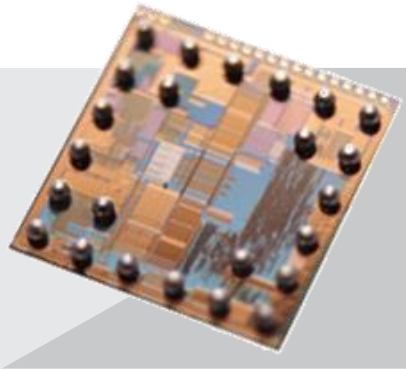
excelitas®

XTOF-100-A



Cost optimized TOF imager chip

The XTOF-100-A chip is a general-purpose, monolithic, fully integrated photoelectric CMOS device for optical distance measurements and object detection. Its working principle is based on 3D TOF measurement. It is a system-on-chip (SOC) device and contains:

- A full data acquisition path including the modulation driver for LEDs or Laser Diodes, the photo-receiver with an 8 x 8 pixel TOF/CCD array, signal conditioning, A/D converter and signal processing.
- An on-chip controller managing data acquisition and data communication.
- An SPI interface for command and data communication.
- A supply-voltage power management unit.

Various modes allow the chip to operate as a very fast one-pixel range-finder chip or as an 8 x 8 TOF imager chip. By adding a small MCU and few external components, a TOF range-finder or a TOF camera with distance ranges of more than 200 m can be built.

The working principle is based on the time-of-flight (TOF) of photons emitted by the illumination and reflected back by the object to the photosensitive pixels. It measures the phase-shift between the emitted and received signal which is proportional to the distance. A very high photo-sensitivity and high resolution ADC allows measurement accuracy down to a centimeter depending on the lens, the illumination power and the modulation frequency.

Due to the unique CCD/CMOS technology, the TOF chip performance is just shot noise limited.

APPLICATIONS

- Range Finder
- Volumetric Measurement
- Presence Detection
- Touchless Switches

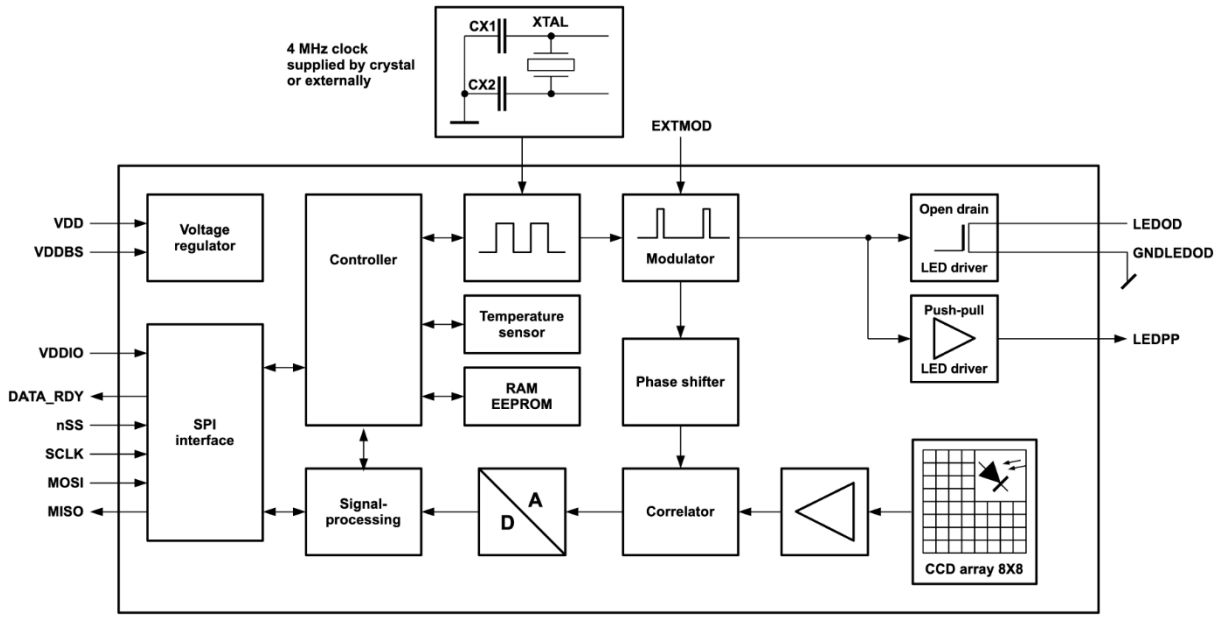
YOUR BENEFITS

- Operating range of up to 240 m
- Very small footprint of 2.8 x 2.8 mm
- Up to 4,000 TOF frames per second
- Full ambient light tolerant (0 .. 100 kLux) with active ambient light suppression

