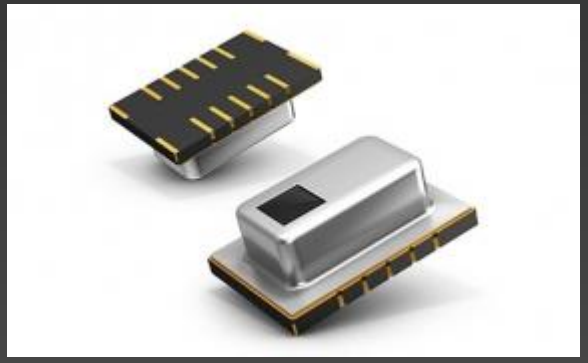
GRIDEYE SENSOR



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  - Working Principle
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PRODUCT INTRODUCTION

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WHAT IS GRIDEYE?

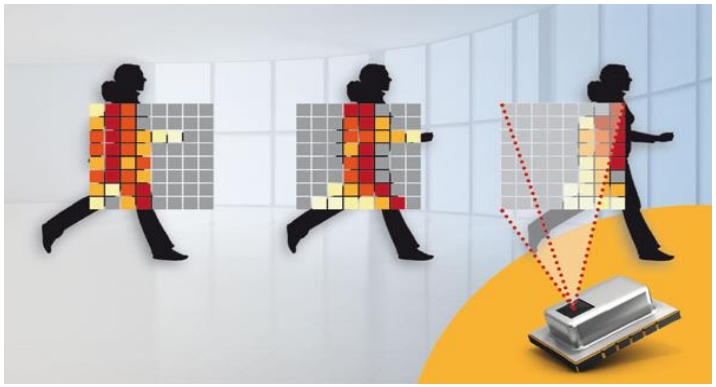
GridEYE Webpage

Overview

- GridEYE is an 8x8 (64) pixel infrared array sensor.
- It uses an array of thermopile to measure actual temperature as well as temperature gradients
- It is a high precision compact SMD design using MEMS technology.

Features

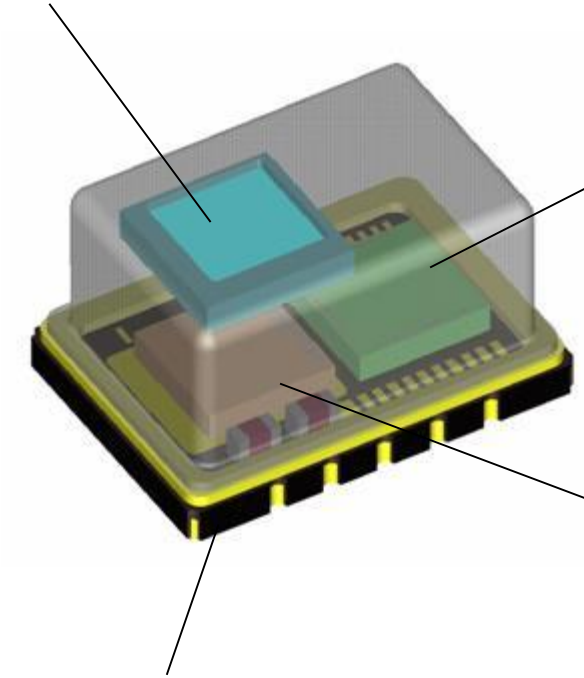
- GridEYE can detect the direction of moving people and objects – up, down, left, right and diagonally.
- Its coordinated array of sensing elements can even detect multiple people or objects moving in different directions.



COMPONENTS & FUNCTIONS

Grid-EYE Sensor

Silicon lens
- Image formation



Mixed signal processing IC
- 64-Pixels signal readout
- Analog amplification
- Analog to Digital conversion
- Sensitivity correction
- Correction for temperature effects
- Digital communication

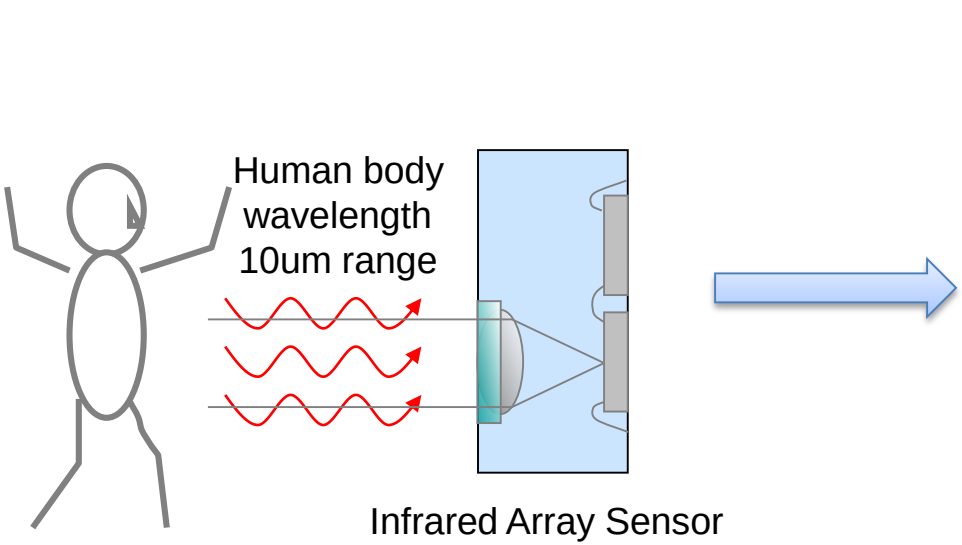
IR detector
- 8 x 8 pixels
- Thermal insulation structure using MEMS technology
- Infrared absorption
- Thermoelectric conversion

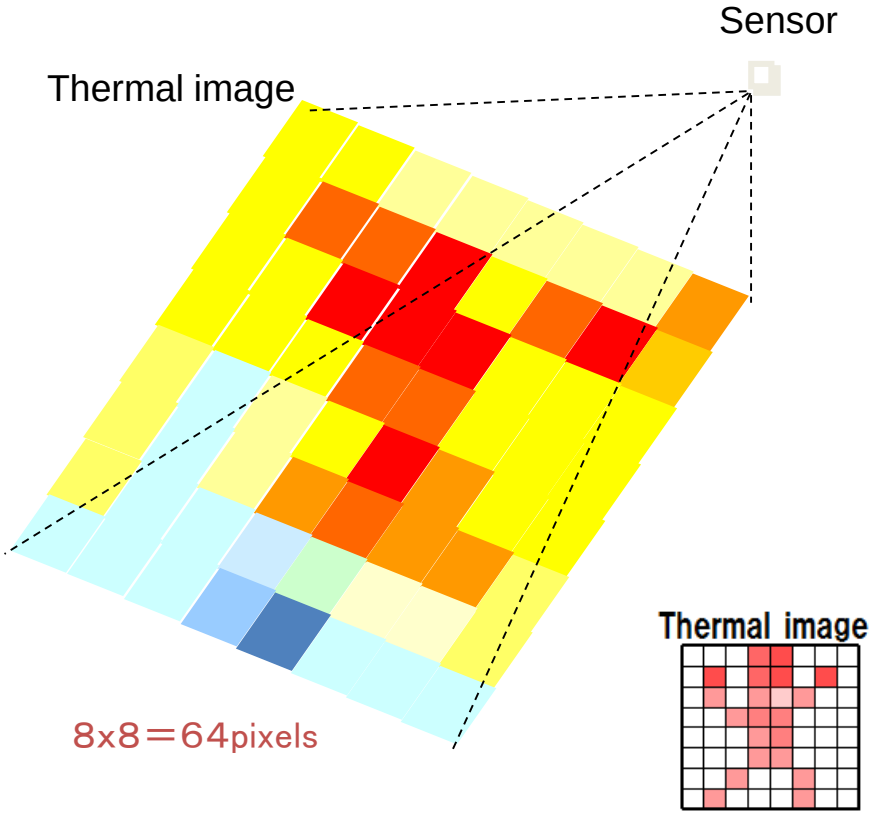
Ceramic package
- Air tightness
- Radio shielding
- Possible to use with Reflow soldering

