Vzense ToF Products Family Guide

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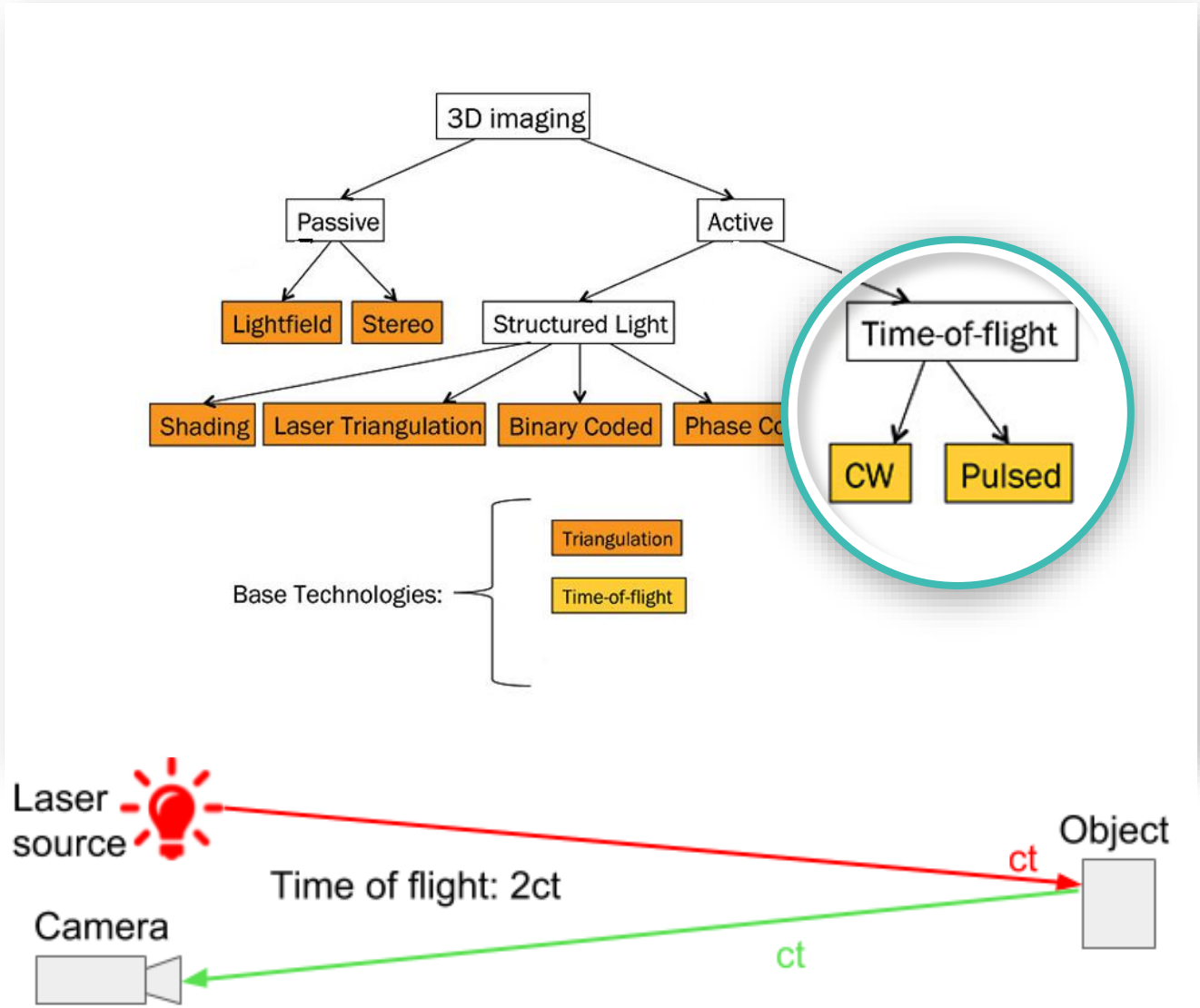
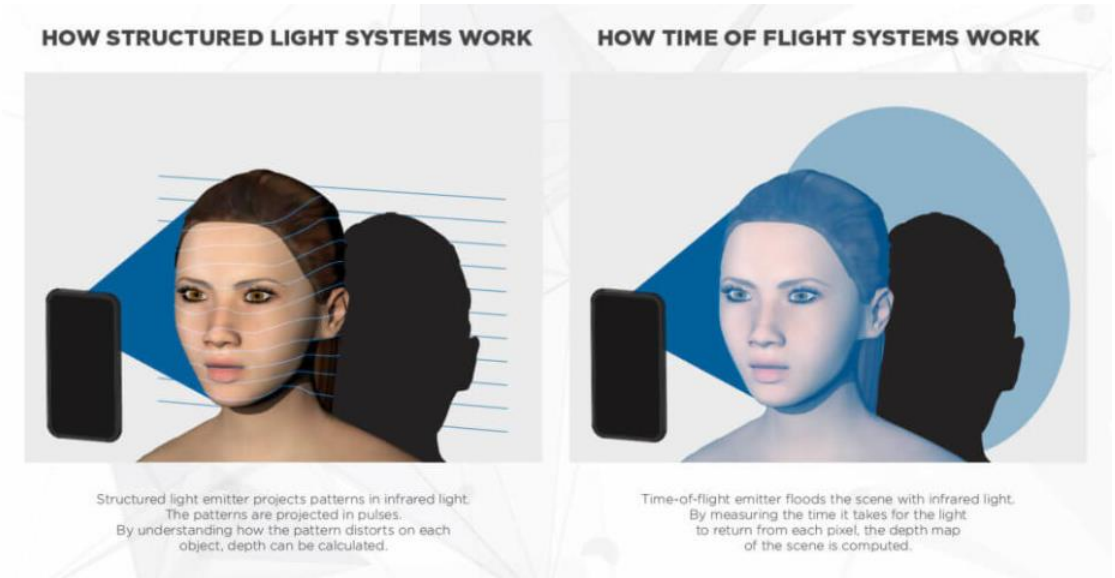
- **ToF Technology Brief**
- ToF Key Parameters
- Vzense ToF Products

