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NTE74HC138 **Integrated Circuit** **TTL – High Speed CMOS, 1-of-8 Decoder/Demultiplexer**

Description:

The NTE74HC138 is a 1-of-8 decoder/demultiplexer in a 16-Lead plastic DIP type package that decodes a three-bit Address to one-of-eight 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.

The NTE74HC138 is identical in pinout to the 'LS138. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

Features:

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage range: 2V to 6V
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristics of CMOS Devices

Absolute Maximum Ratings: (Note 1, Note 2)

Supply Voltage, V_{CC}	–0.5 to +7.0V
DC Input Voltage, V_{IN}	–0.5 to $V_{CC} + 0.5V$
DC Output Voltage, V_{OUT}	–0.5 to $V_{CC} + 0.5V$
DC Input Current (Per Pin), I_{IN}	$\pm 20mA$
DC Output Current (Per Pin), I_{OUT}	$\pm 25mA$
DC V_{CC} or GND Current (Per Pin), I_{CC}	$\pm 50mA$
Power Dissipation (Note 3), P_D	600mW
Storage Temperature Range, T_{stg}	–65°C to +150°C
Lead Temperature (During Soldering, 10sec), T_L	+260°C

Note 1. Stresses exceeding the Absolute Maximum Ratings may damage the device. The device may not function or be operable above the Recommended Operating Conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the Recommended Operating Conditions may effect device reliability. The Absolute Maximum Ratings are stress ratings only.

Note 2. Unless otherwise specified, all voltages are referenced to GND.

Note 3. Power Dissipation temperature derating: 12mW/°C from +65°C to +85°C.

Recommended Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	2.0	–	6.0	V
DC Input or Output Voltage	V_{IN}, V_{OUT}	0	–	V_{CC}	V
Operating Temperature Range	T_A	–55	–	+125	°C
Input Rise or Fall Times $V_{CC} = 2.0V$	t_r, t_f	–	–	1000	ns
$V_{CC} = 4.5V$		–	–	500	ns
$V_{CC} = 6.0V$		–	–	400	ns

DC Electrical Characteristics: (Voltages Referenced to GND unless otherwise specified)

Parameter	Symbol	Test Conditions	V_{CC} (V)	Guaranteed Limits			Unit
				–55 to +25°C	≤ 85°C	≤ 125°C	
Minimum High Level Input Voltage	V_{IH}	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$, $ I_{OUT} \leq 20\mu A$	2.0	1.50	1.50	1.50	V
			3.0	2.10	2.10	2.10	V
			4.5	3.15	3.15	3.15	V
			6.0	4.20	4.20	4.20	V
Maximum Low Level Input Voltage	V_{IH}	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$, $ I_{OUT} \leq 20\mu A$	2.0	0.50	0.50	0.50	V
			3.0	0.90	0.90	0.90	V
			4.5	1.35	1.35	1.35	V
			6.0	1.80	1.80	1.80	V
Minimum High Level Output Voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 20\mu A$	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	V
			6.0	5.9	5.9	5.9	V
	$V_{IN} = V_{IH}$ or V_{IL}	$ I_{OUT} \leq 2.4mA$	3.0	2.48	2.34	2.20	V
		$ I_{OUT} \leq 4.0mA$	4.5	3.98	3.84	3.70	V
		$ I_{OUT} \leq 5.2mA$	6.0	5.48	5.34	5.20	V
Maximum Low Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 20\mu A$	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	V
			6.0	0.1	0.1	0.1	V
	$V_{IN} = V_{IH}$ or V_{IL}	$ I_{OUT} \leq 2.4mA$	3.0	0.26	0.33	0.40	V
		$ I_{OUT} \leq 4.0mA$	4.5	0.26	0.33	0.40	V
		$ I_{OUT} \leq 5.2mA$	6.0	0.26	0.33	0.40	V
Maximum Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND	6.0	±0.1	±1.0	±1.0	μA
Maximum Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0\mu A$	6.0	4.0	40	40	μA

AC Electrical Characteristics: ($t_r = t_f = 6ns$, $C_L = 50pF$ unless otherwise specified)

Parameter	Symbol	Test Conditions	V_{CC} (V)	Guaranteed Limits			Unit
				–55 to +25°C	≤ 85°C	≤ 125°C	
Maximum Propagation Delay, Input A to Output Y	$t_{PLH},$ t_{PHL}		2.0	135	170	205	ns
			3.0	90	125	165	ns
			4.5	27	34	41	ns
			6.0	23	29	35	ns

AC Electrical Characteristics (Cont'd): ($t_r = t_f = 6\text{ns}$, $C_L = 50\text{pF}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	V_{CC} (V)	Guaranteed Limits			Unit
				-55 to +25°C	≤ 85°C	≤ 125°C	
Maximum Propagation Delay, CS1 to Output Y	t_{PLH} , t_{PHL}		2.0	110	140	165	ns
			3.0	85	100	125	ns
			4.5	22	28	33	ns
			6.0	19	24	28	ns
Maximum Propagation Delay, CS2 or CS3 to Output Y	t_{PLH} , t_{PHL}		2.0	120	150	180	ns
			3.0	90	120	150	ns
			4.5	24	30	36	ns
			6.0	20	26	31	ns
Maximum Output Transition Time, Any Output	t_{TLH} , t_{THL}		2.0	75	95	110	ns
			3.0	30	40	55	ns
			4.5	15	19	22	ns
			6.0	13	16	19	ns
Maximum Input Capacitance	C_{in}		–	10	10	10	pF
Parameter	Symbol	Test Conditions	Typical @ +25°C, $V_{CC} = 5\text{V}$, $V_{EE} = 0\text{V}$				Unit
Power Dissipation Capacitance (Per Package)	C_{PD}	Note 4	55				pF

Note 4. C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$

Function Table:

Inputs						Outputs							
CS1	CS2	CS3	A2	A1	A0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	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
L	X	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	H	L	H	H	H	H
H	L	L	L	H	L	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	L	H	H	H	H	H	H	H	H	H	L

H = HIGH Level (Steady State)

L = LOW Level (Steady State)

X = Don't Care

Pin Connection Diagram

