

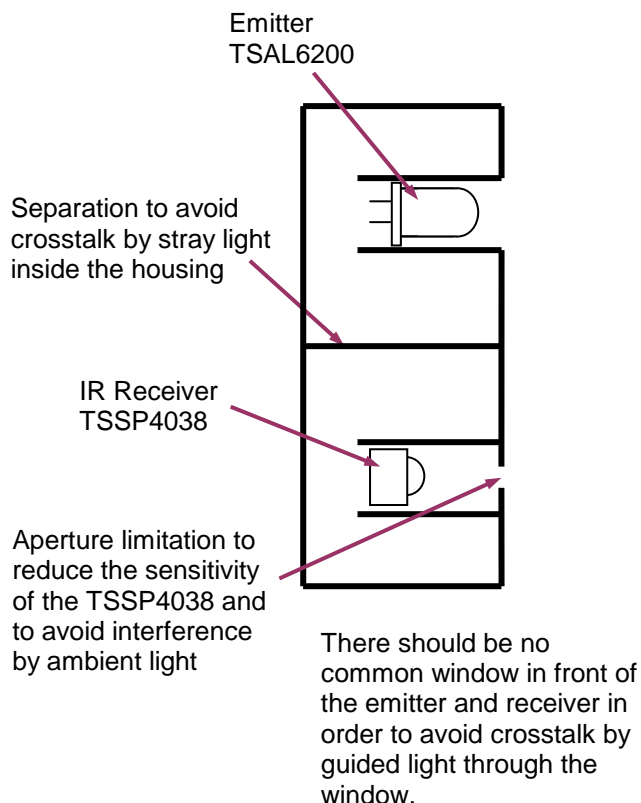
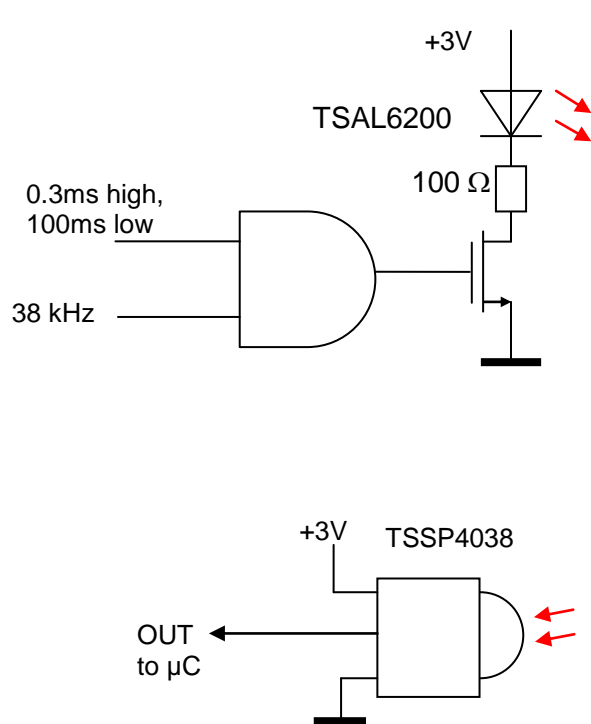
Reflective sensors for up to 2 m detection distance are easily feasible with Vishay's IR receiver modules. Some special features of these detectors are: high sensitivity, low interference due to ambient disturbance sources, compact packages, low current consumption, built in protection against EMI, many mechanical holder and bend options.

Several types of reflective sensor with different features are outlined here along with their solution using a TSSP or TSOP series device:

Reflective sensor 1: Fixed Detection Threshold – Digital Output

The IR signal can be a continuous 38kHz square wave, however in order to save power it is recommended to use 38kHz bursts (burst length about 300µs). For this sensor, the detector should be from the AGC0 series fixed gain devices; TSSP4038 or TSSP58038 (through hole) or TSSP6038, TSSP77038 or TSSP57038 (surface mount). The sensitivity of this receiver type is fixed and hence the detection threshold or detection distance is also fixed. The detection threshold will not change with the ambient brightness. Once the design of the optical parameters such as the intensity of the emitter, the aperture in front of the receiver, the alignment of emitter and detector are fixed, the sensor will have a stable repeatable performance under all lighting conditions. The output is a simple digital state that provides the information for "reflection-yes" or "reflection-no".

