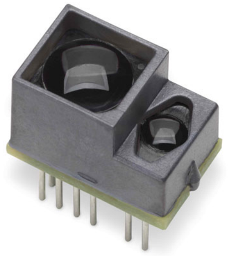
Data Sheet

AFBR-S50MV85G

Time-of-Flight Sensor Module for Distance and Motion Measurement



Description

The AFBR-S50MV85G is a multi-pixel optical distance and motion measurement sensor module based on the optical Time of flight (ToF) principle. The technology excels at supporting up to 3000 frames per second with up to 32 independently working pixels.

This technology has been developed with a special focus on applications that require the highest speed and accuracy at medium distance ranges with small size and very low power consumption.

Due to its best-in-class ambient light suppression of 200K Lux, use in outside environments is possible in direct sunlight. The module works equally well on white, black, colored, and metallic reflective surfaces.

The module also has an integrated infrared laser light source and an integrated clock source. A single power supply of 5V is required.

Data is transferred using a digital serial port interface (SPI) with standard 3.3V CMOS levels.

Specifications

- Voltage supply range of 4.5 to 5.25V
- Typical current consumption of 35 mA
- Typical optical peak output power of 40 mW
- Field-of-View (FoV) of up to 12.4° x 6.2°
- Operating temperature of –20° to 70°C
- Size without pins (l x w x h) is 12.4 x 7.6 x 7.9 mm

Features

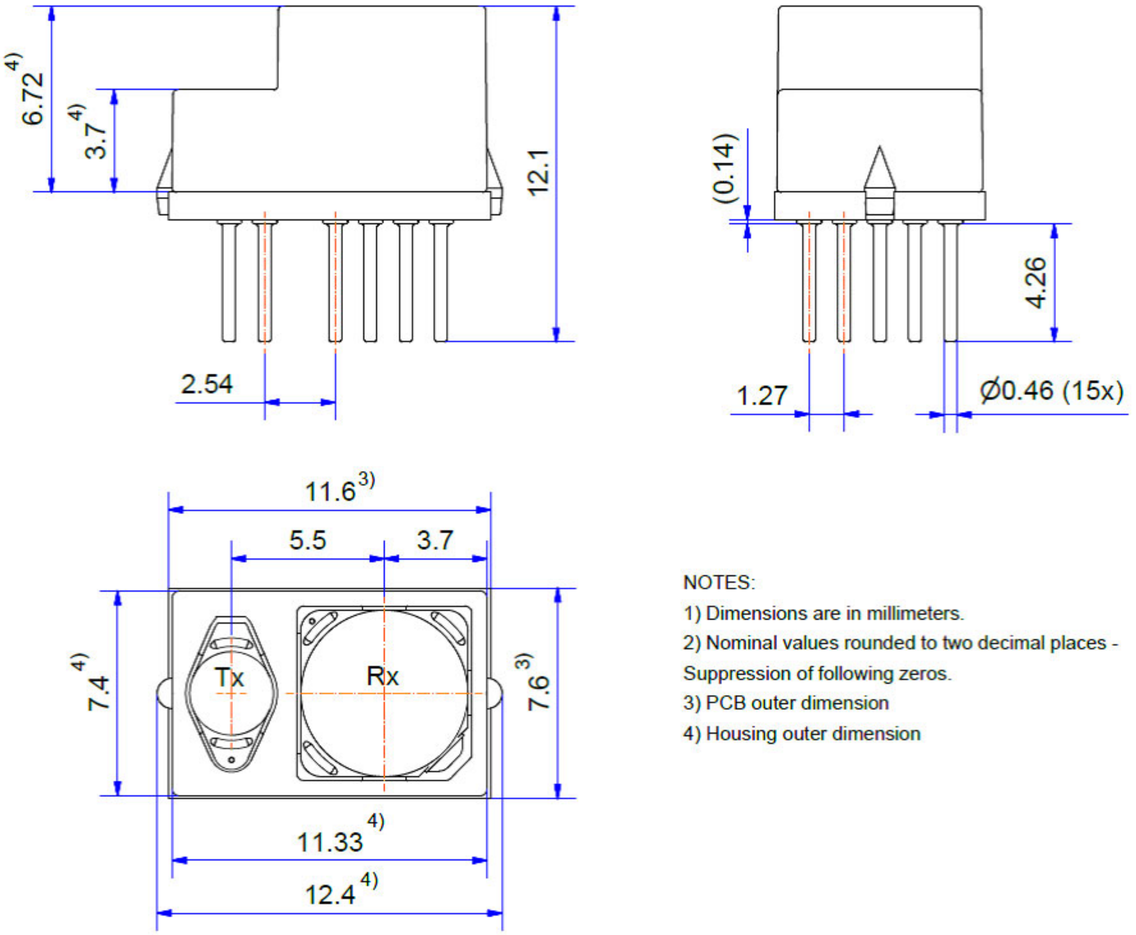
- Integrated 850 nm laser light source
- Operation up to 200K Lux
- Distance ranges from 0.01 to 10m
- Very fast measurement rates of up to 3 kHz
- Works well on all surface conditions
- SPI digital interface up to 25 MHz
- Integrated clock source
- Laser Class 1 eye safe ready

Applications

- Distance measurement
- Human machine interfaces
- Robotics
- Automation and control
- Security surveillance
- Inventory monitoring
- Augmented reality

Mechanical Dimensions

Figure 1: Module Side and Top View (Dimensions in mm)



NOTES:

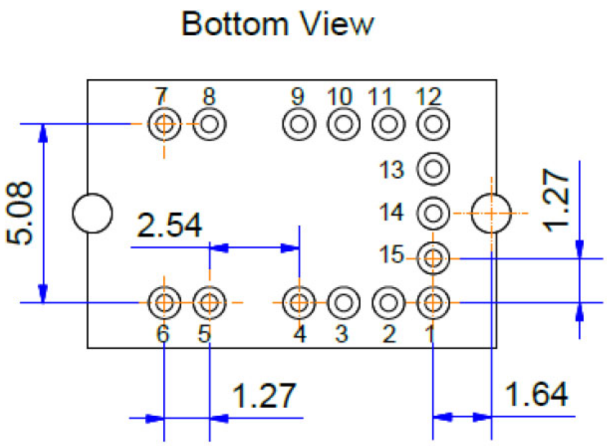
1) Dimensions are in millimeters.

