

SN74LS47N

■ Product Introduction

The SN74LS47N is a seven segment digital tube decoder / driver with low output efficiency (common anode 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

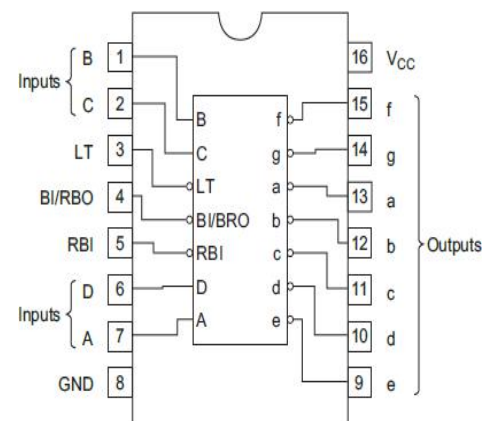
- Direct drive common anode digital tube
- Fully compatible with TTL/DTL input and output logic level
- Convert BCD code to digital display function
- seven sections of figures "6" and "9" show "b" and "q" form
- Open drain output, withstanding voltage up to 15V
- Package : DIP16, SOP16

■ Product Applications

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

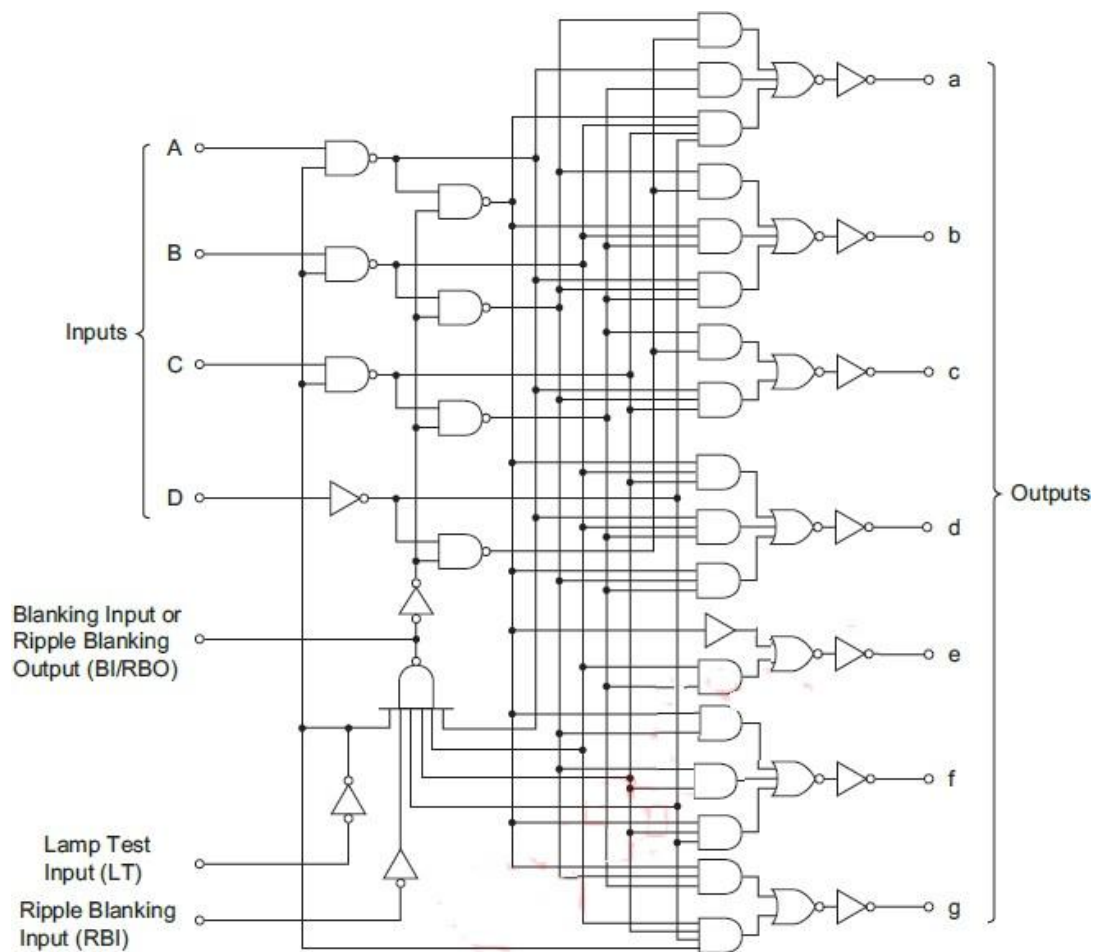


■ Absolute Maximum Ratings

Item	Symbol	Maximum Ratings	Unit
Supply voltage	V_{CC}	7	V
Input voltage	V_I	7	V
Output current(off)	I_o (off)	1	mA
Power dissipation	P_D	500	mW
Operating temperature	T_A	0-70	°C
Storage temperature	T_S	-65-150	°C
welding temperature	T_W	260	°C,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							Note
	LT	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	ON	ON	OFF	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; high level, L; low level, X, irrelevant

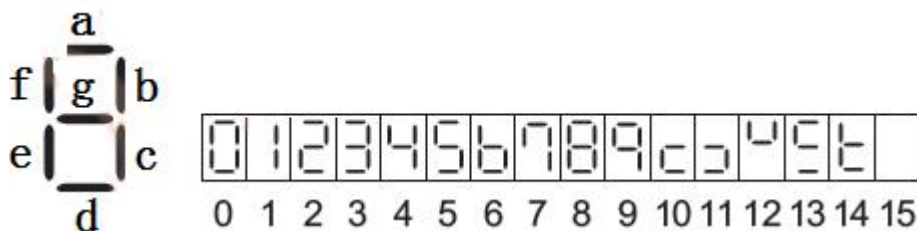
Notes: 1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or high if blanking of a decimal zero is not desired.

