

## Safety precautions

- Do not use these sensors under any circumstances in which the range of their ratings, environment conditions or other specifications are exceeded. Using the sensors in any way which causes their specifications to be exceeded may generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry and possibly causing an accident.
- Before connecting a connector, check the pin layout by referring to the connector wiring diagram, specifications diagram, etc., and make sure that the connector is connected properly. Take note that mistakes made in connection may cause unforeseen problems in operation, generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry.
- Do not use any motion sensor which has been disassembled or remodeled.
- Protection circuit recommended.  
The possible failure mode is either open or short of the output transistor.  
An excess heat is the cause for short mode failure. For any important and serious application in terms of safety, add protection circuit or any other protection method.
  - Various safety equipment and safety equipment
  - Traffic light
  - Security crime prevention equipment
  - Equipment concerning control and safety of trains, cars, etc.
  - Applications such as temperature control using sensor output etc.
- If it is expected that malfunction of each sensor may cause injury to persons or serious expansion damage, be sure to implement safety measures such as double safety circuit.

## Request for ordering and use

The products and specifications listed in this document are subject to change for product improvement, etc. (including specification changes and discontinued manufacturing). When examining mass-production design or placing an order for the listed products, please contact Panasonic to make sure that the information listed in this document is up-to-date.

- If it is expected that malfunction of each sensor may cause injury to persons or serious expansion damage, be sure to implement safety measures.
  - Reference Standards : Computers, office automation equipment, communications equipment, audio-video products, home electrical appliances, machine tools, personal devices, industrial robots.
  - Special Standards : Transportation equipment (automobiles, trains, ships, etc.), traffic signal equipment, crime and disaster prevention devices, electric power equipment, various safety devices, and medical equipment not directly targeted for life support
  - Specified Standards : Aircraft equipment, aeronautical and space equipment, seabed relay equipment, nuclear power control systems, and medical equipment, devices and systems for life support.
- Before considering the use of our products under the following conditions, you must contact one of our customer service representatives without fail and exchange written specifications.
  - When our products are to be used in any of the applications listed for the Special Standards or Specified Standards.
  - When, even for any of the applications listed for the Reference Standards, our products may possibly be used beyond the range of the specifications, environment or conditions listed in the document or when you are considering the use of our products in any conditions or an environment that is not listed in the document.

### [Acceptance Inspection]

For a purchased or delivered product, please conduct an acceptance inspection promptly with adequate consideration given to the management and maintenance of the product before and during the acceptance inspection.

### [Warranty Period]

The warranty period of these products is one year after the purchase or delivery to a location designated by your company, unless otherwise specified by both parties.

### [Scope of Warranty]

If a failure or a defect attributable to Panasonic is found during the warranty period, we will promptly provide a replacement or a necessary replacement part or change/repair the defective part free of charge at the location of the purchase or delivery.

The warranty does not cover a failure or a defect when any of the following applies :

- (1) Caused by specifications, standards, or handling methods, etc. designated by your company.
- (2) Caused by modification of the structure, capabilities, or specifications, etc., in which Panasonic is not engaged, carried out after the purchase or delivery.
- (3) Caused by an unforeseen phenomenon that cannot be predicted with the technologies available after the time of the purchase or at the time of concluding the agreement.
- (4) When the product was used outside the scope of the conditions/environments described in the catalog or specifications.
- (5) When the product is incorporated in your company's equipment for use, damages that could be avoided if your company's equipment had industry-standard functions, structures, etc.
- (6) Caused by natural disasters or Force Majeure.

The warranty described here is limited to the purchased or delivered product only and does not cover any consequential damages arising from the failure or defect of the product.

### [Before Purchase]

- The standard prices of the products listed in this catalog do not include consumption tax, delivery, installation & adjustment fees, used product collection fees, etc.
- The specifications/appearance are subject to change without notice for product improvement.
- The export of products that fall into the category of strategic goods (or services) require an export (or a service transaction) license under the Foreign Exchange and Foreign Trade Law. Please contact Panasonic for details.
- For details of the products listed in this catalog, please contact distributors, specialty contractor stores, or Panasonic.