WORKING PRINCIPLE

Temperature measurement

- Sensor works by detecting infrared and converting it to temperature

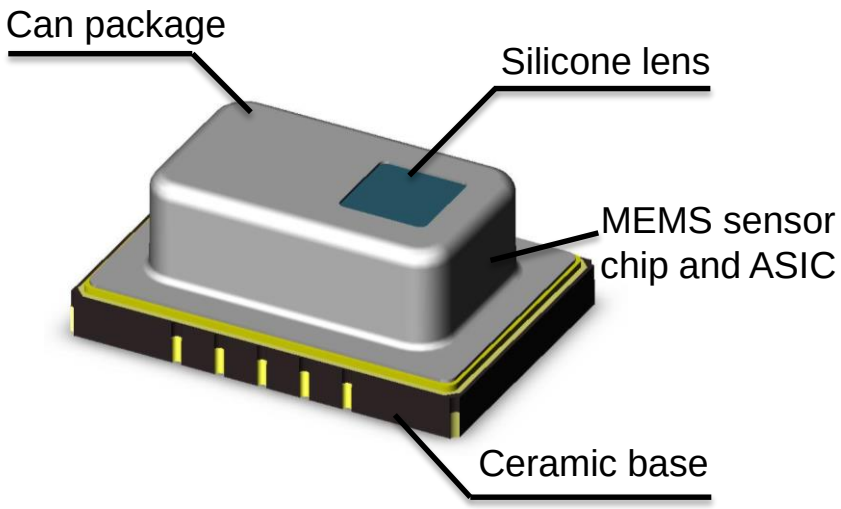




PRODUCT SPECIFICATION

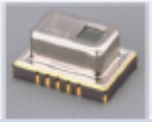
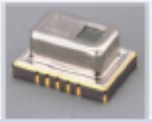
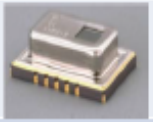
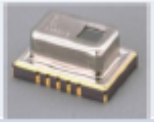
Specification	Value
Power voltage	3.3V ±10%, 5V ±10%
Current consumption	**4.5mA** (normal), **0.8mA** (standby), **0.2mA** (sleep)
View angle	60 degrees (x,y)
Absolute temperature accuracy	High gain: ±2.5°C Low gain: ±3°C
Noise Equivalent Temperature Difference	0.5°C @ 1Hz
Frame rate (selectable):	1 frame/sec or 10 frames/sec
Operating temperature range	0 ~ 80ºC (high gain) -20 ~ 80ºC (low gain)
Detection temperature range	0 ~ 80ºC (high gain) -20 ~ 100ºC (low gain)
External interface	I²C 12bit
Operation mode	Normal, Standby, Sleep

11.6(L) x 8.0(W) 4.3(H) mm



GridEYE GENERATION 2…

Grid EYE 2nd Generation Spec and Schedule

Infrared Array Sensor Grid-EYE	Current Model		New Generation	
	High Gain Type	Low Gain type	High Gain Type	Low Gain type
Appearance				
Part Number	AMG8831 AMG8851	AMG8832 AMG8852	AMG8833 AMG8853	AMG8834 AMG8854
Size	11.6x8.0xH4.3mm			
Number of pixels	64 pixels (Vertical 8 x Horizontal 8 Matrix)			
Interface	I2C **(new generation is 100% compatible to existing designs)**			
Detection Angle	60° × 60°			
Supply Voltage	3.3Vdc or 5Vdc			
Frame rate	10 frames per second or 1 frame per second			
Absolute temperature Accuracy	+/- 2.5°C	+/- 3.0°C	+/- 2.5°C	+/- 3.0°C
Detection Temperature	0 to 80°C	-20 to 100°C	0 to 80°C	-20 to 100°C
Operation Temperature	0 to 80°C	-20 to 80°C	0 to 80°C	-20 to 80°C
NETD*1	0.5°C	0.5°C	**0.16°C**	**0.2°C**
Detection Distance*2	5m	5m	**7m**	**7m**
MP	Already MP	Already MP	**April 2016**	**April 2016**

*1 Typ.Noise Equivalent Temperature Difference @ 10Hz
*2 Please see the spec sheet for measurement conditions

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ADVANTAGES/COMPARISON

	Moving object	Motionless object	Movement direction	Temperature measuring
Pyroelectric	**Possible**	**Impossible**	**Impossible**	**Impossible**
Thermopile (Single element)	**Possible**	**Impossible**	**Impossible**	**Possible**
Grid-EYE	**Possible**	**Possible**	**Possible**	**Possible**

- A lot more functionality as compared to Pyro-electric and Thermopile.
- Above extended features of GridEYE make it possible to be used in a wide variety of applications.
- GridEYE is the latest technology of sensor products available in smallest size in market today.

TARGETED APPLICATIONS

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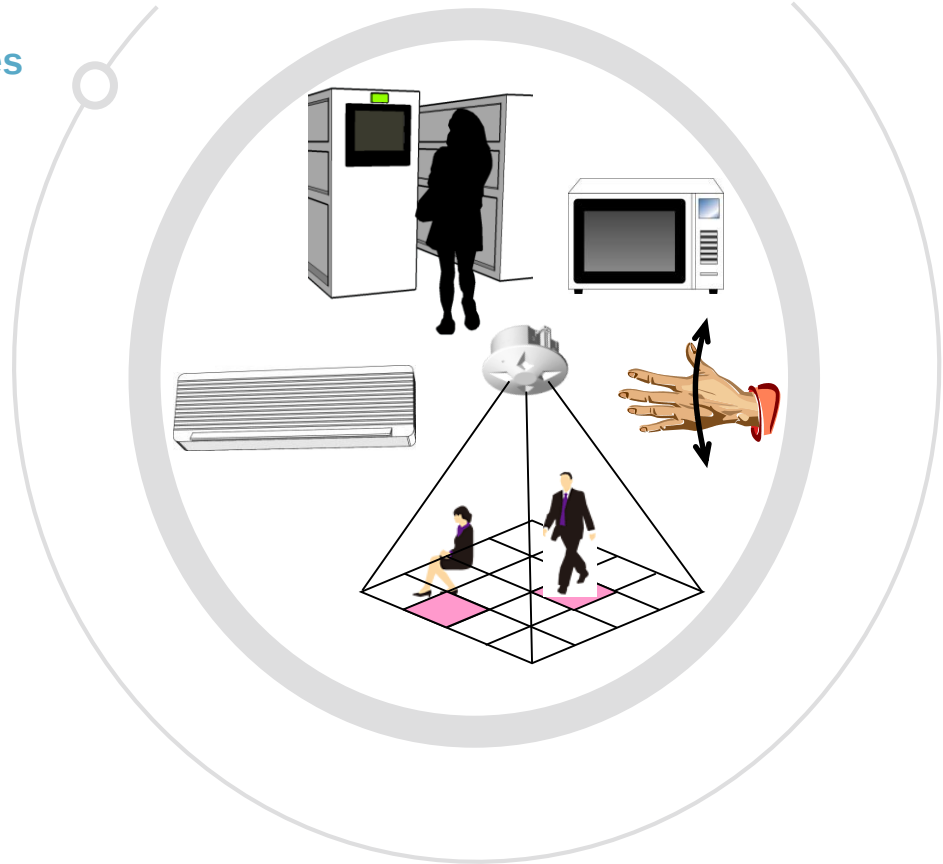
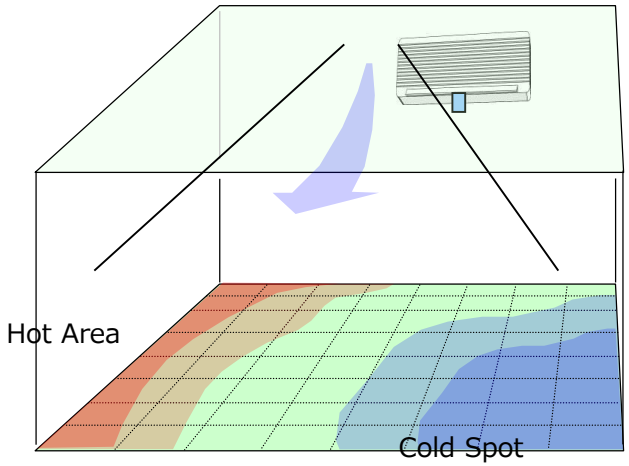
TARGETED APPLICATIONS

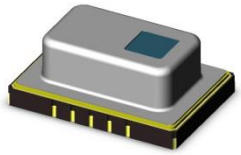
Home Appliances



AIR CONDITIONER APPLICATION

- Detection of temperature distribution for optimal temperature control





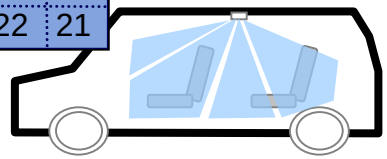
Detected Temperature (degC)

