AFBR-S50 series
Time-of-Flight sensor modules for distance and motion measurement

Release Notes
Argus Maintenance SDK
Release V1.5.6
January 12th, 2024

The SDK Release V1.5.6 is a Maintenance Software Release, which shall be used together with all AFBR-S50 TOF modules. Compared to the previous productive Release 1.4.4 it has both feature and performance upgrades relevant for all AFBR-S50 module types.

All Hardware revisions are supported.

The Software explicitly supports the following AFBR-S50 variants:

AFBR-S50MV85G (medium range, typical up to 10 m, 7… 16 Pixels illuminated), productive

AFBR-S50MV85I (short to medium range, typical up to 5 m, 32 Pixels illuminated), productive

AFBR-S50MV68B (medium range, typical up to 10 m, 1 … 2 Pixel illuminated), productive

AFBR-S50LV85D (long range, typical up to 30 m, 1 … 3 Pixel illuminated), productive

AFBR-S50LX85D (extra-long range, typical up to 50 m, 1 … 3 Pixel illuminated), productive

The Software additionally has preliminary support for the following AFBR-S50 variant:

AFBR-S50MX85I (medium range, typical up to 8 m, 32 Pixel illuminated), engineering

Important remark:

With the basic SDK version, no direct register access is possible and any violations of laser class 1 eye safety limits are blocked.

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1. Feature enhancements from previous release 1.4.4

Id	Feature	Description	Application Note
1.1	Systematic error compensation	Deviations from ideal linear system (rectangular pulses, infinite bandwidth) lead to distance errors in the order of 1% of the unambiguous range	A LUT correction in phase space has been implemented to correct the systematic error. Two tables, one for low and one for high current, for each module type are implemented
1.2	Pixel to Pixel Distance Offsets depending on laser current	Previous Software Versions only used a static Pixel to Pixel Distance Offset correction table	A per pixel offset table for the low laser current operation (in addition to the table for high current) has been added
1.3	Golden Pixel Priority Mode	In case of single Pixel Applications, the “Golden Pixel” can be prioritized	This avoids additional switching noise for horizontally moving objects, also improved immunity against straylight from bright disturbers (e.g. retro-reflectors)*
1.4	DCA min state flag	A flag indicating the DCA is at min. state is added in addition to the DCA max flag	This flag can be used to detect extreme conditions like the presence of a retro-reflector
1.5	Hysteresis thresholds for Pixel Binning parameters	Amplitude or distance noise lead to a “flickering” set of binned pixels, which additionally increased the binned Amplitude and Distance noise.	The selected set of binned pixels is stabilized by introducing Hysteresis thresholds on all binning thresholds (both for distance as well as amplitude criteria)
1.6	Improved exponential Regulation Speed	Exponential integration energy reduction is performed if the number of saturated pixels is reaching the threshold for exponential decrease	The integration energy is reduced by a factor of 1/4 per regulation step. Now only a maximum of four frames are required for regulation (typically one or two frames)
1.7	Improved DFM sync time after overload	DFM always used three frames for DFM to sync in previous SW versions	DFM is now using only two frames for sync after a pixel overload event, if DCA is not at min state
1.8	New multi device example	With v1.4.4. the 04_multi_device_example.c was still set up in TriggerMeasurementBlocking mode without using the period interrupt timer (PIT) like in the simple example	Example features now a measurement with four devices using the Start-/StopMeasurement functions like in the advanced example. A fifo queue makes sure that all measurements are correctly ordered
1.9	New restoreDeviceState function	A power cycle of the device leads to a loss of its last register configuration. Automatic recovery is supported since 1.4.4, but a full restore took a few frames.	Dedicated for low power consumption (battery) applications, this function fully restores the configuration including DCA settings, even after a complete power cycle, in order to have a valid measurement for the following frame.

