Ce qui sera étudié

ANALOGIQUE

Le courant continu
Le volt
L'ampere
L'ohm
Le watt
Les résistances
Les diodes
Les condensateurs
Les transistors
L ampli opérationnel
Les circuits intégrés

Le courant alternatif

Le transformateur
Les relais
Les moteurs
Les hauts parleurs
Les générateurs de signaux(oscillateurs)
Les inducteurs
Les selfs
Les circuits LC, RC, RLC
Les filtres PH, PB
Les antennes

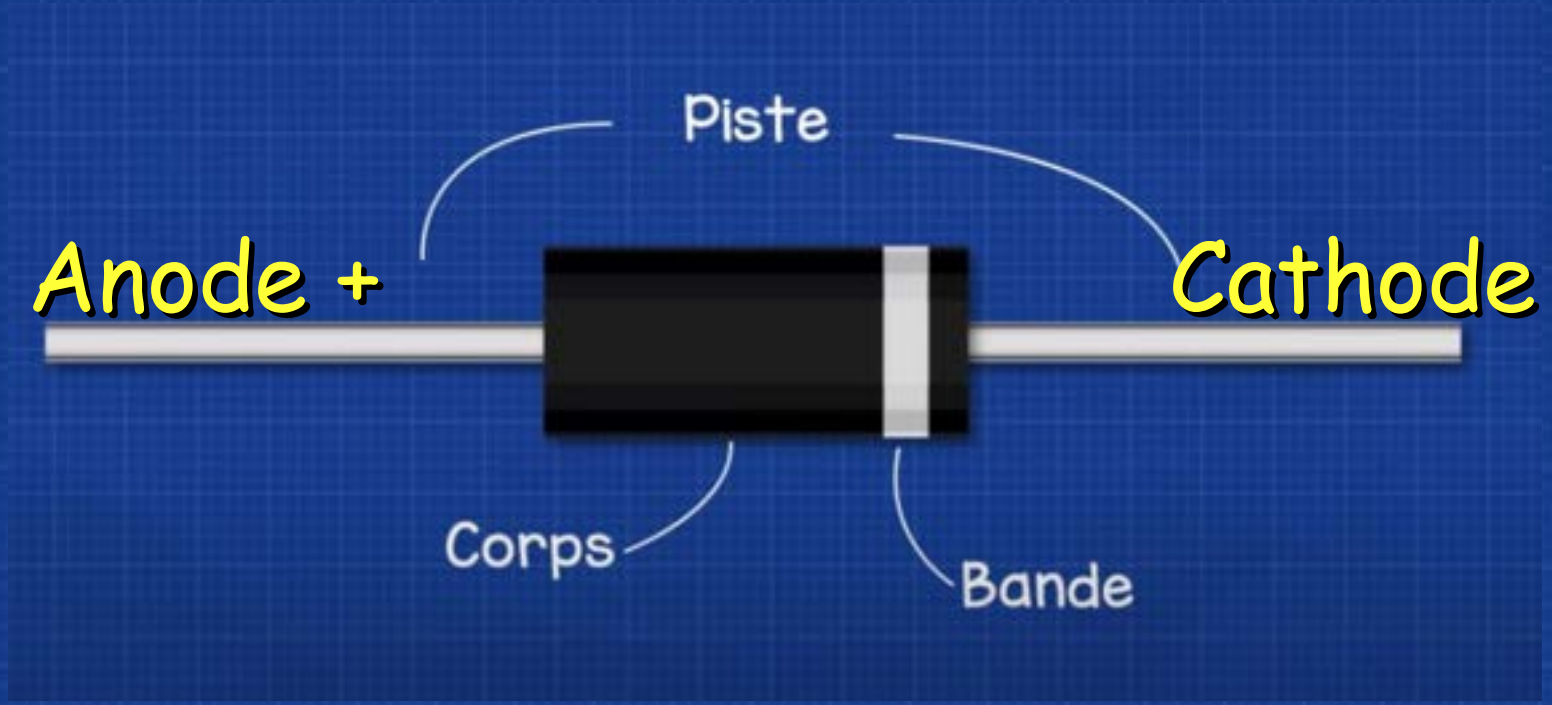
NUMERIQUES

Binaire,octal, hexa,ascii
Les portes et, ou, nand, nor
La logique combinatoire
L'unité arithmétique et logiques
Les memoires
Les registres
Les processeurs
Les micro controleurs

On comprend – On réalise – On expérimente

LES DIODES

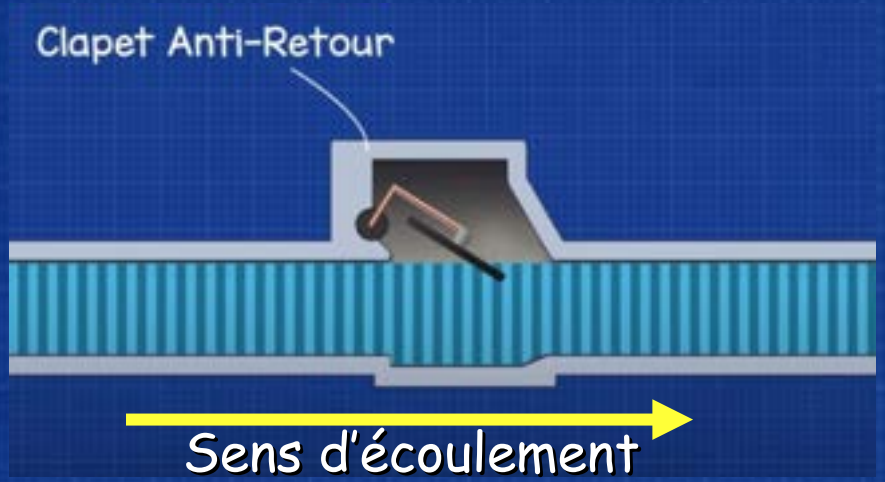
La DIODE est un semi-conducteur

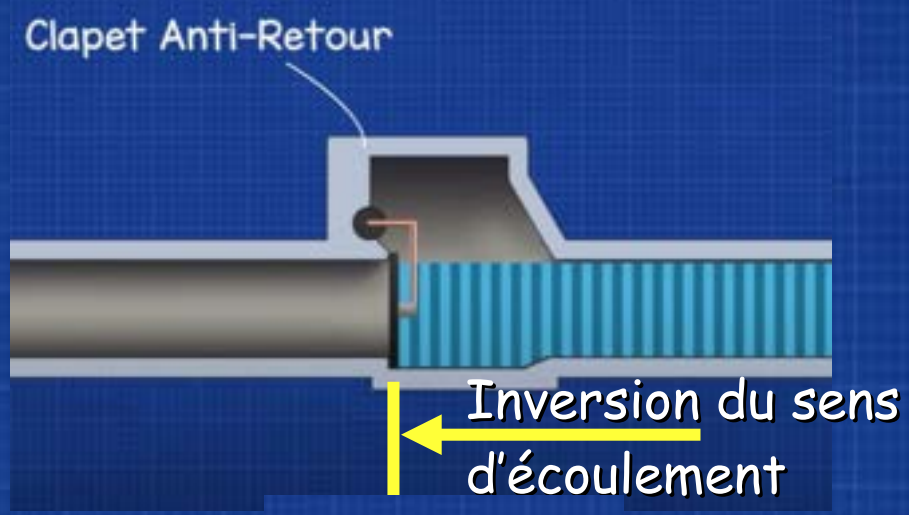


Schottky, Laser, Photodiode, Gunn, PIN, effet tunnel,.....

