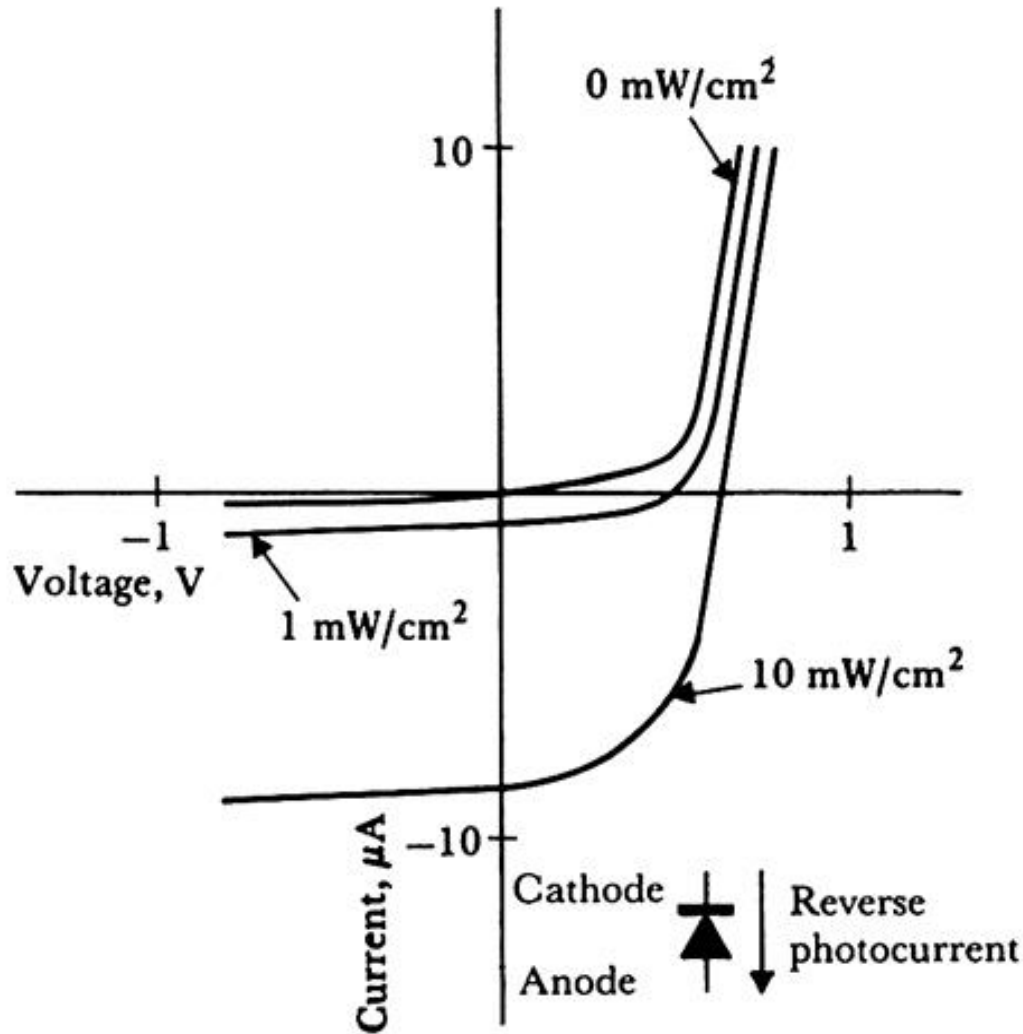


FOTODIODO  
FOTOTRANSISTOR  
&  
FOTOACOPLADOR

Prof. Sérgio F. Pichorim

(figuras Boylestad, Webster e outras fontes)

# Fotodiodo

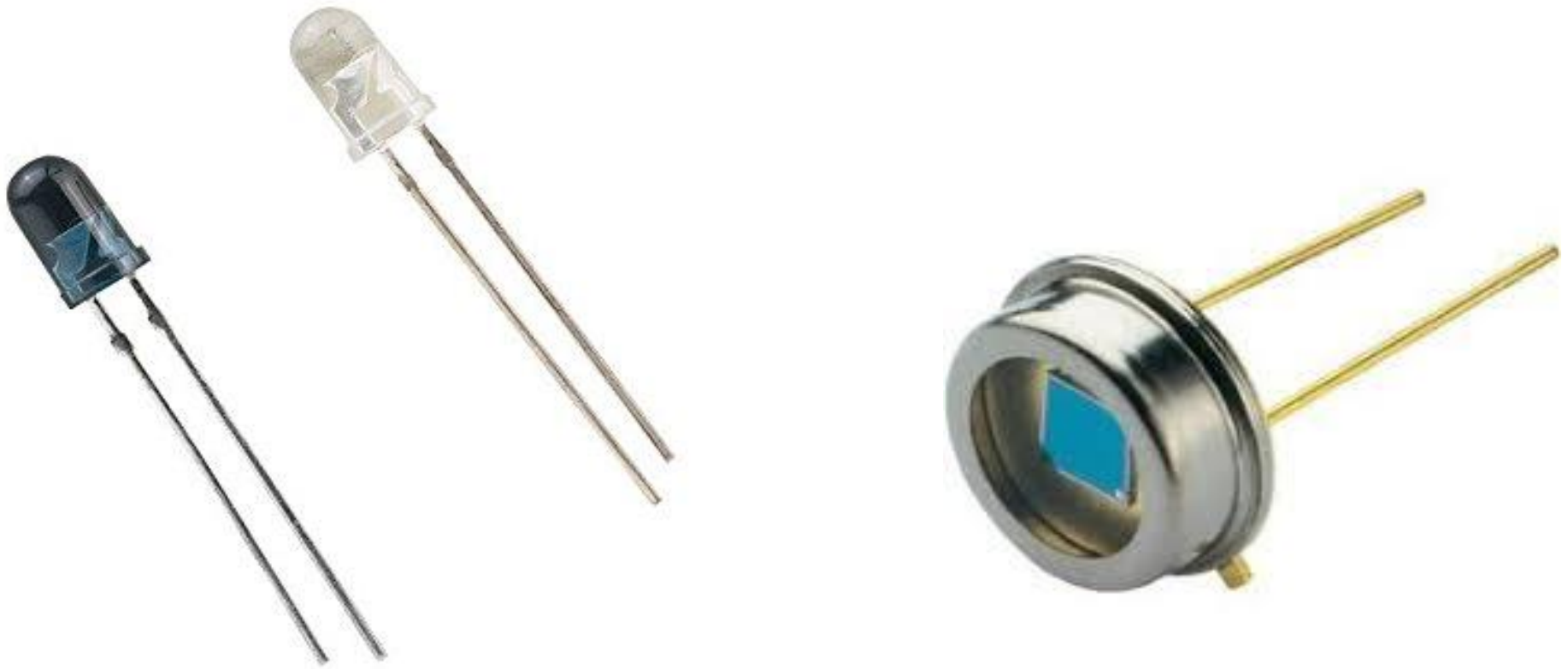


For 0 irradiance, both forward and reverse characteristics are normal.  
For  $10 \text{ mW/cm}^2$ , open-circuit voltage is  $600 \text{ mV}$  and short-circuit current is  $8 \mu\text{A}$ .

