

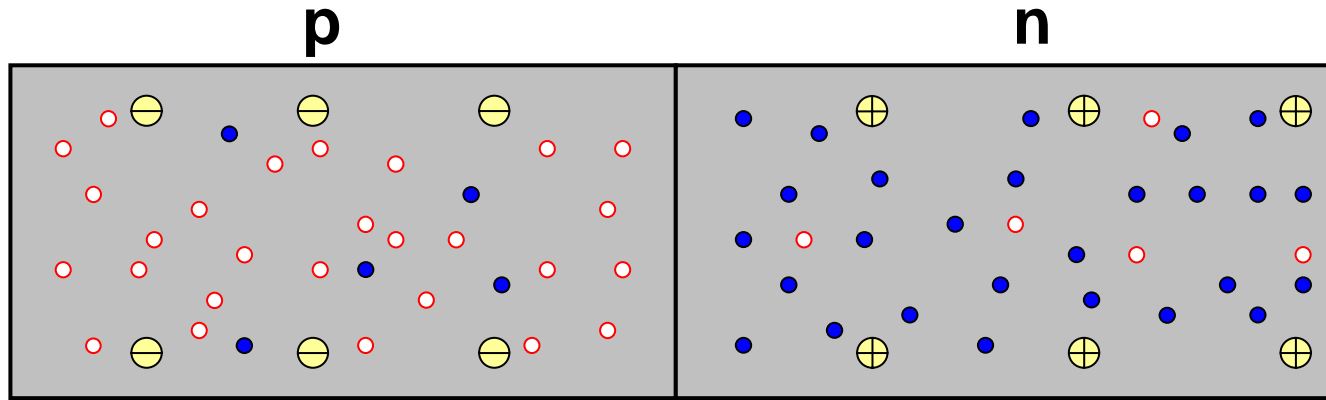
pn JUNCTION

author: Teacher Engineer NICA MADALINA

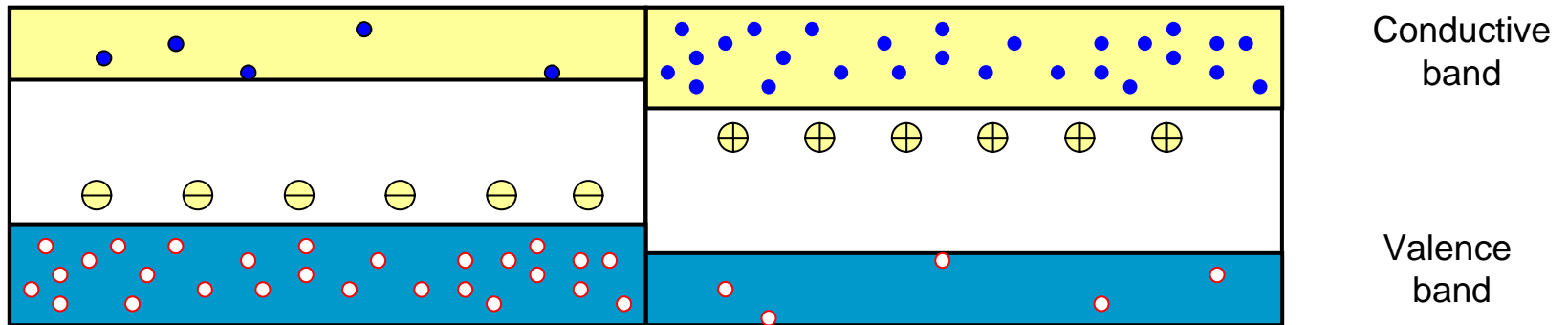
“Costin Nenitescu” Highschool for Chemistry, Romania

Translated by Catalina Rinescu and Adriana Gaspar, english teachers

Nonpolarized pn junction



Power Diagram



Region	p	n
Majority carriers	voids	electrons
Minority carriers	electrons	voids
Impurities atoms	Receiver atoms	Donor atoms

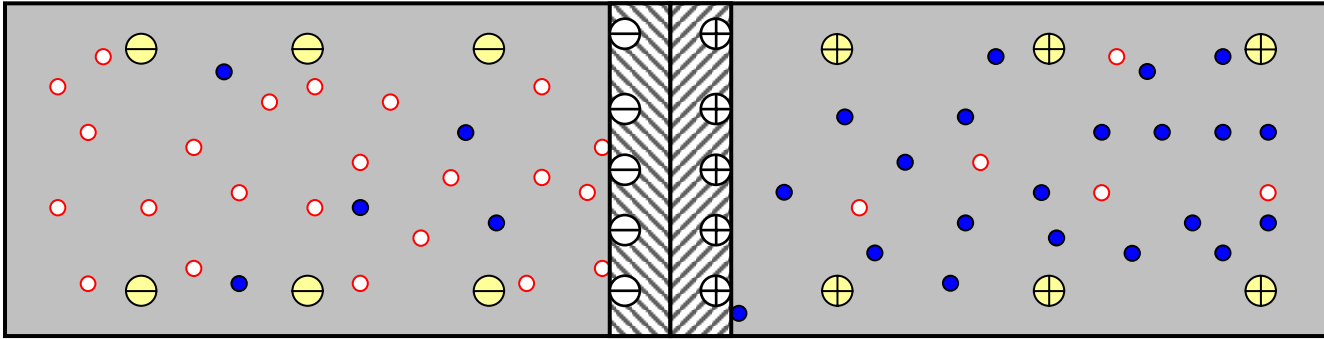
LEGENDUM

- void
- electron
- ⊖ Receiver atom negatively ionized
- ⊕ Donor atom positively ionized