2) Nominal values rounded to two decimal places - Suppression of following zeros.

3) PCB outer dimension

4) Housing outer dimension

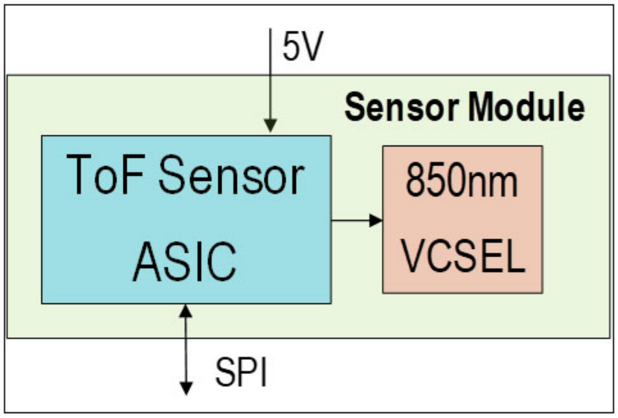
Figure 2: Module Bottom View (Dimensions in mm)



Functional Description

The integrated ToF sensor module is equipped with an 850 nm vertical-cavity surface-emitting laser (VCSEL) for invisible infrared illumination. The integrated lens for the receiver has a clear aperture of 6 mm in diameter and a FoV of 1.55° per pixel.

Figure 3: Block Diagram of the AFBR-S50MV85G



The integrated lens for the transmitter is aligned with the receiver optics to illuminate between 7 and 16 pixels simultaneously, depending on distance and reflectivity of the target object.

In addition, the system compensates for parallax errors for very near distances. Basically, no lower distance limit is required. This allows the module to achieve a good pixel intensity for distance measurements over the whole measurement range, as well as deliver context information for the system. Context information includes motion, speed, tilt angles, or lateral alignment precision for small targets or features.

The maximum distance range is at least 3m for robust operation in any environment. This includes bright sunlight and measurements of all kinds of targets, even black or metallic surfaces. For bright or highly reflective targets, the useful distance can exceed 10m.

The functionality of the ToF Sensor is completely accessible through SPI register access from any microcontroller. There is no processor with firmware on the module. All hardware configuration, calibration, and measurement steps are performed by an external microcontroller using the ToF driver firmware. The ToF driver firmware extracts both the distance and amplitude values of all used pixels on a per-frame basis. The driver firmware is available as binary library files that are independent of the underlying hardware platform. Example software applications such as extraction, graphical display of distance, or speed and motion are available as source code.

The ready-to-run driver firmware binaries include an application programming interface (API). The API allows users to configure and customize device operation. This API is provided free-of-charge under a generic end-user license agreement (EULA). Additionally, a reference implementation utilizing the driver firmware binaries with an ARM Cortex M0+ 32 bit platform is provided with an open source software development kit (SDK) under the GNU General Public License for evaluation and reference purpose. For instructions on installing and running the SDK, refer to the getting started documentation for the product.

The module uses an integrated RC oscillator and phase-locked loop (PLL) for highly precise clock generation. The integrated PLL can optionally be fed by an external 25 MHz oscillator. All data sheet performance values assume the use of only the on-chip clock source and no further external components.

With the exception of cover glass, the module is factory calibrated and does not need customer-side calibration. If cover glass is used, the receiver should be directly attached to the cover. Suitable compensation and calibration functionality is provided along with the firmware driver and application software package.

Description of the Time-of-Flight Sensor ASIC and Detector Matrix

The ToF sensor ASIC includes all of the required items for clock and supply generation out of a single supplied voltage, analog and digital signal processing, and a laser driver.

The receiver sensor consists of 32 pixels partitioned into eight rows and four lines with a hexagonal structure.

Figure 4: Functional Block Diagram of the Sensor ASIC

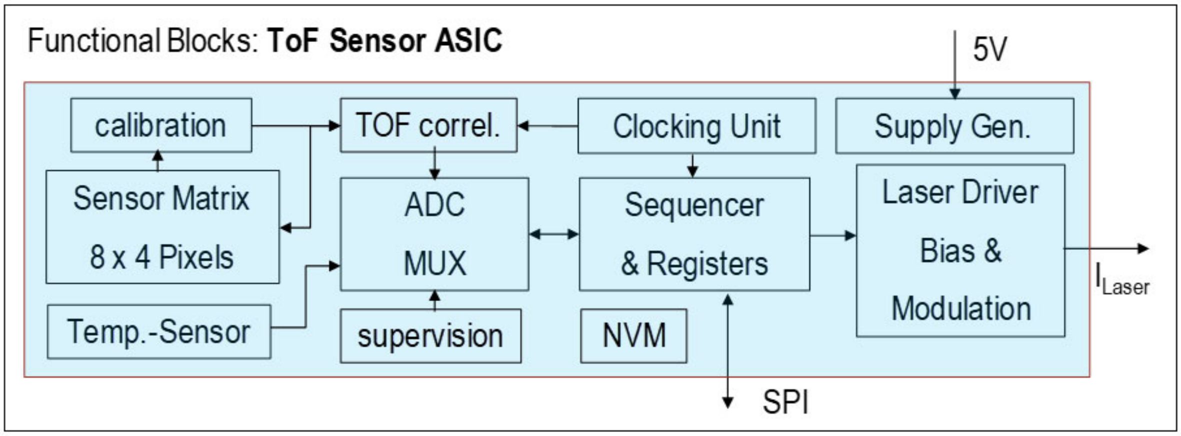
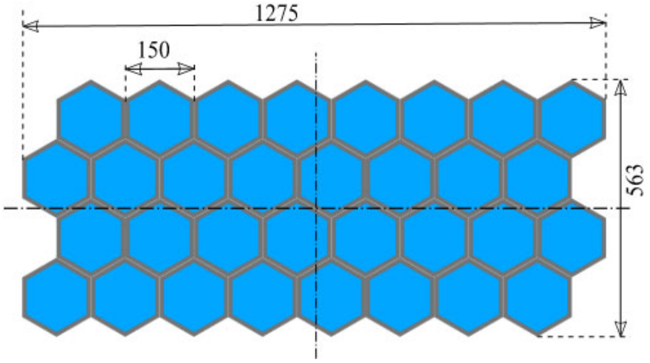


