

# Angular Rate Sensors (ENC Series)



## ENC-03R

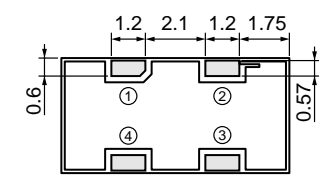
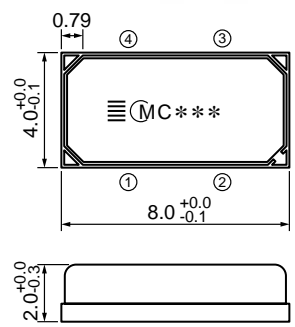
This product is an angular rate sensor that uses the phenomenon of Coriolis force, which is generated when a rotational angular rate is applied to the vibrator.

Murata's original, small ceramic bimorph vibrator and simple Cap-Base structure realize their ultra-small size, under 0.1cc. Their small shape and light weight increase flexibility of installment and help to downsize your equipment.

This surface mountable device can, be mounted by an automatic surface mounter.

### ■ Features

1. Ultra-small and ultra-lightweight
2. Quick response
3. Low driving voltage, low current consumption
4. Lead type : SMD
5. Reflow soldering (standard peak temp. 250°C)



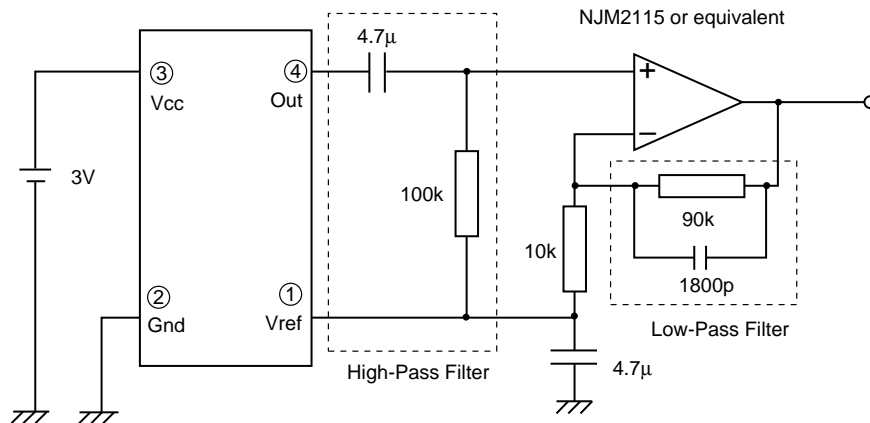
① Vref	Reference voltage
② Gnd	Ground
③ Vcc	Supply voltage
④ Output	Sensor output

( in mm  
 Tolerance ±0.2 )

Part Number	Resonance Frequency (kHz)	Supply Voltage	Maximum Angular Velocity (deg./sec.)	Output (at Angular Velocity=0)	Scale Factor	Linearity (%FS)	Response (Hz)	Weight (g)
ENC-03RC-R	30.8	2.7-5.25V	±300	1.35Vdc	0.67mV/deg./sec.	±5	50	0.2
ENC-03RD-R	32.2	2.7-5.25V	±300	1.35Vdc	0.67mV/deg./sec.	±5	50	0.2

Operating Temperature Range: -5°C to 75°C    Storage Temp. Range: -30°C to 85°C

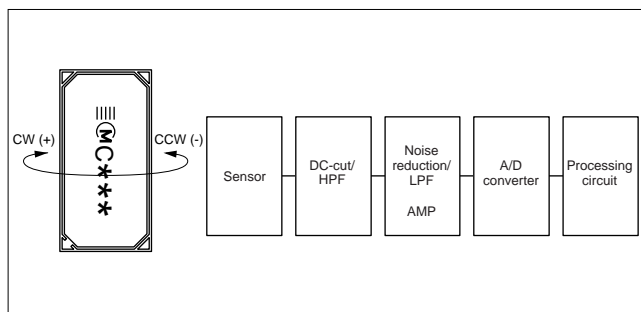
■ Sample Amplifier Circuit



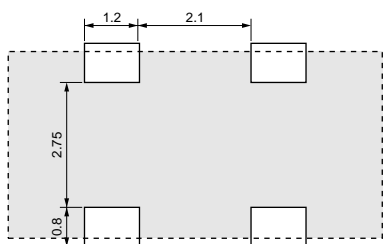
The high-pass filter's cut-off frequency in this circuit is approx. 0.3Hz.  
 The low-pass filter's cut-off frequency in this circuit is approx. 1kHz.

