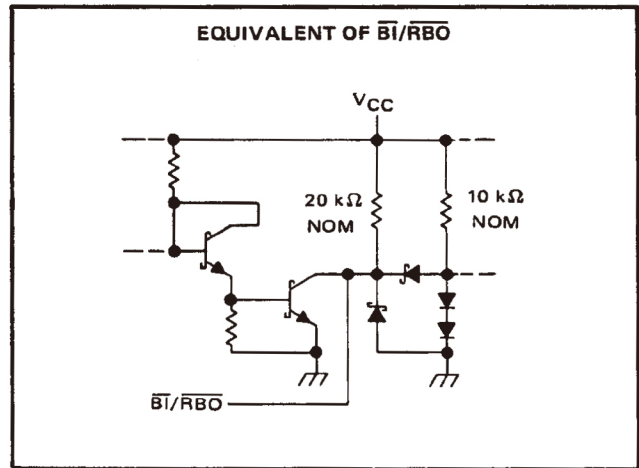
Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs

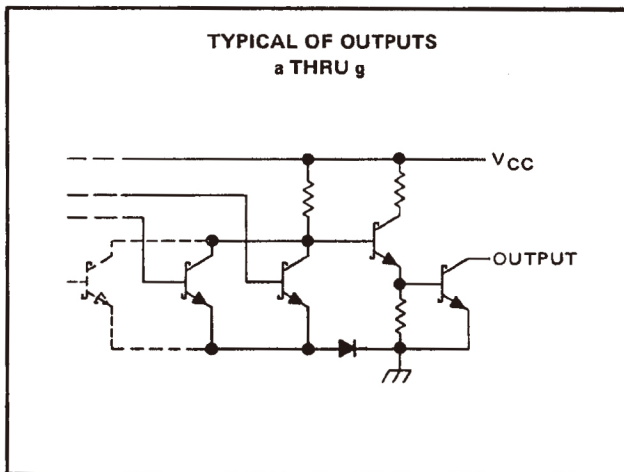
74LS47



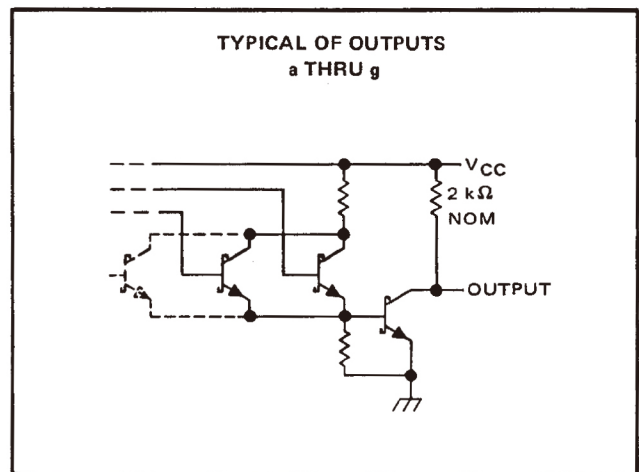
74LS48



74LS47



74LS48



# XD74LS47 DIP-16 XD74LS48 DIP-16

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)**

Supply voltage, $V_{CC}$ (see Note 1)	7	V
Input voltage	7	V
Peak output current ( $t_w \leq 1$ ms, duty cycle $\leq 10\%$ )	200	mA
Current forced into any output in the off state	1	mA
Operating free-air temperature range: 74LS47	0	$^{\circ}\text{C}$ to $70^{\circ}\text{C}$
Storage temperature range	-65	$^{\circ}\text{C}$ to $150^{\circ}\text{C}$

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

**recommended operating conditions**

	74LS47			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 $\mu\text{A}$
Low-level output current, $I_{OL}$	$\overline{BI}/\overline{RBO}$			3.2 mA
Operating free-air temperature, $T_A$	0	70		$^{\circ}\text{C}$

**electrical characteristics over recommended operating free-air temperature 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	$V_{CC} = \text{MIN}, I_I = -18$ mA	-1.5			V
$V_{OH}$ High-level output voltage	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}, I_{OH} = -50$ $\mu\text{A}$	2.4	4.2		V
$V_{OL}$ Low-level output voltage	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}$				V
	$I_{OL} = 1.6$ mA	0.25	0.4		
	$I_{OL} = 3.2$ mA	0.35	0.5		
$I_{O(off)}$ Off-state output current	a thru g $V_{CC} = \text{MAX}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}, V_{O(off)} = 15$ V	250			$\mu\text{A}$
$V_{O(on)}$ On-state output voltage	a thru g $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}$				V
	$I_{O(on)} = 12$ mA	0.25	0.4		
	$I_{O(on)} = 24$ mA	0.35	0.5		
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7$ V	0.1			mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7$ V	20			$\mu\text{A}$
$I_{IL}$ Low-level input current	Any input except $\overline{BI}/\overline{RBO}$ $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 0.4$ V	-0.4			mA
		-1.2			
$I_{OS}$ Short-circuit output current	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$	-0.3	-2		mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX},$ See Note 2	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,  $T_A = 25^{\circ}\text{C}$ .

