Topic:

PHOTOTRANSISTOR

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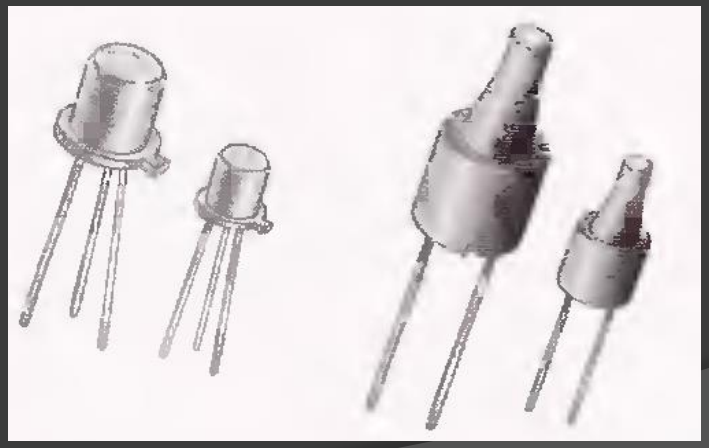


INTRODUCTION

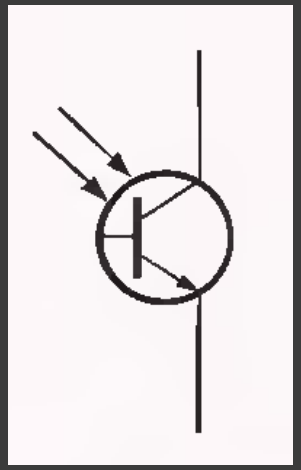
- *The phototransistor is a transistor in which base current is produced when light strikes the photosensitive semiconductor base region.*
- *The collector-base P-N junction is exposed to incident light through a lens opening in the transistor package.*
- *When there is no incident light, there is only a small thermally generated collector-to-emitter leakage current i.e. $I_{(CEO)}$, this is called the dark current and is typically in the nA range.*

- When light strikes the collector-base pn junction, a base current is produced that is directly proportional to the light intensity.
- Since the actual photo generation of base current occurs in the collector-base region, the larger the physical area of this region, the more base current is generated.
- A phototransistor does not activated at every type of wave lengths of light.

- The phototransistor is similar to a regular BJT except that the base current is produced and controlled by light instead of a voltage source.
- The phototransistor effectively converts variations in light energy to an electrical signal
- The collector-base pn junction is exposed to incident light through a lens opening in the transistor package.
- The phototransistor is a transistor in which base current is produced when light strikes the photosensitive semiconductor base region.
- When there is no incident light, there is only a small thermally generated collector-to-emitter leakage current i.e. I(CEO), this is called the dark current and is typically in the range of nA.

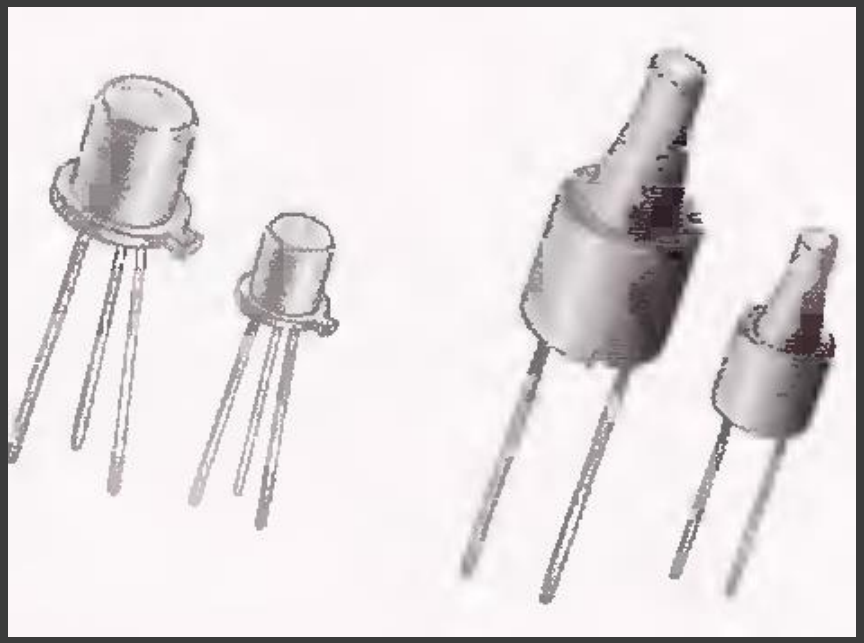
- When light strikes the collector-base pn junction, a base current, I_λ, is produced that is directly proportional to the light intensity.
- This action produces a collector current that increases with I_λ .
- Except for the way base current is generated, the phototransistor behaves as a conventional BJT.
- In many cases there is no electrical connection to the base
- The relationship between the collector current and the light-generated base current in a phototransistor is $I_C = \beta_{DC} * I_\lambda$.

