Very low power LiDAR

Features

- *Application:* *Battery, solar or energy critical applications*
- *Key features:* *Operates from a Lithium-Ion battery (3.7V)*
- *Measuring range:* *0.2 ... 50 m (80% reflective, large target)*
- *Size:* *32 mm x 30 mm x 22 mm*
- *Weight:* *10 grams*
- *Measuring speed:* *0.1 to 20 readings per second (configurable)*
- *Interfaces:* *Serial*
- *Integration:* *User APIs,* ***LightWare Studio***
- *Safety:* *Eye safe laser emission Class 1*
- *Environmental:* *Open frame, no IP rating*

bsi. ISO 9001:2015 Quality Management
FM 654831

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Table of contents

Product ordering codes

Model family	Model name	Model description
SF23	SF23/B (50 m)	Open frame LiDAR sensor, max 50 m

Disclaimer

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1. Overview

The SF23/B is a very low power LiDAR that can be used in energy critical applications where batteries or solar cells are used. It is a small form factor, general purpose LiDAR sensor that measures the distance to objects by timing a laser flash. Accuracy is not generally affected by the colour or texture of the target surface, nor the angle of incidence of the laser beam. The SF23/B is tolerant to changes in background lighting conditions, wind and noise.

The following capabilities are included in the SF23/B as standard:

- Adjustable measuring update rate.
- Internal status monitoring.
- Measurement to the nearest detected surface (first return).

Communication interfaces include:

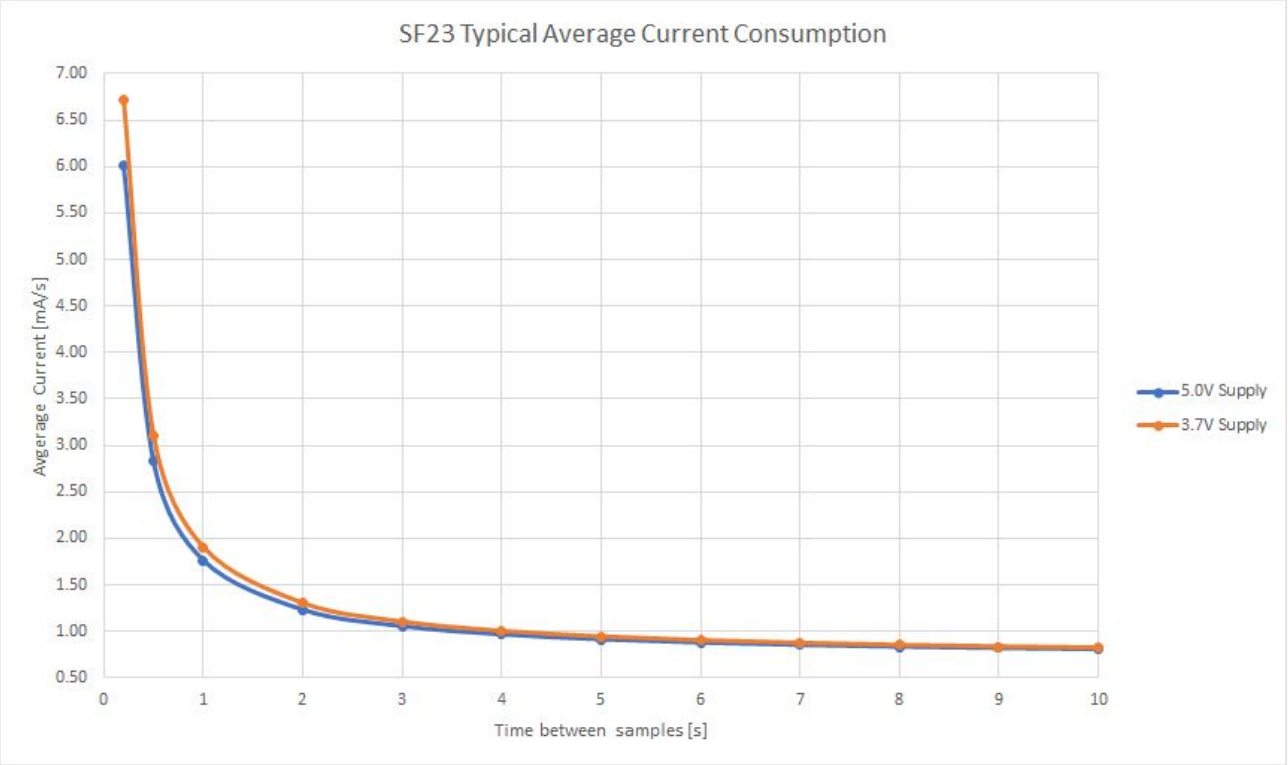
- A serial port (3.0V logic level) to connect to a host controller.
- A shutdown control line.
- A general purpose control line.

Application software support is available from the LightWare ***API*** repository.

The SF23/B LiDAR is rated laser Class 1 eye safe. Do not view the laser with magnifying optics such as microscopes, binoculars or telescopes.

