

## General Description

The SN74HC/HCT42 is a one of ten BCD to decimal decoder. It accepts four BCD inputs (0A to 3A) and provides ten mutually exclusive outputs ( $0\bar{Y}$  to  $9\bar{Y}$ ). The logic design ensures that all outputs are HIGH when binary codes greater than nine are applied to the inputs. The most significant input (3A) produces an useful inhibit function when the device is used as a 1-of-8 decoder. The 3A input can also be used as the data input in an 8-output demultiplexer application. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## Features

- Input levels:  
For SN74HC42: CMOS level  
For SN74HCT42: TTL level
- Mutually exclusive outputs
- 1-of-8 demultiplexing capability
- Outputs disabled for input codes above nine
- Specified from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Packaging information: DIP16/SOP16/TSSOP16

## Ordering Information

| Product Model      | Package Type | Marking  | Packing | Packing Qty  |
|--------------------|--------------|----------|---------|--------------|
| XBLW SN74HC42N     | DIP-16       | 74HC42N  | Tube    | 1000Pcs/Box  |
| XBLW SN74HC42DTR   | SOP-16       | 74HC42   | Tape    | 2500Pcs/Reel |
| XBLW SN74HC42TDTR  | TSSOP-16     | 74HC42   | Tape    | 3000Pcs/Reel |
| XBLW SN74HCT42N    | DIP-16       | 74HCT42N | Tube    | 1000Pcs/Box  |
| XBLW SN74HCT42DTR  | SOP-16       | 74HCT42  | Tape    | 2500Pcs/Reel |
| XBLW SN74HCT42TDTR | TSSOP-16     | 74HCT42  | Tape    | 3000Pcs/Reel |

## Block Diagram And Pin Description

### 2.1、Block Diagram

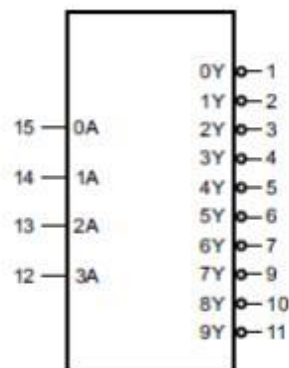


Figure 1. Logic symbol

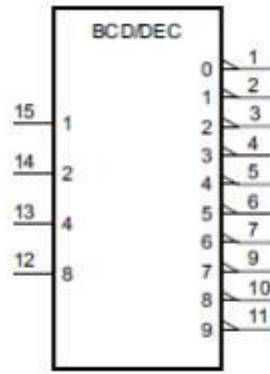


Figure 2. IEC logic symbol

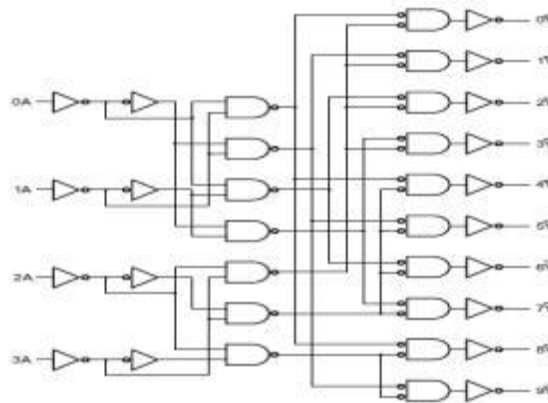
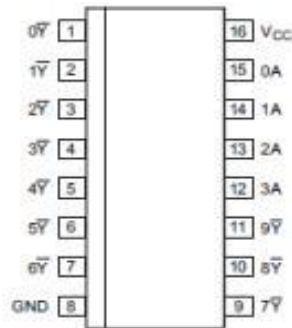


Figure 4. Logic diagram

### Pin Configurations



### Pin Description

| Pin No. | Pin Name    | Description        |
|---------|-------------|--------------------|
| 1       | 0 $\bar{Y}$ | multiplexer output |
| 2       | 1 $\bar{Y}$ | multiplexer output |
| 3       | 2 $\bar{Y}$ | multiplexer output |
| 4       | 3 $\bar{Y}$ | multiplexer output |
| 5       | 4 $\bar{Y}$ | multiplexer output |
| 6       | 5 $\bar{Y}$ | multiplexer output |
| 7       | 6 $\bar{Y}$ | multiplexer output |
| 8       | GND         | ground (0V)        |
| 9       | 7 $\bar{Y}$ | multiplexer output |
| 10      | 8 $\bar{Y}$ | multiplexer output |
| 11      | 9 $\bar{Y}$ | multiplexer output |

|    |                 |                |
|----|-----------------|----------------|
| 12 | 3A              | data input     |
| 13 | 2A              | data input     |
| 14 | 1A              | data input     |
| 15 | 0A              | data input     |
| 16 | V <sub>CC</sub> | supply voltage |