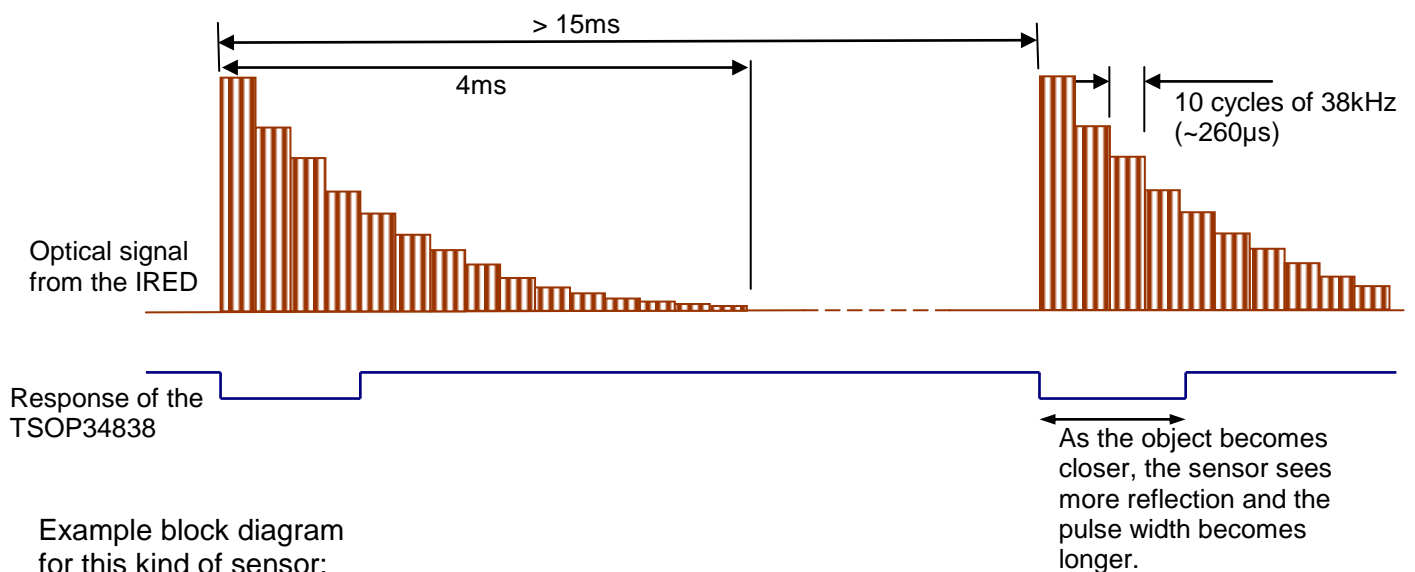
Circuit Example:



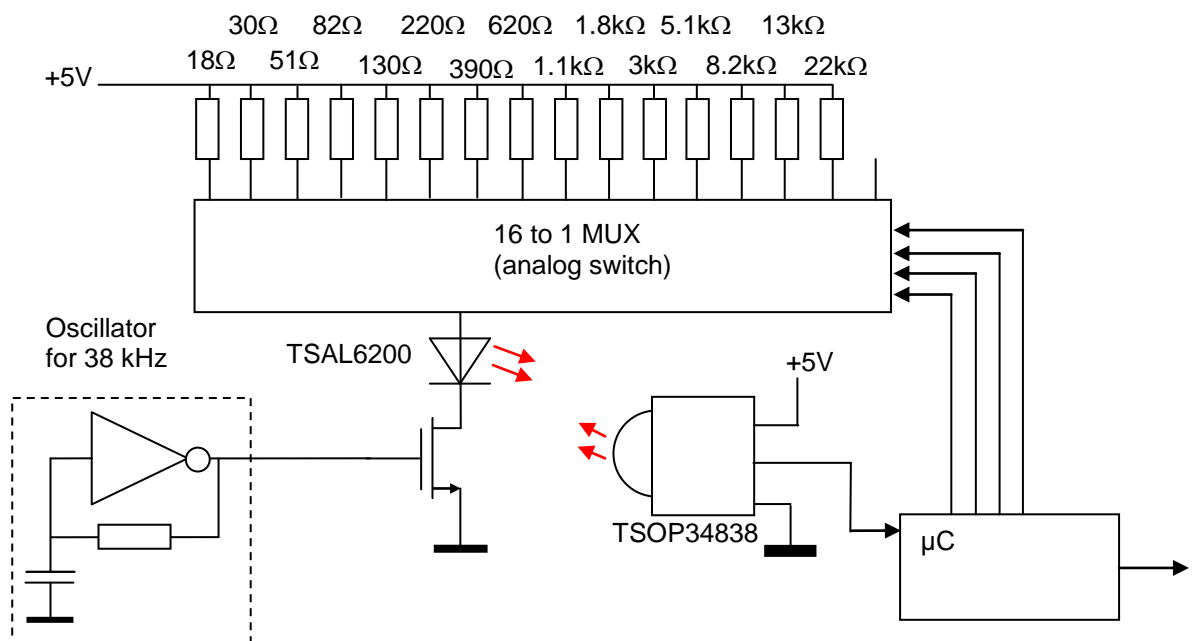
Reflective sensor 2: Sensor with Automatic Gain and Variable Emitter Intensity

