SN74LS48N

■ Product Introduction

The SN74LS48N is a seven segment digitally controlled decoder / driver that outputs high efficiency (digital tube common cathode). It is used to transform the BCD code into the number in the digital tube, thus simplifying the program and saving the number of MCU I/O. The input and output terminals are fully compatible with TTL and DTL input and output interfaces.

The chip has zero-killing input and output control (RBI and RBO), digital tube quality detection control (LT) and light-out control (BI) functions. 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.

■ Product Features

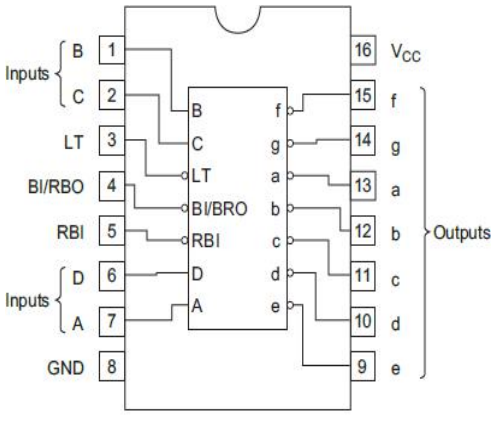
- Direct drive common cathode digital tube
- Fully compatible with TTL/DTL input and output logic level
- Convert BCD code to digital display function
- seven sections of figures “6” and “9” show "b" and "q" form
- Package : DIP16, SOP16

■ Product Applications

- Driving common cathode digital tube, counter and so on
- Digital logic drivers, such as latches
- Other application areasBattery-powered equipment