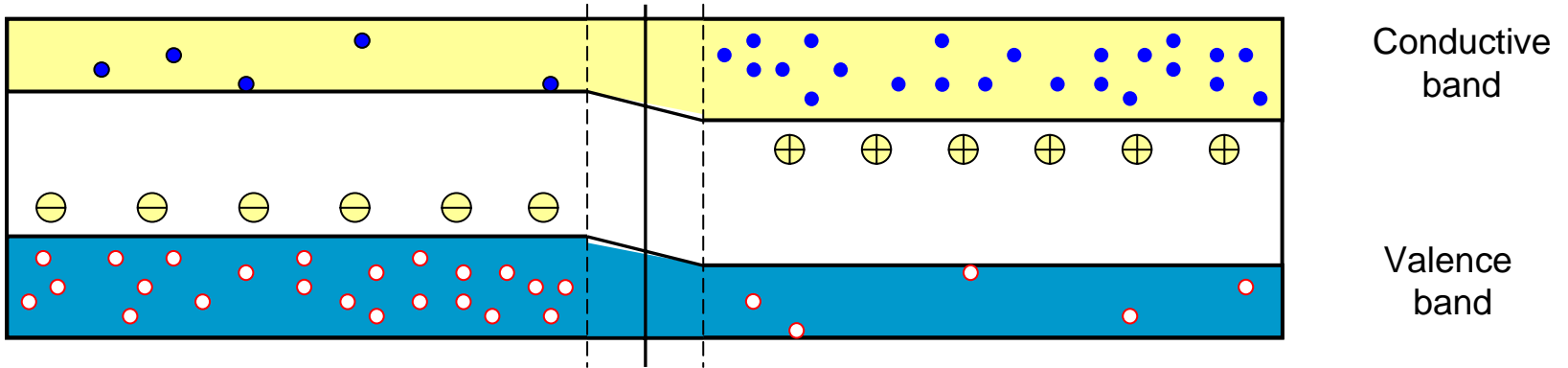
Nonpolarized pn junction

p

n



Power Diagram

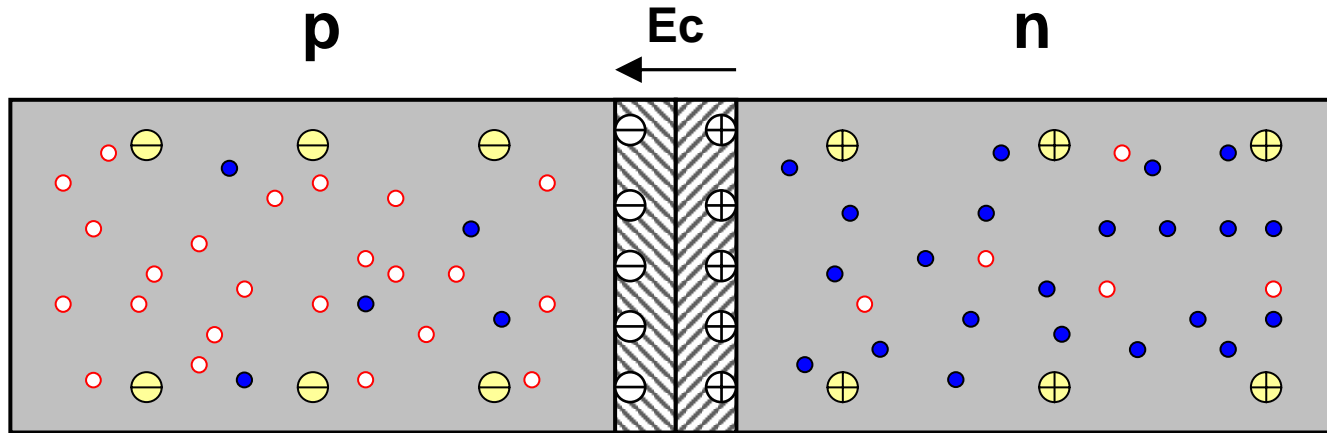


LEGENDUM

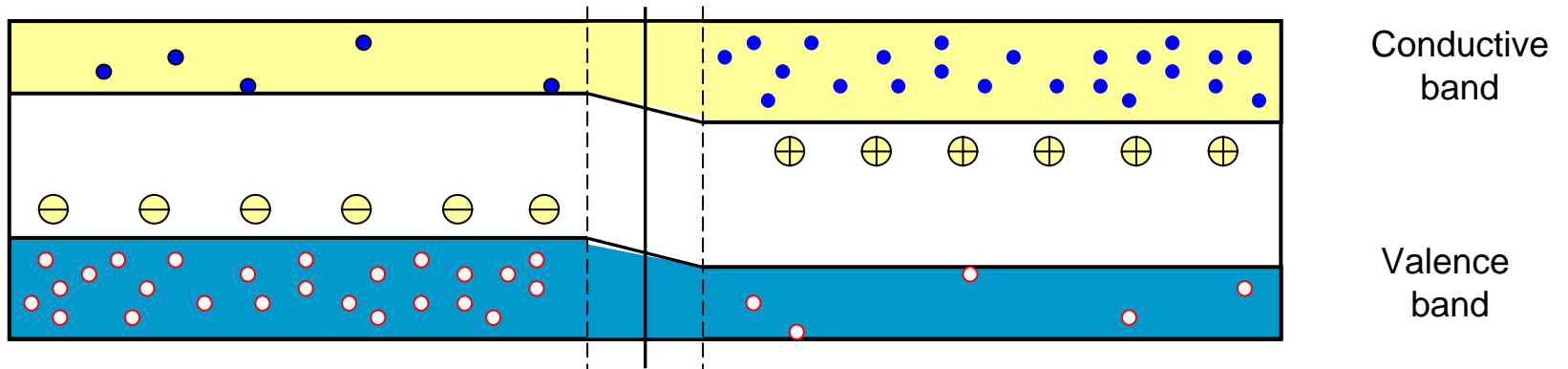
- void
- electron
- ⊖ Ionized receiver atom
- ⊕ Ionized donor atom

Region	p	n
Majority carriers	voids	electrons
Minority carriers	electrons	voids
Impurities atoms	Receiver atoms	Donor atoms

Nonpolarized pn junction



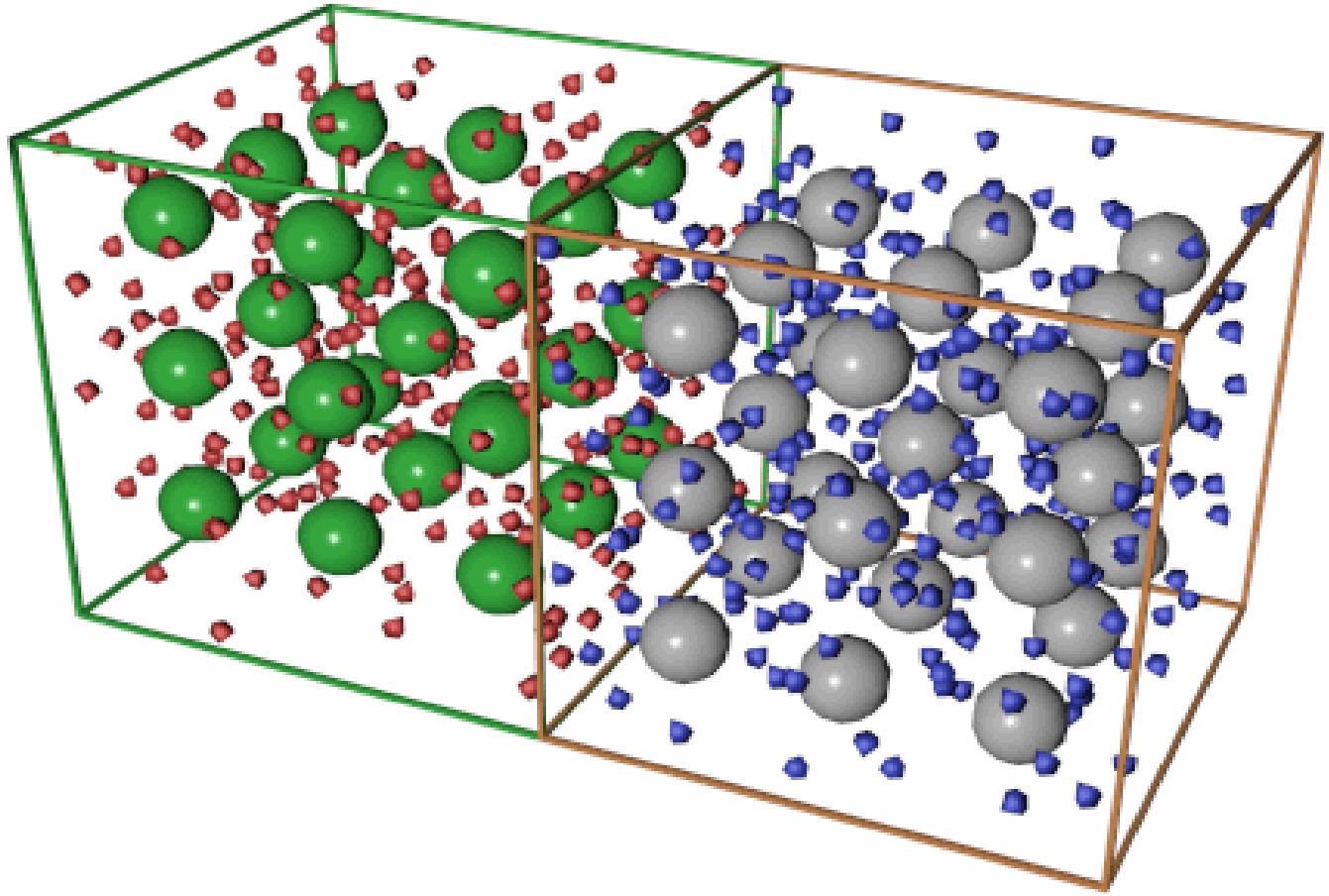
Power Diagram



Region	p	n
Majority carriers	voids	electrons
Minority carriers	electrons	voids
Impurities atoms	Receiver atoms	Donor atoms

