

## SN74LS248N

### ■ Product Introduction

The SN74LS248 is a BCD-to-Seven-Segment Decoder / Driver(internal pull-up outputs), driver common cathode digital tube.The decoding of BCD code into digital segment code can directly drive the display of digital tube, thus simplifying the program and saving the number of I/O of MCU.

The chip is equipped with zero-extinguishing input and output control (RBI and RBO) circuit, digital tube quality detection control (LT) circuit and light-extinguishing control (BI) circuit.One control port (BI/RBO) is shared by the extinguishing lamp and the extinguishing output control, which can be used together to realize the extinguishing control of multi-digit digital display.At the same time, the input and output of the chip are completely compatible with TTL and DTL input and output levels.

### ■ Product Features

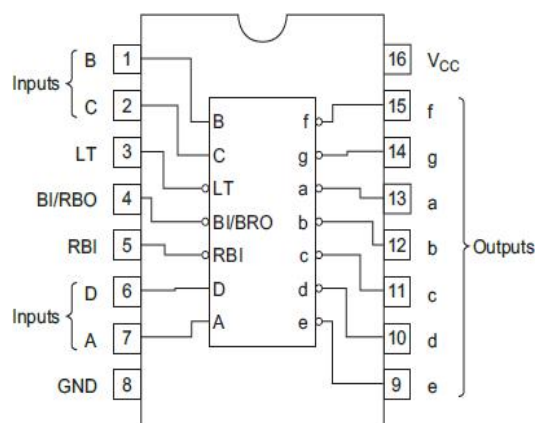
- Direct drive common anode digital tube
- BCD-to-Seven-Segment Decoder / Driver(internal pull-up outputs)
- Fully compatible with TTL/DTL input and output logic level
- The 7 sections of figures 6 and 9 show "6" and "9" forms.
- Package format: DIP16, SOP16

### ■ Product Applications

- Driving common anode digital tube, counter and so on.
- Industrial control application
- Digital logic drivers, such as latches, etc.
- Other application areas

### ■ Package and Pin Assignment

SOP16 or DIP16.			
Pin NO	Pin Definition	Pin NO	Pin Definition
1	Input B	16	Supply VCC
2	Input C	15	Output f
3	LT	14	Output g
4	BI/RBO	13	Output a
5	RBI	12	Output b
6	Input D	11	Output c
7	Input A	10	Output d
8	Supply GND	9	Output e