Figure 5: Hexagonal Structure of the Sensor Matrix (Dimensions in µm)



Detailed Module Pin Description and Operation

The housing uses solder pins of 4.26 mm length. The solder pins can be wave soldered (not reflow soldered) and provide a robust mechanical connection as well as a good thermal and electrical connection to the customer PCB. The module uses a single 5V supply which is split into a Laser and Sensor supply rail. To avoid electrical crosstalk from the laser into the sensor supply, use separate local blocking and filtering. An optional external oscillator can be connected to serve as an exact frequency reference. All data sheet performance values are based on the internal clock source only.

I/O Pin Configuration

Pin Number	Name	Pin Type	Buffer Type	Description
1	SPI_CLK	I	3.3V CMOS	Clock input for SPI interface clock up to 25 MHz using standard 3.3V CMOS levels.
2	SPI_MOSI	I	3.3V CMOS	SPI Slave Data Input using standard 3.3V CMOS levels.
3	SPI_MISO	O	3.3V, PP	SPI Slave Data Output (Push-Pull) using standard 3.3V CMOS levels with a drive strength of 8 mA
4	IRQ_n	O	3.3V, OD	Active Low Interrupt Output (Open Drain), measurement ready output using standard 3.3V CMOS levels with a drive strength of 4mA with an internal Pull-up of 50 kOhm. External Pull up to 3.3V using a 10 kOhm resistor is recommended.
5	GNDL	GND	—	Laser Driver Ground, should be connected with the Sensor GND using a ferrite bead on the PCB.
6	VDDL	PWR	—	Laser Anode Supply, connect with a ferrite bead to 5V and buffer with 10 uF/100 nF versus GNDL.
7	GND	GND	—	Sensor Ground, connect to a GND Plane on the PCB.
8	VDD	PWR	—	Sensor Supply, connect to 5V and buffer with 10 uF/100 nF versus GND.
9	GND	GND	—	Sensor Ground, connect to a GND Plane on the PCB.
10	CLK+	I/O	3.3V/LVDS	Reference clock input or output; do not connect if not used; differential or single ended.
11	CLK-	I/O	LVDS	Reference clock input or output; do not connect if not used; differential only.
12	Test	NU	—	Pin for factory usage, do not connect.
13	VDD	PWR	—	Sensor Supply, connect to 5V and buffer with 10 uF/100 nF versus GND.
14	GND	GND	—	Sensor Ground, connect to a GND Plane on the PCB.
15	SPI_CS_n	I	3.3V CMOS	SPI Chip Select (active-low) input using standard 3.3V CMOS levels, internal pull up of 50 kOhm.

Absolute Maximum Ratings and Regulatory Compliance

Stresses in excess of the absolute maximum ratings can cause catastrophic damage to the device. Limits apply to each parameter in isolation, all other parameters having values within the recommended operation conditions. It should not be assumed that limiting values of more than one parameter can be applied to products at same time. Exposure to the absolute maximum ratings for extended periods can adversely affect device reliability.

Absolute Maximum Ratings

Description	Symbol	Minimum	Typ	Max	Units	Notes
Supply voltage sensor	VDD	–0.5	—	5.25	V	—
Supply voltage laser	VDDL	–0.5	—	5.25	V	—
Storage temperature range	T_{stor}	–40	—	85	°C	—
Maximum operating temperature range	T_{amb}	–20	—	70	°C	a
Lead soldering temperature	Tsold	—	—	260	°C	b
Lead soldering time	tsold	—	—	10	s	b
ESD protection, human body model	ESD_HBM	–1500	—	1500	V	c

a. Operating the product outside the maximum rated ambient operating temperature range will compromise its reliability and may damage the product. Ambient air temperature is defined as the temperature measured with the thermocouple placed close to the sensor.

b. The module is Pb-free wave solderable (no clean). The moisture sensitivity level is 3.

c. Human Body Model (HBM): JEDEC JS-001-2012.

Regulatory Compliance

Feature	Test Method	Performance and Comments
Electrostatic discharge (ESD) to the electrical pins	JEDEC JS-001-2012	Withstands up to 1500V HBM applied between electrical pins.
Eye safety	IEC 60825-1:2007	Class 1[a]
RoHS I and II compliance	RoHS Directive 2011/65EU Annex II	—
REACH compliance	EC No 1907/2006	—
UL-94 flammability	UL-94V-0	—

a. Laser Class 1 operation depends on correct system integration and configuration of software. Without the correct configuration or before the integration has been completed, the module can emit at higher levels and is rated as Laser Class 3B device.

Figure 6: Laser Safety Warning Sign

Operating Conditions and Electrical Characteristics

Recommended Operating Conditions

Description	Symbol	Min	Typ	Max	Units	Notes
Supply voltage sensor	VDD	4.5	5	5.25	V	—
Supply voltage laser (anode)	VDDL	4.5	5	5.25	V	—
Maximum ripple of supply voltage sensor	VPP	—	—	100	mV_{pp}	a
Maximum ripple of supply voltage laser	VPPL	—	—	100	mV_{pp}	a
Operation temperature range	T_{amb}	–20	25	70	°C	—
Relative humidity, non-condensing	RH	5	—	85	%	—

a. Voltage ripple to be measured with a bandwidth of at least 200 MHz.

Electrical Characteristics

All of the data in this specification refers to the operating conditions above unless otherwise stated.