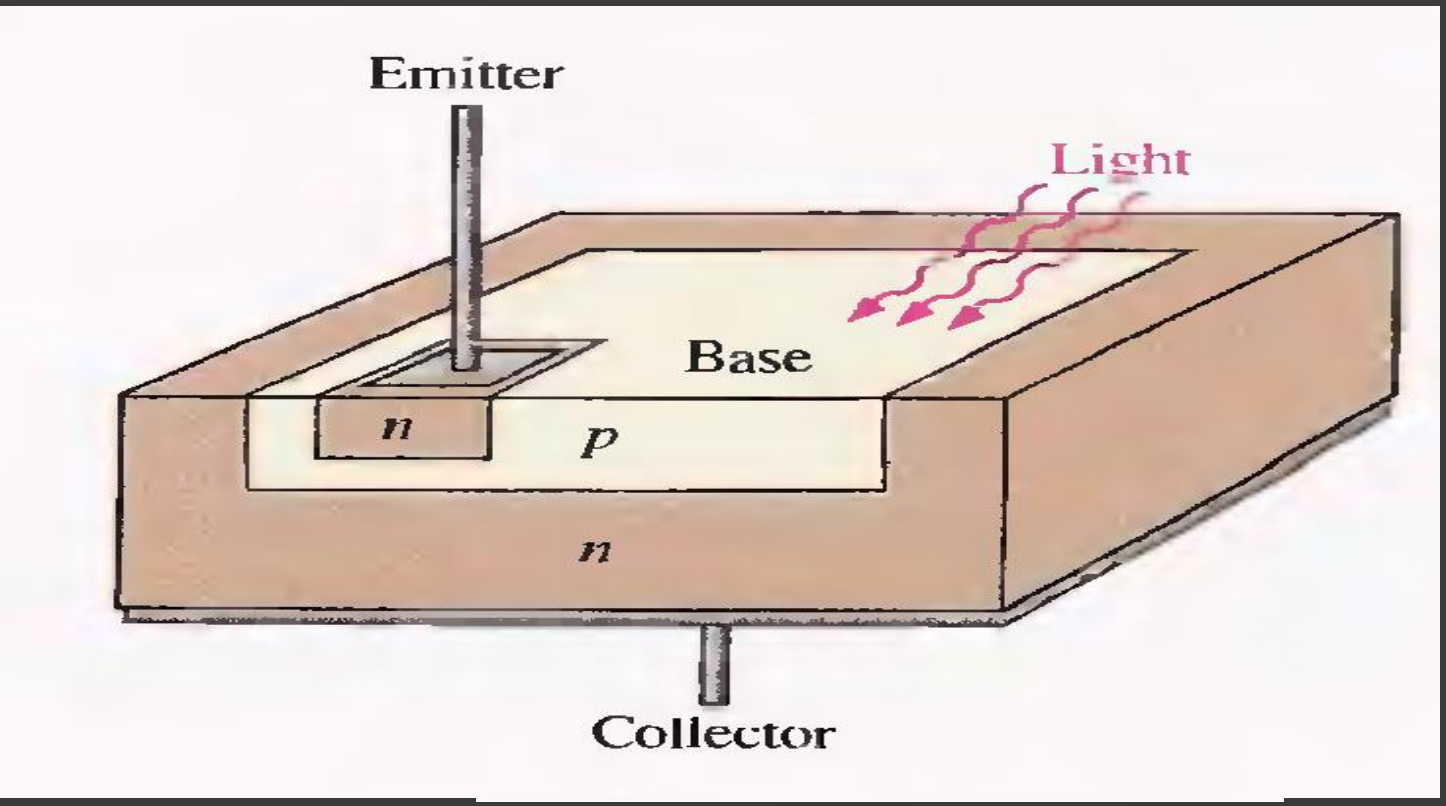
SYMBOL OF PHOTOTRANSISTOR



Schematic symbol

A typical phototransistor is designed to offer a large area to the incident light, as the simplified structure diagram in Figure:



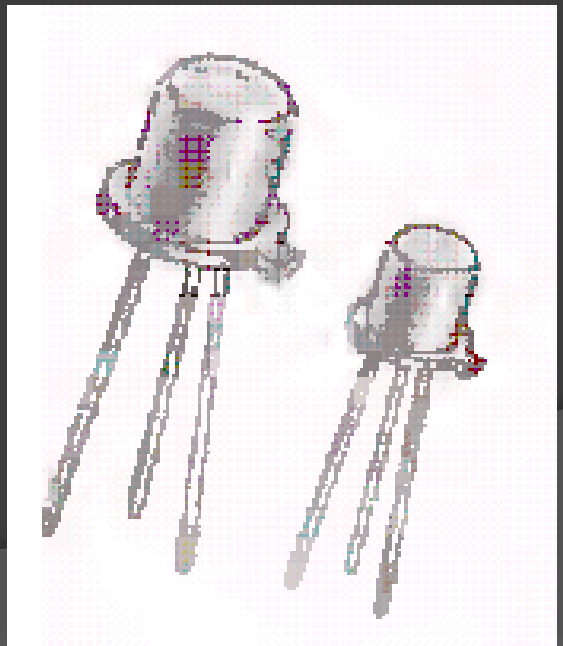

Emitter
Light
Base
n
p
n
Collector

Phototransistor are of two types.