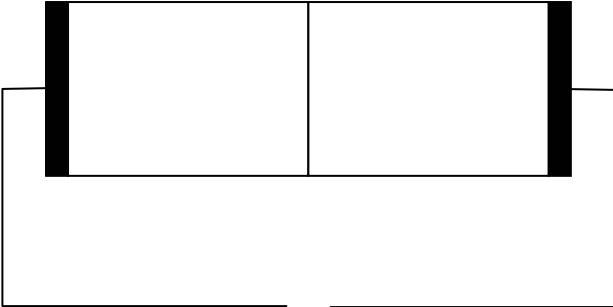
LEGENDUM

- void
- electron
- ⊖ Ionized receiver atom
- ⊕ Ionized donor atom

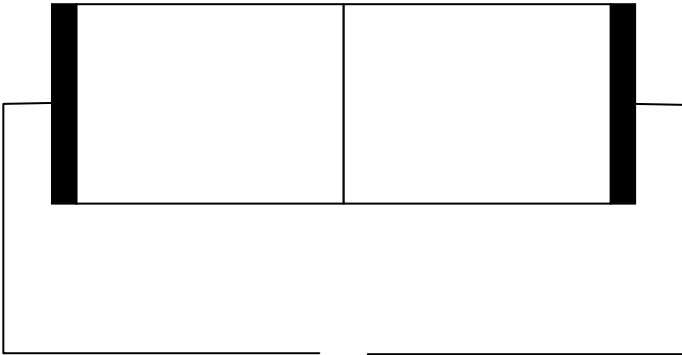


WORK SHEET
Polarized pn junction

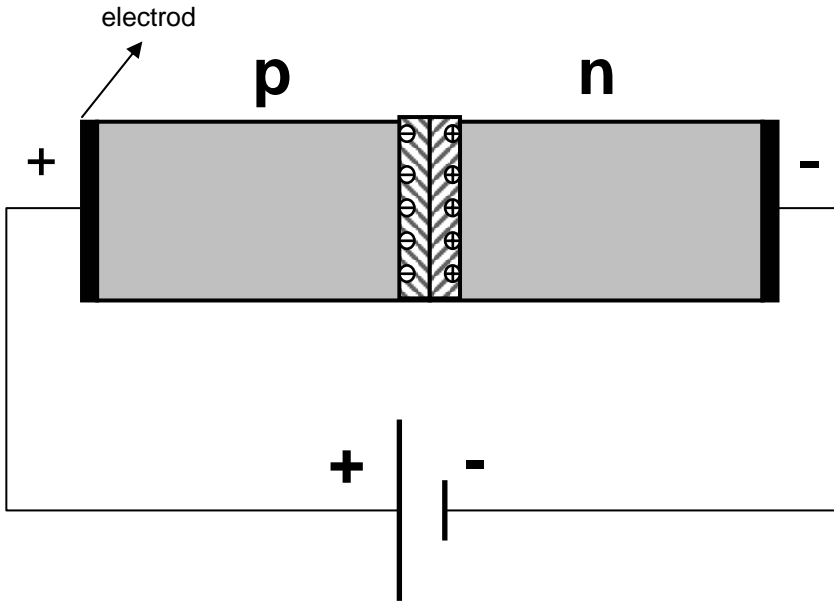
Polarized pn junction



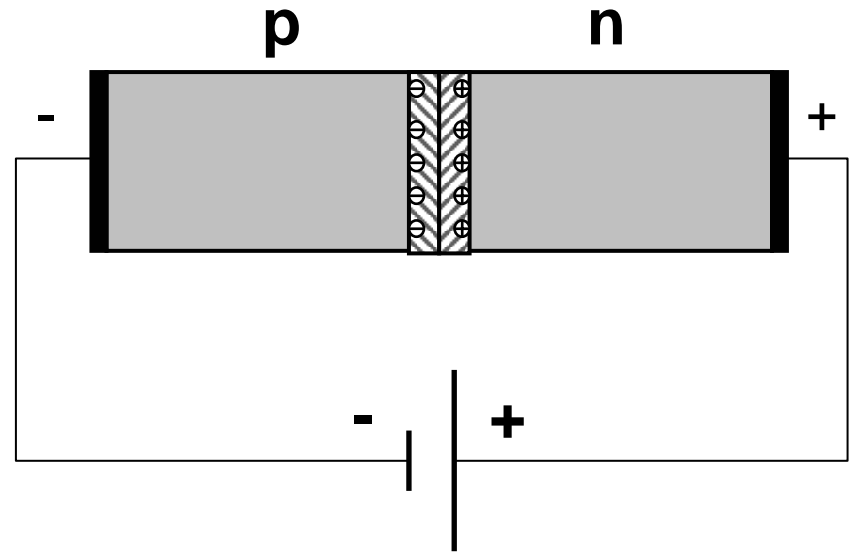
Polarized pn junction



Polarized pn junction



direct polarization

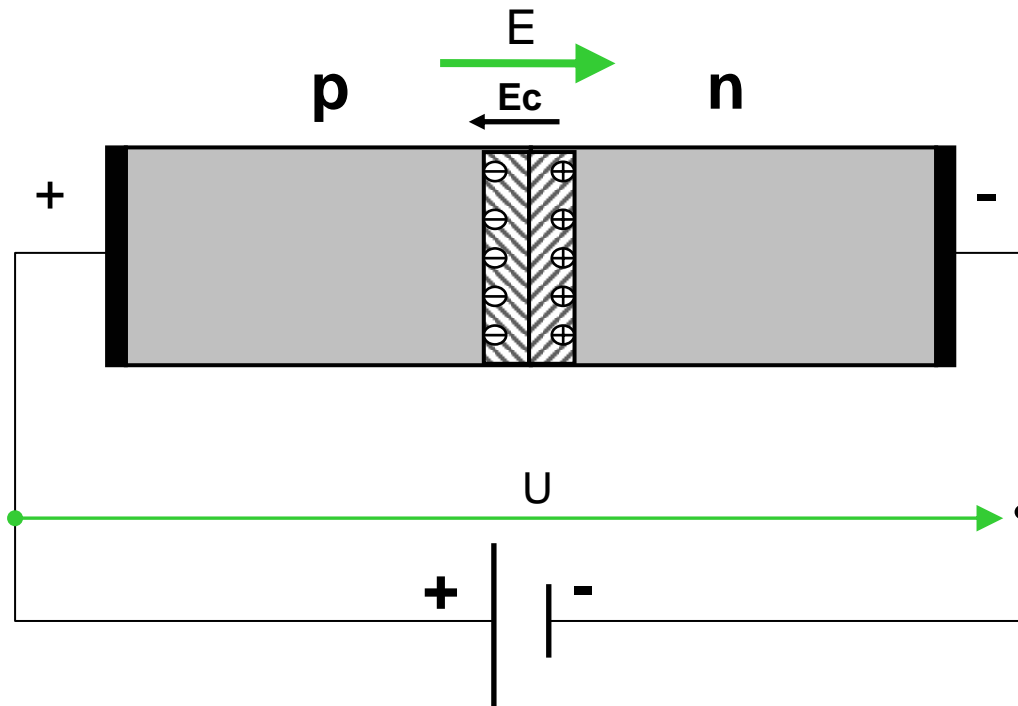


reverse polarization

a) Direct polarized pn junction

It is obtained by connecting:

- the plus clamp of the source to region p
- the minus clamp of the source to region n



The applied tension creates the electrical field E , oriented from region p (+ of the source) to region n (– of the source).