LES DIODES

Principe



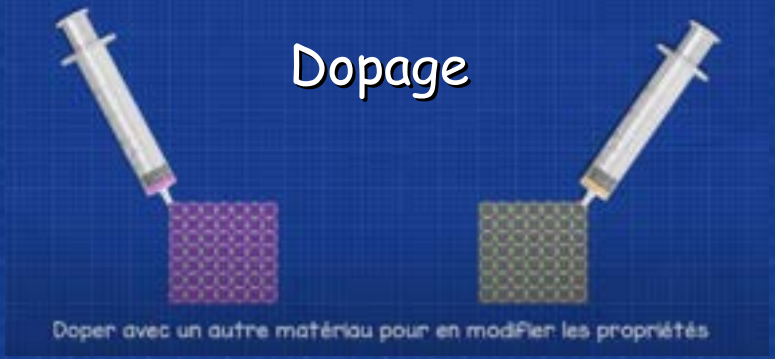


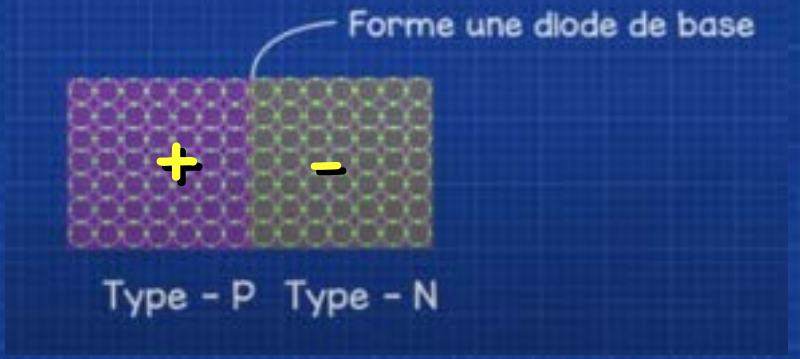
Diode passante

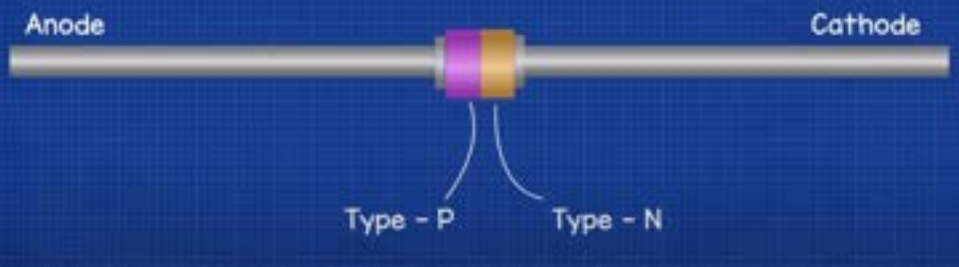
Diode bloquée

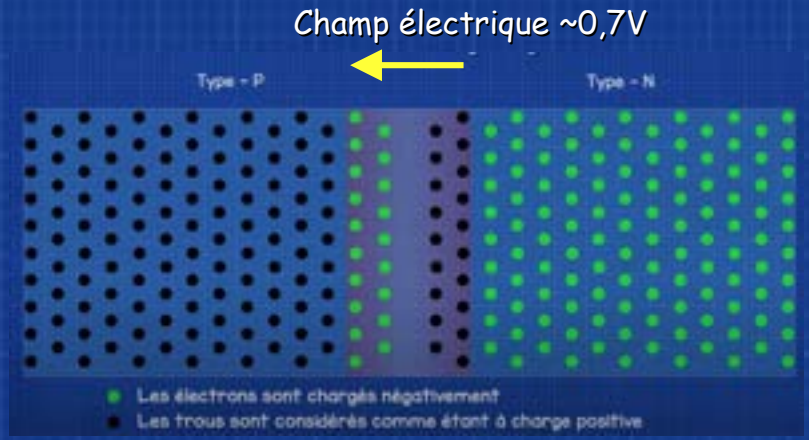
LES DIODES

Conception



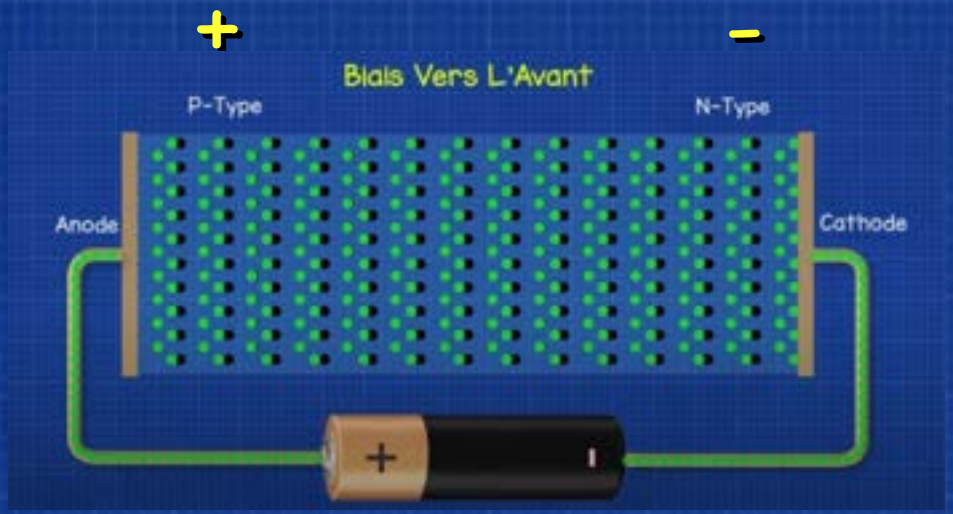






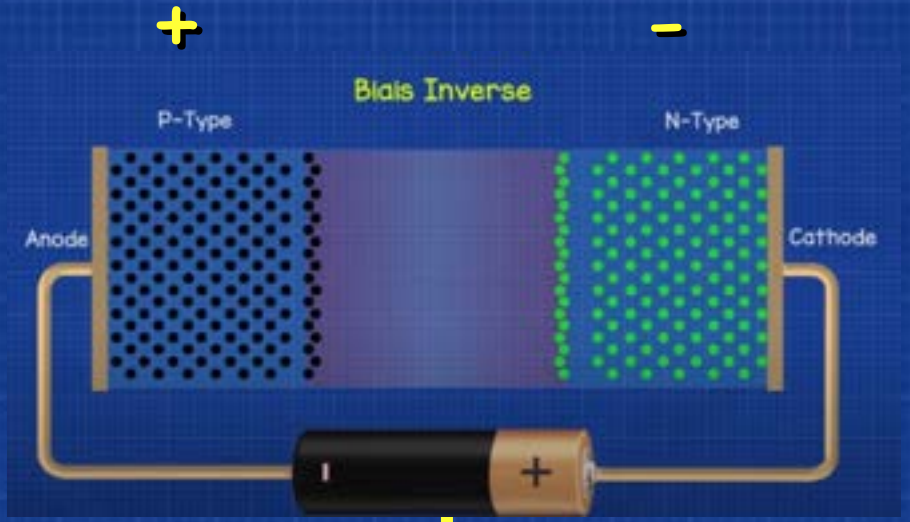
LES DIODES

Conception



passante

Le courant circule



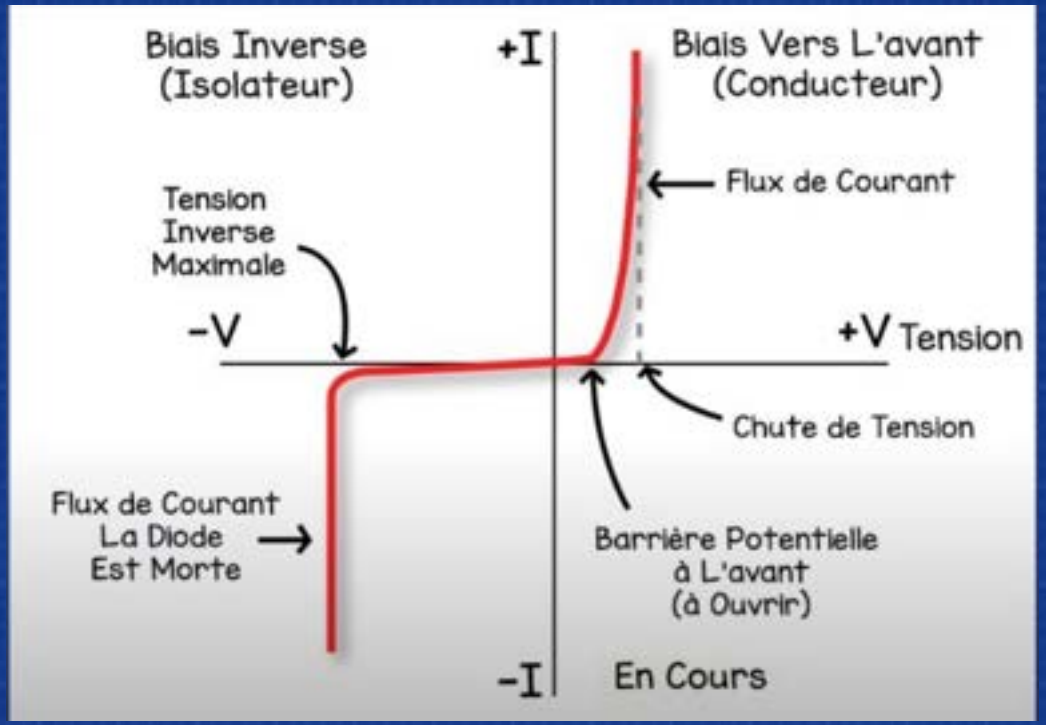
bloquée

Le courant ne circule pas

Il faut que la tension soit supérieure a 0,7V

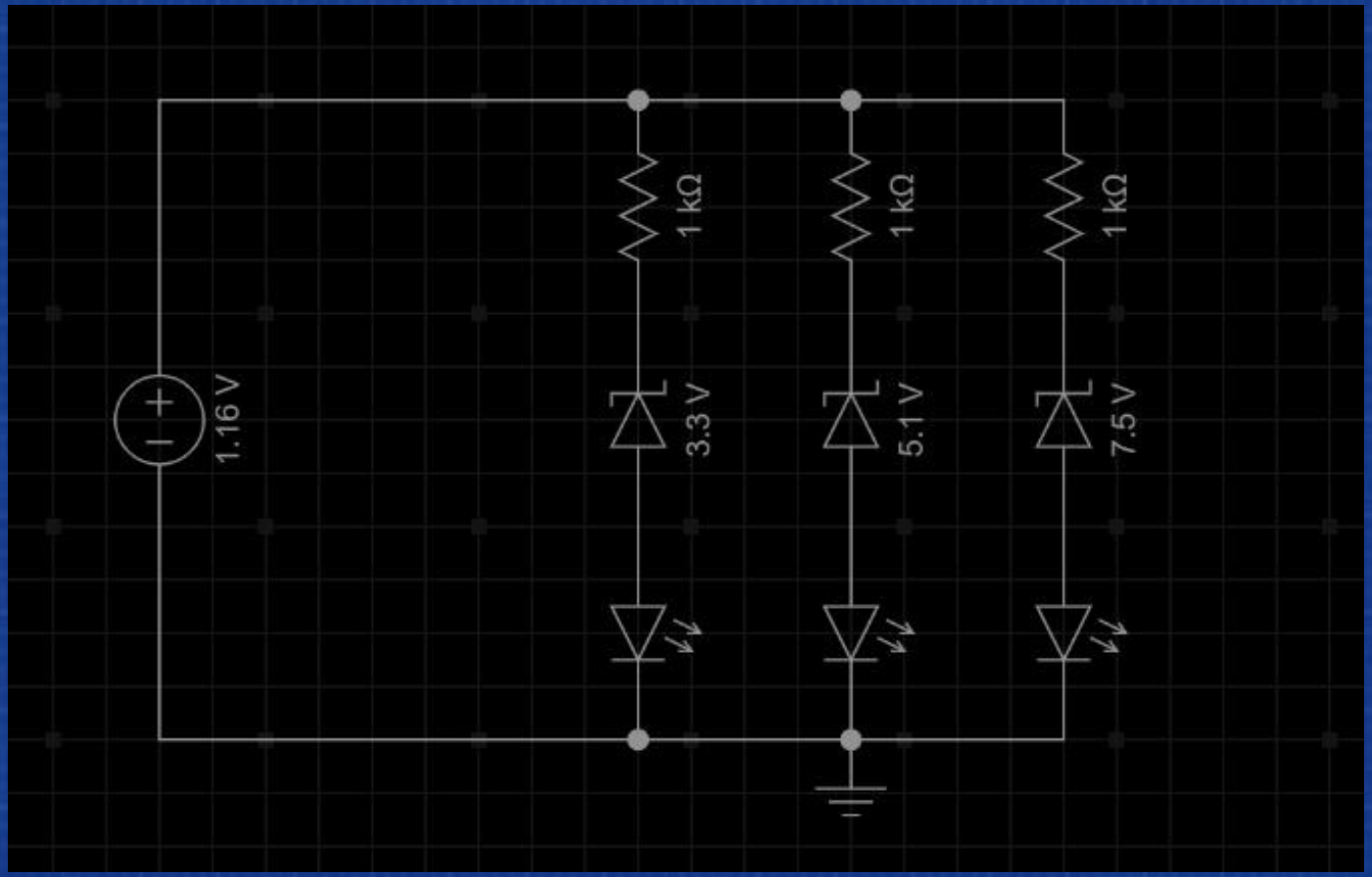
LES DIODES

Caractéristiques :



- Protéger des circuits sur l'inversion de polarité
- Redresser le courant (alternatif en continu)
- Séparer le signal en fréquence de la composante continu
- Matrice a diode

Montage avec des diodes zener (Voltmetre)



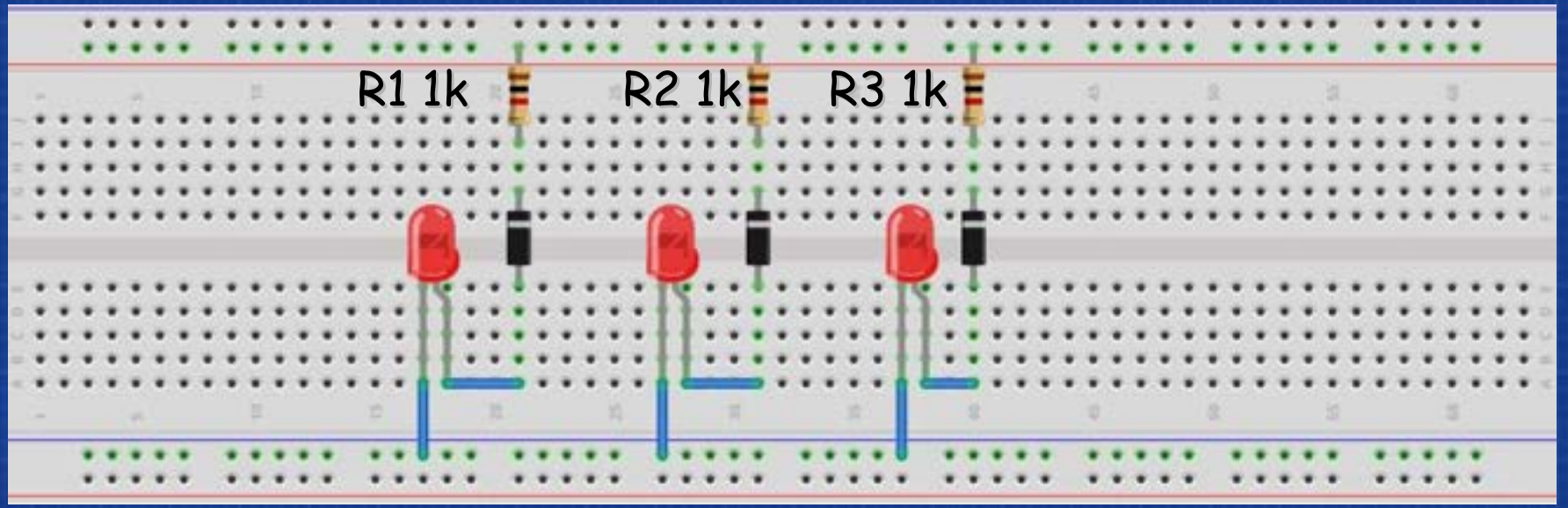
Que se passe t-il si on fait varier la tension d'alimentation ?

Montage avec des diodes zener (Voltmetre)

Zener 1
1N4728

Zener 2
1N4733

Zener 3
1N4737



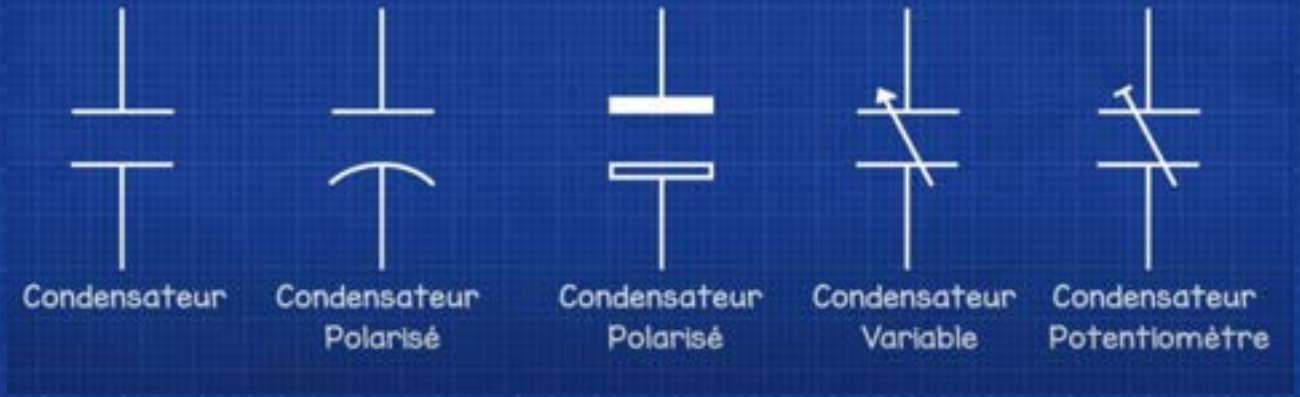
Que se passe t-il si on fait varier la tension d'alimentation ?