**Function Table**

| Input |    |    |    | Output      |             |             |             |             |             |             |             |             |             |
|-------|----|----|----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 3A    | 2A | 1A | 0A | 0 $\bar{Y}$ | 1 $\bar{Y}$ | 2 $\bar{Y}$ | 3 $\bar{Y}$ | 4 $\bar{Y}$ | 5 $\bar{Y}$ | 6 $\bar{Y}$ | 7 $\bar{Y}$ | 8 $\bar{Y}$ | 9 $\bar{Y}$ |
| L     | L  | L  | L  | L           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| L     | L  | L  | H  | H           | L           | H           | H           | H           | H           | H           | H           | H           | H           |
| L     | L  | H  | L  | H           | H           | L           | H           | H           | H           | H           | H           | H           | H           |
| L     | L  | H  | H  | H           | H           | H           | L           | H           | H           | H           | H           | H           | H           |
| L     | H  | L  | L  | H           | H           | H           | H           | L           | H           | H           | H           | H           | H           |
| L     | H  | L  | H  | H           | H           | H           | H           | H           | L           | H           | H           | H           | H           |
| L     | H  | H  | L  | H           | H           | H           | H           | H           | H           | L           | H           | H           | H           |
| L     | H  | H  | H  | H           | H           | H           | H           | H           | H           | H           | L           | H           | H           |
| H     | L  | L  | L  | H           | H           | H           | H           | H           | H           | H           | H           | L           | H           |
| H     | L  | L  | H  | H           | H           | H           | H           | H           | H           | H           | H           | H           | L           |
| H     | L  | H  | L  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| H     | L  | H  | H  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| H     | H  | L  | L  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| H     | H  | L  | H  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| H     | H  | H  | L  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |
| H     | H  | H  | H  | H           | H           | H           | H           | H           | H           | H           | H           | H           | H           |

Note: H=HIGH voltage level; L=LOW voltage level.

## Electrical Parameter

### Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter               | Symbol           | Conditions   | Min.      | Max. | Unit |
|-------------------------|------------------|--|-----------|------|------|
| supply voltage          | V <sub>CC</sub>  | -  | -0.5      | +7.0 | V    |
| input clamping current  | I <sub>IK</sub>  | V <sub>I</sub> < -0.5V or V <sub>I</sub> > V <sub>CC</sub> +0.5V | -         | ±20  | mA   |
| output clamping current | I <sub>OK</sub>  | V <sub>O</sub> < -0.5V or V <sub>O</sub> > V <sub>CC</sub> +0.5V | -         | ±20  | mA   |
| output current          | I <sub>O</sub>   | -0.5V < V <sub>O</sub> < V <sub>CC</sub> +0.5V                   | -         | ±25  | mA   |
| supply current          | I <sub>CC</sub>  | -  | -         | +50  | mA   |
| ground current          | I <sub>GND</sub> | -  | -50       | -    | mA   |
| storage temperature     | T <sub>stg</sub> | -  | -65       | +150 | °C   |
| total power dissipation | P <sub>tot</sub> | -  | -         | 500  | mW   |
| soldering temperature   | T <sub>L</sub>   | 10s  | DIP       |      | °C   |
|                         |                  |  | SOP/TSSOP |      |      |

**Recommended Operating Conditions**

| Parameter                           | Symbol              | Conditions    | Min. | Typ. | Max.     | Unit |
|-------------------------------------|---------------------|---------------|------|------|----------|------|
| <b>SN74HC42</b>                     |                     |               |      |      |          |      |
| supply voltage                      | $V_{CC}$            | -             | 2.0  | 5.0  | 6.0      | V    |
| input voltage                       | $V_I$               | -             | 0    | -    | $V_{CC}$ | V    |
| output voltage                      | $V_O$               | -             | 0    | -    | $V_{CC}$ | V    |
| input transition rise and fall rate | $\Delta t/\Delta V$ | $V_{CC}=2.0V$ | -    | -    | 625      | ns/V |
|                                     |                     | $V_{CC}=4.5V$ | -    | 1.67 | 139      | ns/V |
|                                     |                     | $V_{CC}=6.0V$ | -    | -    | 83       | ns/V |
| ambient temperature                 | $T_{amb}$           | -             | -40  | -    | +125     | °C   |
| <b>SN74HCT42</b>                    |                     |               |      |      |          |      |
| supply voltage                      | $V_{CC}$            | -             | 4.5  | 5.0  | 5.5      | V    |
| input voltage                       | $V_I$               | -             | 0    | -    | $V_{CC}$ | V    |
| output voltage                      | $V_O$               | -             | 0    | -    | $V_{CC}$ | V    |
| input transition rise and fall rate | $\Delta t/\Delta V$ | $V_{CC}=4.5V$ | -    | 1.67 | 139      | ns/V |
| ambient temperature                 | $T_{amb}$           | -             | -40  | -    | +125     | °C   |

