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NTE74HCT138
Integrated Circuit
TTL – High Speed CMOS,
3–to–8 Line Decoder

Description:

The NTE74HCT138 is a 3–to–8 line decoder in a 16–Lead plastic DIP type package that utilizes advanced silicon–gate CMOS technology and is well suited for memory address decoding and data routing applications. This device features high noise immunity and low power consumption usually associated with CMOS circuitry, yet has speeds comparable to low power Schottky TTL logic.

The NTE74HCT138 has 3 binary select inputs (A, B, and C). If the device is enabled, these inputs determine which one of the eight normally HIGH outputs will go LOW. Two active LOW and one active HIGH enables (G1, G2A, and G2B) are provided to ease the cascading decoders.

The decoders' output can drive 10 low power Schottky TTL equivalent loads and are functionally and pin equivalent to the NTE74LS138. All inputs re protected from damage due to static discharge by diodes to V_{CC} and GND.

The NTE74HCT138 is intended to interface between TTL and NMOS components and standard CMOS devices. This device is also a plug–in replacement for LS–TTL devices and can be used to reduce power consumption in existing designs.

Features:

- TTL Pinout Compatible
- Propagation Delay: 20ns (typ)
- Low Quiescent Current: 80μA (max)
- Low Input Current: 1μA (max)
- Fanout of 10 LS–TTL Loads

Absolute Maximum Ratings: (Note 1, Note 2)

Supply Voltage, V_{CC} . . . . . –0.5 to +7.0V
DC Input Voltage, V_{IN} . . . . . –1.5 to V_{CC} +1.5V
DC Output Voltage, V_{OUT} . . . . . –0.5 to V_{CC} + 0.5V
Clamp Diode Current, I_{IK}, I_{OK} . . . . . ±20mA
DC Output Current (Per Pin), I_{OUT} . . . . . ±25mA
DC V_{CC} or GND Current (Per Pin), I_{CC} . . . . . ±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. Absolute Maximum Ratings are those values beyond which damage to the device may occur.
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}	4.5	–	5.5	V
DC Input or Output Voltage	V_{IN}, V_{OUT}	0	–	V_{CC}	V
Operating Temperature Range	T_A	–40	–	+85	°C
Input Rise or Fall Times	t_r, t_f	–	–	500	ns

DC Electrical Characteristics: (V_{CC} = 5V ±10% unless otherwise specified)

Parameter	Symbol	Test Conditions		T_A = +25°C	T_A = –40° to +85°C		Unit
				Typ	Guaranteed Limits		
Minimum High Level Input Voltage	V_{IH}			–	2.0	2.0	V
Maximum Low Level Input Voltage	V_{IL}			–	0.8	0.8	V
Minimum High Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	$\|I_{OUT}\|$ = 20μA	V_{CC}	V_{CC} –0.1	V_{CC} –0.1	V
			$\|I_{OUT}\|$ = 4.0mA, V_{CC} = 4.5V	4.2	3.98	3.84	V
			$\|I_{OUT}\|$ = 4.8mA, V_{CC} = 5.5V	5.2	4.98	4.84	V
Minimum Low Level Output Voltage	V_{OL}	V_{IN} = V_{IH}	$\|I_{OUT}\|$ = 20μA	0	0.1	0.1	V
			$\|I_{OUT}\|$ = 4.0mA, V_{CC} = 4.5V	0.2	0.26	0.33	V
			$\|I_{OUT}\|$ = 4.8mA, V_{CC} = 5.5V	0.2	0.26	0.33	V
Maximum Input Current	I_{IN}	V_{IN} = V_{CC} or GND, V_{IH} or V_{IL}		–	±0.1	±1.0	μA
Maximum Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND, I_{OUT} = 0μA		–	8.0	80	μA
		V_{IN} = 2.4V or 0.5V, Note 4		–	0.3	0.4	mA

Note 4. This is measured per input with all other inputs held at V_{CC} or GND.

AC Electrical Characteristics: (V_{CC} = 5V, t_r = t_f = 6ns, C_L = 15pF, T_A = +25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Typ	Guaranteed Limits	Unit
Maximum Propagation Delay (A, B, or C to Output	t_{PHL}		20	35	ns
	t_{PLH}		13	25	ns
Maximum Propagation Delay (G1 to Y Output	t_{PHL}		14	25	ns
	t_{PLH}		13	25	ns
Maximum Propagation Delay ($\overline{G2A}$ or $\overline{G2B}$ to Y Output	t_{PHL}		17	30	ns
	t_{PLH}		13	25	ns

AC Electrical Characteristics: (V_{CC} = 5V ±10%, t_r = t_f = 6ns, C_L = 50pF unless otherwise specified)

Parameter	Symbol	Test Conditions	T_A = +25°C	T_A = –40° to +85°C		Unit
			Typ	Guaranteed Limits		
Maximum Propagation Delay (A, B, or C to Output)	t_{PHL}		24	40	50	ns
	t_{PLH}		18	30	38	ns
Maximum Propagation Delay (G1 to Y Output)	t_{PHL}		17	30	38	ns
	t_{PLH}		20	30	38	ns
Maximum Propagation Delay ($\overline{G2A}$ or $\overline{G2B}$ to Y Output)	t_{PHL}		23	35	43	ns
	t_{PLH}		18	30	38	ns