Efeitos Fotovoltaico e Fotocondutivo

Corrente de Saturação Reversa ( $I_s$ ) ( $I_{\text{FUGA}}$ ) proporcional à intensidade de luz.

Silício  $\rightarrow$  sensível ao IR ( $900 \text{ nm}$ )



- Resposta mais rápida e mais linear do que os LDRs.
- Usados em sensores e comunicações ópticas.

*Ver datasheet!*

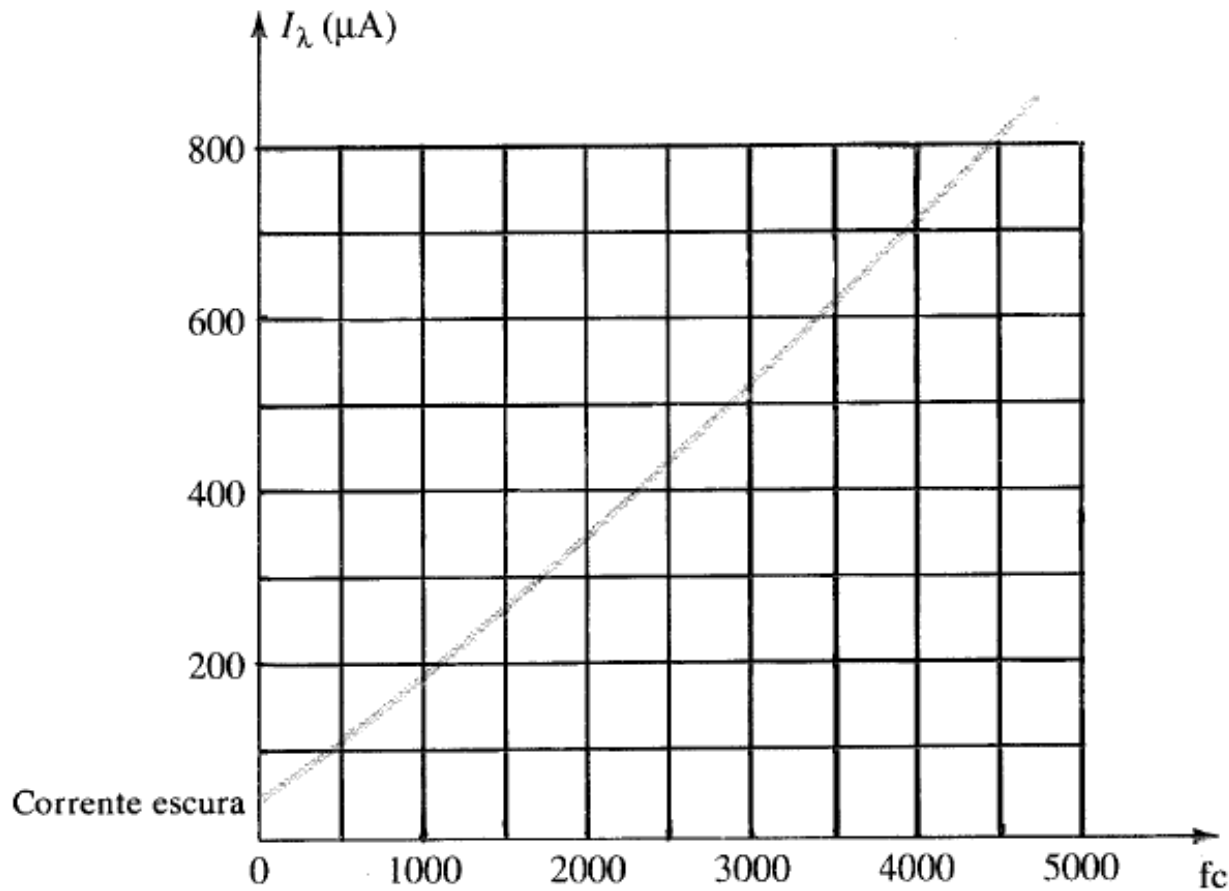
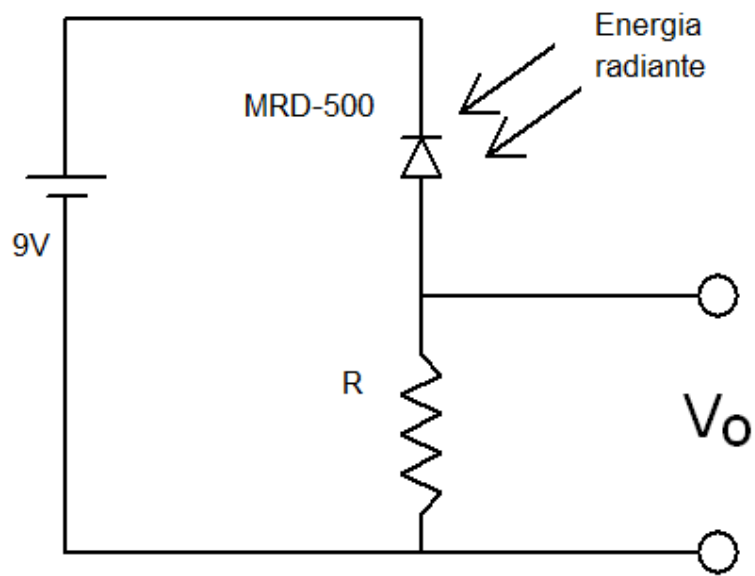


Fig. 20.24  $I_\lambda$  ( $\mu\text{A}$ ) versus  $f_c$  (em  $V_A = 20 \text{ V}$ ) para o fotodiodo da Fig. 20.22.

