

IN74LV138

3-to-8 line decoder/demultiplexer; inverting

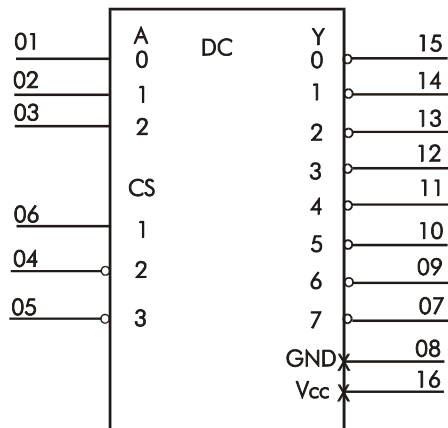
The IN74LV138 is a low-voltage Si-gate CMOS device and is pin and function compatible 74HCT138.

The 74LV138 accepts three binary weighted address inputs - (A_0, A_1, A_2) and when enabled, provide 8 - mutually exclusive active LOW outputs ($\overline{Y}_0$ to $\overline{Y}_7$).

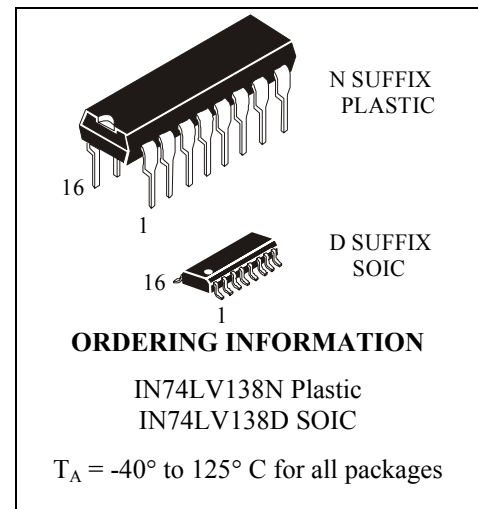
The "138" features three enable inputs: two active LOW ($\overline{CS}_2, \overline{CS}_3$ and one active HIGH (CS_1). Every output will be HIGH unless $\overline{CS}_2$, and CS_3 are LOW and CS_1 is HIGH.

- Optimized for Low Voltage applications: 1.2 to 3.6 V
- Demultiplexing capability
- Multiple input enable for easy expansion
- Ideal for memory chip select decoding
- Active LOW mutually exclusive outputs
- Output capability: standard

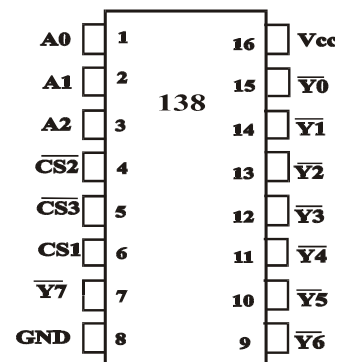
LOGIC DIAGRAM



PIN 16 = V_{CC}
PIN 8 = GND



PIN ASSIGNMENT



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	L	H	H	H	H	H
H	L	L	H	L	L	H	H	H	H	L	H	H	H
H	L	L	H	L	H	H	H	H	H	L	H	H	H
H	L	L	H	H	L	H	H	H	H	H	L	H	H
H	L	L	H	H	H	H	H	H	H	H	H	L	H

H = high level (steady state)

L = low level (steady state)

X = don't care

MAXIMUM RATINGS*

Symbol	Parameter	Value	Conditions	Unit
V_{CC}	DC supply voltage	-0.5 to +7.0		V
I_{IK}	DC input diode current	± 20	$V_I < -0.5$ or $V_I > V_{CC} + 0.5V$	mA
I_{OK}	DC output diode current	± 50	$V_O < -0.5$ or $V_O > V_{CC} + 0.5V$	mA
I_O	DC output source or sink current	± 25	$-0.5B < V_O < V_{CC} + 0.5B$	mA
I_{CC}	DC V_{CC} or GND current for types with standard outputs	± 50		mA
Tstg	Storage Temperature	-65 to +150		°C
P_D	Power Dissipation per package Plastic DIP+ SOIC Package+	750 500		mW
T_L	Lead temperature, 1.5 mm from Case for 4 seconds (Plastic DIP), 0.3 mm (SOIC Package)	260		°C

*

Maximum Ratings are those values beyond which damage to the device may occur.
Functional operation should be restricted to the Recommended Operating Conditions.