SPECIFICATIONS

- 8 x 8 pixel, pixel pitch 20 µm
- Quantum efficiency 90 % @ 850 nm
- Low power consumption of 150 mW
- Integrated illumination driver up to 200 mA
- Low distance noise of ≤10 mm @25% signal
- Output data with 10 .. 18 bit resolution
- Pixel binning supported

FIG 1. BLOCK DIAGRAM



Key characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Supply Voltage		VDD VBS	8 -10.5	8.5 -11.0	9 -11.5	V
Supply Current	Average w/o illumination	I_{VDD} I_{BS}		18 0.1		mA
Illumination Driver		I_{LED}			200	mA
Pixel Pitch				20		µm
Optical fill factor				100		%
TOF Sensitivity	λ = 850 nm T_{int} = 100 µs	S_{TOF}	0.5	0.6	0.7	nW/mm²/LSB
Grayscale Sensitivity	λ = 850 nm T_{int} = 100 µs	S_{Gr}	0.19	0.25	0.31	nW/mm²/LSB
Optical Sensitivity	T_{int} = 100 µs	H_v		150k		LSB/Lux/s
Ambient light suppression	λ = 850 nm T_{int} = 100 µs	E_e		0.2		mW/mm²
Quantum Efficiency	λ = 850 nm	QE		85		%
Wavelength range		λ	400		1030	nm
Modulation frequency	Internal/External	f_{Mod}	0.63		20	MHz
SPI Clock		f_{SCKL}			16	MHz
Programmable Delay Line	In 2.1 ns steps	t_{del}	0		103	ns
3D TOF Pixel Rate		f_{Pix}		61	247	kPix/s
Temperature Range	Operating	T_{Op}	-40		105	°C

FIG 2. OPTICAL KEY PARAMETERS

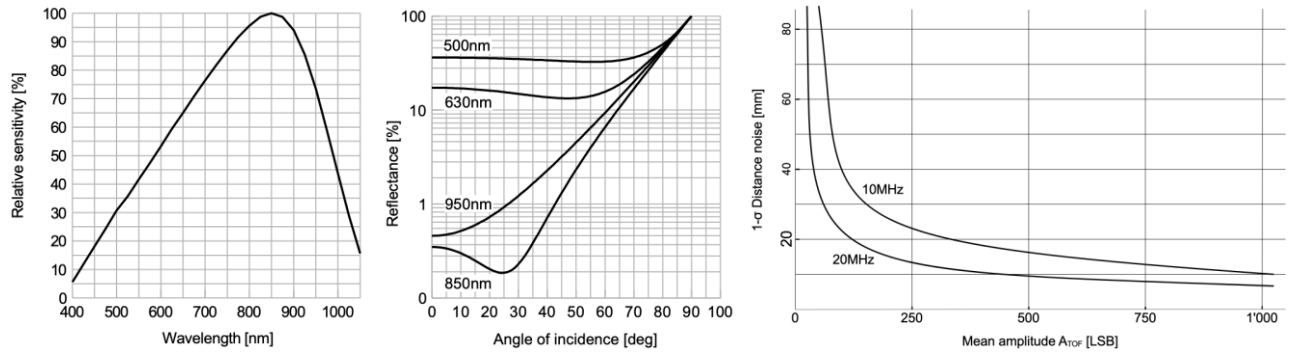
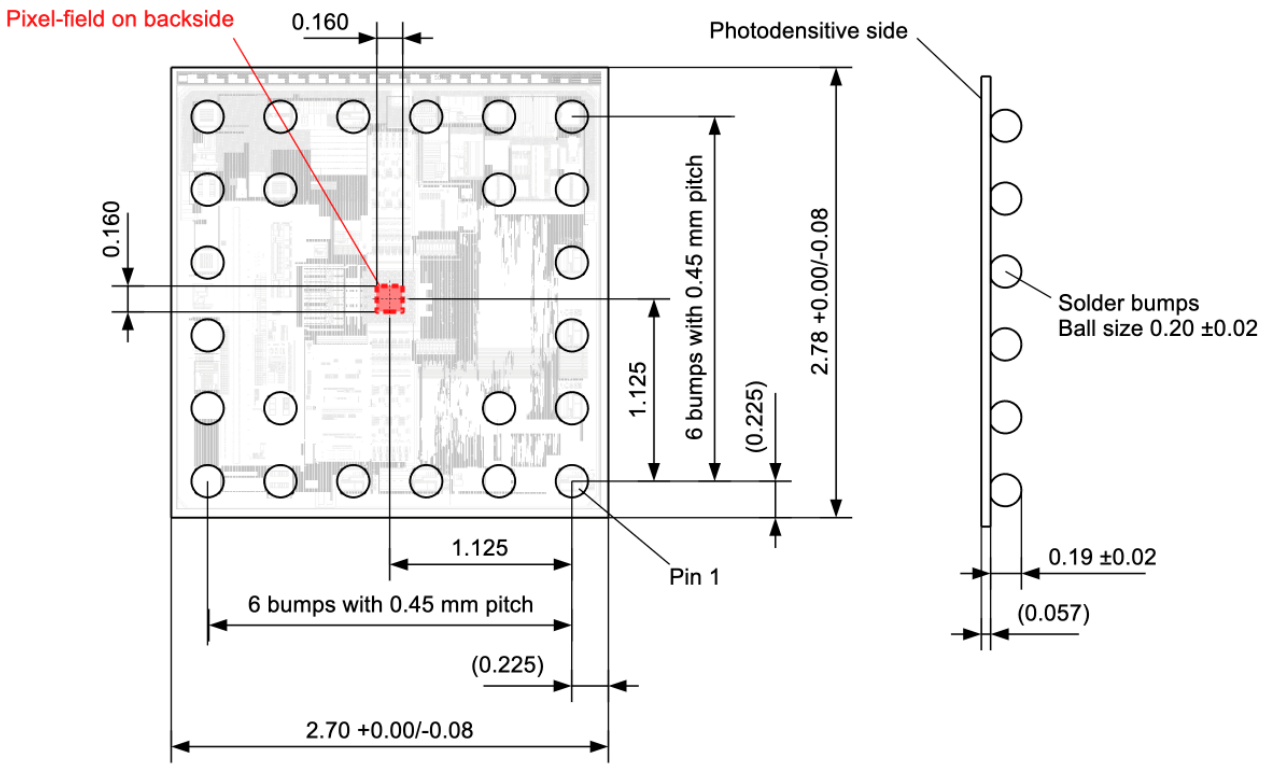


