(DE3 -8d) Transistor NAND

Aim of experiment

The examination of the operation of the Transistor NAND and compare the expected outputs to the truth tables for this device.

Apparatus

Prototyping Board– DC Power Supply 5V or 9V Battery – Light Emitting Diode (LEDs) – Transistors - Resistances – Connection Wires.

Theory of experiment

The use of transistors for the construction of logic gates depends upon their utility as fast switches. When the base-emitter diode is turned on enough to be driven into saturation, the collector voltage with respect to the emitter may be near zero and can be used to construct gates for the TTL logic family.

For the NAND logic, the transistors are in series, but the output is above them as shown in *figure 1*. The output is high unless both A and B inputs are high, in which case the output is taken down close to ground potential.

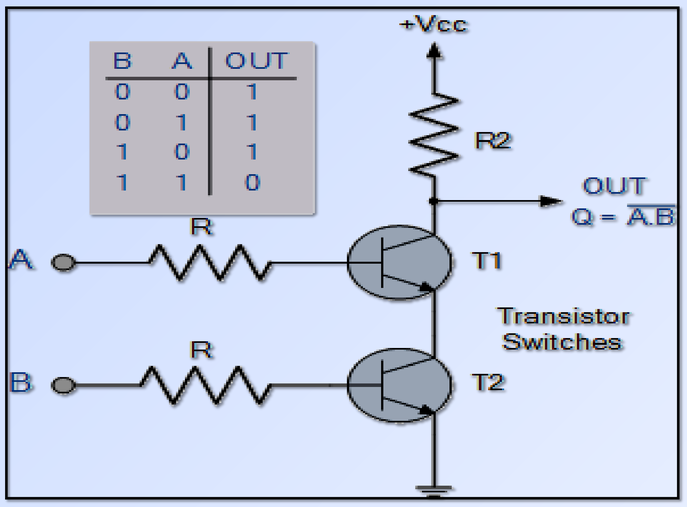


Figure 1. Transistor NAND

The NAND function is the complement of the AND function and the logic symbols have the inversion on the output. The NAND function provides logic 0 on the output only when both inputs are logic 1, and logic 1 output for all other combinations. The logic diagram is in *figure 2*. The Boolean Equation for a NAND gate is:

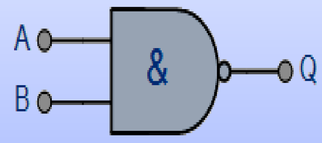
Symbol	Truth Table		
 2-input NAND Gate	**B**	**A**	**Q**
	0	0	1
	0	1	1
	1	0	1
	1	1	0
Boolean Expression Q = A.B	Read as A AND B gives NOT Q		

Figure 2. logic symbols for the OR function

Procedures

1. Connect the circuit as shown in figure 1 in the Prototyping board.
2. Connect the V_{cc} point in figure to 5 V.
3. Connect points A and B to input switches in Prototyping board, and connect OUT to output LED.
4. Change switches 1 and 2 on and off and show the output of LEDS.
5. Record the results in the following table.

Results

Switch 1	Switch 2	LED output
0	0	
1	0	
0	1	
1	1	

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