

Circuit Simulation Project

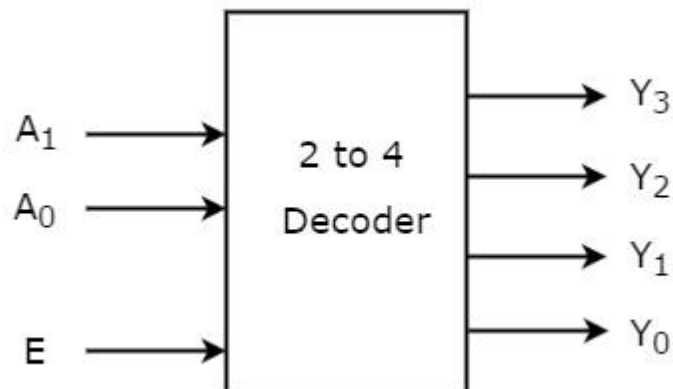
<https://esim.fossee.in/circuit-simulation-project>

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Title of the circuit: Decoder Circuit (4-bit to Analog Voltage)

Theory/Description: Decoder is a combinational circuit that has 'n' input lines and maximum of 2^n output lines. One of these outputs will be active High based on the combination of inputs present, when the decoder is enabled. That means decoder detects a particular code. The outputs of the decoder are nothing but the min terms of 'n' input variables lines, when it is enabled.

2 to 4 Decoder has two inputs A_1 & A_0 and four outputs Y_3 , Y_2 , Y_1 & Y_0 . The **block diagram** of 2 to 4 decoder is shown in the following figure.



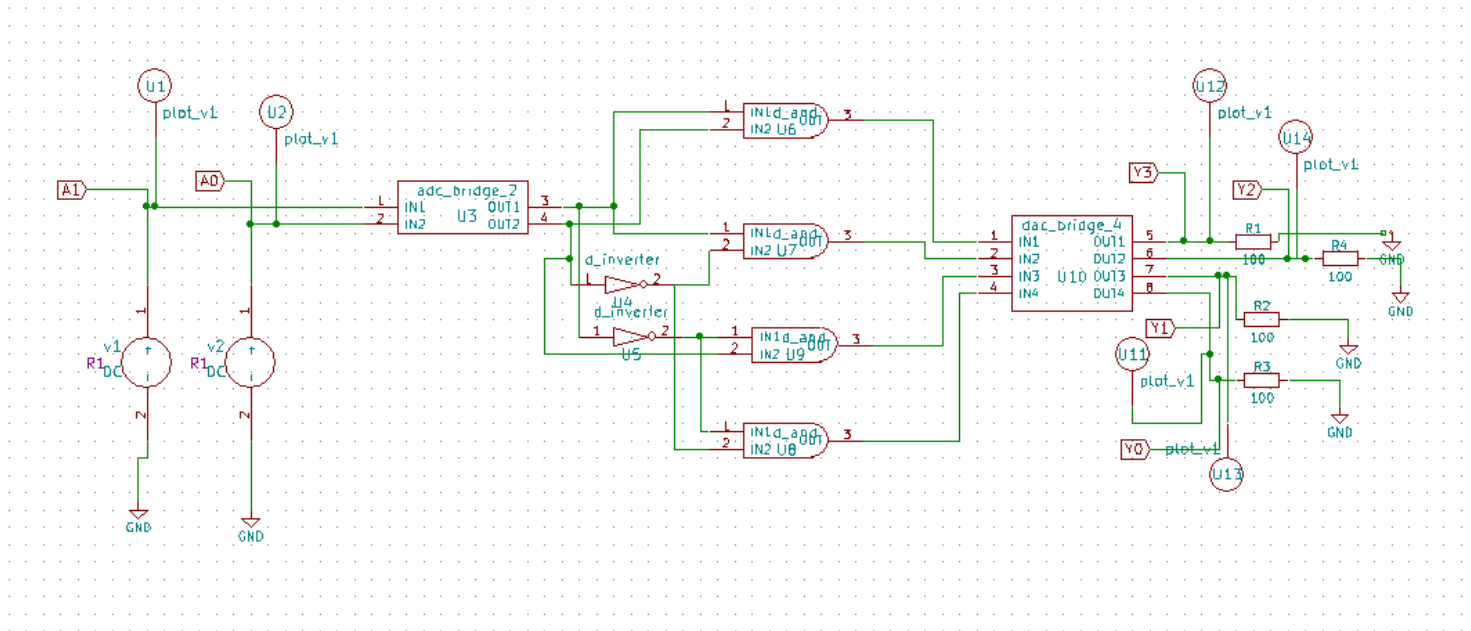
One of these four outputs will be '1' for each combination of inputs when enable, E is '1'. The **Truth table** of 2 to 4 decoder is shown below.

Enable	Inputs		Outputs			
E	A ₁	A ₀	Y ₃	Y ₂	Y ₁	Y ₀
0	x	x	0	0	0	0
1	0	0	0	0	0	1
1	0	1	0	0	1	0
1	1	0	0	1	0	0
1	1	1	1	0	0	0

Here in this case the highlighted case in the truth table is simulated, whose output plots are shown in the below figures.

