

## Parte C

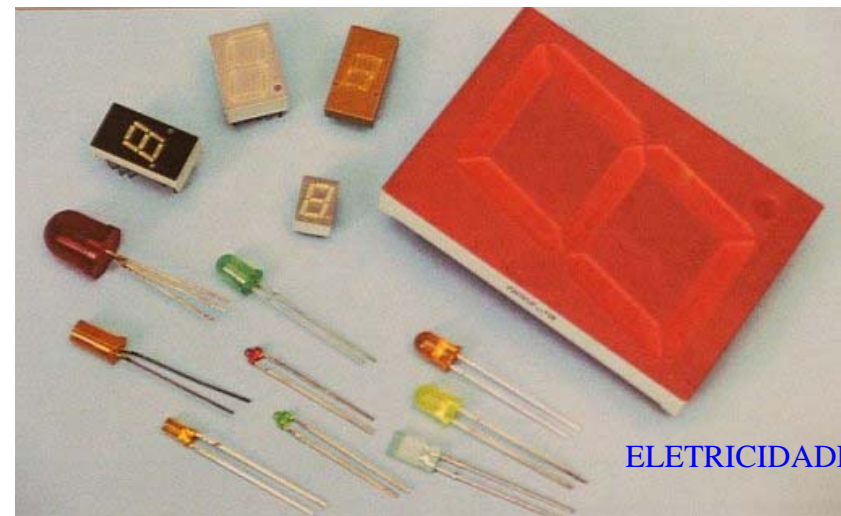
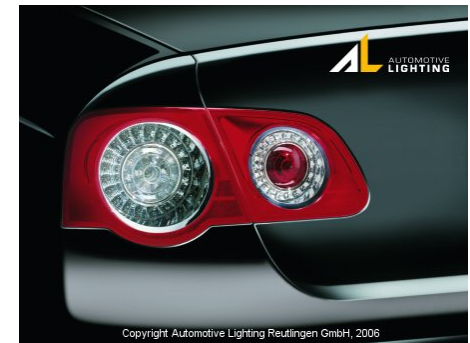
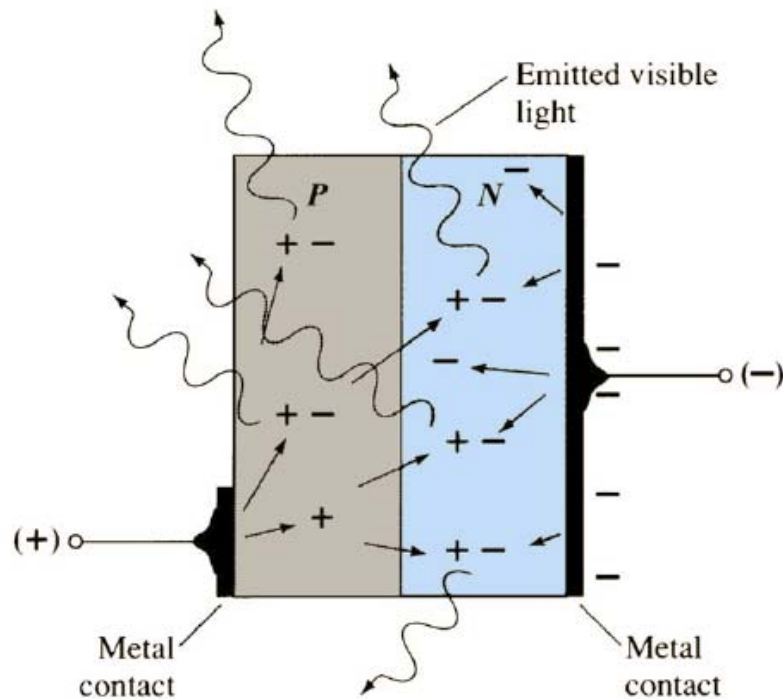
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# Diodos

# LEDs

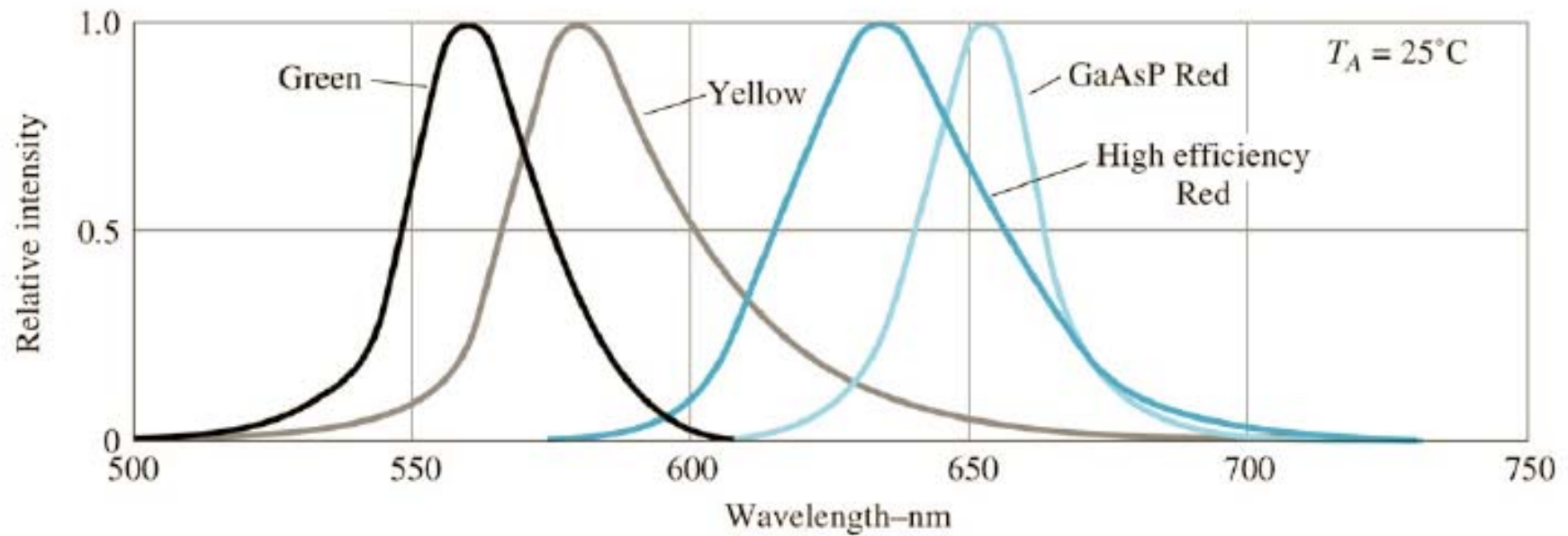
## Diodos emissores de luz (LEDs):

- Eletroluminescência – processo de emissão de luz pela aplicação de uma fonte elétrica de energia.