+Derating - Plastic DIP: - 12 mW/°C from 70° to 125°C

SOIC Package: - 8 mW/°C from 70° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC supply voltage	1.0	5.5	V
V_{IN}	DC input voltage,	0	V_{CC}	V
V_O	DC output voltage	0	V_{CC}	V
T_A	Operating ambient temperature range in free air	-40	+125	°C
t_r, t_f	Input rise and fall times except for Schmitt-trigger inputs	$V_{CC} = 1.0 \div 2.0B$ 0 500 $V_{CC} = 2.0 \div 2.7B$ 0 200 $V_{CC} = 2.7 \div 3.6B$ 0 100 $V_{CC} = 3.6 \div 5.5B$ 0 50		ns/B

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range $GND \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} , B	Guaranteed Limit						Unit
				25°C		or -40°C to 85°C		or -40°C to 125°C		
				min	max	min	max	min	max	
V _{IH}	High-level input voltage		1.2	0.9	-	0.9	-	0.9	-	B
			2.0	1.4	-	1.4	-	1.4	-	
			2.7 to 3.6	2.0	-	2.0	-	2.0	-	
			4.5 to 5.5	0.7 V _{CC}	-	0.7 V _{CC}	-	0.7 V _{CC}	-	
V _{IL}	Low -level input voltage		1.2	-	0.3	-	0.3	-	0.3	B
			2.0	-	0.6	-	0.6	-	0.6	
			2.7 to 3.6	-	0.8	-	0.8	-	0.8	
			4.5 to 5.5	-	0.3 V _{CC}	-	0.3 V _{CC}	-	0.3 V _{CC}	
V _{OH}	High-level output voltage	-I ₀ =100μA V _{IH} or V _{IL}	1.2	-	-	-	-	-	-	B
			2.0	1.85	-	1.8	-	1.8	-	
			2.7	2.55	-	2.5	-	2.5	-	
			3.0	2.85	-	2.8	-	2.8	-	
			3.6	3.45	-	3.4	-	3.4	-	
			4.5	4.35	-	4.3	-	4.3	-	
			5.5	5.35	-	5.3	-	5.3	-	
		V _{IH} or V _{IL} -I _O =6.0 mA -I _O =12.0 mA	3.0	2.48	-	2.40	-	2.20	-	B
			4.5	3.70		3.60		3.50		
V _{OL}	Low-level output voltage	V _{IH} or V _{IL} I ₀ =100μA	1.2	-	0.15	-	0.2	-	0.2	B
			2.0	-	0.15	-	0.2	-	0.2	
			3.0	-	0.15	-	0.2	-	0.2	
			-	-	-	-	-	-	-	
		V _{IH} or V _{IL} I _O =6.0 mA I _O =12.0 mA	3.0	-	0.33	-	0.40	-	0.50	B
4.5			0.40		0.55		0.65			
I _I	Input leakage current	V _{CC} or GND	5.5	-	±0.1	-	±1.0	-	±1.0	mKA
I _{CC}	Quiescent supply current	V _{CC} or GND I _O =0	5.5	-	8.0	-	80	-	160	mKA

AC ELECTRICAL CHARACTERISTICS ($C_L=50$ pF, $t_{LH} = t_{HL} = 2.5$ ns, $V_{IL}=0B$, $V_{IH}=V_{CC}$)

Symbol	Parameter	V _{CC} V	Guaranteed Limit						Unit
			25°C		oT -40°C to 85°C		oT -40°C to 125°C		
			min	max	min	max	min	max	
t _{PLH} , t _{PHL}	Propagation delay, input A to output Y (Figures 1)	1.2	-	150	-	150	-	180	ns
		2.0		33		36		44	
		2.7		23		26		33	
		3.0		19		21		26	
		4.5		14		16		20	
t _{PLH} , t _{PHL}	Propagation delay , CS1 to output Y (Figures 2)	1.2	-	170	-	170	-	200	ns
		2.0		35		39		49	
		2.7		26		29		36	
		3.0		21		23		29	
		4.5		17		19		24	
t _{PLH} , t _{PHL}	Output transition time, CS2 or CS3 to output Y (Figures 3)		-	170	-	170	-	200	ns
				35		39		49	
				26		29		36	
				21		23		29	
				17		19		24	
C _{IN}	Input capacitance	5.0 T=+25 °C		7.0					pF