## Infrared Array Sensor Grid-EYE



High Precision Infrared Array Sensor based on Advanced MEMS Technology

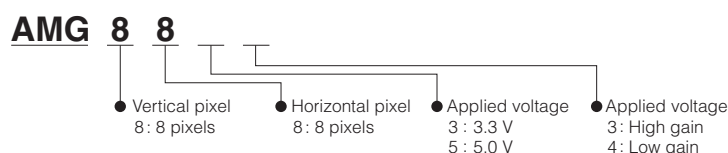
### Features

- Temperature detection of two-dimensional area: 8 × 8 (64 pixels)
- Digital output (capability of temperature value output)
- Compact SMD package (adaptively to reflow mounting)
- RoHS compliant

### Typical applications

- Home appliances (microwaves and air-conditioners)
- Building automation (people counting, Air conditioning control)
- Home automation (people detection)
- Factory automation (Fault prevention)

### Ordering information



### Types

Tape and reel package : 1,000 pcs.

Product name	Number of pixel	Operating voltage	Amplification factor	Part number
Infrared array sensor Grid-EYE	64 (Vertical 8 × Horizontal 8 Matrix)	3.3 V	High gain	AMG8833
			Low gain	AMG8834
		5.0	High gain	AMG8853
			Low gain	AMG8854

### Rating

Item	Performance	
	High gain	Low gain
Applied voltage	3.3 V±0.3 V or 5.0 V±0.5 V	
Temperature range of measuring object	0 °C to 80 °C +32 °F to +176 °F	–20 °C to 100 °C –4 °F to +212 °F
Operating temperature range	0 °C to 80 °C +32 °F to +176 °F	–20 °C to 80 °C –4 °F to +176 °F
Storage temperature range	–20 °C to 80 °C –4 °F to +176 °F	–20 °C to 80 °C –4 °F to +176 °F

## Absolute maximum ratings

Item	Absolute maximum ratings	Terminal
Applied voltage	-0.3 V to 6.5 V	VDD
Input voltage	-0.3 V to VDD +0.3 V	SCL, SDA, AD_SELECT
Output sink current	-10 mA to 10 mA	INT, SDA
Static electricity (Human body model)	1 kV	All terminals
Static electricity (Machine model)	200 V	All terminals

## Characteristics

Item	Performance	
	High gain	Low gain
Temperature accuracy	Typical $\pm 2.5^{\circ}\text{C}$ $\pm 4.5^{\circ}\text{F}$	Typical $\pm 3.0^{\circ}\text{C}$ $\pm 5.4^{\circ}\text{F}$
NETD *1	Typical 0.05 K 1 Hz Typical 0.16 K 10 Hz	
Viewing angle	Typical $60^{\circ}$	
Current consumption	Typical 4.5 mA (normal mode) Typical 0.8 mA (stand-by mode)	
Setup time	Typical 50 ms (Time to enable communication after setup) Typical 15 s (Time to stabilize output after setup)	

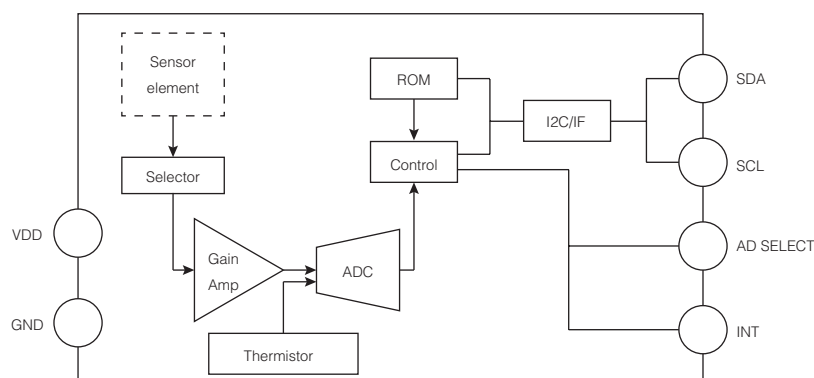
Note: \*1 It is calculated from 4 pixels of centers.