Description	Symbol	Min	Typ	Max	Units	Notes
SPI slave interface clock frequency	f_{SPI}	1	12	25	MHz	—
Low level input voltage	VIL	–0.3	—	0.8	V	—
High level input voltage	VIH	2	—	3.6	V	—
Low level output voltage	VOL	—	—	0.8	V	—
High level output voltage	VOH	2.8	—	—	V	—
Output current of SDO	I_{SDO}	3	—	8	mA	—
Peak laser current	I_{VDDL_peak}	—	55	—	mA	—
Average laser current	$<I_{VDDL}>$	0.5	1	—	mA	a
Average sensor current	$<I_{VDD}>$	—	35	—	mA	—
Active system power consumption	$P_{diss,total}$	—	180	—	mW	b
Power up time	$t_{poweron}$	—	150	—	ms	c

a. Assumes Laser Class 1 operation.

b. Assumes a constantly active device and no use of standby modes between two frames.

c. Time until the device is ready to accept commands and start measurements.

Optical Module Performance Summary

The AFBR-S50MV85G is one of the most flexible ToF measuring systems available in the market. It allows both for very high sensitivity and the highest dynamic range with best-in-class ambient light suppression, as well as very short measurement cycles. In contrast to typical laser ranging sensors, several pixels are operated at the same time to allow for movement and 3D speed extractions. However, all performance parameters cannot typically be optimized at the same time. Therefore, a rich set of possible configurations is supported and can be selected on-the-fly in the driver software to allow for combination and time interleaved operation of different modes.

Optical and Sensor Characteristics

All of the data in this specification refers to the operating conditions above unless otherwise stated.

Description	Symbol	Min	Typ	Max	Units	Notes
Emission wavelength	l	835	850	865	nm	—
Beam divergence $1/e_2$ full width	Θ_{full}	3.5	4.0	4.5	°	a
Light spot diameter at 100 mm distance	D_{100}	8	—	10	mm	a
Light spot diameter at 1000 mm distance	D_{1000}	63	—	80	mm	a
Light spot diameter at 10000 mm distance	D_{10000}	610	—	780	mm	a
Pixel FoV at 100 mm distance	$Dpix_{100}$	—	2.7	—	mm	—
Pixel FoV at 1000 mm distance	$Dpix_{1000}$	—	27	—	mm	—
Pixel FoV at 10000 mm distance	$Dpix_{10000}$	—	270	—	mm	—
Number of actively illuminated pixels	$\#Pix_{illum}$	7	9	16	#	b, g
Number of available pixels	#Pix	—	32	—	#	—
Pitch of detector pixels	d_{Pix}	—	150	—	um	—
Avalanche gain of detector pixels	M	—	25	—	#	c
Bitclock	f_{bit}	50	100	200	MHz	—
Actual laser pulse length (pattern)	t_{pulse}	10	20	40	ns	—
Frame rate (long range, 40 ns pulses)	f_{frame}	—	100	1000	Hz	d
Frame rate (short range, 20 ns pulses)	f_{frame}	—	100	2000	Hz	e
Frame rate (high speed, 10 ns pulses)	f_{frame_max}	—	100	3000	Hz	f
Maximum pattern length	#bits	—	—	128	#	—
Number of pattern repetitions	N_{SCM}	1	8	128	#	—
Number of configurable phase shifts	#ph	1	4	16	#	—
Analog integration time per phase	t_{int}	0.01	10	40	µs	—
Digital averaging depth per phase	#S	1	64	1024	#	
Measurement range	d_{meas}	10	—	10000	mm	g
Distance resolution	Δd_{res}	—	0.1	—	mm	—
1-σ precision	s	—	5	—	mm	h
Ambient light illuminance suppression	E_{AL}	—	20000	200000	lx	—

a. Specified at room temperature.

b. Number of selected pixels depends on software configuration, distance, and remission of target. For example, for a white target between 50cm and 5m distance, at least 7 Pixels are typically selected with default settings.

c. APD Gain is configurable depending on application scenario and can be changed on-the-fly.

d. 40 ns pulses, all pixels active, four phases with 4 x 20 µs integration time, SPI clock speed 12 MHz.

e. 20 ns pulses, all pixels active, four phases with 4 x 10 µs integration time, SPI clock speed 25 MHz.

f. 10 ns pulses, all pixels active, four phases with 4 x 5 µs integration time, SPI clock speed 25 MHz.

g. Maximum measurement range depends on target remission, ambient light, and sensor configuration.

h. Depending on remission and distance of object, pulse length, and integration time (see Typical Precision in Long Range Mode, Indoor (Approximately 1K Lux) and Typical Precision in Short Range Mode, Indoor (Approximately 1K Lux)).

Example Characteristics

To show the dependency of distance measurement repeatability per pixel (1-sigma distance precision) on various factors, including environmental and configuration options, a set of example precision characteristics are presented. The characteristics are valid for well illuminated pixels only. AFBR-S50MV85G has a contiguous cluster of at least seven well illuminated pixels at the same time.

The average output power is selected to meet Laser Class 1 eye safety. The laser pulse lengths can be chosen for high sensitivity and large distances, high precision for a limited distance range (short range mode), or for a good compromise between both using intermediate settings or interleaved operation.

By default, a standard long range mode is selected. The figures in Typical Precision in Long Range Mode, Indoor (Approximately 1K Lux) show the typical precision values per pixel as a function of target distance and target remission (6% for black, 18% for gray, and 90% for white), depending on frame rate and ambient light. In standard long range mode with a 40 ns pulse length, the detection limit is reached at roughly 10m distance for objects with 6% remission (undirected reflectivity with lambertian characteristics). This is shown in a green background color. The unambiguous range is chosen to be 12m. By changing the sensor configuration in the software, this limit can be further increased at the expense of precision and maximum possible frame rates.