■ Application

1. One sensor detects rotation on one axis. If two axes are to be detected in the same equipment, two different types of sensors (EMC-03RC and EMC-03RD) should be used.
2. To reduce the effect of temperature drift (due to change in ambient temperature), a high-pass filter must be connected to sensor output to eliminate the DC component.
3. To suppress the output noise component at around 30-33kHz (resonant frequency of sensor element), a low-pass filter that has a higher cut-off frequency than the required response frequency must be connected to the sensor output.

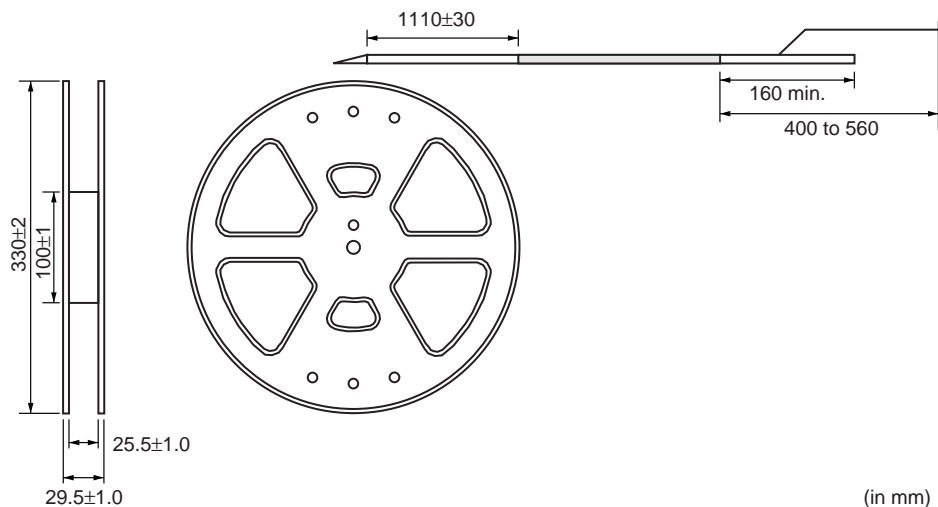


■ Dimensions of Land Pattern

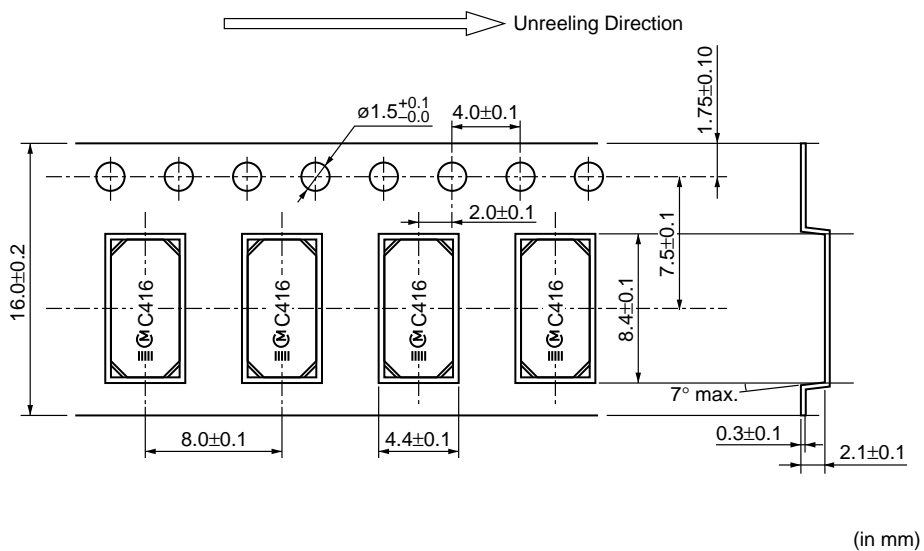


(in mm)

■ Dimensions of Reel



■ Dimensions of Plastic Tape



## Notice

### ■ Storage and Operating Conditions

1. Incorrect handling may affect sensor characteristics.

Please note the following precautions:

- A. Do not subject the sensor to shock or vibration that exceeds the rated limit.
- B. Do not install or store the sensor in a location where condensation is likely to form on it.
- C. Do not install or store the sensor in a location where water may splash directly on it.
- D. Do not install or store the sensor in a location in which it is likely to be exposed to salt water or corrosive vapor.

