Panasonic INDUSTRY

6DoF Inertial Sensor for Automotive

6in1 Sensor

EWTS5G series

The 6in1 sensor is a 6DoF inertial sensor with functional safety standard ISO26262 compliance for automotive applications. The sensing elements consists 3 Accelerometers and 3 Gyroscopes in single MEMS chip.
The MEMS, ASIC and Cap are directly bonded at wafer level and packaged.
This enables the 6in1 sensor to be compact, highly accurate, easy to install, and highly reliable.

Feature

- Function Safety compliance (ISO26262) for automotive safety system
  ・Compatible with ASIL-D functional safety development
- 6DoF sensors on one single MEMS die with high accurate and for more system design flexibility
  ・Orthogonality : ≦0.01° between Gyro and Acceleration axis
- Contribute for compact and simple ECU system design
  ・6DoF one package : 4.5 x 4.5 x 1.1 mm
- RoHS compliance

Rating

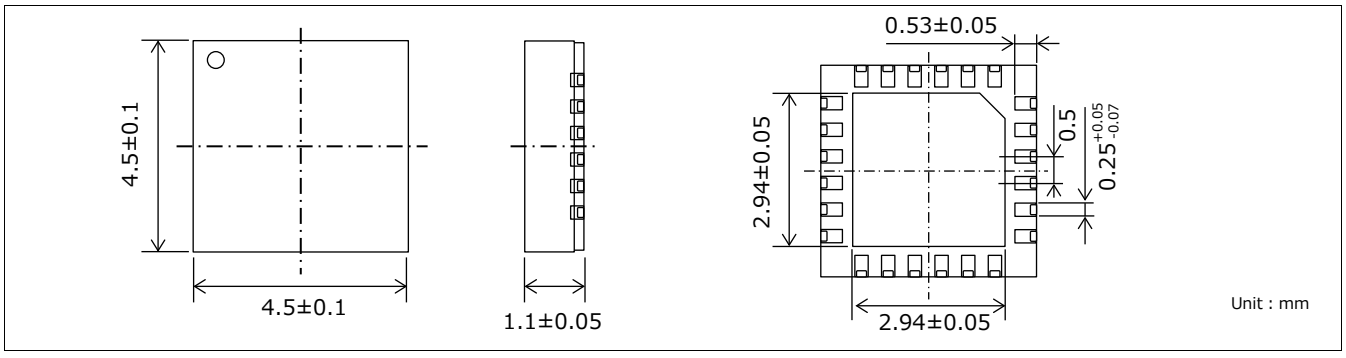
- Characteristics

Size (mm)		4.5 x 4.5 x 1.1
Operation temperature		-40 ℃ to +125 ℃
Storage temperature		-40 ℃ to +125 ℃
Operation voltage [DC]		3.3 ± 0.3 V
Current consumption		≦ 10 mA
Data interface		SPI
Gyro	Axis	X, Y, Z
	Zero point error	≦ ± 2.0 dps
	Scale factor error	≦ ± 3.0 %
	Full scale range	± 300 dps, ± 150 dps, ± 120 dps, ± 60 dps, ± 30 dps (Selectable)
	Frequency response	10 Hz, 12.5 Hz, 27 Hz, 30 Hz, 46 Hz, 60 Hz (Selectable)
	Cross axis sensitivity	≦ ± 1.7 %
	Output noise	≦ 0.1 dps rms (LPF : 60 Hz)
	Orthogonality	≦ 0.01°
Acceleration	Axis	X, Y, Z
	Zero point error	≦ ± 0.05 G (X, Y), ≦ ± 0.084 G (Z)
	Scale factor error	≦ ± 3.0 %
	Full scale range	± 16 G, ± 8 G, ± 2 G, ± 1 G (Selectable)
	Frequency response	10 Hz, 46 Hz, 60 Hz, 250 Hz, 300 Hz, 400 Hz (Selectable)
	Cross axis sensitivity	≦ ± 1.7 %
	Output noise	≦ 0.004 G rms (LPF : 60 Hz)
	Orthogonality	≦ 0.01°

- Reliability test condition (AEC-Q100 compliance)