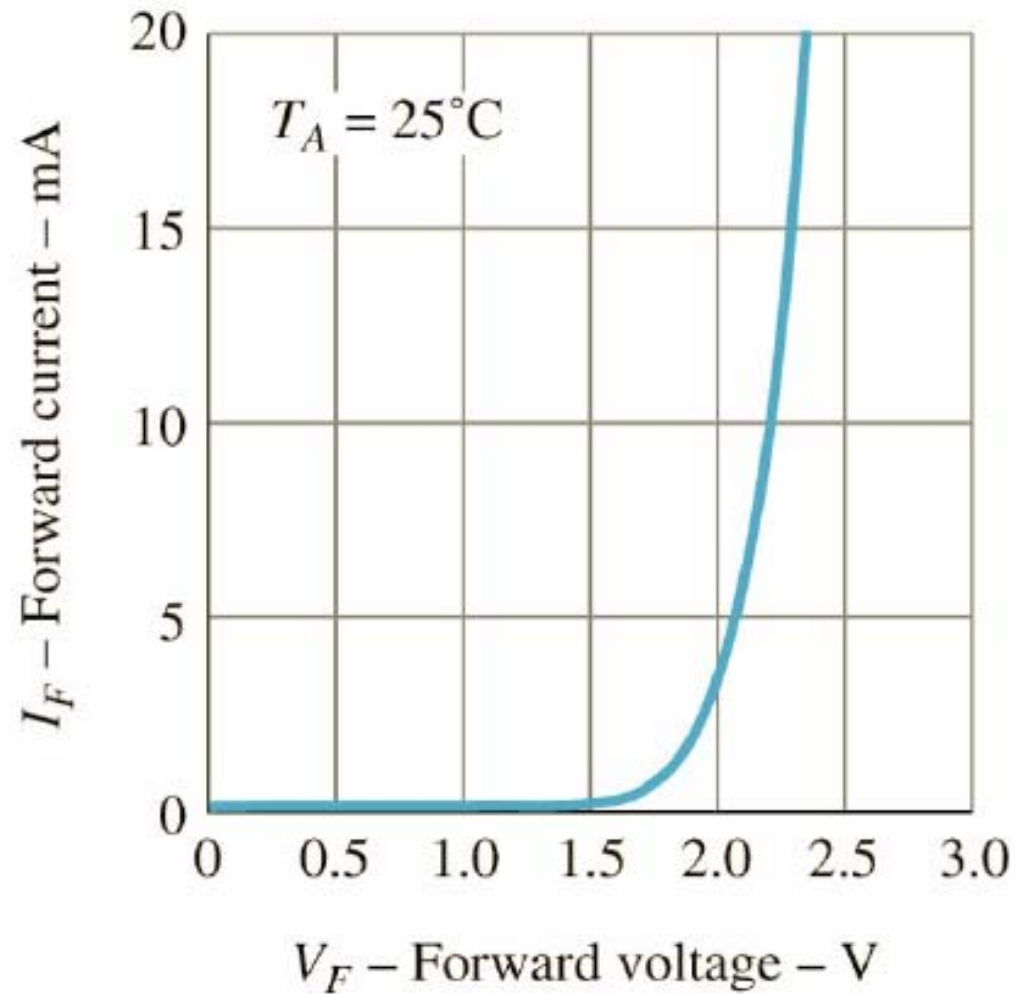
# LEDs

## Comprimentos de onda dos leds:



# LEDs

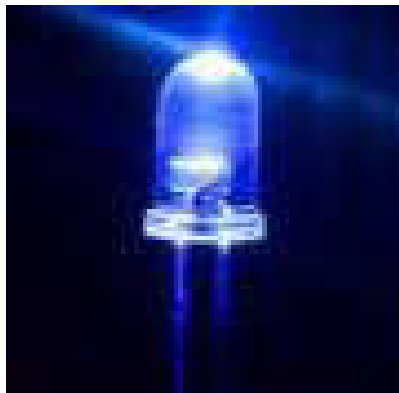
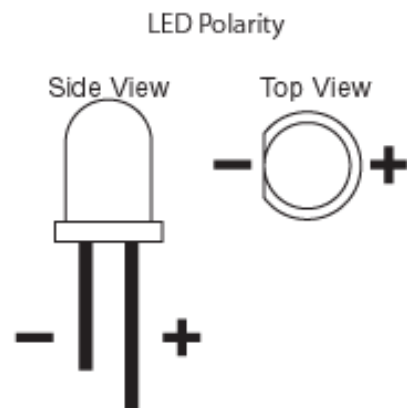
## Corrente direta versus tensão direta para leds miniatura:



# LEDs

## Exercícios:

- Dimensionar circuitos com LED conforme especificações de fabricantes.



