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DID YOU KNOW?

OPTICAL SWITCHING SOLUTIONS

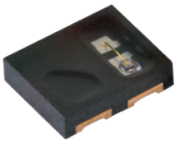
Touchless sensor solutions are a great idea, especially in times when people are more concerned about the risks of touching public surfaces. However, which solution is right for your application? This document will provide a short overview of six different solutions and their main characteristics, with examples and focus products given for each. However, please note that there are more products available, and you are not limited to those mentioned.

Analog Solutions

Analog systems use a photodiode (PD) that gives a signal output with the voltage, depending on the infrared (IR) light received. This signal can be either used to trigger something, e.g. a transistor, or it can be read through an analog / digital converter input in a microcontroller. As photodiodes react with any IR light, sunlight can also trigger a signal. This has to be kept in mind when designing an analog system.

Discrete - Photodiode and IR Emitter

This solution with two discrete components provides increased design flexibility. Adjusting the components positions and angles can achieve various trigger distances and limit external influences.



Reflective Sensor - Integrated Phototransistor and IR Emitter

An integrated reflective sensor offers a smart and compact solution to simple tasks like object / no object detection. With enough signal reflected from the IR emitter, the phototransistor will switch on. The black FAM package offers optimized control over stray light from the side, while an integrated sunlight filter provides an improved signal to noise ratio (SNR).

Reflective Laser Sensor - Integrated Phototransistor and VCSEL

Similar to the above reflective sensor, this solution has an integrated phototransistor and uses a laser (VCSEL) as an emitter. Due to the narrow emitting angle of the VCSEL, the sensor can sense at further distances than an IR emitter. Also, it has a “blind spot” at distances closer than 1 mm, which makes the device ideal for placement behind cover glass to avoid cross talk and false triggers.

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Digital Solutions

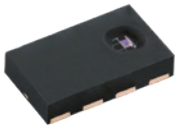
Digital sensors include a photodiode and an internal IC, and in most cases also an integrated emitter. These sensors offer a high degree of control and many settings can be adjusted through the I^2C input, such as emitter current, measure cycle, and sensitivity. The sensors have automatic power-saving modes, as well as sunlight cancellation capabilities.

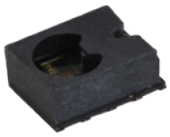
Proximity Sensor -
Integrated Photodiode, IR Emitter, and IC

The VCNL4030 is a very robust sensor with integrated sunlight filters and automotive qualification. The highly sensitive photodiode allows for detection in the µm range for applications like force sensing, while its high detection speed enables more complex applications, such as gesture sensing.

Proximity Sensor -
Integrated Photodiode and IC, Plus External IR Emitter

A variation of the fully integrated digital solution is a sensor with an integrated photodiode but no emitter. This solution increases design flexibility by offering a choice of emitter type, power, and position. Even multiple emitters can be used with one sensor to cover a larger response area.





Proximity Laser Sensor -
Integrated Photodiode, VCSEL, and IC

Using a VCSEL instead of an IR emitting diode results in a very narrow emitting angle and a compact package size. The lower driving current of the VCSEL, combined with the optimized power-saving IC, allows for the lowest possible power consumption of 6 µA.

Additional Resources

Selector Guide for Sensors | Application Note for VCNT2025: Designing VCNT2025

Application Note for VCNL4030: Appnote VCNL4030