

## SN74LS247N

### ■ Product Introduction

The SN74LS247 is a BCD-to-Seven-Segment Decoder / Driver(with three-state outputs).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

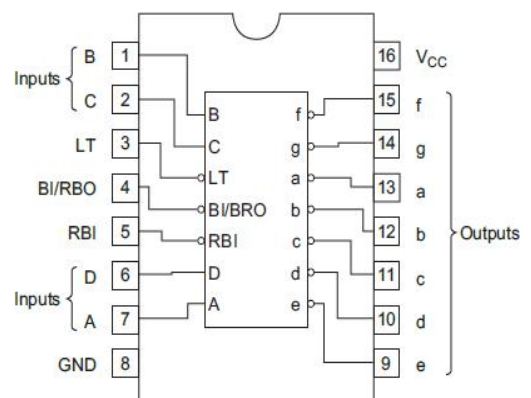
- BCD-to-Seven-Segment Decoder / Driver(with three-state outputs)
- Converting BCD code to digital display function( common anode digital tube)
- Open drain output, withstanding voltage up to 15V
- Fully compatible with TTL/DTL input and output logic level
- The 7 sections of figures 6 and 9 show "6" 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       |

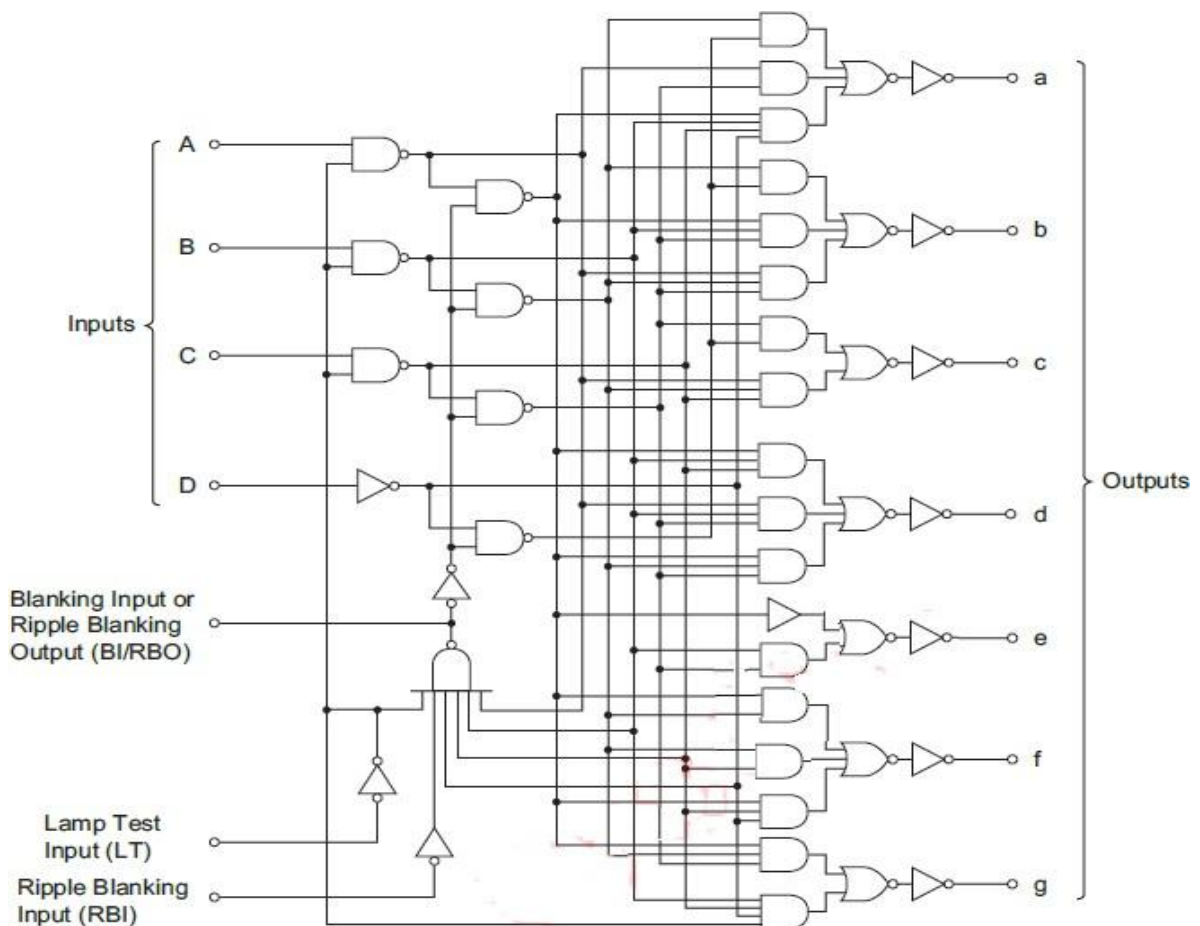


### ■ Absolute Maximum Ratings

| Item                  | Symbol      | Maximum Ratings | Unit   |
|-----------------------|-------------|-----------------|--------|
| Supply voltage        | $V_{CC}$    | 7               | V      |
| Input voltage         | $V_I$       | 7               | V      |
| 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<br>/ Fun | Input |     |   |   |   |   | BI/<br>RBO | Output |     |     |     |     |     |     | Not<br>e |
|------------------|-------|-----|---|---|---|---|------------|--------|-----|-----|-----|-----|-----|-----|----------|
|                  | 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          | ON     | 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  | ON  | 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