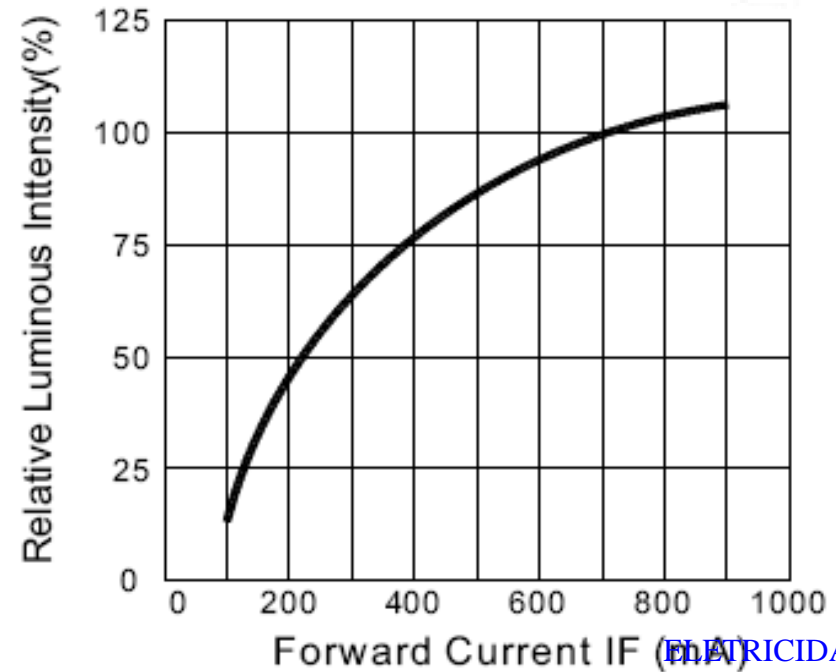
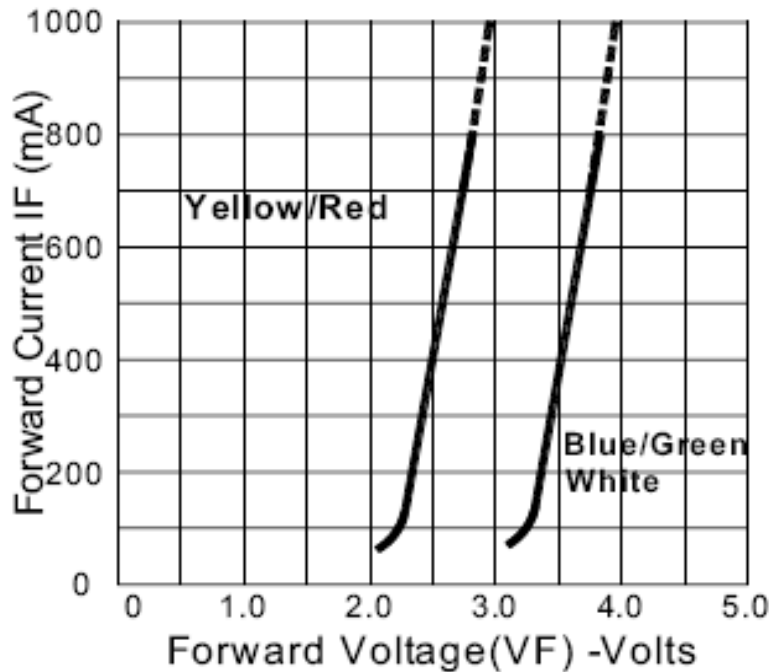
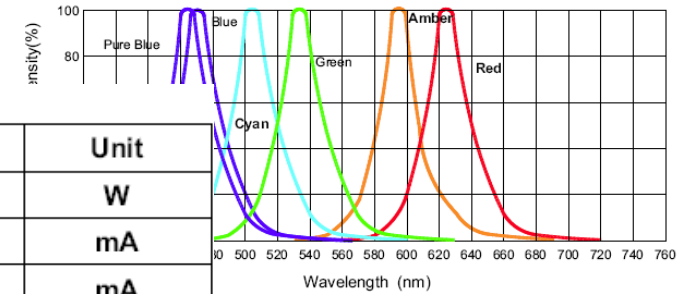
Spec	Value
Product ID	L4-0-Y5TH30-1
Angle	30
Package	5mm
Color	
Peak Wavelength in nm	590
Luminous Intensity	5000mcd typ. @ 20mA
Max Forward Current	30mA
Max Forward Current Pulse	100mA for $\leq 10\text{ms}$ , duty $\leq 1/10$
Forward Voltage	2.25V typ. 2.6V max @ 20mA
Max Reverse Voltage	5V
Power Dissipation	
Operating Temp	-30 to +85 C
Soldering Temp	260 C for 5 Sec.
Max Reverse Current	10uA @ 5V

# LEDs

## SPECIFICATIONS FOR UPEC POWER LIGHT SOURCE TYPE LED

### Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Max	Unit
Power Dissipation	PD	3	W
Pulse Forward Current	IPF	1000	mA
Forward Current	IF	700	mA
Reverse Voltage	VR	5	V
Operating Temperature Range	Topr	- 40 to +85	°C
Storage Temperature Range	Tstg	- 40 to + 85	°C



# LEDs

## SPECIFICATIONS FOR UPEC LTCC LIGHT SOURCE LED

### MAXIMUM RATINGS

Parameter	Symbol	Values			Unit
		Red	Pure Green	Blue	
Operating temperature range	$T_{op}$	-40 ... + 85			°C
Storage temperature range	$T_{stg}$	-40 ... +100			°C
Power dissipation (Max)	$P_d$	2			W
Pulse forward current per chip	$I_{pf}$	250	300	250	mA
Forward current (R,G,B)	$I_f$	150	200	150	mA
Test current (White mixed)	$I_f$	100	200	50	mA
Reverse voltage	$V_r$	5			V



### CHARACTERISTICS ( $T_J = 25\text{ }^\circ\text{C}$ )

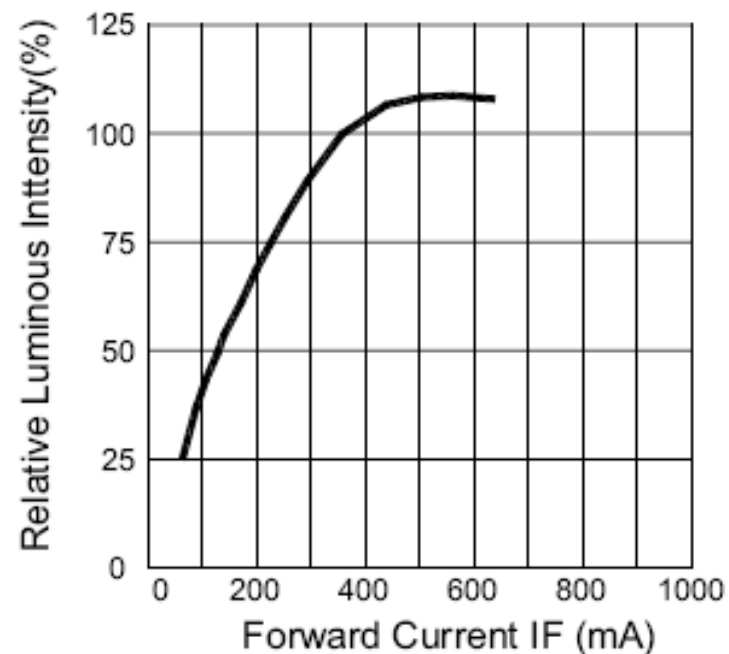
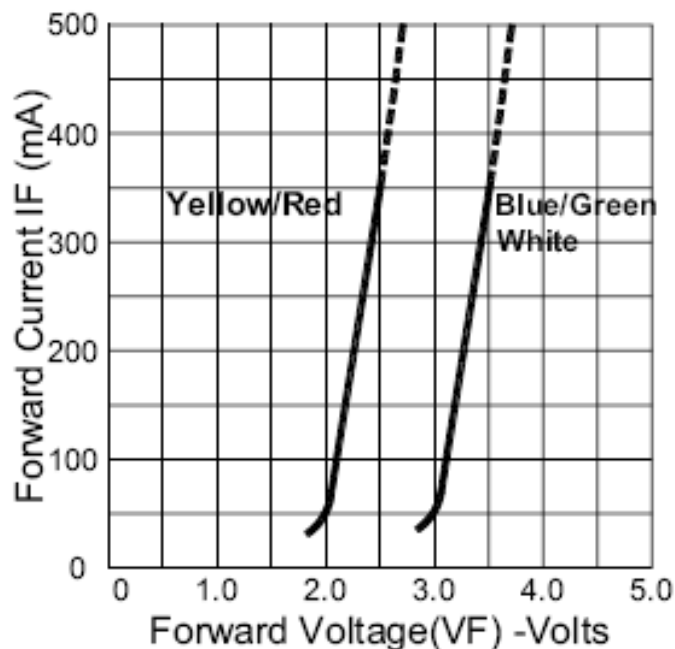
Parameter	Symbol	Values			Unit
		Red	Pure Green	Blue	
Dominant wavelength	$\lambda_{dom}$	620~630	520~530	455~465	nm
Spectral bandwidth at 50 % (Typ)	$\Delta\lambda$	20	30	20	nm
Viewing angle at 50% $I_v$	$2\theta_{1/2}$	120	120	120	deg.
Forward voltage	$V_f$	2.0 3.0	2.8 3.6	2.8 3.6	V
Reverse current	$I_r$	100			$\mu\text{A}$