LES CONDENSATEURS

L'unité est le **FARAD**

Le symbole **F ou µF**

Ses caractéristiques :
Sa capacité en µF
Sa tension max en V



LES CONDENSTEURS

Condensateur

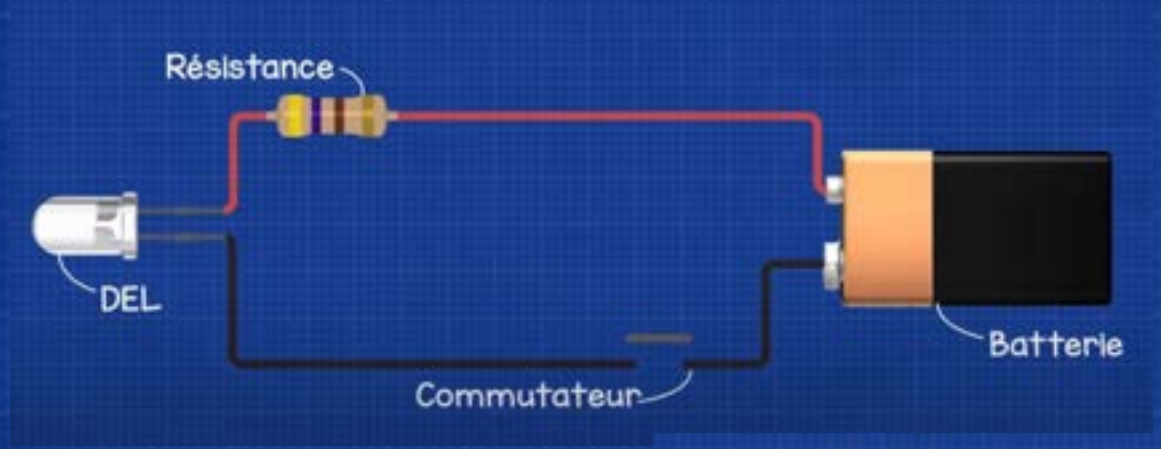
Batterie

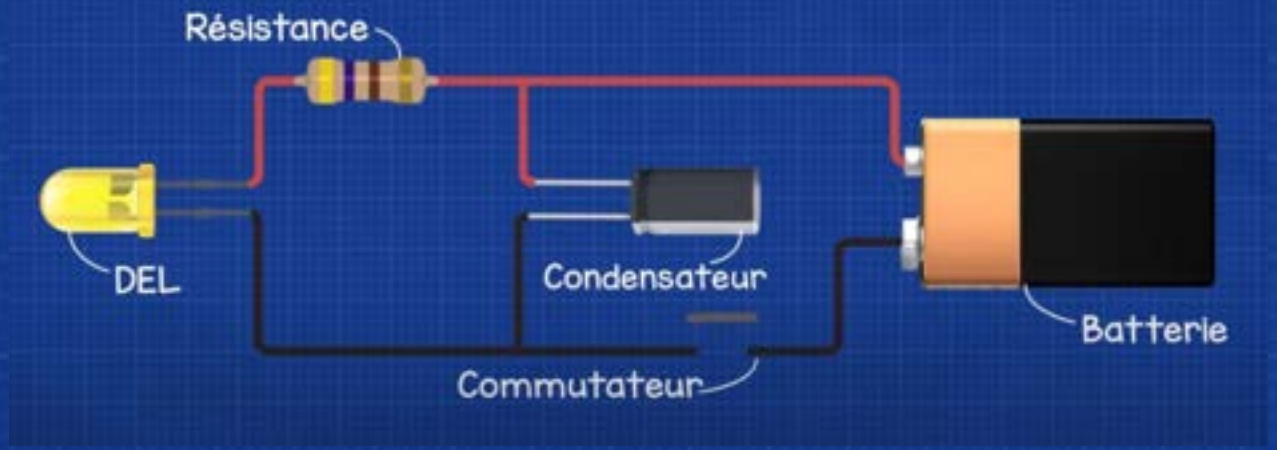
Stockage d'énergie

Champ électrique

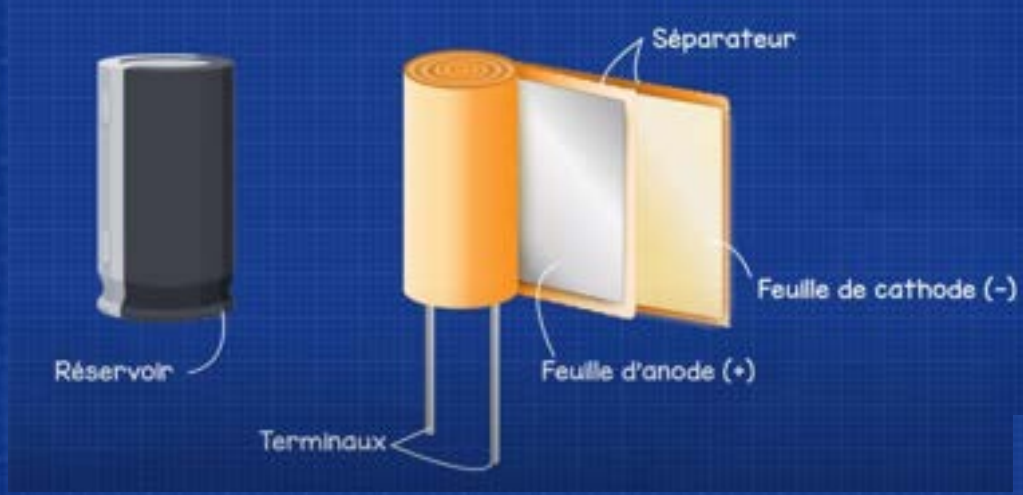
Chimique

LES CONDENSATEURS



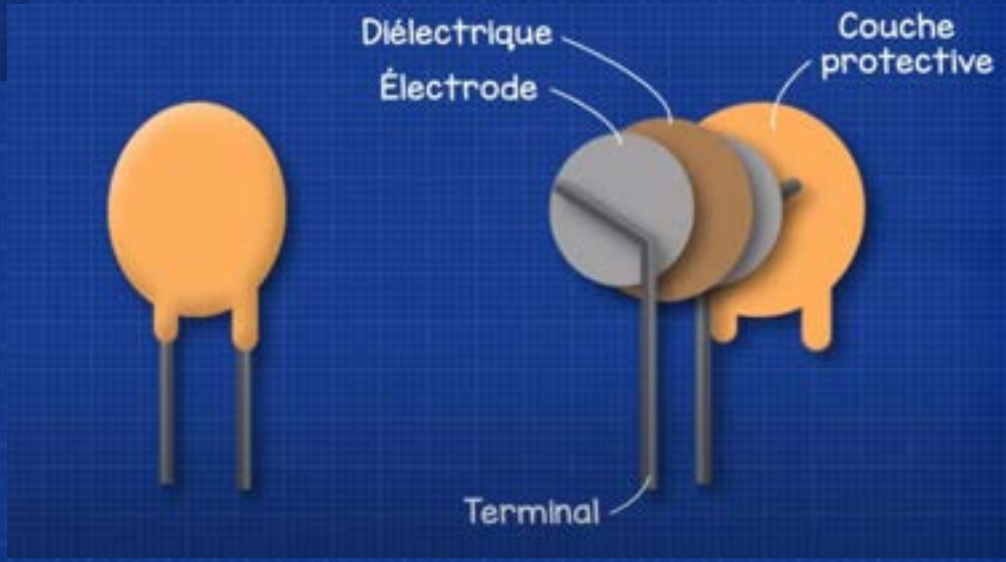


LES CONDENSATEURS

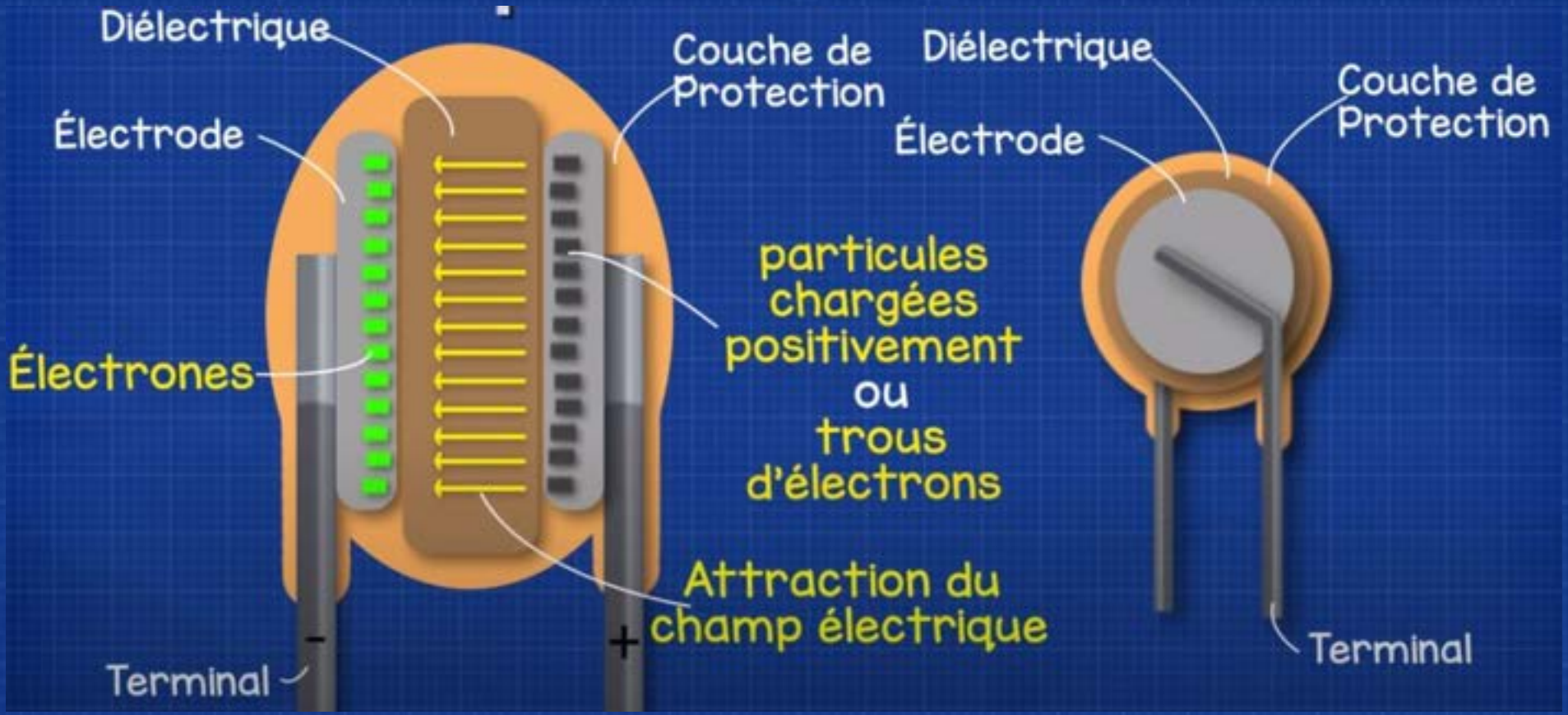


Condensateur électrolytique
(polarisé)

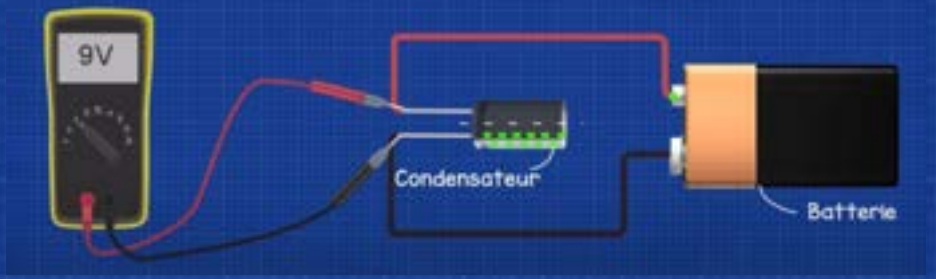
Condensateur tantale
Ou goutte

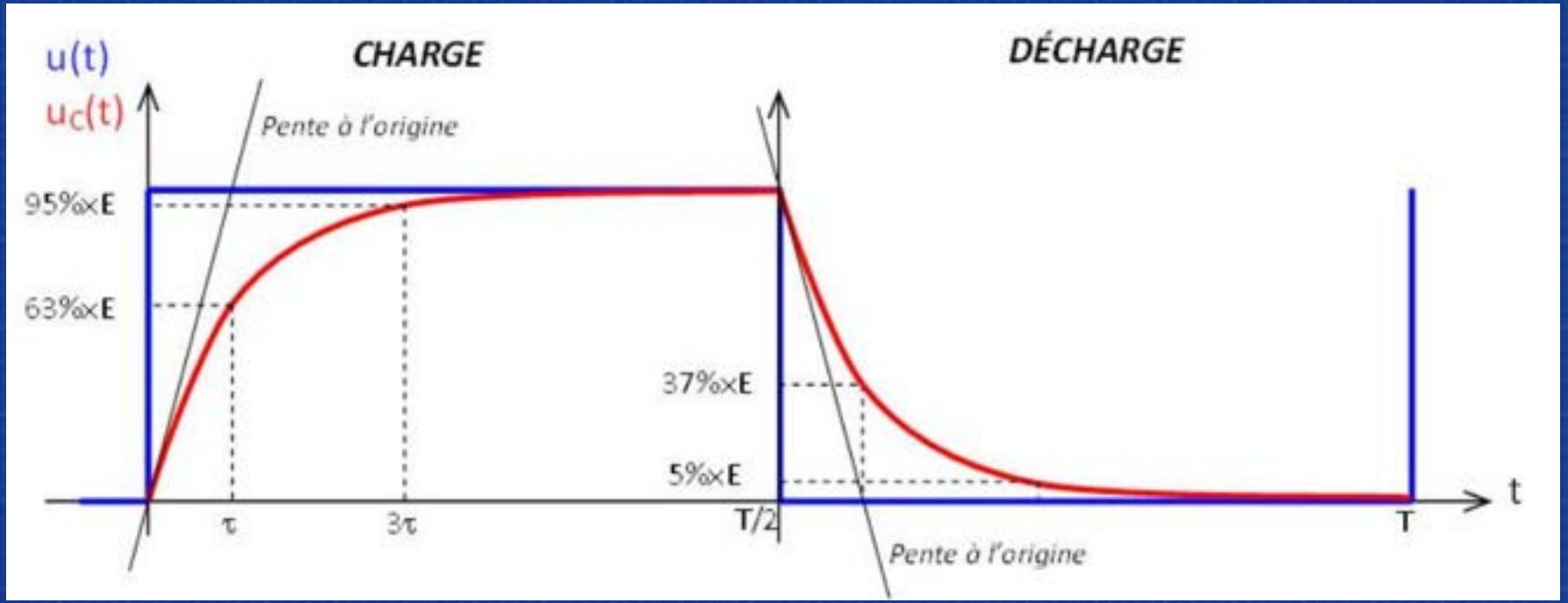


LES CONDENSATEURS



LES CONDENSATEURS





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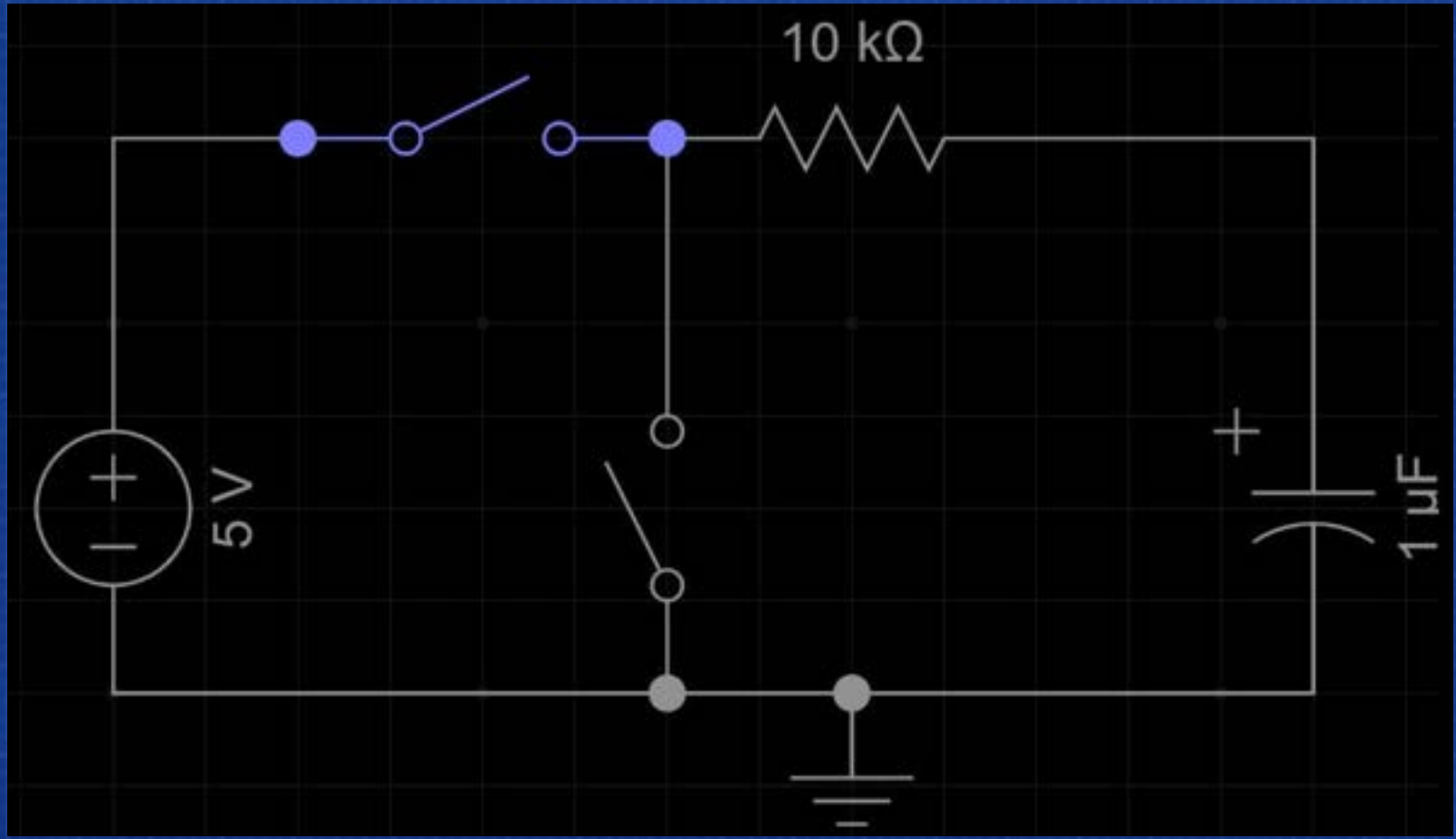
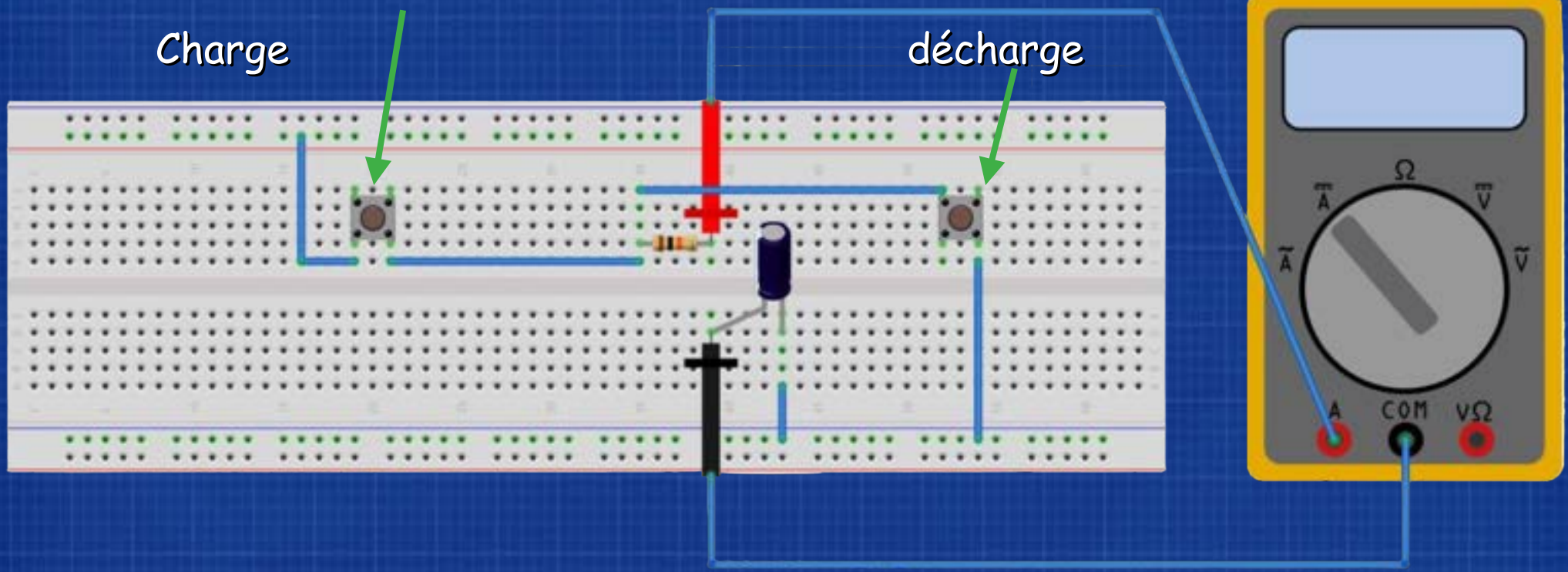