## Performance

Item	Performance
Number of pixel	64 (Vertical 8 × Horizontal 8 Matrix)
External interface	I <sup>2</sup> C
Frame rate	Typical 10 frames/s or 1 frame/s
Operating mode *1	Normal Sleep
Output mode	Temperature output
Calculate mode	No moving average or Twice moving average
Temperature output resolution	0.25 °C 0.45°F
Number of sensor address	2 (I <sup>2</sup> C slave address)
Thermistor output temperature range	-20 °C to 80 °C -4 °F to +176 °F
Thermistor output resolution	0.0625 °C 0.1125°F

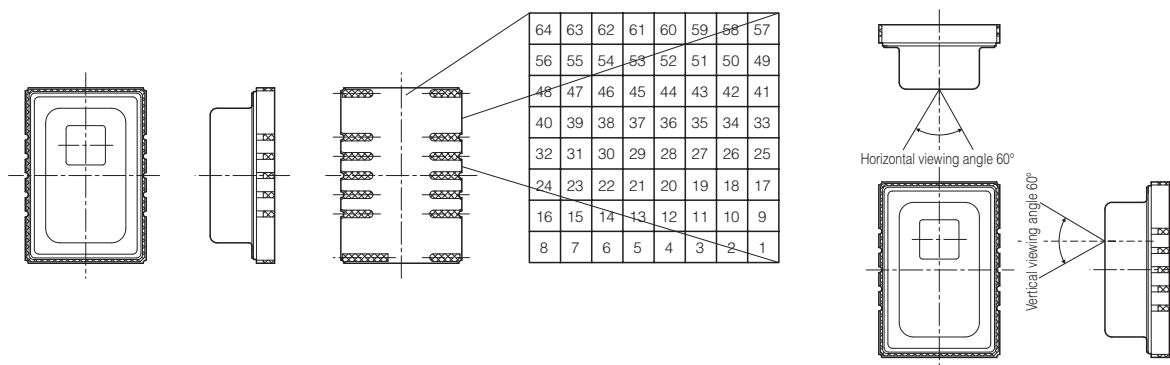
Note: \*1 Normal Mode : normal operation mode; Sleep Mode: detection is off (output and data reading not possible)

## Internal circuit



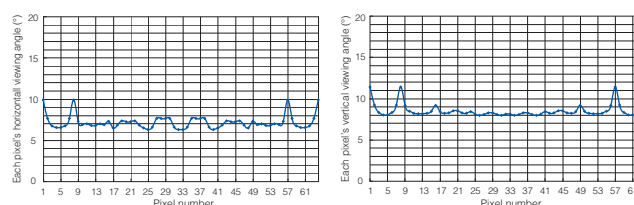
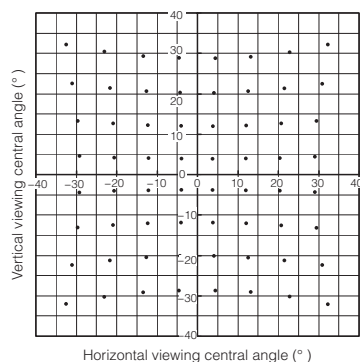
## Pixel array and viewing field

- (1) Pixel array  
Pixel array from 1 to 64 is shown below.
- (2) Viewing field (Typical)  
Sensor viewing field is shown below.  
(Described at half-value angle)



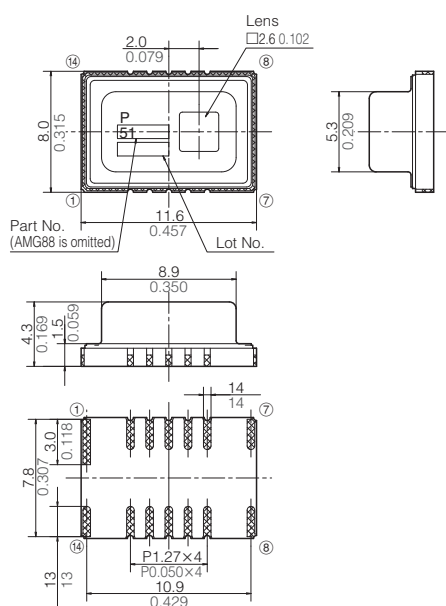
## Optical properties

- (1) Each pixel's viewing central angle (Typical)                      (2) Each pixel's viewing angle (Typical)  
(Described at half-value angle)



