

In order to create a gate element, one terminal of each diode is connected to V_{cc} (through a pull-up resistor) or ground (through a pulldown resistor). The other terminal is connected to (or controlled by) the logic signal that will either <u>forward bias</u> or <u>reverse bias</u> the diode.

Before exploring these gate elements, we need to go back and review the DIODE and its relationship with **pull-up** and **pull-down resistors**.



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5.3.4 Building AND & OR Gates out of these diode networks

There are other devices making up the arrays which will be discussed later. Now,

let's create the AND gate and the OR gate arrays. These arrays use the Diode-to-

Resistor logic building blocks that have just been discussed.

5.3.4.1 The AND gate



The figure to the right represents a 3 input and gate element.



When ABC = 111, all 3 diodes are open circuited and the output is f(A, B, C) = 1 through the pull-up resistor.

If any combination of inputs is equal to zero, it's diode will be forward-biased and will act like a short circuit, pulling the output down to f(A, B, C)= 0.



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= 1



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5.3.5 A Two Level 'AND-OR' ARRAY Example

We can now connect these two gate types together to form a switching function.

1st, we form a **2 level sum of products (SOP)** switching function:

$f(A,B,C) = AB\overline{C} + \overline{B}C$

The designer can implement this switching function with a combination of AND & OR

gates to create a GATE ARRAY as shown in the figure below.

The Multisim simulation of this gate array is follows on the next page.