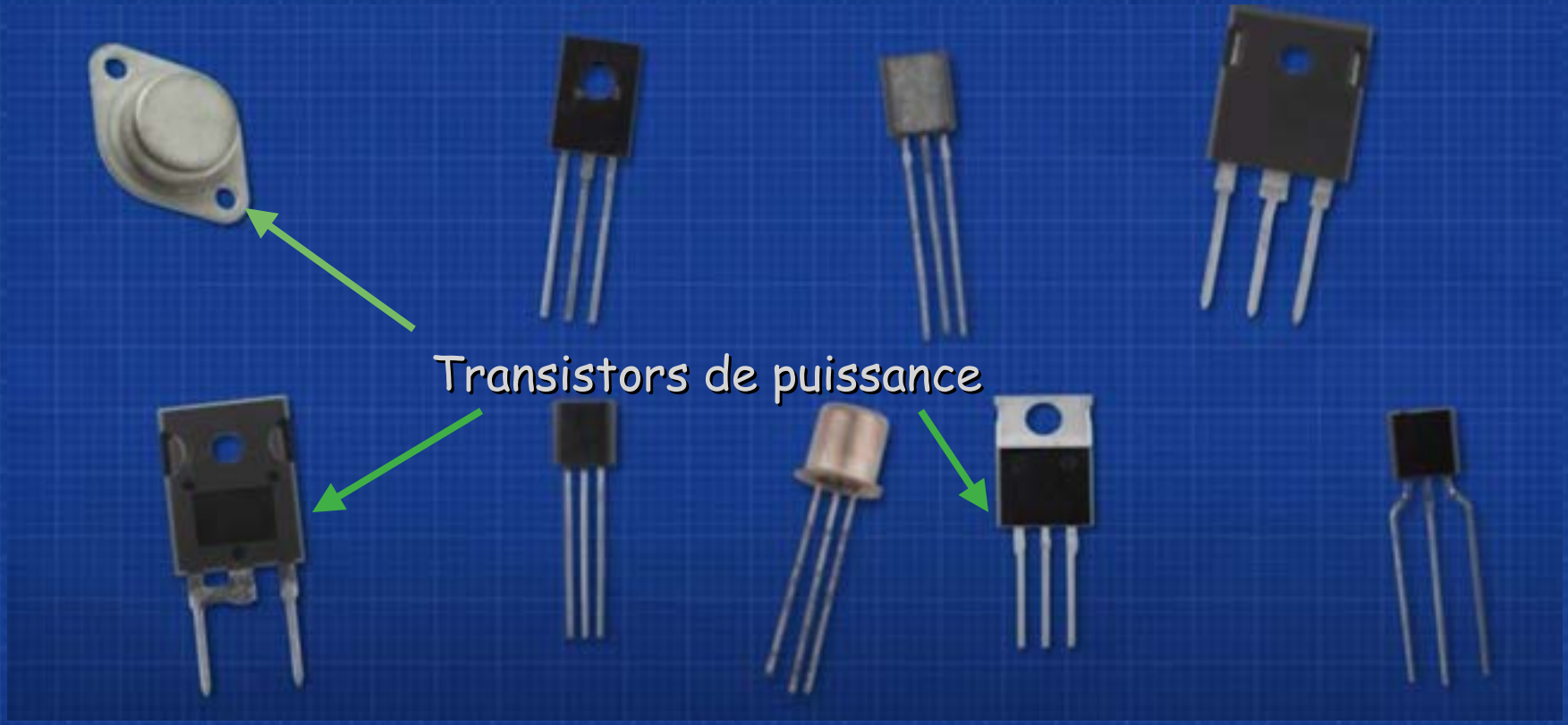
LES CONDENSATEURS

On commute d'abord ce poussoir



LES TRANSISTORS

Différents packagings



LES TRANSISTORS

Bipolaire

Simple - Darlington

Effet de champ

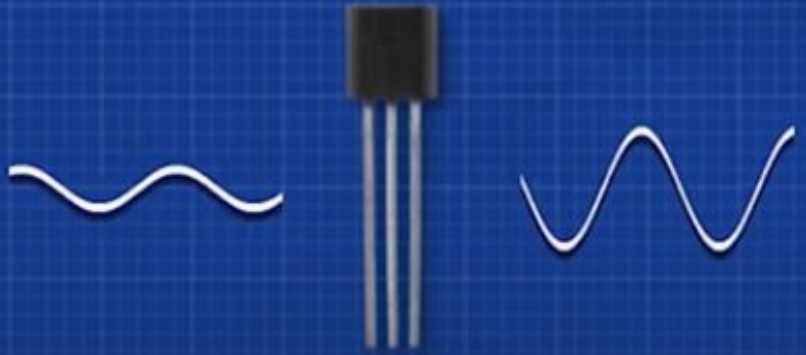
JFET - MOSFET

LES TRANSISTORS

Utilisation en commutation

Allumer et éteindre
les circuits

Utilisation en amplification

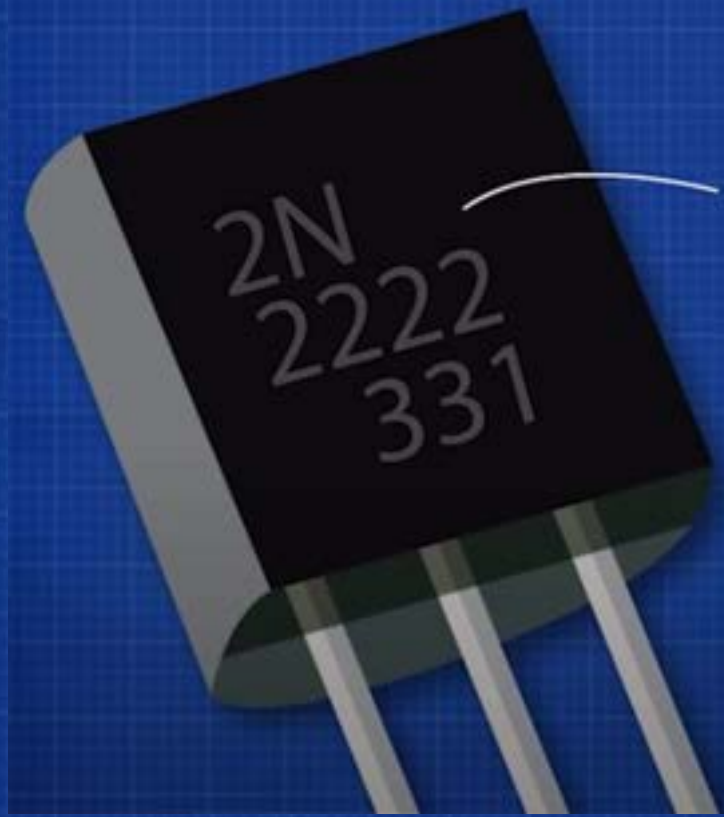


Amplifier les signaux

LES TRANSISTORS

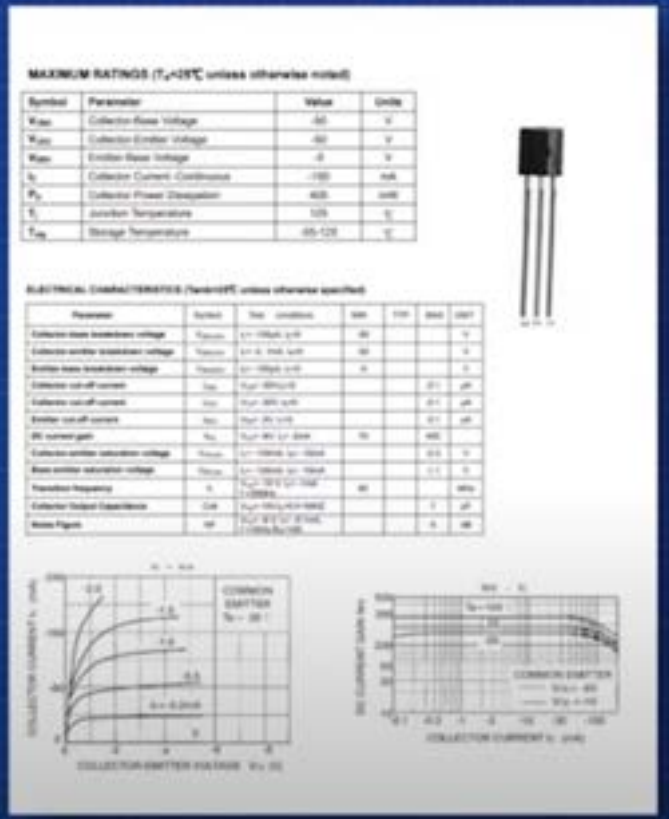
- Configuration typique

LES TRANSISTORS



Numéro d'article

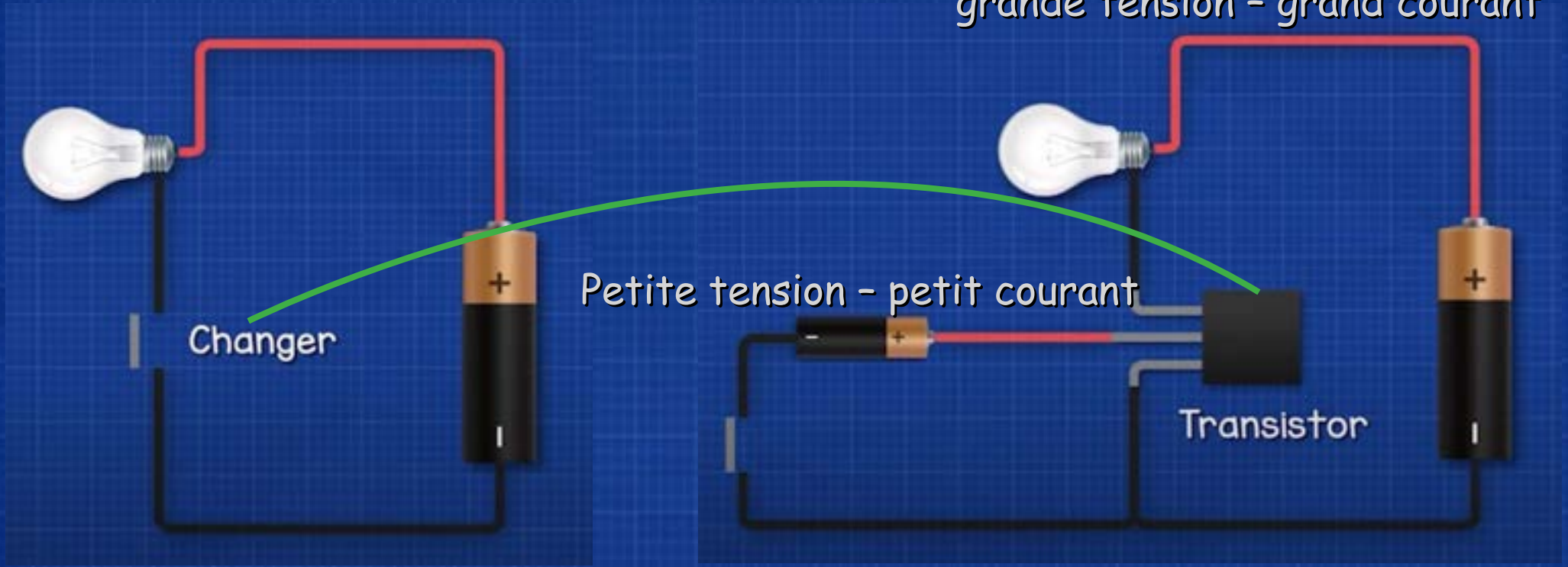
Fiche technique
des fabricants



LES TRANSISTORS

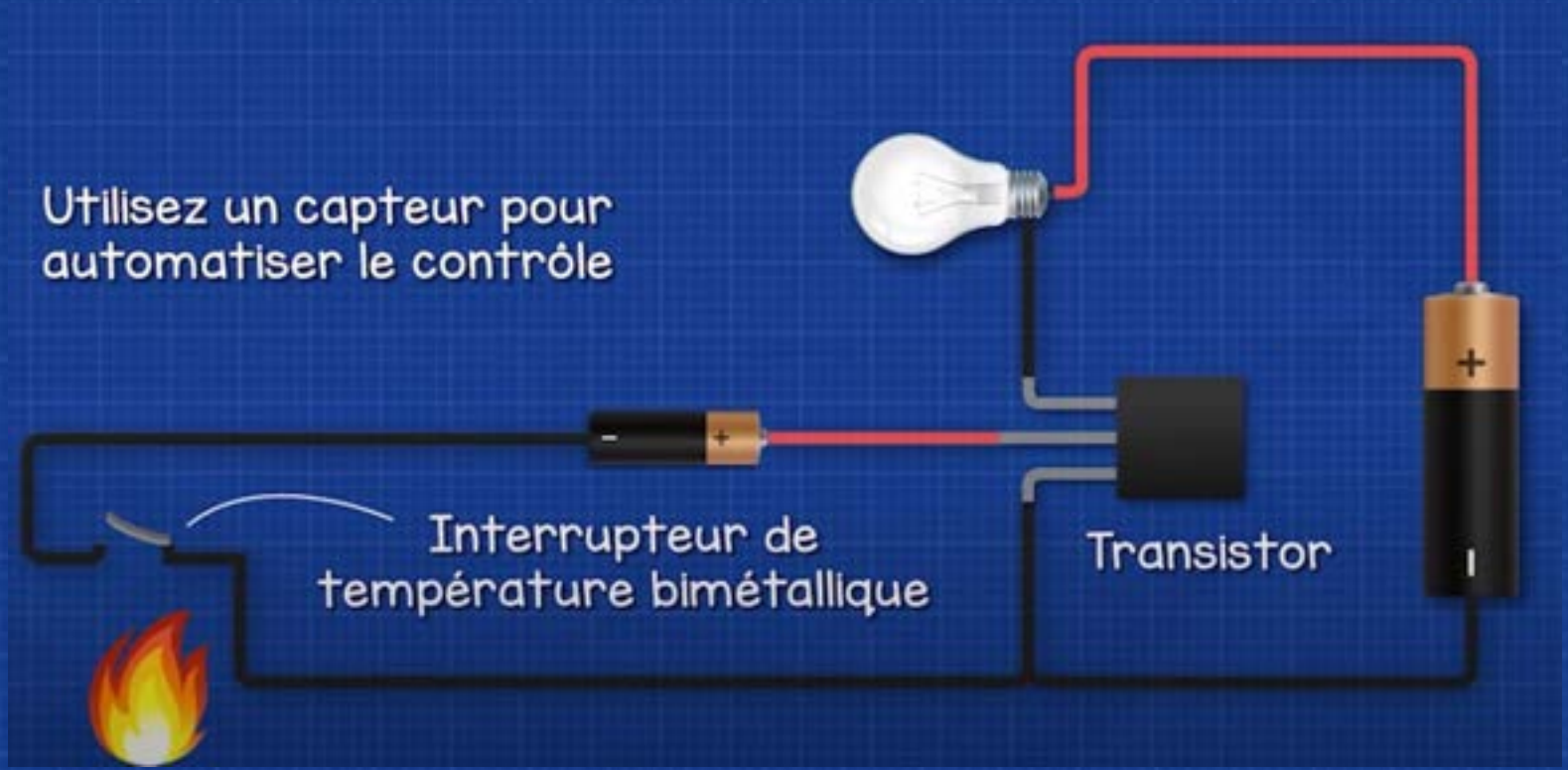