**Electrical Characteristics**
**3.3.1、DC Characteristics 1**

( $T_{amb}=25^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                 | Symbol   | Conditions                                 | Min.                        | Typ. | Max.      | Unit    |   |
|---------------------------|----------|--|-----------------------------|------|-----------|---------|---|
| <b>SN74HC42</b>           |          |  |                             |      |           |         |   |
| HIGH-level input voltage  | $V_{IH}$ | $V_{CC}=2.0V$                              | 1.5                         | 1.2  | -         | V       |   |
|                           |          | $V_{CC}=4.5V$                              | 3.15                        | 2.4  | -         | V       |   |
|                           |          | $V_{CC}=6.0V$                              | 4.2                         | 3.2  | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$ | $V_{CC}=2.0V$                              | -                           | 0.8  | 0.5       | V       |   |
|                           |          | $V_{CC}=4.5V$                              | -                           | 2.1  | 1.35      | V       |   |
|                           |          | $V_{CC}=6.0V$                              | -                           | 2.8  | 1.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$ | $V_I=V_{IH}$ or $V_{IL}$                   | $I_O=-20\mu A; V_{CC}=2.0V$ | 1.9  | 2.0       | -       | V |
|                           |          |  | $I_O=-20\mu A; V_{CC}=4.5V$ | 4.4  | 4.5       | -       | V |
|                           |          |  | $I_O=-20\mu A; V_{CC}=6.0V$ | 5.9  | 6.0       | -       | V |
|                           |          |  | $I_O=-4.0mA; V_{CC}=4.5V$   | 3.98 | 4.32      | -       | V |
|                           |          |  | $I_O=-5.2mA; V_{CC}=6.0V$   | 5.48 | 5.81      | -       | V |
| LOW-level output voltage  | $V_{OL}$ | $V_I=V_{IH}$ or $V_{IL}$                   | $I_O=20\mu A; V_{CC}=2.0V$  | -    | 0         | 0.1     | V |
|                           |          |  | $I_O=20\mu A; V_{CC}=4.5V$  | -    | 0         | 0.1     | V |
|                           |          |  | $I_O=20\mu A; V_{CC}=6.0V$  | -    | 0         | 0.1     | V |
|                           |          |  | $I_O=4.0mA; V_{CC}=4.5V$    | -    | 0.15      | 0.26    | V |
|                           |          |  | $I_O=5.2mA; V_{CC}=6.0V$    | -    | 0.16      | 0.26    | V |
| input leakage current     | $I_I$    | $V_I=V_{CC}$ or GND; $V_{CC}=6.0V$         | -                           | -    | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$ | $V_I=V_{CC}$ or GND; $I_O=0A; V_{CC}=6.0V$ | -                           | -    | 8.0       | $\mu A$ |   |
| input capacitance         | $C_I$    | -  | -                           | 3.5  | -         | pF      |   |
| <b>SN74HCT42</b>          |          |  |                             |      |           |         |   |

|                           |                 |   |                |      |           |         |   |
|---------------------------|-----------------|---|----------------|------|-----------|---------|---|
| HIGH-level input voltage  | $V_{IH}$        | $V_{CC}=4.5V$ to $5.5V$   | 2.0            | 1.6  | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$        | $V_{CC}=4.5V$ to $5.5V$   | -              | 1.2  | 0.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$        | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=-20\mu A$ | 4.4  | 4.5       | -       | V |
|                           |                 |   | $I_O=-4.0mA$   | 3.98 | 4.32      | -       | V |
| LOW-level output voltage  | $V_{OL}$        | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=20\mu A$  | -    | 0         | 0.1     | V |
|                           |                 |   | $I_O=4.0mA$    | -    | 0.16      | 0.26    | V |
| input leakage current     | $I_I$           | $V_I=V_{CC}$ or GND; $V_{CC}=5.5V$  | -              | -    | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$        | $V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$   | -              | -    | 8.0       | $\mu A$ |   |
| additional supply current | $\Delta I_{CC}$ | $V_I=V_{CC}-2.1V$ ;<br>other inputs at $V_{CC}$ or GND; $I_O=0A$ ;<br>$V_{CC}=4.5V$ to $5.5V$ | -              | -    | 360       | $\mu A$ |   |
| input capacitance         | $C_I$           | -   | -              | 3.5  | -         | pF      |   |

