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Time-of-Flight

Sensors | Modules | Cameras | Evaluation Kits

passion.experience.reliability.

Neumüller
Elektronik GmbH

ESPROS Photonics AG
offers an interesting spectrum

ESPROS Photonics AG offers an interesting range of optoelectronic components for industrial use. These components form the heart of an optical sensor system. Whether standard product or customized solution, we are happy to advise you to achieve the best result for your application. Please do not hesitate to contact us for further information. You will also find further information in the detailed data sheets or at www.neumueller.com.

epc espros photonics corporation

ESPROS USPs

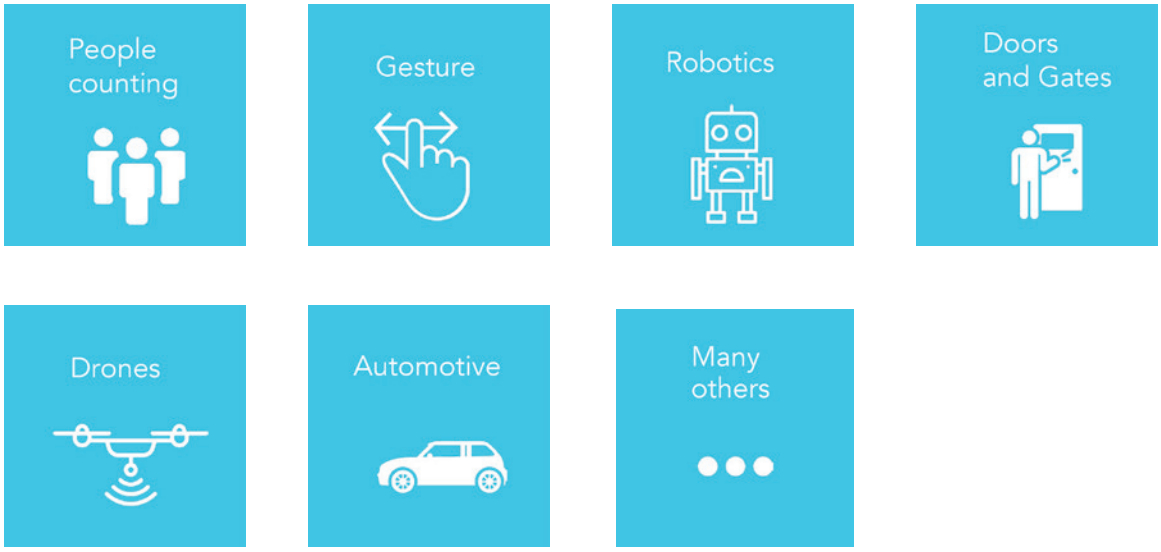
- Very high photosensitivity
- Ambient light insensitive
- On-chip ADC and regulator
- Integrated LED/VCSEL driver

Benefits

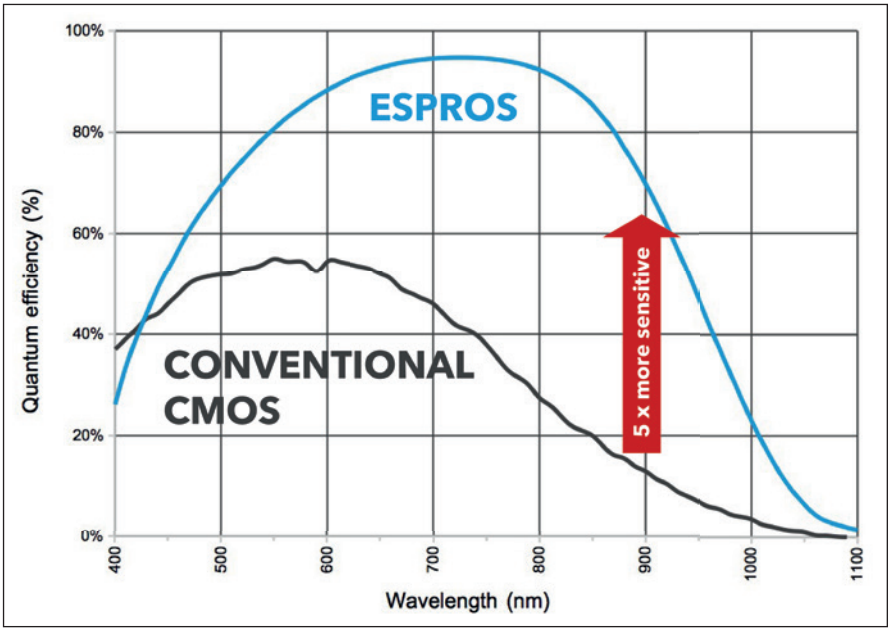
- Extended range (10m +)
- Minimized energy consumption
- Insensitive to sunlight (130kLux)
- ew articles, low costs