The following trends apply to all scenarios:

- Repeatability error scales with the square root of the frame rate. Since frame rate mainly determines the number of measurements per frame and not the length of each individual measurement, it does not directly affect the detection limit.
- Repeatability error also scales with pulse length (the shorter the pulses, the smaller the error), but short pulses also degrade detection limit due to additional noise of the larger bandwidth.
- The influence of ambient light can be efficiently compensated for to ensure that no overflow happens, it also does not change the detector efficiency. However, the remaining additional shot noise degrades both the detection limit as well as the repeatability error.

In short range mode with a 20 ns pulse length, the unambiguous range is limited to 6m, but precision improves substantially. Operation of up to 2 kHz frame rate is also possible in this mode. The figures in Typical Precision in Short Range Mode, Indoor (Approximately 1K Lux) illustrate the performance of short range mode.

The figures in this section only illustrate some of the typical applications supported by the two standard configurations. There are many more configurations possible.

To achieve optimum precision values, the APD Gain (Multiplication Factor “M”) is adjusted by the ToF Firmware according to the current illumination conditions.

NOTE: In near infrared, most objects show different (often higher) remission values than in the visible range. Objects appearing deep black in the visible spectrum can easily have a remission value of 10% or higher in the 850 nm wavelength range.

Typical Precision in Long Range Mode, Indoor (Approximately 1K Lux)

Figure 7: Long Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 1K Lux

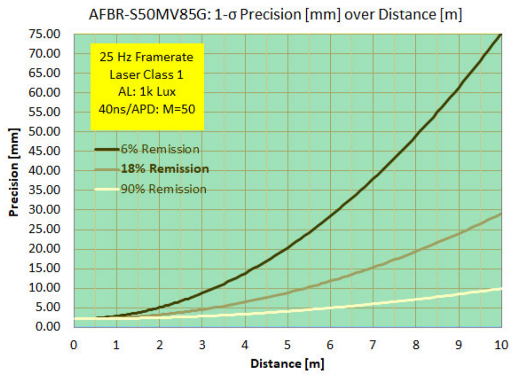
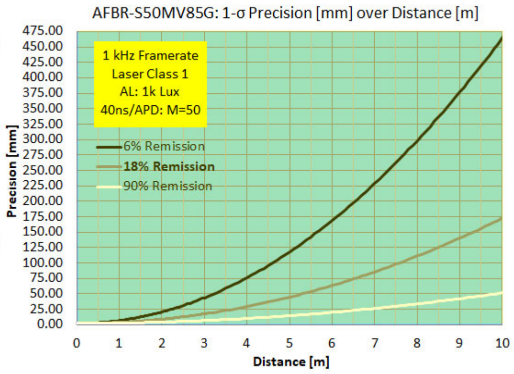


Figure 8: Long Range Mode at a Frame Rate of 1000 Hz and Laser Class 1, 1K Lux



Typical Precision in Long Range Mode, Outdoor (20K Lux and 200K Lux)

Figure 9: Long Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 20K Lux

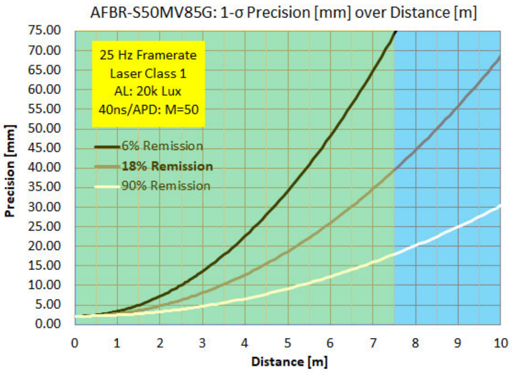


Figure 10: Long Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 200K Lux

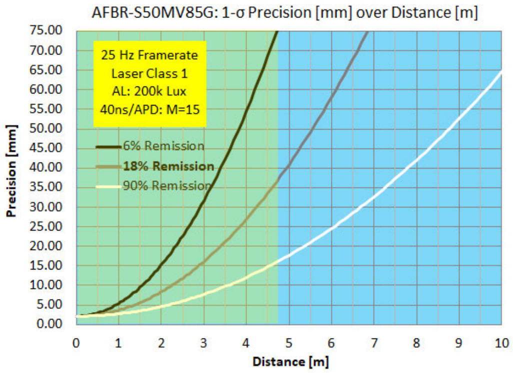
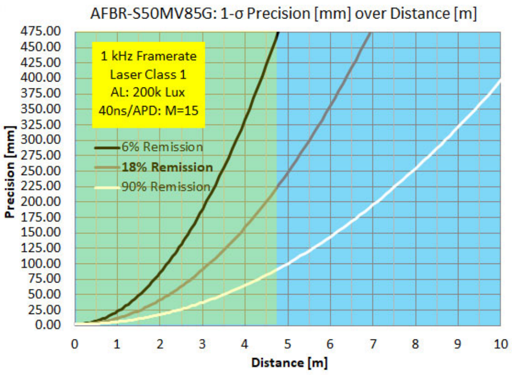


Figure 11: Long Range Mode at a Frame Rate of 1000 Hz and Laser Class 1, 200K Lux



Typical Precision in Short Range Mode, Indoor (Approximately 1K Lux)

Figure 12: Short Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 1K Lux

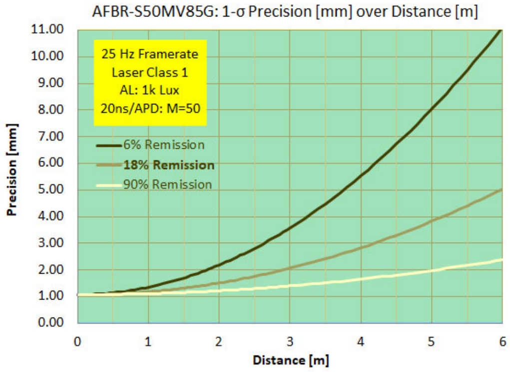
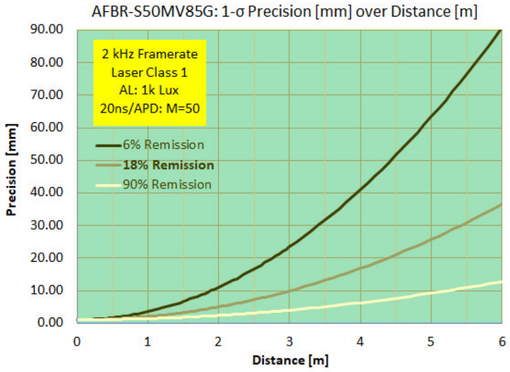