• ToF Technology Brief





The Time-of-Flight principle (ToF) is a **method for measuring the distance between a sensor and an object**, based on the time difference between the emission of a signal and its return to the sensor, after being reflected by an object.

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• ToF Distance Range

As the ToF technology is based on self-emitted laser, the near range is limited by the saturation of the sensor, and the far range is limited by the too weak reflection light.

Normally the maximum distance can be 5 times of the minimum distance, for example if you want to set the nearest distance is 0.4m, the maximum distance will be around 2m. The object closer than 0.4m will cause saturation of the ToF sensor, and the object further than 2m will not be seen because of too weak reflection light. By default, Vzense products will have several calibrated range mode, you can select appropriate one for your application.

Range 0: 0.3m~1.2m

Range 2: 0.6m~4.0m

Range 5: 1m~6m

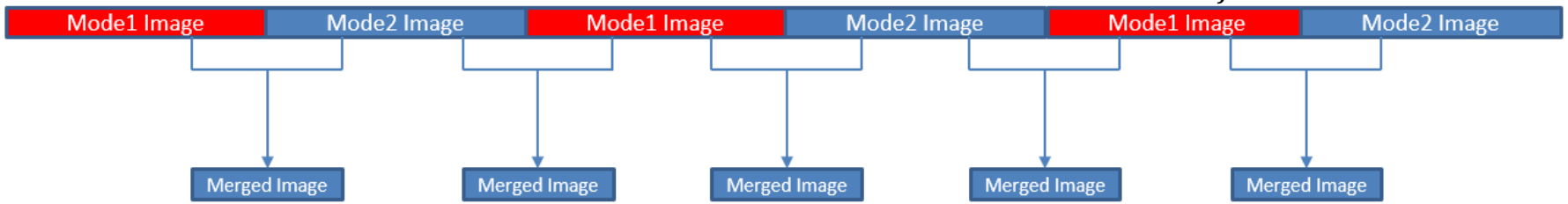
Please note that longer range needs more power supply.

Please note that longer distance spot has less resolution in a specific area.

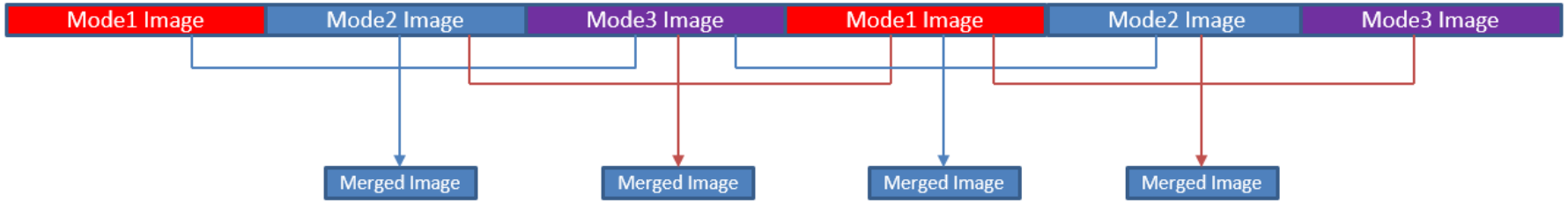
• WDR Feature

You can use the WDR feature to have a wider span of the range, for example 0.3m~4m.
At WDR mode, the sensor works at 2 or more modes by turns. Each frame can generate a full depth image, and then output to the host processor. The host processor will merge the adjacent 2 or more images together to one (That is to say, do this processing in our SDK).