## Dimensions

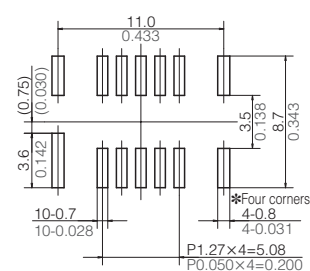
### External dimensions (Typical)



Number	Terminal Name	Number	Terminal Name
①	NC	⑧	NC
②	SDA	⑨	VDD
③	SCL	⑩	AVDD-PC
④	INT	⑪	NC
⑤	AD_SELECT	⑫	DVDD-PC
⑥	GND	⑬	VPP
⑦	NC	⑭	NC

Note : Leave terminal "NC (No.①,⑦,⑧,⑪ and ⑭)"  
unconnected.

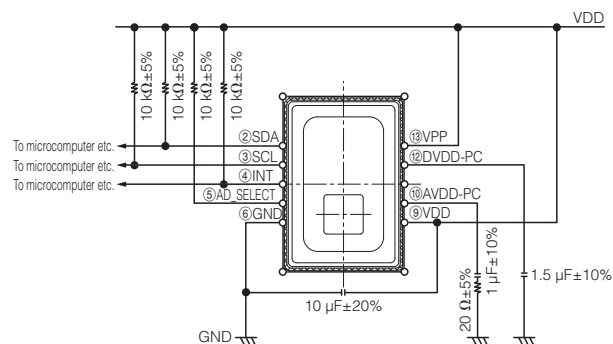
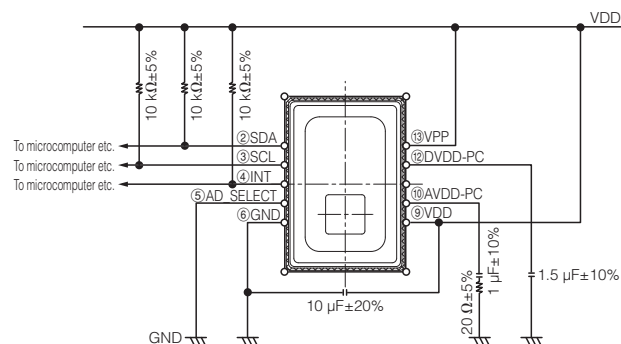
Recommended  
PC board pad (Typical)



unit : mm inch

## External circuit

- (1) In case of setting I<sup>2</sup>C slave address of the sensor 1101000  
\* Connect terminal ⑤ (AD SELECT) to GND.
- (2) In case of setting I<sup>2</sup>C slave address of the sensor 1101001  
\* Connect terminal ⑤ (AD SELECT) to VDD.



This circuit is an example to drive Infrared Array Sensor “Grid-EYE”, so that our company will not take any responsibility of loss which is due to this circuit.

The wiring connected to VDD are same electrical potential (same supply voltage).

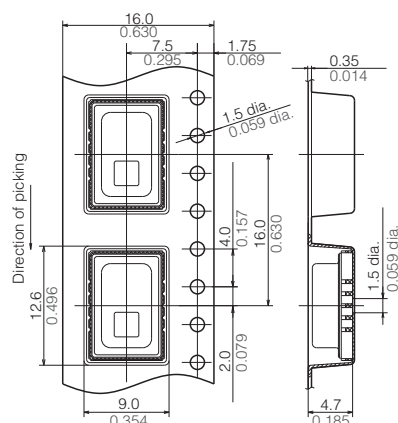
The wiring connected to VDD are same electrical potential (same supply voltage). If there is a difference of electric potential between the terminals, it can be cause of breakdown.