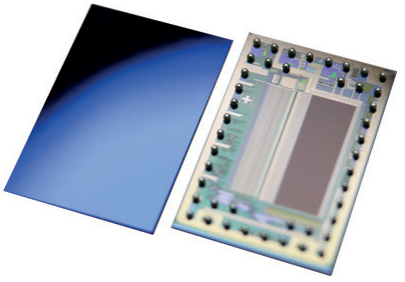
RoHS KONFORM

Applications



Technology
Unique and extremely efficient

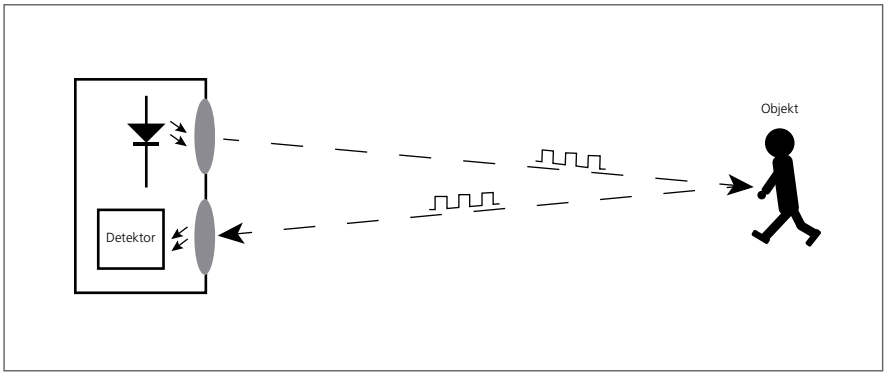


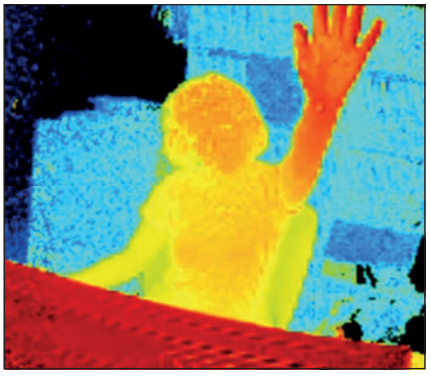


- Ultra small CSP package
- No additional chip required
- System on chip
- Unique CCD technology
- Leading suppression of ambient light

Time-of-Flight
based on the time-of-flight measurement method

The ESPROS 3D Time-of-Flight (ToF) sensors are based on the time-of-flight measurement method. Modulated light is emitted and reflected from the object for detection. The reflected light is detected by a photosensitive ToF CCD array on the chip. The receiver compares the phase shift between emitted and received light and determines from this the time difference individually for each ToF pixel. These values, multiplied by the speed of light (approx. 300.000km/s) and divided by two, correspond proportionally to the distance between sensor module and object.

