

1-OF-8 DECODER/DEMULTIPLEXER

- 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
- FULLY TTL AND CMOS COMPATIBLE

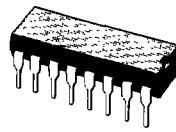
DESCRIPTION

The T74LS138 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

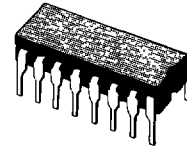
using four LS138 and one inverter. The LS138 is fabricated with the Schottky barrier diode process for high speed and is compatible with all TTL families.

PIN NAMES

$A_0 - A_3$	ADDRESS INPUTS
$E_1 - E_2$	ENABLE (active LOW) INPUTS
E_3	ENABLE (active HIGH) INPUT
$O_0 - O_7$	ACTIVE LOW OUTPUTS



B1
(Plastic Package)



D1
(Ceramic Package)



M1
(Micro Package)

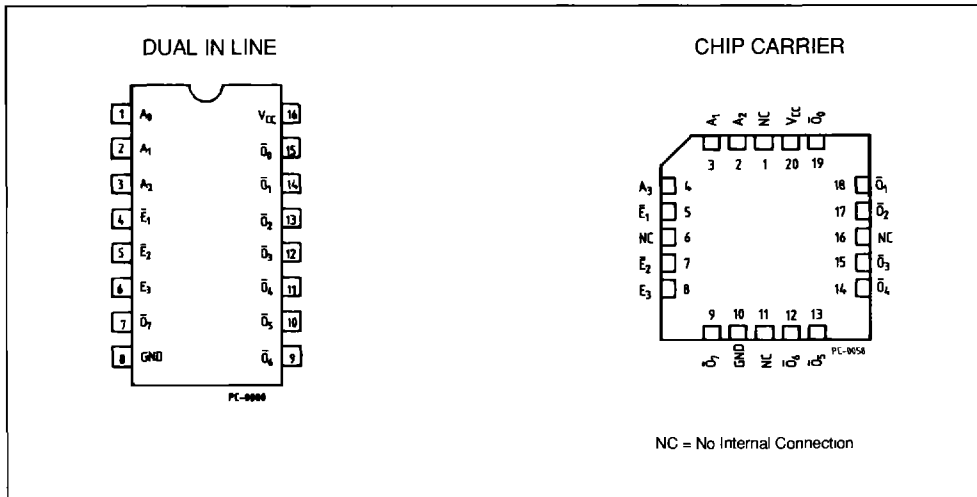


C1
(Plastic Chip Carrier)

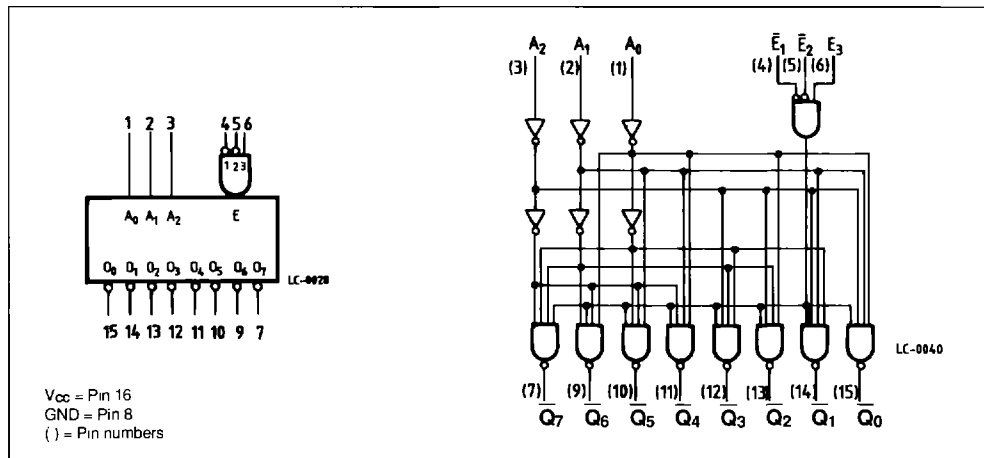
ORDER CODES :

T74LS138 D1 T74LS138 C1
 T74LS138 B1 T74LS138 M1

PIN CONNECTION (top view)



LOGIC SYMBOL AND LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	- 0.5 to 7	V
V_I	Input Voltage, Applied to Input	- 0.5 to 5.5	V
V_O	Output Voltage, Applied to Output	- 0.5 to 10	V
I_I	Input Current, into Inputs	- 30 to 5	mA
I_O	Output Current, into Outputs	50	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

GUARANTEED OPERATING RANGE

Part Numbers	Supply Voltage			Temperature
	Min.	Typ.	Max.	
T74LS138XX	4.75 V	5.0 V	5.25 V	0 °C to + 70 °C

XX = package type.

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 enable 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 expansion of the device of a 1-

of-32 (5 lines to 32) decoded with just four LS138s and one inverter. (see figure 1).

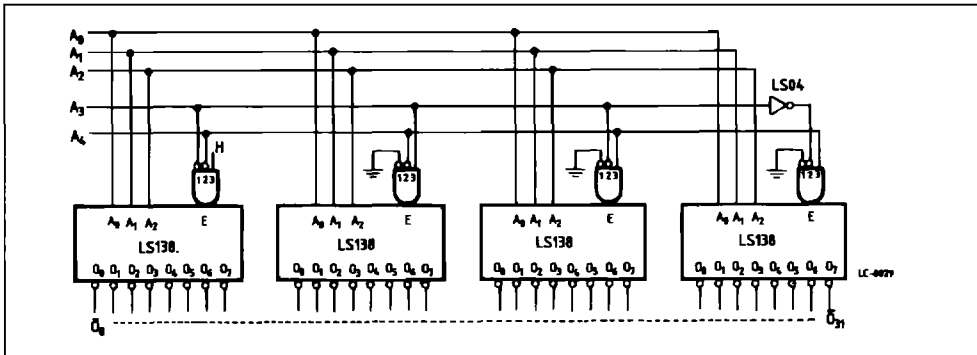
The LS138 can be used as an 8-output demultiplexer by using one of the active LOW Enable Inputs as the data input and the other Enable Inputs as strobes. The Enable inputs which are not used must be permanently tied to their appropriate active HIGH or active LOW state.

TRUTH TABLE

Inputs						Outputs							
\bar{E}_1	\bar{E}_2	\bar{E}_3	A_0	A_1	A_2	\bar{O}_0	\bar{O}_1	\bar{O}_2	\bar{O}_3	\bar{O}_4	\bar{O}_5	\bar{O}_6	\bar{O}_7
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

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Don't Care

Figure 1.



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter	Limits			Test Condition (note 1)	Unit	
		Min.	Typ. (*)	Max.			
V_{IH}	Input HIGH Voltage	2.0			Guaranteed Input HIGH Threshold Voltage for All Inputs	V	
V_{IL}	Input LOW Voltage			0.8	Guaranteed Input LOW Threshold Voltage for All Inputs	V	
V_{CD}	Input Clamp Diode Voltage		- 0.65	- 1.5	$V_{CC} = \text{MIN.}, I_{IN} = -18 \text{ mA}$	V	
V_{OH}	Output HIGH Voltage	2.7	3.4		$V_{CC} = \text{MIN.}, I_{OH} = -400 \mu\text{A}$ $V_{IN} = V_{IH} \text{ or } V_{IL} \text{ per Truth Table}$	V	
V_{OL}	Output LOW Voltage		0.25	0.4	$I_{OL} = 4.0 \text{ mA}$	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ per Truth Table	V
			0.35	0.5	$I_{OL} = 8.0 \text{ mA}$		V
I_{IH}	Input HIGH Current		1.0	20	$V_{CC} = \text{MAX.}, V_{IN} = 2.7 \text{ V}$ $V_{CC} = \text{MAX.}, V_{IN} = 7.0 \text{ V}$	μA mA	
I_{IL}	Input LOW Current			- 0.4	$V_{CC} = \text{MAX.}, V_{IN} = 0.4 \text{ V}$	mA	
I_{OS}	Output Short Circuit Current (note 2)	- 20		- 100	$V_{CC} = \text{MAX.}, V_{OUT} = 0 \text{ V}$	mA	
I_{CC}	Power Supply Current		6.0	10	$V_{CC} = \text{MAX}$	mA	

- Notes : 1. For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.
2. Not more than one output should be shorted at a time.
3. Typical values are at $V_{CC} = 5.0 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$.

AC CHARACTERISTICS : $T_A = 25 \text{ }^\circ\text{C}$

Symbol	Parameter	Level of Delay	Limits			Test Conditions	Unit
			Min.	Typ.	Max.		
t_{PLH} t_{PHL}	Propagation Delay, Address to Output	2 2		13 27	20 41	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$	ns
t_{PLH} t_{PHL}	Propagation Delay, Address to Output	3 3		18 26	27 39		ns
t_{PLH} t_{PHL}	Propagation Delay, E to any Output	2 2		12 21	18 32		ns
t_{PLH} t_{PHL}	Propagation Delay, E to any Output	3 3		17 25	26 38		ns

AC WAVEFORMS

Figure 2.

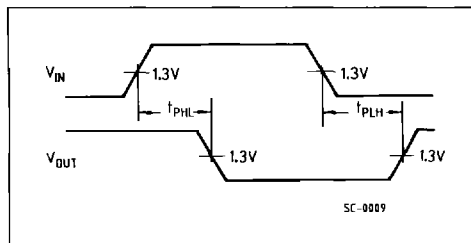


Figure 3.