AC Electrical Characteristics (Cont'd): (V_{CC} = 5V ±10%, $t_r = t_f$ = 6ns, C_L = 50pF unless otherwise specified)

Parameter	Symbol	Test Conditions	T_A = +25°C	T_A = −40° to +85°C		Unit
			Typ	Guaranteed Limits		
Maximum Output Rise and Fall Time	t_{THL}, t_{TLH}		–	15	19	ns
Power Dissipation Capacitance	C_{PD}	Note 5	55	–	–	pF
Input Capacitance	C_{IN}		–	5	10	pF

Note 5. C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Truth Table:

Inputs					Outputs							
Enable		Select										
G1	$\overline{G2}$ (Note 6)	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

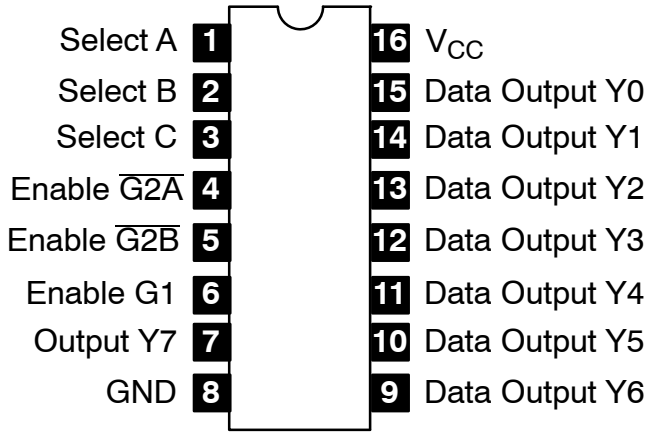
Note 6. $\overline{G2} = \overline{G2A} + \overline{G2B}$

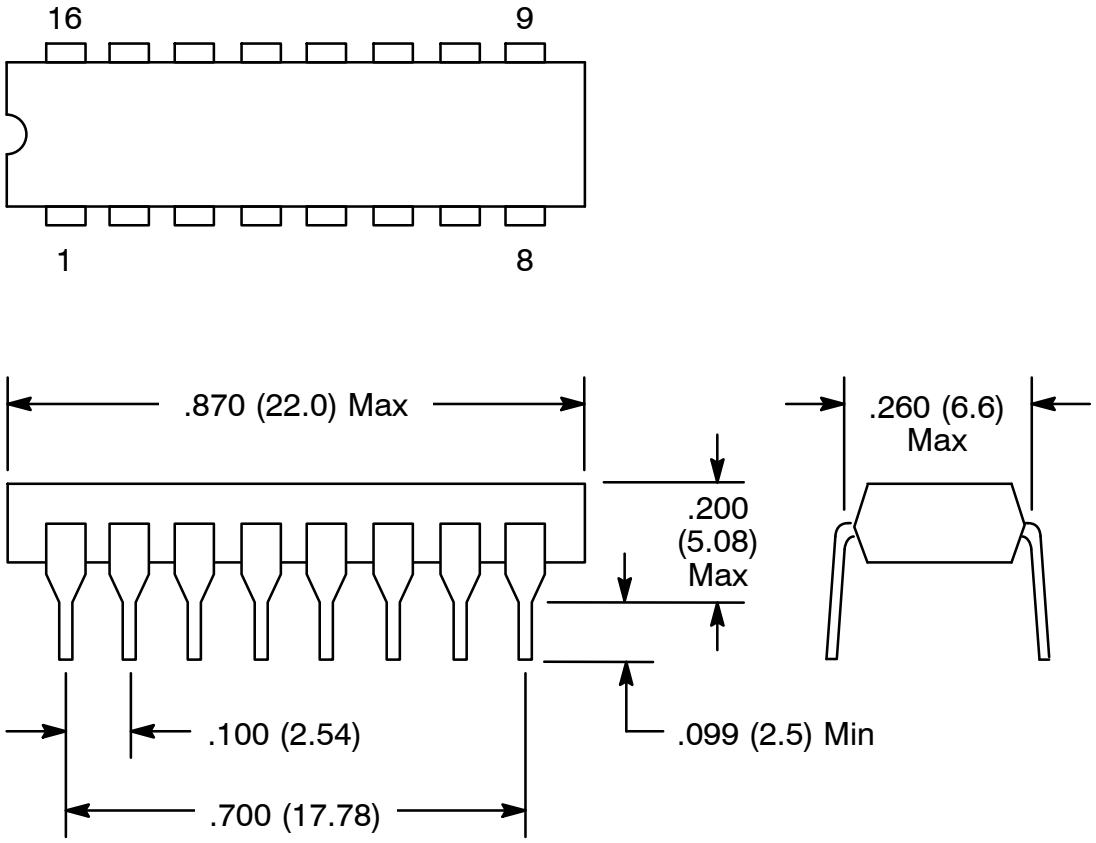
H = HIGH Level

L = LOW Level

X = Don't Care

Pin Connection Diagram




16
9
1
8
.870 (22.0) Max
.260 (6.6)
Max
.200
(5.08)
Max
.100 (2.54)
.099 (2.5) Min
.700 (17.78)