Overview

FDQ-3610x is a 4-meter capable, maximum 50 Hz sample rate Time-of-Flight (ToF) sensor based on VCSEL and SPAD Array technology. This module is protected by an aluminum enclosure, as well as a special, split-view coverglass to prevent internal reflections from causing erroneous readings from the sensor. The package is IP54 when connected to the proper mating connector, though it has not been independently tested.

FDQ-36102 is a CAN-based module with a connector scheme consistent with the DeviceNet M12-5 connector pinout (see diagrams below for specifics).

FDQ-36103 is also CAN-based, but includes a 0-5V analog output on Pin 1 of the M12-5 connector

Features

- Rugged aluminum housing
- M12-5 A-code connector
- Absolute (mm) ranging, max 4 meters
- Adjustable sampling up to 50Hz with several filtering options
- 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
- Wide 6V - 30V supply voltage range

Includes

- FDQ-3610x ToF Module, fully assembled and tested

Typical Applications

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

Description

FDQ-3610x 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 FDQ-3610x:

- 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

FDQ-3610x connects with an application via an open CAN interface. See Appendix 3 below 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.

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-36005: CAN Interfaced ToF module, 5-16V Supply range

Appendix 1: Mech Drawing
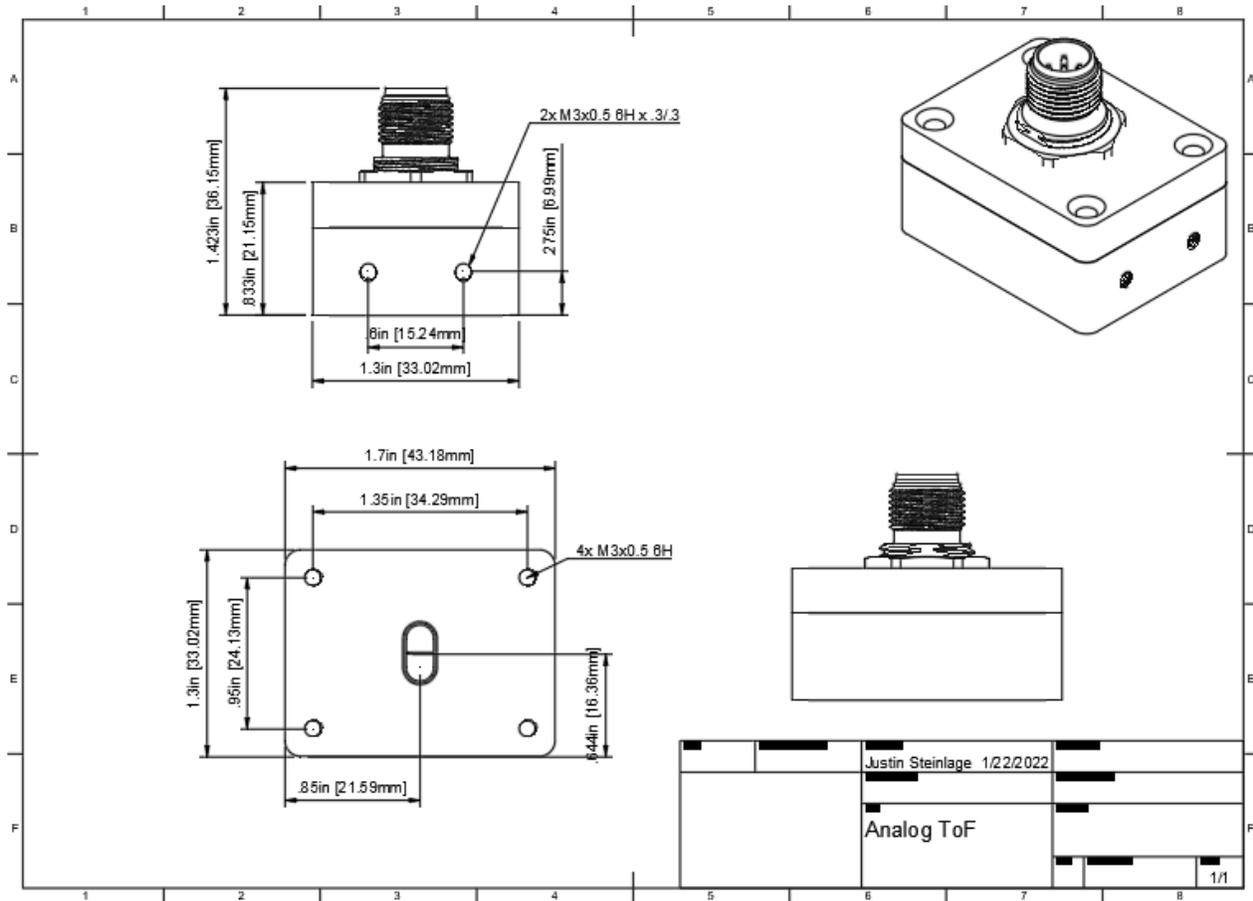
Appendix 2a: FDQ-3610x Front ISO View

Appendix 2b: FDQ-3610x Rear ISO View

Appendix 3: FDQ-3610x CAN Messaging

Messaging for this sensor is the same as the SEN-36005. Please refer to *this guide* until a manual specific to this module is released.

Revision History

Date	Author	Notes
9/1/2022	J. Steinlage	First rev