1. Three Lead Phototransistor.
2. Two Lead Phototransistor.

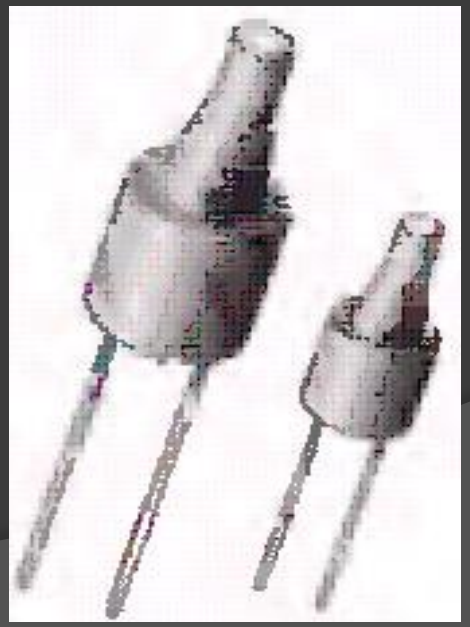
1. Three Lead Phototransistor:

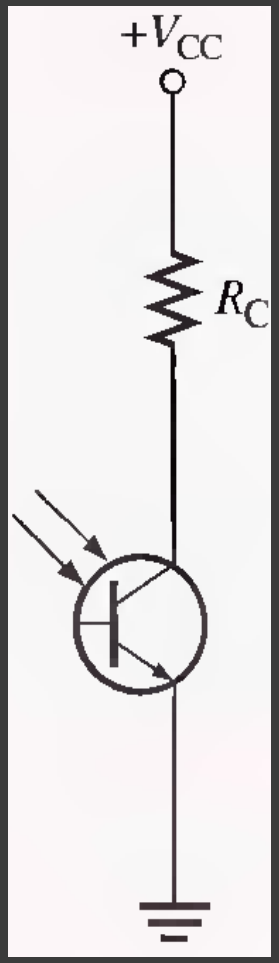
In the three-lead configuration, the base lead is brought out so that the device can be used as a conventional BJT with or without the additional light-sensitivity feature.