C _{PD}	Power dissipation capacitance (per enabled output)	Typical @25°C, V _{CC} =5.5 V	pF
	Used to determine the no-load dynamic power consumption: P _D =C _{PD} V _{CC} ² f+I _{CC} V _{CC}	90	

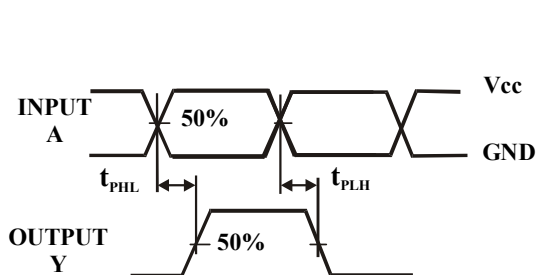


Figure 1. Switching Waveforms

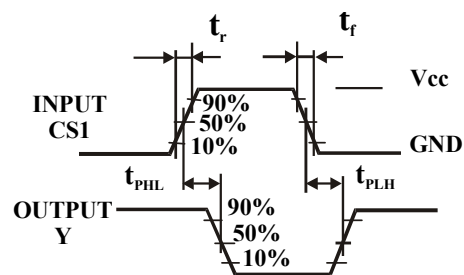


Figure 2. Switching Waveforms

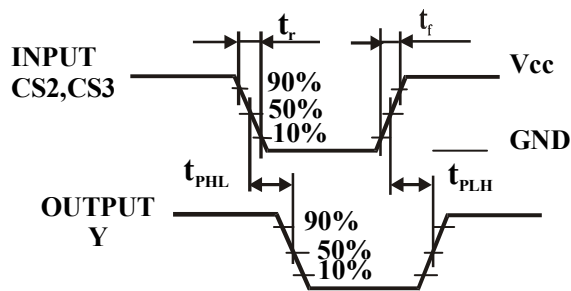


Figure 3. Switching Waveforms

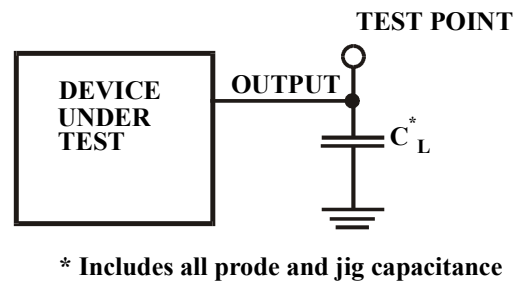
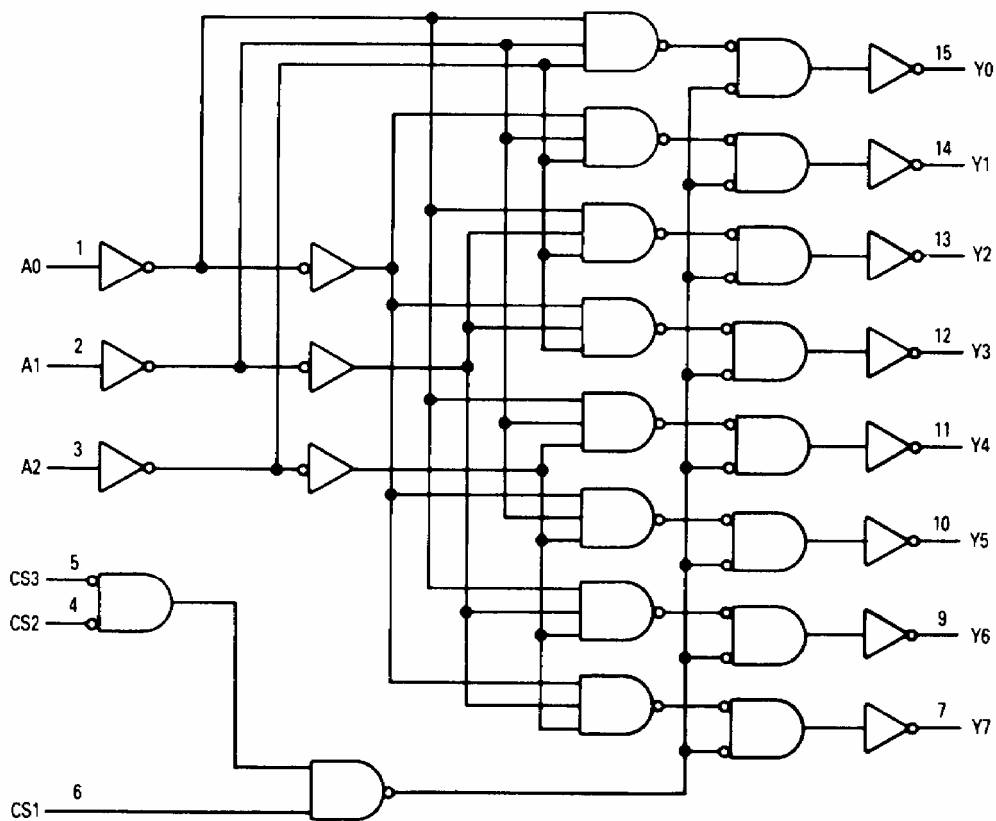
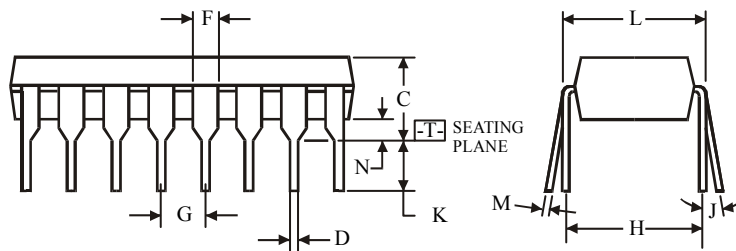
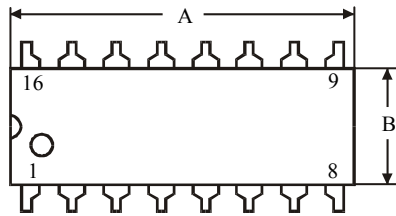


Figure 4. Test Circuit

EXPANDED LOGIC DIAGRAM



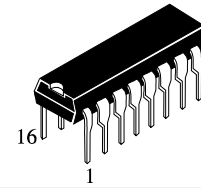
N SUFFIX PLASTIC DIP (MS - 001BB)