# LEDs

## SPECIFICATIONS FOR UPEC LED LIGHT SOURCE TYPE SYSTEM

### Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Max	Unit
Power Dissipation	PD	6	W
Pulse Forward Current	IPF	500	mA
Forward Current	IF	350	mA
Operating Temperature Range	Topr	- 40 to + 120	°C
Storage Temperature Range	Tstg	- 40 to + 120	°C

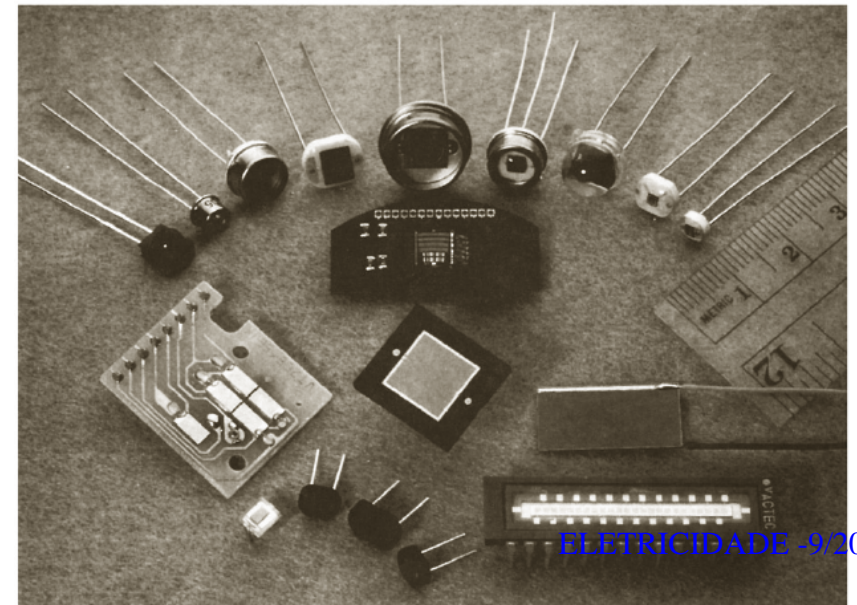
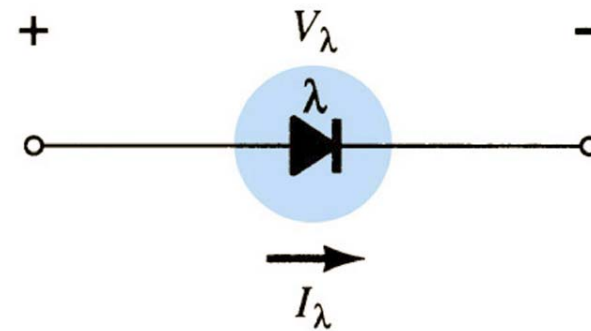
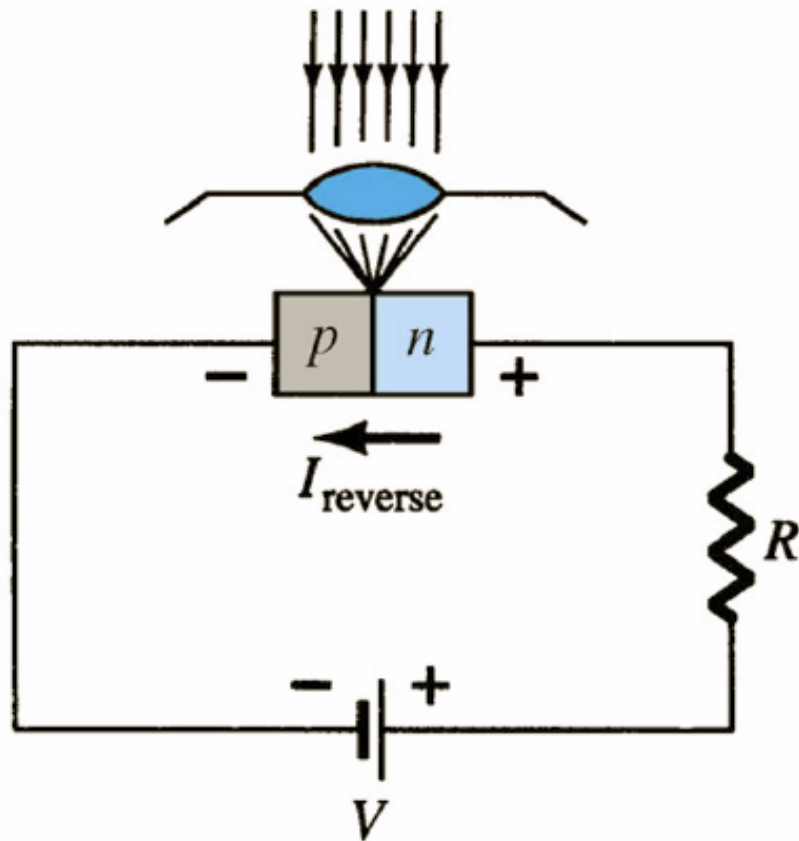




# Fotodiodos

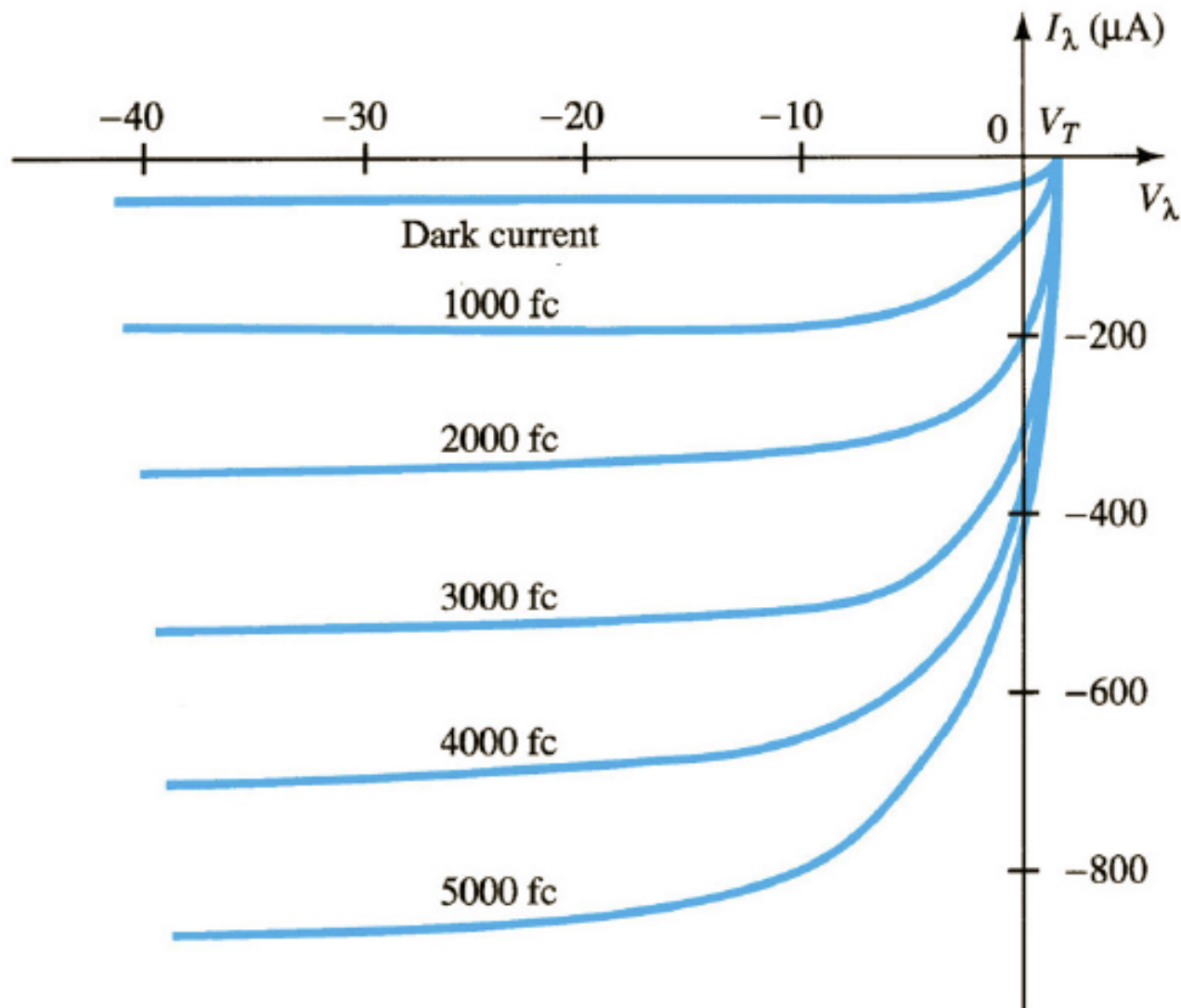
## Fotodiodos:

- São diodos que operam na região reversa e são sensíveis à luz.
- Optoeletrônica – campo de estudo dos dispositivos sensíveis à luz.