2. Do not use or store the products in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. Also avoid exposure to moisture. Store the products where the temperature and relative humidity do not exceed 5 to 40°C and 20 to 75%R.H. Store the products in a sealed bag and use within 6 months.

### ■ Soldering and Mounting

1. Do not mount the sensor on an electric circuit line arranged on the circuit board, because the sensor has an electric circuit on its back.
2. Please ensure that the interference between the resonance frequency of the gyro and any other signals.
3. This product does not support flow soldering.

### ■ Handling

1. Precision electronic parts, such as ICs, are used for the sensor; therefore, it is necessary to take anti-electrostatic precautions when handling.
2. Do not wash the sensor, as it is not water-resistant.
3. Do not disassemble.
4. Do not touch the terminal directly.

# Angular Rate Sensors (ENC Series)



## ENC-03W

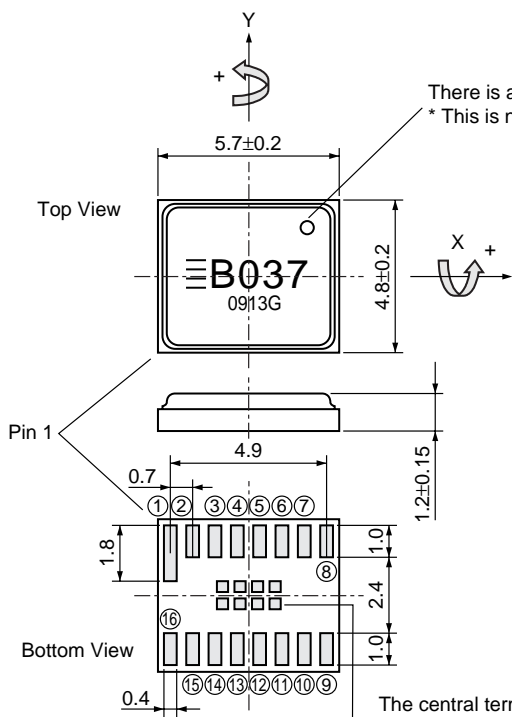
This product is an angular rate sensor that uses the phenomenon of Coriolis force, which is generated when a rotational angular rate is applied to the vibrator.

Their small shape and light weight increase flexibility of installment and help to downsize your equipment. This surface mountable device can be mounted by an automatic surface mounter.



### ■ Features

1. 2 axes in 1 package!
2. High performance with calibration function in ASIC
  - Improvement of zero-rate level drift
  - The reduction of zero-rate level (bias)
  - Reduction of the change of the sensitivity - temperature characteristic
3. Built in amplifier (AMP2)
  - Can set an amplifier gain and the filter characteristic in external CR freely.
4. Built in charge switch (HPF reset)



There is an air hole in the top right corner of the product.  
 \* This is not a pin 1 mark.

Pin Number	Symbol	Function
1	NC	-
2	NC	-
3	NC	-
4	APO X	The AMP2 output of the X-axis
5	AFB X	The return of AMP2 of the X-axis
6	AIN X	The input of AMP2 of the X-axis
7	OUT X	The output of the X-axis (Not AMP2)
8	Vref	Reference voltage
9	GND	Ground
10	OUT Y	The output of the Y-axis (Not AMP2)
11	AIN Y	The input of the AMP2 of the Y-axis
12	AFB Y	The return of AMP2 of the Y-axis
13	APO Y	The AMP2 output of the Y-axis
14	SCT	The control terminal of charge switch
15	Vcc	Power supply
16	NC	-

