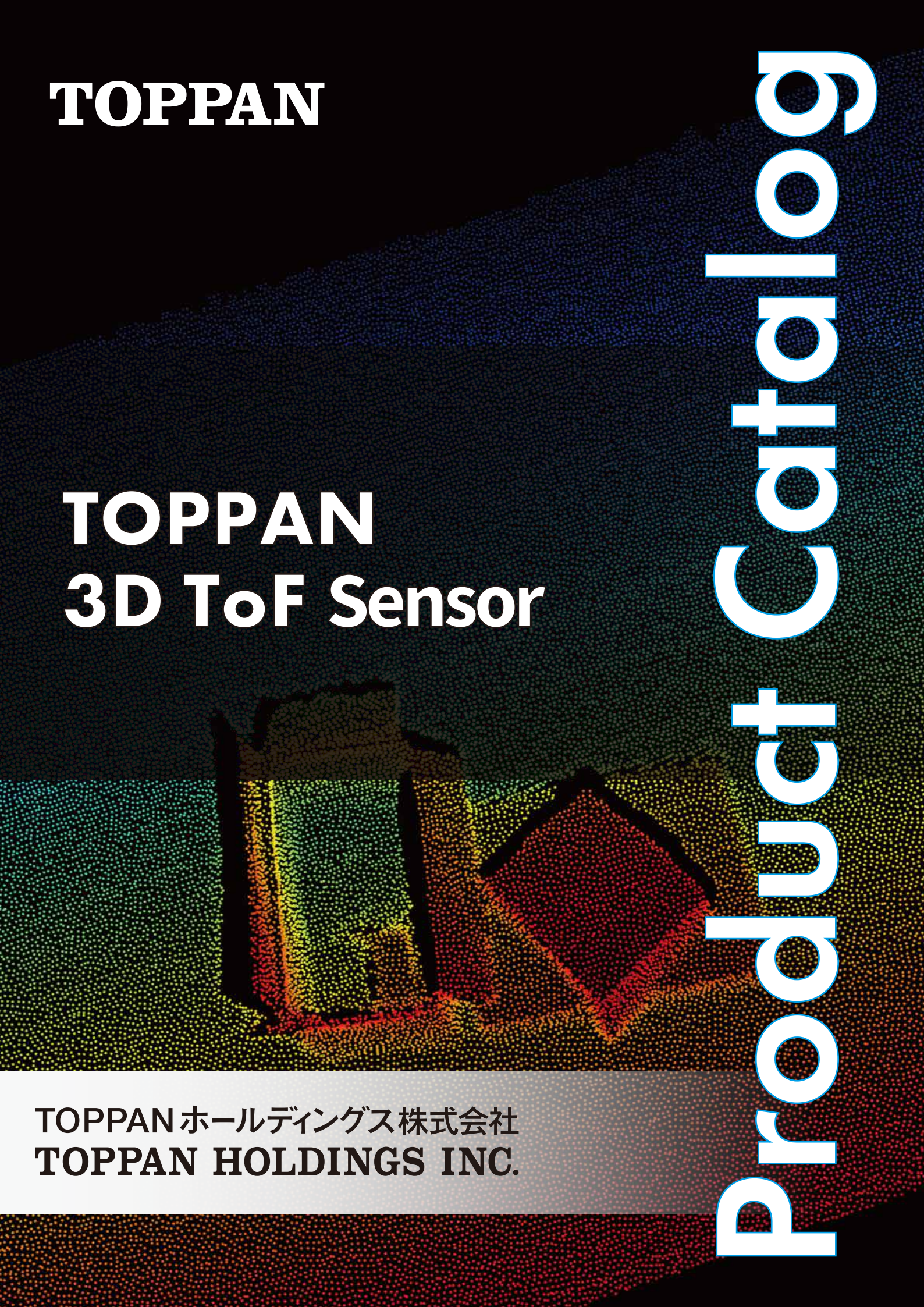
TOPPAN

TOPPAN 3D ToF Sensor

Product Catalog



TOPPANホールディングス株式会社
TOPPAN HOLDINGS INC.

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ToF Sensor and Camera

The TOPPAN ToF sensor family deals with original CMOS-ToF depth image sensor products that use a short pulse of infrared light for 3D depth sensing.

TOPPAN ToF sensors employ our unique multi-tap gating pixel structure optimized in indirect ToF with short pulse modulation method developed together with Brookman Technology, Inc.*, a leading company in the ToF sensor development, in order to achieve high 3D sensing performance required for applications such as autonomous robots, goods conveyor systems, games, human detection, and security.

TOPPAN strongly supports your 3D sensing system development according to the various needs by providing not only ToF sensors but also 3D sensing cameras.

*Brookman Technology, Inc. became a member of TOPPAN Group in March 2021, and was merged into TOPPAN Inc.(Currently: TOPPAN Holdings Inc.) in April 2023.

