Mid-range Infrared Sensors for Object Detection and Ranging

The mid-range sensor series consists of two basic types. The first type, called AGC 0, are sensors whose gain is fixed to enable reproducible object detection in variable ambient lighting conditions. The “0” signifies “no AGC”. These sensors are suitable for both reflective and interruptive (such as a light curtain) sensor applications. The other type, called AGC P (for proximity) contain an automatic gain circuit optimized to provide differential range information. These types are useful for reflective sensor applications where information about an object’s movement toward or away from the sensor must be captured.

KEY BENEFITS

- Interrupter sensor: fixed gain type (AGC 0) with a fast 300 µs reaction time in light curtain and perimeter guard applications up to 30 meters
- Reflective sensor: either for object detection applications (AGC 0) or object ranging applications (AGC P), effective range from 0.2 to 2 meters

APPLICATIONS

- Safety switches for garage door, elevator door, gates and industrial light curtains
- Reflective sensors for toilet, urinal, faucet, hand dryer and towel dispenser
- Navigational sensor for robotics
- Sensor for large format touch panels
- Object detection in vending machines, parking lots, ATMs and many others

RESOURCES

- More IR receiver products at: http://www.vishay.com/ir-receiver-modules/
- Full optoelectronics portfolio at: http://www.vishay.com/optoelectronics/
- Technical questions contact midrangesensors@vishay.com
- Sales contacts: http://www.vishay.com/doc?99914

Mid-Range Detection

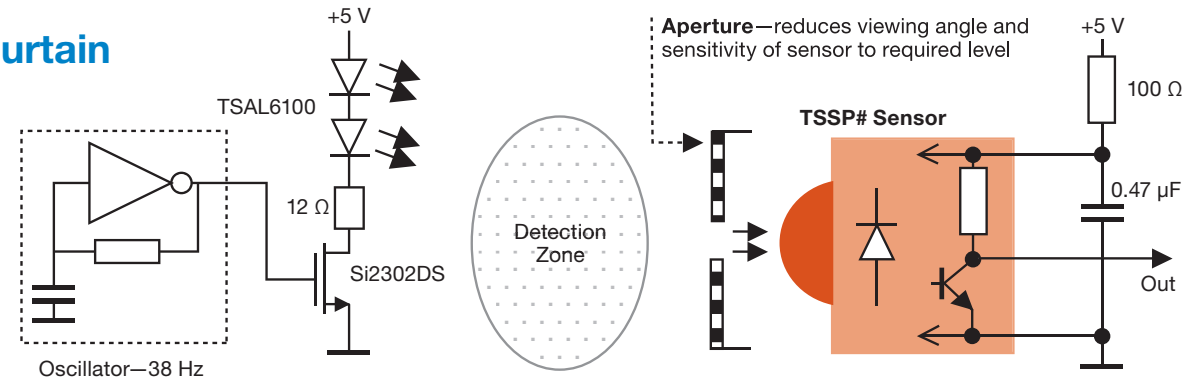
Standard IR remote control receivers have long been used for mid-range detection of objects. Most remote control receivers contain an automatic gain circuit to adjust their detection threshold depending on the amount of ambient light and optical noise present. This can cause two problems:

	Short Range	Mid-Range	Long Range
Reflective	< 4 cm	**20 cm to 2 m**	> 2 m
Interrupter	3 mm	**20 cm to 30 m**	> 30 m

- In noisy environments, the gain of the amplifier may adjust itself to such a low level that sensor responsiveness diminishes or even cuts out entirely
- With low ambient light, the receiver gain can become too sensitive and falsely detect reflections or stray signals from the emitter

Vishay's TSSP4038, TSSP58038, TSSP6038, TSSP77038 and TSSP57038 eliminate these problems by featuring a fixed gain. With a fixed gain the detection threshold and resulting detection distance is fixed. Once the design of the optical parameters such as the intensity of the emitter, the aperture in front of the receiver, and the alignment of emitter and detector are determined, the sensor will have stable, repeatable performance under all lighting conditions. The output of the sensor is the demodulated signal of the emitter (typically transmitting modulated bursts at e.g. 38 kHz or similar frequency).

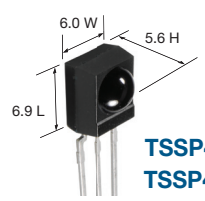
Light Curtain



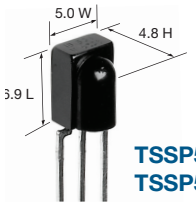
Fast Response Time

People's lives depend on light curtains and perimeter guards having fast reaction times. Typical reaction times for sensors in this application require the infrared beam to be interrupted for up to 5 ms before detection. The 300 µs response time of Vishay's sensors is much faster. For the fastest response time, a continuous 38 kHz signal should be used. For the longest distance, we recommend driving the TSAL6100 infrared emitter using a 38-kHz burst.