FIG 3. MECHANICAL DIMENSIONS



Testing and operation methods

Excelitas verifies the electro optical specifications on every device. Electrical and imaging performance tests as well as visual inspection (AOI) during fabrication is performed as per our quality standard. Failed dies are removed.

Excelitas Technologies is certified to meet ISO-9001.

Packaging and shipping

The devices are mounted on embossed tape for automatic placement systems. Tape width is 8 mm, pitch from part to part is 4 mm. The tape is wound on 178 mm (7 inch) or 330 mm (13 inch) reels and individually packaged for shipment. General tape-and-reel specification data are available in a separate datasheets and indicate the tape sizes for various package types. Further tape-and-reel specifications can be found in the Electronic Industries Association (EIA) standard 481-1, 481-2, 481-3.

Storage and handling

Excelitas highly recommends following the notes below:

- Keep devices in an ESD controlled environment until final assembly.
- Open the sealed packing just before SMT assembly. Once the sealed packing is open, keep the devices under N2 atmosphere to avoid corrosion and oxidation of the solder ball surface.
- PCB design and SMD manufacturing process shall be according to our Chip-Scale Package Assembly Process Guidelines.

RoHS compliance

This series of TOF imagers is designed and built to be fully compliant with the European Union Directive on restrictions on the use of certain hazardous substances in electrical and electronic equipment.

Warranty

A standard 12-month warranty following shipment applies.

Excelitas Technologies
22001 Dumberry Road
Vaudreuil-Dorion, Quebec
Canada J7V 8P7
Telephone: (+1) 450.424.3300
Toll-free: (+1) 800.775.6786
Fax: (+1) 450.424.3345

Excelitas Technologies
GmbH & Co. KG
Wenzel-Jaksch-Str. 31
D-65199 Wiesbaden
Germany
Telephone: (+49) 611 492 430
Fax: (+49) 611 492 165

Excelitas Technologies Singapore, Pte. Ltd.
8 Tractor Road
Singapore 627969
Telephone: (+65) 6775 2022 (Main number)
Telephone: (+65) 6770 4366 (Customer Service)
Fax: (+65) 6778-1752

For a complete listing of our global offices, visit www.excelitas.com/locations

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