Connect wiring to solid GND with wide and short pattern on PCB

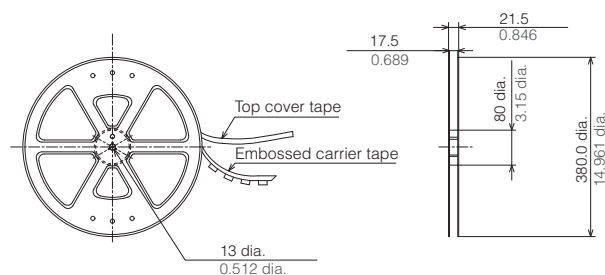
If wiring pattern is designed thin and long, temperature accuracy will be degraded.

## Packing format (Tape and reel)

Tape dimensions (Typical)



### Dimensions of tape reel (Typical)



unit : mm inch

## Notes

## ■ Precaution for fundamental structure of sensor

Infrared Array Sensor is a thermopile type infrared sensor which detects the amount of infrared rays. Below conditions generally degrade the temperature accuracy.

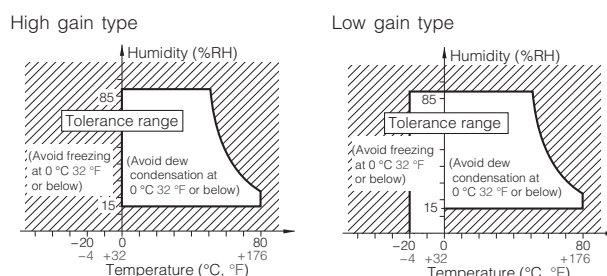
Carefully check the performance and stability under actual use conditions, and perform temperature corrections when necessary.

- 1) When heating elements exist near the mounting position of the sensor.
- 2) When the sensor is exposed to cold or hot air.
- 3) When the temperature of the sensor body rapidly changes.
- 4) When substances (e.g., glasses, acrylics or steams), which hardly transmit a far infrared ray, exist between the sensor and the detected object.
- 5) When substances (e.g., foreign substances or water), which hardly transmit a far infrared ray, adhere to the lens of the sensor.

- Use environment

- 1) Temperature: See the specifications
- 2) Humidity: Between 15 % and 85 % R.H. (Avoid freezing and dew condensation)
- 3) Atmospheric pressure: Between 86 and 106 kPa
- 4) Vibrations and shocks may damage the sensor, and cause malfunction and performance deterioration. If loads and shocks are applied on the lense, the damaged sensor may cause malfunction and performance deterioration.
- 5) The product is not water/splash-proof. Perform water/dust-proofing and dew condensation / freezing countermeasures in accordance with use environment. When dew condensation occurs, responsiveness of heat source detection may delay for several seconds. Be careful to solder migration caused by adhesion of water droplets on solder parts.

- 6) Avoid use and storage in the corrosive gas (organic solvent, sulfurous acid and hydrogen sulfide gases) to avoid malfunction and performance deterioration.
- 7) Use surge absorbers as applying the external surge voltage may damage the internal circuit.
- 8) Malfunction may occur near electric noises from static electricity, lightning, broadcast or amateur radio stations and mobile phones.
- 9) The sensor can continuously operate within the range of using ambient temperature (using ambient humidity). However, ensure that humidity is within the range described in the following page as humidity varies according to temperature. Avoid the continuous operation near the operational limit. The temperature range does not guarantee the durability.
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## ■ Mounting

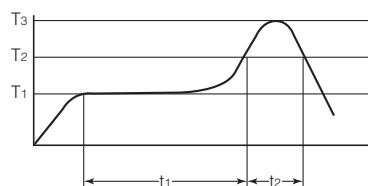
Use the land of the printed-circuit board on which the sensor is securely fixed. The recommended printed-circuit board is FR4 (thickness 1.6 mm 0.063 inch). When mounting on the deprecated circuit board, carefully check the performance and quality under actual use conditions before use.

