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**EXPERIMENT - 10**

**AIM:**

TO DRAW THE CHARACTERISTICS OF PHOTOTRANSISTOR

**APPARATUS REQUIRED:**

* DIGIAC 1750 Transducer and Instrumentation Trainer.
* 4mm Connecting Leads.
* 2 x Digital Multimeters.
* Opaque box to cover the clear plastic enclosure.

**THEORY:**

A Phototransistor is a device that has the ability to detect the level of the incident radiation and accordingly change the flow of electric current between emitter and collector terminal.

*WORKING PRINCIPLE*:

It operates on the principle of Photoelectric effect. As it changes light signal incident on its surface into its electrical equivalent form.

*ABOUT PHOTOTRANSISTOR:*

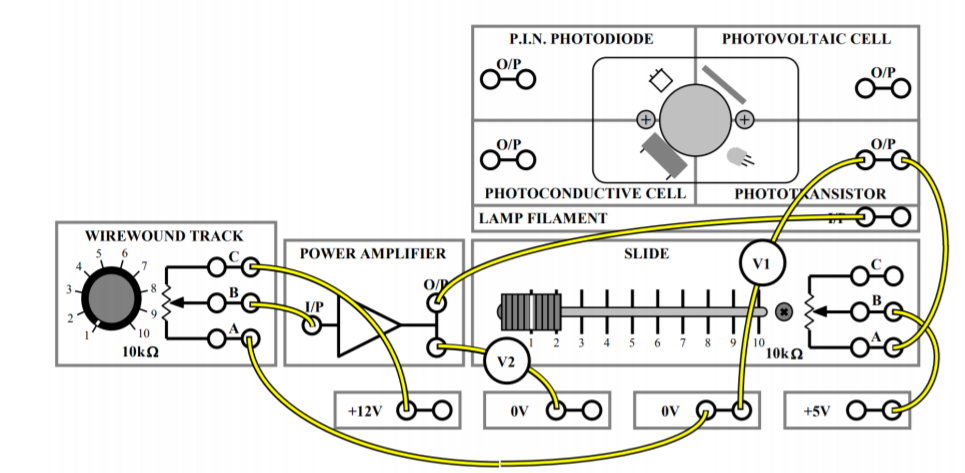
• It is a 3-layer semiconductor device that consists of a light sensitive base region. It is basically a transistor whose action depends on the application of light. Hence named phototransistor.

• The phototransistor is basically an enhancement of Photodiode.

• Both photodiode and phototransistor are light sensing device but the sensitivity of phototransistor is somewhat more as compared to the photodiode.

• As phototransistor has the ability to give larger gain than that of the photodiode.

**CIRCUIT DIAGRAM:**



**OBERSERVATION TABLE:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lamp filament  Voltage(V) | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | 9V | 10V |
| Photo  Transistor  Voltage(V) | 5 | 5 | 4.92 | 4.30 | 2.73 | 0.82 | 0.77 | 0.75 | 0.74 | 0.73 |

**GRAPH:**

**LAMP FILAMENT VOLTAGE(V)**

**PHOTO TRANSISTOR OUTPUT VOLTAGE(V)**

**APPLICATION:** ROTATIONAL SPEED OR MEASUREMENTS

*SLOTTED OPTO TRANSDUCER:*

The slotted opto transducer, consists of a gallium arsenide infra-red LED and silicon phototransistor mounted on opposite sides of a gap in the case, each being enclosed in a plastic case which is transparent to infra-red radiations.

The gap between them allows the infra-red beam to be broken when a solid object is inserted.

The collector current of the phototransistor is low when the infra-red beam is broken and increases when the beam is admitted. Positive voltage pulses are obtained from the emitter circuit of the phototransistor each time the beam is admitted and hence the device generates pulses which are suitable for counting rotations.

**OBSERVATION:**

|  |  |  |
| --- | --- | --- |
|  | Beam Broken | Beam Admitted |
| Output Voltage | 1.5mV | 4.92V |
| Led-On/Off | OFF | ON |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Motor input | 2V | 4V | 6V | 8V | 10V |
| Count | 5 | 15 | 24 | 34 | 43 |

**RESULT:**

Hence, we have studied about the principle and application of phototransistor and verified the characteristics of phototransistor.