



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.

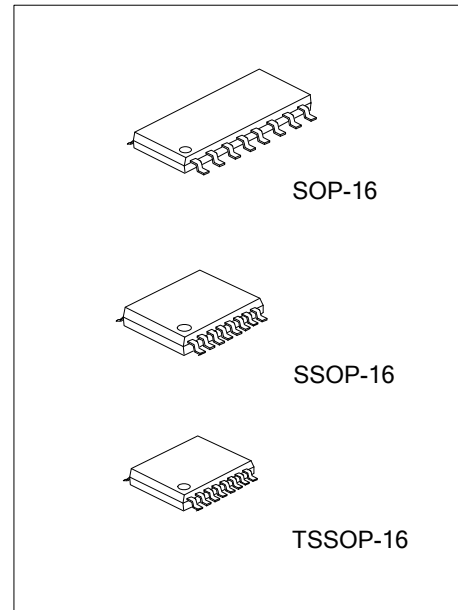
The demultiplexing function is accomplished by using the Address inputs to select the desired device output. One of the Chip Selects is used as a data input while the other Chip Selects are held in their active states.

FEATURES

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

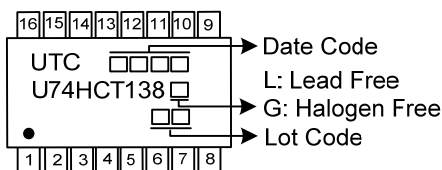
ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|------------------|------------------|----------|-----------|
| Lead Free | Halogen Free | | |
| U74HCT138L-S16-R | U74HCT138G-S16-R | SOP-16 | Tape Reel |
| U74HCT138L-R16-R | U74HCT138G-R16-R | SSOP-16 | Tape Reel |
| U74HCT138L-P16-R | U74HCT138G-P16-R | TSSOP-16 | Tape Reel |

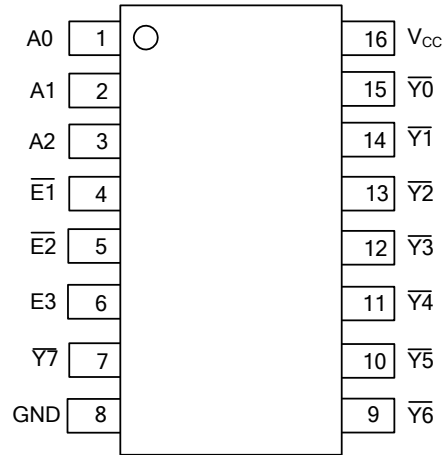


| | |
|--|--|
| <p>U74HCT138G-S16-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) R: Tape Reel</p> <p>(2) S16: SOP-16, R16: SSOP-16, P16: TSSOP-16</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|--|