■ 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

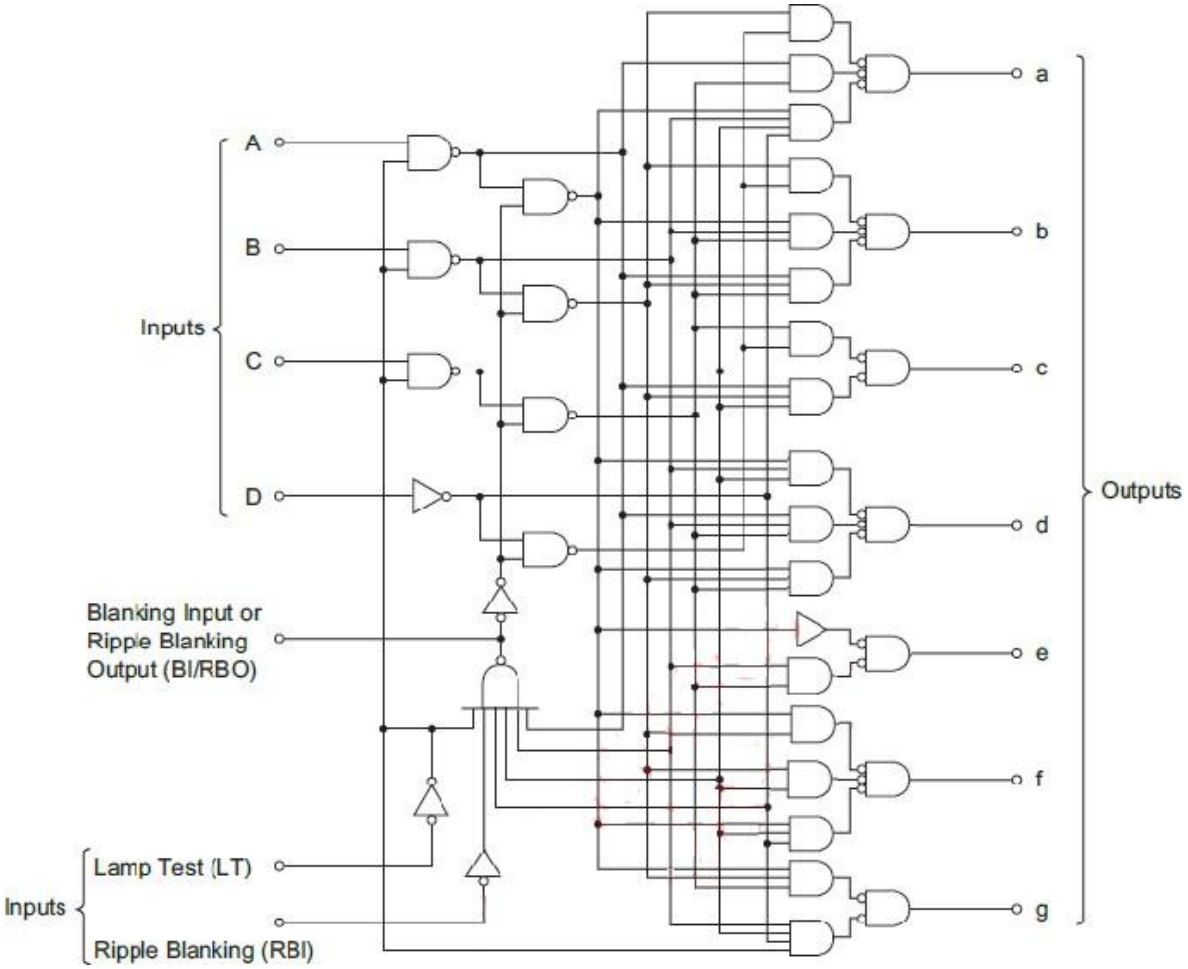


Absolute Maximum Ratings

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

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/RBO	Outputs						
	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	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
RBI	H	L	L	L	L	L	L	L	L	L	L	L	L	L
LT	L	X	X	X	X	X	H	H	H	H	H	H	H	H

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

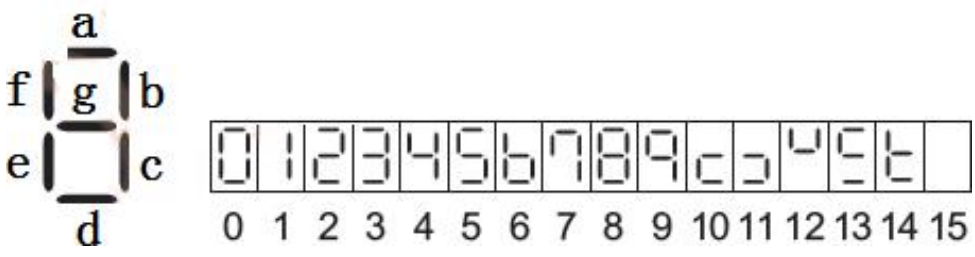
Notes: 1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired.

2. When a low logic level is applied directly to the blanking input (BI), all segment outputs are low regardless of the level of any other input.

3. When ripple-blanking input (RBI) and inputs A, B, C, and D are at a low level with the lamp-test input high, all segment outputs go low and the ripple-blanking output (RBO) goes to a low level (response condition).

4. When a blanking input / ripple blanking output (BI / RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are high.

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_{OH}	—	—	-100	μA
	BI / RBO		—	—	-50	μA
	a to g	I_{OL}	—	—	6	mA
	BI / RBO		—	—	3.2	mA
Operating temperature		T_A	0	—	60	℃

Electrical Characteristics

(T_A=25℃, Unless specified)