29	29	29	28	28	28	28	28
29	29	28	28	28	28	28	27
29	29	28	28	28	27	27	26
29	29	28	28	27	27	26	26
29	28	28	28	27	26	26	26
29	28	28	28	27	26	26	26
29	28	28	28	27	26	26	26
29	28	28	28	27	26	26	25

Air conditioner for vehicle

31	30	29	27
29	28	26	25
25	24	23	23
22	22	22	21

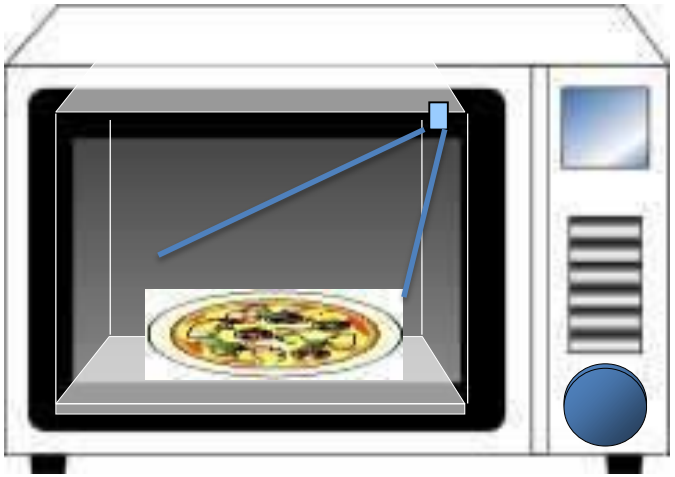
(deg.C)



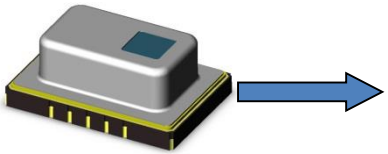
- Comfort – Regularize room temperature
- Saving Energy – Control temperature of necessary areas

MICROWAVE APPLICATION

- Detect food temperature



Detected Temperature



(degC)

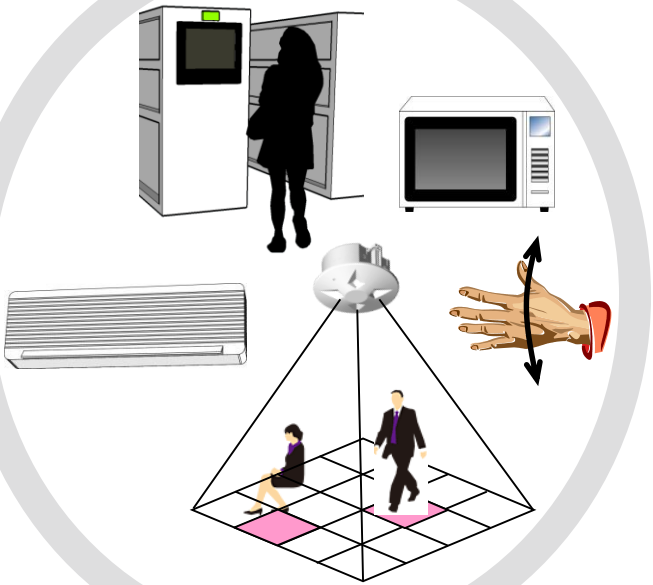
36	40	43	36	35	37	36	36
37	41	41	42	43	42	39	36
38	43	58	65	67	68	38	37
36	43	60	75	75	68	45	37
37	42	59	72	73	60	42	37
37	40	51	58	58	50	40	36
36	36	40	41	36	35	35	36
36	35	35	33	36	35	37	35

- Convenience – Avoid food being too hot.
- Saving Energy – Only heat up necessary area

TARGETED APPLICATIONS

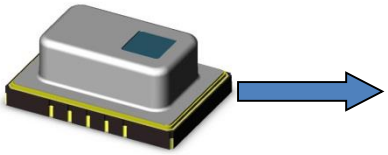
Home Appliances

Hot Spot Detection



HOT SPOT DETECTION

- Detect hot spots in critical industrial areas e.g. Circuit breakers



Detected Temperature

(degC)

36	40	43	36	35	37	36	36
37	41	41	42	43	42	39	36
38	43	58	65	67	68	38	37
36	43	60	75	75	68	45	37
37	42	59	72	73	60	42	37
37	40	51	58	58	50	40	36
36	36	40	41	36	35	35	36
36	35	35	33	36	35	37	35

Functionalities : hot spot detection (permanent monitoring)

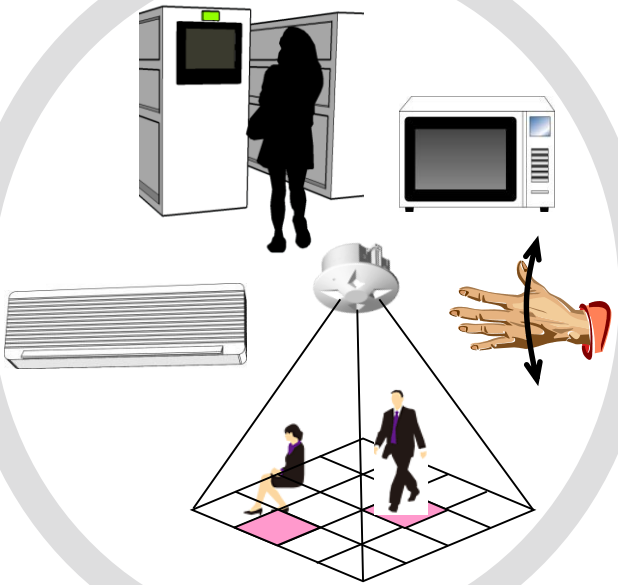
- Pre-alarm / alarm : crossing of pre-defined threshold T° values
- Hot spot localization
- T max, Surface of the hot spot