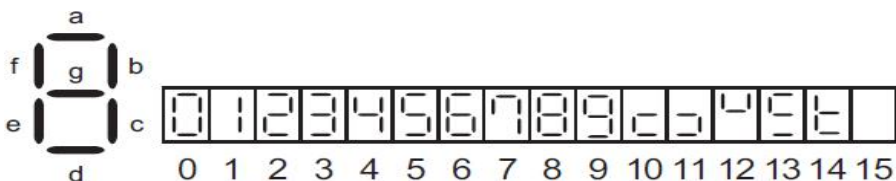
Notes: 1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or high if blanking of a decimal zero is not desired.

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 input (BI/RBO) is open or held high and a low is applied to the lamptest 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  | $\mu A$     |
|                       | BI / RBO | $I_{OL}$     | —   | 3.2  | mA          |
| Operating temperature | $T_A$    | 0            | -   | 60   | $^{\circ}C$ |

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

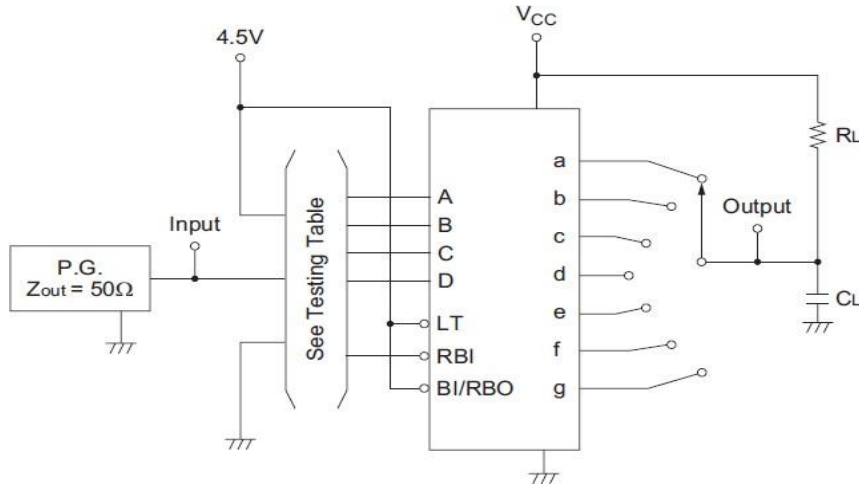
| Item                            | Symbol                     | Min          | Tpy  | Max  | Unit | Conditions |   |
|---------------------------------|----------------------------|--------------|------|------|------|------------|---|
| Input voltage                   | $V_{IH}$                   | 2.0          | —    | —    | V    |            |   |
|                                 | $V_{IL}$                   | —            | —    | 0.7  | V    |            |   |
| Output voltage                  | BI / RBO                   | $V_{OH}$     | 2.4  | 3.8  | —    | V          | VCC=4.75V, $V_{IH}=2V$ , $V_{IL}=0.7V$ ,<br>$I_{OH}=-50\mu A$ |
|                                 |                            | $V_{OL}$     | —    | 0.24 | 0.4  | V          | $I_{OL}=1.6mA$<br>$I_{OL}=3.2mA$                              |
|                                 | —                          |              | 0.3  | 0.5  |      |            |   |
|                                 | a-g                        | $V_{O(on)}$  | —    | 0.45 | 0.6  | V          | $I_{O(on)}=12mA$<br>$I_{O(on)}=24mA$                          |
| —                               |                            |              | 0.7  | 0.9  |      |            |   |
| Output current                  | a-g                        | $I_{O(off)}$ | —    | 0.1  | 250  | $\mu A$    | VCC=5.25V, $V_{IH}=2V$ , $V_{IL}=0.7V$ ,<br>$V_{O(off)}=15V$  |
| Input current                   | All input                  | $I_{IH}$     | —    | 0.1  | 20   | $\mu A$    | VCC=5.25V, $V_I=2.7V$   |
|                                 | All input<br>Except BI/RBO | $I_{IL}$     | —    | 0.2  | -0.4 | mA         | VCC=5.25V, $V_I=0.4V$   |
|                                 | BI/RBO                     |              | —    | 0.2  | -1.2 |            |   |
|                                 | All input                  | $I_I$        | —    | 0    | 0.1  | mA         | VCC=5.25V, $V_I=7V$   |
| Short-circuit<br>output current | BI/RBO                     | $I_{OS}$     | -0.3 | 0.9  | -2   | mA         | VCC=5.25V   |
| Supply current                  | $I_{CC}$                   | —            | —    | 8.5  | 13   |            | VCC=5.25V, $V_I=4.5V$   |
| Input clamp voltage             | $V_{IK}$                   | —            | —    | 0.9  | -1.5 |            | VCC=4.75V, $I_{IN}=-18mA$                                     |

