



## U74HC138

CMOS IC

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

#### DESCRIPTION

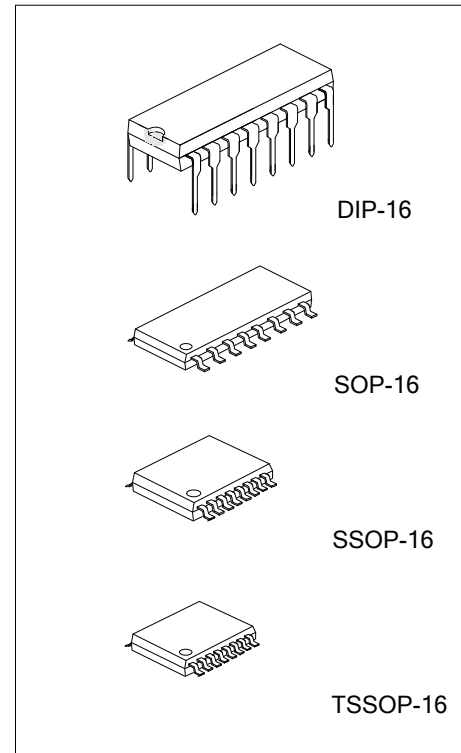
The **U74HC138** decodes a three-bit Address to 1-of-8 active-low outputs.

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 2.0V ~ 6.0V
- \* Low Input Current: 100nA Max
- \* Low Quiescent Current: 8µA Max
- \* Typ  $t_{PD}$ =15ns
- \* Output Drive:4mA @ 5V

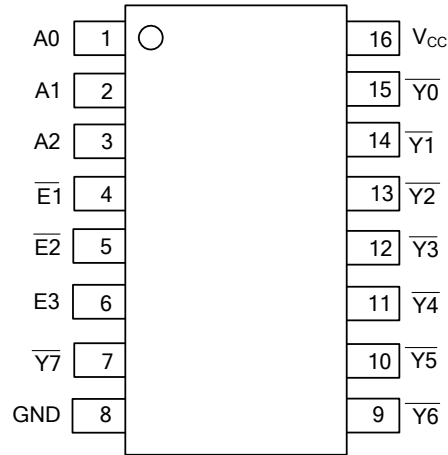


#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC138L-D16-T	U74HC138G-D16-T	DIP-16	Tube
U74HC138L-S16-T	U74HC138G-S16-T	SOP-16	Tube
U74HC138L-S16-R	U74HC138G-S16-R	SOP-16	Tape Reel
U74HC138L-R16-T	U74HC138G-R16-T	SSOP-16	Tube
U74HC138L-R16-R	U74HC138G-R16-R	SSOP-16	Tape Reel
U74HC138L-P16-T	U74HC138G-P16-T	TSSOP-16	Tube
U74HC138L-P16-R	U74HC138G-P16-R	TSSOP-16	Tape Reel

<p>U74HC138L-D16-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube, R: Tape Reel (2) D16: DIP-16, S16: SOP-16, R16: SSOP-16 P16: TSSOP-16 (3) L: Lead Free, G: Halogen Free</p>
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■ PIN CONFIGURATION