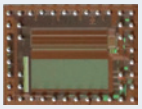
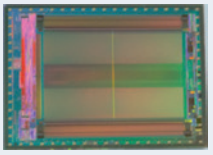




TIme-of-Flight measuring method

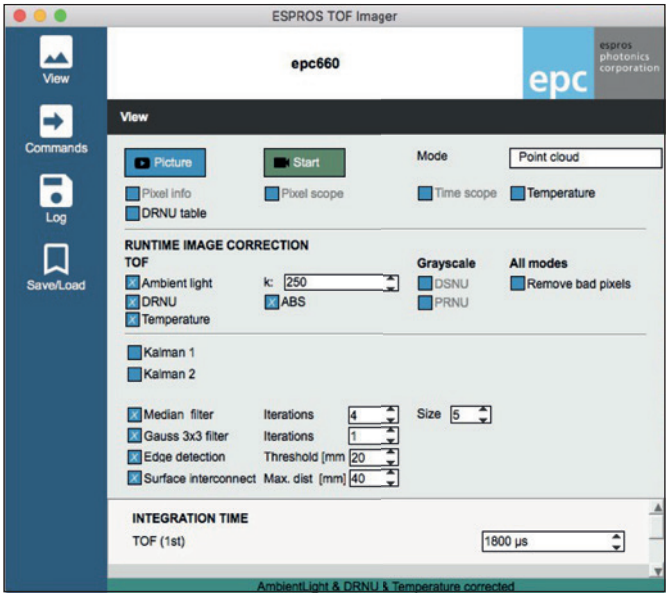
The ESPROS ToF sensors are designed to realize simple and cost effective 3D ToF cameras. Together with a microcontroller and some additional external components, fully functional ToF cameras can be developed. The functionality of the chips includes distance and ambient light measurement with variable integration times. In addition, on-chip temperature sensors for measured value compensation are integrated.

Technical data
Overview

Product	epc611	epc635	epc660
Pixel field	8 x 8	160 x 60	320 x 240
Pixel pitch	20 x 20 µm	20 x 20 µm	20 x 20 µm
Photosensitive area	0.16 x 0.16 mm	3.20 x 1.20mm	6.40 x 4.80 mm
Packaging	CSP24	CSP44	CSP68
Packaging size	2.8 x 2.8 x 0.25 mm	6.3 x 4.2 x 0.25 mm	9.7 x 8.7 x 0.25 mm
Frame rate	up to 8'000 fps	up to 488 fps	up to 156 fps
	up to 2'000 fps	up to 122 fps	up to 39 fps
Output data	up to 18 bit DCS	12 bit DCS	12 bit DCS
Data interface	SPI	TCMI up to 80MHz	TCMI up to 80MHz
Control interface	SPI	SPI	SPI
Power consumption	155mW	300mW	750mW
Ambient light suppression	130kLux	130kLux	130kLux

Evaluation Kit
for epc635 and epc660



- Complete development system for imager applications
- Open controller environment with integrated BeagleBone Black Controller board
- Connection to the PC via USB interface
- GUI software for visualization and data storage for PC/MAC
- Firmware based on Open Source

ToF Range Finder
TOF>range 611

The TOF>range 611 enables industrial distance measurement based on the time-of-Flight principle. The unit measures the distance to an object by the time a light pulse is emitted to get to an object and back to the sensor. Therefore the range finder contains an LED light source, a high-frequency electronics and a very light-sensitive chip sensor. This detection principle is very energy-efficient and enables measurements at high speed. The robust, lightweight and cost-effective design of TOF>range 611 enables for use in many industrial indoor and outdoor applications.