TARGETED APPLICATIONS

Home Appliances

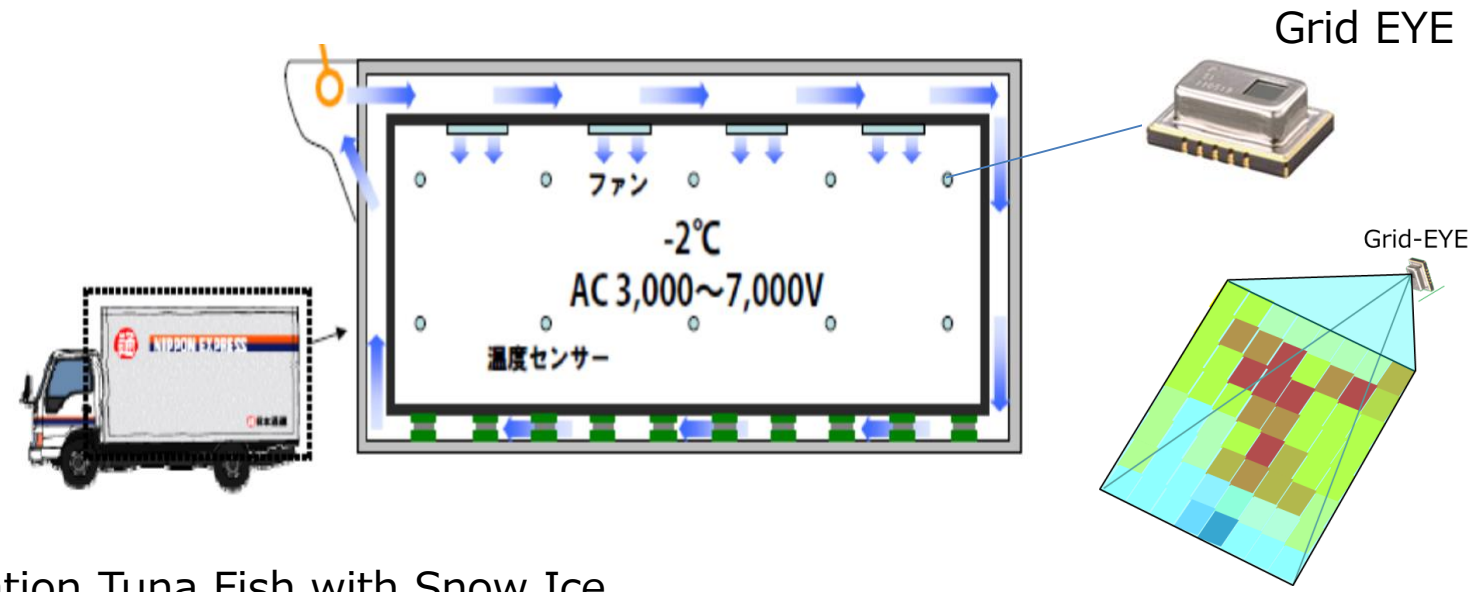
Hot Spot Detection

Area Monitoring

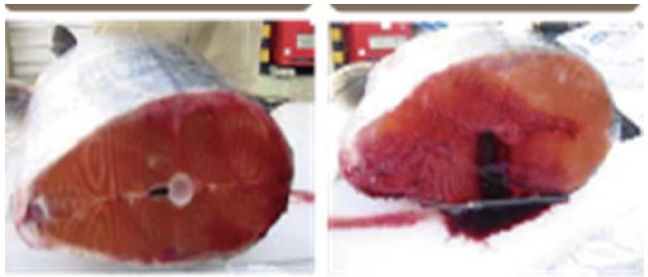


Innovation for Cold Chain Business in Japan

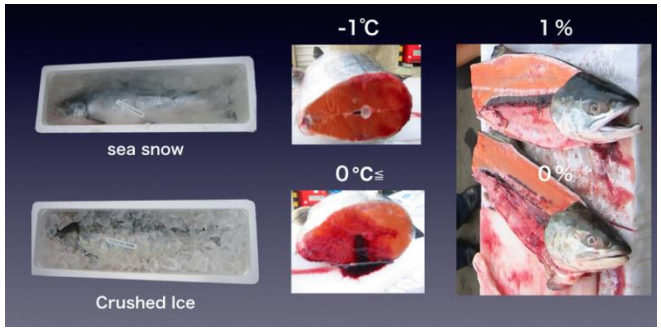
- Monitoring and Preservation of Fish for transportation



Transportation Tuna Fish with Snow Ice



Snow Ice Normal Ice



Temp：-1.0℃ Salt Density:>1%

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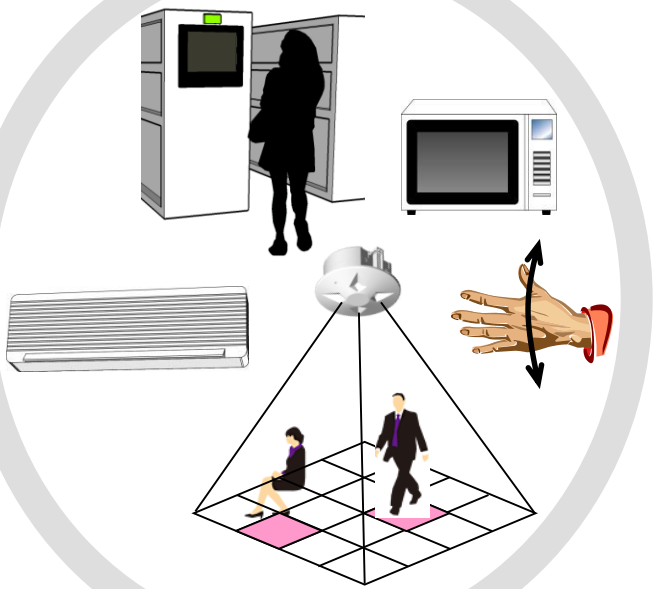
TARGETED APPLICATIONS

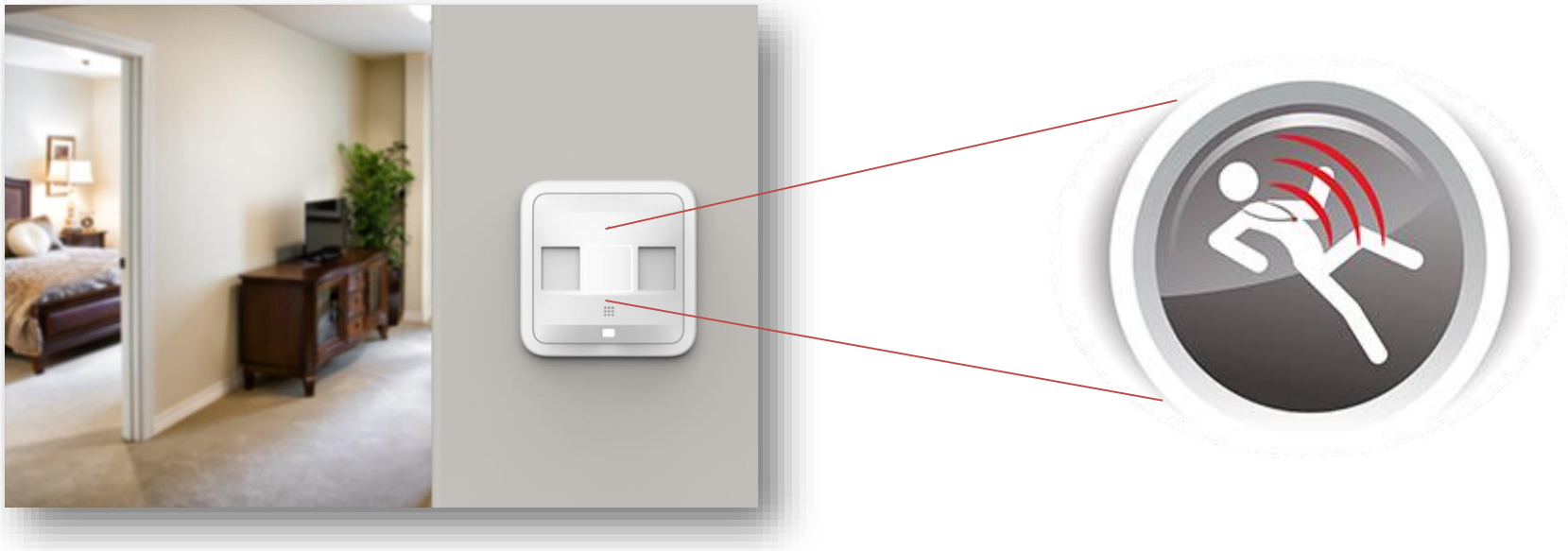
- Home Appliances
- Hot Spot Detection
- Area Monitoring
- Ambient Assisted Living



January 6, 2017

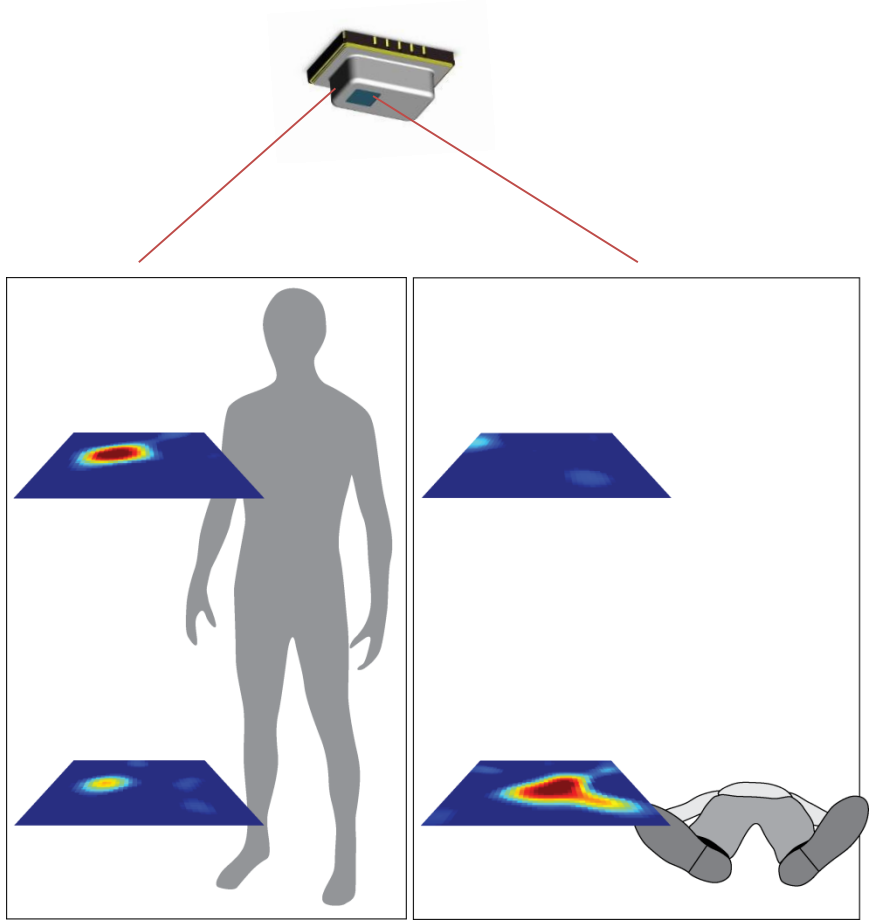
AMBIENT ASSISTED LIVING

- Each device to have 2 grid eye sensors.
- Application: People and Fall detection in Hospitals/old homes/Apartments