The IR signal in this sensor is using bursts with different intensity levels. Although TSSPs from the AGC0 series will function for this application, a better choice are the detectors from the standard TSOP AGC 2-4 series with variable gain, e.g. TSOP34838. This sensor is designed to evaluate whether there is a sudden change of the reflected irradiance and provides an output with analog information corresponding to this change. Thus a fixed detection threshold is not needed. The AGC 2-4 series detectors have the added advantage of being able to suppress interference signals from ambient light sources. The controller software evaluating the output of the sensor can determine based on the pulse width sudden changes in sensor's field, i.e. whether a person previously in front of the sensor has left.

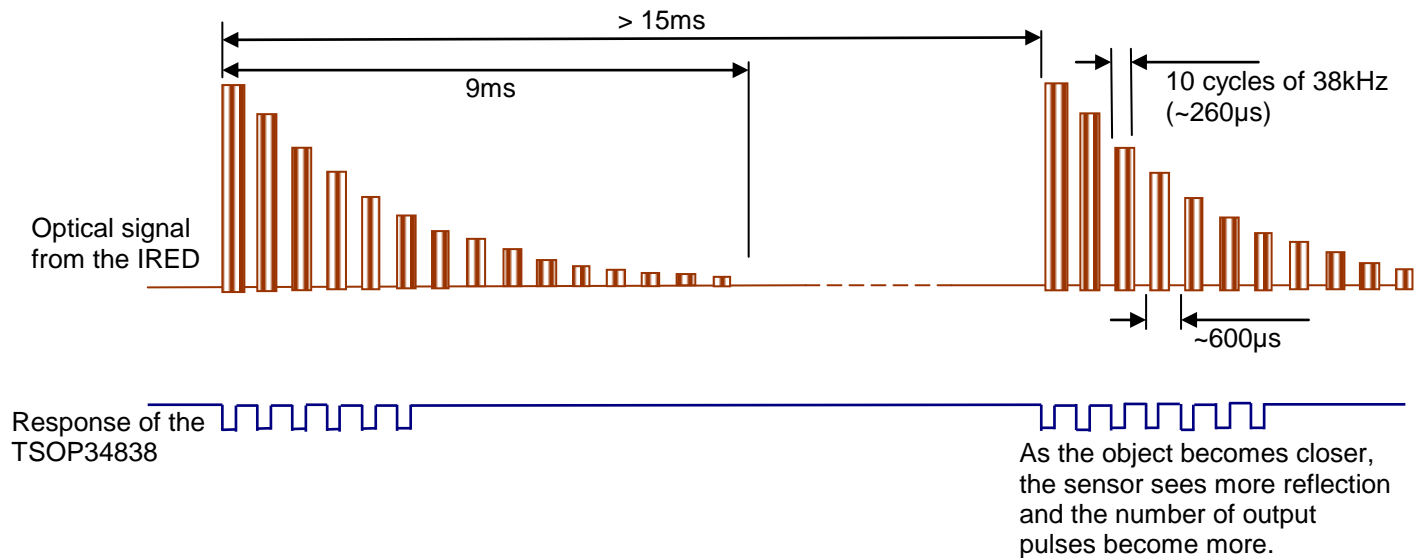
Example for an IR signal pattern with logarithmic steps:



Example block diagram for this kind of sensor:



An alternative IR signal pattern for this kind of reflective sensor could use also separate bursts for each intensity level using logarithmic steps as shown in this diagram:

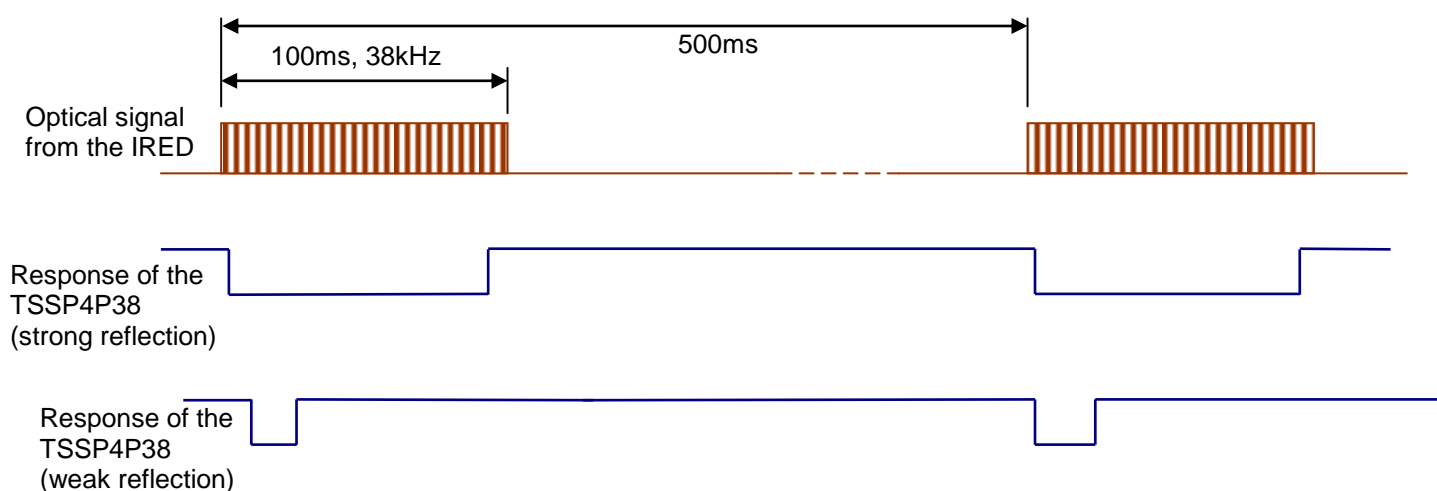


In a typical proximity application each burst has about 30% less optical power compared to the burst before.

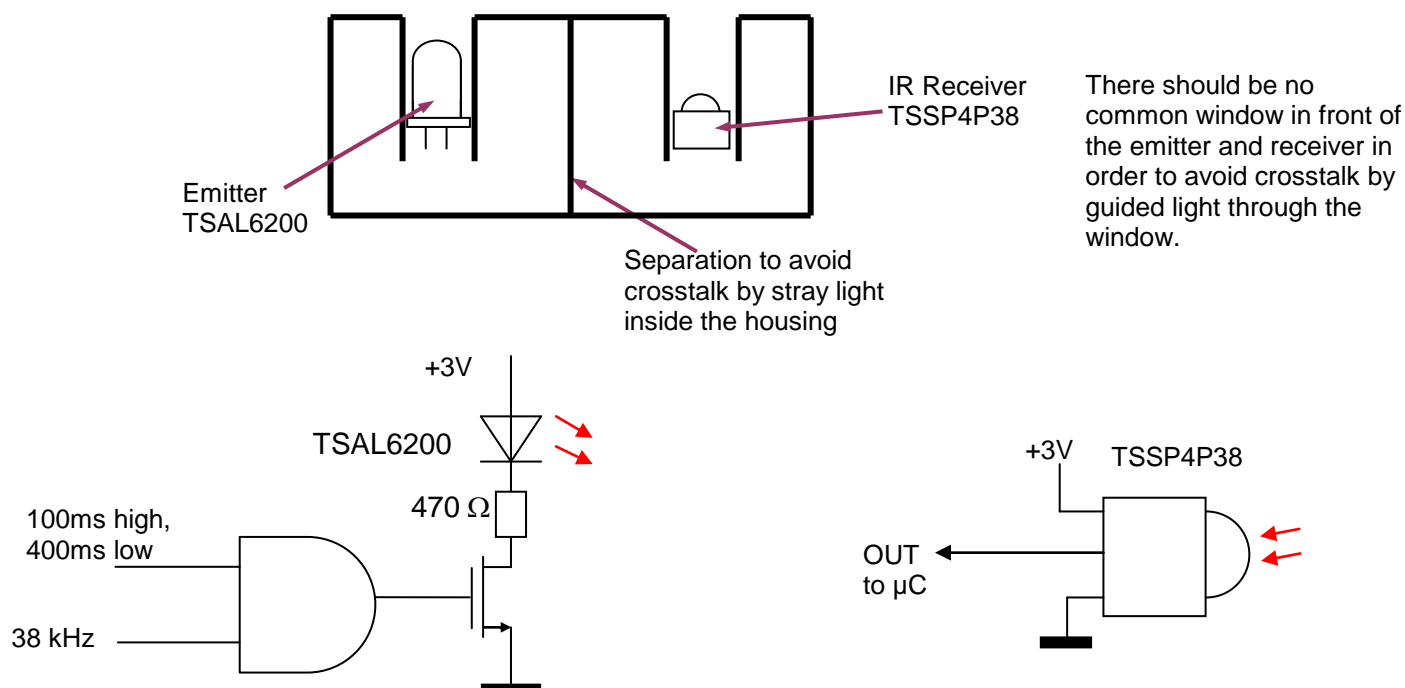
Reflective sensor 3: AGC of the IR Receiver is Used to Detect the Strength of the Optical Signal