The total frame rate is 30fps, so each mode's frame rate will be $\frac{30}{amount\ of\ mode}$fps.



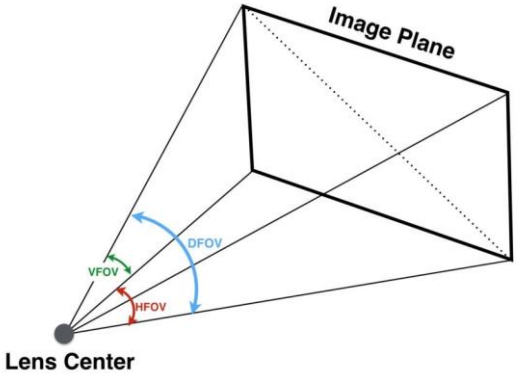
Two Modes Merge



Three Modes Merge

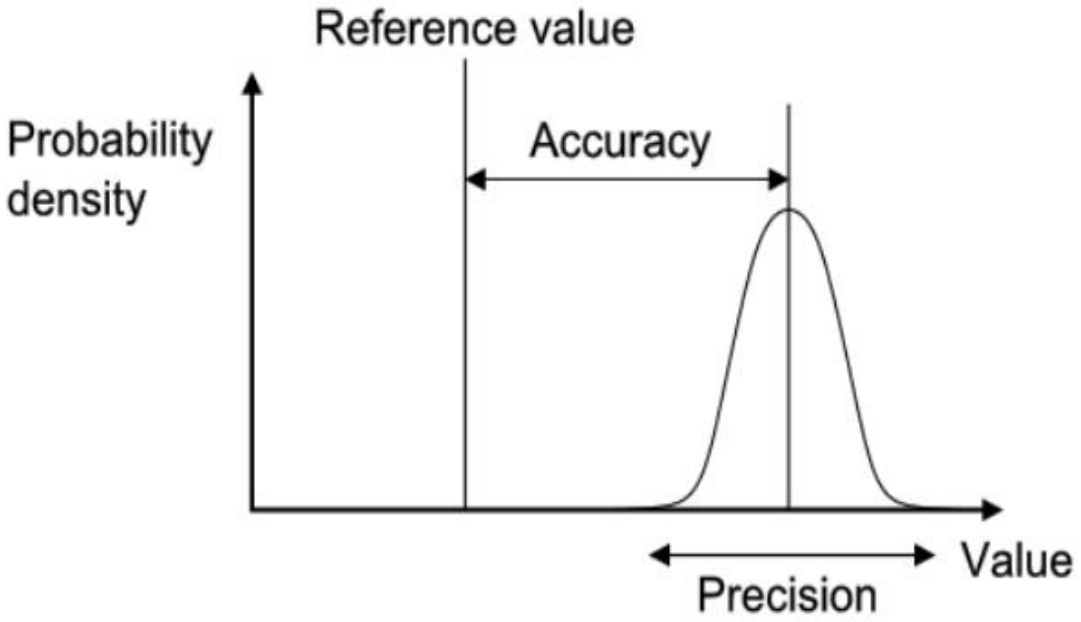
• Field of View

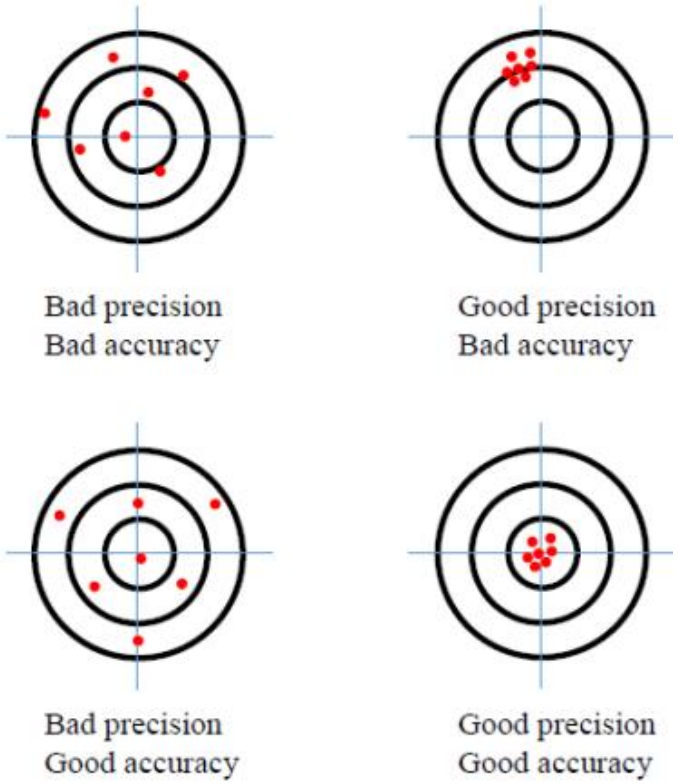
FOV(Field of View) means the view angle of the optical lens based products, including ToF products. Please see below figure for the basic concept.