Utilisation en commutation

grande tension – grand courant



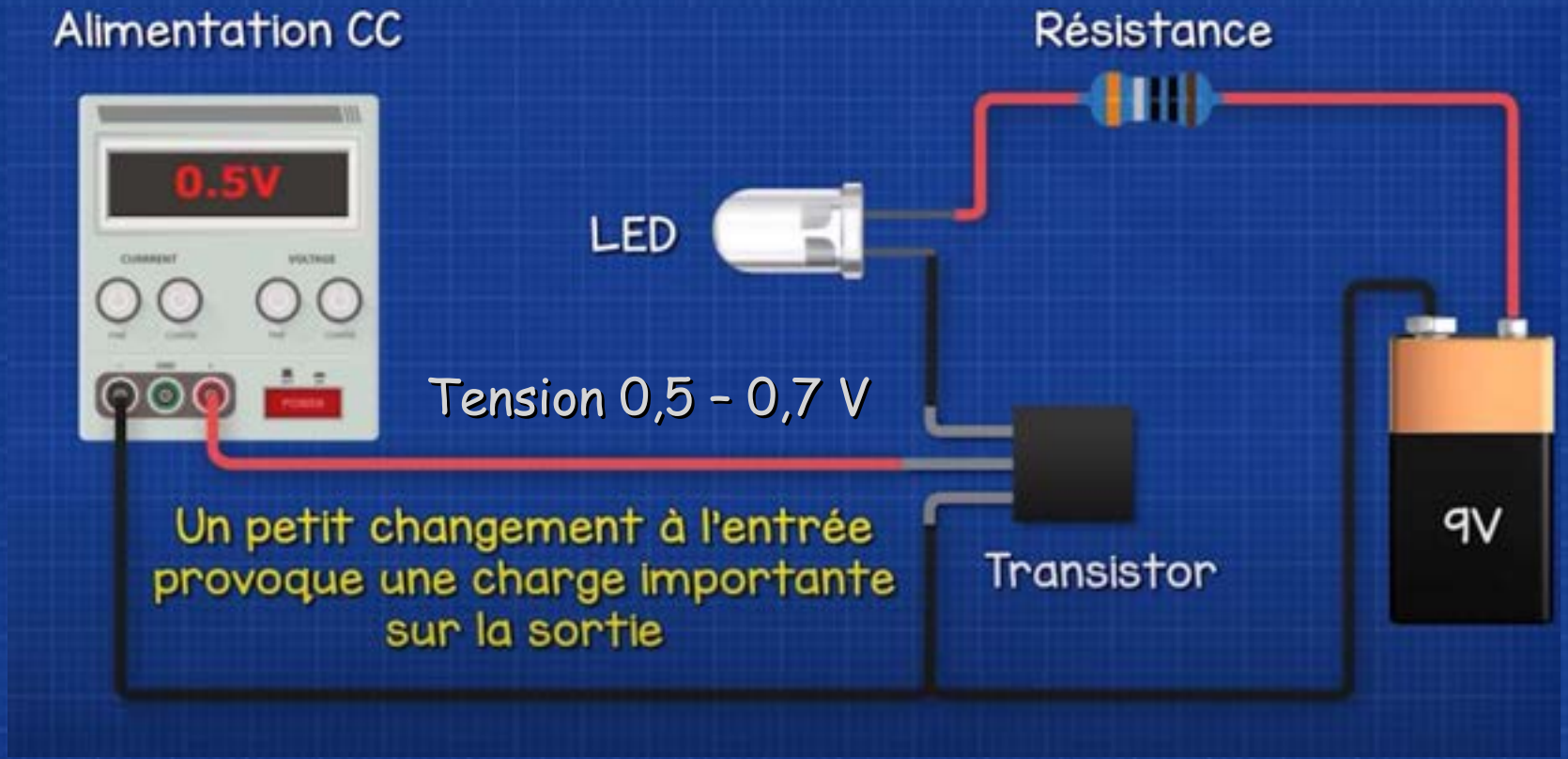
LES TRANSISTORS

Utilisation en commutation



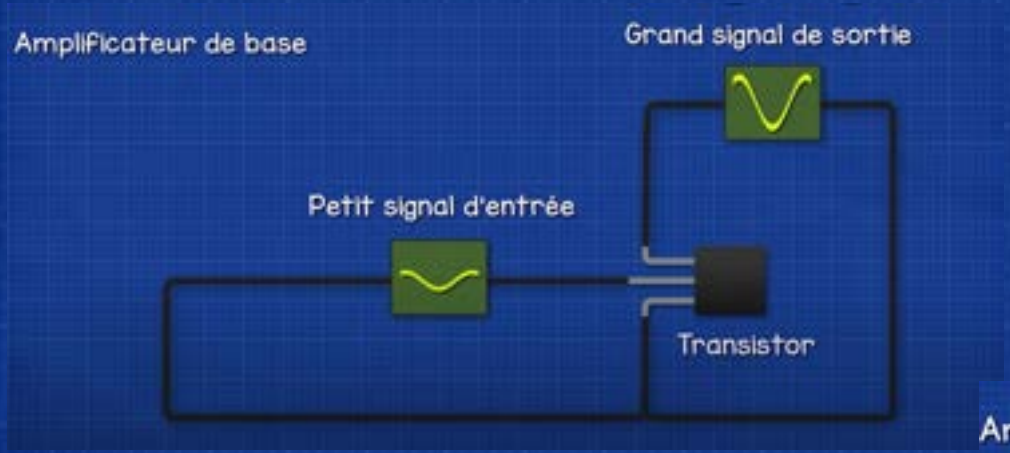
LES TRANSISTORS

Utilisation en commutation



LES TRANSISTORS

Utilisation en amplification



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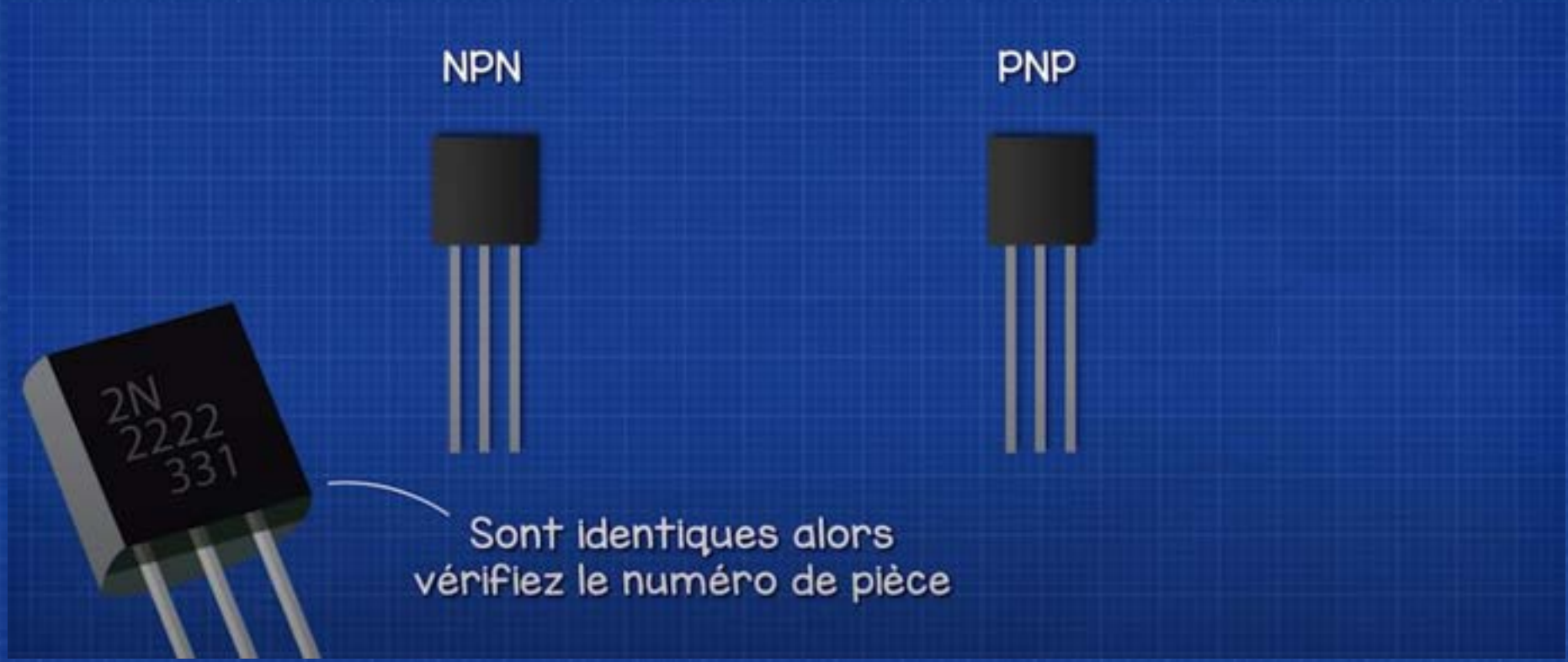
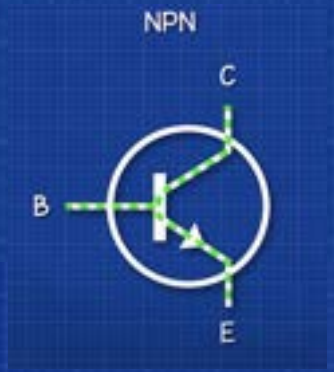
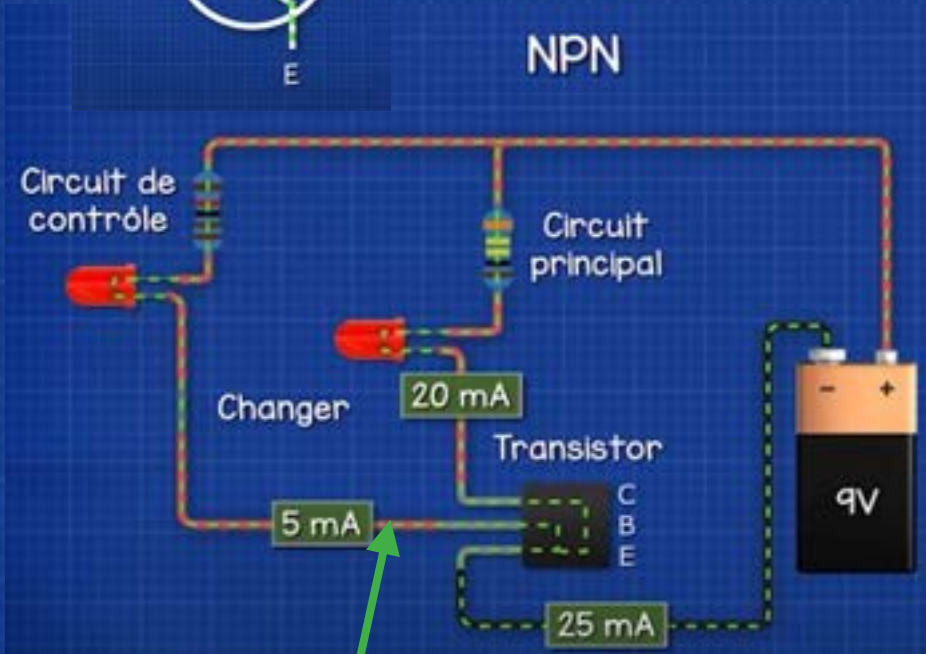
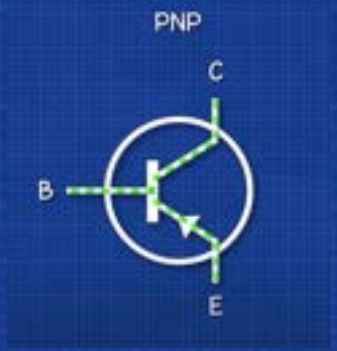


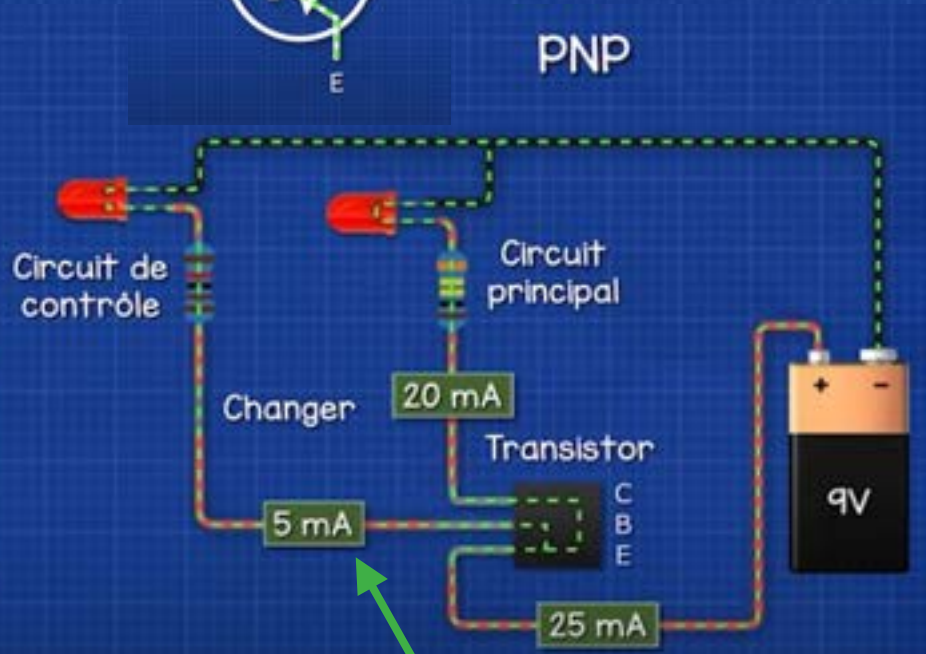
LES TRANSISTORS





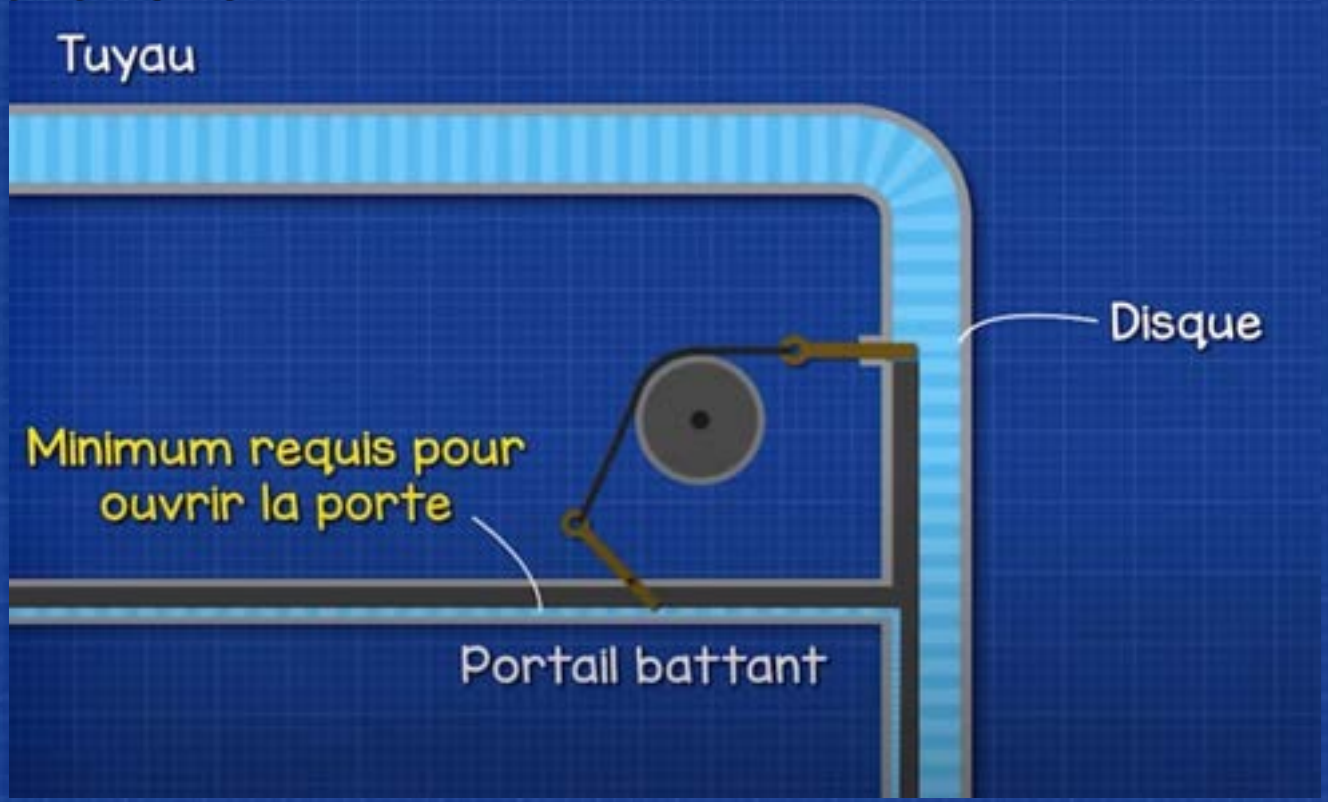
Le signal d'entrée est un signal positif (arbitraire)





