



## U74HCT138

CMOS IC

### 3-TO-8 LINE DECODERS / DEMULTIPLEXERS

#### DESCRIPTION

The **U74HCT138** decodes a three-bit Address to 1-of-8 active-low outputs.

This device features three Chip Select inputs, two active-low and one active-high, to facilitate the demultiplexing, cascading and chip-selecting functions.

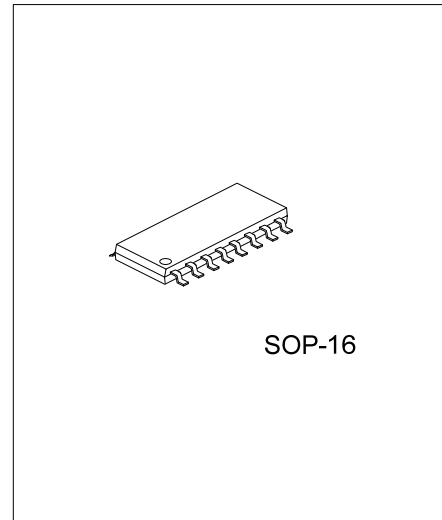
The demultiplexing function is accomplished by using the Address inputs to select the desired device output. One of the Chip Selects is used as a data input while the other Chip Selects are held in their active states.

#### FEATURES

- \* Operate from 4.5V to 5.5V
- \* Low Input Current: 1.0uA Max
- \* Low Power Consumption: 8µA Max
- \* Typical  $t_{PD}$  = 15ns
- \* Inputs are TTL voltage compatible

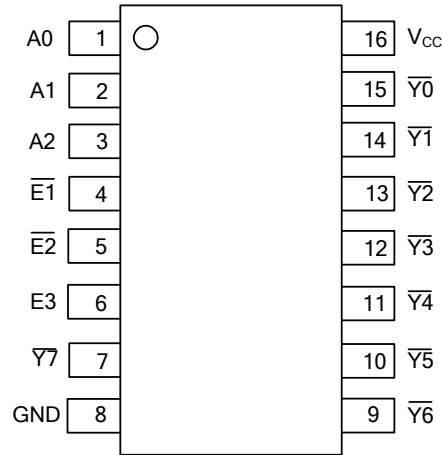
#### ORDERING INFORMATION

| Ordering Number  |                  | Package | Packing   |
|------------------|------------------|---------|-----------|
| Lead Free        | Halogen Free     |         |           |
| U74HCT138L-S16-R | U74HCT138G-S16-R | SOP-16  | Tape Reel |
| U74HCT138L-S16-T | U74HCT138G-S16-T | SOP-16  | Tube      |



|  |  |
|--|--|
| <p>U74HCT138L-S16-R</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Lead Free</p> | <p>(1) R: Tape Reel, T: Tube<br/>(2) S16: SOP-16<br/>(3) G: Halogen Free, L: Lead Free</p> |
|--|--|