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

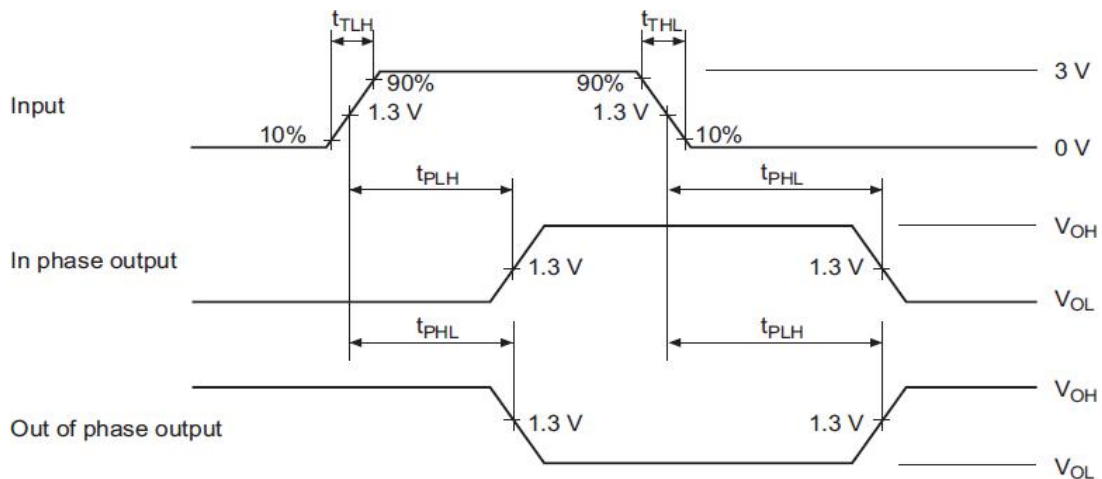
| Item                   | Symbol    | Input | Min | Tpy | Max | Unit | Conditions                            |
|------------------------|-----------|-------|-----|-----|-----|------|---------------------------------------|
| Propagation delay time | $t_{PLH}$ | A     | —   | 130 | —   | ns   | VCC=5V<br>CL=16pF,<br>RL=666 $\Omega$ |
|                        |           | 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)

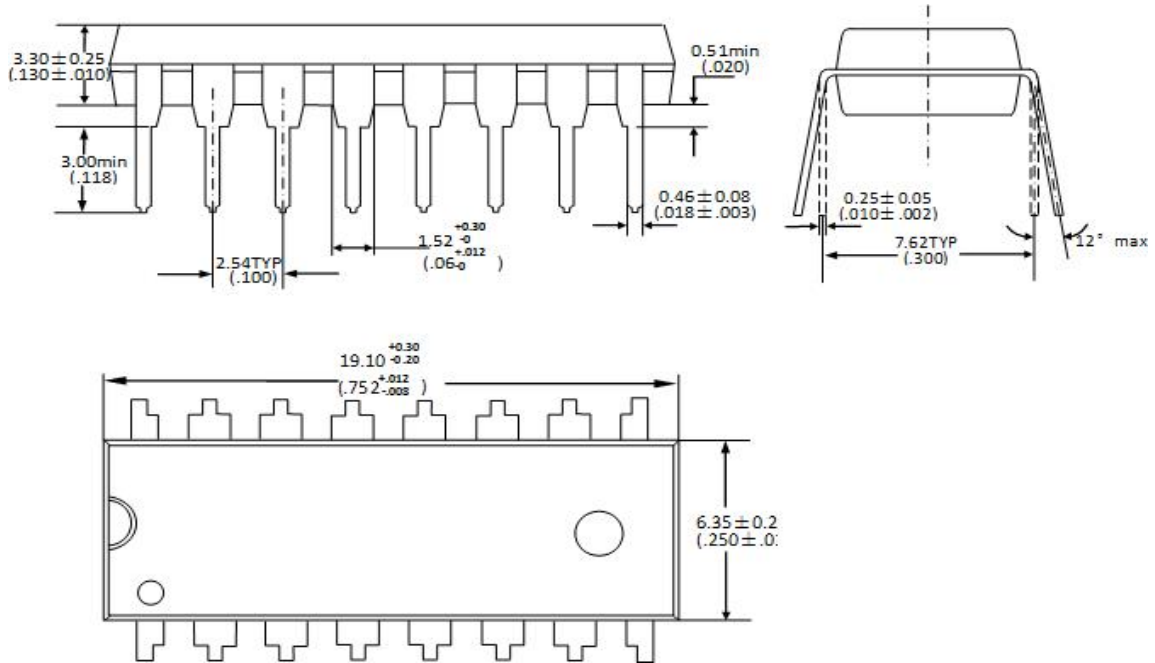
### 3、Testing Table :

| 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 | —   |

### ■ Package Dimensions

Unit : mm / inch

#### DIP16



#### SOP16