$\oplus 0.25 (0.010) \text{ (M)} \text{ T}$

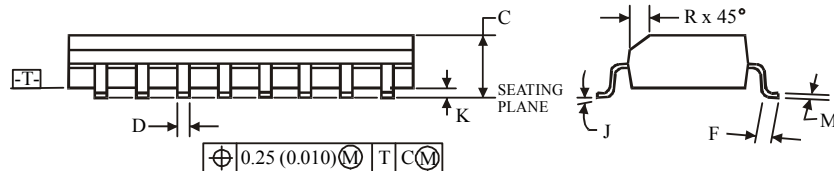
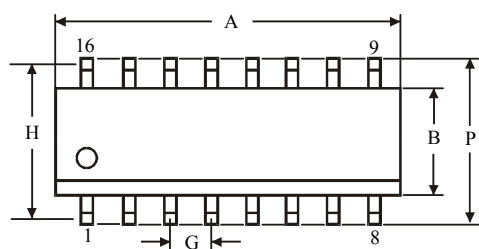
NOTES:

- Dimensions "A", "B" do not include mold flash or protrusions.
Maximum mold flash or protrusions 0.25 mm (0.010) per side.



Symbol	Dimension, mm	
	MIN	MAX
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

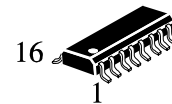
D SUFFIX SOIC (MS - 012AC)



$\oplus 0.25 (0.010) \text{ (M)} \text{ T C (M)}$

NOTES:

- Dimensions A and B do not include mold flash or protrusion.
- Maximum mold flash or protrusion 0.15 mm (0.006) per side
for A; for B - 0.25 mm (0.010) per side.



Symbol	Dimension, mm	
	MIN	MAX
A	9.8	10
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5