Figure 13: Short Range Mode at a Frame Rate of 2000 Hz and Laser Class 1, 1K Lux



Typical Precision in Short Range Mode, Outdoor (20K Lux and 200K Lux)

Figure 14: Short Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 20K Lux

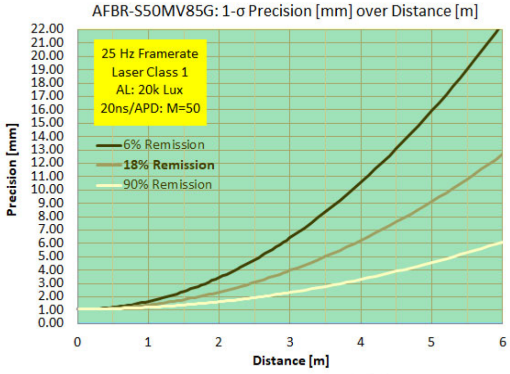


Figure 15: Short Range Mode at a Frame Rate of 25 Hz and Laser Class 1, 200K Lux

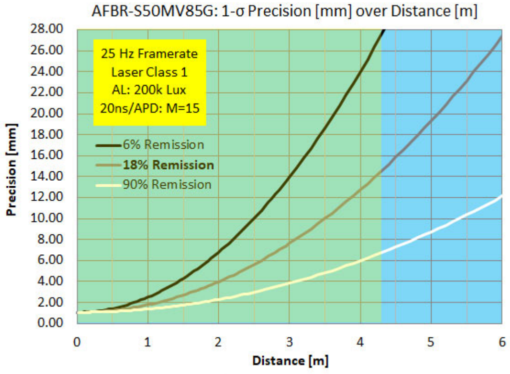
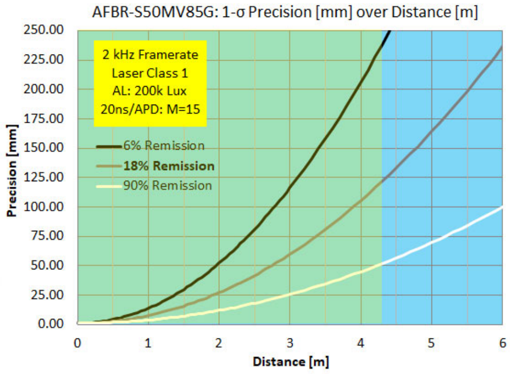


Figure 16: Short Range Mode at a Frame Rate of 2000 Hz and Laser Class 1, 200K Lux

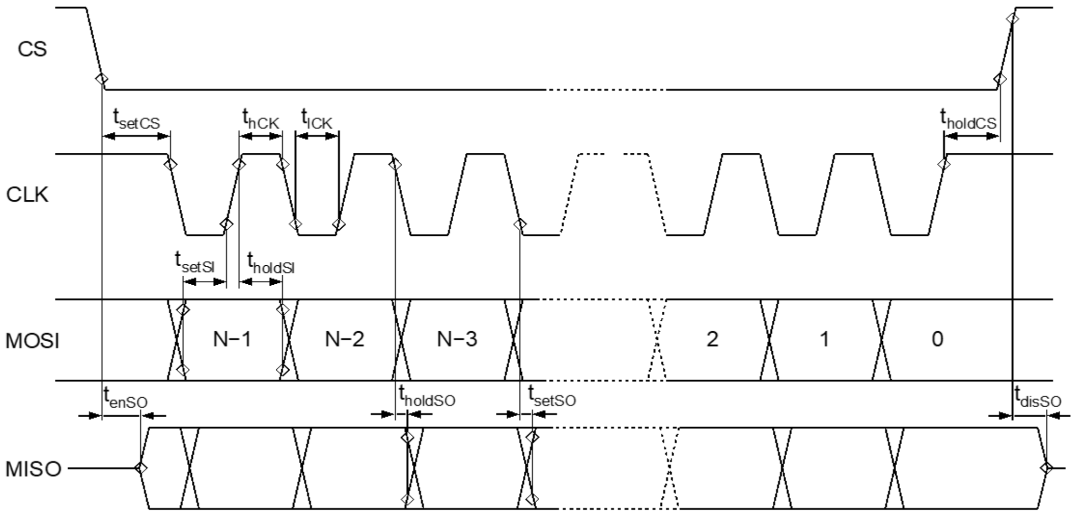


Digital Interface Characteristics

Register access is performed with a standard four-wire SPI, which is available in all common microcontrollers. It can be run with up to 25 MHz clock frequency.

The default mode is SPI Mode 3, which translates into Clock Polarity CPOL = 1 (base value of clock is high) and Clock Phase CPHA = 1 (data output on falling edge, data is captured on rising edge). The chunk size is 8 Bits (8 Address Bits, multiples of 8 Data Bits) and the Endianess is Big Endian (most significant bit first). The timing relations are sketched in the following diagram:

Figure 17: SPI Timing Diagram



SPI Slave Interface Timing Parameters

Description	Symbol	Min	Typ	Max	Units	Notes
SPI clock frequency	f_{SPI}	1	12	25	MHz	—
SPI clock high period	T_{hCK}	—	40	—	ns	—
SPI clock low period	T_{lCK}	—	40	—	ns	—
Input logic low hysteresis	V_{IL}	—	—	1	V	—
Input logic high hysteresis	V_{IH}	2.18	—	—	V	—
Output rise time	t_{rO}	—	9	—	ns	10 pF load
Output fall time	t_{fO}	—	2.1	—	ns	10 pF load
Output low strength	I_{sLO}	—	13.5	—	mA	$V_o = 0.8V$
Output high strength	I_{sHO}	—	2.5	—	mA	$V_o = 2.4V$
Chip select set time	t_{setCS}	—	20	—	ns	—
Chip select hold time	t_{holdCS}	—	20	—	ns	—
Data input set time	t_{setSI}	—	15	—	ns	—
Data input hold time	t_{holdSI}	—	15	—	ns	—
Data output enable time	t_{enSO}	1.7	—	—	ns	—
Data output disable time	t_{disSO}	—	—	18.6	ns	—