Features of TOPPAN 3D ToF sensor

Strong ambient light tolerance	• **Top class tolerance to ambient light noise with Dynamic Ambient Light Suppression technology** Able to use under sunlight (Around 100,000 lx environment)
High-speed performance	• **High Frame Rate (120fps)** • **No motion artifacts (blurring and distortion) with short pulse ToF method.** Able to accurately sense objects moving at high speed.
Multi-camera drive	• **Smart signal interference cancellation function** Enables operation of multiple ToF cameras in the same space.
High-precision ranging technology (hybrid ToF™)	• **Sensing by hybrid ToF™ technology (patented)** Sensor performance can be maximized with optimal drive technology. • **Max 20m long range sensing** (Depth-HDR Technology) • **Sensing of low/high reflective objects** (Signal-HDR Technology) • **False-signal reduction** (Reduces noise effect due to multipass and lens flare)

Application

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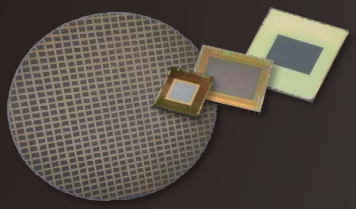
TOPPAN ToF Sensing Business

TOPPAN will deliver cutting-edge 3D ToF sensors and ToF cameras, perfectly tailored for the next generation of small mobility, intelligent factory/warehouse automation, and xR experiences.