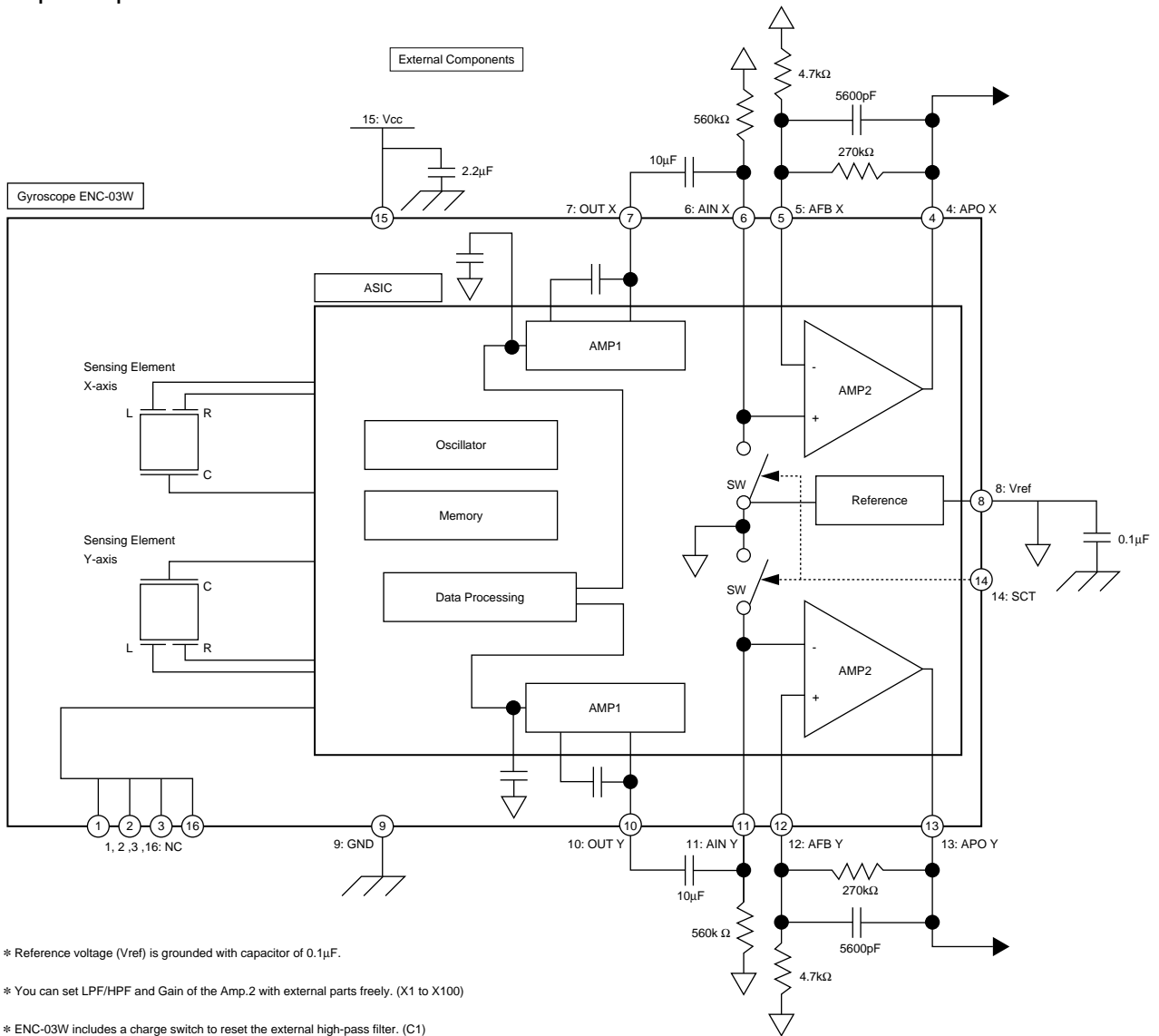
\* NC: No Connect (Do not connect to any other circuit line.)