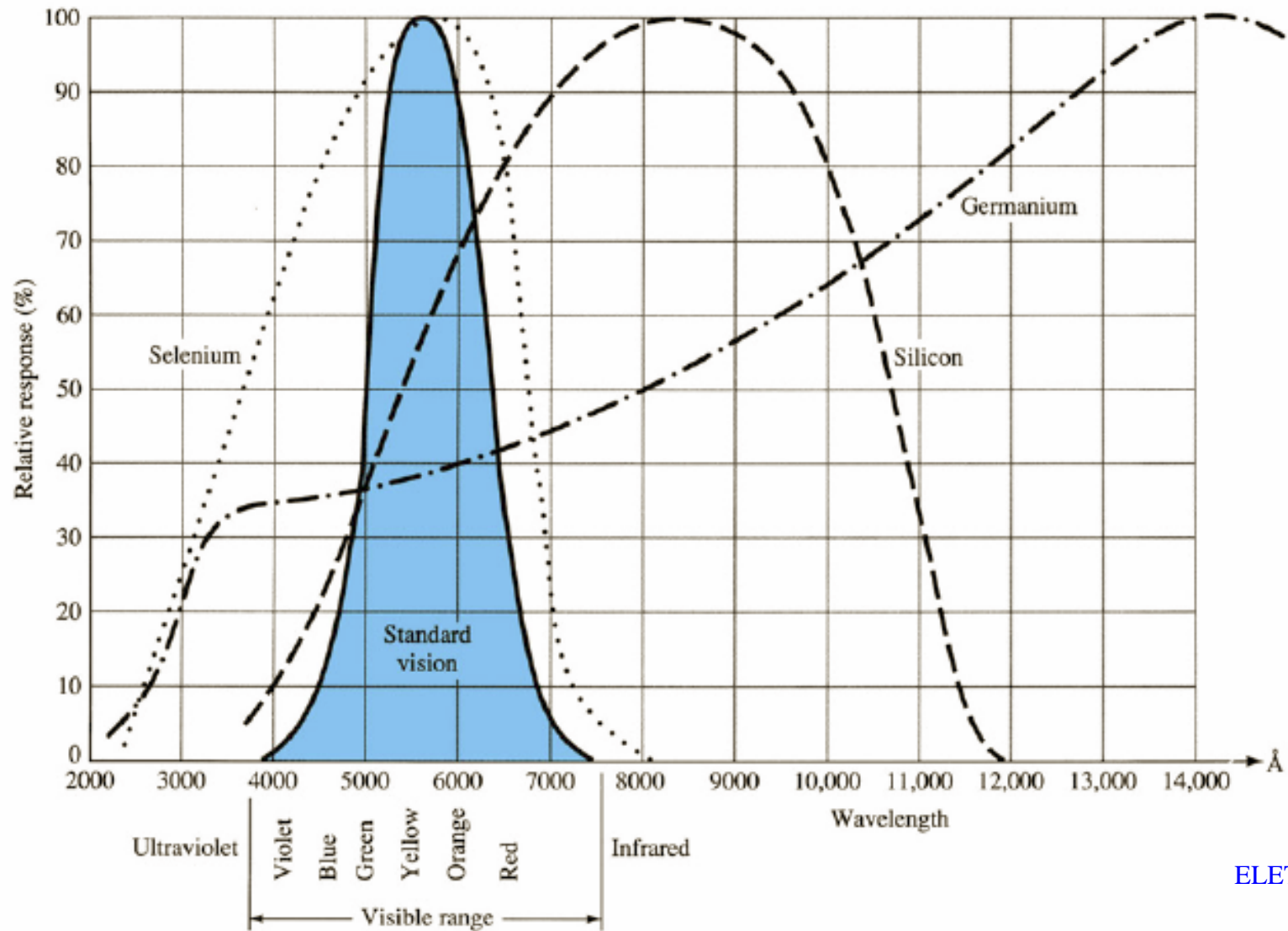
# Fotodiodos

## Curvas características dos fotodiodos:



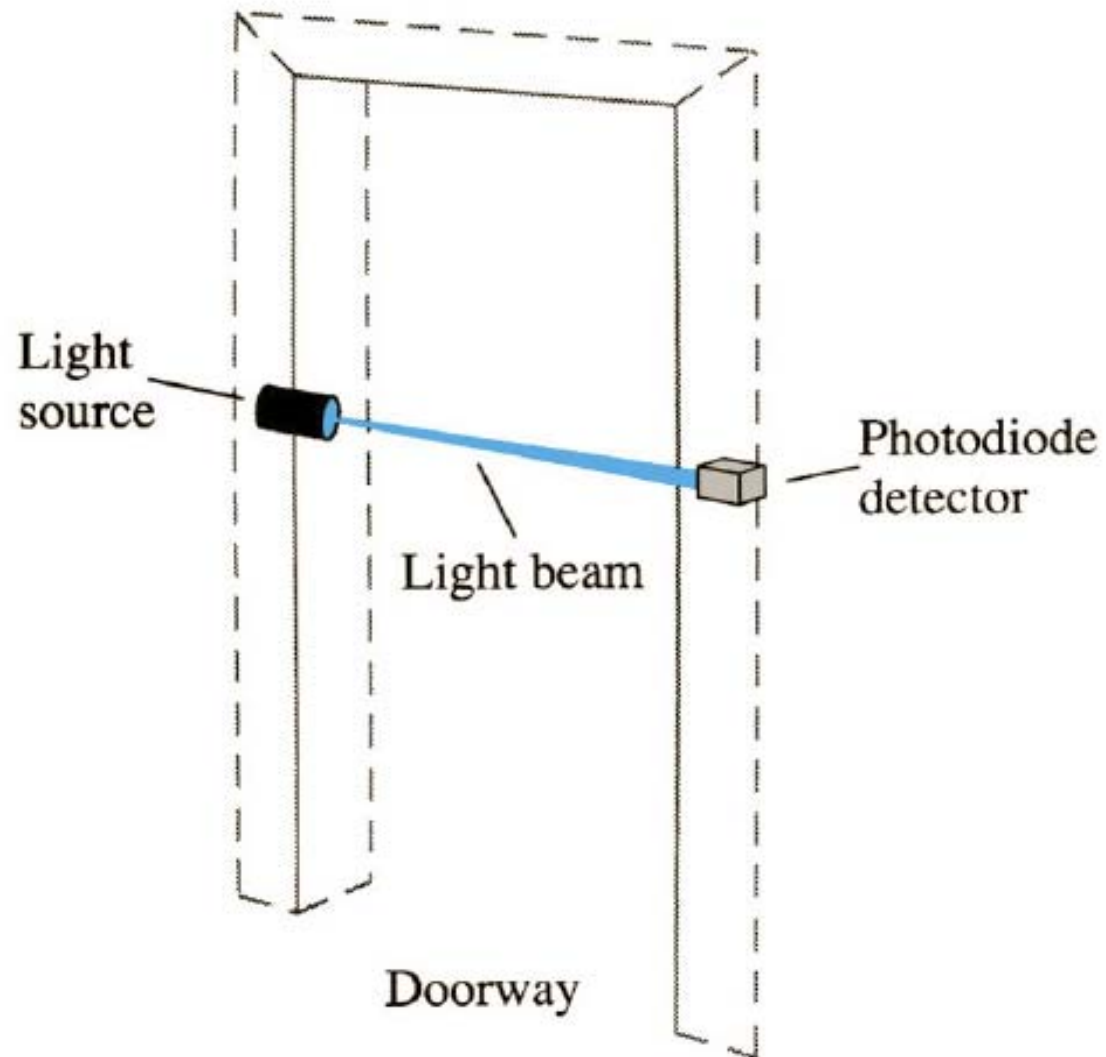
# Fotodiodos

## Resposta espectral de fotodiodos:



# Fotodiodos

**Exemplo de aplicação:**



## Parte D

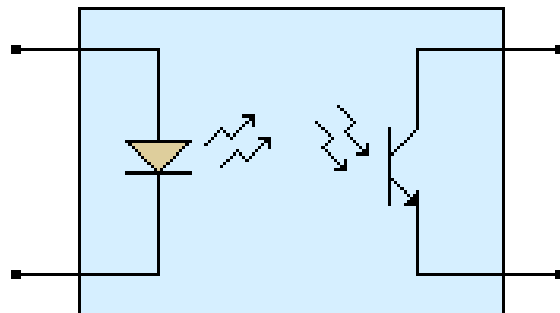
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# Transistores

