Electronics
Optical Isolation

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Isolation

The purpose is to remove large DC offsets from a signal; it could be to add a DC offset instead. Op-amps can remove small DC offsets, of the same order of voltage as the supply voltage. Sometimes hundreds or thousands of volts must be removed. For example, inside a car engine, the ignition system produces sparks of thousands of volts, while the electronics runs on normal logic levels. The spark plug voltages could not be directly sensed by the microprocessor.
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  The spark plug voltages could not be directly sensed by the microprocessor.
  At least more than once.....)
Basic Optoisolator
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Characteristics of Optical Isolation
Using Optoisolators in a Circuit
Calculations for the use of optoisolators
You can think of the photosensitive device like a photoresistor.
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When the LED conducts, the resistance between the outputs is reduced.
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*Optical* isolation using an LED and a phototransistor or photodiode
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The above two conditions mean that there is no danger of voltage spikes as there is with inductive isolation.
Using Optoisolators in a Circuit

Note that the grounds on the two sides need not be the same.
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The amount of DC isolation provided by an optoisolator is usually in the range of kV. At some point the insulation will break down and arcs can occur.
An optoisolator can be connected either to have the output voltage increase when the input increases, or to have the output voltage decrease when the input increases.
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Isolation

Characteristics of Optical Isolation

Using Optoisolators in a Circuit

Calculations for the use of optoisolators

\[ V_{\text{out}} \]

\[ V_{\text{supply}} \]
Optical Isolation
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Whenever sensors are in a place where it is possible for high voltages to be induced, optical isolation should be used to protect electronic devices which follow.
Calculations for the use of optoisolators
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From the data sheet, determine the values for:

- recommended forward current for the LED
- typical forward voltage for the LED
- typical current transfer ratio for the photodiode or phototransistor

Together these will make it possible to calculate resistance values.
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Together these will make it possible to calculate resistance values.
Input side

The LED and resistor form a voltage divider. Given the input HIGH logic level, the forward voltage of the LED, the voltage across the resistor can be determined. Given the forward current of the LED, it should be possible to determine the resistance which will give this current.
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the **voltage** across the resistor can be determined. Given the
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it should be possible to determine the **resistance** which will give this current.
Output side

The photodiode (or phototransistor) and the resistor form a voltage divider. Given the forward current of the LED, the recommended current through the resistor can be determined. Given the output supply voltage and output HIGH logic level, it should be possible to determine the resistance which will give this current.
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The photodiode (or phototransistor) and the resistor form a voltage divider. Given the forward current of the LED and the current transfer ratio, the recommended current through the resistor can be determined. Given the output supply voltage and output HIGH logic level...
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