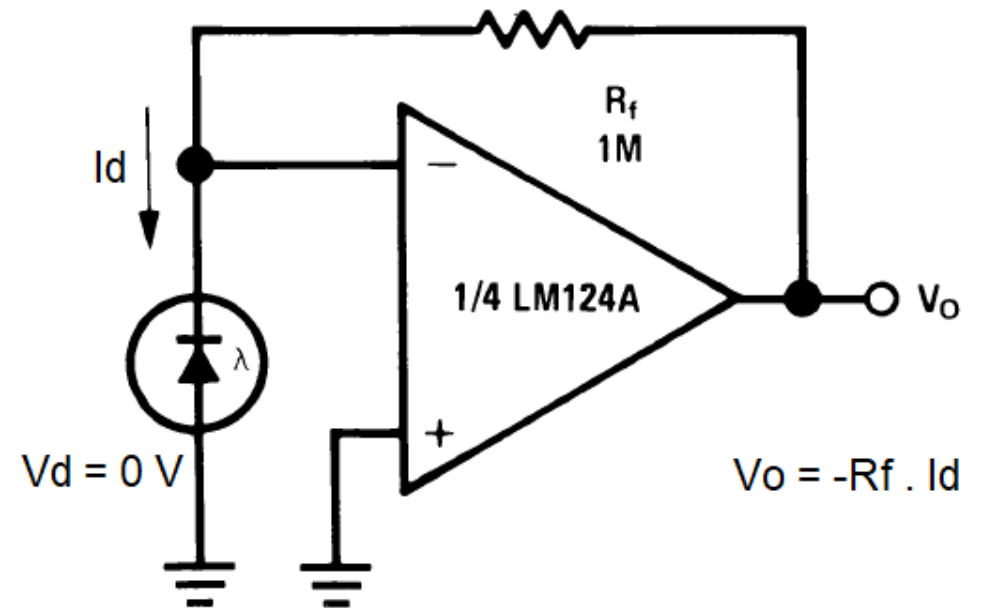
1 fc = foot-candle = 1 lúmen por  $\text{ft}^2 = 10,7 \text{ lux}$ .  
 A iluminação de uma sala de estar = 100 a 200 lux.  
 4.000 fc = 43 mil lux (30 mil lux é a iluminação solar).

# Circuitos com Fotodiodo



$V_d$  é variável

## AMPLIFICADOR DE TRANSIMPEDÂNCIA

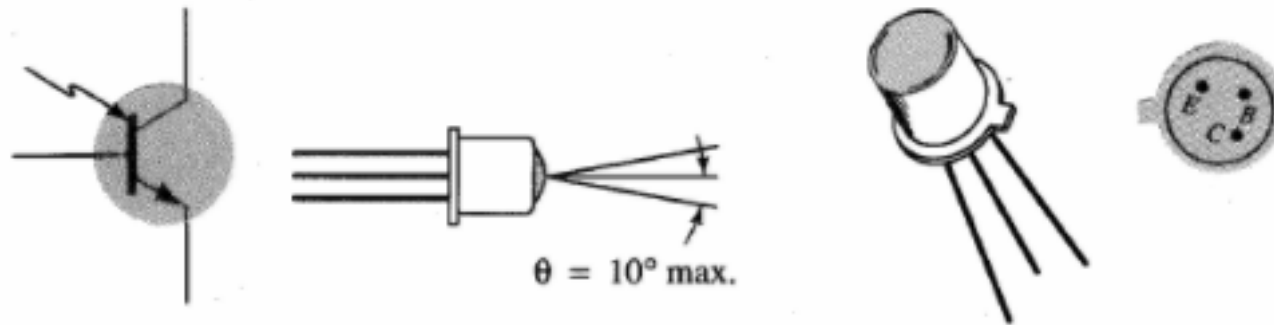
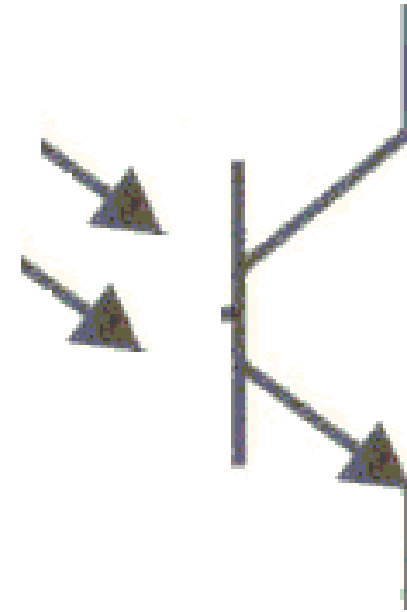


$V_d$  é nula

# FOTOTRANSISTOR

$$I_B \propto D_\lambda$$

$$I_C = \beta I_B \propto \beta \cdot D_\lambda$$



Mais sensível que o Fotodiodo!