### DC Characteristics 2

( $T_{amb}=-40^{\circ}C$  to  $+85^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                 | Symbol   | Conditions                                    | Min.                           | Typ. | Max.      | Unit    |   |
|---------------------------|----------|---|--------------------------------|------|-----------|---------|---|
| <b>SN74HC42</b>           |          |   |                                |      |           |         |   |
| HIGH-level input voltage  | $V_{IH}$ | $V_{CC}=2.0V$                                 | 1.5                            | -    | -         | V       |   |
|                           |          | $V_{CC}=4.5V$                                 | 3.15                           | -    | -         | V       |   |
|                           |          | $V_{CC}=6.0V$                                 | 4.2                            | -    | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$ | $V_{CC}=2.0V$                                 | -                              | -    | 0.5       | V       |   |
|                           |          | $V_{CC}=4.5V$                                 | -                              | -    | 1.35      | V       |   |
|                           |          | $V_{CC}=6.0V$                                 | -                              | -    | 1.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$ | $V_I=V_{IH}$ or $V_{IL}$                      | $I_O=-20\mu A$ ; $V_{CC}=2.0V$ | 1.9  | -         | -       | V |
|                           |          |   | $I_O=-20\mu A$ ; $V_{CC}=4.5V$ | 4.4  | -         | -       | V |
|                           |          |   | $I_O=-20\mu A$ ; $V_{CC}=6.0V$ | 5.9  | -         | -       | V |
|                           |          |   | $I_O=-4.0mA$ ; $V_{CC}=4.5V$   | 3.84 | -         | -       | V |
|                           |          |   | $I_O=-5.2mA$ ; $V_{CC}=6.0V$   | 5.34 | -         | -       | V |
| LOW-level output voltage  | $V_{OL}$ | $V_I=V_{IH}$ or $V_{IL}$                      | $I_O=20\mu A$ ; $V_{CC}=2.0V$  | -    | -         | 0.1     | V |
|                           |          |   | $I_O=20\mu A$ ; $V_{CC}=4.5V$  | -    | -         | 0.1     | V |
|                           |          |   | $I_O=20\mu A$ ; $V_{CC}=6.0V$  | -    | -         | 0.1     | V |
|                           |          |   | $I_O=4.0mA$ ; $V_{CC}=4.5V$    | -    | -         | 0.33    | V |
|                           |          |   | $I_O=5.2mA$ ; $V_{CC}=6.0V$    | -    | -         | 0.33    | V |
| input leakage current     | $I_I$    | $V_I=V_{CC}$ or GND; $V_{CC}=6.0V$            | -                              | -    | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$ | $V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=6.0V$ | -                              | -    | 80        | $\mu A$ |   |
| <b>SN74HCT42</b>          |          |   |                                |      |           |         |   |
| HIGH-level input voltage  | $V_{IH}$ | $V_{CC}=4.5V$ to $5.5V$                       | 2.0                            | -    | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$ | $V_{CC}=4.5V$ to $5.5V$                       | -                              | -    | 0.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$ | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=-20\mu A$                 | 4.4  | -         | -       | V |
|                           |          |   | $I_O=-4.0mA$                   | 3.84 | -         | -       | V |

|                           |                 |   |               |   |           |         |   |
|---------------------------|-----------------|---|---------------|---|-----------|---------|---|
| LOW-level output voltage  | $V_{OL}$        | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=20\mu A$ | - | -         | 0.1     | V |
|                           |                 |   | $I_O=4.0mA$   | - | -         | 0.33    | V |
| input leakage current     | $I_I$           | $V_I=V_{CC}$ or GND; $V_{CC}=5.5V$  | -             | - | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$        | $V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$   | -             | - | 80        | $\mu A$ |   |
| additional supply current | $\Delta I_{CC}$ | $V_I=V_{CC}-2.1V$ ;<br>other inputs at $V_{CC}$ or GND; $I_O=0A$ ;<br>$V_{CC}=4.5V$ to $5.5V$ | -             | - | 450       | $\mu A$ |   |