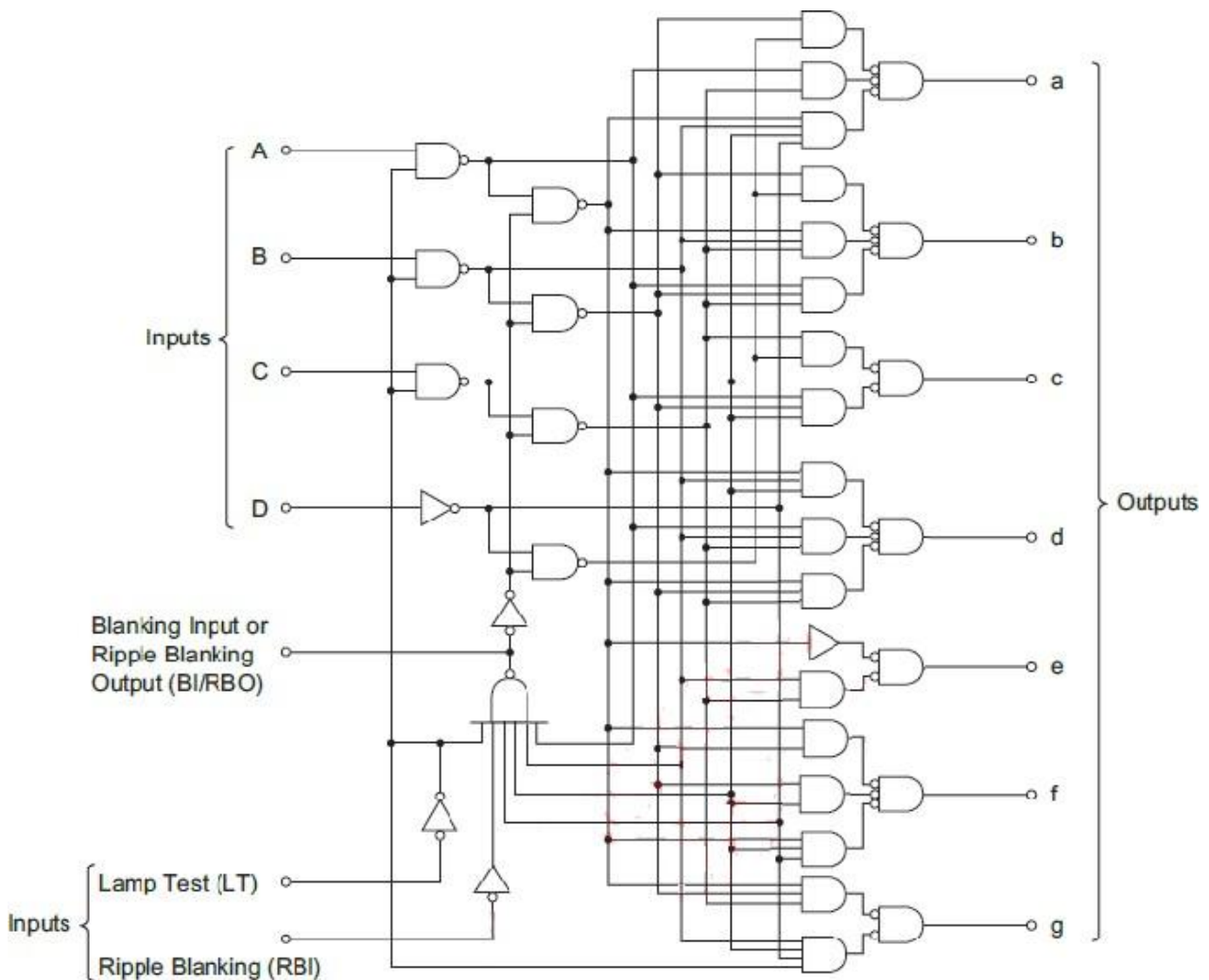


### ■ Absolute Maximum Ratings

Item	Symbol	Maximum Ratings	Unit
Supply voltage	$V_{CC}$	7	V
Input voltage	$V_I$	7	V
Power dissipation	PD	500	mW
Operating temperature	$T_A$	0-70	°C
Storage temperature	$T_S$	-65-150	°C
Welding temperature	$T_W$	260, 10s	°C

Note: the limit parameter is the limit value that cannot be exceeded under any condition. Once this limit is exceeded, it may cause physical damage such as deterioration of the product. At the same time, the chip can not be guaranteed to work properly when it is close to the limit parameters.

### ■ Block Diagram



### ■ Function Table

Decimal or Function	Inputs						BI/R BO	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	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

H; high level, L; low level, X; irrelevant

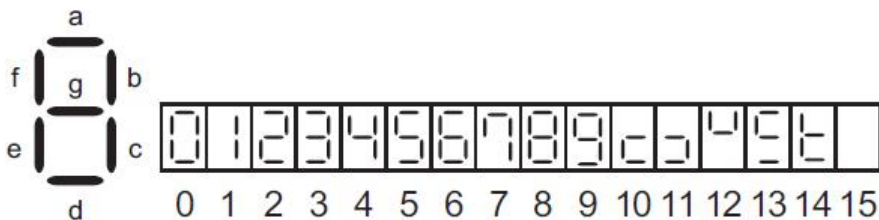
Notes: 1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or high if blanking of a decimal zero is not desired.

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.

5. digital tube display graphics:



**Recommended Operating Conditions**

Item	Symbol	Min	Tpy	Max	Unit	
Supply voltage	VCC	4.75	5	5.25	V	
Output current	a to g	I <sub>OH</sub>	—	—	-100	μA
	BI / RBO		—	—	-50	μA
	a to g	I <sub>OL</sub>	—	—	6	mA
	BI / RBO		—	—	3.2	mA
Operating temperature	T <sub>A</sub>	0	—	60	°C	