- 1) A large noise on the power supply may cause malfunction. Place the recommended capacitor near the sensor (within 20 mm 0.787 inch of the wiring pattern length) between sensor input terminals (VDD-GND) to secure power superimposed noise resistance. Test with the actual machine and reselect the capacitor with optimal capacitance.
- 2) Prevent the metal part of other electronic components from contacting with the sensor body as the upper face (where part numbers are imprinted) of the sensor is GND.

## ■ Soldering

Due to the thermal capacity of the infrared array sensor is low, therefore, take steps to minimize the effects of external heat. Damage and changes to characteristics may occur due to heat deformation.

- 1) Manual soldering
  - Set the soldering tip from 350 to 400 °C (30 - 60 W), and solder within 3 seconds or less.
  - Note that output may be changed if the load is applied to the terminals when the soldering
  - Carefully clean the tip of soldering iron.
- 2) Reflow soldering
  - Solder coating
  - We recommend the screen solder printing method as the method of cream. Halogen type (Chlorine type, Bromine type, etc.) or other high-activity flux is not recommended as the residue may affect performance or reliability of resistors.
  - Mounting of sensor
  - Self alignment may not always work as expected, therefore, be carefully the position of the terminals and pattern.
  - The recommended reflow temperature profile
  - The recommended reflow temperature profile conditions are given below.
  - The temperature of the profile is assumed to be a value measured with the printed wiring board of the terminal neighborhood.



T<sub>1</sub> = 150 to 180 °C 302 °F to 356 °F  
 T<sub>2</sub> = 230 °C 446 °F  
 T<sub>3</sub> = Below 250 °C 482 °F  
 t<sub>1</sub> = 60 to 120 s.  
 t<sub>2</sub> = Less than 30 s.

- 3) Solder reworking
  - Finish reworking in one operation.
  - For reworking of the solder bridge, use a soldering iron with a flat tip.
  - Do not add more flux when reworking.
  - Refer the conditions of manual soldering to rework.

- 4) When you cut or fold the PCB after mounting the sensor, be careful not to stress to the sensor and the soldered parts.
  - To prevent the insulation of the PC board after soldering, be careful not to place the chemicals on lens of the sensor when coating.
- 5) Dividing of PCB
  - When you cut or fold the PCB after mounting the sensor, be careful not to stress to the sensor and the soldered parts.
- 6) Structure of sensor terminals
  - The sensor terminals are designed to be exposed, so contact of the terminals with metal shards and the like will cause output errors. Therefore, be careful not to touch the terminals with the metal piece or the hand.
- 7) Both-side soldering
  - When you do the reflow solder to the back of the PC board after the reflow of the sensor, execute fixed processing, or instance, with the adhesive etc.

## ■ Wire connection

- 1) Correctly wire as in the connection diagram. Reverse connection may damage the product and degrade the performance.
- 2) Do not use idle terminals. Such use may damage the sensor.
- 3) For cable wiring, use shield wires with possibly short wiring lengths to prevent the influence of the noise.

## ■ Cleaning

If the dirt or water droplets is attached to the lens, wipe it with soft cloth.

- 1) The lens is damaged when strongly rubbed, and causes the characteristic deterioration.
- 2) Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.

## ■ Transportation and storage

- 1) Extreme vibration and shock during transport will damage the sensor.  
Handle the outer box and reel with care.
- 2) Storage under extreme conditions will cause soldering degradation, external appearance defects, and characteristic deterioration.  
The following storage conditions are recommended.  
Temperature : 0 to 45 °C  
Temperature : 70 %RH  
Others : Not storage in places full of corrosive gases such as sea breeze, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>x</sub>, minimal dust.  
Not storage in places exposed to direct sunlight.
- 3) The sensors are sensitive to moisture and come in moisture-proof packages.  
Observe the following cautions when storing.
  - After the moisture-proof package is unsealed, take the sensors out of storage as soon as possible (within 1 week, less than 30 °C, less than 60 %R.H.)
  - If the sensors are to be left in storage for a considerable period after the moisture-proof package has been unsealed, it is recommended to keep them in another moisture-proof bag containing silica gel (within 3 months at the most).
- 4) It is recommended to bake the package before reflow soldering if there is a concern for moisture absorption due to the expired storage period or uncertain storage period and storage conditions.
  - When mounting with solder, if thermal stress is applied to sensors that have absorbed moisture, the moisture will vaporize, swelling will occur, and the inside of the package will become stressed. This may cause the package surface to blister or crack.  
Therefore, take caution and observe the soldering conditions.