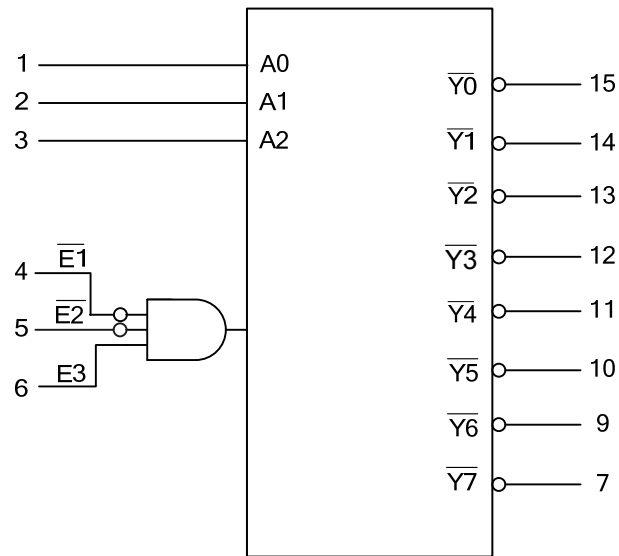


■ FUNCTION TABLE

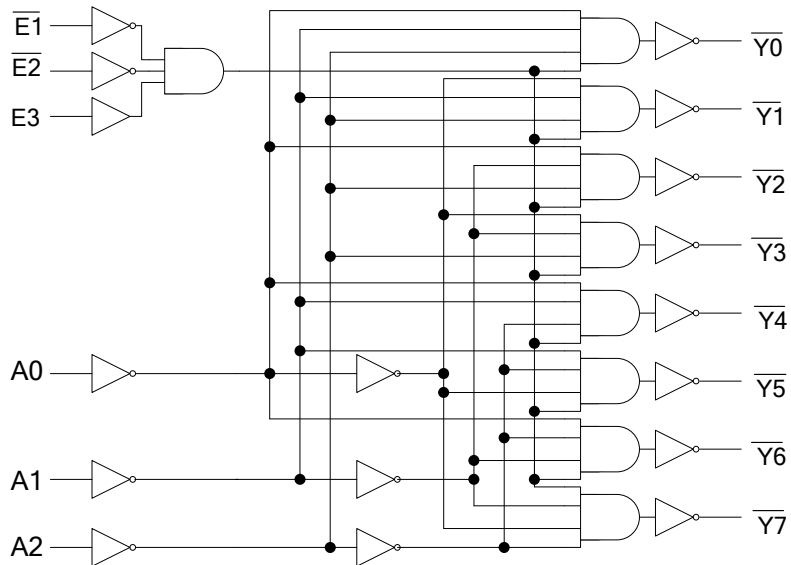
INPUTS						OUTPUTS							
$\overline{E1}$	$\overline{E2}$	E3	A0	A1	A2	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	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 $V_I > V_{CC}$ )	$I_{IK}$	$\pm 20$	mA
Output Clamp Current( $V_O < 0$ or $V_O > V_{CC}$ )	$I_{OK}$	$\pm 20$	mA
Continuous Output Current( $V_O = 0 \sim V_{CC}$ )	$I_O$	$\pm 25$	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	2.0	5.0	6.0	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	$t_R, t_F$	$V_{CC}=2.0V$			1000	ns
		$V_{CC}=4.5V$			500	
		$V_{CC}=6.0V$			400	

### ■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT	
Junction to Ambient	$\theta_{JA}$	DIP-16	67	$^{\circ}C/W$
		SOP-16	73	
		SSOP-16	82	
		TSSOP-16	108	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-level input voltage	$V_{IH}$	$V_{CC}=2V$	1.5			V
		$V_{CC}=4.5V$	3.15			V
		$V_{CC}=6V$	4.2			V
Low-level output voltage	$V_{IL}$	$V_{CC}=2V$			0.5	V
		$V_{CC}=4.5V$			1.35	V
		$V_{CC}=6V$			1.8	V
High-Level Output Voltage	$V_{OH}$	$V_{CC}=2V, I_{OH}=-20\mu A$	1.9	1.998		V
		$V_{CC}=4.5V, I_{OH}=-20\mu A$	4.4	4.499		V
		$V_{CC}=6V, I_{OH}=-20\mu A$	5.9	5.999		V
		$V_{CC}=4.5V, I_{OH}=-4.0mA$	3.98	4.3		V
		$V_{CC}=6V, I_{OH}=-5.2mA$	5.48	5.8		V
Low-Level Output Voltage	$V_{OL}$	$V_{CC}=2V, I_{OL}=20\mu A$		0.002	0.1	V
		$V_{CC}=4.5V, I_{OL}=20\mu A$		0.001	0.1	V
		$V_{CC}=6V, I_{OL}=20\mu A$		0.001	0.1	V
		$V_{CC}=4.5V, I_{OH}=4mA$		0.17	0.26	V
		$V_{CC}=6V, I_{OL}=5.2mA$		0.15	0.26	V
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND		$\pm 0.1$	$\pm 100$	nA
Quiescent Supply Current	$I_{CC}$	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$			8	$\mu A$
Input Capacitance	$C_I$	$V_{CC}=2\sim 6V$		3	10	pF

