The Ideal Diode Circuit Analysis Guide

Follow these easy steps to successfully analyze a circuit containing one or more **ideal** diodes !

Step 1: *ASSUME* a bias state for each ideal diode.

⇨ In other words, **GUESS** !!

Either,

a) *ASSUME* an **ideal** diode is **forward biased**, or

b) *ASSUME* it is **reversed biased**.

Step 2: *ENFORCE* the **equality** condition consistent with your assumption.

a) If you assume an ideal diode is **f.b.**, then *ENFORCE* the equality:

$$v_D^i = 0$$

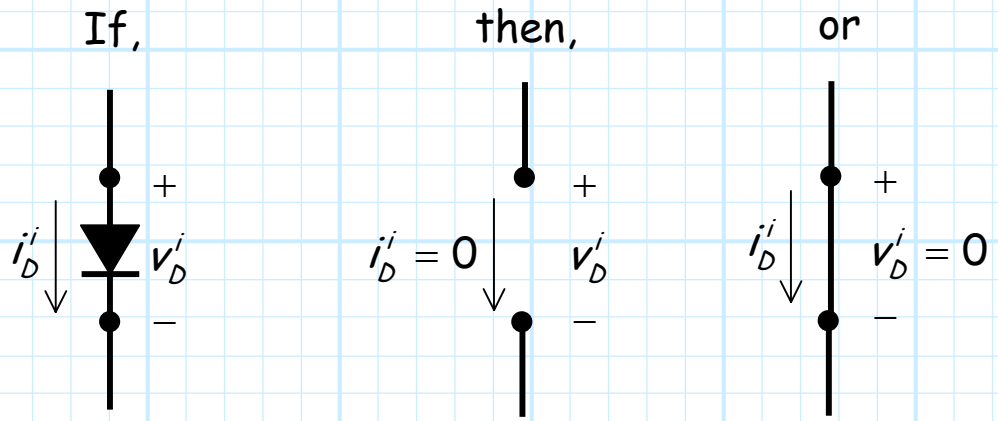
HOW ? ⇨ By replacing the **ideal** diode with a **short** circuit!

b) If you assumed an ideal diode was **r.b.**, then *ENFORCE* the condition that:

$$i_D^i = 0$$

HOW ? ⇨ By replacing the ideal diode with an **open** circuit.

IMPORTANT !!! Retain the **same** current and voltage definitions when you replace the ideal diode!



Step 3: *ANALYZE* the circuit.

After the all **ideal** diodes have been replaced with either shorts or opens:

a) Determine **all** desired (required) circuit values.

b) Determine i_D^i through each **short** circuit and v_D^i across each **open** circuit.

Step 4: *CHECK* the **inequality** consistent with your assumption to see **if** this assumption is correct.

HOW ??

a) An **ideal** diode cannot have negative current flowing through it. If you ASSUMED the ideal diode was **forward biased**, *CHECK* to see if the **short** circuit current is positive, i.e.:

$$i_D^i > 0$$

If true, you *ASSUMED* correctly ! If **not**, your **f.b.** assumption is wrong.

b) An **ideal** diode cannot have positive voltage across it. If you ASSUMED the ideal diode was **reversed biased**, *CHECK* to see if the **open** circuit voltage is negative, i.e.:

$$v_D^i < 0$$

If true, you *ASSUMED* correctly ! If **not**, your **r.b.** assumption is wrong.

Step 5: If you ASSUMED incorrectly, then change your assumptions and return to step 1 !

Notes on ideal diode circuit analysis:

1) You **must** check all assumptions in this form:

$$i_D^i = 2\ mA > 0\ \checkmark \quad \text{or} \quad v_D^i = 2.2 > 0\ X$$

2) Do **not** check the condition that you enforced !

3) For **every** circuit, one and only one assumption will be valid.