## ■ Other handling cautions

- 1) To assure reliability, check the sensor under actual loading conditions.  
Avoid any situation that may adversely affect its performance.
- 2) This product may malfunction if dropped on its own before it is installed.  
Do not use if this happens.
- 3) If the sensor get high frequency vibration, it can be cause of breakdown.  
When the product get impulse like below, do not use it.
  - Touch to a object made of metal
  - Touch of mutual sensors
- 4) Since static charge can damage the sensor, bear in mind the following handling precautions.
  - Plastic containers should not be used to store or transport the sensors since they readily become charged.
  - Store or transport the product in an environment that hinders the occurrence of static electricity (for example, places with 45 % to 60 % humidity) and protect the product using electrically conductive packaging.
  - Implement static electricity prevention measures once the product packaging has been opened.
- 5) Do not use any Infrared Array Sensor which has been disassembled or remodeled.



### ■ Special remarks

Although the best attention will be paid for the quality controls of the products, consider the followings concerns.

- 1) To prevent unexpected failures as much as possible under the conditions not shown in this specifications, let us know the detailed information on the application, such as the environmental, operational and mounting condition.
- 2) By any chance, if the failure of the product is considered to cause a personal injury or death or property damage, the safety rate should be added to the specified values shown in this specifications and the dual safety structure or circuit is recommended to be taken from the stand point of the Product Liability Indemnity.
- 3) This specification shows the quality and performance of a unit component.  
Before adoption, be sure to evaluate and verify the product mounting it in your product.
- 4) We take no responsibility for troubles caused by the product usage that is not specified in this specification.
- 5) The product is designed to use in general standard applications of general electric equipment (AV products, household electric appliances, office equipment, information and equipment, etc.) ; hence, it do not take the use under the following special communication environments into consideration.

If this product were used for other development purposes, contact our customer service desk.

Accordingly, the use in the following special environments, and such environmental Conditions may affect the performance of the product; verify the performance, reliability, etc. thoroughly.

- Use in liquids such as water, oil, chemical, and organic solvent.
- Use under direct sunlight, in outdoor or in dusty atmospheres.
- Use in places full of corrosive gases such as sea breeze, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>x</sub>.
- Use in environment with large static electricity or strong electromagnetic waves or strong radial ray.
- Where the product is close to a heating component, or where an inflammable such as a polyvinyl chloride wire is arranged close to the product.
- Where the sensor is sealed or coated with resin etc.



## **Guidelines and precautions regarding the technical information and use of our products described in this online catalog.**

- If you want to use our products described in this online catalog for applications requiring special qualities or reliability, or for applications where the failure or malfunction of the products may directly jeopardize human life or potentially cause personal injury (e.g. aircraft and aerospace equipment, traffic and transportation equipment, combustion equipment, medical equipment, accident prevention, anti-crime equipment, and/or safety equipment), it is necessary to verify whether the specifications of our products fit to such applications. Please ensure that you will ask and check with our inquiry desk as to whether the specifications of our products fit to such applications use before you use our products.
- The quality and performance of our products as described in this online catalog only apply to our products when used in isolation. Therefore, please ensure you evaluate and verify our products under the specific circumstances in which our products are assembled in your own products and in which our products will actually be used.
- If you use our products in equipment that requires a high degree of reliability, regardless of the application, it is recommended that you set up protection circuits and redundancy circuits in order to ensure safety of your equipment.
- The products and product specifications described in this online catalog are subject to change for improvement without prior notice. Therefore, please be sure to request and confirm the latest product specifications which explain the specifications of our products in detail, before you finalize the design of your applications, purchase, or use our products.
- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
- If any of our products, product specifications and/or technical information in this online catalog is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially with regard to security and export control, shall be observed.

## **<Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>**

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

**We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.**