Application Circuit and Layout Recommendations

The ToF sensor module requires local power supply filtering to limit voltage ripple based on dynamic variations of current consumption and respective noise coupling into the module, as well as coupling back into the application circuit using the supply rails VDD and VDDL. The main noise source is the laser driver, which generates pulses on the order of 100 mA for a few ns lengths, mainly drawn from the VDDL supply rail. The respective noisy GND is denoted as GNDL. The short pulses should be buffered with a 100 nF ceramic capacitor placed close to the VDDL and the GNDL pin with a sufficiently high frequency response (impedance of less than 0.5 Ohm between 10 MHz and 200 MHz, such as in the X7R type in a 0603 SMD package). Since the pulses are grouped into bursts, another larger capacitor referenced to GNDL should be used to stabilize the supply, followed by a bead and another 10 uF capacitor referenced to GND (pi filter) to block noise in both directions. At this point, VDD and VDDL can be combined on the PCB to a single 5V supply rail. Since a similar switching noise needs to be filtered for the sensor supply VDD, both VDD supply pins should be buffered against GND with 100 nF. Another bead is used to connect the noisy island GNDL to GND.

There is no need to place an external oscillator, coils, or other active components, except for a Micro Controller Unit (MCU) for module configuration and data processing.

The following images show an example schematic for the application board integration and layout proposal based on a 2-layer application PCB.

Figure 18: Application Schematic

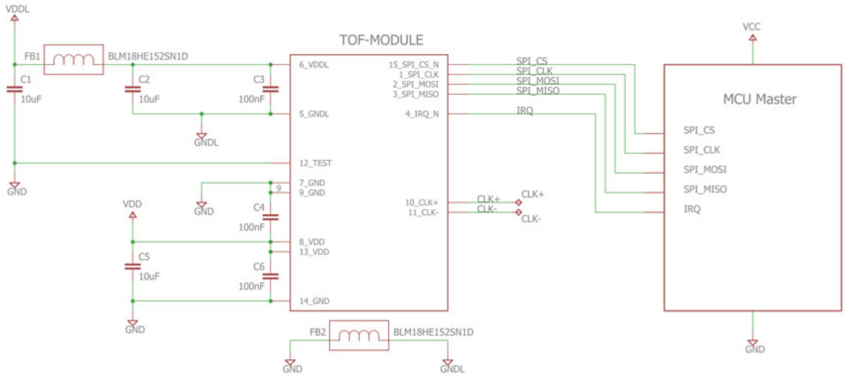
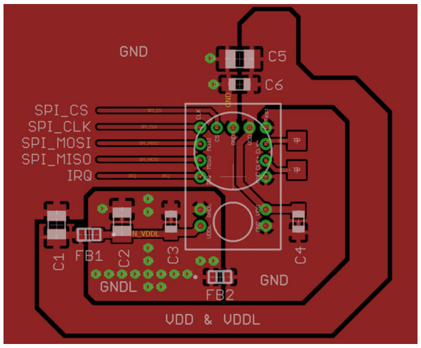


Figure 19: Application Layout (the Top Layer of a 2-layer PCB Design)



Module Software and Firmware Package Overview

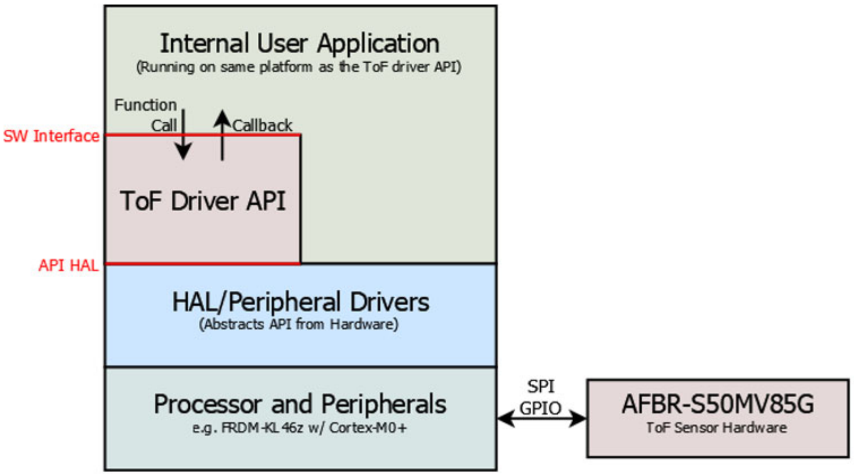
The driver firmware contains all necessary parts for sensor operation within a low-cost embedded system. It controls the light source, evaluates distances and amplitudes, regulates integration times, calibrates absolute distances and temperature effects, and chooses the optimal pixels depending on the application (either distance measurement or multipixel applications).

The module software package, containing the Driver Firmware binaries as well as example applications, is provided free-of-charge under a generic EULA. The binaries are embedded in a reference application that runs on the NXP/Freescale KL46Z, Cortex-M0+, platform. The reference application is distributed under the open source GNU GPL license. The driver firmware was developed with a focus on portability to any low-power ARM, 32-bit based, operation-system-less, microcontroller platform. All calculations are based on fixed point arithmetic.

In addition, an open source GUI Software based on C# running on Windows is provided for evaluation and graphical display of measurement results, as well as easy configuration management. The GUI connects to the reference application using a generic Systems Communication Interface (SCI) that sends and receives data packages over a simple serial interface. The SCI defines another API and enables access to the Firmware using hardware communication interfaces such as I^{2}C, SPI, and UART.