This has the direction reverse to the contact field E_c , which is oriented from region n (positive space electric charges) to region p (negative space electric charges).

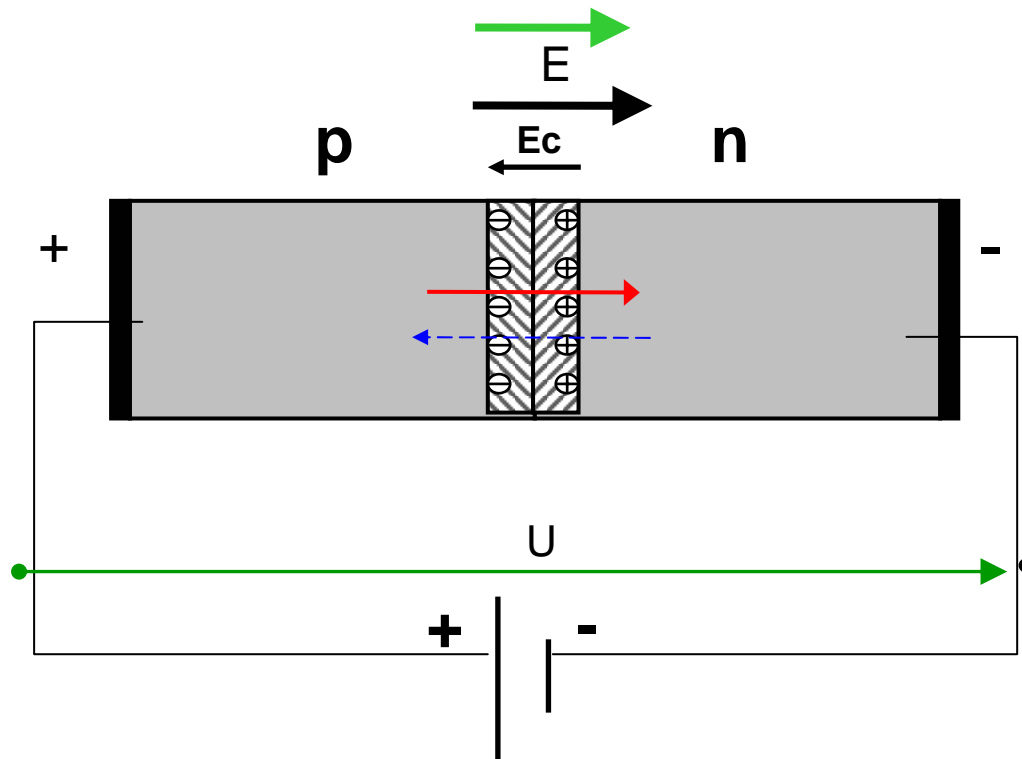
a) Directly polarized pn junction

As a result of the fact that the applied field of E intensity has a value bigger than the contact field of E_c intensity, the movement of electric charge carriers is determined by a resulting field, which has the intensity, in absolute value, equal to the difference between the intensities of the two fields:

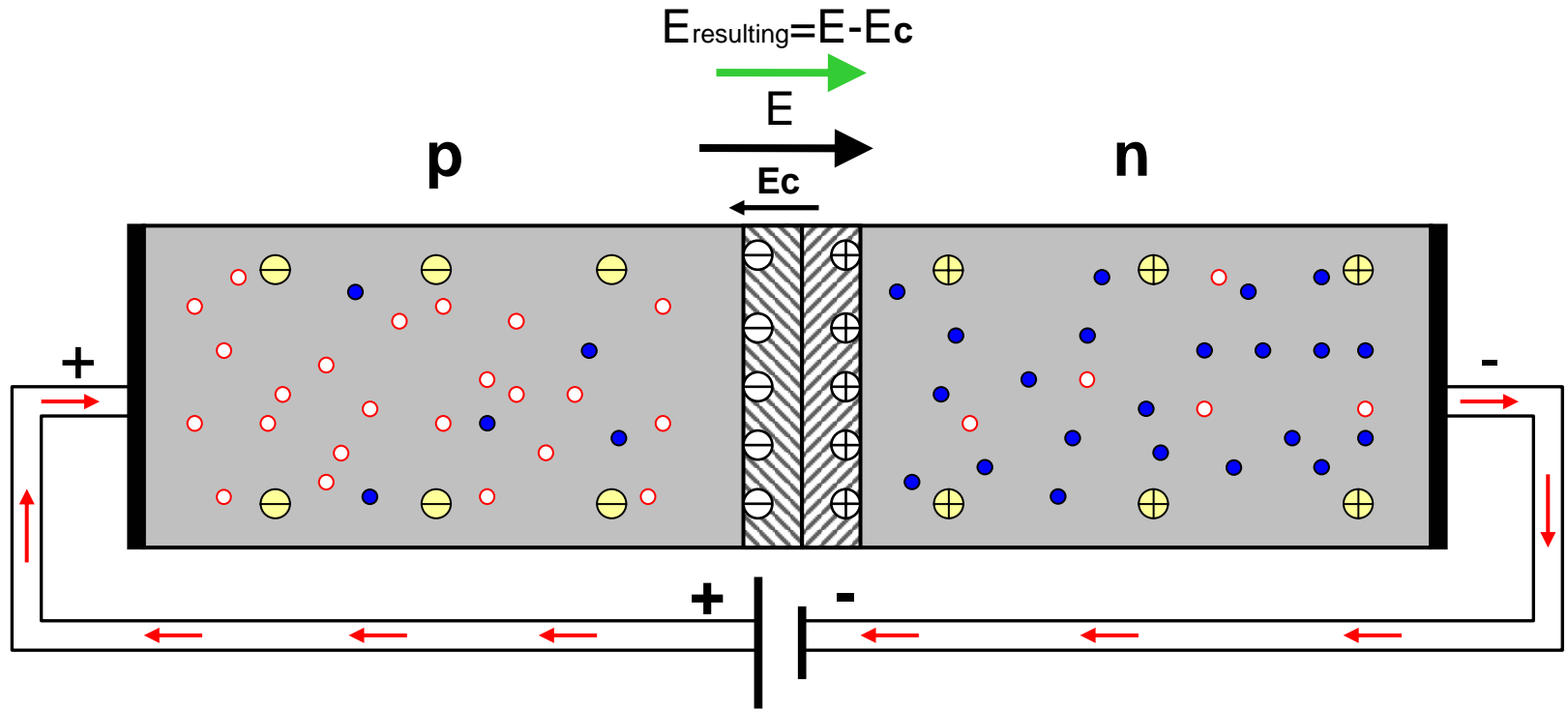
$$E_{\text{resulting}} = E - E_c$$

The result is:

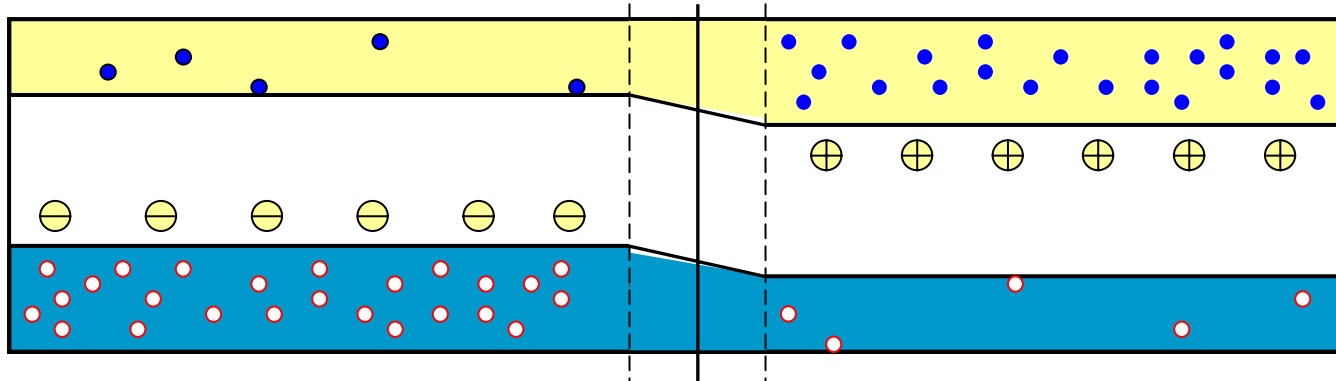
- **the voids** in region p (attracted to the $-$ of the source) move from region p to region n
- **the electrons** in region n (attracted to the $+$ of the source) move from region n to region p



a) Directly polarized pn junction

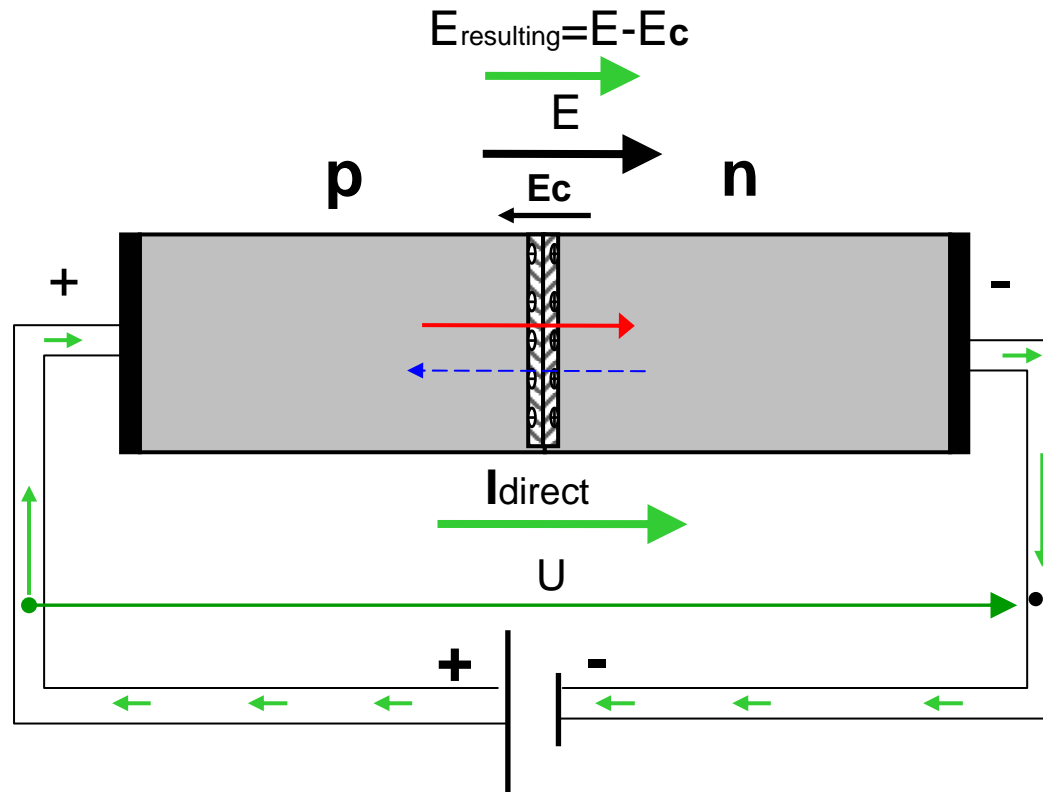


Power diagram



a) Directly polarized pn junction

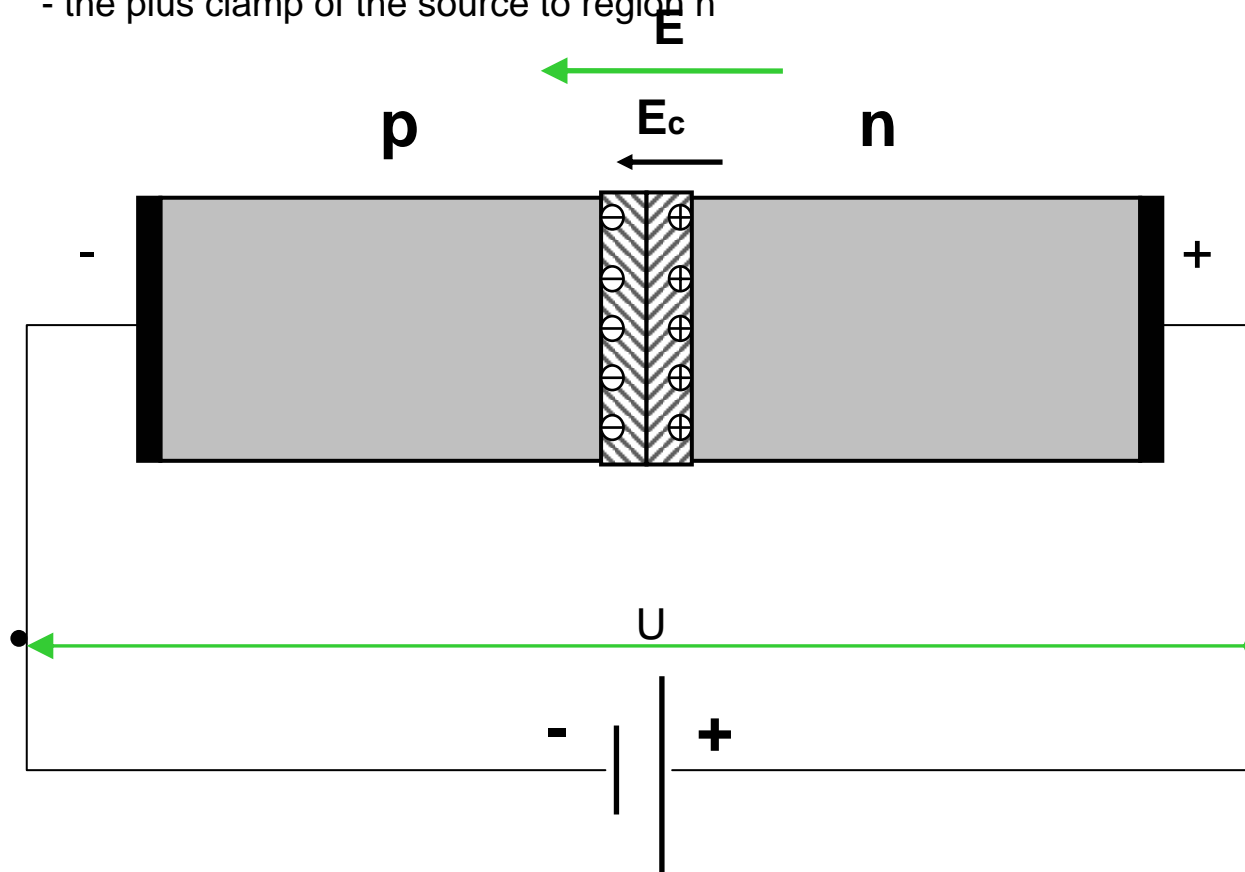
Through the directly polarized pn junction it appears an electric power which has the direction from region p to region n and which is called direct power. **I direct**



b) Reverse polarized pn junction

It is obtained by connecting:

- the minus clamp of the source to region p
- the plus clamp of the source to region n