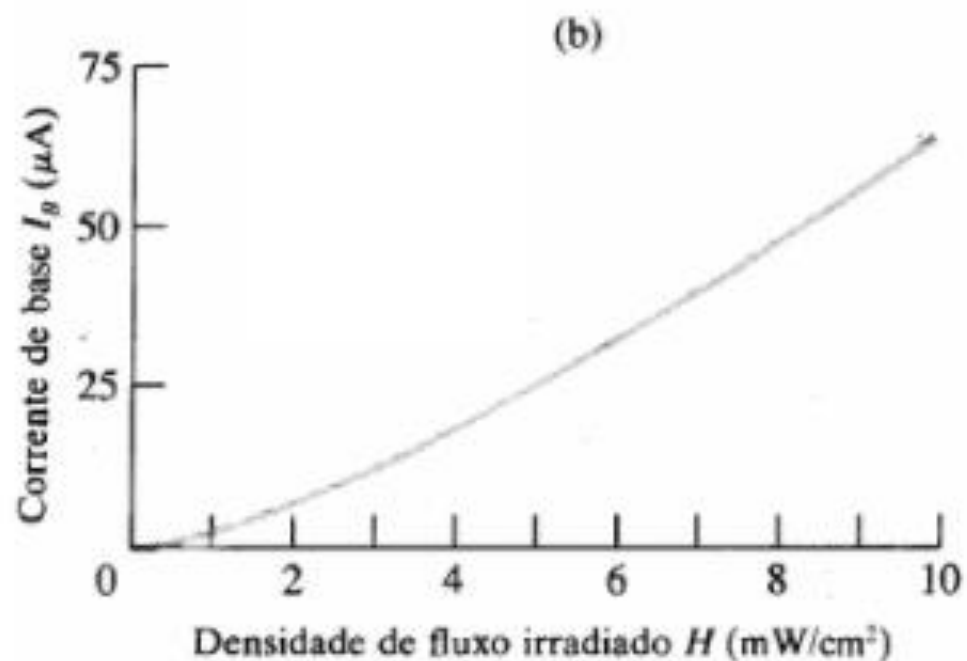
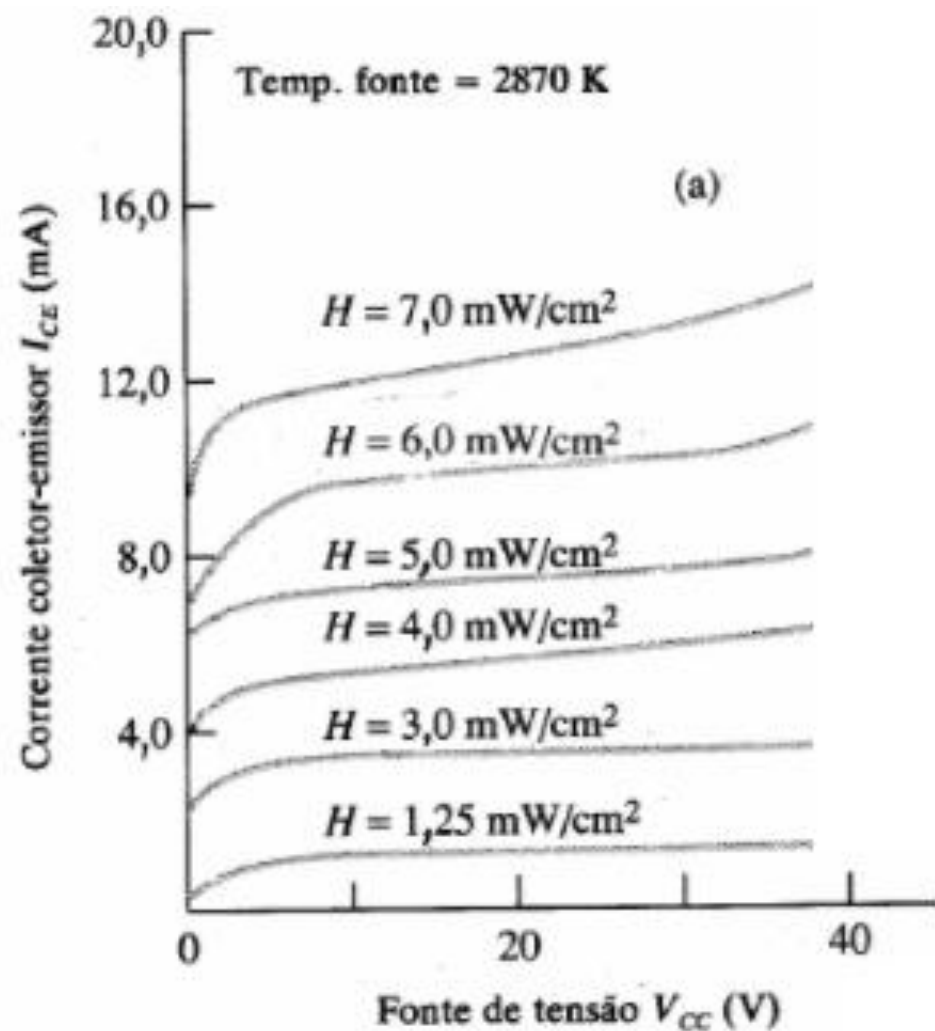
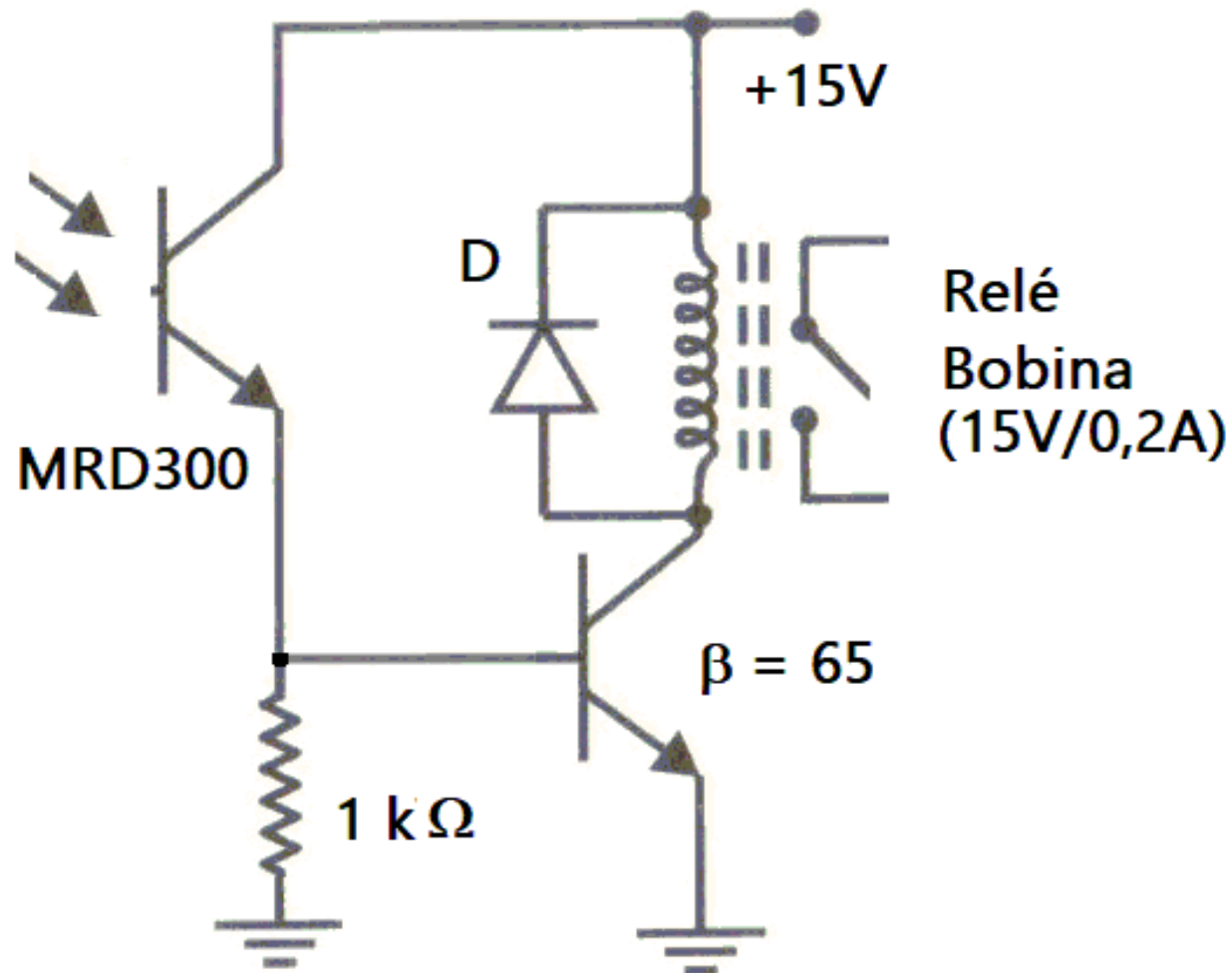


Fig. 21.50 Fototransistor (a) características de coletor (MRD300);