■ PIN CONFIGURATION

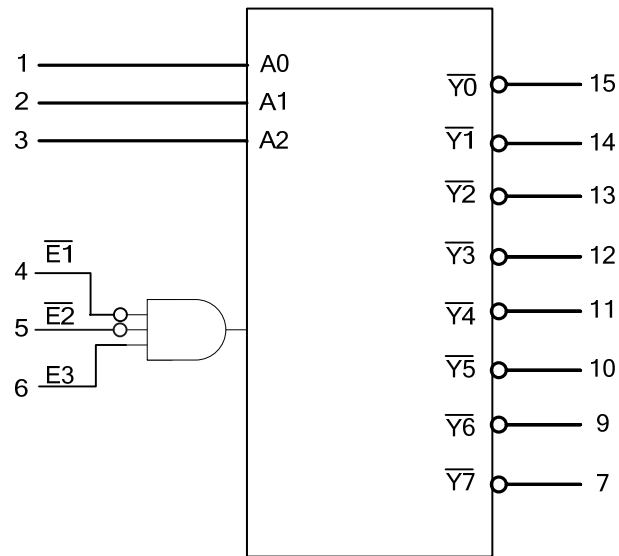


■ FUNCTION TABLE

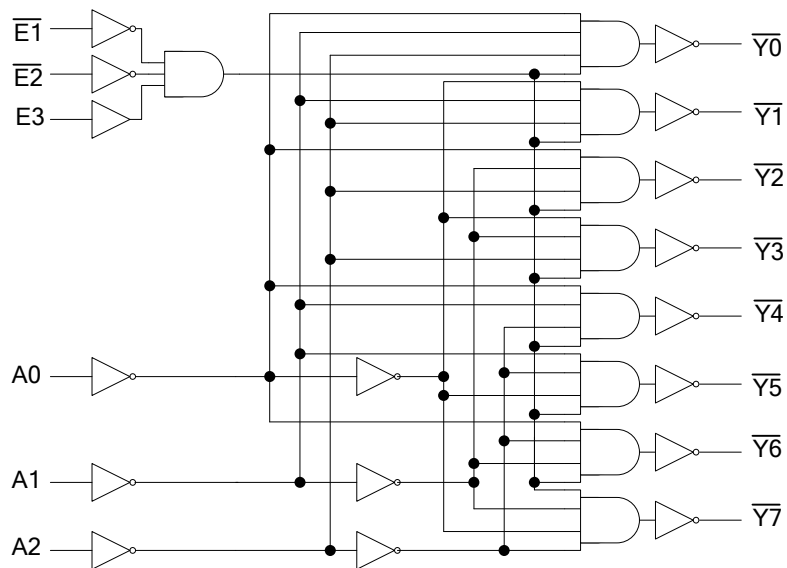
| INPUTS |    |    |    |    |    | OUTPUTS |    |    |    |    |    |    |    |
|--------|----|----|----|----|----|---------|----|----|----|----|----|----|----|
| E1     | E2 | E3 | A0 | A1 | A2 | Y0      | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| H      | X  | X  | X  | X  | X  | H       | H  | H  | H  | H  | H  | H  | H  |
| X      | H  | X  | X  | X  | X  | H       | H  | H  | H  | H  | H  | H  | H  |
| X      | X  | L  | X  | X  | X  | H       | H  | H  | H  | H  | H  | H  | H  |
| L      | L  | H  | L  | L  | L  | L       | H  | H  | H  | H  | H  | H  | H  |
| L      | L  | H  | H  | L  | L  | H       | L  | H  | H  | H  | H  | H  | H  |
| L      | L  | H  | L  | H  | L  | H       | H  | L  | H  | H  | H  | H  | H  |
| L      | L  | H  | H  | H  | L  | H       | H  | H  | L  | H  | H  | H  | H  |
| L      | L  | H  | L  | L  | H  | H       | H  | H  | H  | L  | H  | H  | H  |
| L      | L  | H  | H  | L  | H  | H       | H  | H  | H  | H  | L  | H  | H  |
| L      | L  | H  | L  | H  | H  | H       | H  | H  | H  | H  | H  | L  | H  |
| L      | L  | H  | H  | H  | H  | H       | H  | H  | H  | H  | H  | H  | L  |