**Electrical Characteristics** (T<sub>A</sub>=25°C, Unless specified)

Item	Symbol	Min	Tpy	Max	Unit	Conditions	
Input voltage	V <sub>IH</sub>	2.0	—	—	V		
	V <sub>IL</sub>	—	—	0.7	V		
Output voltage	a-g	V <sub>OH</sub>	2.4	4.5	—	V	I <sub>OH</sub> =-100μA VCC=4.75V, V <sub>IH</sub> =2V V <sub>IL</sub> =0.7V
			BI/RBO	2.4	3.8		
	a-g	V <sub>OL</sub>	—	0.3	0.5	V	VCC=4.75V, V <sub>IH</sub> =2V, V <sub>IL</sub> =0.7V
			—	0.4	0.6		
BI/RBO	V <sub>OL</sub>	—	0.1	0.4	V	I <sub>OL</sub> =6mA	
		—	0.15	0.5		I <sub>OL</sub> =1.6mA I <sub>OL</sub> =3.2mA	
Output current	a-g	I <sub>O</sub>	1.3	1.8	—	mA	VCC=4.75V, V <sub>O</sub> =0.85V, Output=V <sub>OH</sub>
Input current	Except BI/RBO	I <sub>IH</sub>	—	0	20	μA	VCC=5.25V, V <sub>I</sub> =2.7V
			BI/RBO	I <sub>IL</sub>	—		
	Except BI/RBO	I <sub>I</sub>			—	0	0.1
			BI/RBO	I <sub>I</sub>	—	0	0.1
Short-circuit output current*	BI/RBO	I <sub>OS</sub>			-0.3	-0.8	-2
Supply current	I <sub>CC</sub>	—	26	38	—	mA	VCC=5.25V, all V <sub>I</sub> =4.5V
Input clamp voltage	V <sub>IK</sub>	—	0.9	-1.5	—	V	VCC=4.75V, I <sub>IN</sub> = -18mA

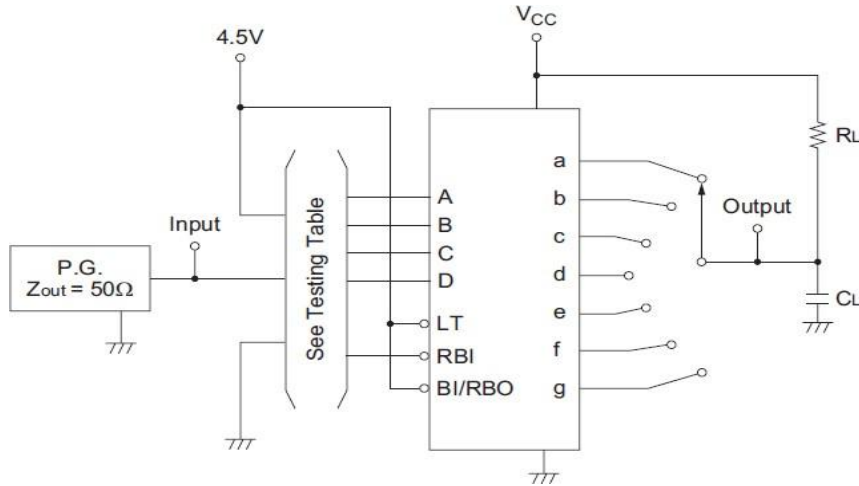
Notes: \* only one output port is short circuited each time, and the short circuit time is not more than one second.