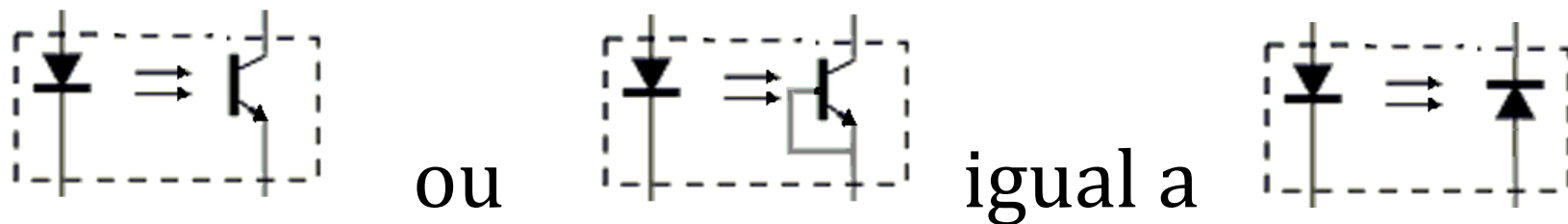
Qual a densidade luminosa necessária para ligar o relé?





# Fotoacoplador ou Fotoisolador (*optocoupler or optoisolator*)

- Isola eletricamente 2 circuitos.
- O sinal é acoplado via enlace óptico.



Exemplo: TIL 111 → 100 GΩ e 7,5 kV

**TIL111**

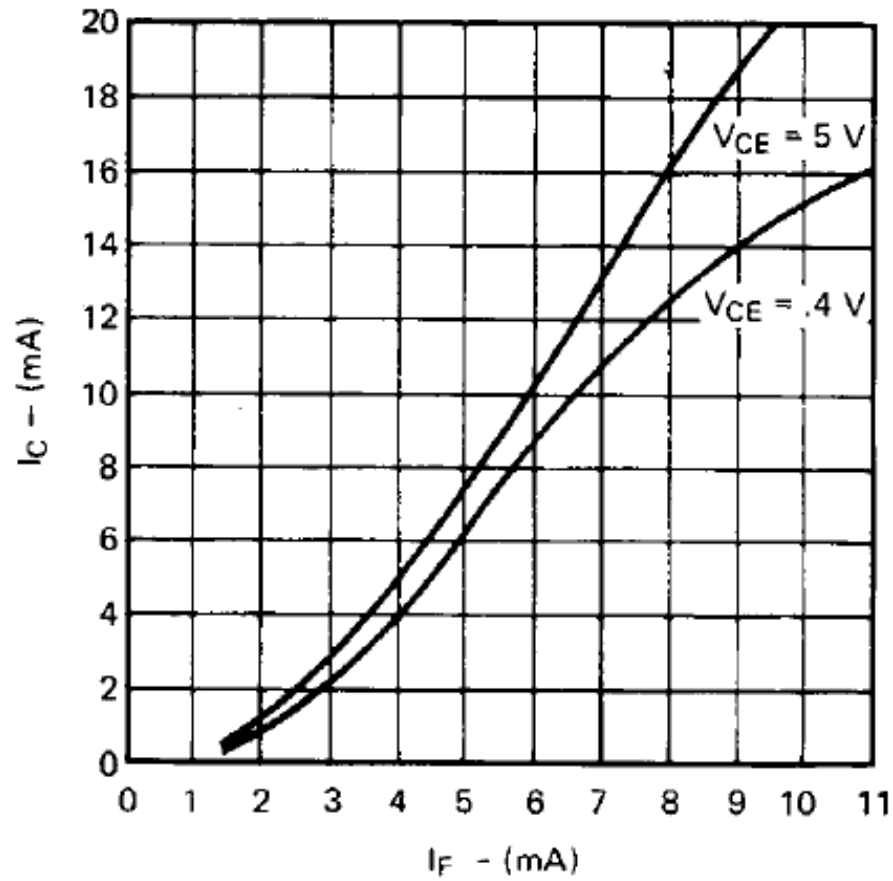
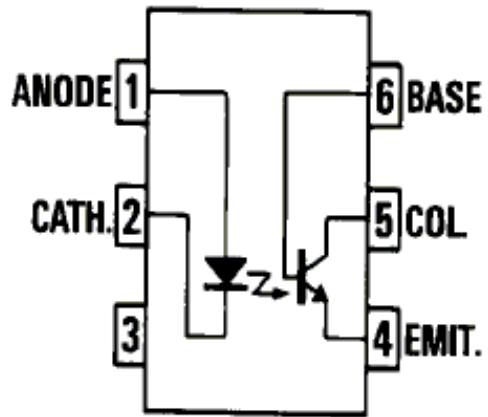
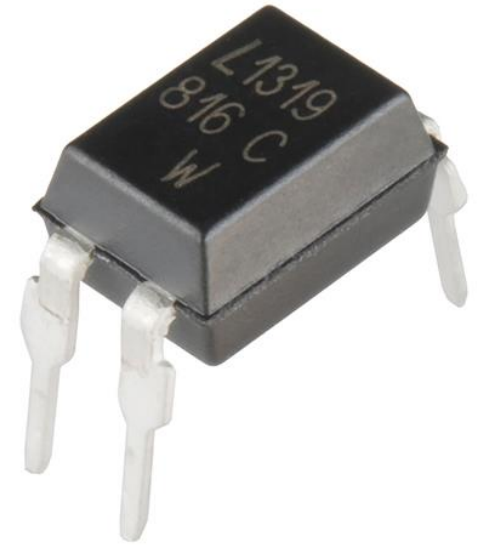
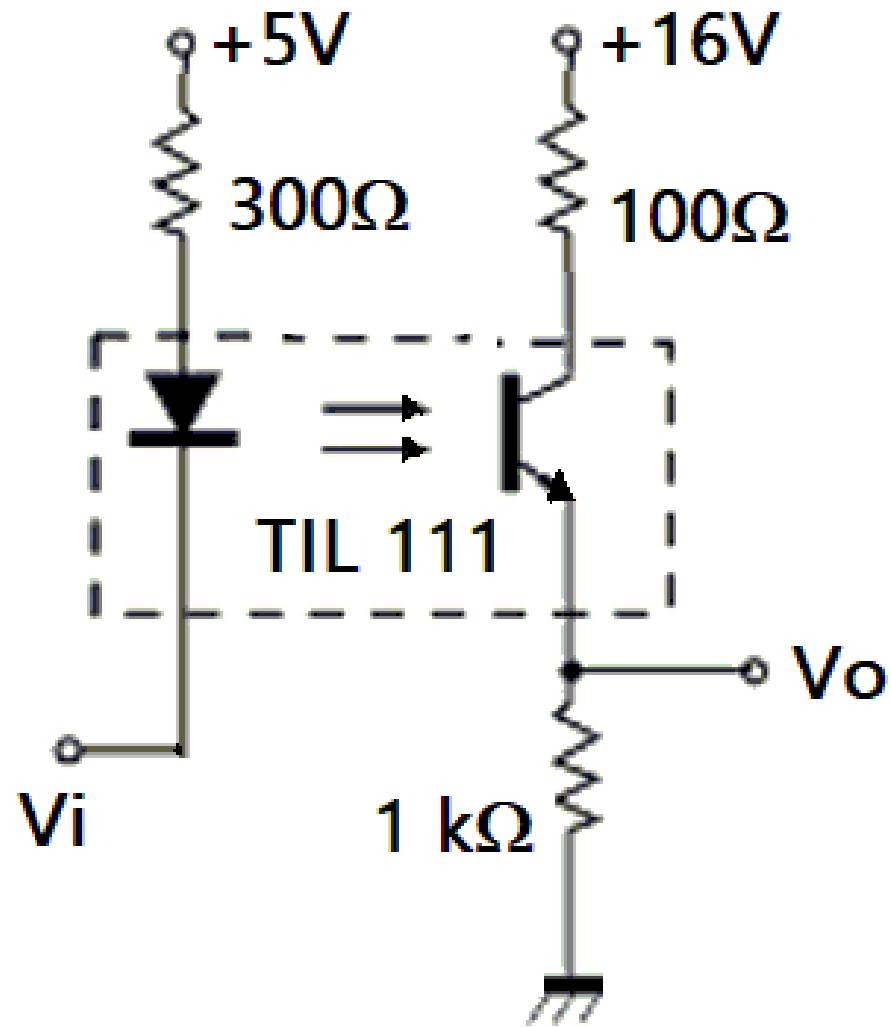