The central terminals are for internal use only.  
 Do not connect and contact to any other circuit line and do not solder to any other pattern. General Tolerance: ±0.2 (in mm)

Part Number	Supply Voltage	Maximum Angular Velocity (deg./sec.)	Output (at Angular Velocity=0)	Scale Factor	Linearity (%FS)	Response (Hz)	Weight (g)
ENC-03WB-R	2.7-3.6V	±300	1.35Vdc	0.67mV/deg./sec.	±5	50	0.1

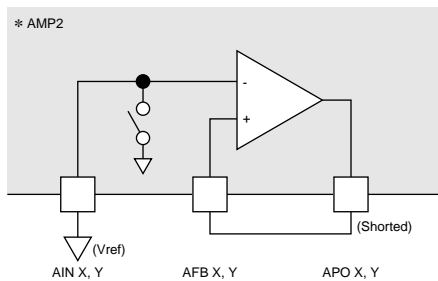
Operating Temperature Range: -5°C to 75°C Storage Temp. Range: -30°C to 85°C

## ■ Sample Amplifier Circuit

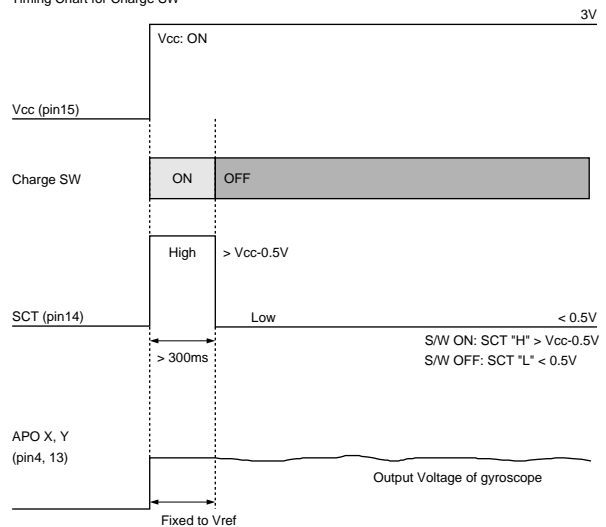


- \* Reference voltage (Vref) is grounded with capacitor of 0.1μF.
- \* You can set LPF/HPF and Gain of the Amp.2 with external parts freely. (X1 to X100)
- \* ENC-03W includes a charge switch to reset the external high-pass filter. (C1)
- \* When you do not use AMP2, please short-circuit in AFB and APO, and connect AIN to Vref.

- X-axis:  
 ④ APO X → ⑥ AFB X shorted  
 ⑤ AFB X → ④ APO X shorted  
 ⑥ AIN X → ⑧ Vref connected
- Y-axis:  
 ⑪ AIN Y → ⑧ Vref shorted  
 ⑫ AFB Y → ⑬ APO Y shorted  
 ⑬ APO Y → ⑫ AFB Y connected



Timing Chart for Charge SW

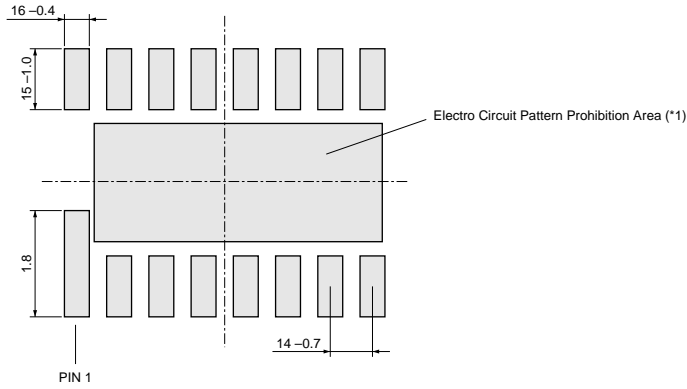


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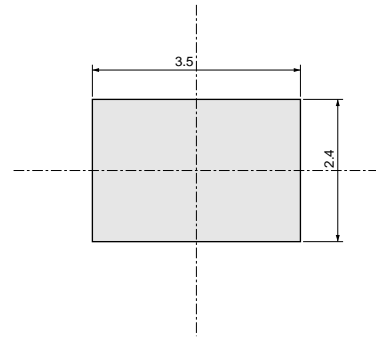
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## ■ Dimensions of Land Pattern

The Land Pattern Dimensions for SMD. (1<sup>st</sup> layer)