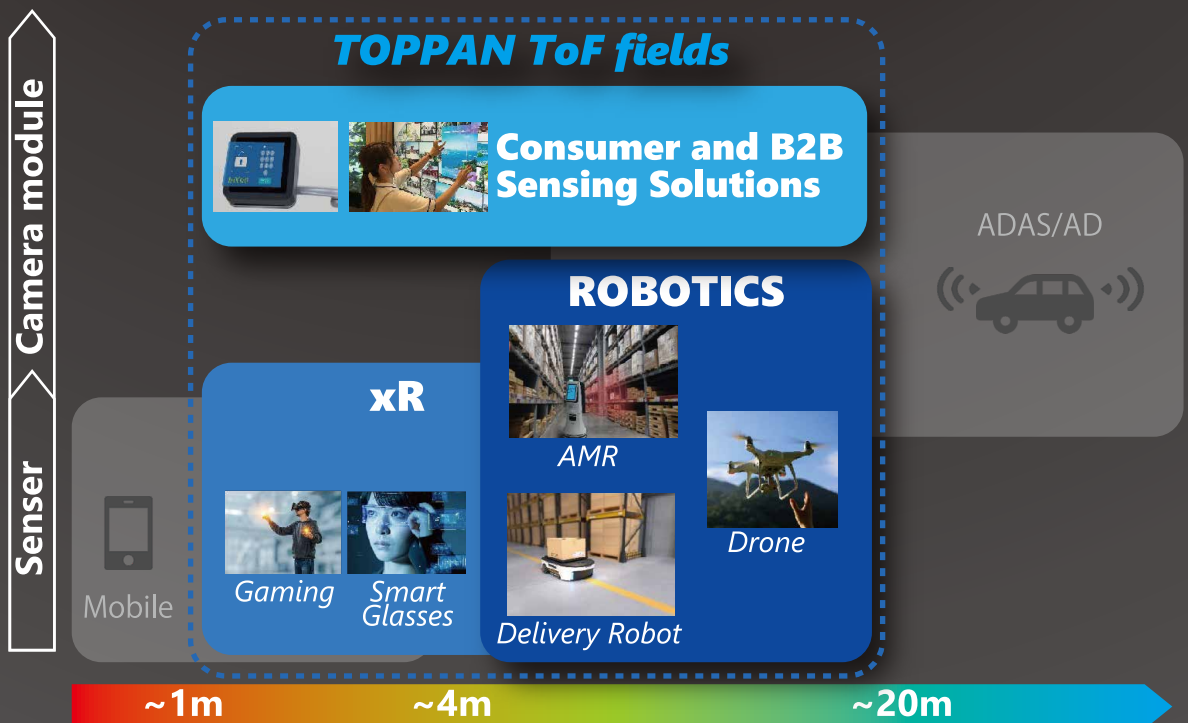
Sensor

- Wafer
- Die chip



Camera

- ToF Camera module
- ToF Evaluation camera kit
- ToF SDK for multi-os



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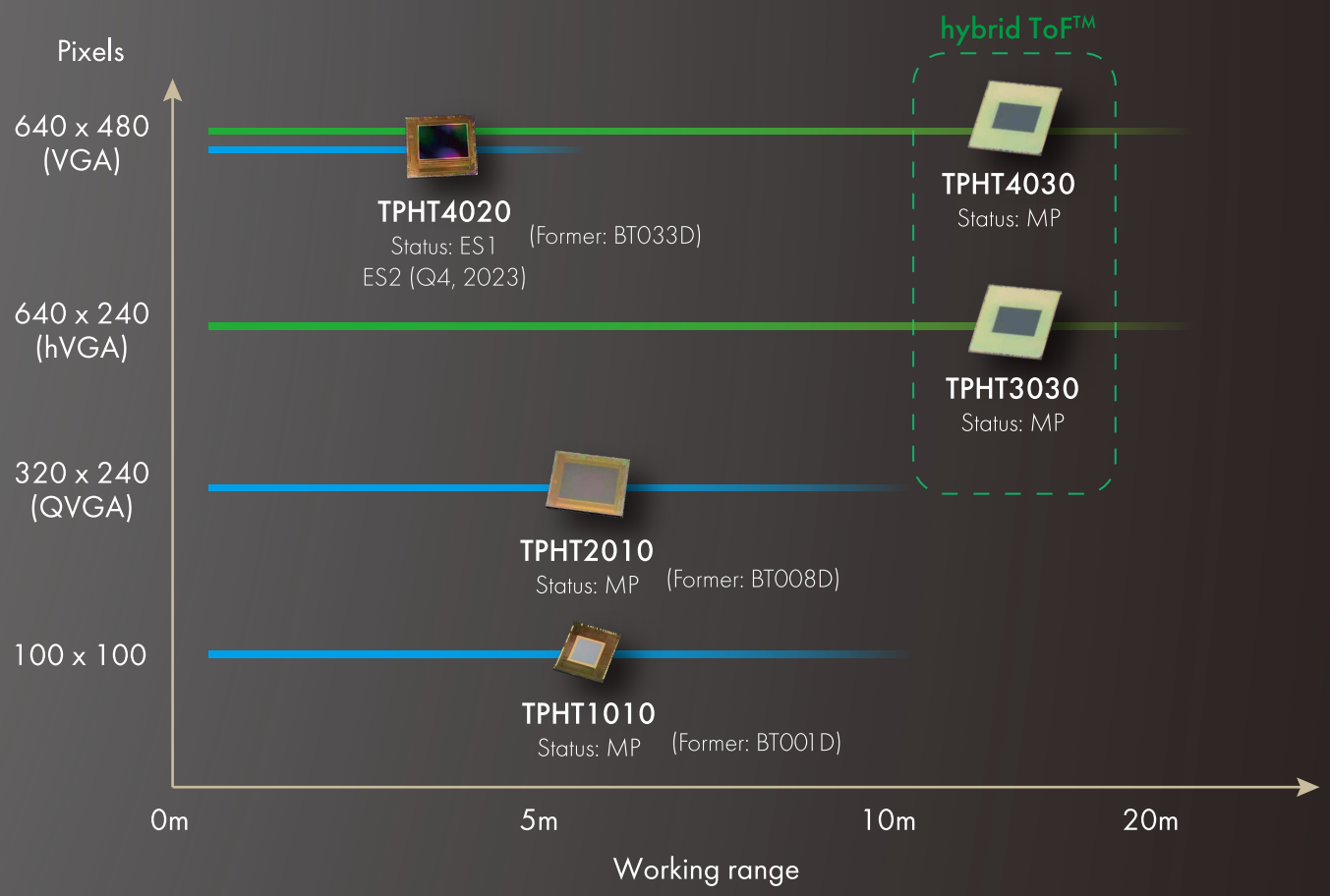
TPHT Series

TOPPAN 3D ToF Sensor products

TOPPAN 3D ToF sensor TPHT series is a CMOS-ToF depth image sensor designed for 3D depth sensing based on the indirect ToF method with short pulse modulation (SP-iToF). TPHT sensors employ our unique multi-tap gating pixel structure and an optimized pixel operation for SP-iToF to achieve a high SNR and high speed sensing without dynamic motion defects. In addition, we have been developing a Hybrid ToF™ (hToF™) sensor that adopted a feature of indirect and direct ToF sensing techniques in order to enhance wide-range sensing capability together with strong ambient light tolerance.



Model	ToF sensing Type	Pixel Array	Optical format	Pixel size	Max. framerate*1	On-chip ADC	Sensor Output I/F
TPHT1010	3Tap iToF	100 x 100	1/7	16.8μm	≧120fps	12bit/tap	2-Data lane MIPI CSI-2
TPHT2010	3Tap iToF	320 x 240	1/2.7	16.8μm	120fps	12bit/tap	2-Data lane MIPI CSI-2
TPHT4020	3Tap iToF	640 x 480	1/3	7.0μm	120fps	12bit/tap	4-Data lane MIPI CSI-2
TPHT3030	4Tap ***hToF***™	640 x 240	1/4	5.6μm	120fps	12bit/tap	8-Data lane LVDS
TPHT4030	4Tap ***hToF***™	640 x 480	1/4	5.6μm	120fps	12bit/tap	8-Data lane LVDS

*1 High framerate operating mode

For detailed sensor specifications and other information, please feel free to contact us.