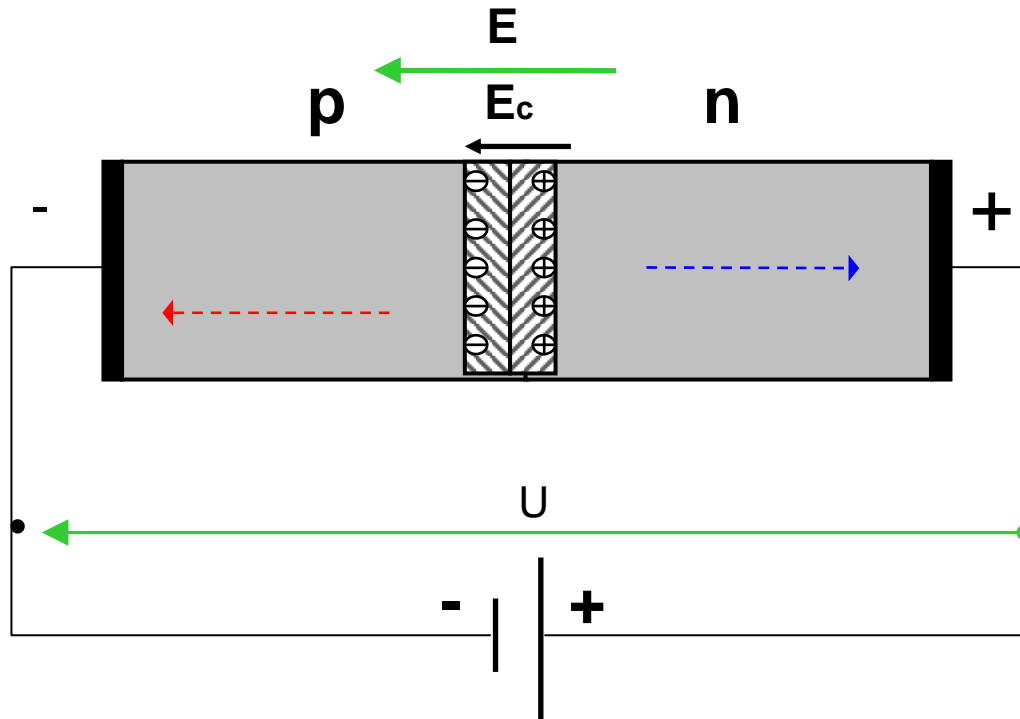
The applied tension creates an electric field E , oriented from region n (+ of source) to region p (-of source)

This has the same direction as the contact field E_c , fortifying its action.

b) Reverse polarized pn junction

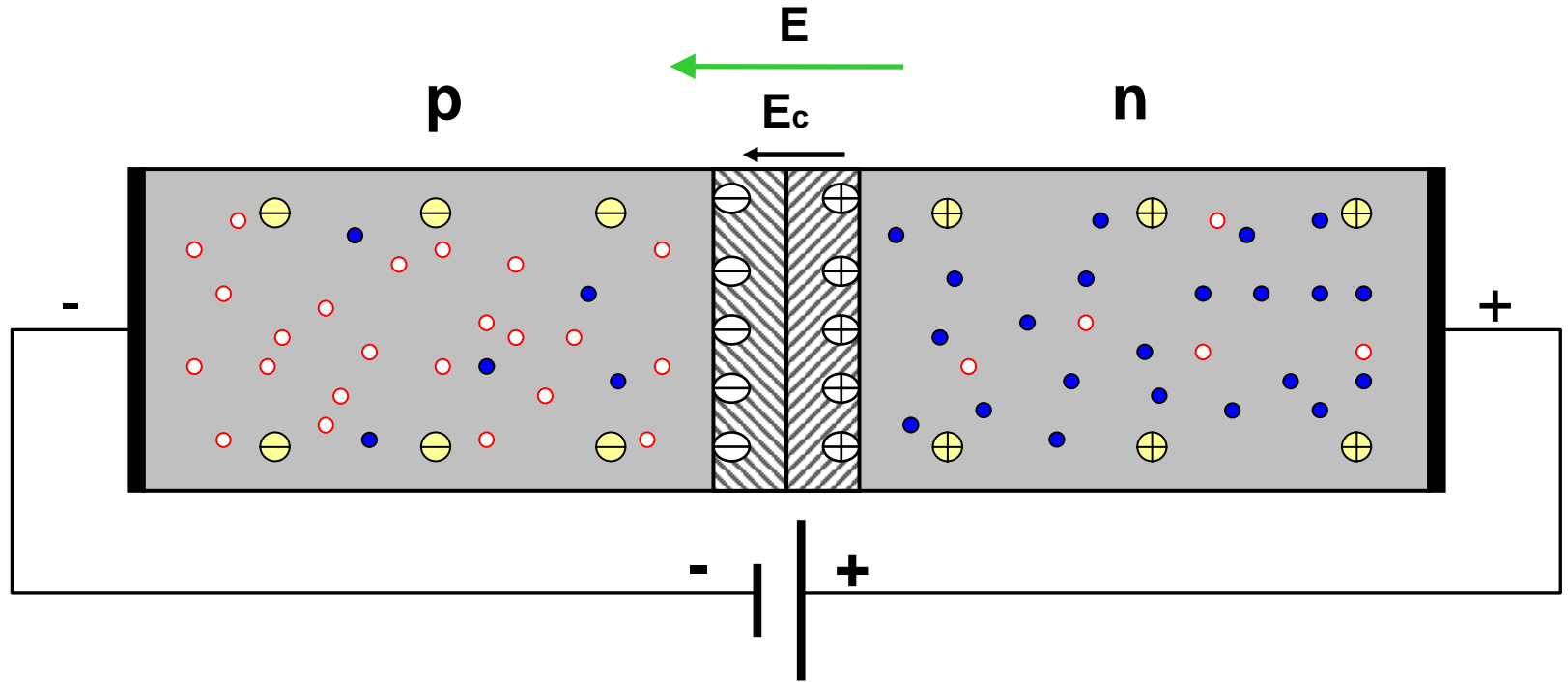
The result is:

- the voids in region p, attracted to the - of source, removes from the junction
- the electrons in region n, attracted to the + of source, removes from the junction

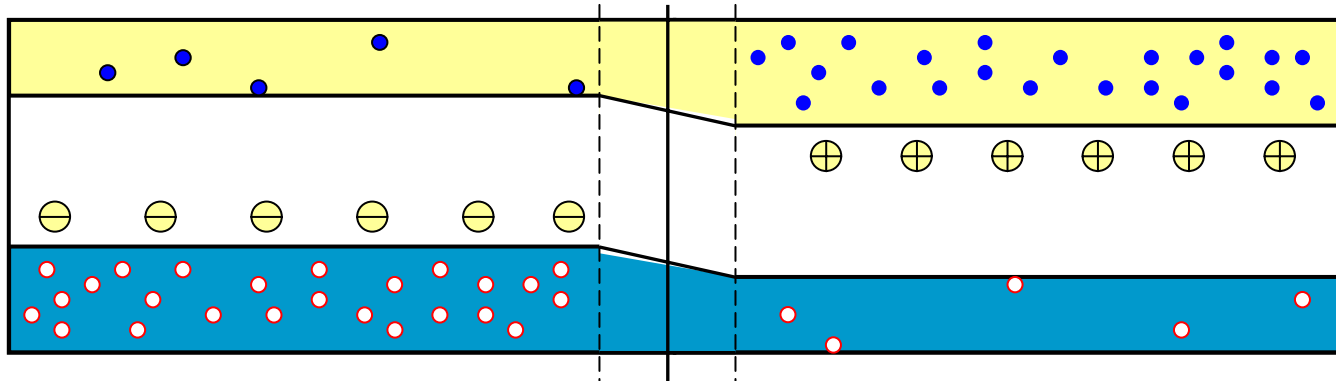


Both on the left and on the right sides of the junction it will appear a region low in electric charge carriers, which is called **blocking layer**.

