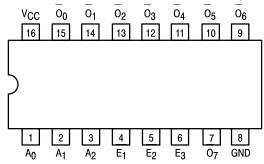


1-OF-8 DECODER/ DEMULTIPLEXER

The LSTTL/MSI SN54/74LS138 is a high speed 1-of-8 Decoder/Demultiplexer. This device is ideally suited for high speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three LS138 devices or to a 1-of-32 decoder using four LS138s and one inverter. The LS138 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

- Demultiplexing Capability
- Multiple Input Enable for Easy Expansion
- Typical Power Dissipation of 32 mW
- Active Low Mutually Exclusive Outputs
- Input Clamp Diodes Limit High Speed Termination Effects

CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE: The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

LOADING (Note a)

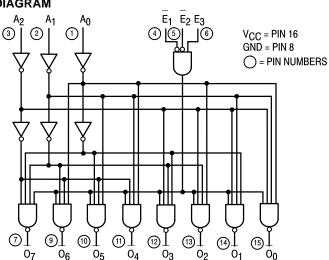
PIN NAMES

		HIGH	LOW
<u>A</u> 0- <u>A</u> 2	Address Inputs	0.5 U.L.	0.25 U.L.
E ₁ , E ₂	Enable (Active LOW) Inputs	0.5 U.L.	0.25 U.L.
<u>E</u> 3 _	Enable (Active HIGH) Input	0.5 U.L.	0.25 U.L.
$O_0 - O_7$	Active LOW Outputs (Note b)	10 U.L.	5 (2.5) U.L.

NOTES:

- a) 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.
- b) The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

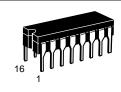
LOGIC DIAGRAM



SN54/74LS138

1-OF-8 DECODER/ DEMULTIPLEXER

LOW POWER SCHOTTKY



J SUFFIX CERAMIC CASE 620-09



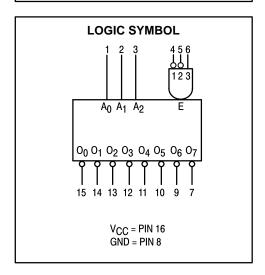
N SUFFIX PLASTIC CASE 648-08



D SUFFIX SOIC CASE 751B-03

ORDERING INFORMATION

SN54LSXXXJ Ceramic SN74LSXXXN Plastic SN74LSXXXD SOIC



SN54/74LS138

FUNCTIONAL DESCRIPTION

The LS138 is a high speed 1-of-8 Decoder/Demultiplexer fabricated with the low power Schottky barrier diode process. The decoder accepts three binary weighted inputs (A $_0$, A $_1$, A $_2$) and when enabled provides eight mutually exclusive active LOW Outputs (O $_0$ -O $_7$). The LS138 features three Enable inputs, two active LOW (E $_1$, E $_2$) and one active HIGH (E $_3$). All outputs will be HIGH unless E $_1$ and E $_2$ are LOW and E $_3$ is HIGH. This multiple enable function allows easy parallel ex-

pansion of the device to a 1-of-32 (5 lines to 32 lines) decoder with just four LS138s and one inverter. (See Figure a.)

The LS138 can be used as an 8-output demultiplexer by using one of the active LOW Enable inputs as the data input and the other Enable inputs as strobes. The Enable inputs which are not used must be permanently tied to their appropriate active HIGH or active LOW state.

TRUTH TABLE

		INP	UTS						OU.	TPUTS			
E ₁	E ₂	E ₃	A ₀	A ₁	A ₂	00	01	02	03	04	05	06	07
Н	Х	Х	Х	Х	Х	Н	Н	Н	Н	Н	Н	Н	Н
Х	Н	Χ	Х	Χ	Χ	Н	Н	Н	Н	Н	Н	Н	Н
Х	Χ	L	Х	Χ	Χ	Н	Н	Н	Н	Н	Н	Н	Н
L	L	Н	L	L	L	L	Н	Н	Н	Н	Н	Н	Н
L	L	Н	Н	L	L	Н	L	Н	Н	Н	Н	Н	Н
L	L	Н	L	Н	L	Н	Н	L	Н	Н	Н	Н	Н
L	L	Н	Н	Н	L	Н	Н	Н	L	Н	Н	Н	Н
L	L	Н	L	L	Н	Н	Н	Н	Н	L	Н	Н	Н
L	L	Н	Н	L	Н	Н	Н	Н	Н	Н	L	Н	Н
L	L	Н	L	Н	Н	Н	Н	Н	Н	Н	Н	L	Н
L	L	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	L

H = HIGH Voltage Level

X = Don't Care

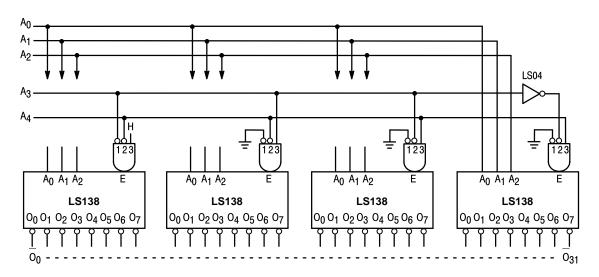


Figure a

L = LOW Voltage Level

SN54/74LS138

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Тур	Max	Unit
VCC	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T _A	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
ЮН	Output Current — High	54, 74			-0.4	mA
lOL	Output Current — Low	54 74			4.0 8.0	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