Fig. 4. Collector Current vs. Forward Current

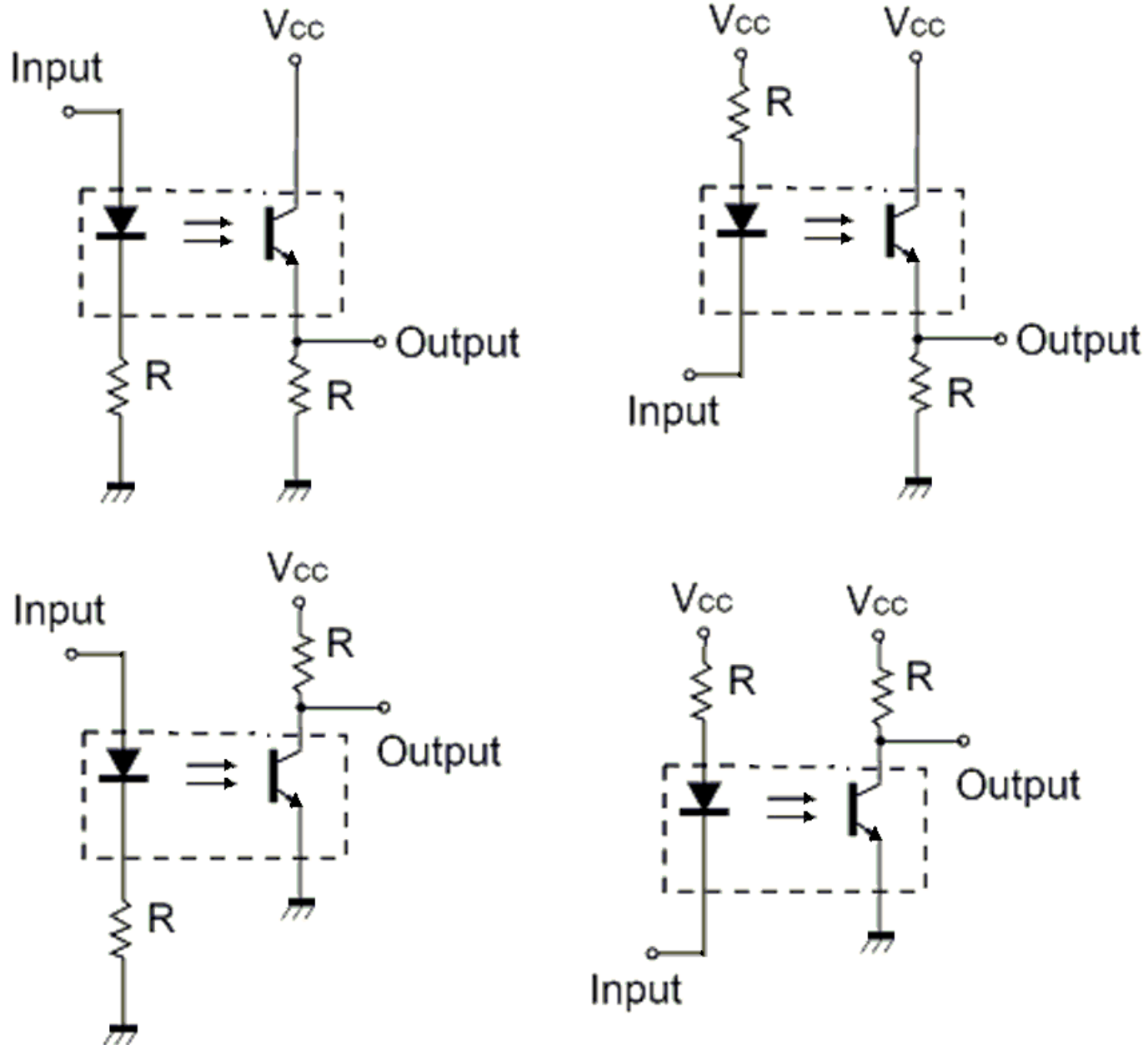


*Ver datasheet!*

Para uma tensão de 2 V em  $V_i$ , qual o valor de  $V_o$ ?



