Overview

SEN-36005 is a highly integrated time-of-flight ranging/distance sensor with a 1M bit CAN (Controller Area Network) interface. It is capable of measuring distances up to 4-meters at a maximum 50 Hz sample rate. The time-of-flight (ToF) sensor is based VCSEL and SPAD Array technology.

This sensor is protected by a plastic enclosure, including special, split-view cover glass to prevent internal reflections from causing erroneous readings from the sensor. This package is not water-proof, but is capable of preventing direct mechanical access (rocks, dirt, metal shavings). SEN-36005 represents a good balance between cost and performance of a ToF sensing solution.

Features

- Absolute proximity sensing up to 4 meters, depending on ambient conditions and detected objects
- Ambient light intensity measurement
- Up to 50 Hz sample rate
- 1M bit CAN bus
- 254 configurable CAN IDs to allow multiple devices on a single bus (Note, most CAN buses can only support 120 physical nodes)
- Wide supply voltage range: 6.0V – 16.0V
- Invisible 940nm Class 1 laser emitter
- Adjustable Field-of-View (15° - 27°) by programmable Region-of-Interest (RoI)
- 16x16 SPAD Array (full FoV), 4x4 (min) SPADs can be used for custom FoV
- Multi-zone sampling possible via software use of RoI

Includes

- SEN-36005 CAN bus ToF Module, fully assembled

Typical Applications

- Service robots and vacuum cleaners
- Drones
- Laser-assisted autofocus
- User detection
- Smart (shelves, vending, sanitary, lighting, building)
- 1-D gesture recognition

Description

SEN-36005 uses an invisible Class 1 VCSEL laser with integrated SPAD array to measure absolute distance, regardless of color or reflectance. There are several user-adjustable parameters for end-use optimization including ranging (distance) modes, ranging (distance) timing and allowance, Field-of-View, SPAD Array Region-of-Interest, data validation thresholds, calibration functions, and more. All parameters are available through an open CAN interface.

These adjustable parameters will be specific to application needs, so a user must understand operating conditions for their expected use case in order to properly design a robust calibration. Calibration functions support a handful of primary outputs from the SEN-36005:

- Ranging distance and offset, in mm
- Return signal rate (signal integrity)
- Ambient signal rate (noise)
- Range status (confidence in result)
- Measurement Standard Deviation

Application & Guide

SEN-36005 connects with an application via an open CAN interface. See SEN-36005 product page at PlayingWithFusion.com for details.

Perhaps the biggest impact on sensor performance is the "**Distance Mode**" chosen by the user. Short, Medium, and Long modes can be selected. Tuning this parameter is an exercise in balancing maximum distance performance with ambient light (noise) immunity. Short mode, for example, provides nearly identical maximum ranging capability under dark (ideal) and strong ambient light conditions, at just over 1.3 meters. Medium distance mode gives a maximum range of ~2.9 m (290cm), but strong ambient light conditions will reduce this range. Long mode pushes the range over 3.5m, with strong ambient light reducing the ranging potentially below 1m.

Ranging timing (**timing budget**) not only impacts maximum ranging distance, but also the repeatability (statistical significance) of the output. Lowering the timing budget to increase sample frequency rate reduces the maximum distance that can be ranged for a given ambient lighting condition and target color, while simultaneously increasing the standard deviation of the measurement.

Region of Interest configuration allows a user to select which Single Photon Avalanche Diode (SPAD) pads are active during operation. The sensor contains a 16x16 SPAD array, which, in conjunction with the integrated optics, can sense objects in up to a 27° field-of-view. A user can, however, reduce the active SPADs to use as few as a 4x4 area of the array, and this area can be adjusted (doesn't have to be at the center of the array). This allows two functions. First, it can reduce the FoV from 27°to 15°, which can be used to avoid known obstacles near the sensor. Second, software can use this FoV knowledge and RoI placement to identify and range multiple objects in the full FoV of the sensor.