Ambient Assisted Living

- GridEYE on the roof
- Application: People and Fall detection in Hospitals/old homes/Apartments



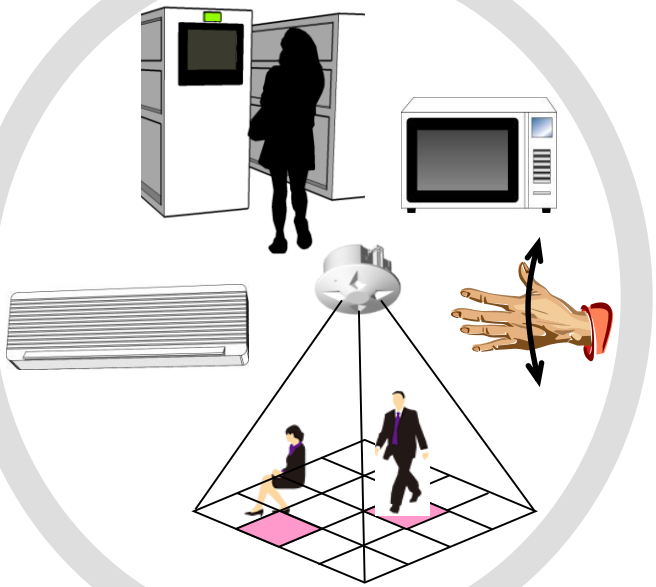
TARGETED APPLICATIONS

Home Appliances

Hot Spot Detection

Area Monitoring

Ambient Assisted Living



Industry Safety & Control

January 6, 2017

INDUSTRIAL SAFETY & CONTROL

- Area monitoring near sensitive or dangerous machines
- Unauthorized people or people near dangerous machines

TARGETED APPLICATIONS

Home Appliances

Hot Spot Detection

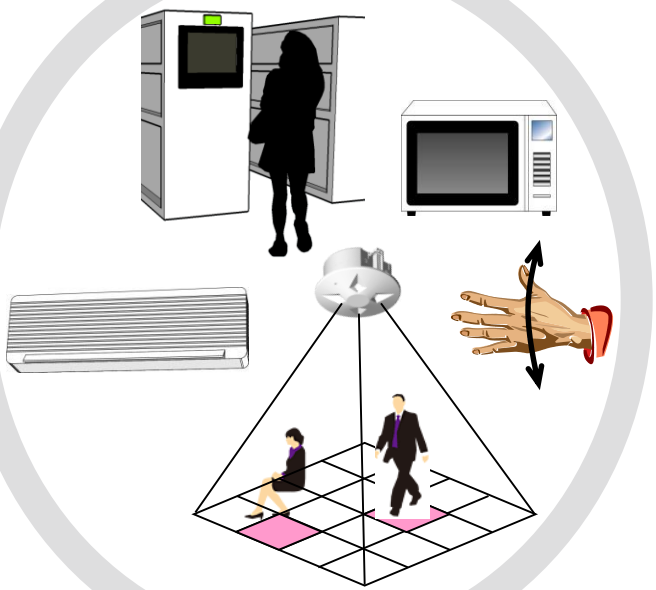
Area Monitoring

Ambient Assisted Living

Industry Safety & Control

Energy Saving

Consumer Comfort



January 6, 2017

Grid-EYE Unit

- Panasonic Product
- 4 Grid-EYE Sensors
- In production and commercialized in Japan
- Used to achieve Zero Energy Building
- Used to control lighting and Air conditioning

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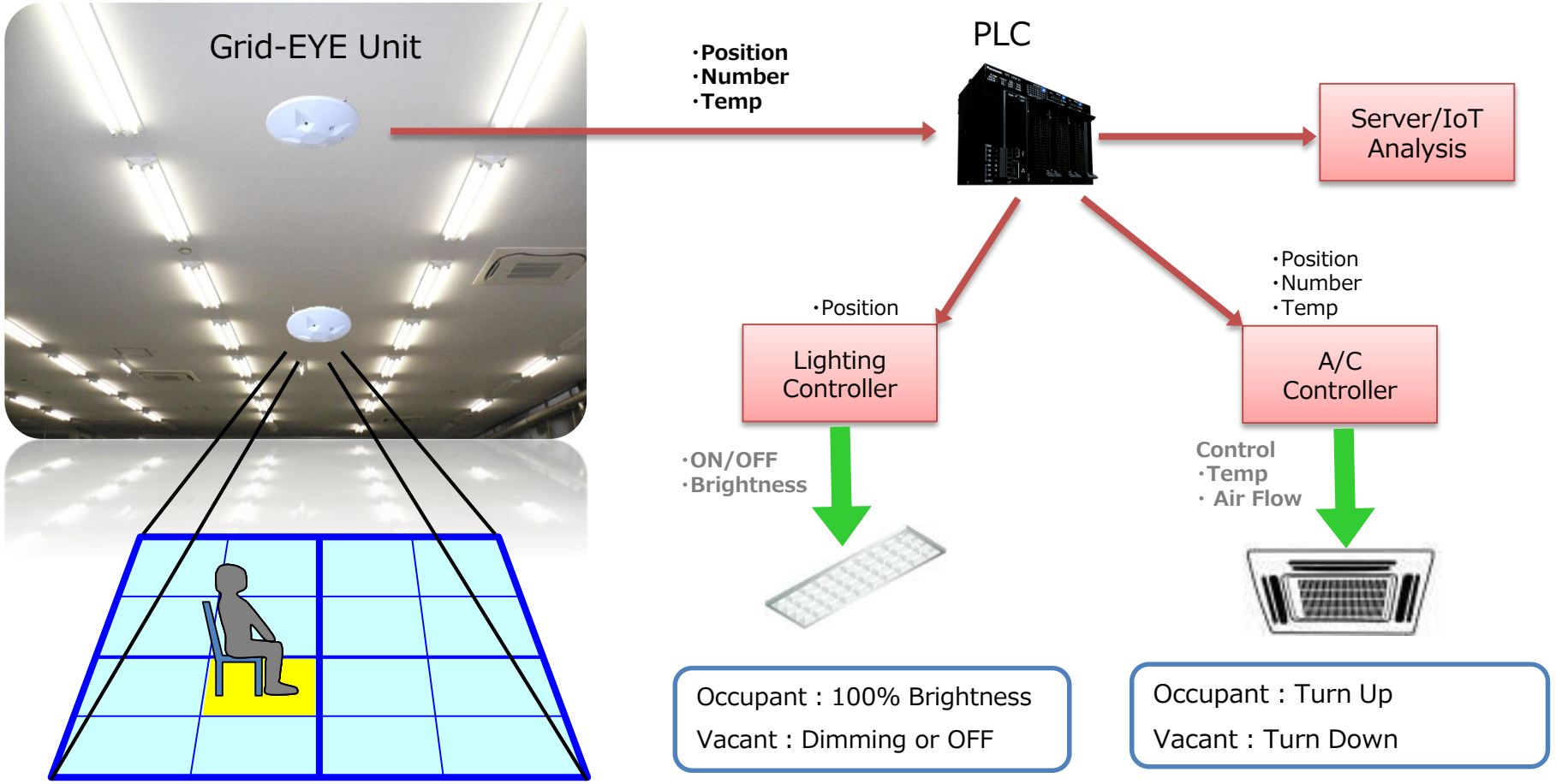
Grid-EYE Unit

- Control of Lighting and Air Conditioning by utilizing the information from Grid-EYE unit. (Number of people, position, moving direction, and Temp information)



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COMPARISON TABLE – ENERGY SAVING

Type		Grid-EYE Unit Type	PIR	Camera
Detection	Area	3.6 m × 3.6 m	Φ 4.9 m	7.2 m × 7.2 m
	Number	YES （8 People）	NO	NO
	Position	YES （4 × 4）	NO	NO
	Temp	YES	NO	NO
Privacy Protection		YES	YES	NO
Energy Saving （Occupancy rate 50%）		<20 %	<5 %	<10 %