5V represents a high logic level and 0V represents low logic level in the multimeter.

Circuit Diagram(s):

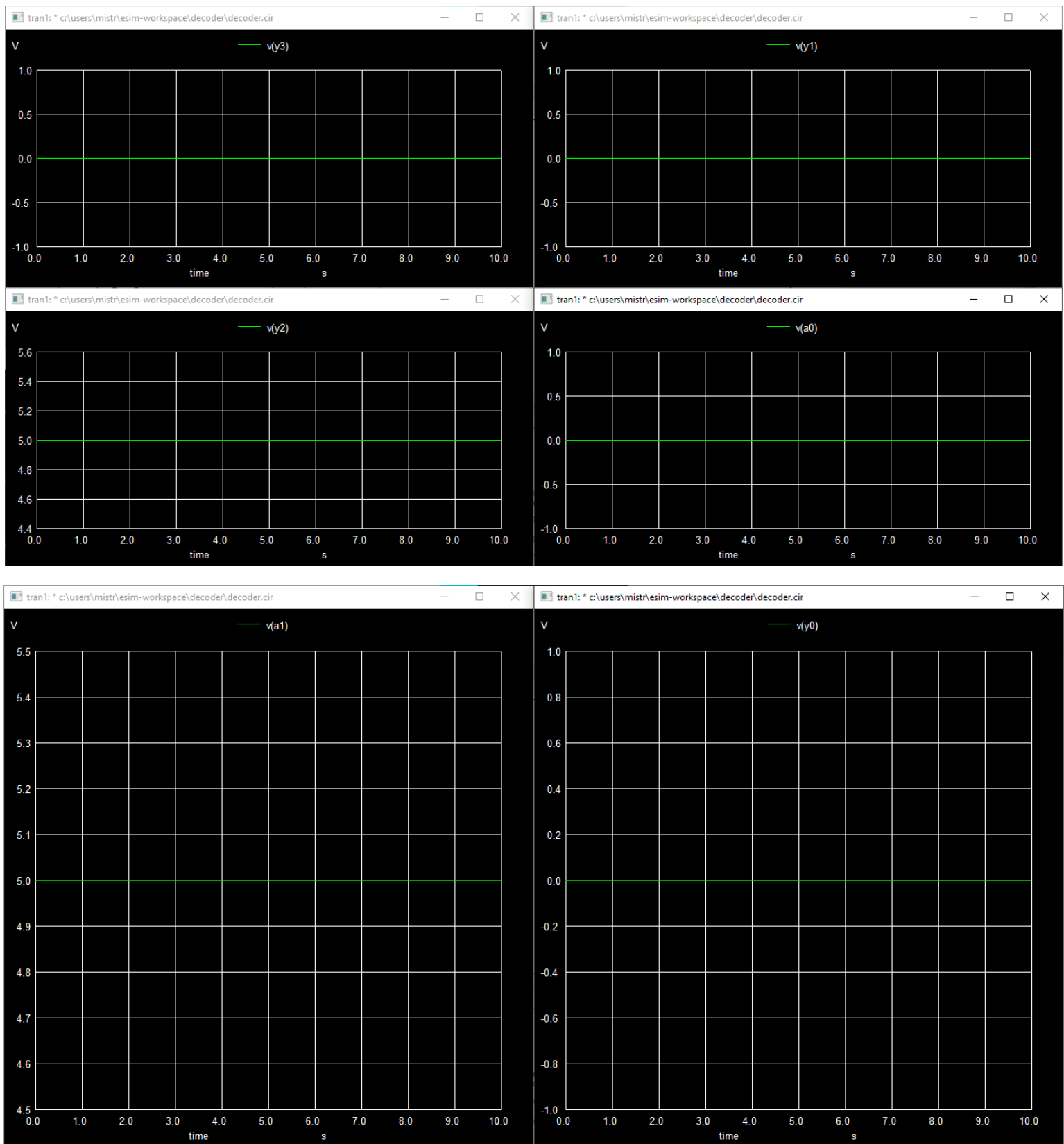


Outputs:

Multimeter values:

<div>MultiMeter</div> <div>Node RMS Value</div> <div>? 0.000000 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>a5#branch_1_0 0.000000 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>a0 0.000000 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>a5#branch_1_1 0.050 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>a1 5.0 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>a5#branch_1_2 0.000000 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>y0 0.000000 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>a5#branch_1_3 0.000000 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>y1 0.000000 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>v1#branch 0.000000 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>y2 5.0 Volts</div>	<div>MultiMeter</div> <div>Branch RMS Value</div> <div>v2#branch 0.000000 Amp</div>
<div>MultiMeter</div> <div>Node RMS Value</div> <div>y3 0.000000 Volts</div>	

Plots:



References:

https://www.tutorialspoint.com/digital_circuits/digital_circuits_decoders.htm