Note: H : High voltage level    L : Low voltage level    X : Don't care

■ LOGIC SYMBOL



■ LOGIC DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

| PARAMETER   | SYMBOL    | RATINGS     | UNIT        |
|---|-----------|-------------|-------------|
| Supply Voltage                                      | $V_{CC}$  | -0.5 ~ 7.0  | V           |
| Input Clamp Current( $V_I < 0$ or $V_I > V_{CC}$ )  | $I_{IK}$  | $\pm 20$    | mA          |
| Output Clamp Current( $V_O < 0$ or $V_O > V_{CC}$ ) | $I_{OK}$  | $\pm 20$    | mA          |
| Continuous Output Current( $V_O = 0$ to $V_{CC}$ )  | $I_O$     | $\pm 25$    | mA          |
| $V_{CC}$ or GND Current                             | $I_{CC}$  | $\pm 50$    | mA          |
| Storage Temperature                                 | $T_{STG}$ | -65 ~ + 150 | $^{\circ}C$ |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL     | TEST CONDITIONS           | MIN | TYP | MAX      | UNIT        |
|--------------------------|------------|---------------------------|-----|-----|----------|-------------|
| Supply Voltage           | $V_{CC}$   | Operating                 | 4.5 | 5.0 | 5.5      | V           |
| Input Voltage            | $V_{IN}$   |                           | 0   |     | $V_{CC}$ | V           |
| Output Voltage           | $V_{OUT}$  |                           | 0   |     | $V_{CC}$ | V           |
| Operating Temperature    | $T_A$      |                           | -40 |     | +85      | $^{\circ}C$ |
| Input Rise or Fall Times | $t_R, t_F$ | $V_{CC} = 4.5V \sim 5.5V$ |     |     | 500      | ns          |

### ■ ELECTRICAL CHARACTERISTICS( $T_A = 25^{\circ}C$ )

| PARAMETER                           | SYMBOL          | TEST CONDITIONS  | MIN  | TYP       | MAX       | UNIT    |
|-------------------------------------|-----------------|--|------|-----------|-----------|---------|
| High-Level input voltage            | $V_{IH}$        | $V_{CC} = 4.5V \sim 5.5V$                                | 2.0  |           |           | V       |
| Low-Level output voltage            | $V_{IL}$        | $V_{CC} = 4.5V \sim 5.5V$                                |      |           | 0.8       | V       |
| High-Level Output Voltage           | $V_{OH}$        | $V_{CC} = 4.5V, I_{OH} = -20\mu A$                       | 4.4  | 4.499     |           | V       |
|                                     |                 | $V_{CC} = 4.5V, I_{OH} = -4mA$                           | 3.98 | 4.3       |           | V       |
| Low-Level Output Voltage            | $V_{OL}$        | $V_{CC} = 4.5V, I_{OL} = 20\mu A$                        |      | 0.001     | 0.1       | V       |
|                                     |                 | $V_{CC} = 4.5V, I_{OL} = 4mA$                            |      | 0.17      | 0.26      | V       |
| Input Leakage Current               | $I_{I(LEAK)}$   | $V_{CC} = 5.5V, V_{IN} = V_{CC}$ or GND                  |      | $\pm 0.1$ | $\pm 100$ | nA      |
| Quiescent Supply Current            | $I_{CC}$        | $V_{CC} = 5.5V, V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$   |      |           | 8         | $\mu A$ |
| Additional Quiescent Supply Current | $\Delta I_{CC}$ | One input at 0.5V or 2.4V, other inputs at 0 or $V_{CC}$ |      | 1.4       | 2.4       | mA      |
| Input Capacitance                   | $C_I$           | $V_{CC} = 4.5V \sim 5.5V$                                |      | 3         | 10        | pF      |