### DC Characteristics 3

( $T_{amb}=-40^{\circ}C$  to  $+125^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                 | Symbol          | Conditions  | Min.                           | Typ. | Max.      | Unit    |   |
|---------------------------|-----------------|---|--------------------------------|------|-----------|---------|---|
| <b>SN74HC42</b>           |                 |   |                                |      |           |         |   |
| HIGH-level input voltage  | $V_{IH}$        | $V_{CC}=2.0V$   | 1.5                            | -    | -         | V       |   |
|                           |                 | $V_{CC}=4.5V$   | 3.15                           | -    | -         | V       |   |
|                           |                 | $V_{CC}=6.0V$   | 4.2                            | -    | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$        | $V_{CC}=2.0V$   | -                              | -    | 0.5       | V       |   |
|                           |                 | $V_{CC}=4.5V$   | -                              | -    | 1.35      | V       |   |
|                           |                 | $V_{CC}=6.0V$   | -                              | -    | 1.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$        | $V_I=V_{IH}$ or $V_{IL}$  | $I_O=-20\mu A$ ; $V_{CC}=2.0V$ | 1.9  | -         | -       | V |
|                           |                 |   | $I_O=-20\mu A$ ; $V_{CC}=4.5V$ | 4.4  | -         | -       | V |
|                           |                 |   | $I_O=-20\mu A$ ; $V_{CC}=6.0V$ | 5.9  | -         | -       | V |
|                           |                 |   | $I_O=-4.0mA$ ; $V_{CC}=4.5V$   | 3.7  | -         | -       | V |
|                           |                 |   | $I_O=-5.2mA$ ; $V_{CC}=6.0V$   | 5.2  | -         | -       | V |
| LOW-level output voltage  | $V_{OL}$        | $V_I=V_{IH}$ or $V_{IL}$  | $I_O=20\mu A$ ; $V_{CC}=2.0V$  | -    | -         | 0.1     | V |
|                           |                 |   | $I_O=20\mu A$ ; $V_{CC}=4.5V$  | -    | -         | 0.1     | V |
|                           |                 |   | $I_O=20\mu A$ ; $V_{CC}=6.0V$  | -    | -         | 0.1     | V |
|                           |                 |   | $I_O=4.0mA$ ; $V_{CC}=4.5V$    | -    | -         | 0.4     | V |
|                           |                 |   | $I_O=5.2mA$ ; $V_{CC}=6.0V$    | -    | -         | 0.4     | V |
| input leakage current     | $I_I$           | $V_I=V_{CC}$ or GND; $V_{CC}=6.0V$  | -                              | -    | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$        | $V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=6.0V$   | -                              | -    | 160       | $\mu A$ |   |
| <b>SN74HCT42</b>          |                 |   |                                |      |           |         |   |
| HIGH-level input voltage  | $V_{IH}$        | $V_{CC}=4.5V$ to $5.5V$   | 2.0                            | -    | -         | V       |   |
| LOW-level input voltage   | $V_{IL}$        | $V_{CC}=4.5V$ to $5.5V$   | -                              | -    | 0.8       | V       |   |
| HIGH-level output voltage | $V_{OH}$        | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=-20\mu A$                 | 4.4  | -         | -       | V |
|                           |                 |   | $I_O=-4.0mA$                   | 3.7  | -         | -       | V |
| LOW-level output voltage  | $V_{OL}$        | $V_I=V_{IH}$ or $V_{IL}$ ;<br>$V_{CC}=4.5V$   | $I_O=20\mu A$                  | -    | -         | 0.1     | V |
|                           |                 |   | $I_O=4.0mA$                    | -    | -         | 0.4     | V |
| input leakage current     | $I_I$           | $V_I=V_{CC}$ or GND; $V_{CC}=5.5V$  | -                              | -    | $\pm 1.0$ | $\mu A$ |   |
| supply current            | $I_{CC}$        | $V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$   | -                              | -    | 160       | $\mu A$ |   |
| additional supply current | $\Delta I_{CC}$ | $V_I=V_{CC}-2.1V$ ;<br>other inputs at $V_{CC}$ or GND; $I_O=0A$ ;<br>$V_{CC}=4.5V$ to $5.5V$ | -                              | -    | 490       | $\mu A$ |   |

**AC Characteristics 1**

 (T<sub>amb</sub>=25°C, GND=0V, C<sub>L</sub>=50pF, unless otherwise specified.)

| Parameter                          | Symbol          | Conditions   | Min.  | Typ. | Max. | Unit |    |
|------------------------------------|-----------------|--|---|------|------|------|----|
| <b>SN74HC42</b>                    |                 |  |   |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | t <sub>pd</sub> | see Figure 6 <sup>[1]</sup>  | V <sub>CC</sub> =2.0V                       | -    | 47   | 150  | ns |
|                                    |                 |  | V <sub>CC</sub> =4.5V                       | -    | 17   | 30   | ns |
|                                    |                 |  | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 17   | -    | ns |
|                                    |                 |  | V <sub>CC</sub> =6.0V                       | -    | 14   | 26   | ns |
| transition time                    | t <sub>t</sub>  | see Figure 6 <sup>[2]</sup>  | V <sub>CC</sub> =2.0V                       | -    | 19   | 75   | ns |
|                                    |                 |  | V <sub>CC</sub> =4.5V                       | -    | 7    | 15   | ns |
|                                    |                 |  | V <sub>CC</sub> =6.0V                       | -    | 6    | 13   | ns |
| power dissipation capacitance      | C <sub>PD</sub> | per package; V <sub>I</sub> =GND to V <sub>CC</sub> <sup>[3]</sup>       | -   | 37   | -    | pF   |    |
| <b>SN74HCT42</b>                   |                 |  |   |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | t <sub>pd</sub> | see Figure 6 <sup>[1]</sup>  | V <sub>CC</sub> =4.5V                       | -    | 20   | 35   | ns |
|                                    |                 |  | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 17   | -    | ns |
| transition time                    | t <sub>t</sub>  | V <sub>CC</sub> =4.5V; see Figure 6 <sup>[2]</sup>                       | -   | 7    | 15   | ns   |    |
| power dissipation capacitance      | C <sub>PD</sub> | per package; V <sub>I</sub> =GND to V <sub>CC</sub> -1.5V <sup>[3]</sup> | -   | 37   | -    | pF   |    |

Note:

 [1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

 [2] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.