You can calculate the required FOV depends on the size of expected area and distance from the ToF product to the area.
All our product are based on VCSEL laser. We have variety choices according to the lens FOV and wavelength;
The laser FOV must match to the lens FOV, and the wider FOV products need stronger power, therefore higher power consumption. Even with higher power supplied, the laser power per angle of the wider FOV product may be reduced, so normally the maximum distance of wider FOV products is shorter than narrower FOV products.

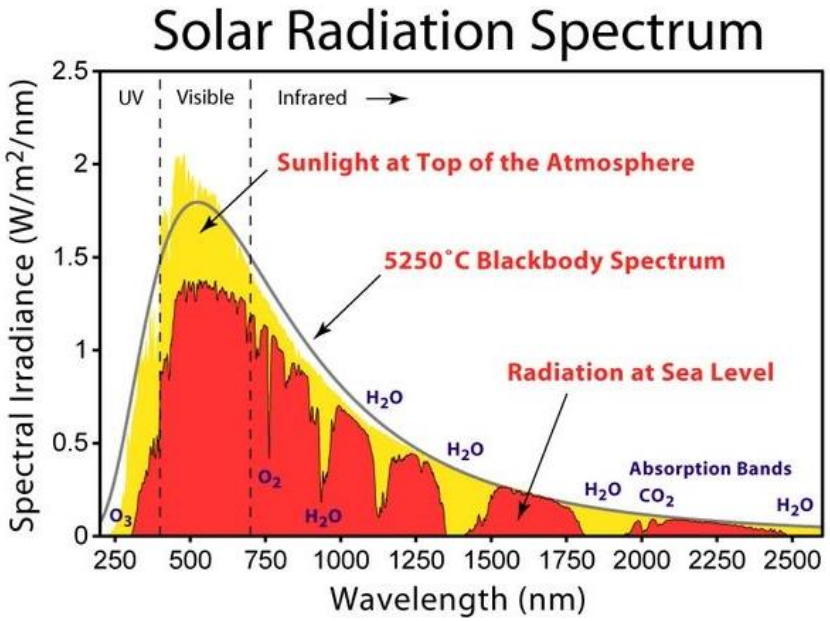
• Accuracy and Precision



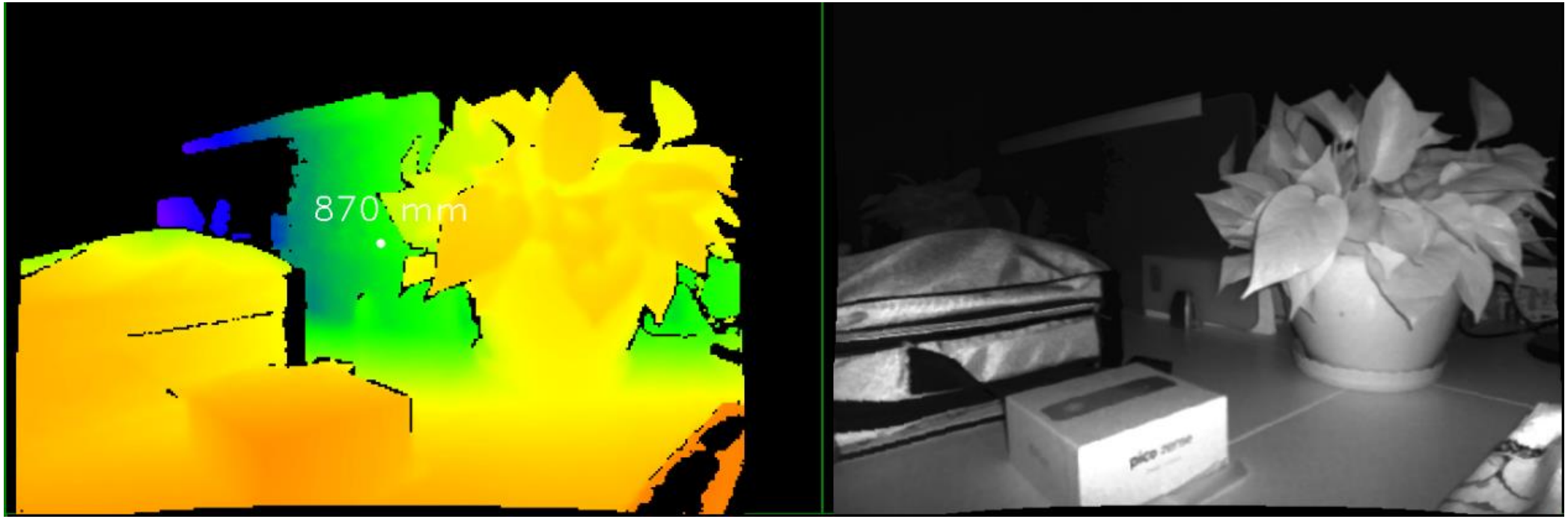


• Ambient Light and Wavelength

As for the wavelength, we have 850nm and 940nm laser selection. Because of the silicon process based ToF sensor, the ToF sensor's QE of 850nm is much better than it of 940nm. That means normally 850nm product can reach longer distance or the same distance with lower power consumption;
But the 940nm wavelength has better performance under strong sunlight, especially when the ambient light is stronger than 20K LUX.
Below are the laser choices we can provide, if you have other needs, please let us know.
H58°, V45° --- 2W, 940nm
H69°, V51° --- 2W, 850nm
H100°, V70° --- 2W, 850nm
H120°, V90° --- 2W, 850nm and 2W, 940nm



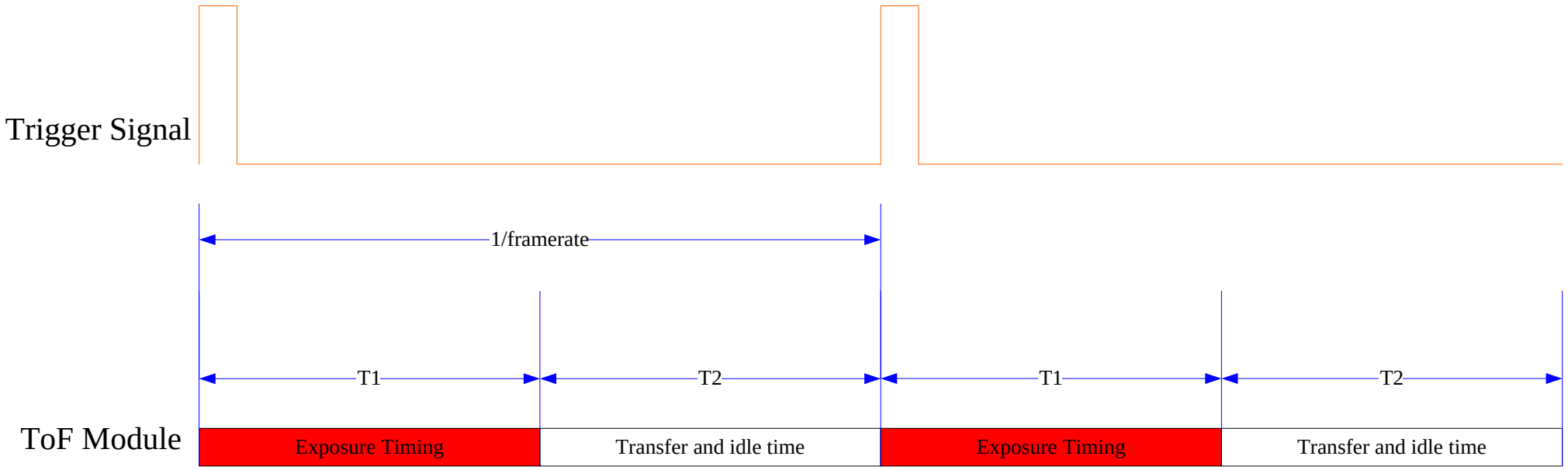
- # IR Image



- Vzense ToF products can output 12 bit IR image besides the depth image simultaneously.

• Slave Trigger

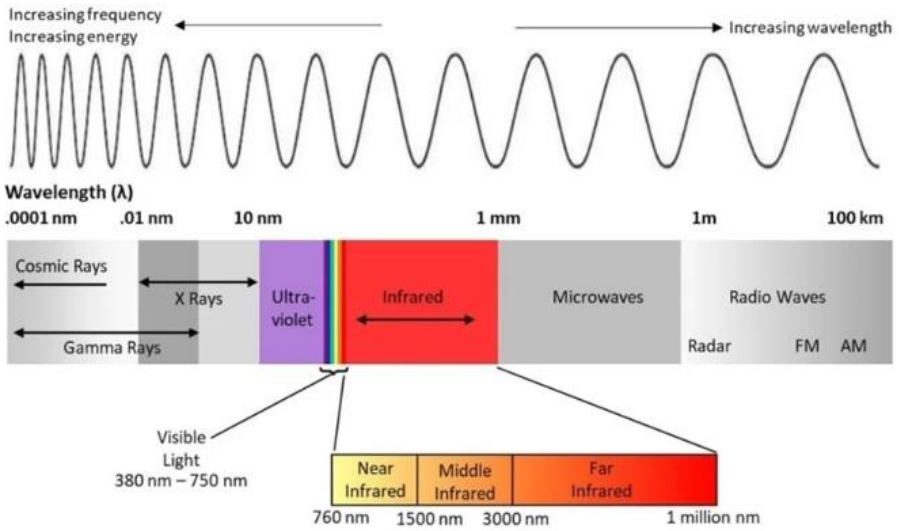
At slave trigger mode, Vzense ToF product outputs image only at every trigger signal happens.



• Multiple Products Coexist

As the ToF product emits laser light, so if multiple cameras operate simultaneously, they interfere with each other. The multi-camera interference causes a lot of errors in depth measurement. The depth quality is severely reduced, which limits the application of TOF cameras and needs to be resolved.