2. Two Lead Phototransistor:

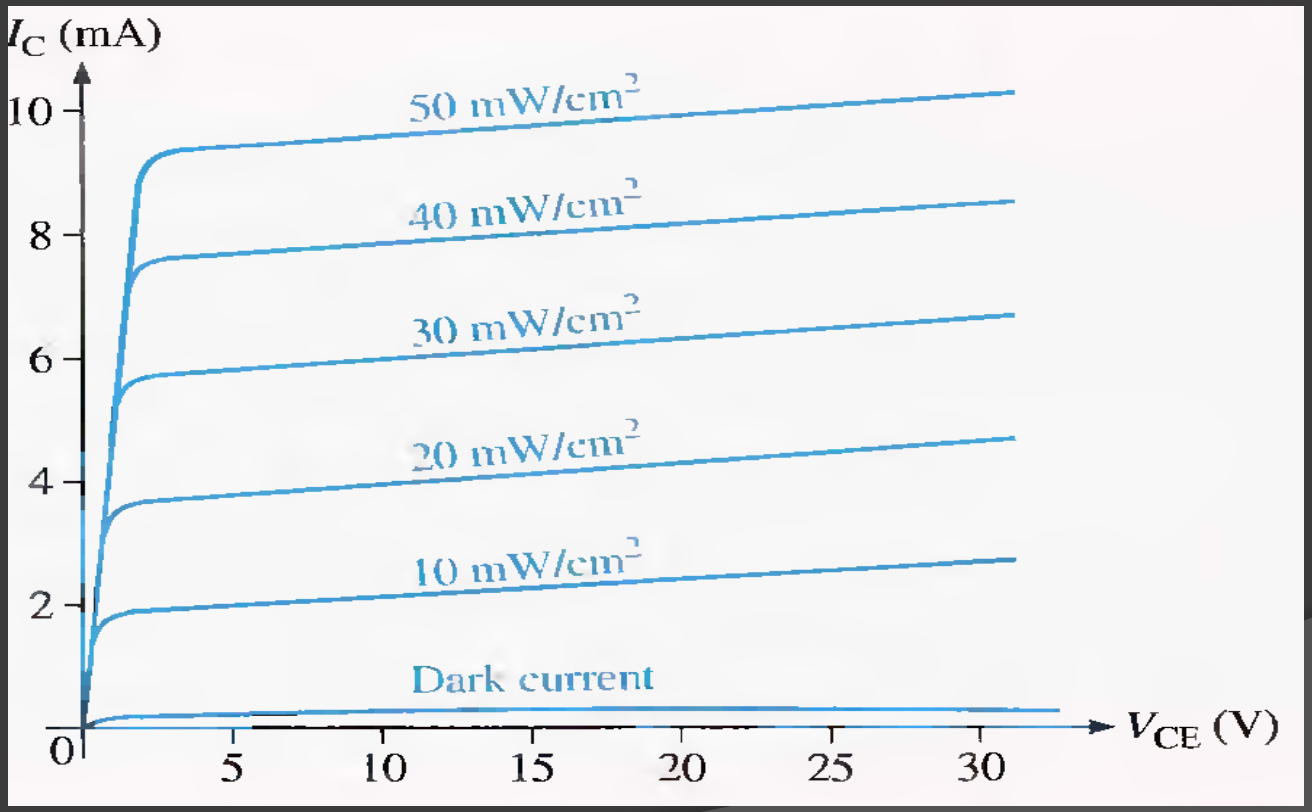
In the two-lead configuration. the base is not electrically available, and the device can be used only with light as the input. In many applications, the phototransistor is used in the two-lead version.