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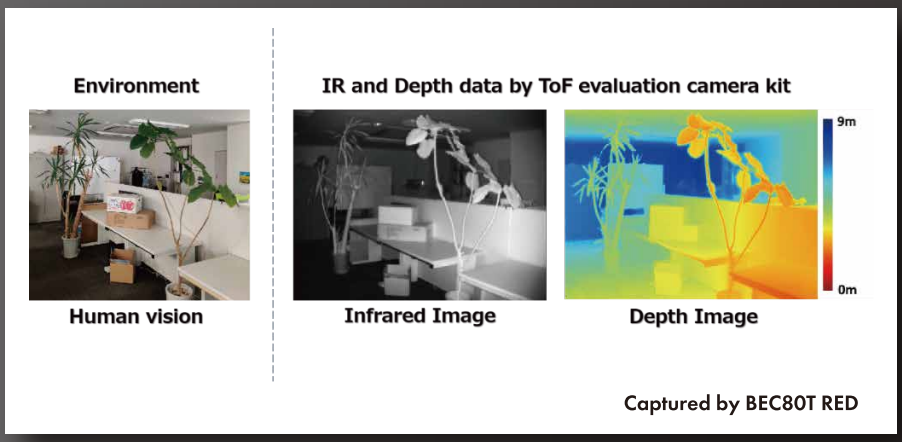
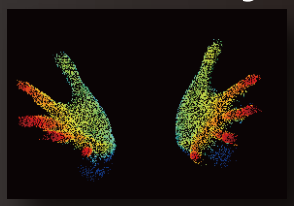
TPHT Series

QVGA 3D ToF Sensor (TPHT2010)

QVGA (Measuring points; 80,000 points/frame)
Better for Near range sensing (~5m)



Point Cloud Image



Application Example

Applications

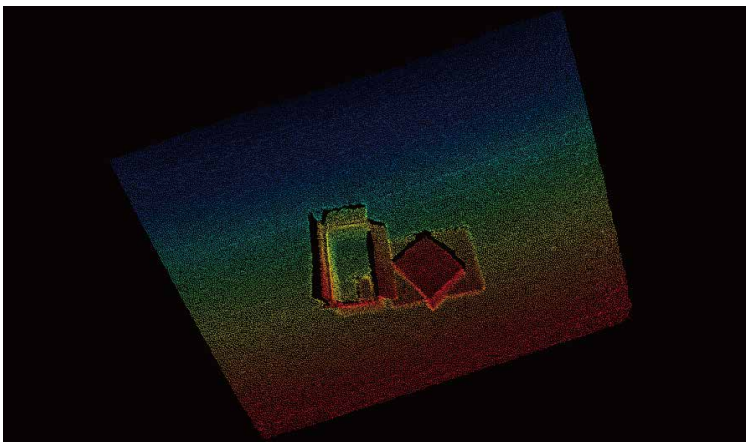
- Gesture recognition
- Robot perception sensors
- Touch-less UI device
- People-Flow Analysis

...etc.

VGA 3D ToF Sensor (TPHT4030)

hybrid ToF™

VGA (Measuring points; 320,000 points/frame)
Capable of Middle range sensing (~30m) by hybrid ToF™ Technology
Strong ambient light tolerance of up to 100,000 lx



Point Could Image

Outdoor

Applications

- AGV
- Drone
- Mobile robot
- SLAM
- 3D Identification (Security)

...etc.

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TPHT4030

VGA 3D ToF Sensor

hybrid ToF™

Description

The new Short Pulse based hybrid ToF™(hToF)™ sensor has a 4-tap pixel structure, back-side illumination (BSI) and VGA resolution depth image sensor that is developed for next-generation ToF sensing devices. This sensor supports highly-flexible measurement range and up to 120fps fast-tracking performance with ambient light tolerance. It is suitable for FA and service robots, obstacle detection and SLAM for autonomous robot applications.

Feature

- Thanks to TOPPAN' s original pixel structure, 1.5x high sensitivity performance than conventional ToF sensors.
- Fast and accurate dynamic 3D sensing thanks to pixel operation optimized for our unique ToF sensing technology.
- With the Dynamic Ambient Light Suppression (DALS) technology, the objects are recognized even with an ambient light of up to 100,000 lx.
- Flexible measurement range by hToF™ sensing techniques.
- The smart interference cancelation function for the use of multiple ToF cameras.

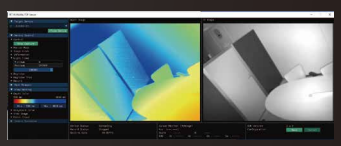
Optical format	1/4 Type
Die size	8.1mm x 8.1mm (Tentative)
Number of pixels	647 x 488
Pixel size	5.6μm x 5.6μm
Temperature sensor	1 x 488
Pixel structure	4Tap ToF pixel
Shutter type	Gloval shutter
ADC	On-chip 12-bit
Frame rate	30fps(Typ.), up to 120fps
Read time	≦13msec(Typ.)
Sensor interface	4data + 1clock lanes LVDS
Output data rate	540Mbps
Input clock frequency	27MHz
Power supply voltage	1.2V / 3.3V + bias voltages
Q.E.	49% @850nm, 30% @940nm
Ordering	Wafer or Die

ToF Evaluation Camera Kit

Dimensions	60 x 60 x 60mm (Camera head)
Weight	965g
Depth sensor	TPHT4030A 3D ToF Sensor
Depth sensing method	Short pulse based hToF™ Sensing
Active pixels	640 x 480
Measurement range	0.5 ~ 7m (Normal) 1 ~ 20m (Wide range)
Frame rate	30, 60, 90 and 120fps (Normal) 15fps (Wide Range)
Illumination	**4x VCSEL (λ = 940nm)**
Illumination power	**T.B.D.** **Laser class1 (IEC60825-1 Ed. 3)**
Depth noise	**≦1% (@4m, Normal)** **≦1% (@20m, Wide range)**
Field of view	**60° (H) x 45° (V)**
Power supply	**12V / 2A**
Interface	**USB3.0 (Micro-B)**
Operation system	**Windows 10, Linux (Ubuntu)**
Remark	**Separate ToF camera head and Depth Calculation unit type**

Depth Calc. Unit

ToF Camera Head



VGA ToF viewer

Kit Contents

- ToF evaluation camera for TPHT4030 Sensor
- VGA ToF viewer application for sensor evaluation
- USB cable, AC adapter (pulg: Type A)
- Camera Cable (Camera head - Depth Calc. Unit)
- SDK documents
- Camera documents

This product is under development and will be upgraded in the future to improve sensing performances.
The above specifications might be changed depending on the camera settings.

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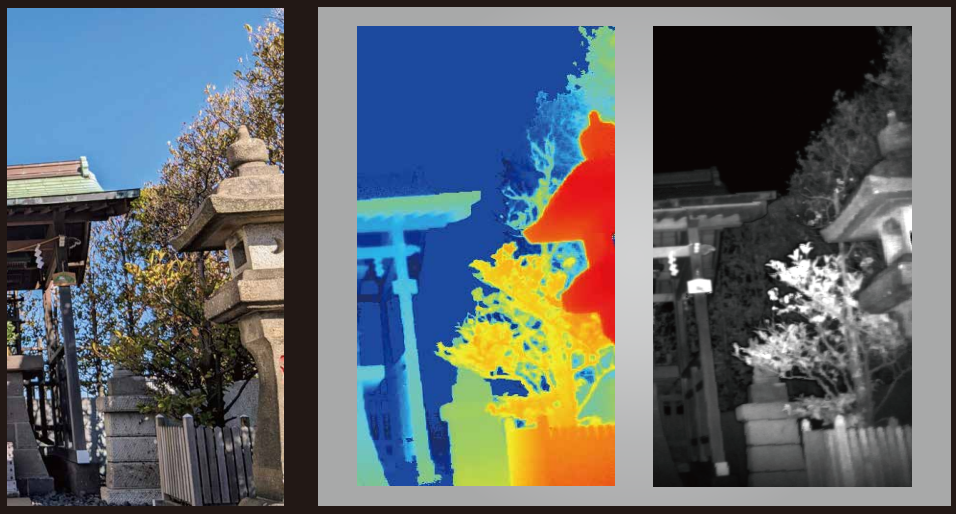
High Ambient Light Tolerance

by our patented Dynamic Ambient Light Suppresion technology, allowing use outdoors

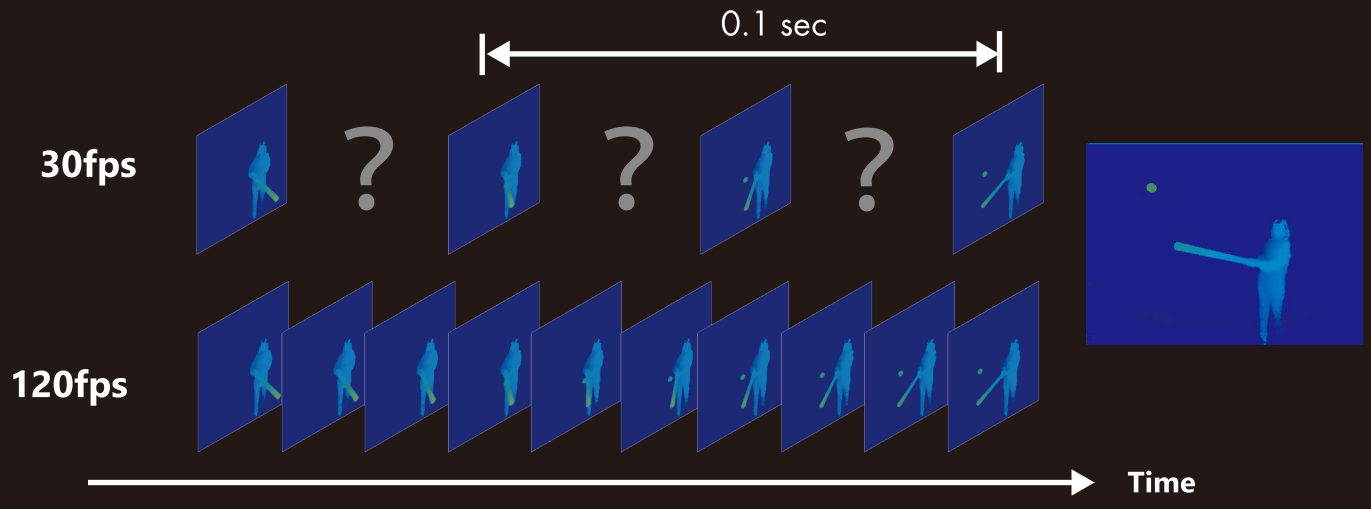
Capable of 3D sensing both indoors and outdoors in approximately 100,000 lx environment.



Outdoor **Depth** **Infrared**

High Frame Rate

120fps operation by short pulse ToF method thanks to less motion blurs and artifacts



120fps high-speed mode, 4 times faster than 30fps normal operation, is supported.