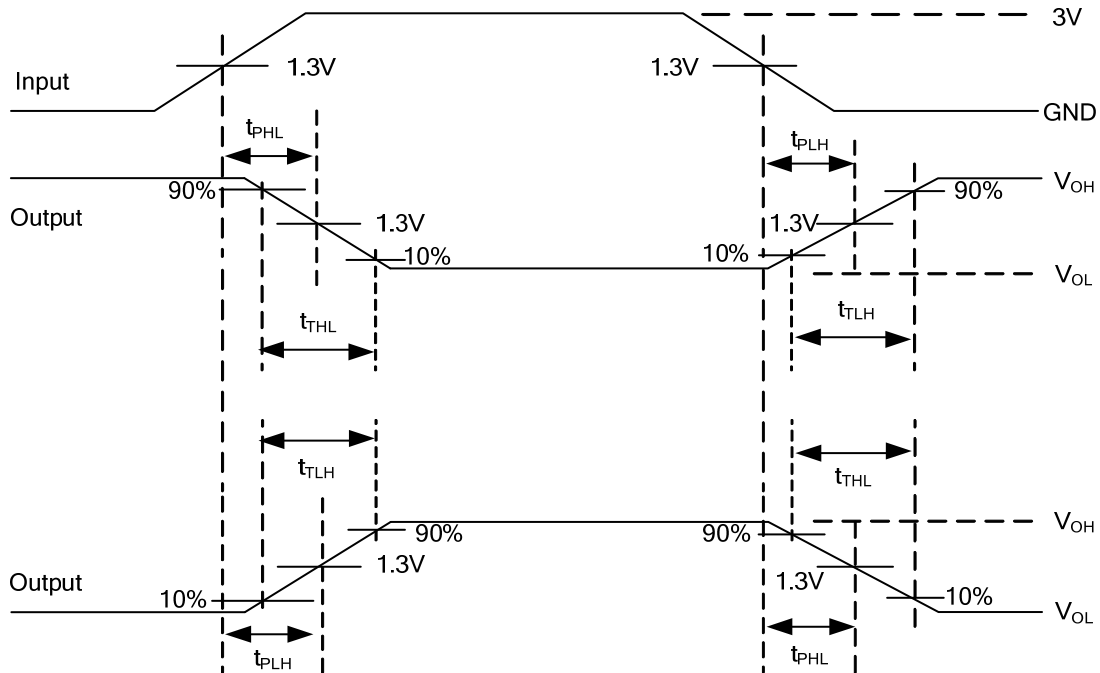
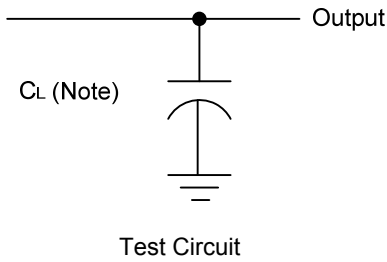
### ■ SWITCHING CHARACTERISTICS( $T_A = 25^{\circ}C$ , see TEST CIRCUIT AND WAVEFORMS)

| PARAMETER  | SYMBOL            | TEST CONDITIONS             | MIN | TYP | MAX | UNIT |
|--|-------------------|-----------------------------|-----|-----|-----|------|
| Propagation delay from input ( $A_n$ ) to output ( $\bar{Y}_n$ )       | $t_{PLH}/t_{PHL}$ | $V_{CC} = 4.5V, C_L = 50pF$ |     | 23  | 36  | ns   |
|  |                   | $V_{CC} = 5.5V, C_L = 50pF$ |     | 17  | 32  | ns   |
| Propagation delay from input ( $\bar{E}_n$ ) to output ( $\bar{Y}_n$ ) | $t_{PLH}/t_{PHL}$ | $V_{CC} = 4.5V, C_L = 50pF$ |     | 22  | 33  | ns   |
|  |                   | $V_{CC} = 5.5V, C_L = 50pF$ |     | 18  | 30  | ns   |
| Output Transition Time   | $t_{TLH}/t_{THL}$ | $V_{CC} = 4.5V, C_L = 50pF$ |     | 12  | 15  | ns   |
|  |                   | $V_{CC} = 5.5V, C_L = 50pF$ |     | 11  | 14  | ns   |

### ■ OPERATING CHARACTERISTICS

| PARAMETER                     | SYMBOL   | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|----------|-----------------|-----|-----|-----|------|
| Power Dissipation Capacitance | $C_{PD}$ | No load         |     | 85  |     | pF   |

■ TEST CIRCUIT AND WAVEFORMS



Propagation Delay and Output Transition Times

Note:  $C_L$  includes probe and jig capacitance.

All input pulses are supplied by generators having the following characteristics:  $Z_o = 50\Omega$ ,  $t_R = 6ns$ ,  $t_F = 6ns$ .

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