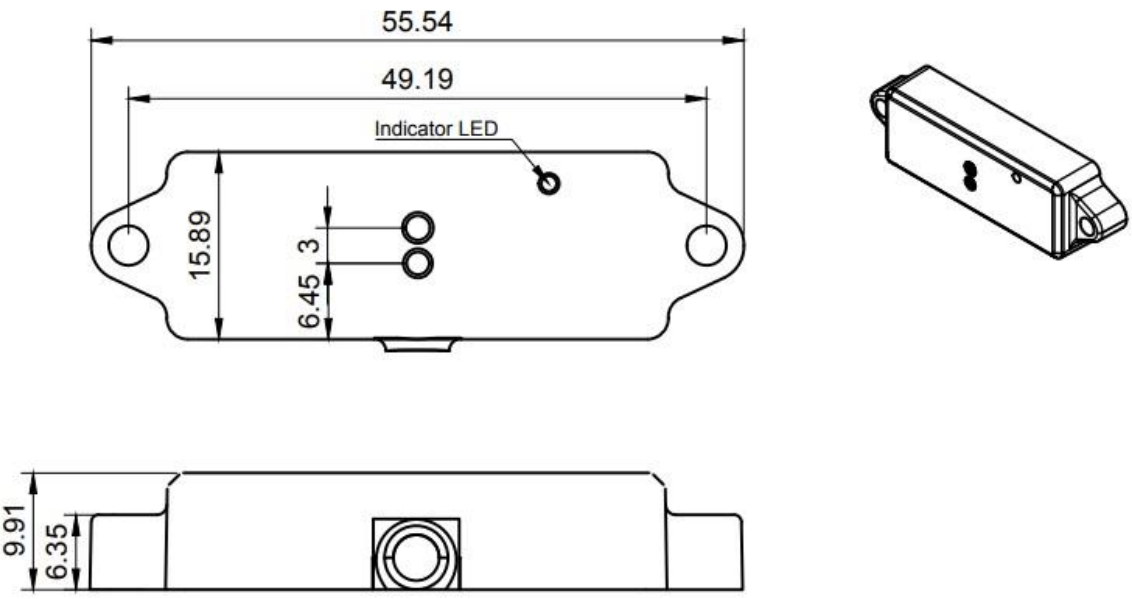
Common Issues

- Inconsistent readings on a target
  - First, consider your ranging mode and expected target distance range (what is the maximum distance you need to sense)
  - Adjust the timing budget to allow the sensor time to acquire a statistically relevant result
  - Adjust Region-of-Interest if adjacent objects are being detected instead of your intended target
  - Consider applying retroreflective tape to your target for a higher return signal

Ordering Options & Related Parts

- FDQ-36102: DeviceNet compatible ToF module, 6-30V Supply range
- FDQ-36103: CAN and Analog ToF module, 6-30V Supply range
- SEN-36007-L1: VL53L1X Qwiic 4m ToF Module
- SEN-36007-L3: VL53L3 Qwiic 2m, multi-target ToF Module

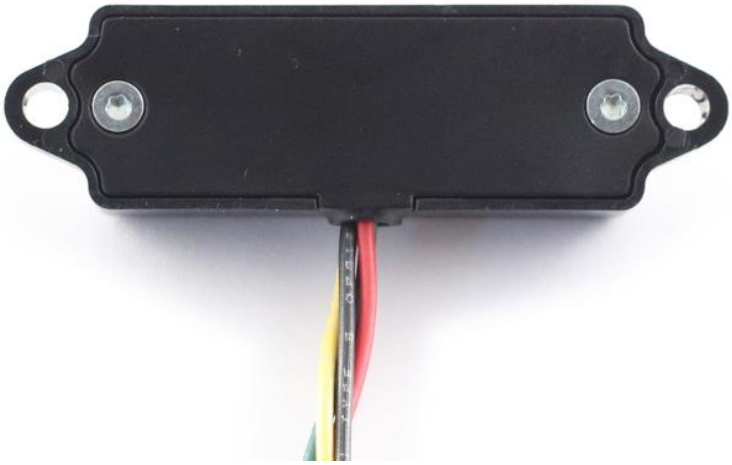
Appendix 1: Mech Drawing



Notes:
1) All dimensions in mm

Appendix 2a: SEN-36007 Front View

Appendix 2b: SEN-36007 Back View



Revision History

Date	Author	Notes
10/04/2023	J. Leonard	First revision published