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TARGETED APPLICATIONS

Home Appliances

Hot Spot Detection

Area Monitoring

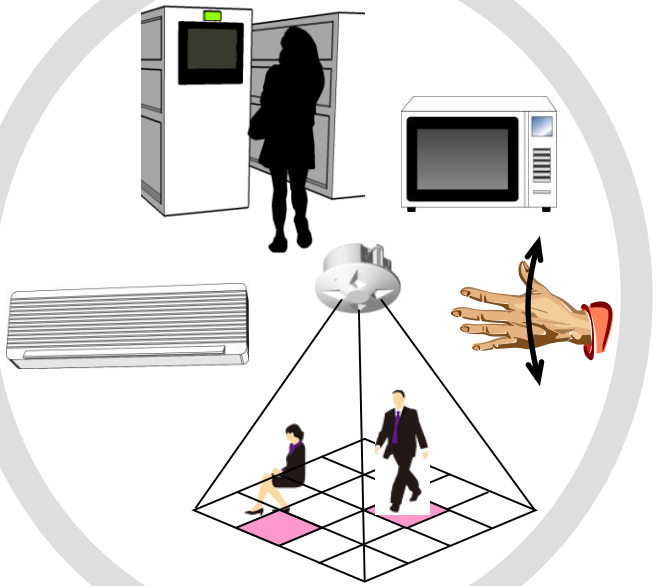
Ambient Assisted Living

Industry Safety & Control

Energy Saving

Consumer Comfort

Stove Guard



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STOVE GUARD

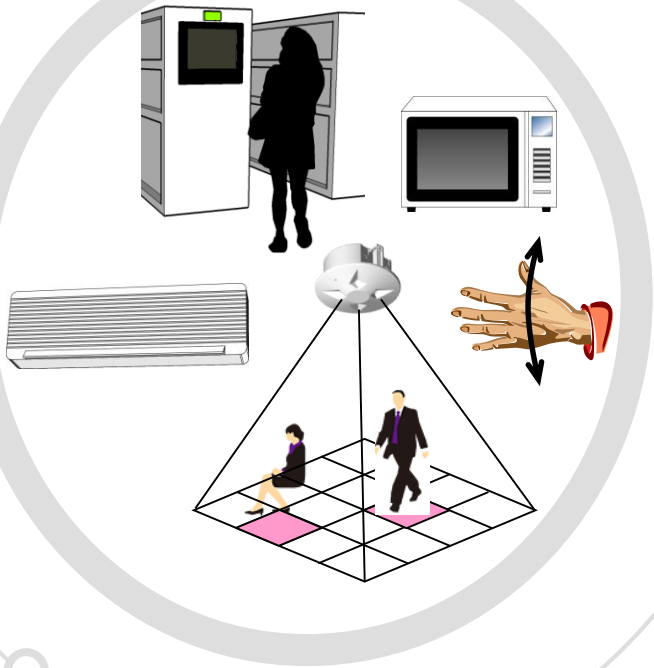
- EU Regulation that every household to have a stove guard
- Total no. of households in EU in 2014 were 216 million

TARGETED APPLICATIONS

Home Appliances

Business Intelligence

Hot Spot Detection



Stove Guard

Area Monitoring

Consumer Comfort

Ambient Assisted Living

Energy Saving

Industry Safety & Control

January 6, 2017

BUSINESS INTELLIGENCE

- Monitor number of people near an advertisement or crossing it inside a shopping mall.
- Use this information to sell at a higher price.

GRIDEYE Videos

https://www.youtube.com/watch?v=_HA1DX4DQdM
https://www.youtube.com/watch?v=yciuaZY6EUc
https://www.youtube.com/watch?v=SUpV8WSUb_I

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TECHNICAL DETAILS

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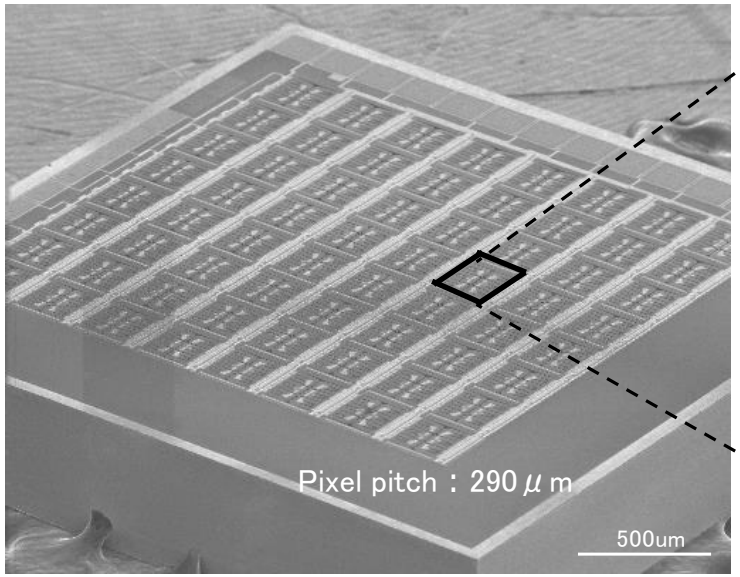
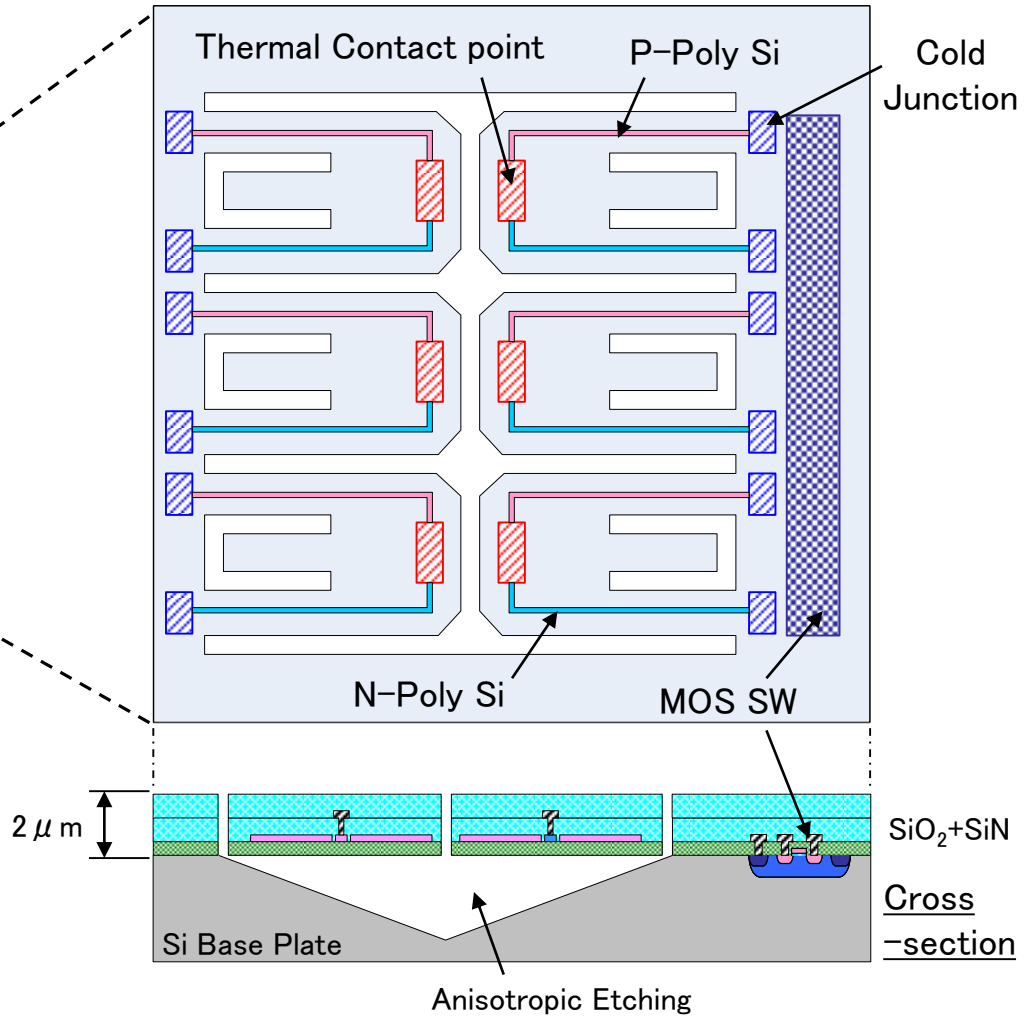
MEMS Technology of Grid EYE