Item		Symbol	Min	Tpy	Max	Unit	Conditions	
Input voltage		V_{IH}	2.0	—	—	V		
		V_{IL}	—	—	0.7	V		
Output voltage	a-g	V_{OH}	2.4	4.5	-	V	I_{OH}=-100uA	VCC=4.75V, V_{IH}=2V, V_{IL}=0.7V
	BI/RBO		2.4	3.8	-		I_{OH}=-50uA	
	a-g	V_{OL}	—	0.10	0.4	V	I_{OL}=2mA	VCC=4.75V, VIH=2V, V_{IL}=0.7V
			—	0.20	0.6		I_{OL}=6mA	
	BI/RBO		—	0.10	0.4	V	I_{OL}=1.6mA	
			—	0.20	0.6		I_{OL}=3.2mA	
Output current	a-g	I_O	1.3	1.8	-	mA	VCC=4.75V, V_O=0.85V, Output=V_{OH}	
Input current	Except BI/RBO	I_{IH}	—	0.01	20	uA	VCC=5.25V, V_I=2.7V	
	Except BI/RBO	I_{IL}	—	0.20	-0.4	mA	VCC=5.25V, V_I=0.4V	
	BI/RBO		—	0.50	-1.2	mA		
	Except BI/RBO	I_I	—	0.01	100	uA	VCC=5.25V, V_I=7V	
Short-circuit output current	BI/RBO	I_{OS}	-0.3	0.85	-2	mA	VCC=5.25V	
Supply current		I_{CC}	—	25	38	mA	VCC=5.25V, all V_I=4.5V	
Input clamp voltage		V_{IK}	—	0.9	-1.5	V	VCC=4.75V, I_{IN} = - 18mA	

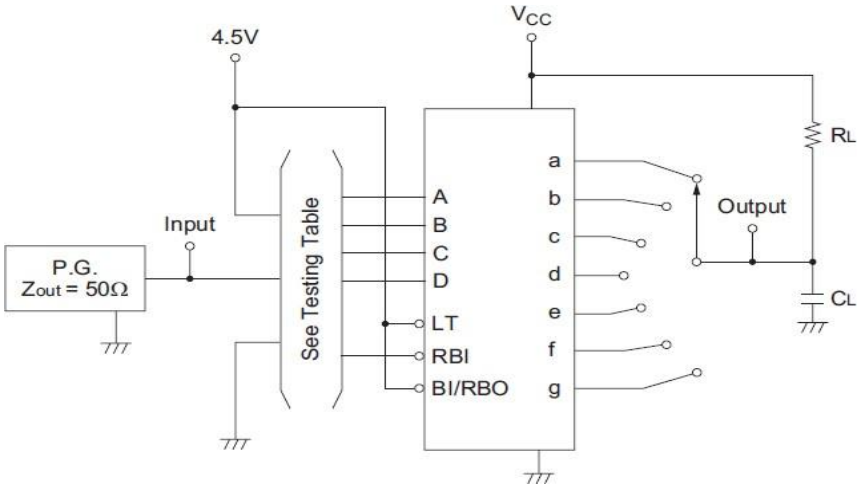
Switching Characteristics

(T_A=25℃, Unless specified)

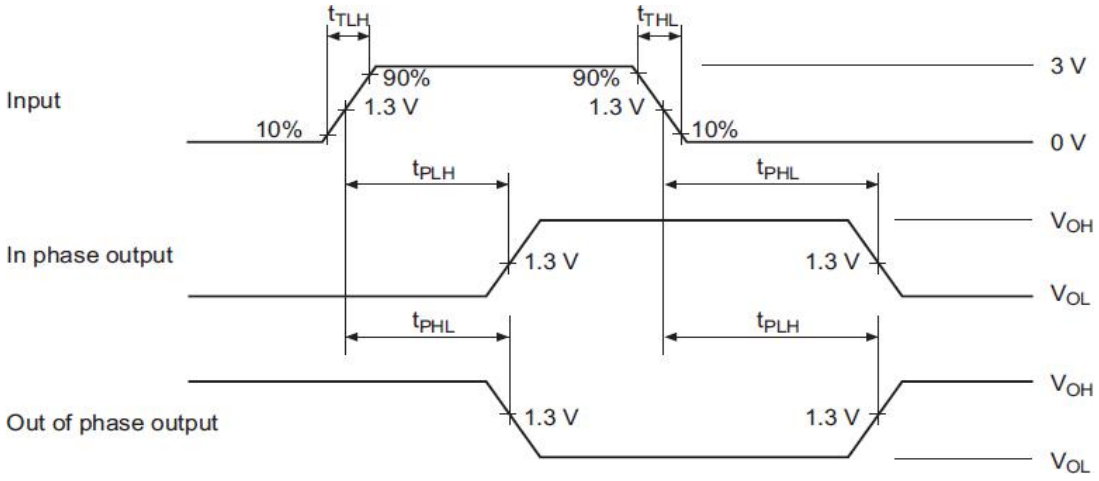
Item	Symbol	Input	Min	Tpy	Max	Unit	Conditions
Propagation delay time	t_{PLH}	A	—	92	—	ns	VCC=5V, CL=16pF, RL=4KΩ
		RBI	—	140	—	ns	
	t_{PHL}	A	—	36	—	ns	
		RBI	—	48	—	ns	