2. Fixes for issues of previous release 1.4.4

Id	Issue	Description	Fix
API / Embedded Software			
2.1	Pixel to Pixel crosstalk compensation did not include optical crosstalk	Optical crosstalk between adjacent pixels is the dominant effect reducing sharpness (~distance accuracy) of detecting small dark objects before a bright background	A full vectorial crosstalk compensation scheme has been implemented, to compensate optical crosstalk for each pixel from all adjacent pixels
2.2	Remaining short distance errors	For distances below 1m (especially below 15cm) the distance error increased with target remission	The improvement is achieved due to a combination of the new features 1.1, 1.2, 1.3, and 1.5
2.3	Dynamic over- and undershoots of reported distance	Typically observed upon horizontally moving objects in and out of the FoV	The improvement is achieved due to a combination of the new features 2.2 … 2.7
2.4	Crosstalk Monitor scaling errors in case of customized maximum integration depth	The Crosstalk Monitor was not scaling the measured crosstalk vectors correctly, if the max. integration depth value was changed from the default value	Now the crosstalk monitor is calculating the values correctly, independent of the actually configured maximum integration depth value (# of patterns)
GUI / Evalkit			
2.5	Firmware Flash sometimes fails	Flashing .srec Firmware files sometimes was not successful with the KL-46 Evalboards	Switch from .srec to .bin file format
2.6	GUI performance decrease	The GUI performance decreased with each calibration request	Implementation of a cleanup procedure

3. Known Issues and limitations

Id	Issue	Description	Recommendation	Fix planned
3.1	Productive support of AFBR-S50MX85I	Currently AFBR-S50MX85I support is still preliminary due to limited test coverage.	Report any issues or recommendations for future Software Features to our support: support.tof@broadcom.com	Upcoming Software Release
3.2	Highspeed Mode with 3kHz	3kHz Highspeed Mode is supported, but the current Evalkit is not capable of achieving the full 3kHz performance	Bottleneck is not the chip timing any more (since SW 1.4.4), but the MCU processor. A new reference design is in preparation.	Upcoming Appnote Release
3.3	Multiple Objects within one pixel	Reflexes from different distances within the same pixel cannot be differentiated, the reported distance will be an Amplitude-weighted average	Using adjacent pixel information as far as possible. With applying an 8-phase scheme (supported by the Hardware, but not by the Software yet), the presence of multiple objects could be detected	Future Software Release
3.4	Dynamic Range between pixels within one frame limited to about 23dB	Currently the ratio between lowest and highest acceptable pixel amplitude within one frame is about 200	A series of short and long integration times can be used to “fuse” pixel values (replace too low or too high pixel signals with valid ones)	Future Software Release

***Application Note: Golden Pixel Priority Mode**

The “Golden Pixel” is the pixel with the highest receiving amplitude for a flat target at a distance outside of the parallax regime (>50cm). It is factory calibrated.
So far, the “Golden Pixel” has been used as a “Fallback Pixel” in case of inferior illumination conditions (e.g. all pixel amplitudes are below the user configured binning thresholds).
This mode has been unchanged, but renamed to “Golden Pixel Fallback” Mode.

The newly introduced “Golden Pixel Priority Mode” improves both accuracy and dynamic performance of single pixel operation in case of good illumination conditions. It is enabled by default in the Module Types AFBR-S50LV85D, AFBR-S50LX85D, and AFBR-S50MV68B:

1. If the Golden Pixel Amplitude is above the “Golden Pixel Amplitude Inclusion” threshold, all other pixels are disregarded, even if they would have higher Amplitudes.
2. If the Golden Pixel Amplitude is between the “Inclusion” and Exclusion” threshold, additional criteria are used: If all regularly binned pixels are within the configured Relative Distance Scope, the regular binning is performed (to optimize distance noise for large objects), otherwise only the Golden Pixel is used.
3. If the Golden Pixel Amplitude is below the “Golden Pixel Amplitude Exclusion” threshold, the regular binning is performed