Typical Phototransistor and IRED Applications

Why Use Phototransistors?

Phototransistors are solid state light detectors that possess internal gain. This makes them much more sensitive than photodiodes of comparably sized area. These devices can be used to provide either an analog or digital output signal. This family of detectors offers the following general characteristics and features:

- *Low cost visible and near-IR photodetection*
- *Available with gains from 100 to over 1500*
- *Moderately fast response times*
- *Available in a wide range of packages including epoxy coated, transfer molded, cast, hermetic packages, and in chip form*
- *Usable with almost any visible or near infrared light source such as IREDs; neon, fluorescent, incandescent bulbs; lasers; flame sources; sunlight; etc.*
- *Same general electrical characteristics as familiar signal transistors (except that incident light replaces base drive current)*

Why Use IREDs?

IREDs are solid state light sources which emit light in the near-IR part of the spectrum. Because they emit at wavelengths which provide a close match to the peak spectral response of silicon photodetectors, both GaAs and GaAlAs IREDs are often used with phototransistors. Key characteristics and features of these light sources include:

- *Long operating lifetimes*
- *Low power consumption, compatible with solid state electronics*
- *Narrow band of emitted wavelengths*
- *Minimal generation of heat*
- *Available in a wide range of packages including transfer molded, cast, and hermetic packages*
- *Low cost*

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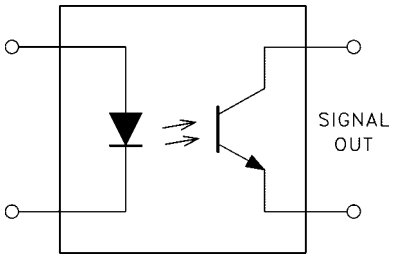
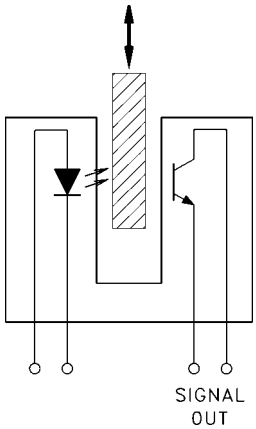
Applications

Phototransistors can be used as ambient light detectors. When used with a controllable light source, typically an IRED, they are often employed as the detector element for optoisolators and transmissive or reflective optical switches. Typical configurations include:



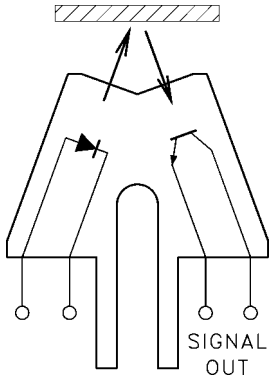
Optoisolator

The optoisolator is similar to a transformer in that the output is electronically isolated from the input.



Optical Switch

An object is detected when it enters the gap of the optical switch and blocks the light path between the emitter and detector.



Retro Sensor

The retro sensor detects the presence of an object by generating light and then looking for its reflectance off of the object to be sensed.

Phototransistors and IREDs have been used in the following applications.

Computer/Business Equipment

- *Write protect control - floppy drive*
- *Margin controls - printers*
- *Monitor paper position - copiers*
- *Monitor paper stack height - copiers*

Industrial

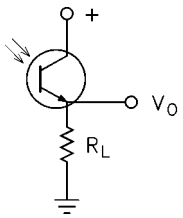
- *LED light source - light pens*
- *Security systems*
- *Safety shields*
- *Encoders - measure speed and direction*
- *Photoelectric controls*
- *Remote residential electric meter reading*

Consumer

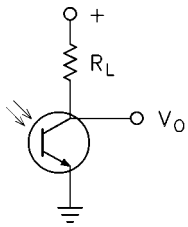
- *Coin counters*
- *Lottery card readers*
- *Position sensors - joysticks*
- *Remote controllers - toys, appliances, audio/visual equipment*
- *Games - laser tag*
- *Camera shutter control*

Typical Phototransistor and IRED Applications

Fundamental Circuit Approaches

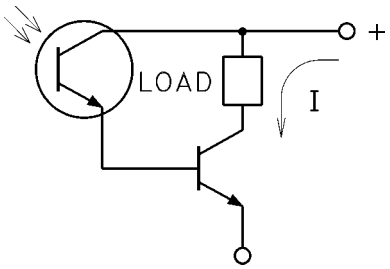


V_O is "HIGH" with light

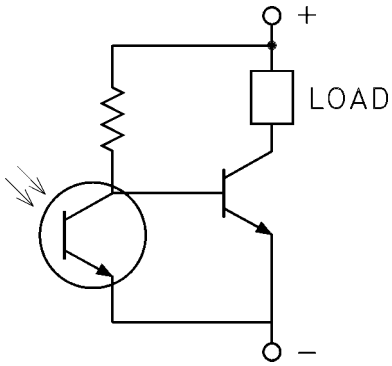


V_O is "LOW" with light

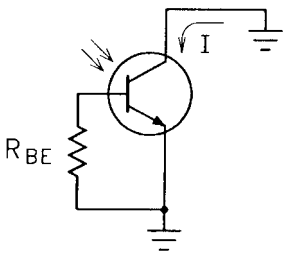
Basic Circuits

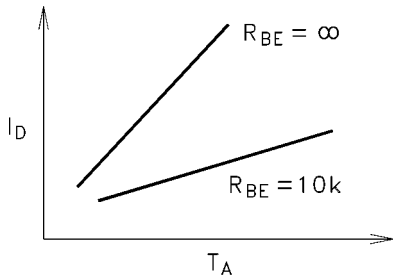


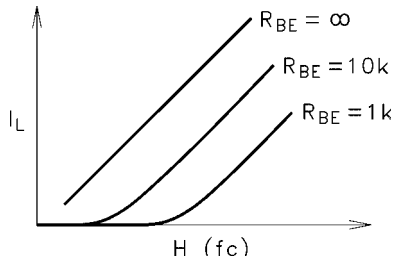
More Output Current Capability



More Voltage Switching Capability







Reducing Dark Current