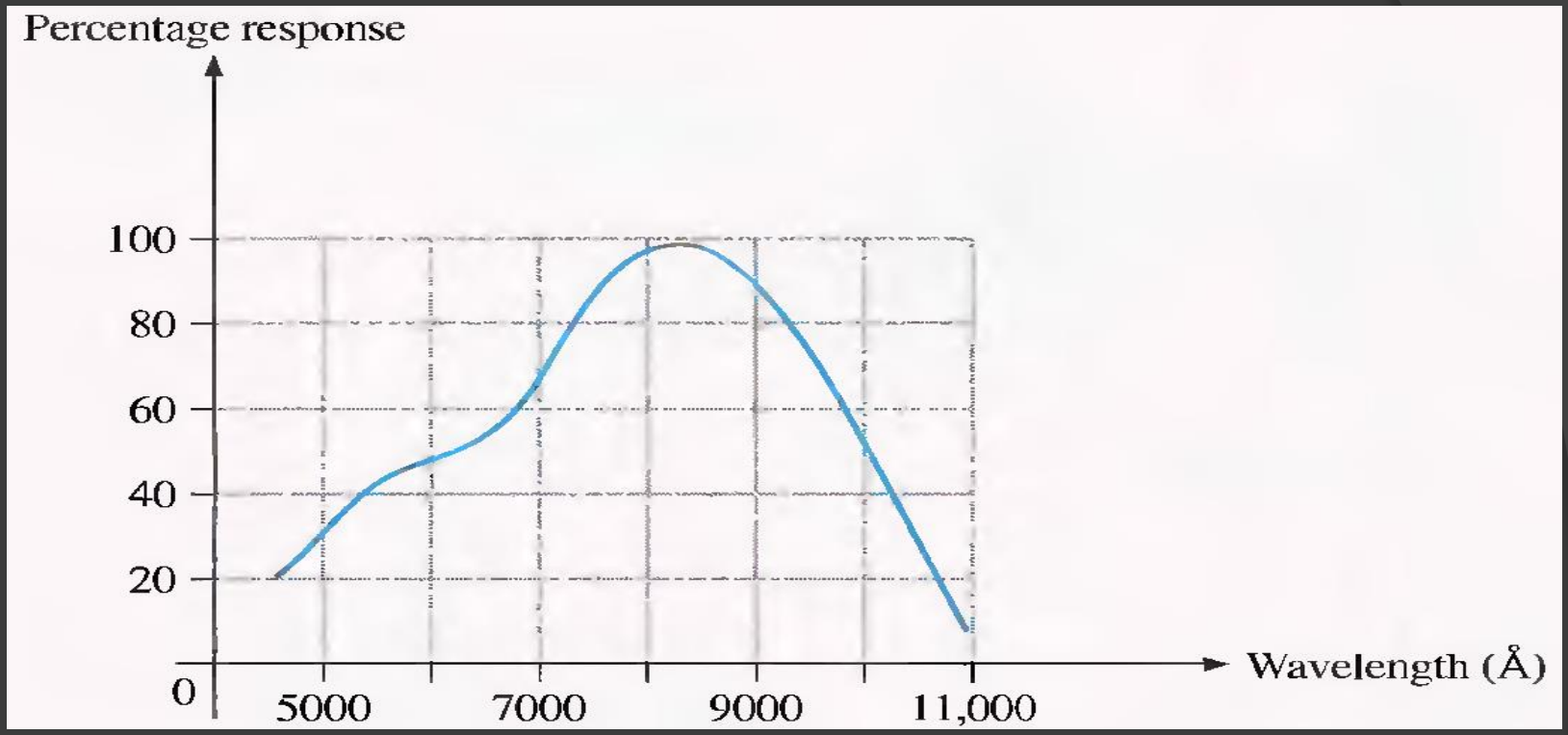




Phototransistor Bias Circuit

Typical collector characteristic curves. Notice that each individual curve on the graph corresponds to a certain value of light intensity (in this case, the units are m W/cm²) and that the collector current increases with light intensity.





Phototransistors are not sensitive to all light but only to light within a certain range of wavelengths. They are most sensitive to particular wavelengths. as shown by the peak of the spectral response curve in Figure.