				Limits					
Symbol	Parameter		Min	Тур	Max	Unit	Tes	st Conditions	
VIH	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs		
\/	Input LOW Voltage	54			0.7	V		t LOW Voltage for	
VIL	Input LOW Voltage	74			0.8	V	All Inputs		
V _{IK}	Input Clamp Diode Voltage			-0.65	-1.5	V	V _{CC} = MIN, I _{IN} = -18 mA		
Vari	V Outrut HIGH Voltage		2.5	3.5		٧	V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH}		
Vон	Output HIGH Voltage	74	2.7	3.5		V	or V _{IL} per Truth Table		
V	Output LOW Voltage	54, 74		0.25	0.4	V	I _{OL} = 4.0 mA	V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH}	
VOL	Output LOW Voltage	74		0.35	0.5	V	I _{OL} = 8.0 mA	per Truth Table	
I	Input HICH Current				20	μΑ	V _{CC} = MAX, V _{IN} = 2.7 V		
liΗ	Input HIGH Current				0.1	mA	V _{CC} = MAX, V _{IN} = 7.0 V		
IIL	Input LOW Current				-0.4	mA	V _{CC} = MAX, V _{IN} = 0.4 V		
los	Short Circuit Current (Note 1)		-20		-100	mA	V _{CC} = MAX		
Icc	Power Supply Current				10	mA	V _{CC} = MAX		

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS ($T_A = 25^{\circ}C$)

		Levels of	Limits				
Symbol	Parameter	Delay	Min	Тур	Max	Unit	Test Conditions
tPLH tPHL	Propagation Delay Address to Output	2 2		13 27	20 41	ns	
tPLH tPHL	Propagation Delay Address to Output	3 3		18 26	27 39	ns	V _{CC} = 5.0 V C _L = 15 pF
tPLH ^t PHL	Propagation Delay E ₁ or E ₂ Enable to Output	2 2		12 21	18 32	ns	C _L = 15 pF
^t PLH ^t PHL	Propagation Delay E ₃ Enable to Output	3 3		17 25	26 38	ns	

AC WAVEFORMS

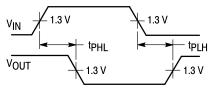


Figure 1

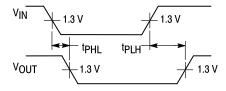
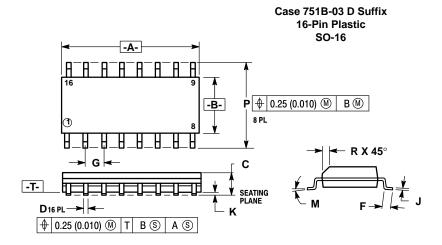
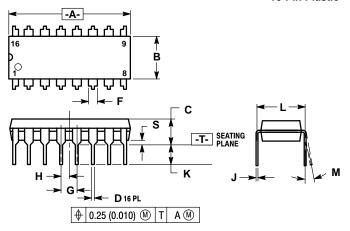
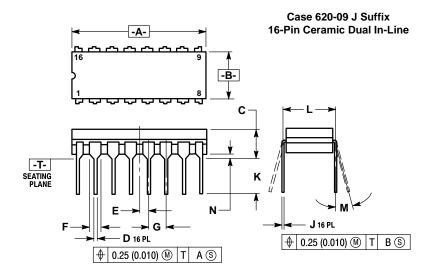


Figure 2



Case 648-08 N Suffix 16-Pin Plastic





- NOTES: 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
 DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 (0.006)
- PER SIDE. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03.

	MILLIM	ETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	9.80	10.00	0.386	0.393	
В	3.80	4.00	0.150	0.157	
С	1.35	1.75	0.054	0.068	
D	0.35	0.49	0.014	0.019	
F	0.40	1.25	0.016	0.049	
G	1.27	BSC	0.050 BSC		
J	0.19	0.25	0.008	0.009	
K	0.10	0.25	0.004	0.009	
M	0°	7°	0°	7°	
P	5.80	6.20	0.229	0.244	
R	0.25	0.50	0.010	0.019	

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
 DIMENSION "L" TO CENTER OF LEADS WHEN
 FORMED PARALLEL.
- DIMENSION "B" DOES NOT INCLUDE MOLD
- ROUNDED CORNERS OPTIONAL. 648-01 THRU -07 OBSOLETE, NEW STANDARD

	MILLIM	ETERS	INC	HES		
DIM	MIN	MAX	MIN	MAX		
Α	18.80	19.55	0.740	0.770		
В	6.35	6.85	0.250	0.270		
С	3.69	4.44	0.145	0.175		
D	0.39	0.53	0.015	0.021		
F	1.02	1.77	0.040	0.070		
G	2.54	BSC	0.100 BSC			
Н	1.27	BSC	0.050 BSC			
J	0.21	0.38	0.008	0.015		
K	2.80	3.30	0.110	0.130		
L	7.50	7.74	0.295	0.305		
M	0°	10°	0°	10°		
S	0.51	1.01	0.020	0.040		

- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
 5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-0.9

 - 620-09.

	MILLIM	ETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	19.05	19.55	0.750	0.770	
В	6.10	7.36	0.240	0.290	
С	_	4.19	_	0.165	
D	0.39	0.53	0.015	0.021	
E	1.27	BSC	0.050 BSC		
F	1.40	1.77	0.055	0.070	
G	2.54	BSC	0.100 BSC		
J	0.23	0.27	0.009	0.011	
K	_	5.08	_	0.200	
L	7.62 BSC		0.300 BSC		
M	0°	15°	0°	15°	
N	0.39	0.88	0.015	0.035	

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