



U74HC138

CMOS IC

3-TO-8 LINE DECODERS / DEMULTIPLEXERS

■ DESCRIPTION

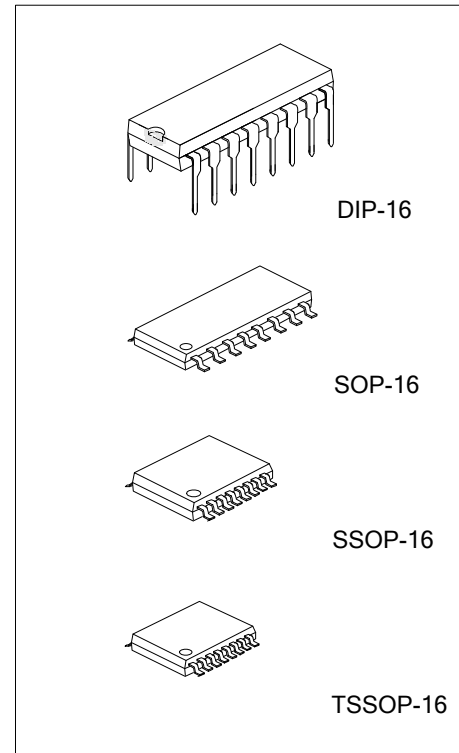
The **U74HC138** decodes a three-bit Address to 1-of-8 active-low outputs.

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

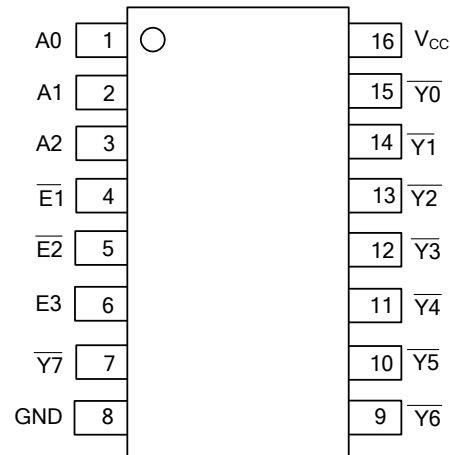


■ ORDERING INFORMATION

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

U74HC138L-D16-T (1) Packing Type (2) Package Type (3) Lead Free	(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
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■ PIN CONFIGURATION

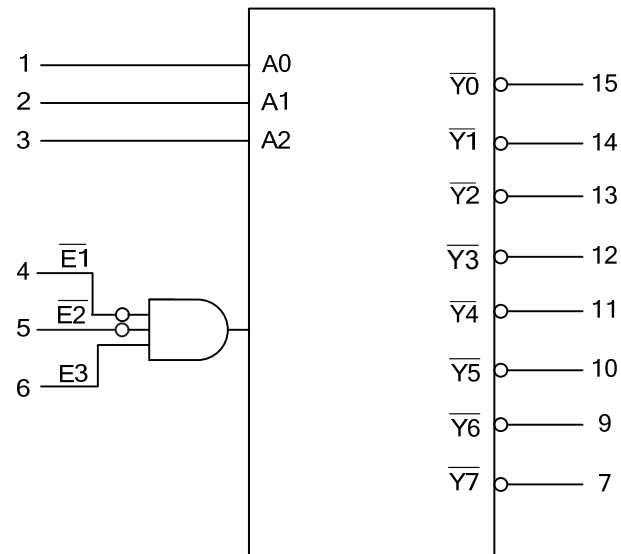


■ FUNCTION TABLE

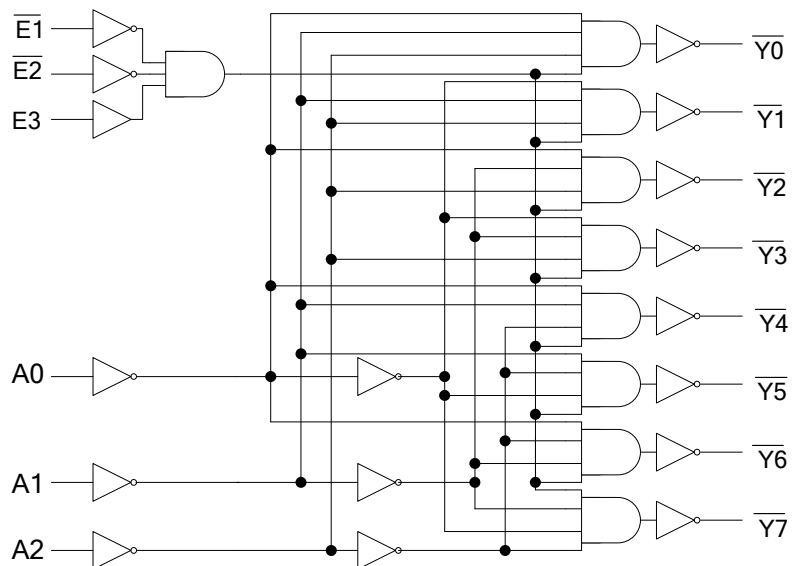
INPUTS						OUTPUTS							
$\overline{E1}$	$\overline{E2}$	E3	A0	A1	A2	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	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}	± 20	mA
Output Clamp Current($V_O < 0$ or $V_O > V_{CC}$)	I_{OK}	± 20	mA
Continuous Output Current($V_O = 0 \sim V_{CC}$)	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	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	°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	DIP-16	θ_{JA}	67	°C/W
	SOP-16		73	
	SSOP-16		82	
	TSSOP-16		108	