Downsizing and Larger pixel number by Unique MEMS Technology



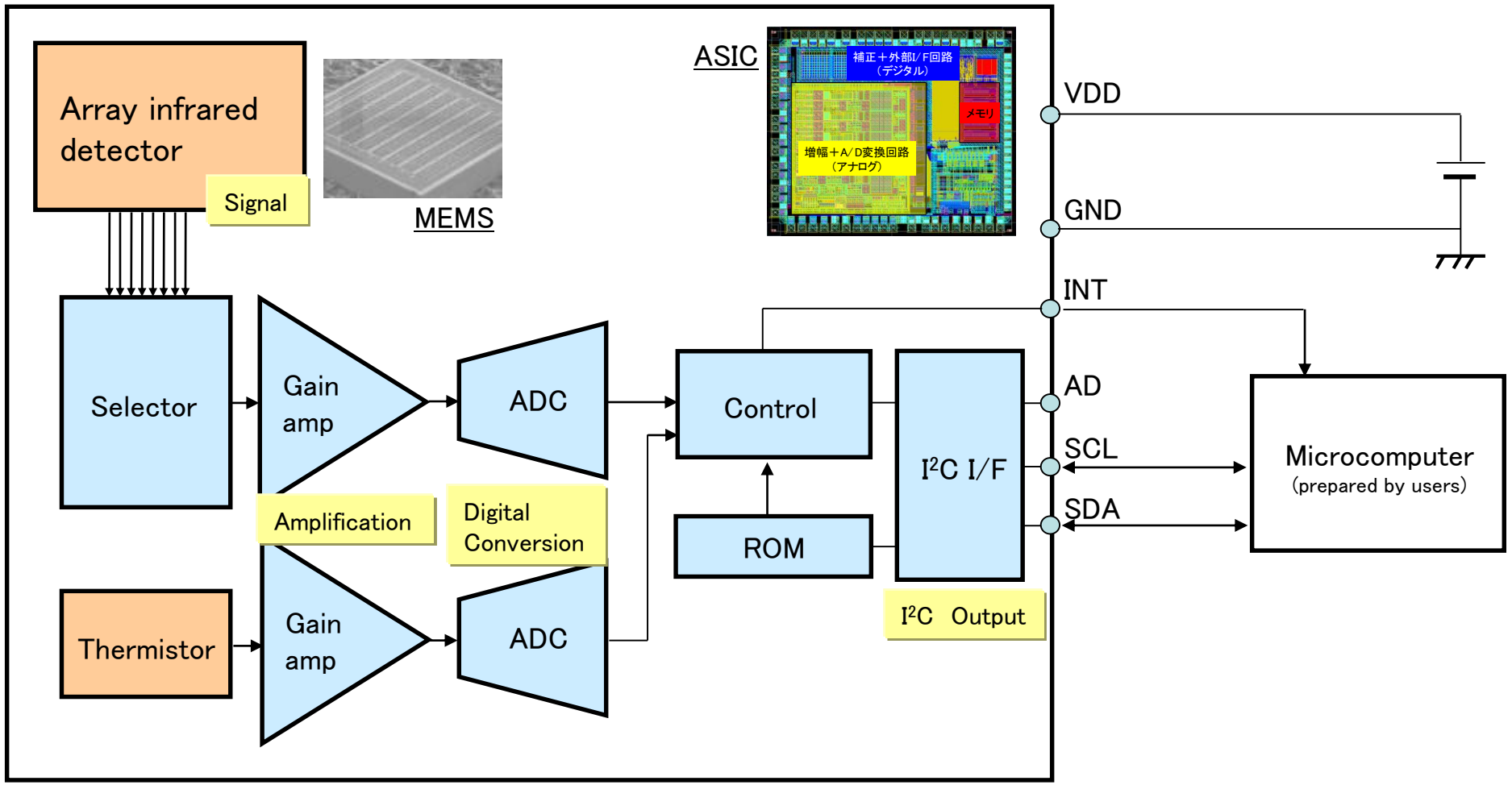
8×8 Infrared Array Sensor Chip

(Chip Size：3mm×3mm)



Principle of Grid-EYE

Sensor ⇒ Selector ⇒ Digital Output



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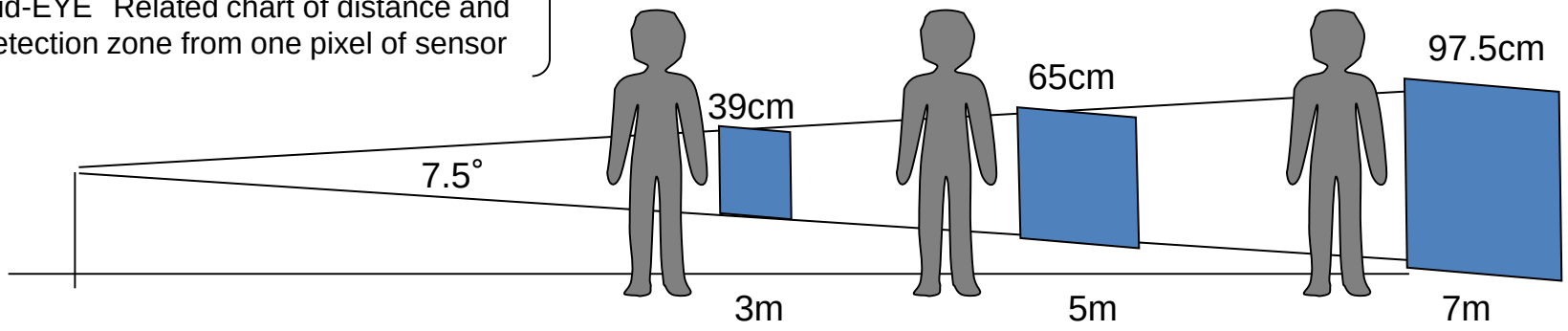
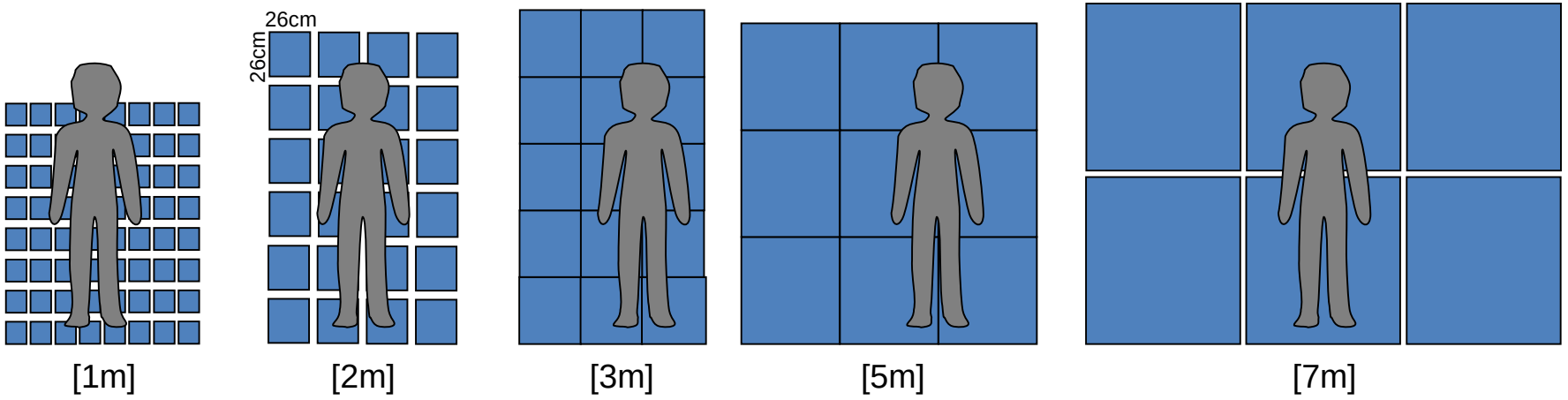
HUMAN DETECTION DISTANCE

- Grid-EYE detects human from about 5m away with using appropriate software

Grid-EYE Related chart of distance and detection zone from one pixel of sensor





EVALUATION KIT

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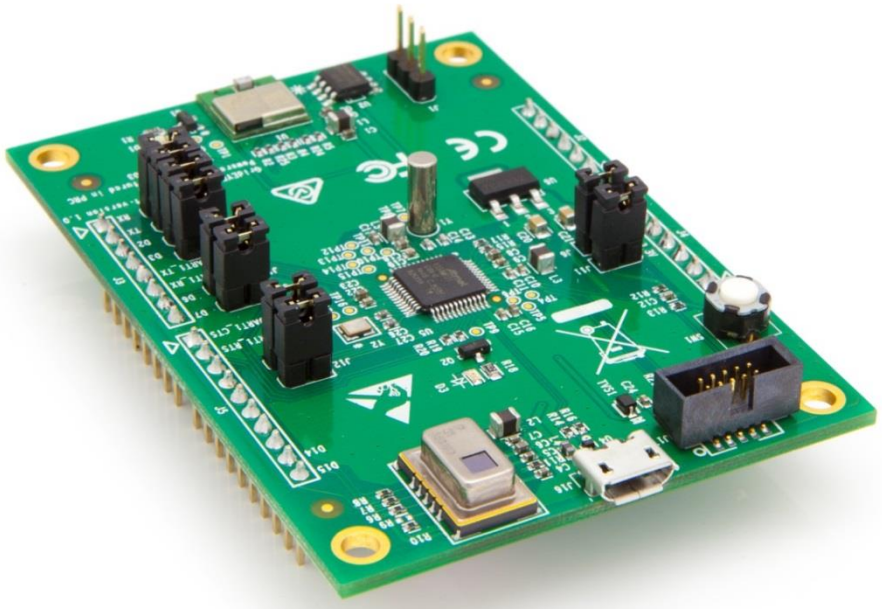
EVALUATION KIT