a) Reverse polarized pn junction



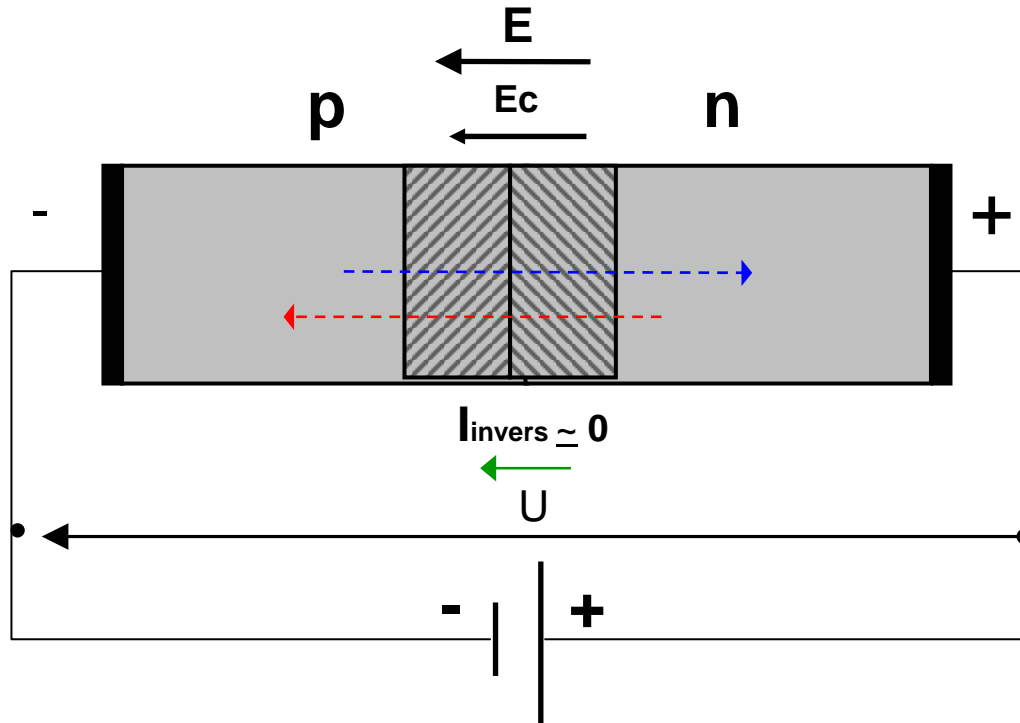
Power diagram



b) Reverse polarized pn junction

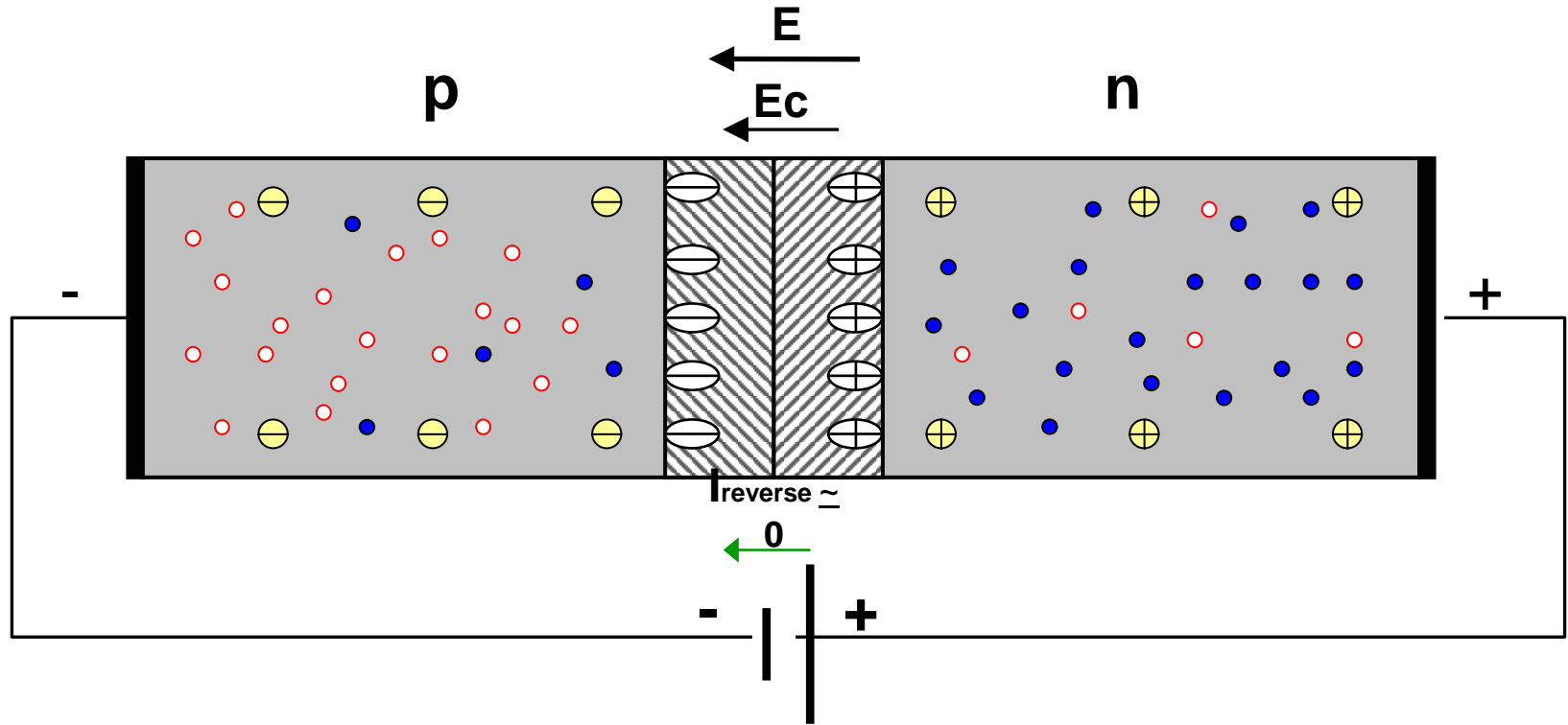
Majority carriers (electrons) in region p, attracted to +of source, move to region n

Minority carriers (voids) in region n, attracted to –of source, move to region p

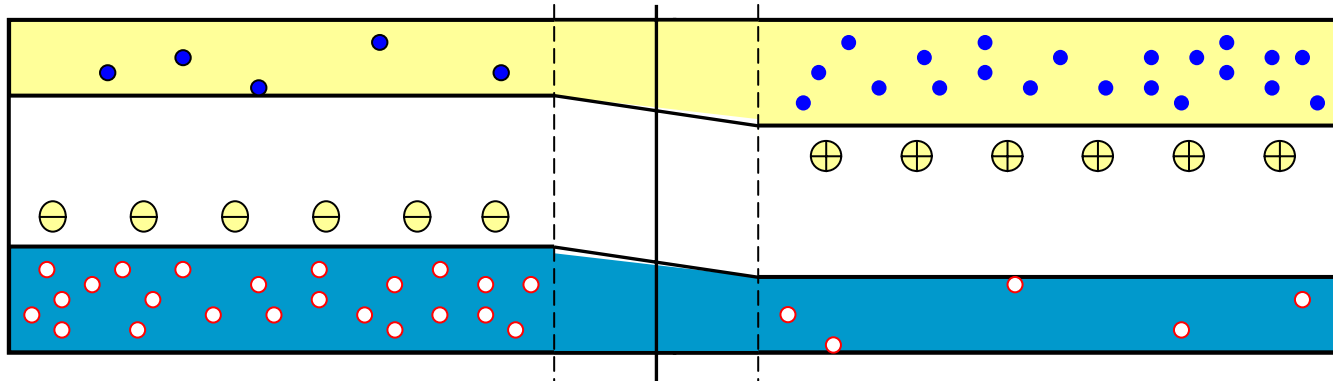


In the circuit it appears a very low electric power because of minority carriers, called **current reverse**, which is directed from **n** to **p**.