A simplified reflective sensor with analog information contained in its output is feasible using an IR receiver by evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

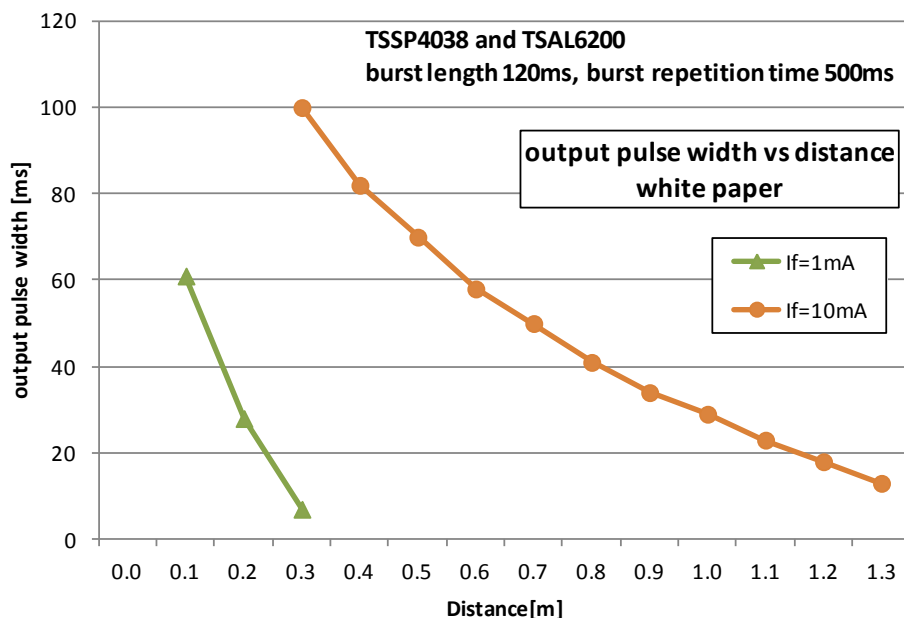
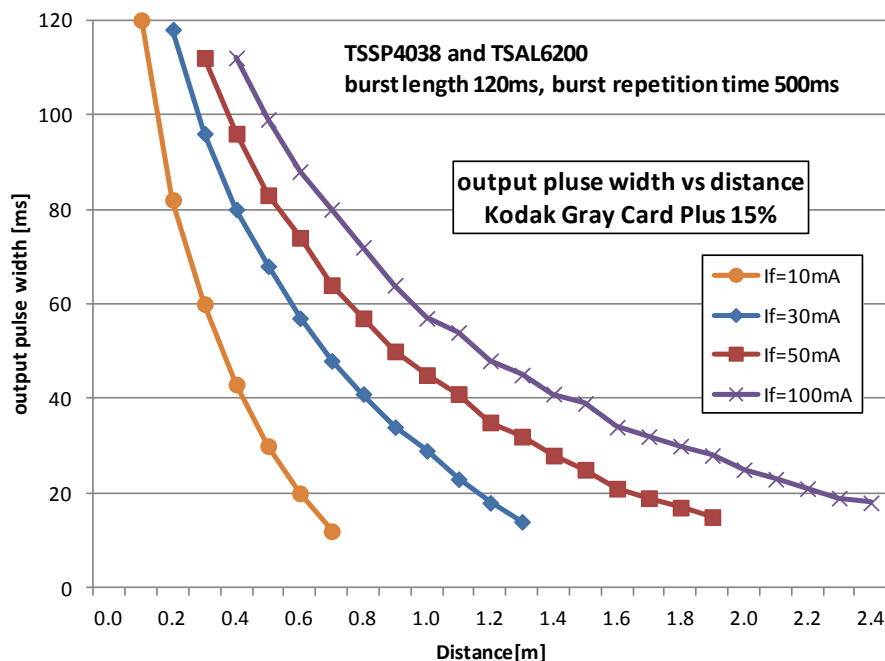
Example of a signal pattern:



Example for a sensor hardware:



The logarithmic characteristic of the AGC in the TSSP4P38 results in an almost linear relationship between distance and pulse width. This chart shows test results using this kind of sensor setup:



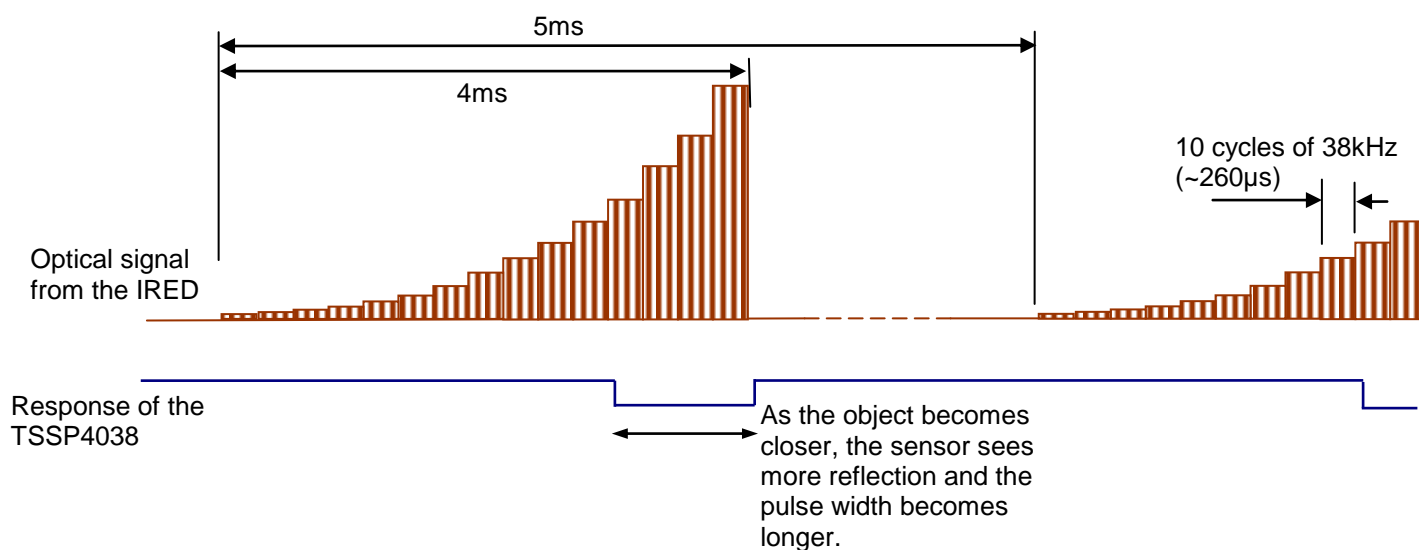
Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

Recommended IR receiver types for this kind of reflective sensor are TSSP4P38, TSSP6P38, TSSP58P38, TSSP77P38 or TSSP57P38.

Reflective sensor 4: Sensor with Fix Gain and Variable Emitter Intensity

The IR signal for this sensor is using bursts with different intensity levels. A receiver with fixed detection threshold is used to have a stable detection range under various ambient lighting conditions. In order to become insensitive to ambient light we recommend reducing the sensitivity of the IR receiver (e.g. TSSP4038, TSSP6038) by a small aperture in front of the detector or by an attenuating filter. The sensitivity of the IR receiver should be reduced to that level that there are no spurious output pulses, even under the strongest disturbance level of the application.

Example for an IR signal pattern with logarithmic steps:



Example block diagram for this kind of sensor:

