

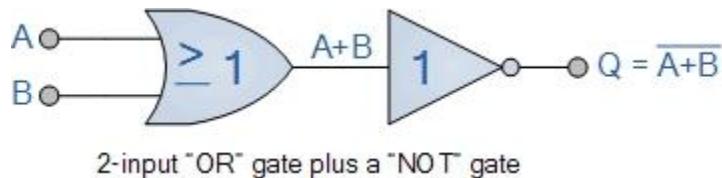


Logic NOR Gate Tutorial

The Logic NOR Gate gate is a combination of the digital logic OR gate and an inverter or NOT gate connected together in series

The inclusive NOR (Not-OR) gate has an output that is normally at logic level "1" and only goes "LOW" to logic level "0" when **ANY** of its inputs are at logic level "1". The **Logic NOR Gate** is the reverse or "*Complementary*" form of the inclusive OR gate we have seen previously.

Logic NOR Gate Equivalent



The logic or Boolean expression given for a logic NOR gate is that for *Logical Multiplication* which it performs on the *complements* of the inputs. The Boolean expression for a logic NOR gate is denoted by a plus sign, (+) with a line or *Overline*, ($\overline{\quad}$) over the expression to signify the NOT or logical negation of the NOR gate giving us the Boolean expression of: $A+B = Q$.

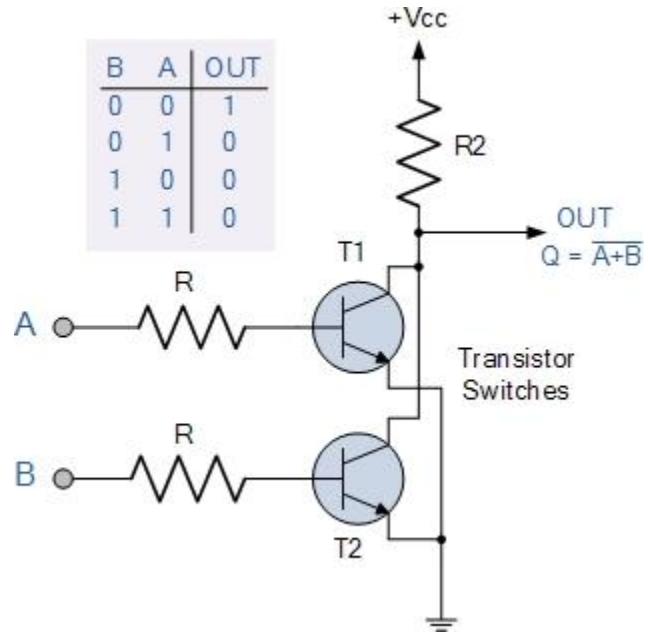
Then we can define the operation of a 2-input digital logic NOR gate as being:

"If both A and B are NOT true, then Q is true"

Transistor NOR Gate

A simple 2-input logic NOR gate can be constructed using RTL Resistor-transistor switches connected together as shown below with

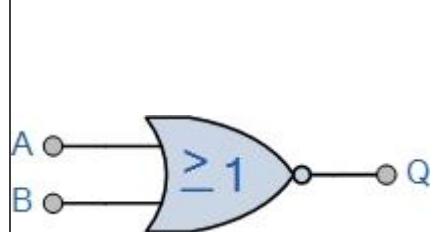
the inputs connected directly to the transistor bases. Both transistors must be cut-off “OFF” for an output at Q.



Logic NOR Gates are available using digital circuits to produce the desired logical function and is given a symbol whose shape is that of a standard OR gate with a circle, sometimes called an “inversion bubble” at its output to represent the NOT gate symbol with the logical operation of the NOR gate given as.

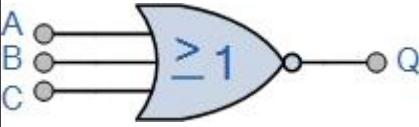
The Digital Logic “NOR” Gate

2-input NOR Gate

Symbol	Truth Table												
 2-input NOR Gate	<table border="1"> <thead> <tr> <th>B</th><th>A</th><th>Q</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td></tr> </tbody> </table>	B	A	Q	0	0	1	0	1	0	1	0	0
B	A	Q											
0	0	1											
0	1	0											
1	0	0											

	1	1	0
Boolean Expression $Q = A+B$	Read as A OR B gives NOT Q		

3-input NOR Gate

Symbol	Truth Table
	
3-input NOR Gate	
Boolean Expression $Q = A+B+C$	Read as A OR B OR C gives NOT Q

As with the OR function, the NOR function can also have any number of individual inputs and commercial available NOR Gate IC's are available in standard 2, 3, or 4 input types. If additional inputs are required, then the standard NOR gates can be cascaded together to provide more inputs for example.