2. Specifications

Performance	
Range	0.2 ... 50 m (white wall in daylight conditions)
Resolution	1 cm
Update rate	0.1 ... 20 readings per second
Accuracy	±10 cm
Connections	
Power supply voltage	3.2 V ... 5.5 V
Power supply current	< 5 mA (average at 1 reading per second), 300 mA (maximum for less than 5ms)
Outputs & interfaces	Serial (3.0 V logic), shutdown, control
Mechanical	
Dimensions	32 mm x 30 mm x 22 mm
Weight	10 g (excluding cables)
Optical	
Laser safety	Class 1 (refer to www.lightware.co.za/safety for full details)
Optical aperture	28 mm x 15 mm
Beam divergence	< 0.5°
Environmental	
Operating temperature	-10 ... +50°C
Approvals	FDA: 1910981-000 (08/2019)
Enclosure rating	N/A
Accessories	
Main cable	Main cable - 6 way, DigiKey 455-3003-ND; Mating socket, DigiKey 455-1806-ND
Default settings	
Serial port settings	9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking (Low Power Mode) 115200 baud, 8 data bits, 1 stop bit, no parity, no handshaking (Communication Mode)
Update rate	1 reading per second
Main cable connections	
1	+3.7 V - power supply positive (3.2 V to 5.5 V at 100 mA peak)
2	GND - power supply negative
3	Control signal (3.0 V logic level)
4	Shutdown (active low with 470k pull up resistor to power supply)
5	RX - serial data receive line (3.0V logic level)
6	TX - serial data transmit line (3.0V logic level)


SF23 Typical Average Current Consumption
Avgerage Current [mA/s]
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0
1
2
3
4
5
6
7
8
9
10
Time between samples [s]
5.0V Supply
3.7V Supply

3. Quickstart guide

Caution

The SF23/B laser rangefinder contains a laser and should never be aimed at a person or an animal. Do not look at the beam directly with optical instruments.

- Download the ***LightWare Studio*** application to your PC or laptop.
- Install and start the application by following the prompts.
- Connect the SF23/B to the PC using a serial to USB adaptor.
- The SF23/B will automatically be detected by the application.
- Settings options will be displayed in the main window along with a visualisation of the data coming from the SF23/B.
- Change the settings to suit your application.
- Unplug the serial to USB adaptor.

Once the settings have been entered, your host controller can communicate with the SF23/B through the serial port. API support is available from the LightWare ***API*** repository. To test the serial port the ***LightWare Communication Adaptor*** is available.

Firmware updates and additional features will become available from time to time. These can be installed into the SF23/B using a serial to USB adapter and the ***LightWare Studio*** application.

The default operational communication mode is the low power mode. The low power mode does not accept any commands and will only transmit the distance information every second over the serial interface at 9600 baud rate. The low power mode communication packet is as follows:

Byte Number	Value	Description
0	0xAA	
1	0.01m ... 100.00m (LSB = 0.01m)	Distance in cm (Low Byte)
2		Distance in cm (High Byte)
3	0...100%	Signal Strength
4	0...100%	Signal Strength
5		Checksum (Low Byte)
6		Checksum (High Byte)

4. Safety instructions

The SF23/B emits ionizing laser radiation. The level of the laser emission is Class 1 which indicates that the laser beam is safe to look at with the unaided eye but must not be viewed using binoculars or other optical devices. Notwithstanding the safety rating, avoid looking into the beam and switch the unit off when working in the area.

Caution

The use of optical instruments with this product will increase eye hazard.

The SF23/B should not be disassembled or modified in any way. The laser eye safety rating depends on the mechanical integrity of the optics and electronics so if these are damaged do not continue using the SF23/B. There are no user serviceable parts and maintenance or repair must only be carried out by the manufacturer or a qualified service agent.

No regular maintenance is required for the SF23/B but if the lenses start to collect dust then they may be wiped with suitable lens cleaning materials.

4.1. Labelling

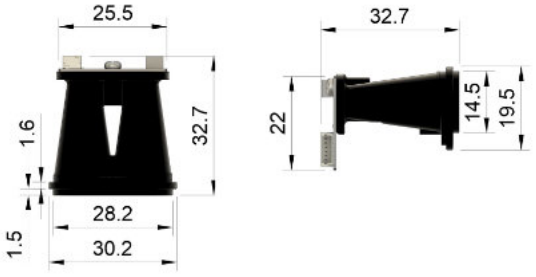
Laser radiation information and product identification labels

4.2. Laser radiation information

Specification	Value / AEL	Notes
Eye safety classification	Class 1	
Laser wavelength	905 nm	
Pulse width	15 ns	
Pulse frequency	20 kHz	Intermittent, not continuous
Average power	< 0.5 mW	At one reading per second
NOHD	0.5 m	Distance beyond which binoculars with may be used safely

5. Hardware

5.1. Dimension drawings



Dimension drawings, units in mm

5.2. Installation

SF23/B requires a clear line-of-sight to measure distance to a target surface. It can be mounted with a vertical or horizontal lens orientation.

Several mounting accessories can be purchased or downloaded from the LightWare website.

Do not mount the rangefinder within the cavity of an airframe, rather mount it directly at the surface boundary. This can prevent beam divergence from causing false readings in short range distances, or out of range conditions.

Precautions

Ensure that nothing is in the path of the laser beam.

Ensure that no shiny or highly reflective surfaces are near the path of the beam.

Secure the cable with zip ties to protect it from pulling on the connectors.

6. Revision history

Revision	Date	Comments
Rev 0	2019/10/04	First edition
Rev 1	2020/02/07	Change default serial port baud rate for communication mode to 115200

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