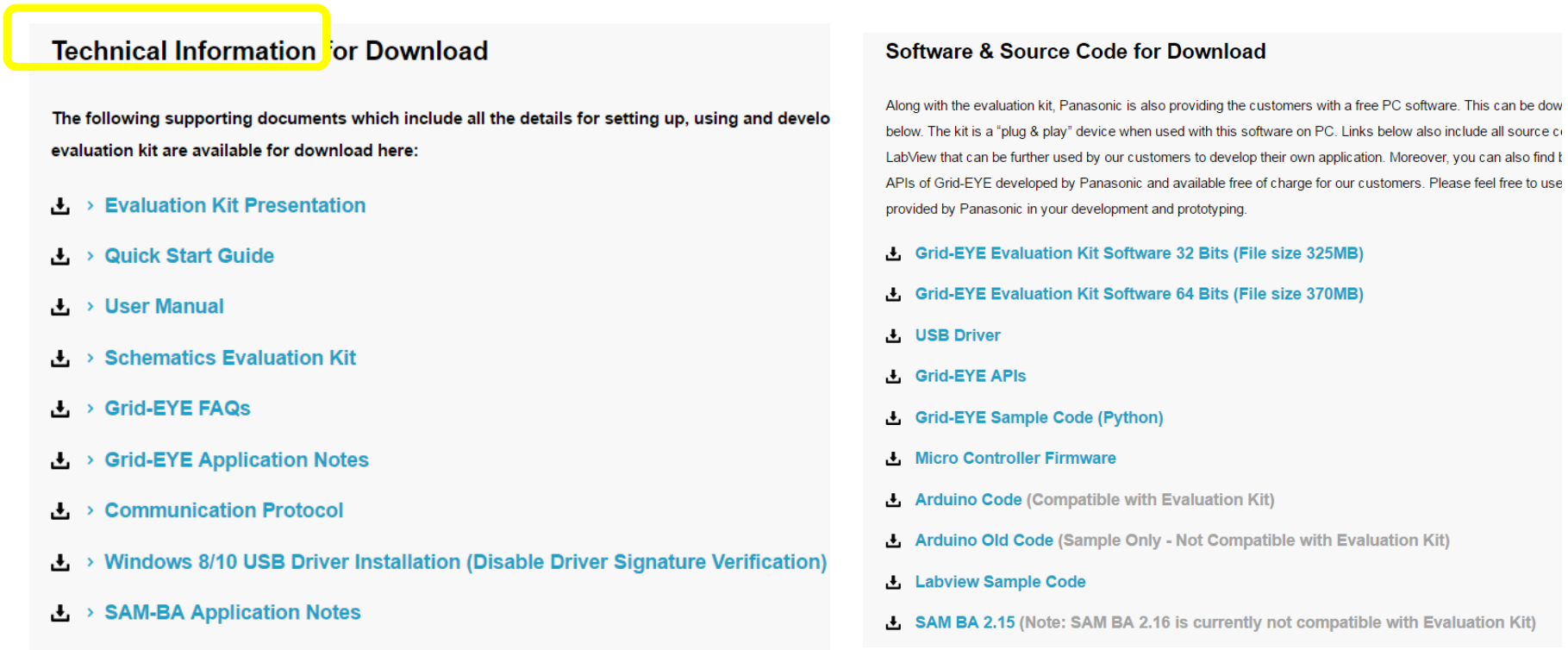
- Plug & Play
- Quick prototyping & testing GridEYE
- Open source Firmware and Software
- Strong customer support



Evaluation Kit Deliverables

[Avnet Abacus Grid-EYE Evaluation Kit Webpage]

[Panasonic Grid-EYE Evaluation kit Software and Documentation]



Technical Information for Download

The following supporting documents which include all the details for setting up, using and develo evaluation kit are available for download here:

- Evaluation Kit Presentation
- Quick Start Guide
- User Manual
- Schematics Evaluation Kit
- Grid-EYE FAQs
- Grid-EYE Application Notes
- Communication Protocol
- Windows 8/10 USB Driver Installation (Disable Driver Signature Verification)
- SAM-BA Application Notes

Software & Source Code for Download

Along with the evaluation kit, Panasonic is also providing the customers with a free PC software. This can be dow below. The kit is a "plug & play" device when used with this software on PC. Links below also include all source c LabView that can be further used by our customers to develop their own application. Moreover, you can also find t APIs of Grid-EYE developed by Panasonic and available free of charge for our customers. Please feel free to use provided by Panasonic in your development and prototyping.

- Grid-EYE Evaluation Kit Software 32 Bits (File size 325MB)
- Grid-EYE Evaluation Kit Software 64 Bits (File size 370MB)
- USB Driver
- Grid-EYE APIs
- Grid-EYE Sample Code (Python)
- Micro Controller Firmware
- Arduino Code (Compatible with Evaluation Kit)
- Arduino Old Code (Sample Only - Not Compatible with Evaluation Kit)
- Labview Sample Code
- SAM BA 2.15 (Note: SAM BA 2.16 is currently not compatible with Evaluation Kit)

FAQs

Panasonic

AVAILABLE FAQs

Panasonic

VERSION 1.0

FAQs

(Frequently Asked Questions)

INFRARED GRIDEYE SENSOR

Author: Mubeen Abbas
Date: 6/11/2015 4:20
Version: 1.0

Panasonic FAQ

A. Questions & Answers

Which aperture (if used within a housing) should be used?

A thin plate which is transparent for infrared beam of 5-13 µm has to be selected. Several materials like Silicon with optical filter, Polyethylene (PE), Ge, ZnS or others can be chosen.

What are the performance differences between normal-, stand-by- and sleep mode?

Normal mode: Frame rate can be 1 frame/s or 10 frames/s
Stand-by mode: Frame rate is same than Normal Mode but temperature register is only updated every 10 or 60 sec
Sleep mode: Temperature register is not updated
Reading and writing is possible while all 3 modes!

Is GridEYE able to measure temperatures higher/ lower than mentioned in the specification?

In principle yes, but it depends on the sensor temperature (ΔT to thermistor). Furthermore the accuracy of temperature will be worse than specified in the datasheet.

Is it possible to place an additional lens in front of GridEYE in order to change the Field of View (FOV) or detection distance?

An infrared image is formed on the sensor surface through the Silicon lens. This sensor is placed on the focal point of the lens and only parallel infrared beam can be detected. If an additional lens is placed on front of the sensor, the focal point is changed and the infrared image is out of focus. A changed field of view means another focal point. In this case the height of GridEYE and the lens shape have to be changed. Please contact your local sales representative to evaluate if a special type is possible.

What is the worst case temperature difference (ΔT) between two pixels if the same temperature is measured over all pixels?

Worst case ΔT= typ. 5°C. If one pixel has the tolerance of +2,5°C and the other pixel has some noise with -2,5 °C the temperature difference could be typ. 5°C.

What is the set up time after starting the GridEYE sensor?

We recommend waiting at least 15 s, because this is the time GridEYE needs to stabilize the Output

Panasonic FAQ

What ist the set up time after "Initial Reset" (GridEYE always powerd on)

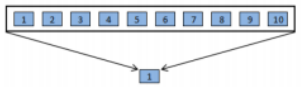
We recommend waiting 50ms, because this the time GridEYE needs to enable the communication.

What is the benefit of 1 frame/s compared with µ-controller calculation?

The C-code volume of µ-Controller can be reduced.

What is the difference between 1 frame/s and 10 frames / s?

The GridEYE ASIC has internally always 10 frame /s. 1 frame /s is the average of 10 frames / s



What is the benefit between 1 frame/s compared to 10 frames/s?

The noise level is reduced. The noise level will only be about 1/3 compared with 10 frames /s.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