# Fototransistor

## Fototransistor:

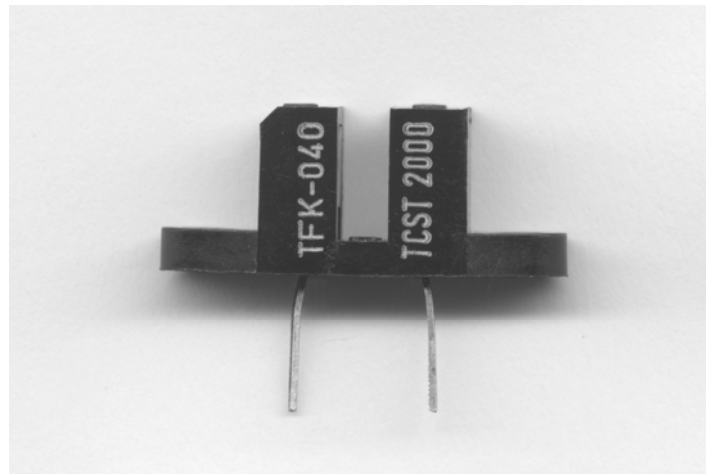
- São transistores sensíveis à luz.



# Optoacopladores

## Optoacoplador:

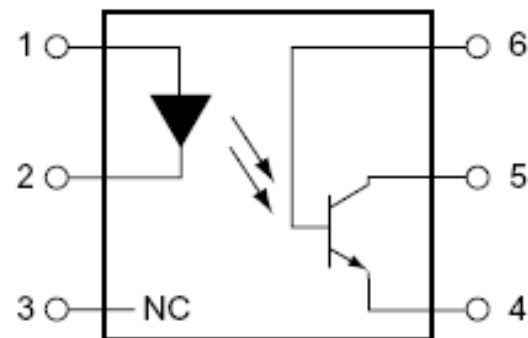
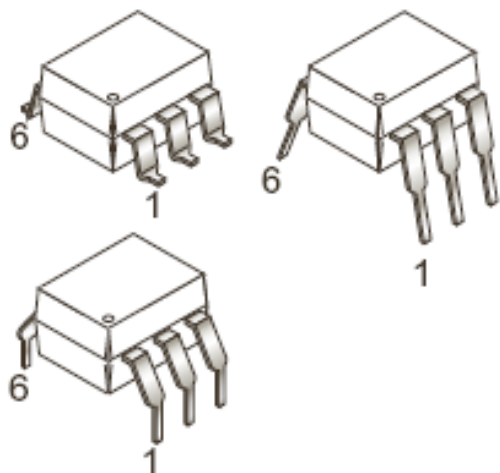
- São dispositivos que possuem no mesmo encapsulamento um fotodiodo e um fototransistor (ou tiristor), montados de maneira a permitirem o acoplamento óptico entre os dois.
- Usados para isolação entre circuitos, pois não ocorre ligação elétrica entre os circuitos, por exemplo para transmissão de dados.



# Optoacopladores

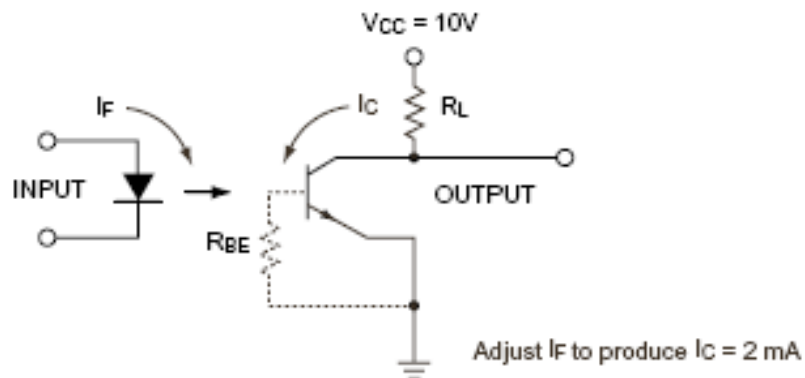


4N25M, 4N26M, 4N27M, 4N28M, 4N35M, 4N36M, 4N37M,  
H11A1M, H11A2M, H11A3M, H11A4M, H11A5M  
General Purpose 6-Pin Phototransistor Optocouplers