■ 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=500kHz, D=50%, tTLH=tTHL or less 20ns;
4. Output: Y output test port (Out of Phase Output, In Phase Output)

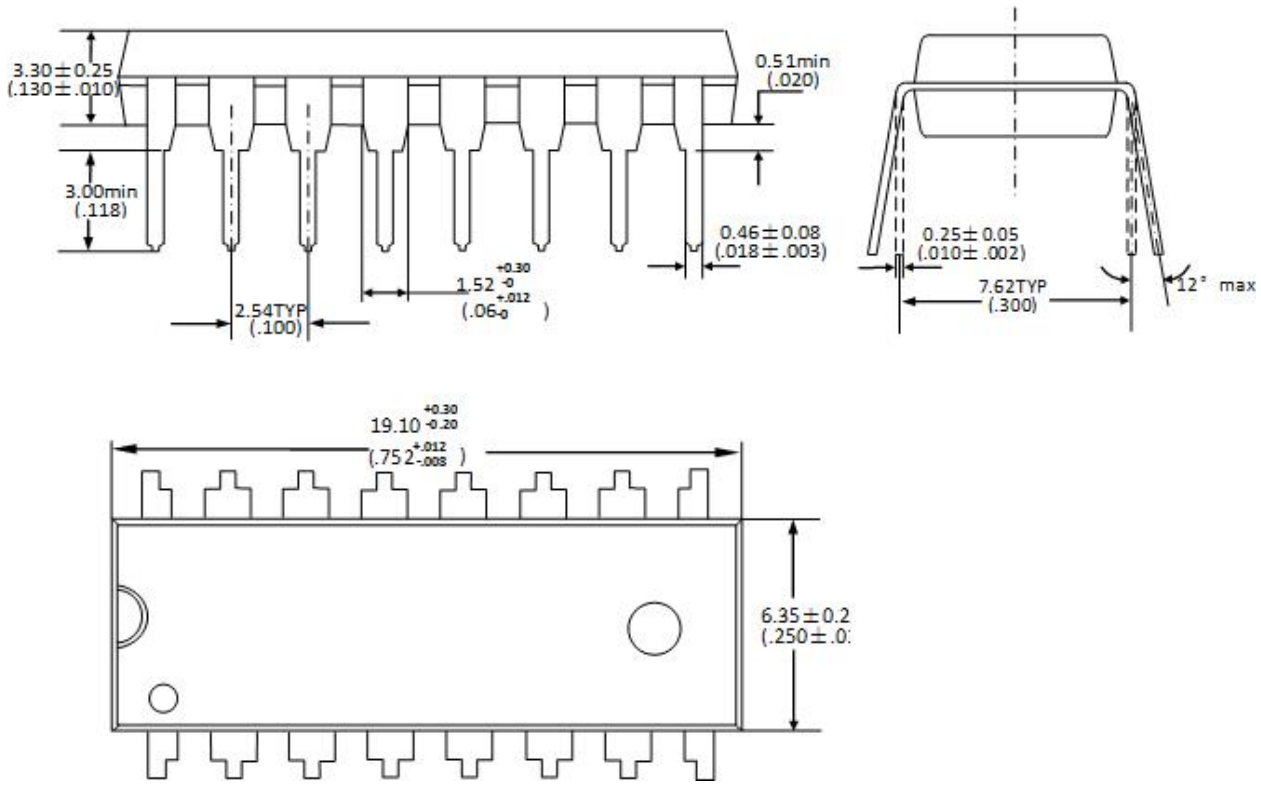
3、Testing Table：

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