# Algumas opções de circuitos



# Outro exemplo

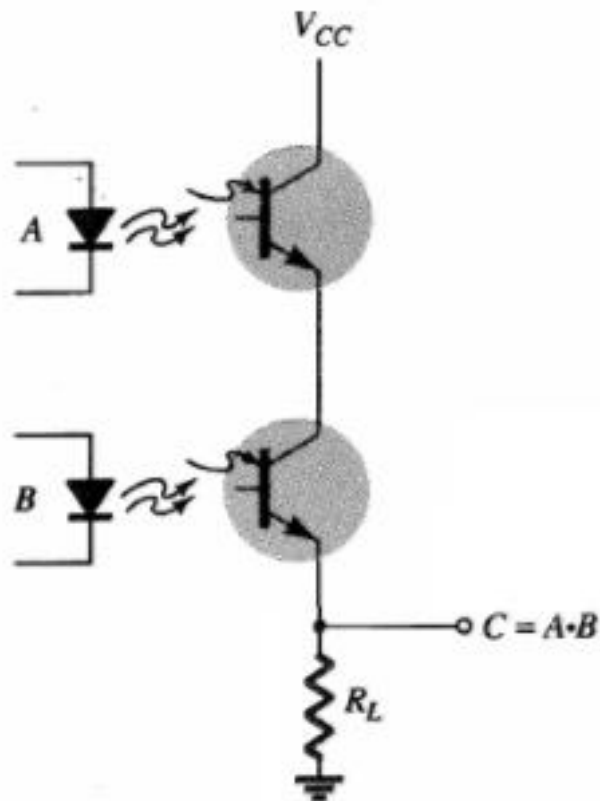
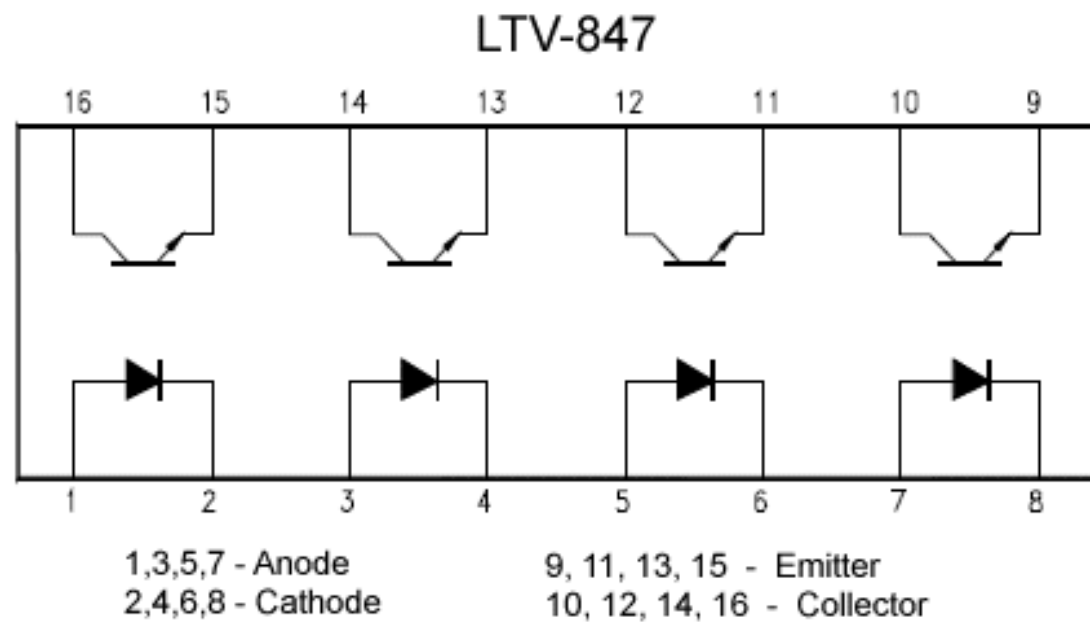