 [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in uW).

 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

 f<sub>i</sub>=input frequency in MHz;

 f<sub>o</sub>=output frequency in MHz;

 C<sub>L</sub>=output load capacitance in pF;

 V<sub>CC</sub>=supply voltage in V;

N=number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ =sum of outputs

**AC Characteristics 2**

 (T<sub>amb</sub>=-40°C to +85°C, GND=0V, C<sub>L</sub>=50pF, unless otherwise specified.)

| Parameter                          | Symbol          | Conditions   | Min.                  | Typ. | Max. | Unit |    |
|------------------------------------|-----------------|--|-----------------------|------|------|------|----|
| <b>SN74HC42</b>                    |                 |  |                       |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | t <sub>pd</sub> | see Figure 6 <sup>[1]</sup>                        | V <sub>CC</sub> =2.0V | -    | -    | 190  | ns |
|                                    |                 |  | V <sub>CC</sub> =4.5V | -    | -    | 38   | ns |
|                                    |                 |  | V <sub>CC</sub> =6.0V | -    | -    | 33   | ns |
| transition time                    | t <sub>t</sub>  | see Figure 6 <sup>[2]</sup>                        | V <sub>CC</sub> =2.0V | -    | -    | 95   | ns |
|                                    |                 |  | V <sub>CC</sub> =4.5V | -    | -    | 19   | ns |
|                                    |                 |  | V <sub>CC</sub> =6.0V | -    | -    | 16   | ns |
| <b>SN74HCT42</b>                   |                 |  |                       |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | t <sub>pd</sub> | see Figure 6 <sup>[1]</sup>                        | V <sub>CC</sub> =4.5V | -    | -    | 44   | ns |
| transition time                    | t <sub>t</sub>  | V <sub>CC</sub> =4.5V; see Figure 6 <sup>[2]</sup> | -                     | -    | 19   | ns   |    |

Note:

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .

### AC Characteristics 3

( $T_{amb} = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $GND = 0\text{V}$ ,  $C_L = 50\text{pF}$ , unless otherwise specified.)

| Parameter                          | Symbol   | Conditions   | Min.                   | Typ. | Max. | Unit |    |
|------------------------------------|----------|--|------------------------|------|------|------|----|
| <b>SN74HC42</b>                    |          |  |                        |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | $t_{pd}$ | see Figure 6 <sup>[1]</sup>                          | $V_{CC} = 2.0\text{V}$ | -    | -    | 225  | ns |
|                                    |          |  | $V_{CC} = 4.5\text{V}$ | -    | -    | 45   | ns |
|                                    |          |  | $V_{CC} = 6.0\text{V}$ | -    | -    | 38   | ns |
| transition time                    | $t_t$    | see Figure 6 <sup>[2]</sup>                          | $V_{CC} = 2.0\text{V}$ | -    | -    | 110  | ns |
|                                    |          |  | $V_{CC} = 4.5\text{V}$ | -    | -    | 22   | ns |
|                                    |          |  | $V_{CC} = 6.0\text{V}$ | -    | -    | 19   | ns |
| <b>SN74HCT42</b>                   |          |  |                        |      |      |      |    |
| nA ton $\bar{Y}$ propagation delay | $t_{pd}$ | see Figure 6 <sup>[1]</sup>                          | $V_{CC} = 4.5\text{V}$ | -    | -    | 53   | ns |
| transition time                    | $t_t$    | $V_{CC} = 4.5\text{V}$ ; see Figure 6 <sup>[2]</sup> |                        | -    | -    | 22   | ns |

Note:

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .

## Testing Circuit

### AC Testing Circuit

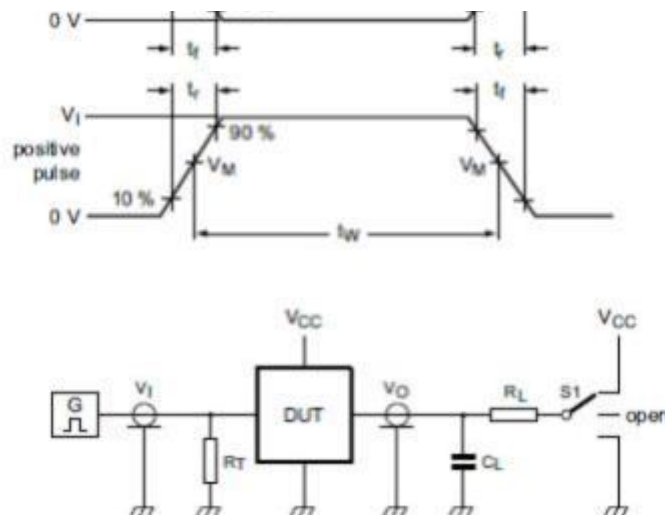


Figure 5. Test circuit for measuring switching times

Definitions for test circuit:



$C_L$ =Load capacitance including jig and probe capacitance.