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 output (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 voltage	a to g	$V_{O(off)}$	—	15	V
Output current	a to g	$I_{O(on)}$	—	24	mA
	BI / RBO	I_{OH}	—	-50	μA
	BI / RBO	I_{OL}	—	3.2	mA
Operating temperature	T_A	0	-	60	$^{\circ}C$

Electrical Characteristics ($T_A=25^{\circ}C$, Unless specified)

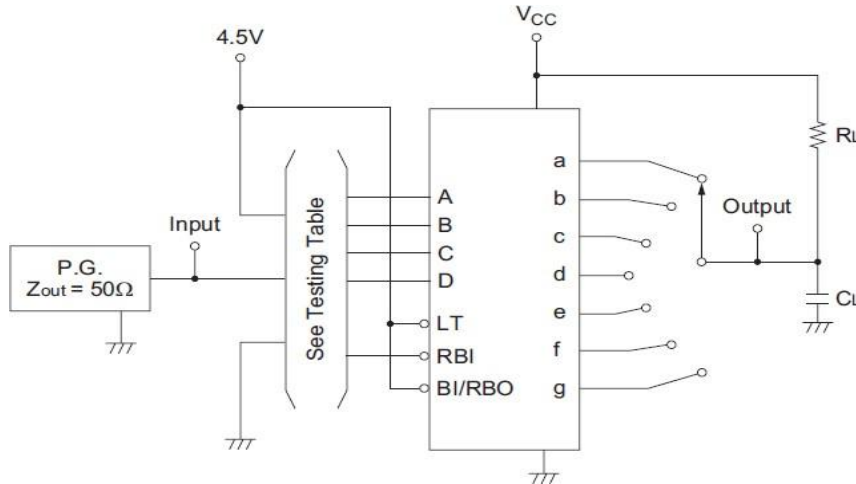
Item	Symbol	Min	Tpy	Max	Unit	Conditions	
Input voltage	V_{IH}	2.0	—	—	V		
	V_{IL}	—	—	0.7	V		
Output voltage	BI / RBO	V_{OH}	2.4	3.785	—	V	VCC=4.75V, $V_{IH}=2V$, $V_{IL}=0.7V$, $I_{OH} = -50\mu A$
		V_{OL}	—	0.1	0.4	V	$I_{OL}=1.6mA$ $I_{OL}=3.2mA$ VCC=4.75V, $V_{IH}=2V$, $V_{IL}=0.7V$
	—		0.15	0.5			
	a-g	$V_{O(on)}$	—	0.5	0.8	V	$I_{O(on)}=12mA$ $I_{O(on)}=24mA$ VCC=4.75V, $V_{IH}=2V$, $V_{IL}=0.7V$,
—			0.7	0.9			
Output current	a-g	$I_{O(off)}$	—	0.1	250	μA	VCC=5.25V, $V_{IH}=2V$, $V_{IL}=0.7V$, $V_{O(off)}=15V$
Input current	All input	I_{IH}	—	0.1	20	μA	VCC=5.25V, $V_I=2.7V$
	All input Except BI/RBO	I_{IL}	—	0.2	-0.4	mA	VCC=5.25V, $V_I=0.4V$
			—	0.7	-1.2		
	All input	I_I	—	0	0.1	mA	VCC=5.25V, $V_I=7V$
Short-circuit output current	BI/RBO	I_{OS}	-0.3	-0.8	-2	mA	VCC=5.25V
Supply current	I_{CC}	—	8	13	mA	VCC=5.25V, $V_I=4.5V$	
Input clamp voltage	V_{IK}	—	0.9	-1.5	V	VCC=4.75V, $I_{IN} = -18mA$	