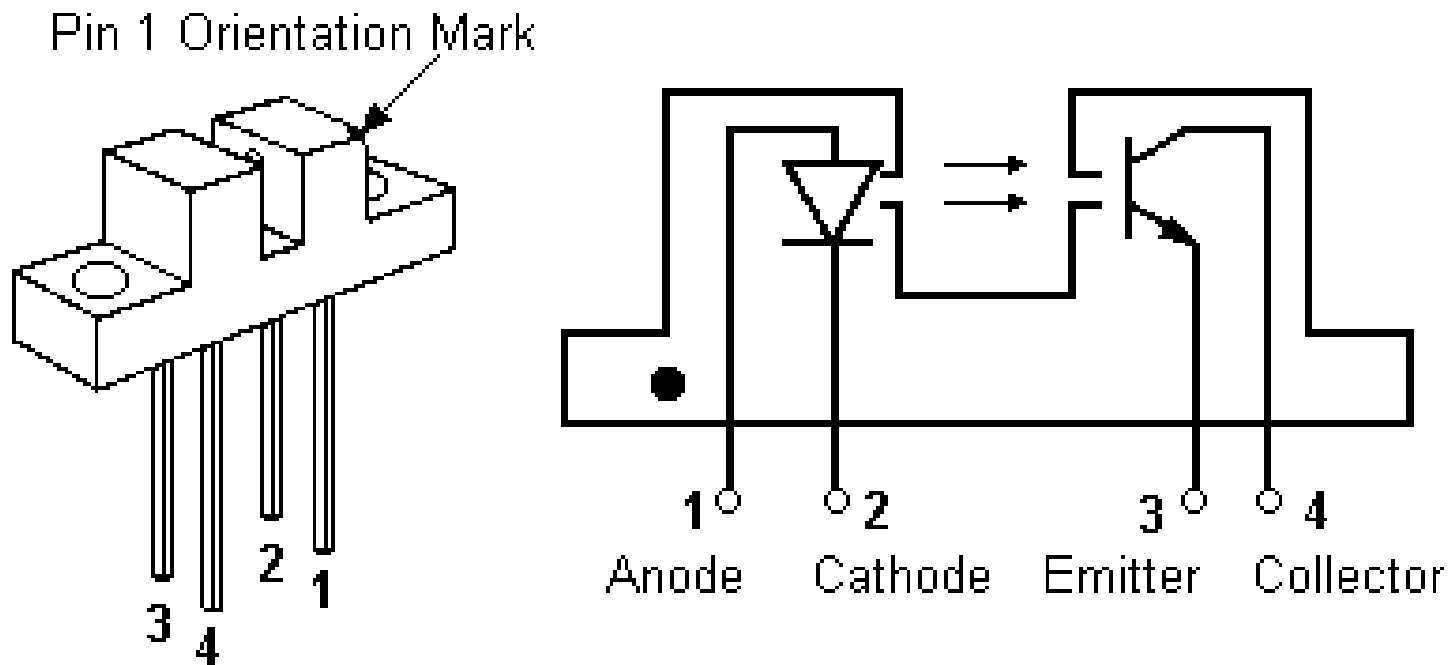
Fig. 21.52 Porta AND de alta isolação



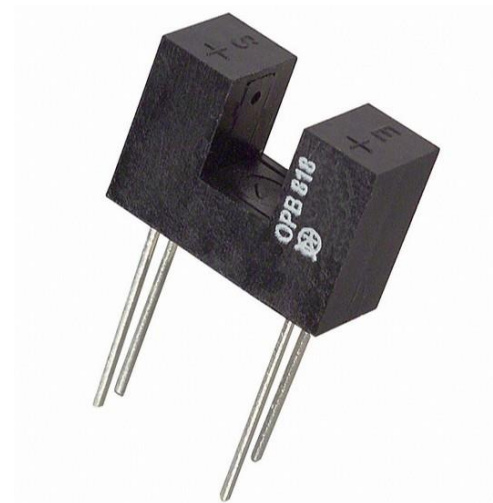
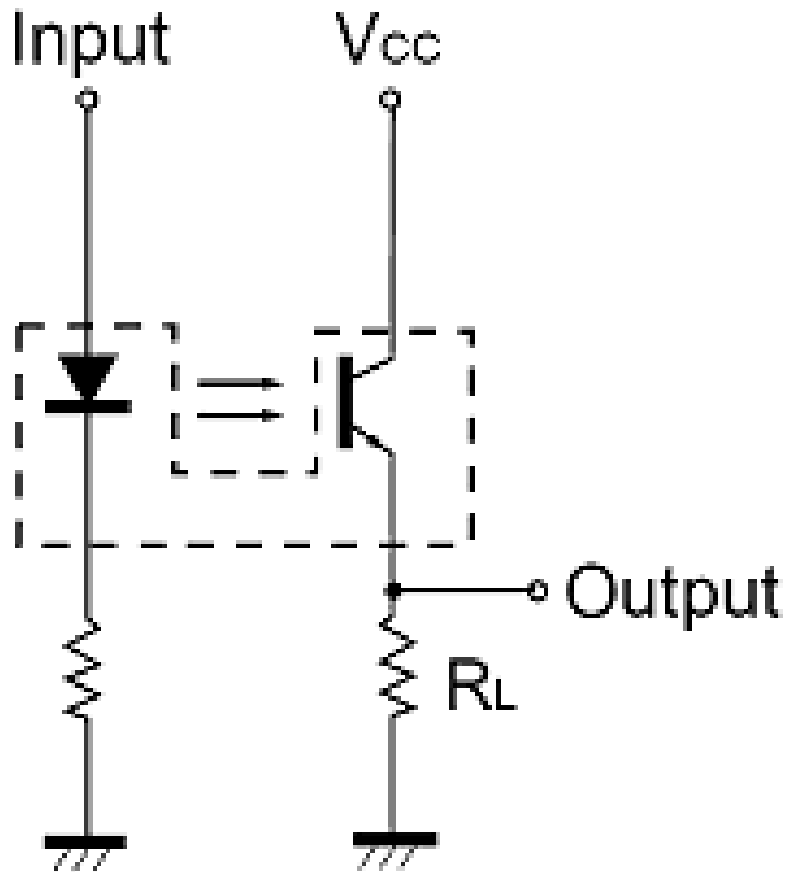
## Conjunto de Fotoacopladores

# Sensores Mecânicos: Chaves ópticas (*Opto Slot Sensor*)

Com Fenda (*Slotted* ou *Transmissive*)



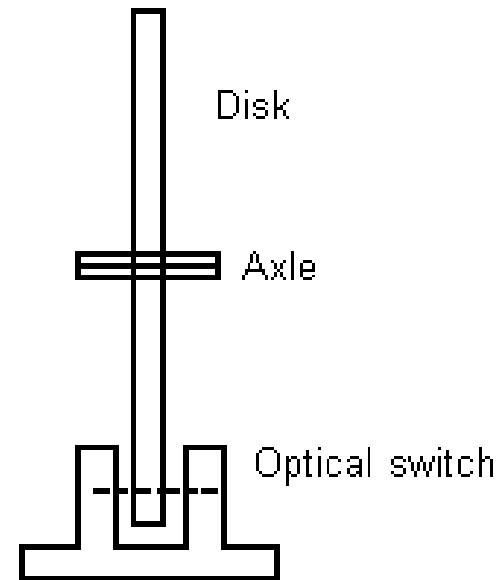
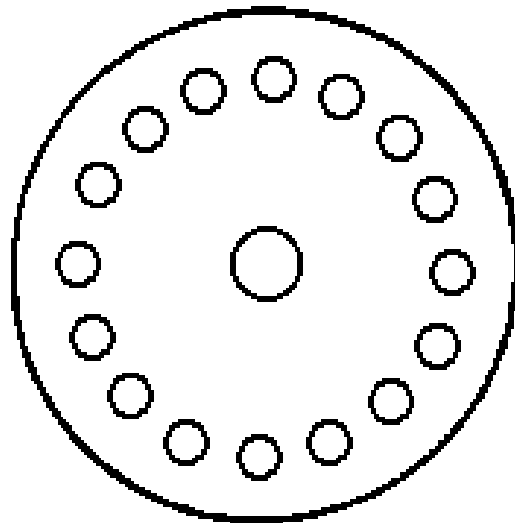
# Circuito



OPB818

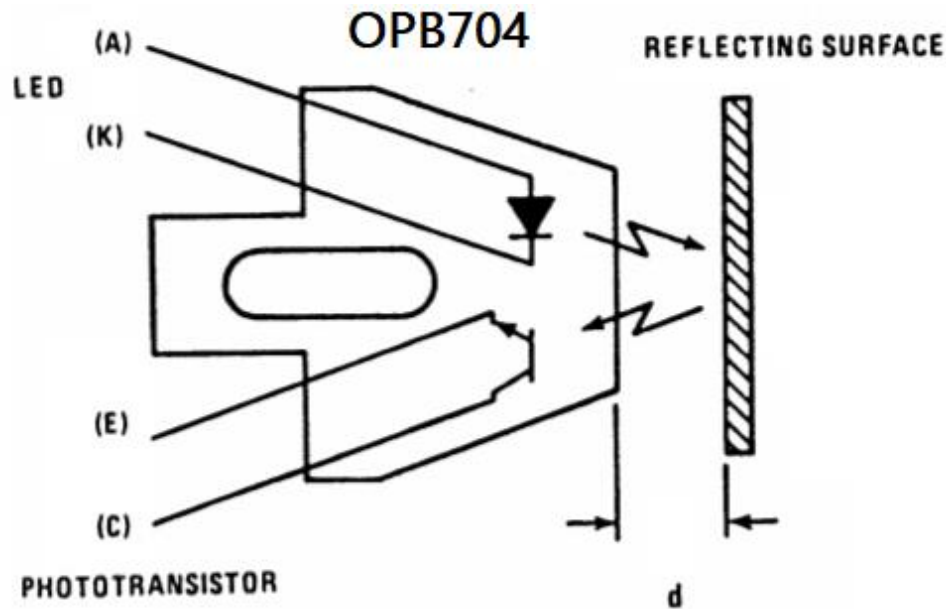
# Aplicações

- Sensor de fim-de-curso
- Sensor de papel
- Medição de rotação





# Reflexivo (*Reflective* ou *Object Sensor*)



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## Aplicações:

- Sensor de proximidade
- Sensor de papel
- Sensor de fim-de-curso