$R_T$ =Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  $R_L$ =Load resistance.

S1=Test selection switch

### AC Testing Waveforms

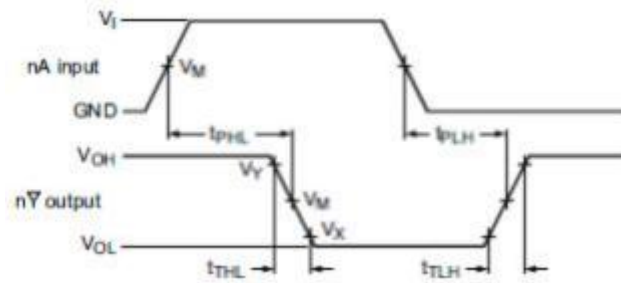


Figure 6. Input (nA) to output (nY) propagation delays and output transition times

### Measurement Points

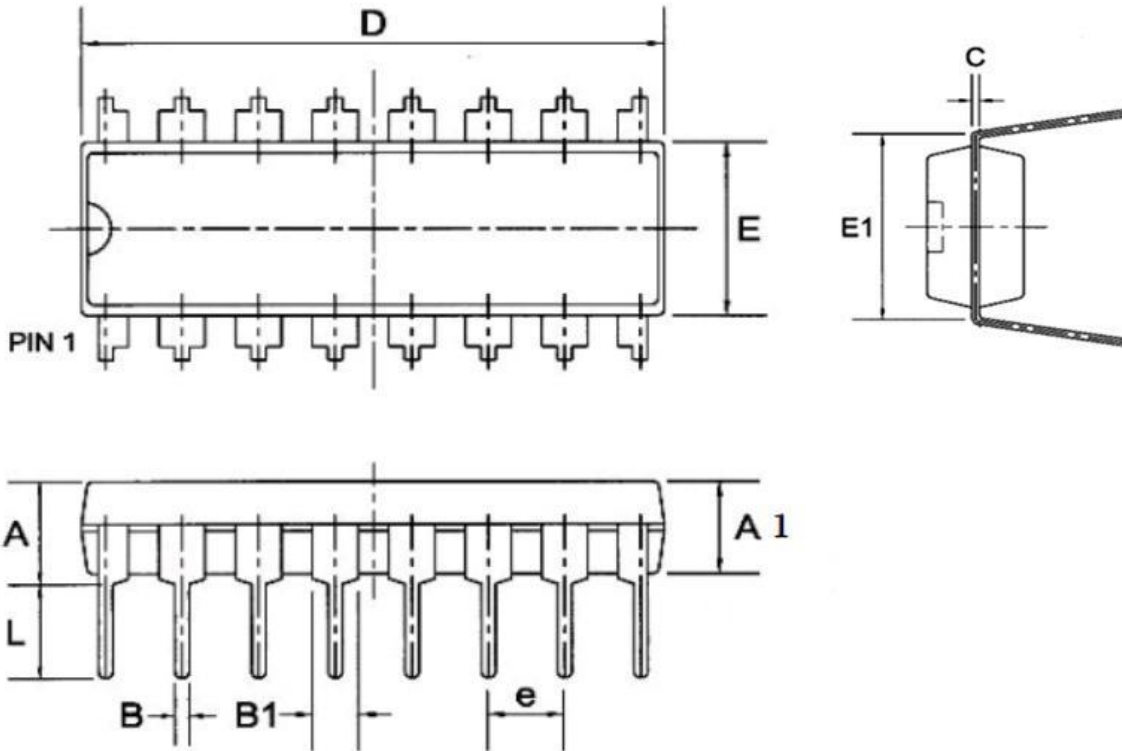
| Type      | Input               | Output              |                     |                     |
|-----------|---------------------|---------------------|---------------------|---------------------|
|           | $V_M$               | $V_M$               | $V_X$               | $V_Y$               |
| SN74HC42  | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |
| SN74HCT42 | 1.3V                | 1.3V                | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |

### Test Data

| Type      | Input    |            | Load          |                | S1 position<br>$t_{PLH}, t_{PHL}$ |
|-----------|----------|------------|---------------|----------------|-----------------------------------|
|           | $V_I$    | $t_r, t_f$ | $C_L$         | $R_L$          |                                   |
| SN74HC42  | $V_{CC}$ | 6ns        | 15pF,<br>50pF | 1k<br>$\Omega$ | open                              |
| SN74HCT42 | 3V       | 6ns        | 15pF,<br>50pF | 1k<br>$\Omega$ | open                              |

