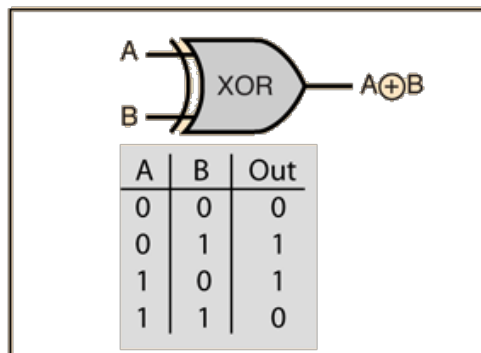# Exclusive OR Gate

The output is high when either of inputs A or B is high, but not if both A and B are high.

[How do you make one?](#)

[IC Example: IC 7486](#)

[Basic Gates](#)

Index
Reference:

[Tocci, Sec 4-6](#)

[Electronics concepts](#)

[Digital Circuits](#)

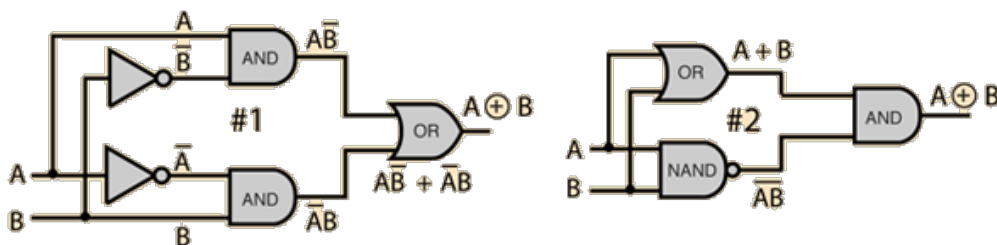[HyperPhysics](#)*****[Electricity and magnetism](#)   *R Nave*

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Exclusive OR Gate

Logically, the [exclusive OR (XOR)](#) operation can be seen as either of the following operations:

1. $A \oplus B = A\overline{B} + B\overline{A}$ A AND NOT B OR B AND NOT A

2. $A \oplus B = (A + B)(\overline{AB})$ A OR B AND NOT A AND B

which can be implemented by the gate arrangements shown. They can also be implemented using [NAND](#) gates only.

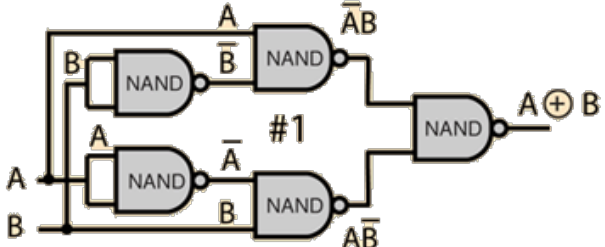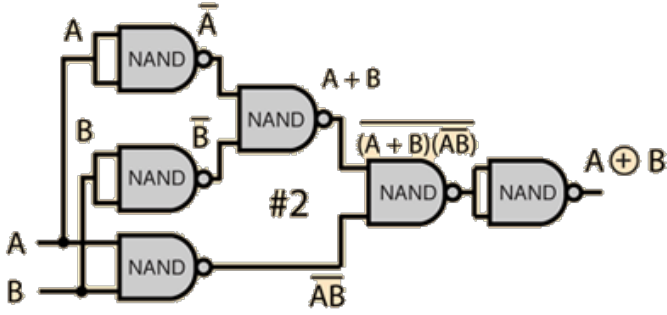Index
Reference:

[Horowitz & Hill, Sec 8-12](#)

[Electronics concepts](#)

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Exclusive OR with NAND

The implementation of the exclusive OR (XOR) operation with just NAND gates illustrates the function of NANDs as universal gates.

1. $A \oplus B = A\overline{B} + B\overline{A}$

A AND NOT B OR B AND NOT A

2. $A \oplus B = (A + B)(\overline{AB})$

A OR B AND NOT A AND B

DeMorgan's Theorem

Basic Gates

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IC 7486 Exclusive-OR

This is an example of convenient packaging of XOR gates in

integrated circuit form.

IC 7486

14 13 12 11 10 9 8

XOR   XOR

XOR   XOR

1   2   3   4   5   6   7
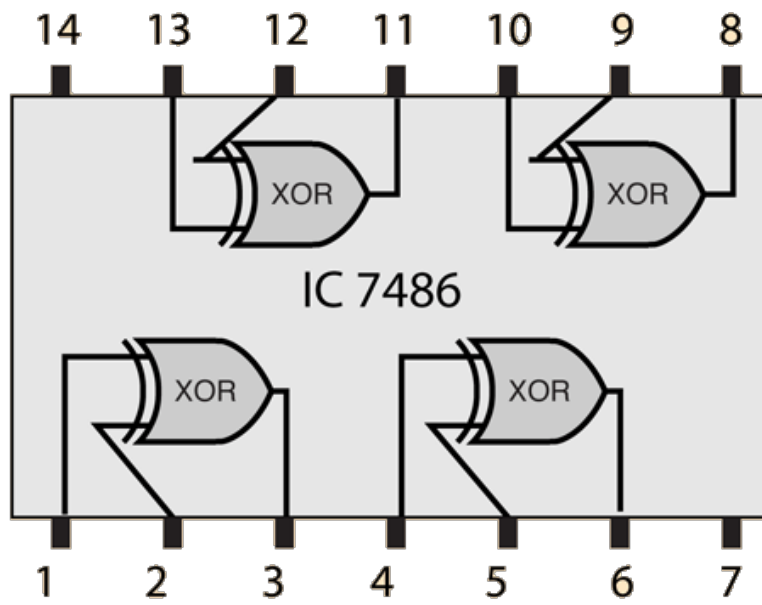
Basic Gates IC Logic Circuits

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