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

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		± 0.1	± 100	nA
Quiescent Supply Current	I_{CC}	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$			8	μA
Input Capacitance	C_i	$V_{CC}=2\sim 6V$		3	10	pF

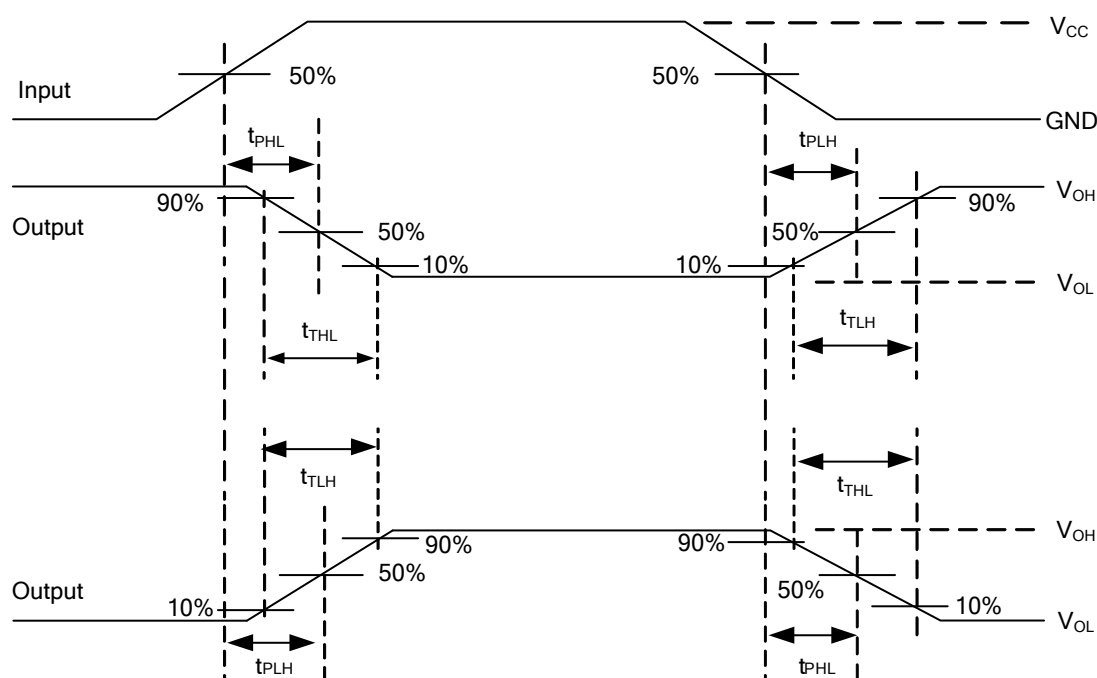
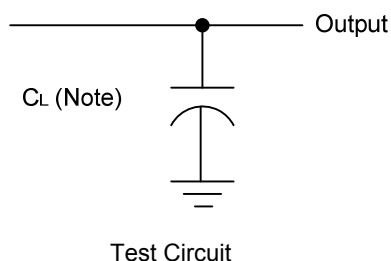
■ **SWITCHING CHARACTERISTICS** ($T_A=25^\circ\text{C}$, $C_L=50\text{pF}$, see Test Circuit and Waveforms)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (An) to output($\overline{Y_n}$)	t_{PLH}/t_{PHL}	$V_{CC}=2.0\text{V}$		67	180	ns
		$V_{CC}=4.5\text{V}$		18	36	ns
		$V_{CC}=6.0\text{V}$		15	31	ns
Propagation delay from input (E3) to output($\overline{Y_n}$)	t_{PLH}/t_{PHL}	$V_{CC}=2.0\text{V}$		66	155	ns
		$V_{CC}=4.5\text{V}$		18	31	ns
		$V_{CC}=6.0\text{V}$		15	26	ns
Propagation delay from input ($\overline{E_n}$) to output($\overline{Y_n}$)	t_{PLH}/t_{PHL}	$V_{CC}=2.0\text{V}$		66	155	ns
		$V_{CC}=4.5\text{V}$		18	31	ns
		$V_{CC}=6.0\text{V}$		15	26	ns
Output Transition Time	t_{TLH}/t_{THL}	$V_{CC}=2.0\text{V}$		38	75	ns
		$V_{CC}=4.5\text{V}$		8	15	ns
		$V_{CC}=6.0\text{V}$		6	13	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: $Z_O = 50\Omega$, $t_R = 6\text{ns}$, $t_F = 6\text{ns}$.

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