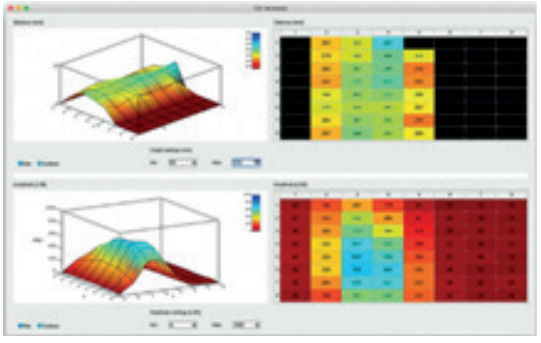
Product	Distance (max.) [m]	Detection spot size	Interface	Dimension (LxBxH) [mm]	Ambient light suppression	Framerate (max) [fps]	Field of view (hxv) [°]
TOF>range611	15	3 x 3mm @1m	UART/USB	58.6 x 39.6 x 17	100kLux	500	0.18

Miniature 3D Camera Module
TOF>frame 611

The TOF>frame 611 is a miniaturized and cost-optimized 3D-TOF camera module. It is based on ESPROS' proprietary Time-of-Flight technology with the epc611 TOF chip and a LED to illuminate the scenery. Due to the high performance of the imager chip with its unique ambient light suppression the camera can operate in full sunlight even outdoors. All complex engineering and time-consuming design tasks in the fields of optics, lighting and signal processing have already been solved.

Product	Distance (max.) [m]	Detection spot size	Interface	Dimension (LxBxH) [mm]	Ambient light suppression	Framerate (max) [fps]	Field of view (hxv) [°]
TOF>frame 611	2	8 x 8	UART/USB	39.6 x 16.3 x 8	100 kLux	80	12

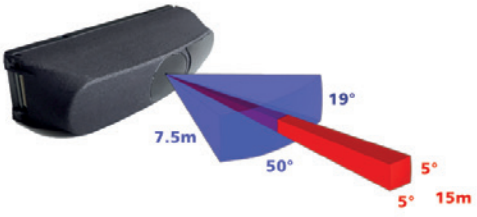
Evaluation Kit
for epc611, TOF>range 611 and TOF>frame 611



- TOF>range 611 range finder module
- TOF>frame 611 miniature 3D camera
- UART-->USB adapter
- GUI software for control and visualization
- Open source software library
- Circuit diagrams for hardware reference design

Half QQVGA 3D ToF Camera Module

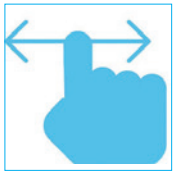
TOF>cam 635



The TOF>cam 635 is a 3D Time-of-Flight camera module and is based on the proven sensor SoC epc635 with a resolution of 160x60 pixels. It has two operating modes for point-to-point distance measurement or presence detection and a mode for 3D image capture. The camera is already Fully calibrated at the factory and features powerful algorithms for compensation of temperature and ambient light, which in many cases makes a operation under direct sunlight possible. The integrated infrared lighting ensures optimum illumination of the field of vision. This makes the image acquisition independent of ambient light conditions, e.g. even in darkness, possible. For simple integration into downstream systems, the TOF>cam 635 comes with a ROS (Robot Operating System) driver.

Product	Distance (max.) [m]	Resolution [Pixel]	Interface	Dimension (LxBxH) [mm]	Ambient light suppression	Framerate (max) [fps]	Field of view (hxv) [°]
TOF>cam 635	15 (NFOV) 7.5 (WFOV)	160 x 60	UART (10Mbit/s)	80.5 x 28.0 x 24.0	100kLux	50	NFOV: 5 x 5 WFOV: 50 x 19

Applications


Gesture recognition


Incabin monitoring


Humanoid and houshold robots


Doors and gates


People counting


Industrial automation

3D ToF Micro Camera Module

TOFcam-635-S-UWF

The TOFcam-635-S-UWF provides distance information with 160x60 pixel resolution. Due to its particularly wide field of view of 125°x25° and a range of 3m it is especially suitable for applications in the field of autonomous transport systems, door and gate control and people counting. For a flexible integration in different applications the camera module has a UART and a USB interface for data transfer as well as digital inputs and outputs for direct process control. Free memory and processor capacities offer the possibility to extend the camera module with application software. The available ROS driver additionally facilitates system integration. The camera is fully calibrated at the factory and the depth information is compensated for ambient light, temperature and reflectivity.