Part Numbers*		Supply Current (mA)	Supply Voltage (V)	Response Time (µs)	Light curtain Range (m)	Reflective Range (m)
Presence (Digital Out)	**Proximity (PWM Out)**					
TSSP4038 TSSP58038 TSSP6038 TSSP77038 TSSP57038	**TSSP4P38 TSSP58P38 TSSP6P38 TSSP77P38 TSSP57P38**	0.7	2.5 to 5.5	300	30	0.2 to 2

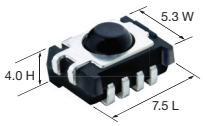


TSSP4038
TSSP4P38



TSSP58038
TSSP58P38

TSSP77038
TSSP77P38



TSSP6038
TSSP6P38

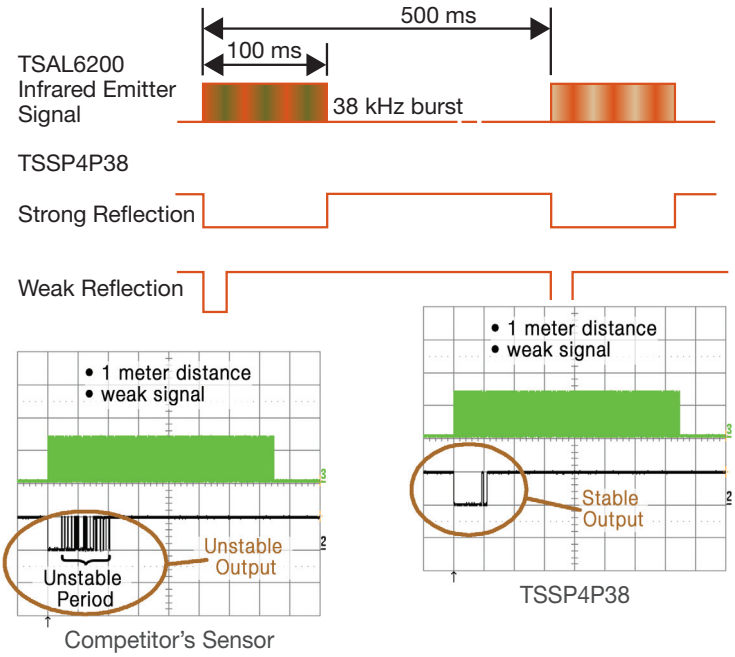
TSSP57038
TSSP57P38

* 38 kHz sensors, other modulation frequencies available by request

Mid-Range Detection with Ranging Capability

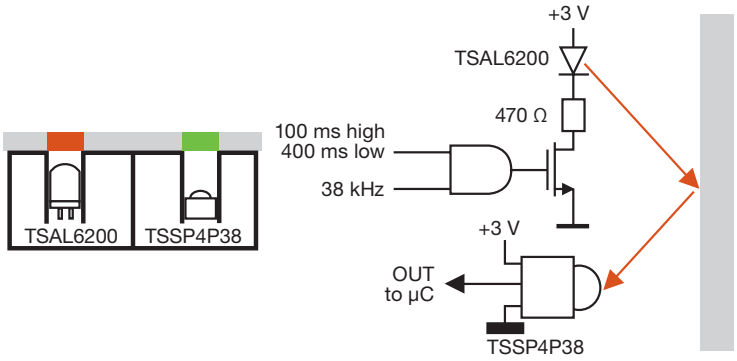
Many applications require a reflective sensor that detects not only the presence of an object, but also its relative proximity. This information can answer the question whether an object is moving toward or away from the sensor. This is possible with Vishay's TSSP4P38, TSSP58P38, TSSP6P38, TSSP77P38 and TSSP57P38 infrared proximity sensors.

The principle of operation for this type of sensor is that the onboard AGC P circuit reduces the gain in response to a reflected long burst signal from the TSAP6200 IR emitter. The amount of time required to completely suppress the signal, and correspondingly the output pulse width, is inversely proportional to the strength of the signal, which in turn is proportional to the distance to the object. A near object reflects more light, resulting in a longer pulse width, and vice versa. This type of sensor cannot be used to measure absolute distance, but it is very sensitive to changes in distance, hence relative range.



No Crosstalk Allowed

Like all infrared proximity sensors, the receiver's view must be limited to only the reflected infrared light. If the detector is exposed to light within the package or if the emitter and detector share a common window, this will lead to crosstalk. Detection will be unreliable. The distance between the emitter and detector, and how far they are recessed, will affect the range.



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