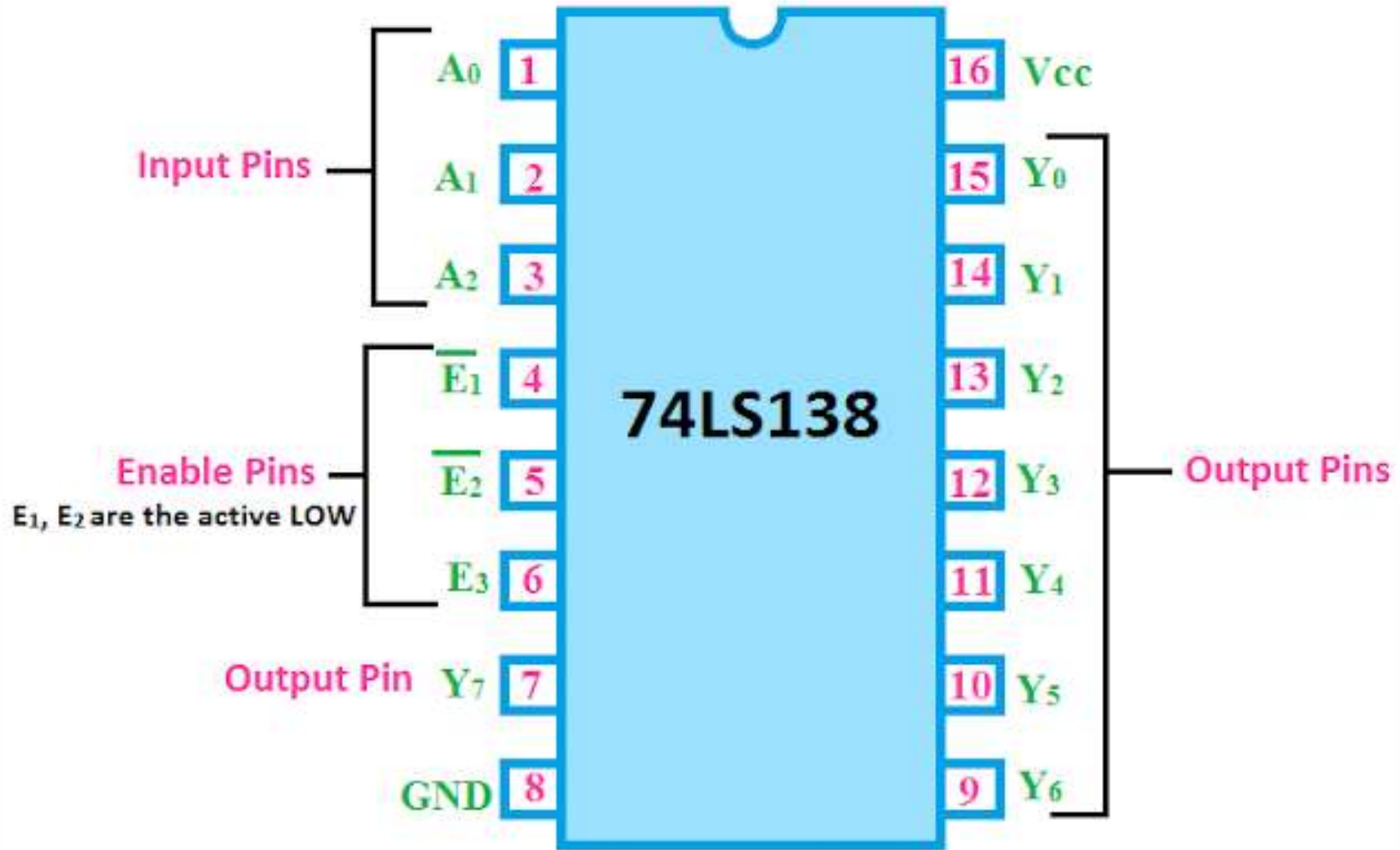


Decoder 74138

Decoder 74138

- **IC 74138** is a Logical Decoder IC.
- It also has a demultiplexing facility.
- The IC 74138 is available in the market with the name of 74LS138.
- It is a 3 to 8 decoder IC.
- The internal circuit of this IC is made of high-speed Schottky barrier diode.

IC 74138 Pin Diagram

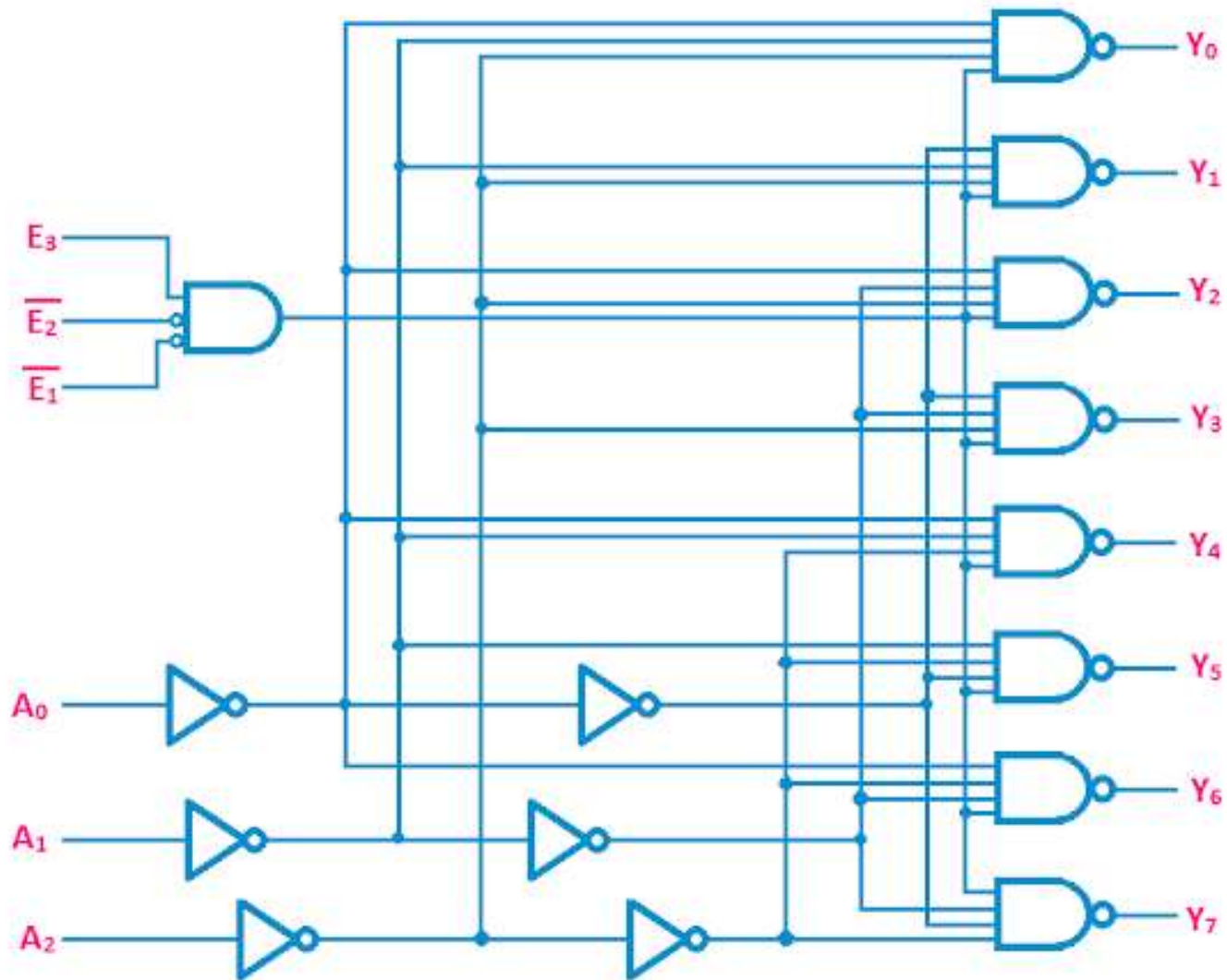


IC 74LS138 Pin Diagram

- 1. The pin no. 8 and 16 are the ground and Vcc respectively for the power input.
- 2. There are a total of three input pins(pin no. 1, 2, 3).
- They are denoted by A0, A1, A2.
- So the IC 74LS138 can take three binary input signals.

- 3. There are three enable input pins E1, E2, E3(pin no. 4, 5, 6).
- E1 and E2 are the active LOW pins that mean when low signals are applied to those pins they will be active.
- 4. Pin no. 7 and 9 to 15 are the output pins.

Logical Diagram of IC 74138



Logical Diagram of IC 74138

IC 74138 Truth Table

INPUTS						OUTPUTS							
$\overline{E_1}$	$\overline{E_2}$	E_3	A_0	A_1	A_2	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_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, L - Low, X - Don't Care

Operating Condition of IC 74138

- 1. The supply voltage or V_{cc} should be given between 4.75V to 5.25V
- 2. Operating temperature range should be between 0 to 70-degree centigrade

Features and Electrical characteristics of IC 74138

- It is very fast and high-speed IC.
- It consumes very low power because it consists of low power Schottky diodes (32mW).
- It has a de-multiplexing facility.
- Incorporates three enable pins to simplify cascading

- Inputs accept voltages higher than VCC
- Supply voltage: 1.0V to 5.5V
- Typical propagation delay: 21nS
- Low power consumption: 32mW
- Operating temperature: -40°C to +125°C

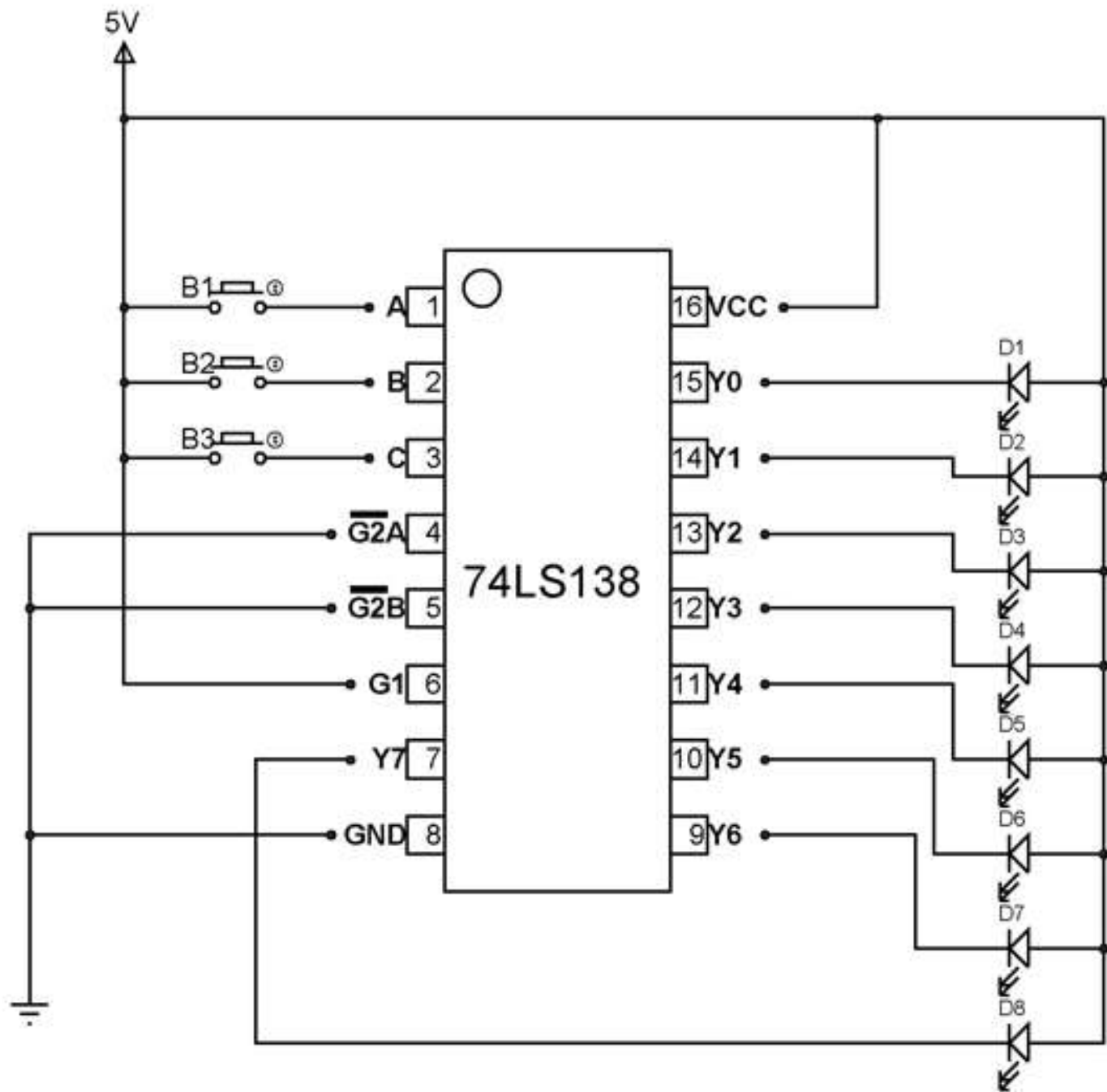
- ESD protection
- Protection against electrostatic discharges (ESD) is part of EMC Immunity (Electro Magnetic Compatibility) requirements. It is **the ability for equipment to properly operate in its electromagnetic environment by limiting the reception of electromagnetic energy that may cause physical damage.**

How to use 74LS138 Decoder

- For understanding the working of device let us construct a simple application circuit with a few external components as shown below.

IC 74138 Applications

- 1. Decode the digital signal.
- 2. digital memory circuits.
- 3. data routing applications.
- 4. de-multiplexing of digital signals.
- 5.Servers
- 6.Telecom circuits



- About circuit: Here the outputs are connected to LED to show which output pin goes LOW and do remember the outputs of the device are inverted.
- We are using a single device so we will connect G2A and G2B pin to ground followed by connecting G1 to VCC to enable the chip.
- The three buttons here represent three input lines for the device.

Implementing function using Decoder

- Implement Boolean function $f = \Sigma m(1,2,3,7)$ using 3:8 decoder