**Switching Characteristics** (T<sub>A</sub>=25°C, Unless specified)

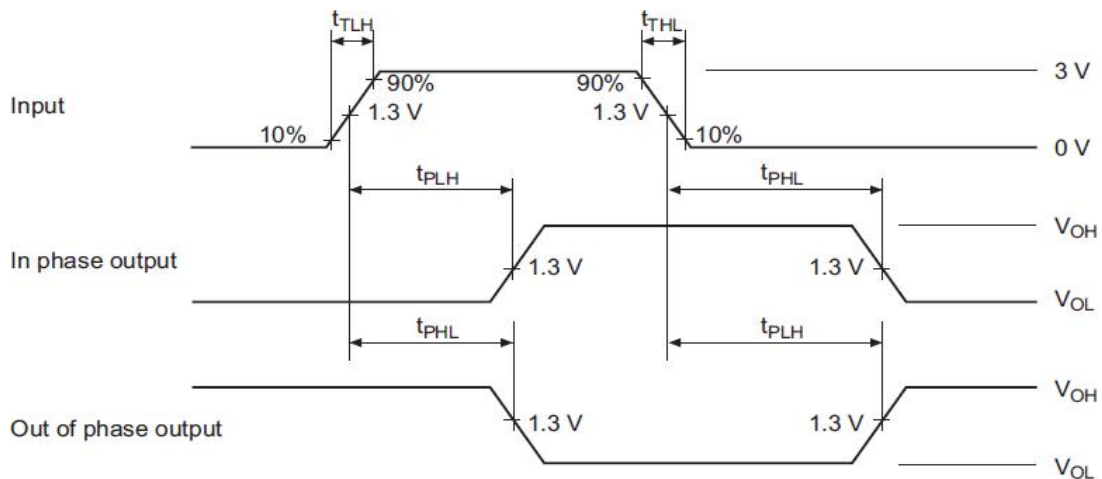
Item	Symbol	Input	Min	Tpy	Max	Unit	Conditions
Propagation delay time	t <sub>PLH</sub>	A	—	88	—	ns	VCC=5V, CL=16pF, RL=4KΩ
		RBI	—	124	—	ns	
	t <sub>PHL</sub>	A	—	36	—	ns	
		RBI	—	48	—	ns	

## ■ Testing Method

### 1、Test Circuit



### 2、Waveform



Note:

1. See Testing Table refers to the corresponding test items in the switch characteristic table.
2. the CL capacitor is an external patch capacitor (0603), which is connected to the output pin and the capacitor is near the chip GND.
3. Input: port input level,  $f=500\text{kHz}$ ,  $D=50\%$ ,  $t_{\text{TLH}}=t_{\text{THL}}$  or less 20ns;
4. Output: Y output test port (Out of Phase Output, In Phase Output)

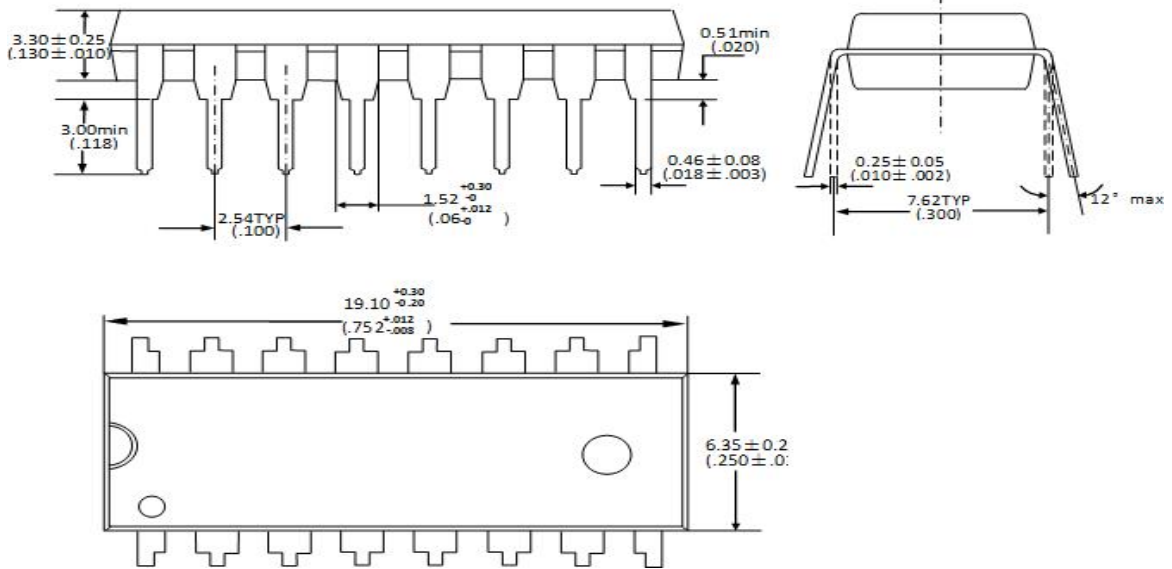
### 3、Testing Table :

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

### ■ Package Dimensions

Unit : mm / inch

#### DIP16



#### SOP16