a) Reverse polarized pn junction



Power diagram



Conclusion:

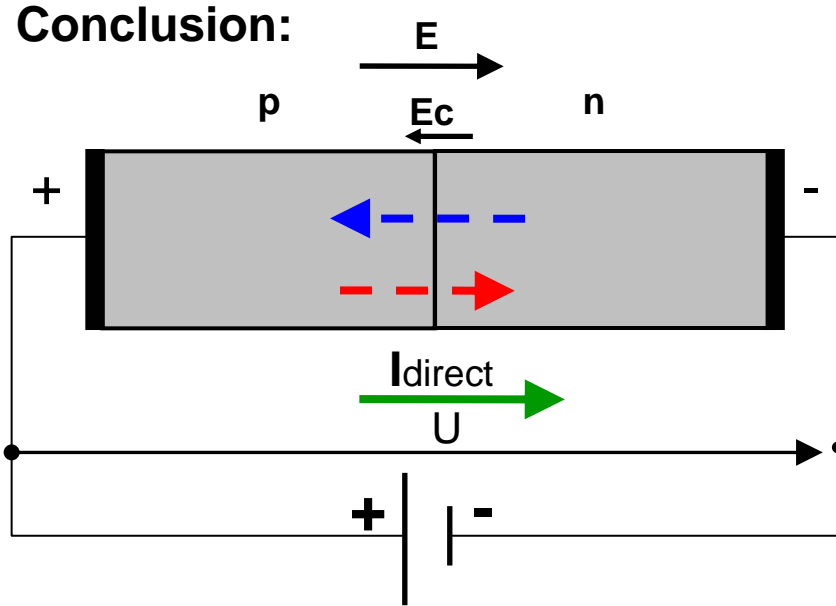


Fig. II.a
Direct polarization

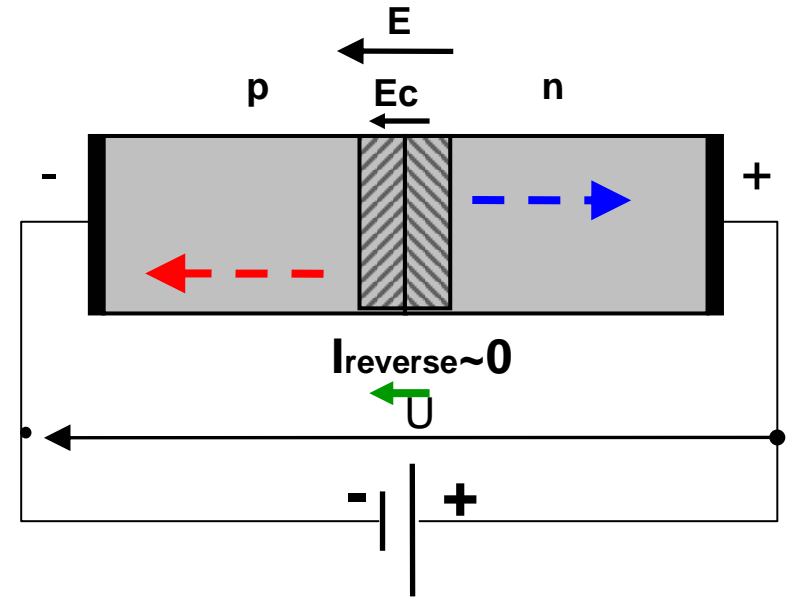
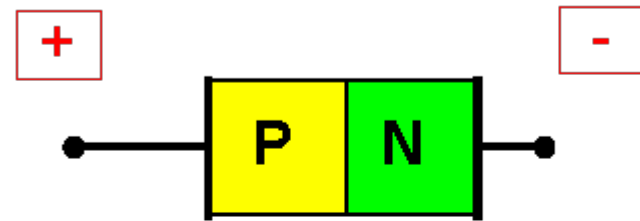
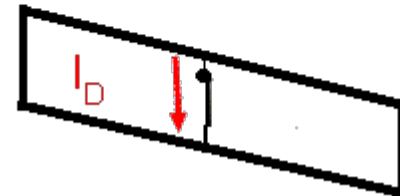


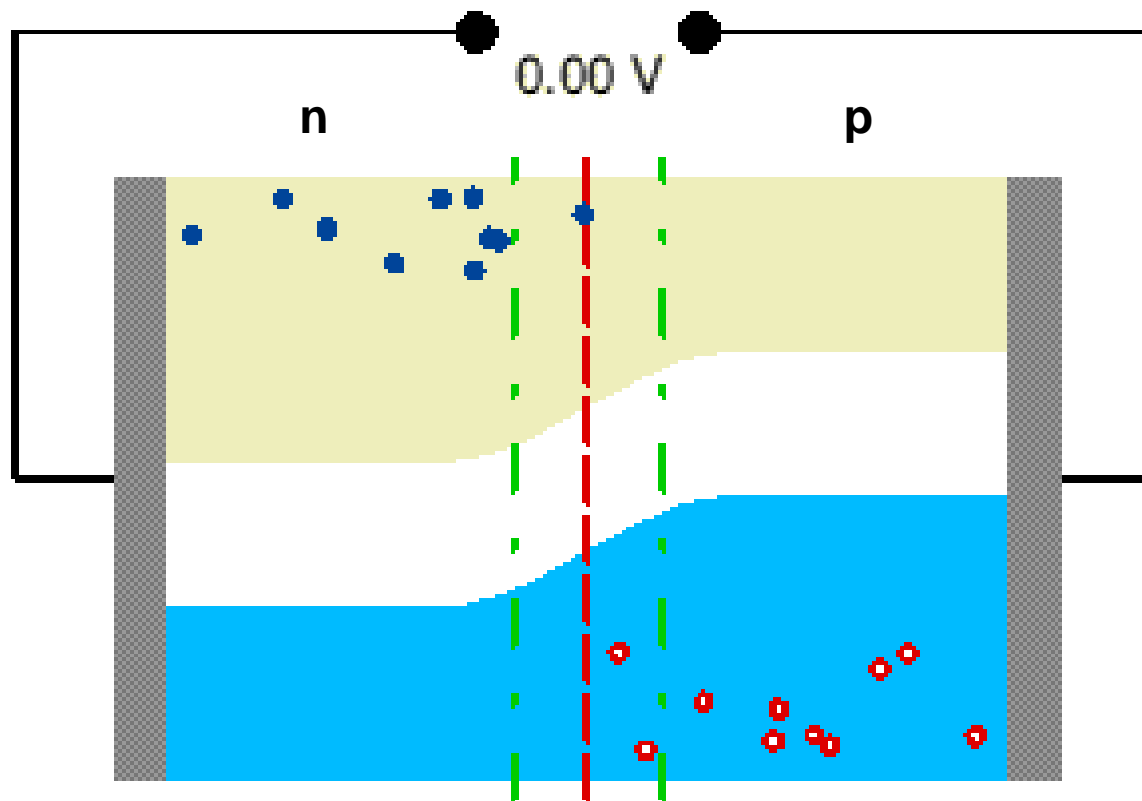
Fig. II b
Reverse polarization

The pn junction works as an electrical contact with no mechanical elements.



Jonctiunea polarizata direct





La contactul dintre un semiconductor de tip P si un semiconductor de tip N se creaza in zona jonctiunii o zona de trecere care actioneaza ca o bariera, impiedicand trecerea purtatorilor de sarcina