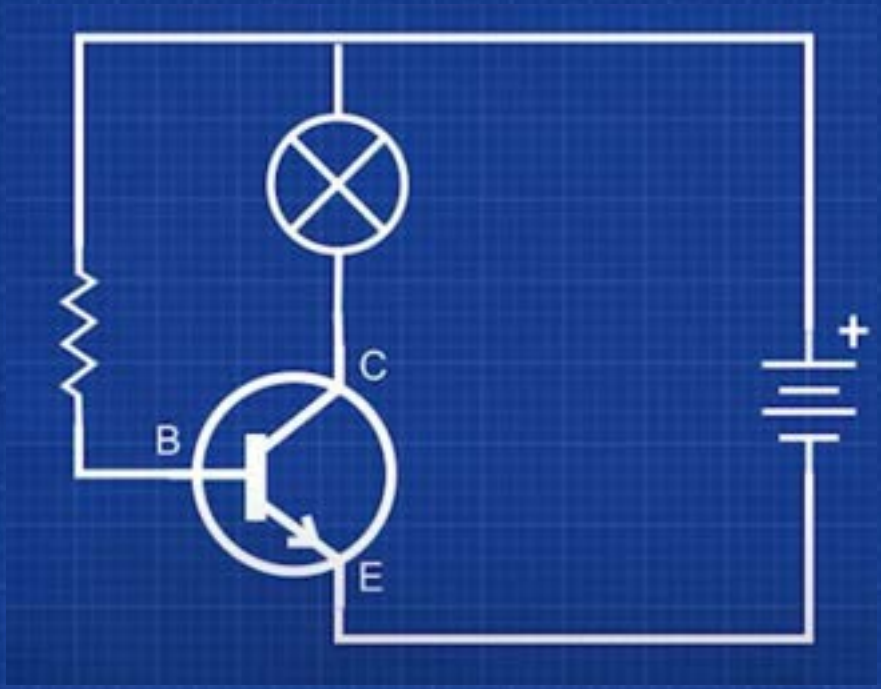
Le signal d'entrée est un signal négatif

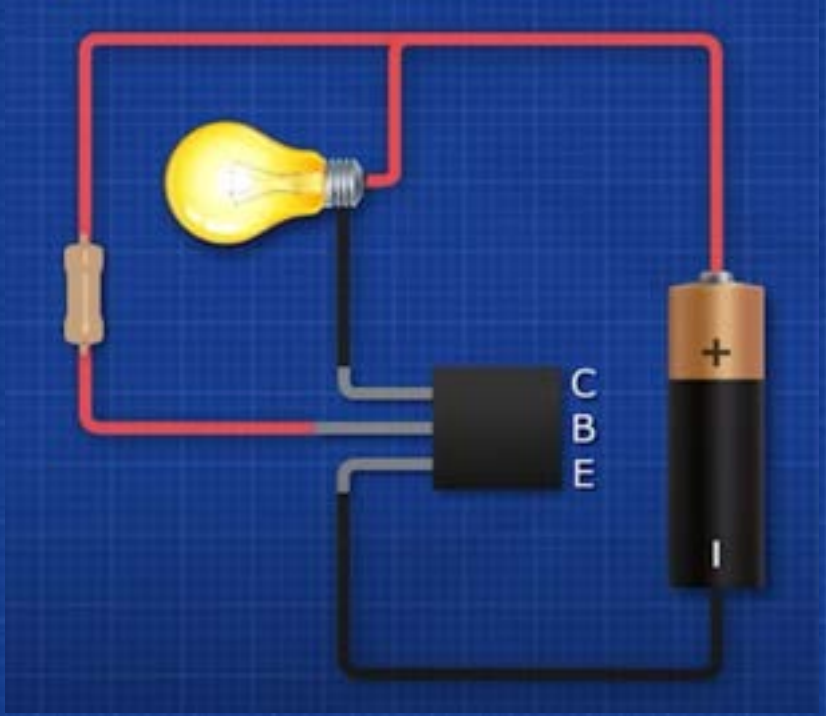
LES TRANSISTORS



Comparaison avec un circuit d'eau

LES TRANSISTORS

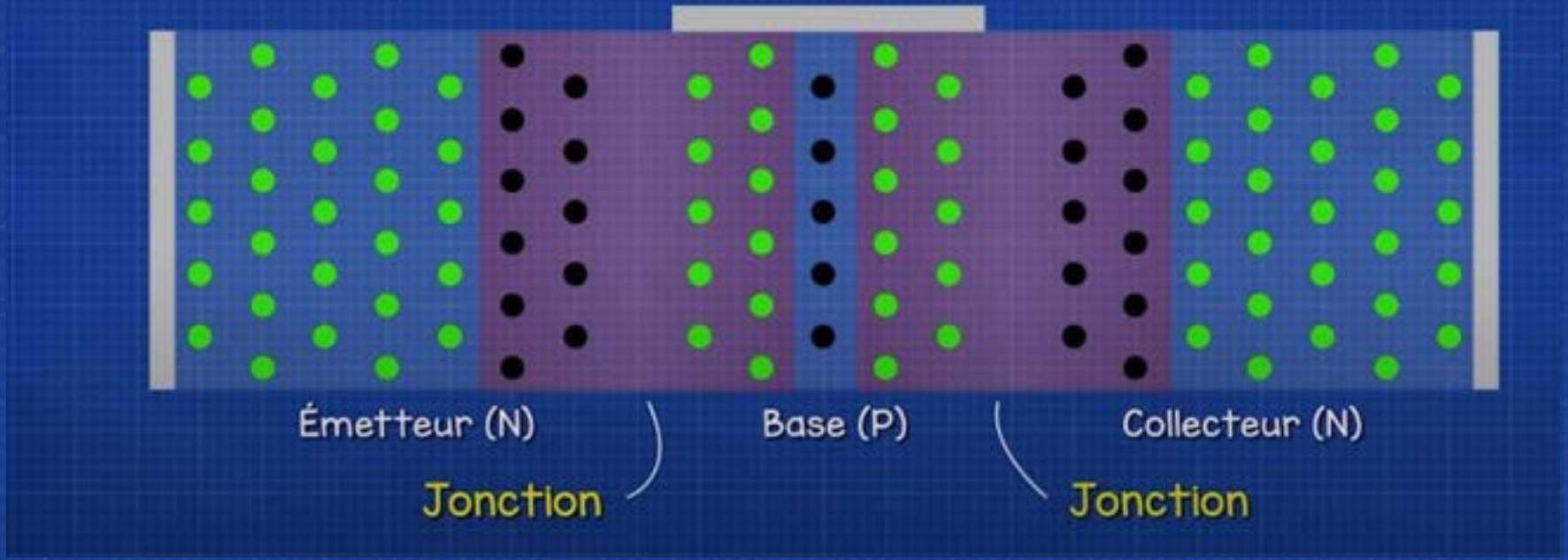




Représentaion schématique

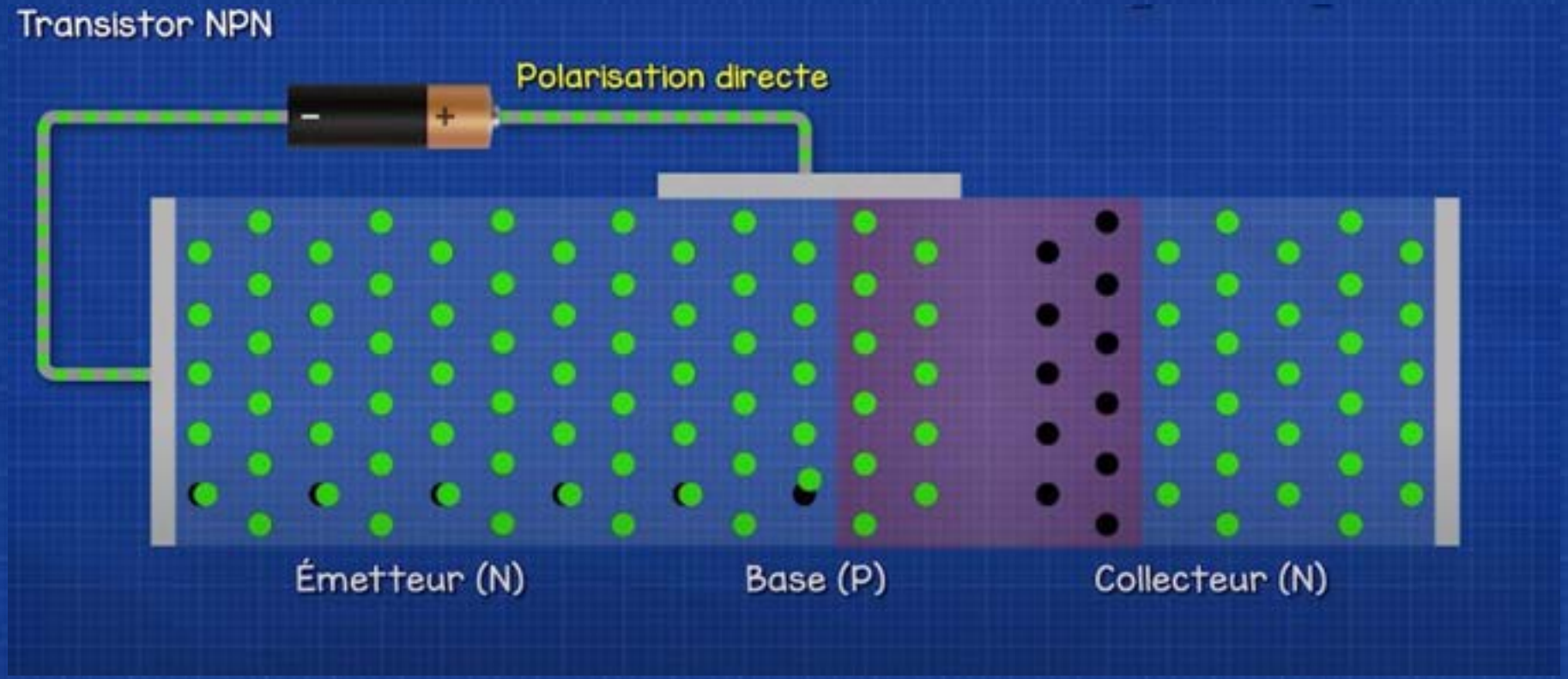
LES TRANSISTORS

Transistor NPN



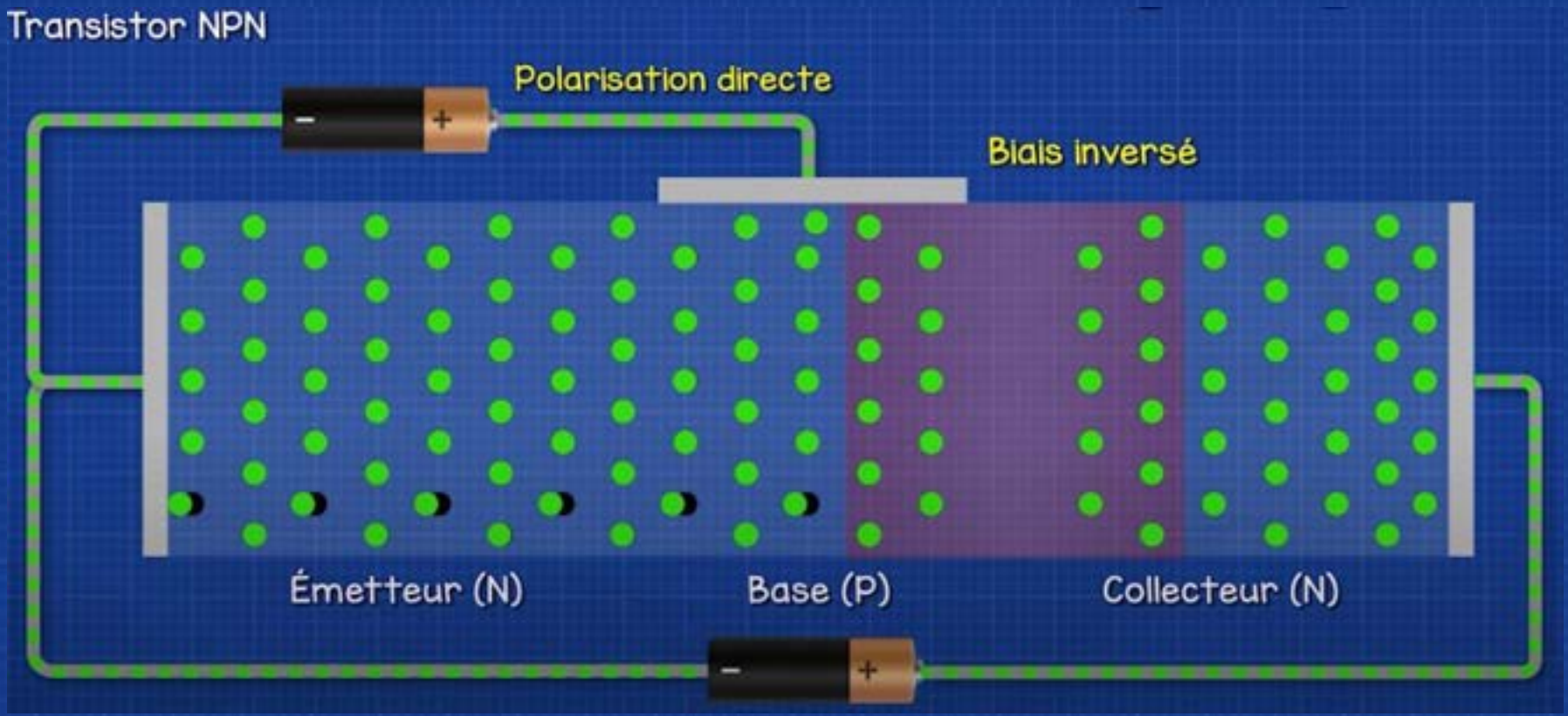
Polarisation interne

LES TRANSISTORS



Polarisation interne

LES TRANSISTORS



Polarisation interne

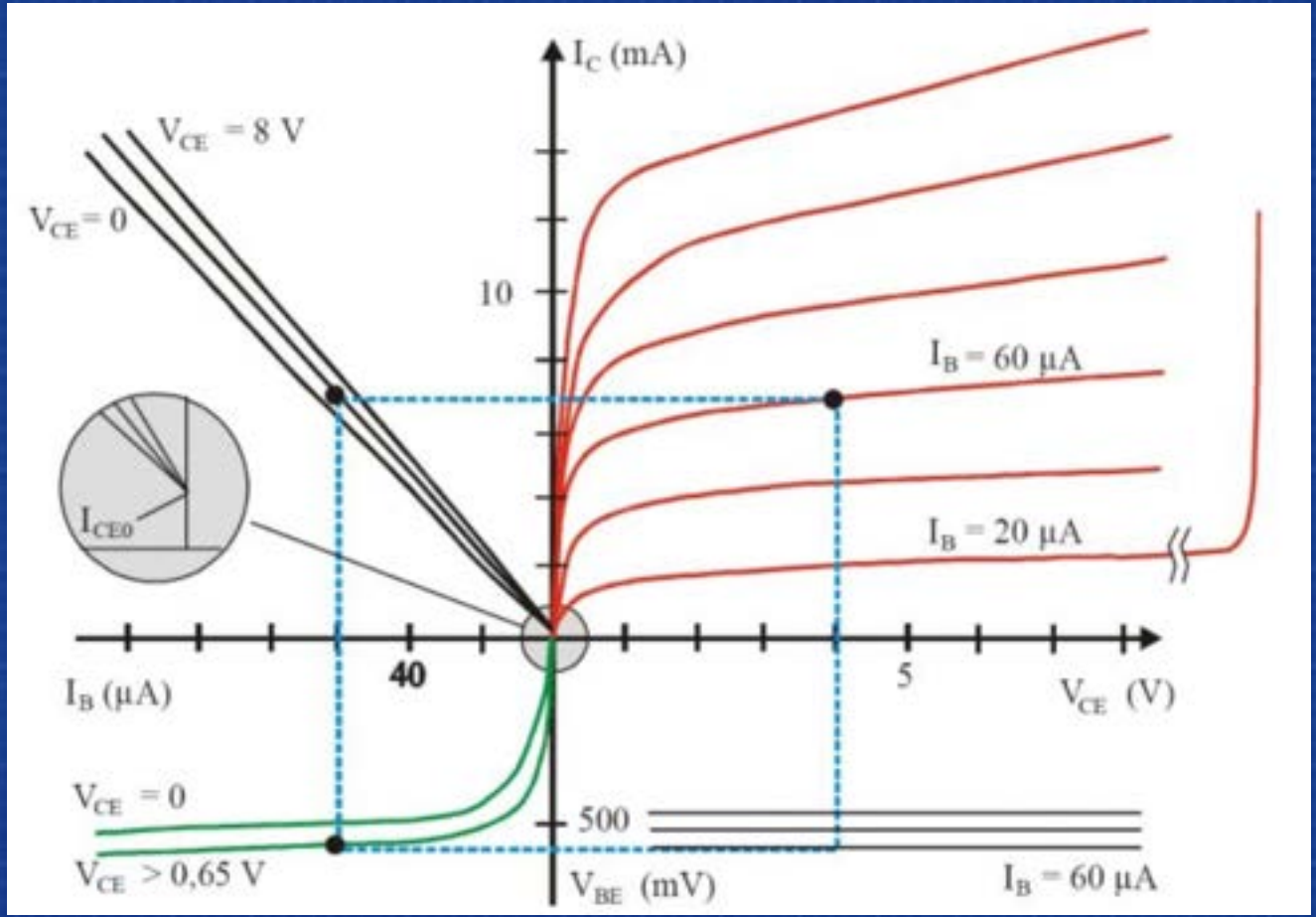
LES TRANSISTORS

$I_c = \beta I_b$

$I_e = I_c + I_b$

β Béta = gain (amplification) en courant

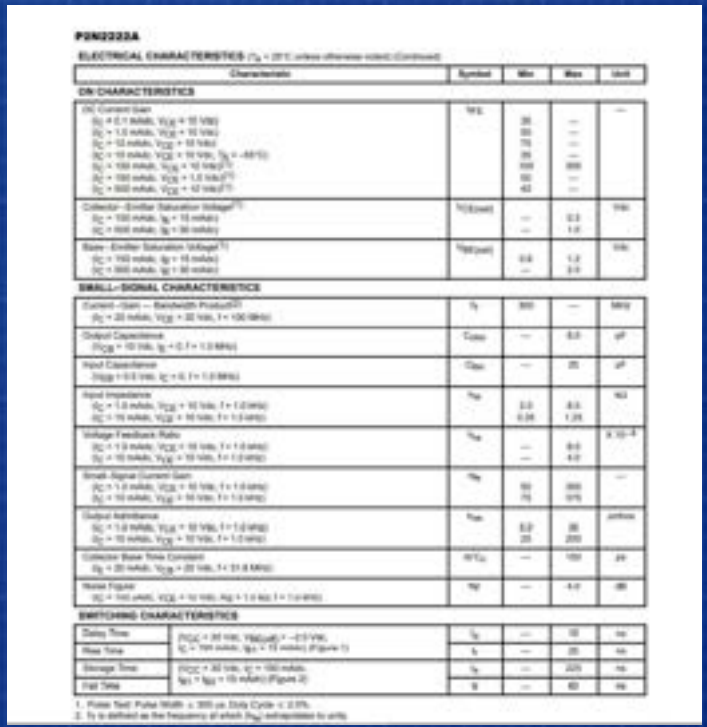
Aussi appelé **HFE**
Hybrid parameter **F**orward current gain common **E**mitter



LES TRANSISTORS

Tension C-E VCEO = 40V
Tension B-E VEBO = 6V
Courant C – E ICEX = 10µA
Courant B – E IBEX = 20 nA

Gain HFE (β) max 100



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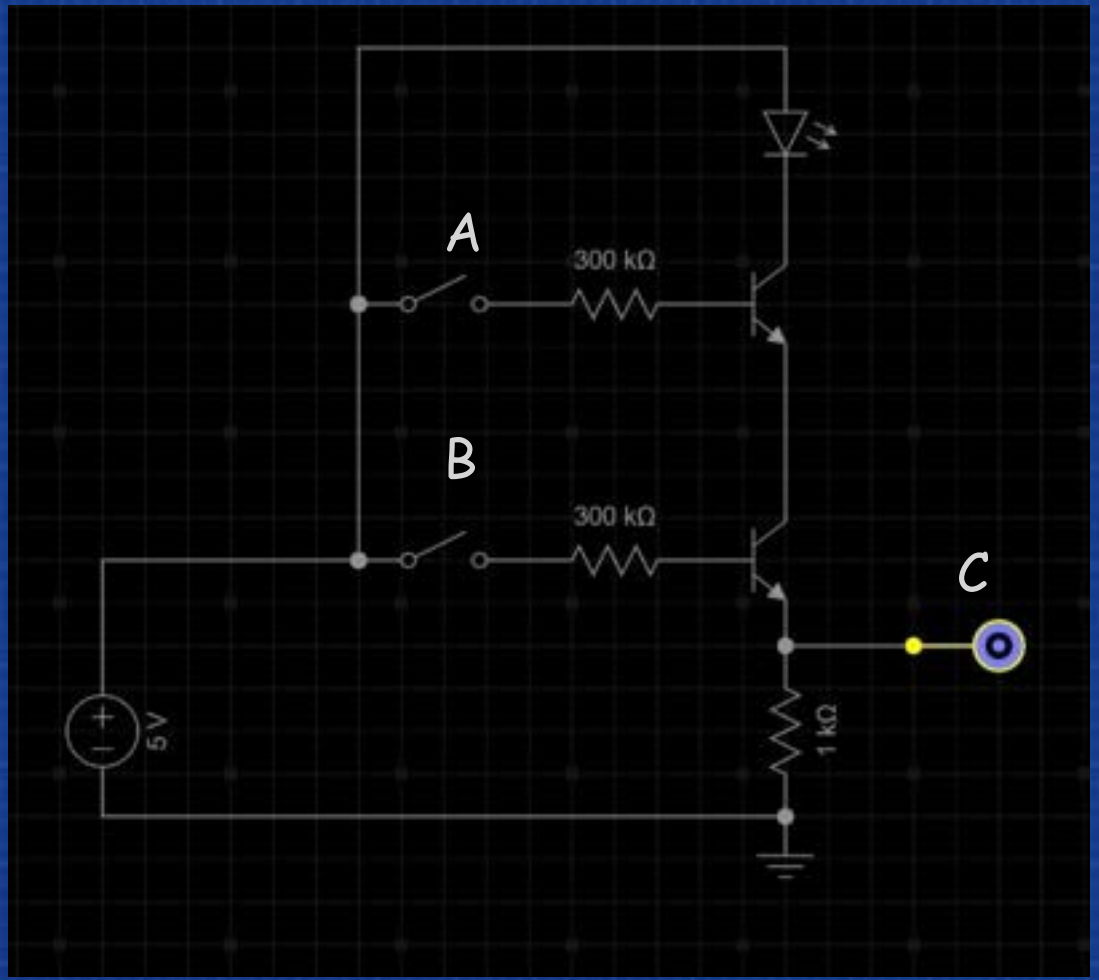
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain (I_C = 0.1 mAdc, V_{CE} = 10 Vdc) (I_C = 1.0 mAdc, V_{CE} = 10 Vdc) (I_C = 10 mAdc, V_{CE} = 10 Vdc) (I_C = 10 mAdc, V_{CE} = 10 Vdc, T_A = −55°C) (I_C = 150 mAdc, V_{CE} = 10 Vdc)[1] (I_C = 150 mAdc, V_{CE} = 1.0 Vdc)[1] (I_C = 500 mAdc, V_{CE} = 10 Vdc)[1]	h_{FE}	35 50 75 35 100 50 40	— — — — 300 — —	—
Collector–Emitter Saturation Voltage[1] (I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{CE(sat)}$	— —	0.3 1.0	Vdc
Base–Emitter Saturation Voltage[1] (I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{BE(sat)}$	0.6 —	1.2 2.0	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product[2] (I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	300	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	—	8.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	—	25	pF
Input Impedance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{ie}	2.0 0.25	8.0 1.25	kΩ
Voltage Feedback Ratio (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{re}	— —	8.0 4.0	$X 10^{-4}$
Small–Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{fe}	50 75	300 375	—
Output Admittance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{oe}	5.0 25	35 200	μmhos
Collector Base Time Constant (I_E = 20 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	$r'_b C_c$	—	150	ps
Noise Figure (I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	NF	—	4.0	dB
SWITCHING CHARACTERISTICS				
Delay Time (V_{CC} = 30 Vdc, $V_{BE(off)}$ = −0.5 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc) (Figure 1)	t_d	—	10	ns
Rise Time	t_r	—	25	ns
Storage Time (V_{CC} = 30 Vdc, I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc) (Figure 2)	t_s	—	225	ns
Fall Time	t_f	—	60	ns

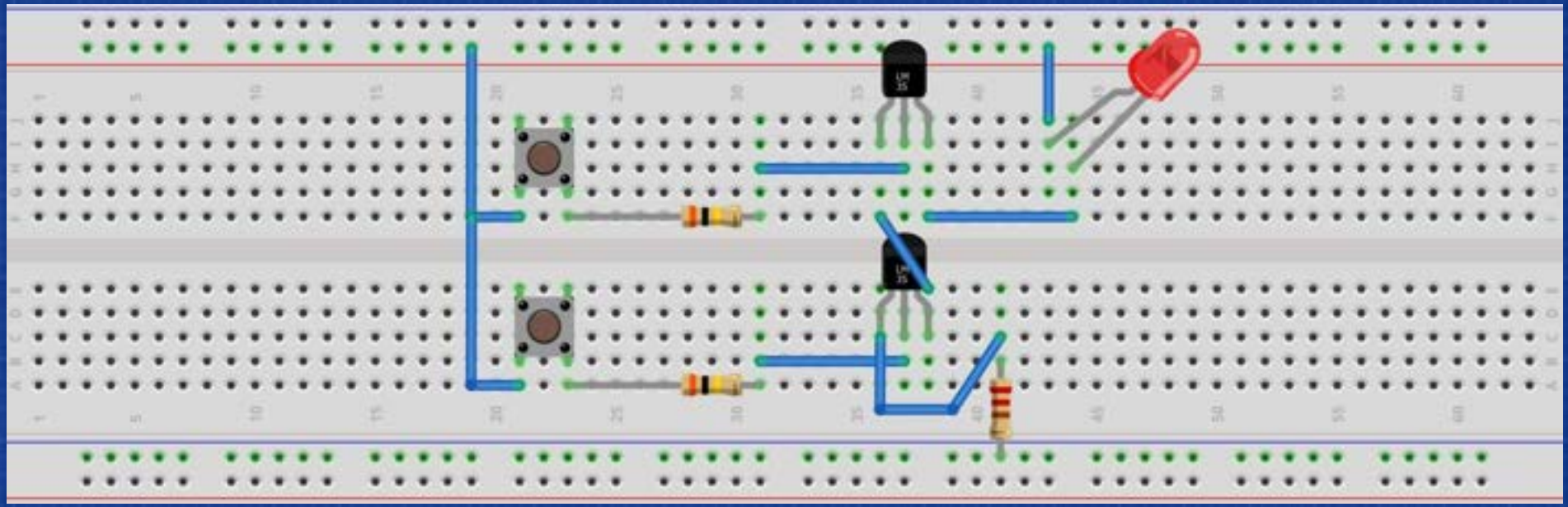
1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
2. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

LES TRANSISTORS

Que ce passe t-il ?