The GND Pattern for Electric Shield. (2<sup>nd</sup> layer) (\*2)



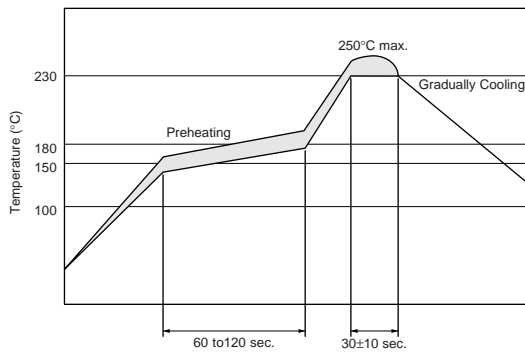
(in mm)

(\*1) Do not make the electro circuit pattern at the prohibition area to prevent contact with the central terminals of product's back side and to prevent interference with the other signal.  
 (Prohibition area: the central hatching area at 1<sup>st</sup> layer)

(\*2) Please make the GND pattern for electric shield (2<sup>nd</sup> layer) to reduce interference with the other signal.

\* Mechanical stress to the mounted board, such as bending and pushing, affects the zero-rate level of the product. Zero-rate level can change slightly at the moment when mechanical stress is being changed. If the hardness of mounted board is high, the zero-rate level changes very little, and the influence of the zero-rate level is changed by the condition of fixed position and shape of the mounted board. Therefore, please ensure that your product has been evaluated in view of your specifications with our product being mounted to your product.

## ■ Reflow Chart







## Notice

### ■ Storage and Operating Conditions

1. Incorrect handling may affect sensor characteristics.

Please note the following precautions:

- A. Do not subject the sensor to shock or vibration that exceeds the rated limit.
- B. Do not install or store the sensor in a location where condensation is likely to form on it.
- C. Do not install or store the sensor in a location where water may splash directly on it.
- D. Do not install or store the sensor in a location in which it is likely to be exposed to salt water or corrosive vapor.

2. Do not use or store the products in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. Also avoid exposure to moisture. Store the products where the temperature and relative humidity do not exceed 5 to 40°C and 20 to 75%R.H. Store the products in sealed bag and use within 6 months. In addition, this product should be treated as MSL3 of JEDEC J-STD-020D.1. After unsealing the bag, at less than 30°C/60%R.H, do reflow soldering on this product within 7 days.

### ■ Soldering and Mounting

1. Do not mount the sensor on an electric circuit line arranged on the circuit board, because the sensor has an electric circuit on its back.
2. Please ensure that the interference between the resonance frequency of the gyro and any other signals.
3. This product does not support hand soldering.
4. This product does not support flow soldering.

### ■ Handling

1. Precision electronic parts, such as ICs, are used for the sensor; therefore, it is necessary to take anti-electrostatic precautions when handling.
2. Do not wash the sensor, as it is not water-resistant.
3. Do not disassemble.
4. Do not touch the terminal directly.

■ Minimum Quantity

Part Number	ø330mm Reel	ø254mm Reel
<b>ENC-03R</b>	2000 pcs	–
<b>ENC-03W</b>	–	1500 pcs

● Part Numbering

Angular Rate Sensors (ENC Series)



- ① Product ID
- ② Type
- ③ Individual Specification Code
- ④ Packaging

**EU RoHS Compliant**

- All the products in this catalog comply with EU RoHS.
- EU RoHS is "the European Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment."
- For more details, please refer to our website 'Murata's Approach for EU RoHS' (<http://www.murata.com/info/rohs.html>).

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2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- |                             |  |
|-----------------------------|--|
| ① Aircraft equipment        | ② Aerospace equipment  |
| ③ Undersea equipment        | ④ Power plant equipment  |
| ⑤ Medical equipment         | ⑥ Transportation equipment (vehicles, trains, ships, etc.)   |
| ⑦ Traffic signal equipment  | ⑧ Disaster prevention / crime prevention equipment   |
| ⑨ Data-processing equipment | ⑩ Application of similar complexity and/or reliability requirements to the applications listed above |

3. Product specifications in this catalog are as of May 2011. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.

5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please review our product specifications or consult the approval sheet for product specifications before ordering.

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