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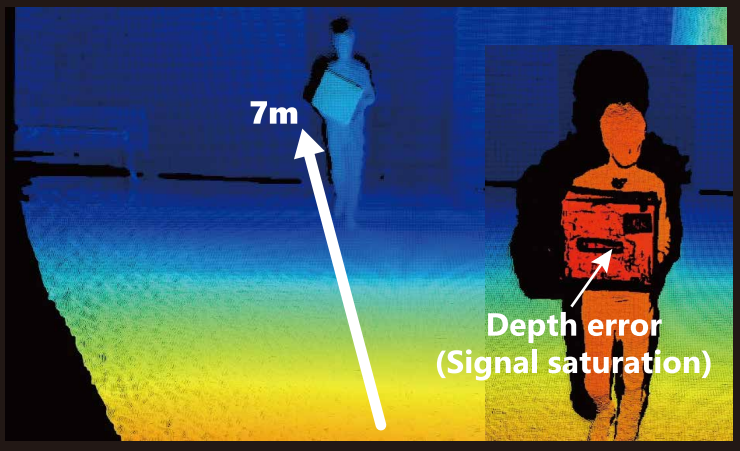
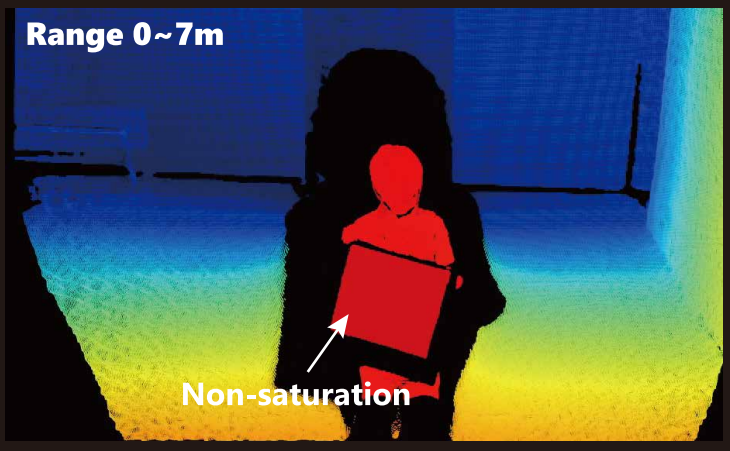
High Dynamic Range

Enables signal synamic range expansion without decreasing frame rate



Normal mode 30fps



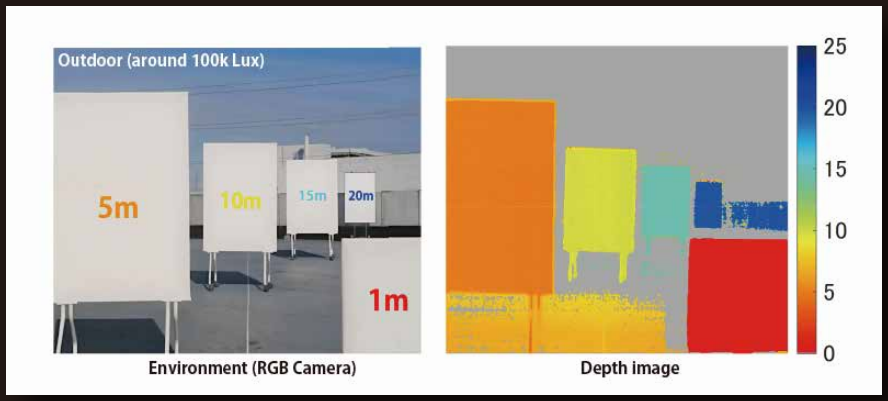
HDR mode 30fps

HDR mode is capable of reducing signal saturation at closer distances or high reflective objects while simultaneously covering a wide working range of up to 7 meters without frame rate degradation.

Long Working Distance

Depth sensing up to 20m by the long range mode using hybrid ToF™ technology

Outdoor Demonstration (Around 100,000 lx)



An evaluation on a prototype camera with the hybrid ToF™ sensor TPHT4030A confirms it can measure distances from 1m to 20m, even outdoor around 100,000 lx.