Product	Distance (max.) [m]	Resolution [Pixel]	Interface	Dimension (LxBxH) [mm]	Framerate (max) [fps]	Field of view (hxv) [°]
TOFcam-635-S-UWF-E	3	160 x 60	UART, USB 1x dig. In 3x dig. Out	59,5 x 44,5 x 26,2	20	125 x 25 (ToF) 125 x 45 (Grayscale)
TOFcam-635-S-UWF-R	3	160 x 60	UART, USB 1x dig. In 3x dig. Out (Relay)	59,5 x 44,5 x 26,2	20	125 x 25 (ToF) 125 x 45 (Grayscale)

3D ToF OEM Camera Module

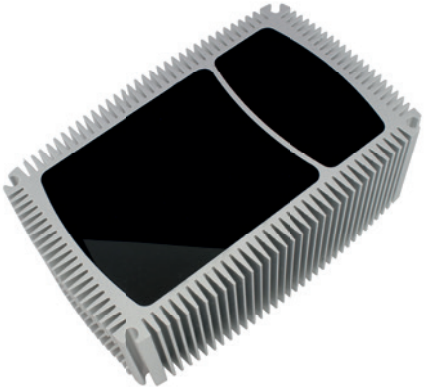
TOFcb-635-S-UWF

The OEM ToF camera module TOFcb-635-S-UWF is based on the epc635 imager chip with a resolution of 160x60 pixels and has a field of view of 125°x25° (3D ToF) or 125°x45° (grayscale) with a range of up to 3m. The compact module is specially designed for the development of an individual ToF sensor and has an integrated memory for calibration data. Via the proprietary parallel data interface (TCMI) of the imager chip epc635 the module is connected to a processor system and delivers 4 DCS (Distance correlation sample) values to calculate the distance values per pixel. The complex Development of the ToF Imager including optics and illumination unit (850nm) is already done. In this way, an application-specific ToF Sensor can be installed very quickly.

Product	Distance (max.) [m]	Resolution [Pixel]	Interface	Dimension (LxBxH) [mm]	Framerate (max) [fps]	Field of view (hxv) [°]
TOFcb-635-S-UWF-850	3	160 x 60	epc635 TCMI	30 x 30 x 11.4	20	125 x 25 (ToF) 125 x 45 (Grayscale)

3D ToF Camera Module

TOFcam 660



The TOFcam 660 is the flagship of the Swiss photonics specialist Espros. The camera module is based on the epc660 ToF Imager with a resolution of 320x240 pixels and delivers both 3D depth images and grayscale images with up to 40fps. The module is available in two different versions with a field of view of 31°x24° at a range of 30m or with a field of view of 108°x77° at a range of 5m. The integrated illumination unit is based on 16 high power infrared LEDs with a wavelength of 940nm and is therefore invisible to the human eye. A Gbit Ethernet TCP/IP interface provides distance and amplitude values as well as grayscale images. A ROS driver for easy control is available as well as an intuitive GUI software for PC or Mac for an easy evaluation of the system. The camera is fully calibrated at the factory and has powerful algorithms for compensation of ambient light up to 100k Lux. Therefore the camera is also suitable for outdoor use.

Product	Distance (max.) [m]	Resolution [Pixel]	Interface	Dimension (LxBxH) [mm]	Framerate (max) [fps]	Field of view (hxv) [°]
TOFcam 660-NF-31-24	30	320 x 240	Gbit Ethernet 2 dig. I/O	140 x 90 x 50	40	31° x 24°
TOFcam 660-WF-108-77	30	320 x 240	Gbit Ethernet 2 dig. I/O	140 x 90 x 50	40	108° x 77°

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