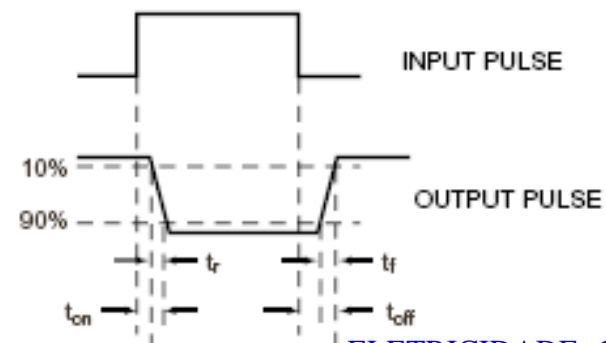


- PIN 1. ANODE
- 2. CATHODE
- 3. NO CONNECTION
- 4. EMITTER
- 5. COLLECTOR
- 6. BASE

TEST CIRCUIT



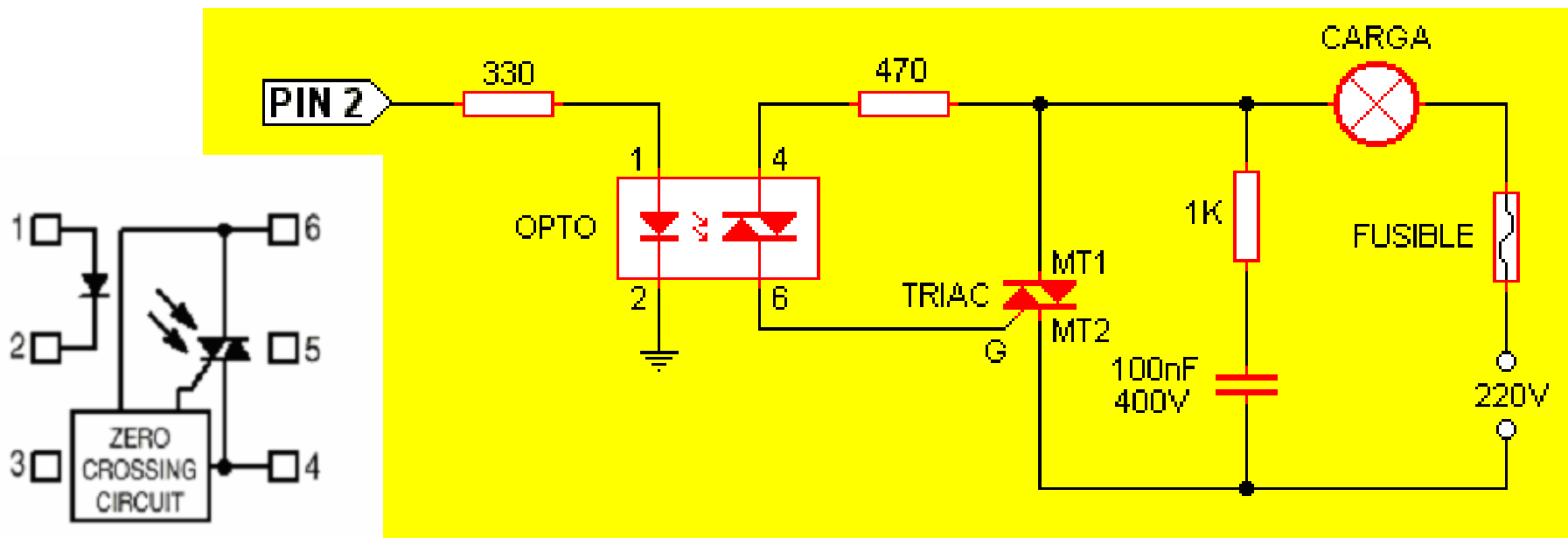
WAVE FORMS



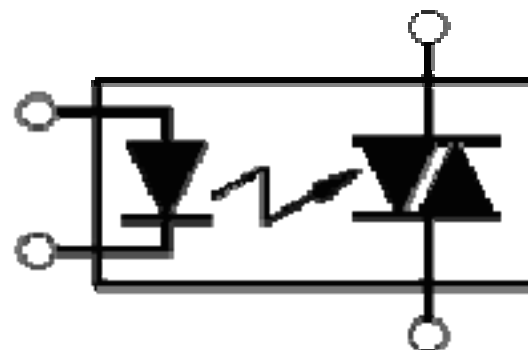


# Optoacopladores

## Optoacoplador com saída tiristorizada:



- 1. ANODE
- 2. CATHODE
- 3. NC
- 4. MAIN TERMINAL
- 5. SUBSTRATE  
DO NOT CONNECT
- 6. MAIN TERMINAL



## **Outros dispositivos**

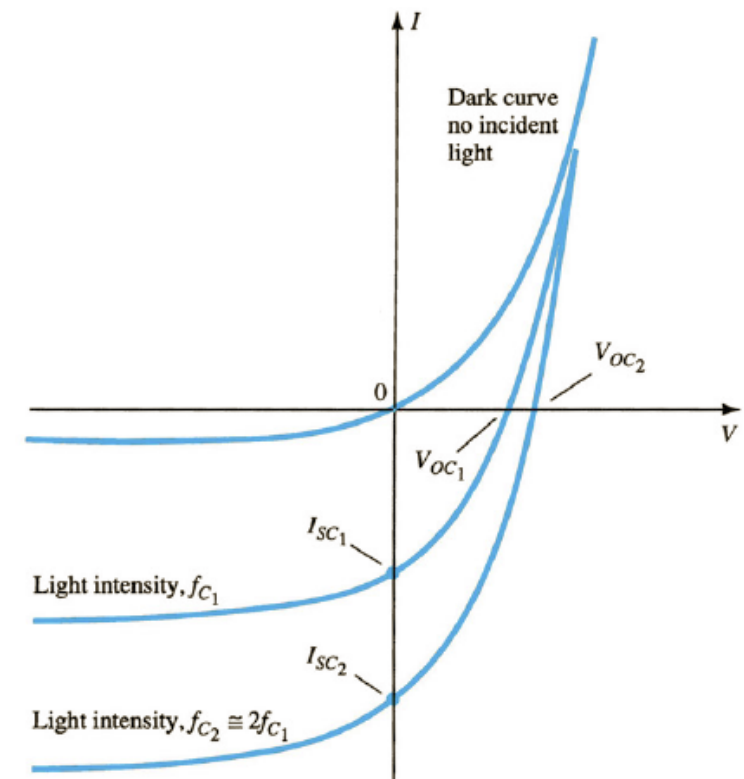
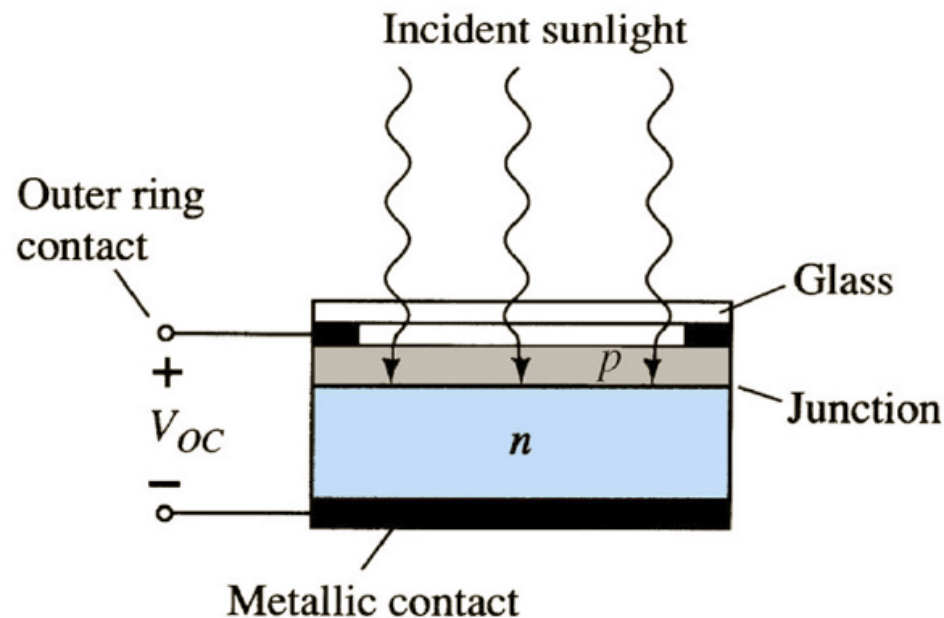
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# **Células solares**

# Células solares

## Células solares:

- São dispositivos construídos a partir de materiais semicondutores e que são sensíveis à luz.
- Geram potências da ordem de mW quando iluminados.



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