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BEC80T RED・BLUE

Product code: TPHT2010C-EC

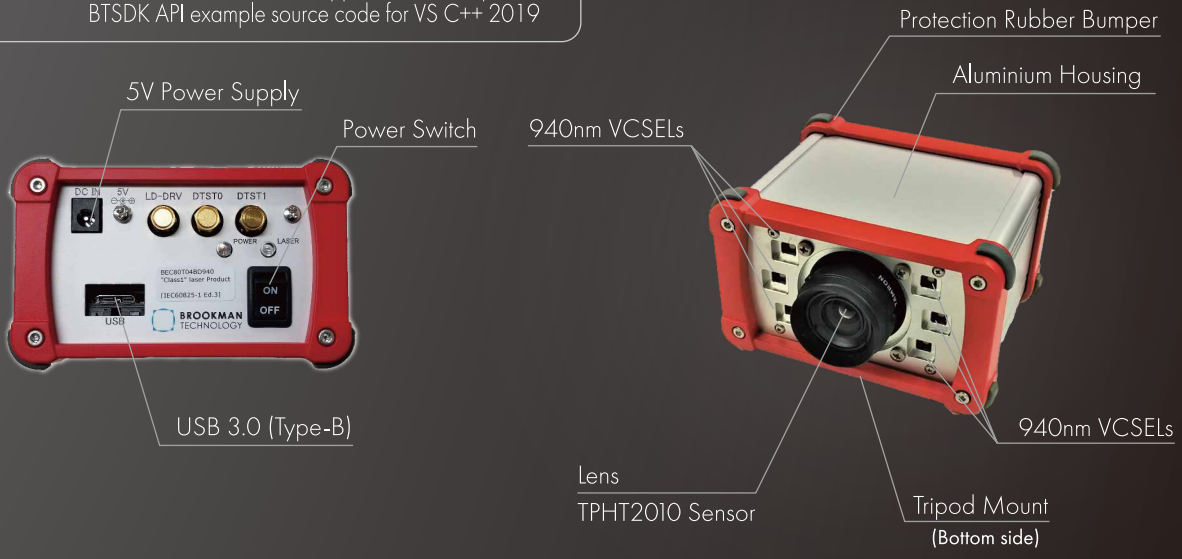
Short Pulse ToF **Up to 60fps**

ToF Standard Evaluation Camera for TPHT2010 sensor

	High Tolerance to Sunlight	For Indoor Use
Camera name	BEC80T RED (Type: 940nm)	BEC80T BLUE (Type: 850nm)
Product code	TPHT2010C-**EC1** (Former: BEC80T15BD940)	TPHT2010C-**EC2** (Former: BEC80T15BC)
Dimensions	116mm x 107mm x 70mm (body only)	116mm x 107mm x 70mm (body only)
Weight	530g	485g
Depth sensor	TPHT2010 3D ToF sensor	TPHT2010 3D ToF sensor
Depth sensing method	Indirect ToF with short pulse modulation	Indirect ToF with short pulse modulation
Measurement range	0.5m ~ 8m	0.5m ~ 4m (Range shift 4m ~ 8m)
Frame rate	10fps, 30fps(Typ.) and 60fps	10fps, 30fps(Typ.) and 60fps
Acquisition time of per frame	27msec(Typ.) @30fps	27msec(Typ.) @30fps
Number of active pixels	320(H) x 240(V); ~80000 Measuring points	320(H) x 240(V); ~80000 Measuring points
Illumination*	6x VCSEL (λ : 940nm) Laser class 1 certificated	2x VCSEL (λ : 850nm) Laser class 1 certificated
Illumination power	Peak: 2.7W/VCSEL Ave.: 0.82W/Camera	Peak: 1.2W/VCSEL Ave.: 0.22W/Camera
Depth noise	≦2.5% of distance @ 8m**	≦1% of distance @ 4m**
Field of view	40°(H) x 30°(V)$^{typ.}$	53°(H) x 40°(V)$^{typ.}$
Lens	F#1.2, 1/3 Type	F#1.2, 1/3 Type
Power supply	DC 5V / ≦6A	DC 5V / ≦3A
Interface	USB 3.0 (Micro-B)	USB 3.0 (Micro-B)
Operation system	64-bit Windows 10	64-bit Windows 10

Don't disassemble and/or modify the products for safety reasons.
* This camera is classified in IEC standards (IEC 60825-1 Ed.3: 2014).
** Target reflectance: 80%, Integration time: 27msec, Frame rate: 30fps, 30frames average, 10x10 pixels @Center of active pixel area.

Software
- Demo viewer for ToF sensor evaluation
- ToF Application SDK
  - BTSDK API documents for application developer
  - BTSDK API example source code for VS C++ 2019



Camera body (Product code: TPHT2010C-EC1)

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BEM80T Module

Product code: TPHT2010C-EM

Smaller design **Short Pulse ToF** **Up to 60fps**

Reference design of ***Tiny!*** Camera Unit

For Near-range Sensing

Camera name	BEM80T (Type: 940nm)	BEM80T (Type: 850nm)
Product code	TPHT2010C-**EM1** (Former: BEM80T04BC940)	TPHT2010C-**EM2** (Former: BEM80T04BB)
Dimensions	18mm x 90mm x 9mm	18mm x 90mm x 9mm
Weight	16g	16g
Depth sensor	TPHT2010 3D ToF sensor	TPHT2010 3D ToF sensor
Depth sensing method	Indirect ToF with short pulse modulation	Indirect ToF with short pulse modulation
Measurement range	0.2m ~ 1.2m(T.B.D.)	0.2m ~ 2m
Frame rate	10fps, 30fps(Typ.) and 60fps	10fps, 30fps(Typ.) and 60fps
Acquisition time of per frame	27msec(Typ.) @30fps	27msec(Typ.) @30fps
Number of active pixels	240(H) x 240(V) ; ~58k measuring points	240(H) x 240(V) ; ~58k measuring points
Illumination*	1x VCSEL (λ : 940nm) Laser class 1 certificated	1x VCSEL (λ : 850nm) Laser class 1 certificated
Illumination power	Peak: 2W/VCSEL Ave.: 0.2W/Camera	Peak: 1.2W/VCSEL Ave.: 0.12W/Camera
Depth noise	≦2% of distance @ 1m(T.B.D.) **	≦2% of distance @ 1.5m**
Field of view	55°(H) x 55°(V)typ.	55°(H) x 55°(V)typ.
Lens	Integrated F#2.2 lens in module	Integrated F#2.2 lens in module
Power supply	DC 5V/ ≦0.9A (USB power)	DC 5V/ ≦0.9A (USB power)
Interface	USB 3.0 (Micro-B)	USB 3.0 (Micro-B)
Operation system	64-bit Windows 10	64-bit Windows 10