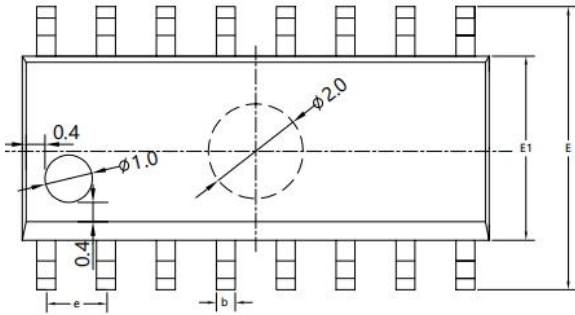
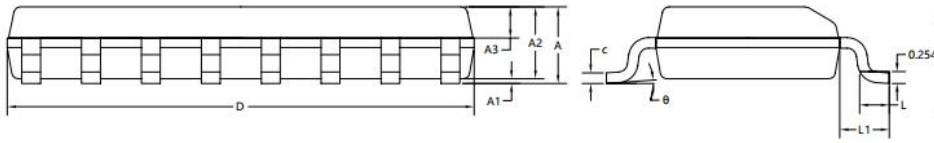
Package Information

DIP16



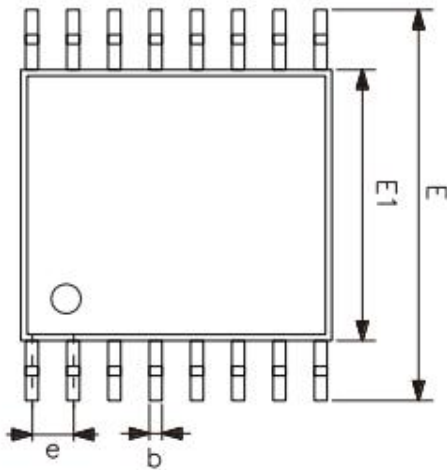
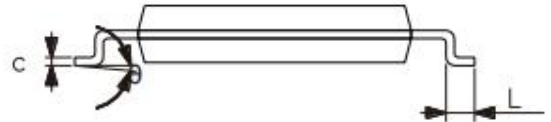
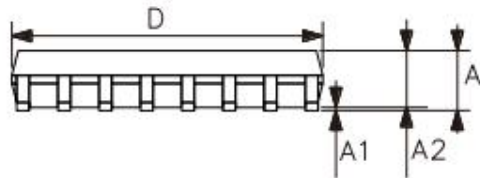
| Symbol | Dimensions in Millimeters |       |       |
|--------|---------------------------|-------|-------|
|        | Min                       | Nom   | Max   |
| A      | --                        | --    | 4.31  |
| A1     | 3.15                      | 3.30  | 3.65  |
| B      | --                        | 0.50  | --    |
| B1     | --                        | 1.6   | --    |
| C      | --                        | 0.27  | --    |
| D      | 19.00                     | 19.20 | 19.60 |
| E      | 6.20                      | 6.50  | 6.60  |
| E1     | --                        | 8.0   | --    |
| e      | --                        | 2.3   | --    |
| L      | 3.00                      | 3.20  | 3.60  |

SOP16



| SYMBOL | MILLIMETER |      |       |
|--------|------------|------|-------|
|        | MIN        | NOM  | MAX   |
| A      | 1.50       | 1.60 | 1.70  |
| A1     | 0.10       | 0.15 | 0.25  |
| A2     | 1.40       | 1.45 | 1.50  |
| A3     | 0.60       | 0.65 | 0.70  |
| b      | 0.30       | 0.40 | 0.50  |
| c      | 0.15       | 0.20 | 0.25  |
| D      | 9.80       | 9.90 | 10.00 |
| E      | 5.80       | 6.00 | 6.20  |
| E1     | 3.85       | 3.90 | 3.95  |
| e      | 1.27BSC    |      |       |
| L      | 0.50       | 0.60 | 0.70  |
| L1     | 1.05BSC    |      |       |
| θ      | 0°         | 4°   | 8°    |

TSSOP16



| Symbol   | Dimensions (mm) |      |
|----------|-----------------|------|
|          | Min.            | Max. |
| A        | -               | 1.20 |
| A1       | 0.05            | 0.15 |
| A2       | 0.80            | 1.05 |
| b        | 0.19            | 0.30 |
| c        | 0.09            | 0.20 |
| D        | 4.90            | 5.10 |
| E1       | 4.30            | 4.50 |
| E        | 6.20            | 6.60 |
| e        | 0.65            |      |
| L        | 0.45            | 0.75 |
| $\theta$ | 0°              | 8°   |

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