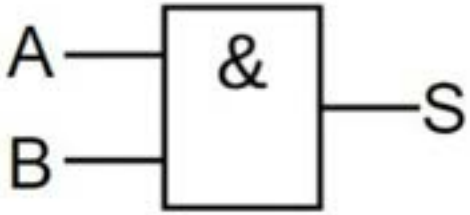


LES TRANSISTORS



Porte ET à transistors

LES TRANSISTORS

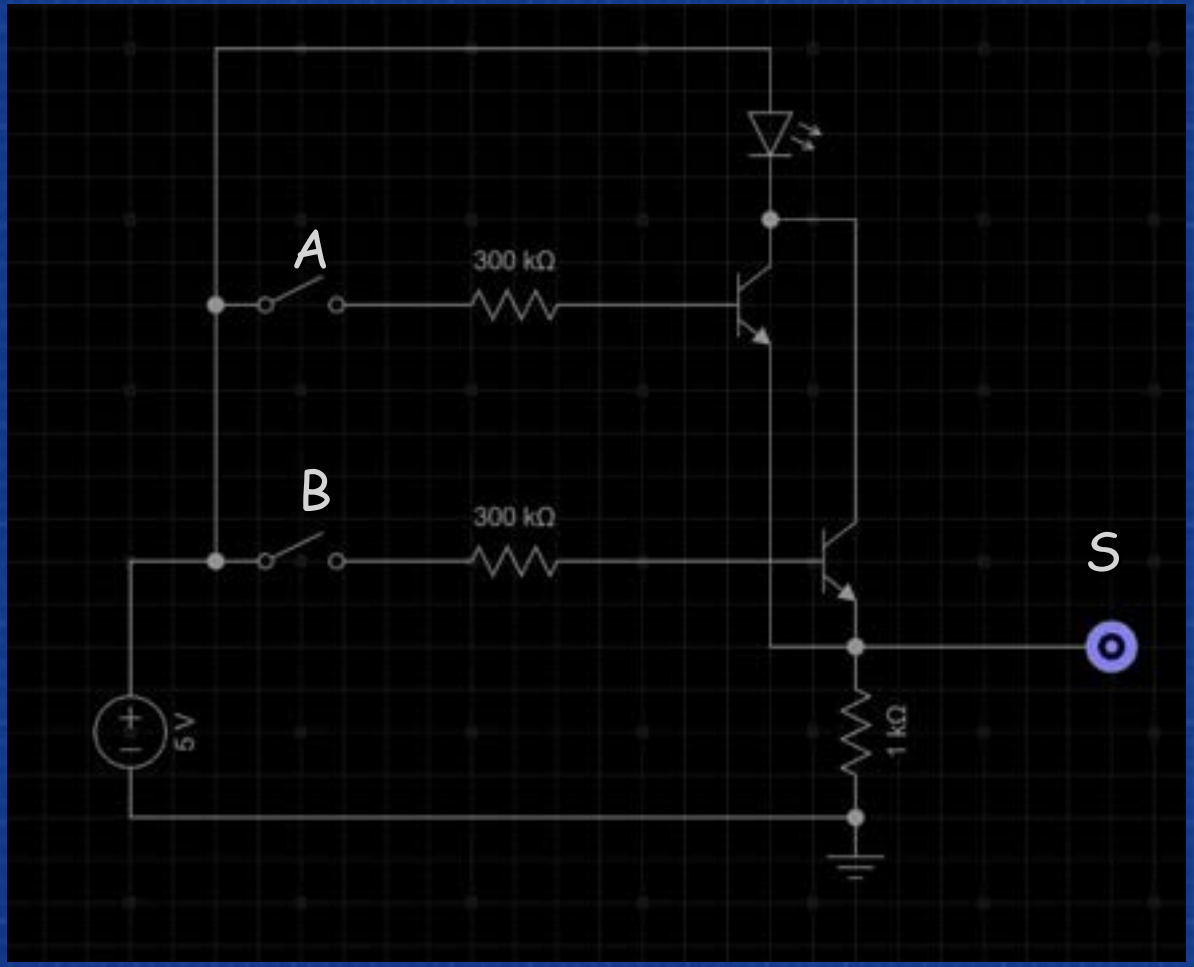


A	B	S
0	0	**0**
0	1	**0**
1	0	**0**
1	1	**1**

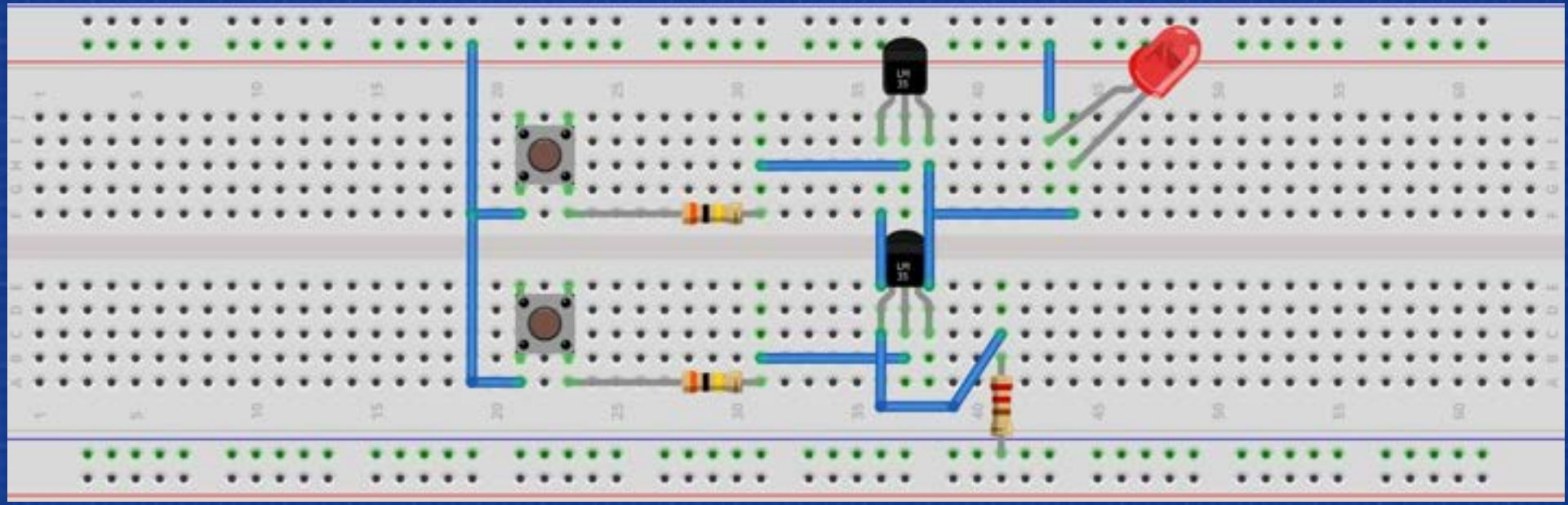
Porte ET logique combinatoire

LES TRANSISTORS

Que ce passe t-il ?

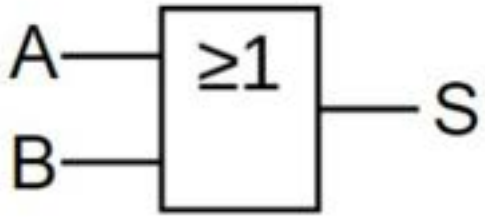


LES TRANSISTORS

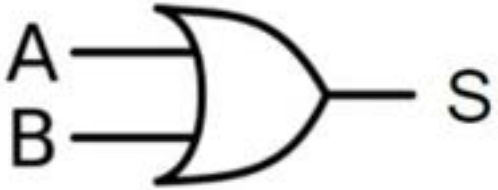


Porte OU à transistors

LES TRANSISTORS



A	B	S
0	0	**0**
0	1	**1**
1	0	**1**
1	1	**1**

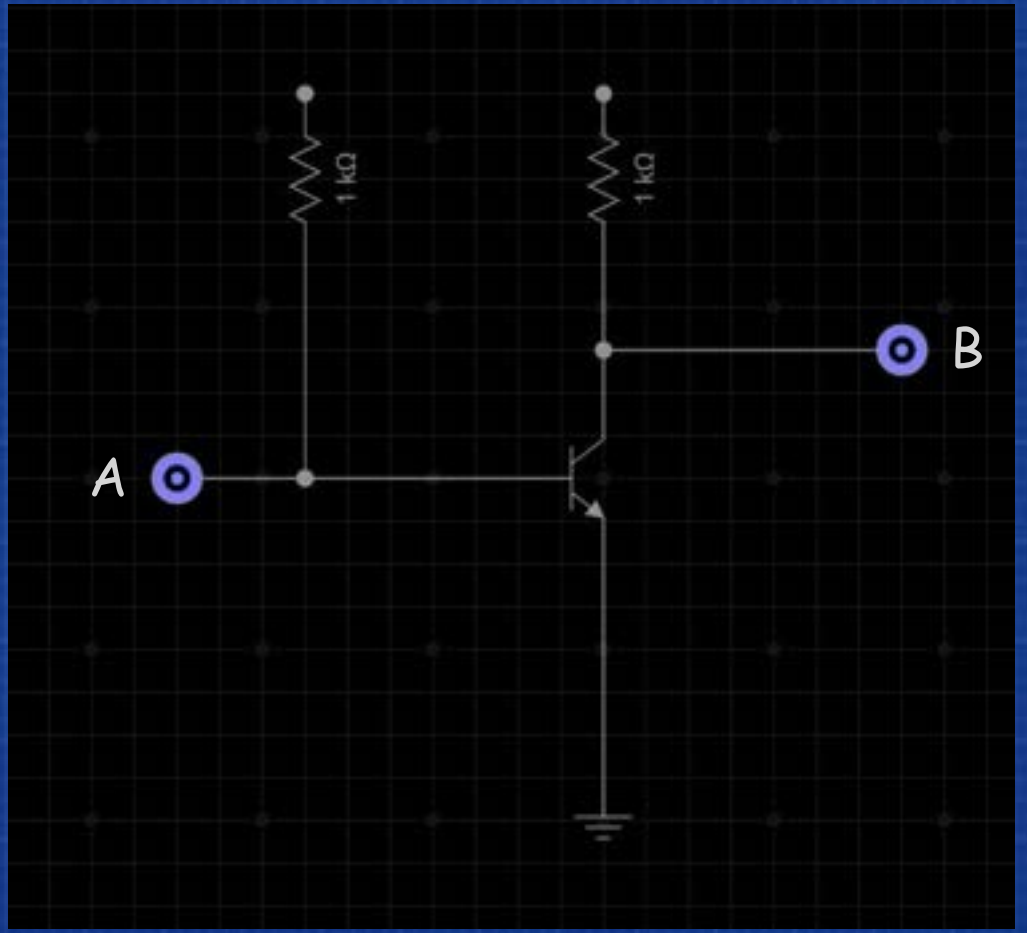


Porte OU logique combinatoire

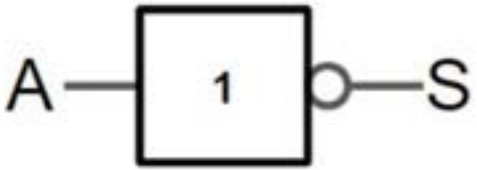
LES TRANSISTORS en circuit logique

Qu'est ce que c'est ?
Quelle fonction logique ?

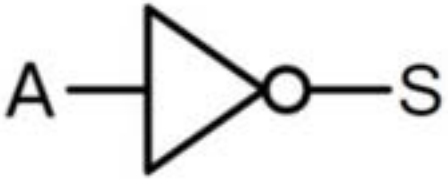
A	B
0	1
1	0



LES TRANSISTORS



A	S
0	1
1	0



Inverseur logique

CIRCUITS LOGIQUES

Exercice :

Le voyant d'alarme s'alume quand :

- la fenetre ou la porte est ouverte et que l'interrupteur « mise en route alarme est ON »

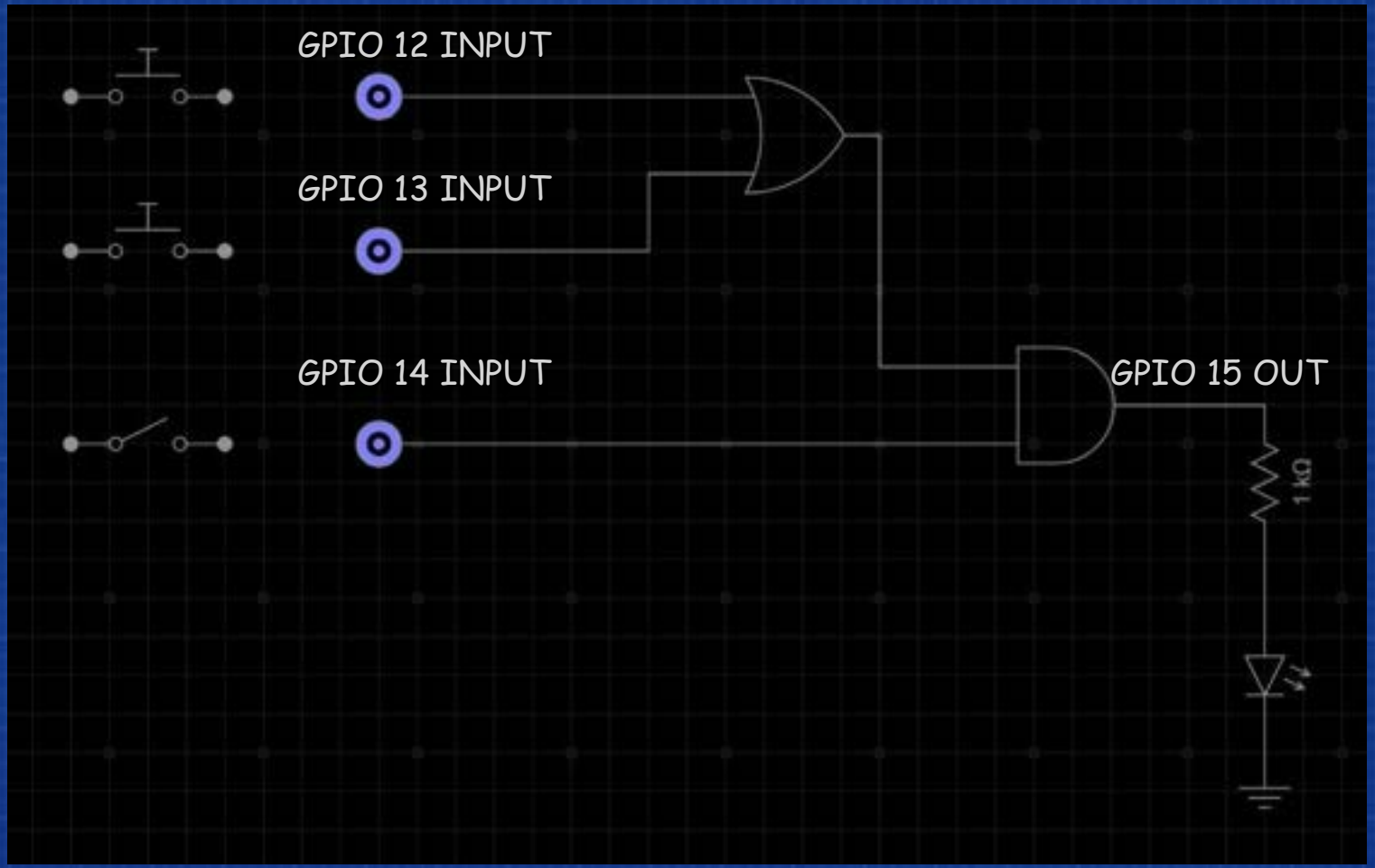
Faire le schema logique

CIRCUITS LOGIQUES

fenetre

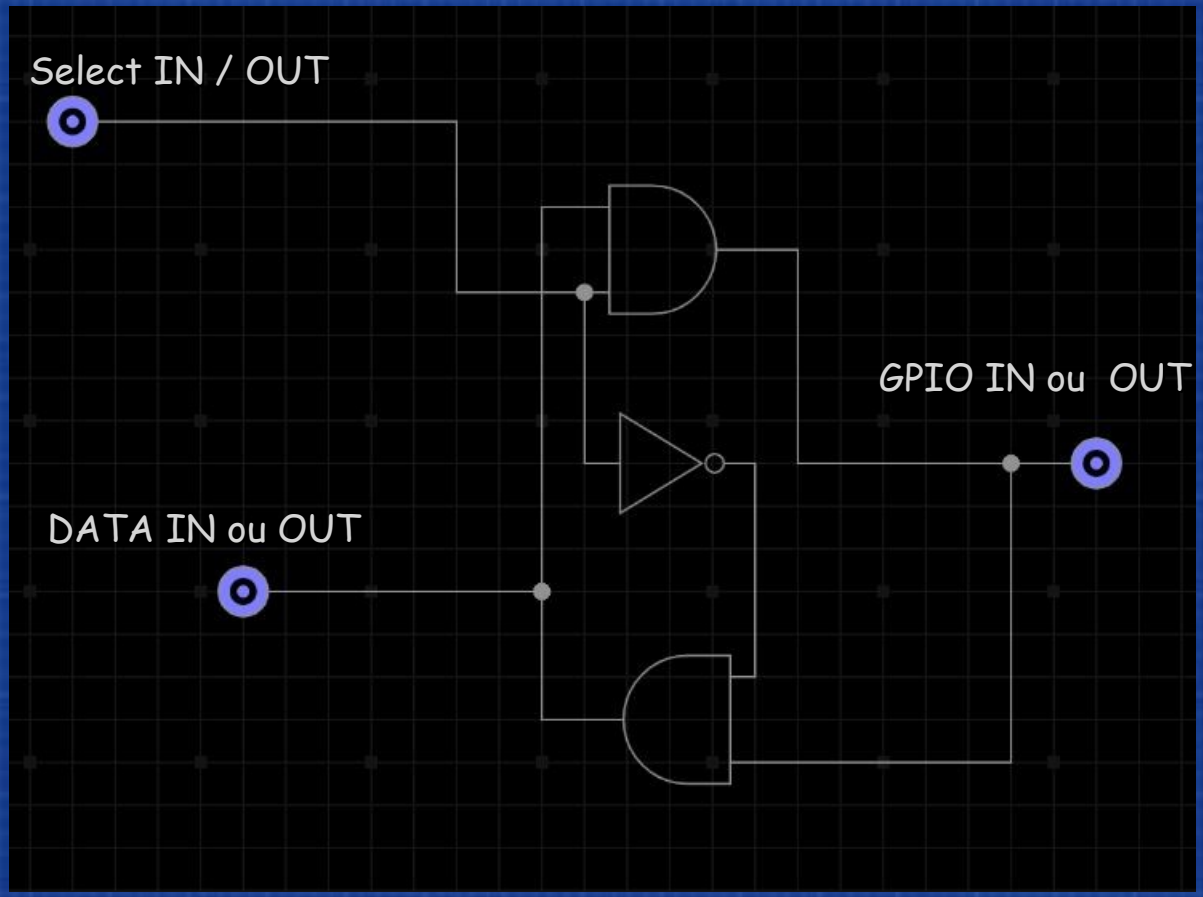
Porte

Alarme ON/OFF



CIRCUITS LOGIQUES

GPIO SETUP



CIRCUITS LOGIQUES

GPIO SETUP