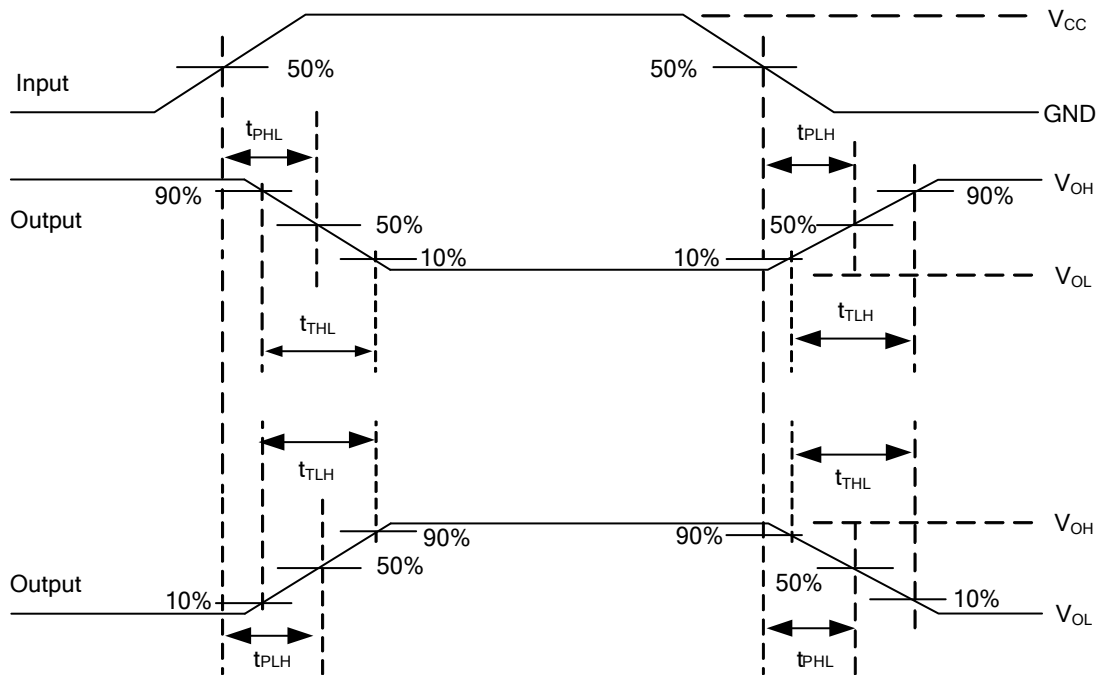
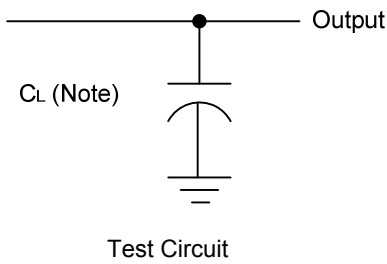
■ SWITCHING CHARACTERISTICS (T<sub>A</sub>=25°C, C<sub>L</sub>=50pF, see Test Circuit and Waveforms)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A <sub>n</sub> ) to output( $\overline{Y}_n$ )	t <sub>PLH</sub> /t <sub>PHL</sub>	V <sub>CC</sub> =2.0V		67	180	ns
		V <sub>CC</sub> =4.5V		18	36	ns
		V <sub>CC</sub> =6.0V		15	31	ns
Propagation delay from input (E3) to output( $\overline{Y}_n$ )	t <sub>PLH</sub> /t <sub>PHL</sub>	V <sub>CC</sub> =2.0V		66	155	ns
		V <sub>CC</sub> =4.5V		18	31	ns
		V <sub>CC</sub> =6.0V		15	26	ns
Propagation delay from input ( $\overline{E}_n$ ) to output( $\overline{Y}_n$ )	t <sub>PLH</sub> /t <sub>PHL</sub>	V <sub>CC</sub> =2.0V		66	155	ns
		V <sub>CC</sub> =4.5V		18	31	ns
		V <sub>CC</sub> =6.0V		15	26	ns
Output Transition Time	t <sub>TLH</sub> /t <sub>THL</sub>	V <sub>CC</sub> =2.0V		38	75	ns
		V <sub>CC</sub> =4.5V		8	15	ns
		V <sub>CC</sub> =6.0V		6	13	ns

■ OPERATING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C <sub>PD</sub>	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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