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* This camera is classified in IEC standards (IEC 60825-1 Ed.3: 2014).
** Target reflectance: 80%, Integration time: 27msec, Frame rate: 30fps, 30frames average, 10x10 pixels @Center of active pixel area.

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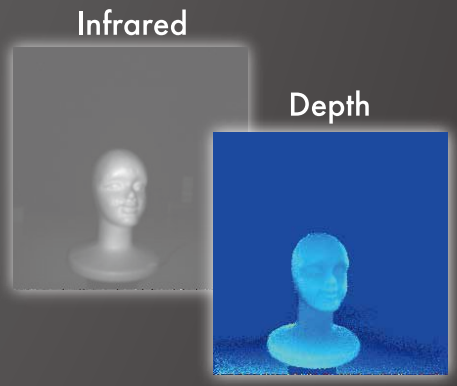

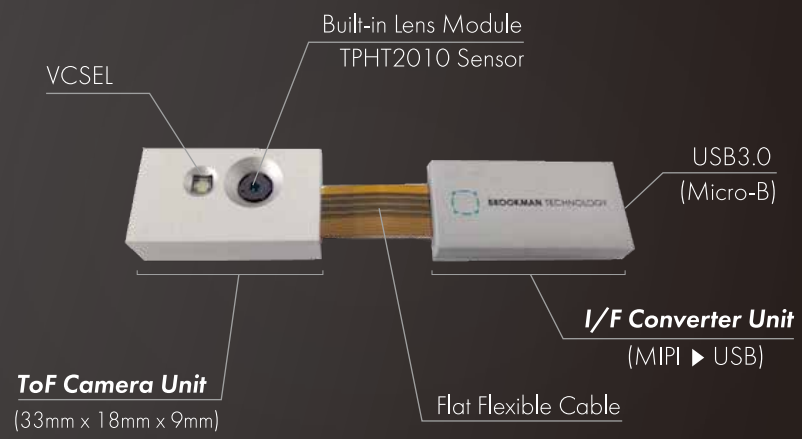

YouTube
Scan QR Code to Watch Demo

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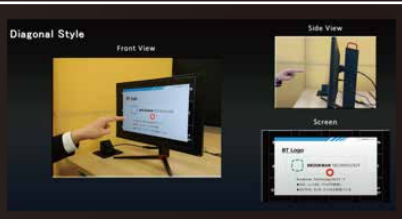
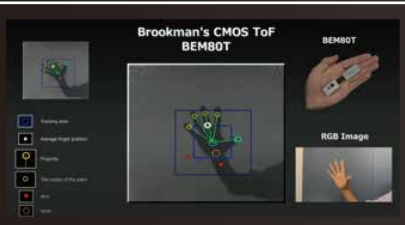
Application PoC examples

We introduce some examples of application development using our 3D ToF cameras. In addition to the following cases, Our ToF cameras are used in various 3D sensing applications, including volumetric camera systems and obstacle detection cameras for autonomous robots.

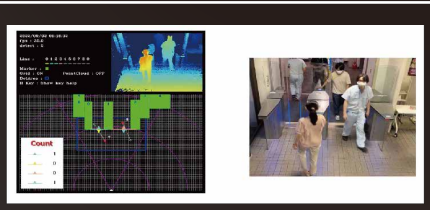
Touchless control UI



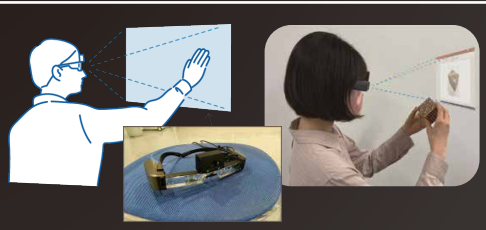
Gesture recognition



People counting (flow) analysis



AR Glasses UI



Infomation

TOPPAN 3D ToF Sensing Website

TOPPAN 3D ToF Sensor & Camera (Electronics Division, TOPPAN Inc.)
https://www.toppan.com/en/electronics/device/tof/

TOPPAN ToF Sensing BLOG
https://toppan-tof.jp/

Document
TOPPAN 3D ToF Sensor Product Catalog Ver.4
Publication Date
2024.02.20
Publisher
TOPPAN Holdings Inc., Business Development Division, TOF Business Development Center

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Toppan ToF

Challenging and Seeking to the new field,
where nobody can achieve, and where nobody has done before.

TOPPAN

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