For a detailed description, refer to the reference manual included with each software release.

Figure 20: Firmware Block Diagram



The ToF Driver API is embedded into the user application and hardware abstraction layers, as well as the peripheral drivers abstracting the underlying platform that connects to the ToF Sensor Hardware using SPI and GPIO.

The ToF Driver API provides functionality for device control and communication, sensor calibrations, and measurement data evaluations. Because of this, several functions need to be executed in a predefine sequence. After a measurement has been performed on the chip, data needs to be read and evaluated. The next measurement cycle with an updated device configuration must then be triggered. In order to achieve highest flexibility, these small tasks are kept separate in the API layer so the user can decide if performance, accuracy, or convenient implementation is preferred in their application.

To meet performance requirements, the main thread must schedule CPU time for the API and the user application. This can be achieved using a simple main loop which executes all of the required tasks for a single measurement frame sequentially in a blocking manner. However, a more sophisticated method evaluates previous measurement data while the device is doing the next measurement in parallel. This requires a simple preemptive task scheduler, which is used for reference application implementation. Alternatively, the timing could also be based on a real time operating system (RTOS). The measurements can also be performed on a time-based schedule in the background using an additional hardware timer that creates periodic interrupts.

The API separates the measurement cycle into two main tasks:

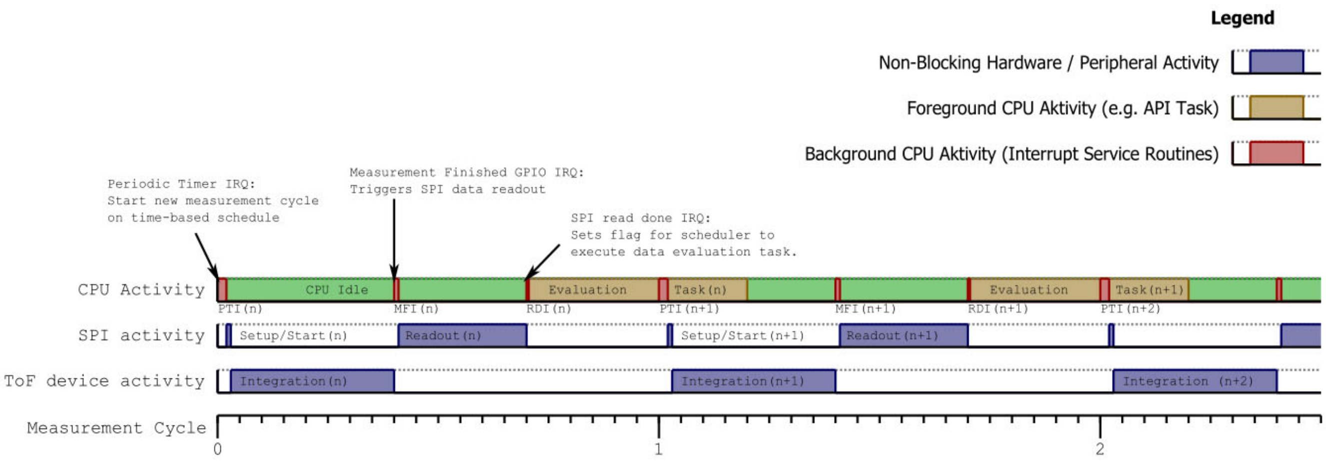
- The device communication with the ToF hardware is performed using a standard SPI interface plus a single IRQ line to obtain the data ready event. The communication is fully automated in the background within small interrupt service routines. The only action the user application might need to take is on the trigger of a new measurement cycle. This can also be done from a periodic interrupt timer. The device is updated with new configurations (obtained by evaluation of the previous results or user request) before the measurement data acquisition is started. After the measurement cycle is finished, the pending IRQ from the device initiates the data read-out and a callback function is invoked to inform the user application of the data ready event.
- The data evaluation and calibration of the raw data is performed by a simple function call from the main thread to the API. Afterwards, useful information such as range values, signal strength, ambient light level, or gestures are available for further usage in the user application.

The following figure shows an example of the Firmware API measurement task timing. In addition to these main tasks, there are several utility functions for calibration (for example, crosstalk/cover glass correction, temperature calibration, or ambient light suppression) and configuration (for example, integration time adaption, or eye-safety timing) tasks that can run in the background at a lower priority.

To be portable, the API requires some interfaces to peripherals which must be implemented by the user for the platform of choice. These interfaces are as follows:

- SPI – Communication with the device is done using a standard four-wire SPI interface.
- GPIO – A single GPIO input line is required for the measurement finished interrupt.
- Timer 1 (mandatory) – To obey the eye-safety limits, a highly accurate and independent hardware timer is required for time measurement occasions.
- Timer 2 (optional) – To maintain a fixed framerate and trigger measurements independently in the background, an additional periodic interrupt timer can be used.

Figure 21: Firmware Timing Diagram



A periodic timer interrupt (PTI) triggers the measurements in the background on a time based schedule. After the device configuration is optionally updated, the integration cycle starts and the device will acquire all measurement data and raise the measurement finished interrupt (MFI) using a GPIO line after finishing. The data is then ready and can be read using the SPI interface. After the communication is done, the user application is informed about the new data using a callback from the SPI read done interrupt (RDI). The user application is now responsible for calling the evaluation and calibration task for the received measurement data. Meanwhile, the PTI triggers the next measurement frame independently of the current user application state.

NOTE: The length of the evaluation task highly depends on the platform and chosen algorithms, and might be longer than the bare measurement frame time. This would lead to a delay of the measurement start and a slower frame rate.

Software and Application Support

Contact your local sales representative to get the latest SDK and associated documentation. Evaluation kits that include Windows-based evaluation software are also available.

For more information, refer to the AFBR-S50MV85G Product Page.

Packaging and Ordering Information

The modules are shipped in tubes of 60 pieces each. The minimum order quantity is one tube. Including plugs, the tube length is 50 cm.

Figure 22: Packing Details