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

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

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

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

# XD74LS47 DIP-16 XD74LS48 DIP-16

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

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

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

### recommended operating conditions

		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			$\mu A$
	$\overline{BI}/\overline{RBO}$	-50			
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

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†	74LS48			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	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$	-1.5			V
$V_{OH}$	High-level output voltage	a thru g and $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = \text{MAX}$	2.4	4.2		V
$I_O$	Output current	a thru g $V_{CC} = \text{MIN}, V_O = 0.85 \text{ V},$ Input conditions as for $V_{OH}$	-1.3	-2		mA
$V_{OL}$	Low-level output voltage	a thru g $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 2 \text{ mA}$	0.25	0.4	V
			$I_{OL} = 6 \text{ mA}$	0.35	0.5	
	$\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 1.6 \text{ mA}$	0.25	0.4	V
			$I_{OL} = 3.2 \text{ mA}$	0.35	0.5	
$I_I$	Input current at maximum input voltage	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$	0.1			mA
$I_{IH}$	High-level input current	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$	20			$\mu A$
$I_{IL}$	Low-level input current	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-0.4			mA
		$\overline{BI}/\overline{RBO}$	-1.2			
$I_{OS}$	Short-circuit output current	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$	-0.3		-2	mA
$I_{CC}$	Supply current	$V_{CC} = \text{MAX},$ See Note 2		25	38	mA

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

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

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

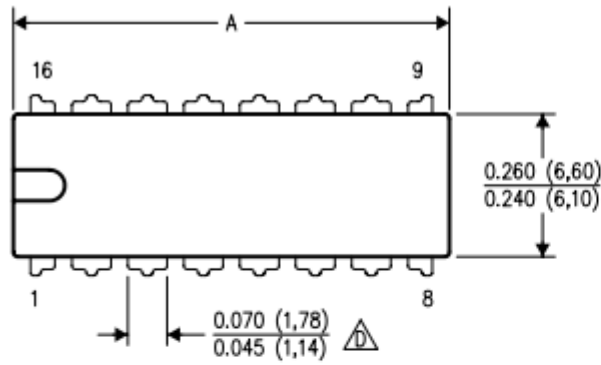
### switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

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 $\overline{RBI}$ 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 $\overline{RBI}$ input		100			

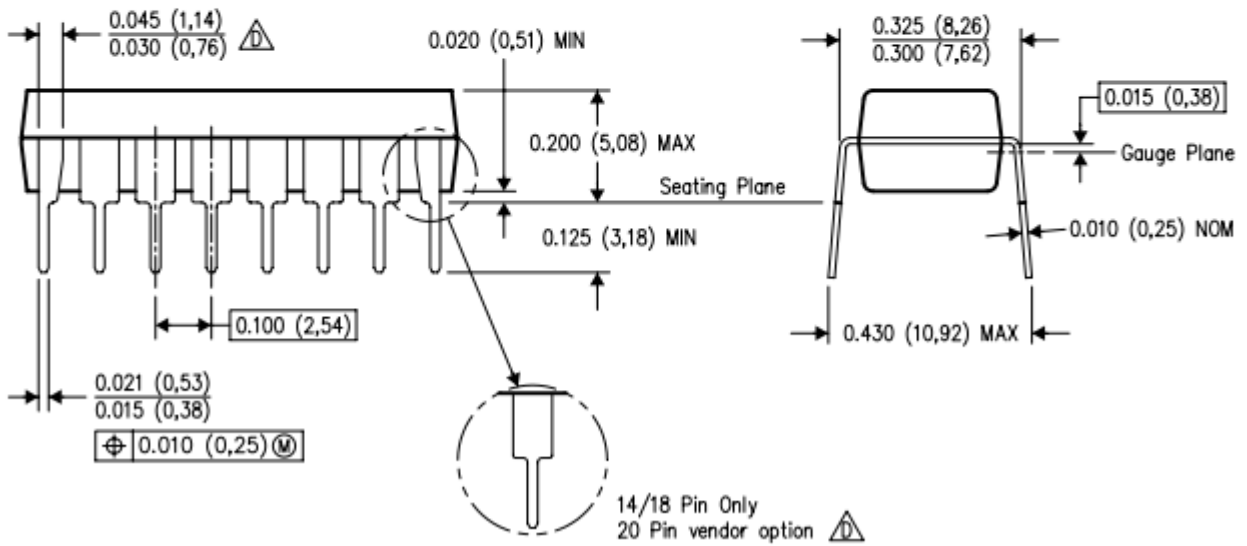
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

# XD74LS47 DIP-16 XD74LS48 DIP-16

## DIP16



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



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