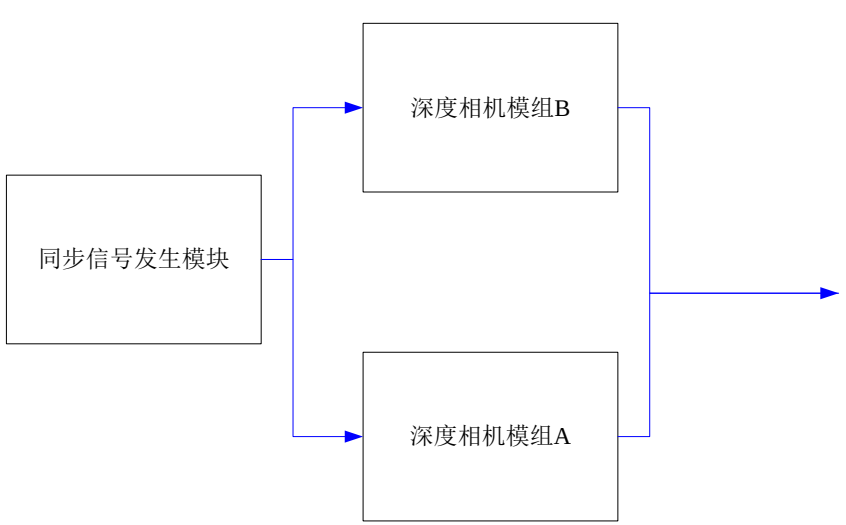
1. Use different wavelength products：

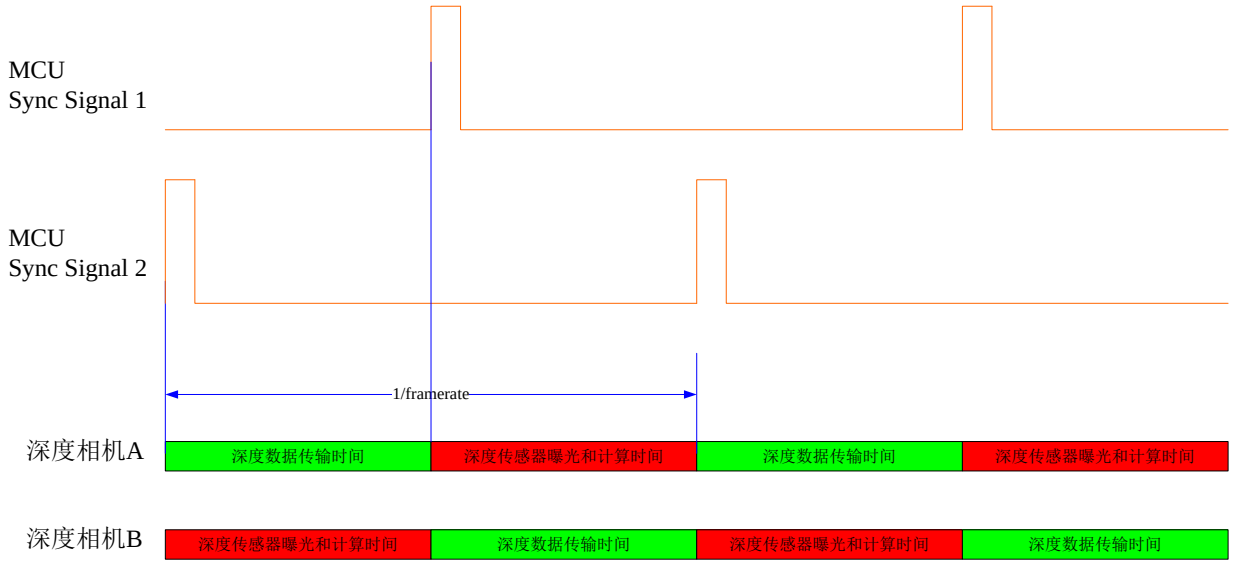


Vzense has the two type of the laser wavelength, 850nm and 940nm. A band pass filter in the lens is used to filter out unwanted light. So two products with different waveform can coexist in the same area.
This way is applicable if only two cameras coexist. No additional setting for the software, just install two different wavelength ToF products.

• Multiple Products Coexist

2. Timing Division Control：





1)Set multiple cameras as slave trigger mode, please find the operation steps in the user manual of the camera;
2)Use a center controller to generate the trigger signal for each camera. Make sure the timing of each trigger signal is timing divided.
3)Please find the Ext_Trigger signal, and connect the trigger signal from the center controller to the cameras.

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• Core Products

USB Interface Products

DCAM710

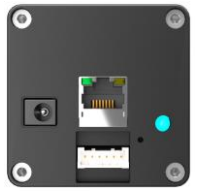
- RGB Sensor: 1080P, 30fps
- ToF Sensor：VGA，up to 60 fps
- ToF FOV: 69° * 51°
- Effective Range：0.35m~4.4m
- Interface： USB2.0

Industrial Grade Products

DCAM550-U

- ToF Sensor：VGA，30fps
- ToF FOV: 69° * 51°
- Effective Range：0.35m~6m
- Interface： USB2.0/RS485
- Power: DC 12V~24V

DCAM550-P

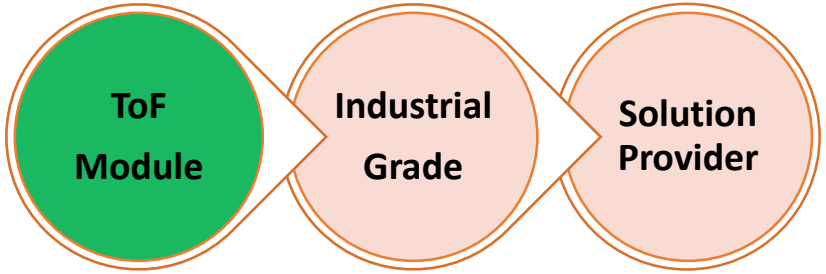


- ToF Sensor：VGA，30fps
- ToF FOV: 69° * 51°
- Effective Range：0.35m~6m
- Interface： 100M Ethernet/RS485
- Power: DC 12V~24V/PoE+

DCAM550-E

- ToF Sensor：VGA，30fps
- ToF FOV: 69° * 51°
- Effective Range：0.35m~6m
- Interface： 100M Ethernet/RS485
- Power: DC 12V~24V/PoE+

• Product Brief



DCAM710N(940nm)

Depth + RGB

ToF Sensor	TOF CCD+RGB
Laser Type	940nm VCSEL
ToF Resolution	640*480, 30fps
RGB Resolution	1920*1080, 30fps
TOF FOV	69°(H)*51°(V)
RGB FOV	73°(H)*42°(V)
Data Format	RAW12(depth,IR), H.264/MJPEG(RGB)
Interface	USB2.0
Power Supply	5V(USB) or 5V~6V(DC JACK), < 5W
Detected Range	0.35m~4.4m
Dimension	103mm*33mm*22mm
Working Temperature	-10℃-50℃
Software Platform	Windows/Linux

Features:

- USB 2.0 Interface;
- Compact Size;
- Full SDK;
- Low Cost, For evaluation and study