MARKING



■ PIN CONFIGURATION

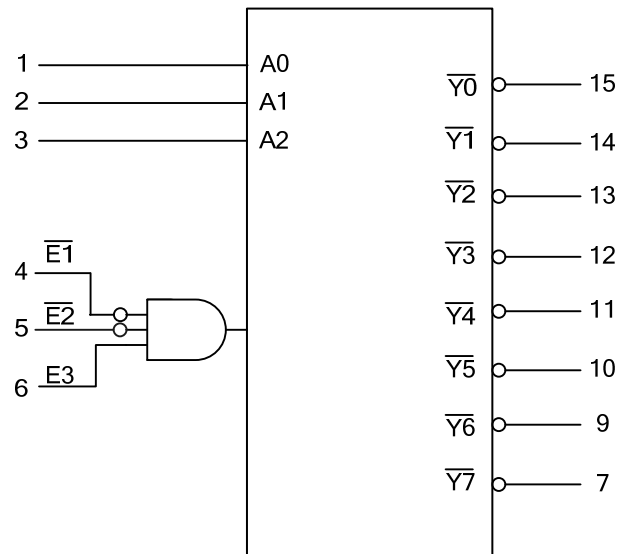


■ FUNCTION TABLE

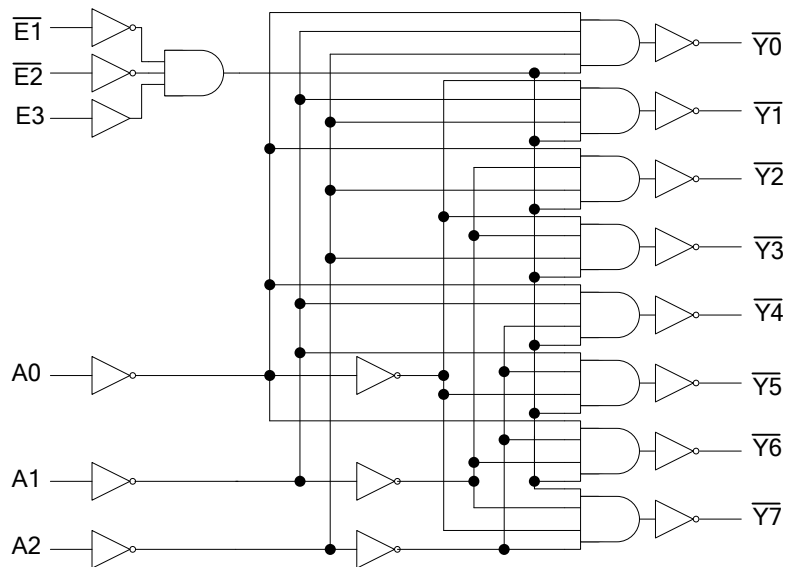
| INPUTS | | | | | | OUTPUTS | | | | | | | |
|-----------------|-----------------|----|----|----|----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| $\overline{E1}$ | $\overline{E2}$ | E3 | A0 | A1 | A2 | $\overline{Y0}$ | $\overline{Y1}$ | $\overline{Y2}$ | $\overline{Y3}$ | $\overline{Y4}$ | $\overline{Y5}$ | $\overline{Y6}$ | $\overline{Y7}$ |
| 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} | ±20 | mA |
| Output Clamp Current($V_O < 0$ or $V_O > V_{CC}$) | I_{OK} | ±20 | mA |
| Continuous Output Current($V_O = 0$ to V_{CC}) | I_O | ±25 | mA |
| V_{CC} or GND Current | I_{CC} | ±50 | mA |
| Storage Temperature | T_{STG} | -65 ~ + 150 | °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 | °C |
| Input Rise or Fall Times | t_R, t_F | $V_{CC}=4.5V\sim 5.5V$ | | | 500 | ns |

■ THERMAL CHARACTERISTICS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---------------------|----------|---------|------|
| Junction to Ambient | SOP-16 | 73 | °C/W |
| | TSSOP-16 | 108 | |

■ 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 | | ±0.1 | ±100 | nA |
| Quiescent Supply Current | I_{CC} | $V_{CC}=5.5V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$ | | | 8 | μA |
| Additional Quiescent Supply Current | ΔI_{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 |

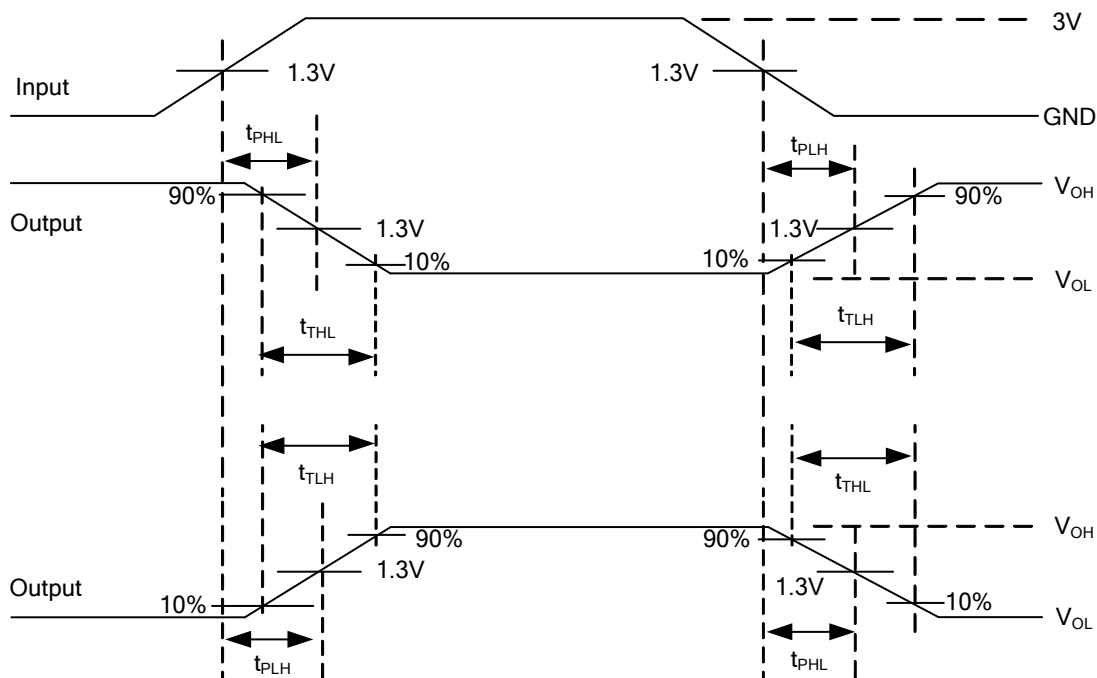
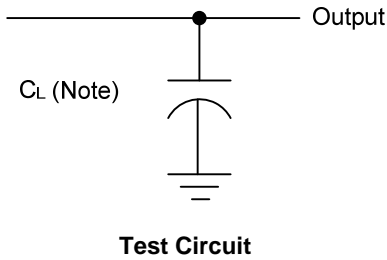
■ SWITCHING CHARACTERISTICS($T_A=25^\circ C$, see TEST CIRCUIT AND WAVEFORMS)

| 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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