Switching Characteristics ($T_A=25^{\circ}C$, Unless specified)

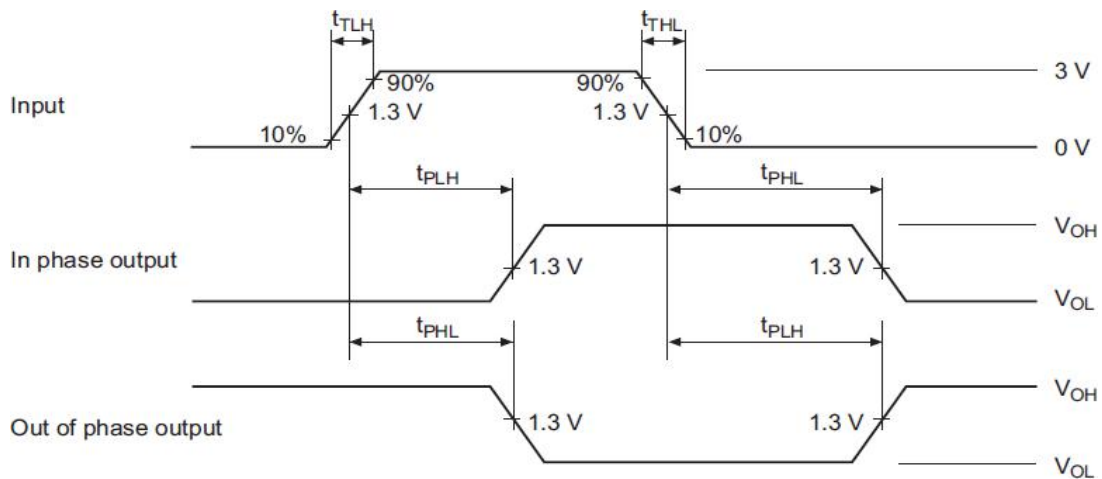
Item	Symbol	Input	Min	Tpy	Max	Unit	Conditions
Propagation delay time	t_{PLH}	A	—	130	—	ns	VCC=5V CL=16pF, RL=666 Ω
		RBI	—	140	—	ns	
	t_{PHL}	A	—	32	—	ns	
		RBI	—	52	—	ns	

■ 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, $f=1\text{MHz}$, $D=50\%$, $t_{TLH}=t_{THL}$ 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_{PLH}	4.5V	GND	GND	GND	IN	OUT	—	—	OUT	OUT	OUT	—
	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	—