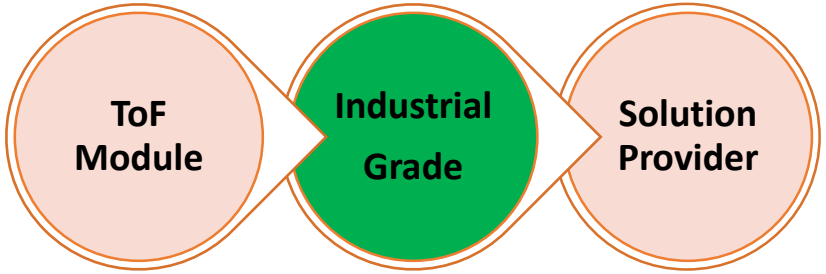
Mass Production for 3 years

(Retail Price: $279)

• Product Brief

Mass Production

（Retail Price: $549）



DCAM550-U

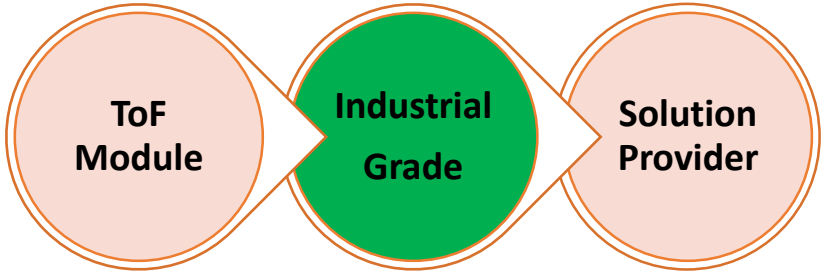
ToF Only
Industrial Level

ToF Sensor	TOF CCD
Laser Type	850nm or 940nm VCSEL * 2
ToF Resolution	640*480, 30fps
TOF FOV	69°(H)*51°(V)
Data Format	RAW12(Depth,IR)
Interface	USB2.0 / RS485
Power Supply	USB5V or 12V~24V(DC JACK), < 10W
Detected Range	0.35m~6m
Dimension	65mm*65mm*52.7mm
Working Temperature	-20℃-50℃
Software Platform	Windows/Linux

• Product Brief

Mass Production

（Retail Price: $599）



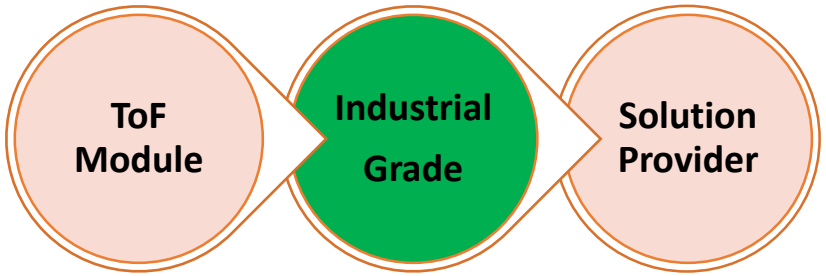
DCAM550-P

ToF Only
Industrial Level

ToF Sensor	TOF CCD
Laser Type	850nm or 940nm VCSEL * 2
ToF Resolution	640*480, 30fps
TOF FOV	69°(H)*51°(V)
Data Format	RAW12(Depth,IR)
Interface	100M Ethernet/ RS485
Power Supply	PoE+ or 12V~24V(DC JACK), < 10W
Detected Range	0.35m~6m
Dimension	65mm*65mm*52.7mm
Working Temperature	-20℃-50℃
Software Platform	Windows/Linux

• Product Brief

Mass Production
IP67
（Retail Price: $749）



DCAM550-E

ToF Only

Industrial Level, IP67

ToF Sensor	TOF CCD
Laser Type	850nm or 940nm VCSEL * 2
ToF Resolution	640*480, 30fps
TOF FOV	69°(H)*51°(V)
Data Format	RAW12(Depth,IR)
Interface	100M Ethernet/ RS485
Power Supply	PoE+ or 12V~24V(DC JACK), < 10W
Detected Range	0.35m~6m
Dimension	65mm*65mm*52.7mm
Working Temperature	-20℃-50℃
Software Platform	Windows/Linux

• Strong Customization Ability

Schedule Management	Working Sample	2 Month
	Engineering Sample	3-4 Month
	Mass Production	5 Month
Product Test and Calibration	R&D Test, Reliability Test, DQA Test, Factory Test, Calibration Test	
Operation System	Android/Linux / ARM Linux/Windows7/8/10 ROS/OpenNI	
ToF FOV	60°、70°、90°、100°、110°、120°	
Certificate	EE, ME, Optical Simulation and Heat Dissipation Simulation EMC, Eye Safety, Vibration Test	

Vzense is able to provide customization service for volume customer with NRE fee.

Vzense

THE END

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