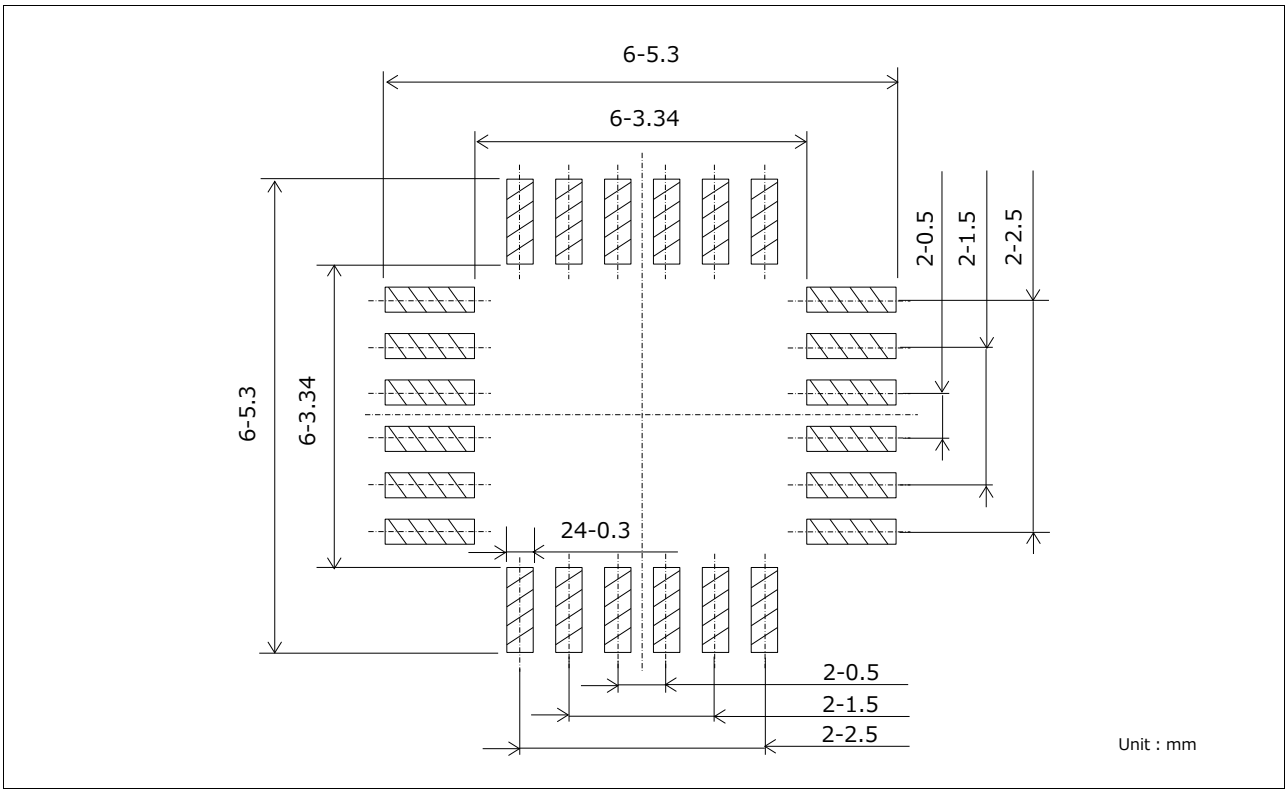
Temperature humidity bias (THB)	85 ℃ / 85 %RH / 3.6 V / 1000 h
High temperature storage life (HTSL)	150 ℃ / 1000 h
High temperature operating life (HTOL)	125 ℃ / 3.6 V / 1000 h
Temp cycling (TC)	-55 ℃ to 150 ℃ / 1000 cycles
Mechanical shock (MS)	1500 G / 0.5 ms / 5 times for each axis
Variable frequency vibration (VFV)	50 G / 20 Hz to 2 kHz / 4 times for each axis

Dimension

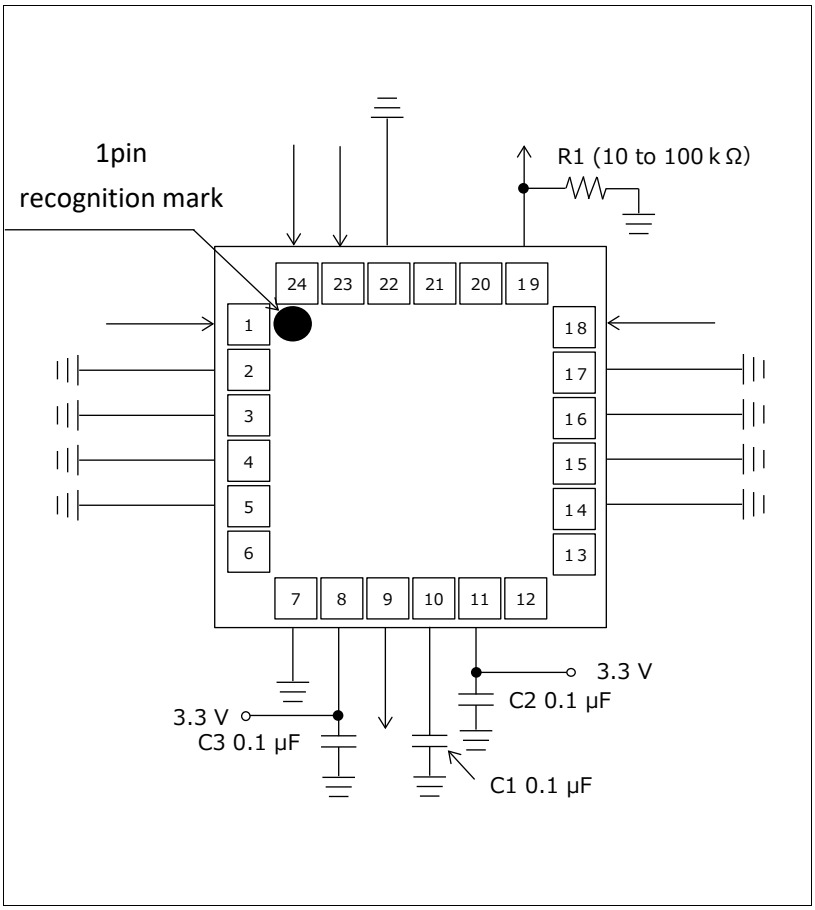


Land pattern

・Recommended land pattern



Electrical connection



No.	Abbreviations
1	MOSI
2	GND3 (MEMS cap)
3, 4, 5	NC
6	TP3
7	GND
8	VDDIO
9	MISO
10	REGOUT
11	VDD
12	TP1
13	TP2
14, 15, 16	NC
17	GND4
18	RESETN
19	TP0 / ALARMB
20	VPP
21	DVDD
22	GND2 (duplicate)
23	NCS
24	SCLK

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

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- 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.

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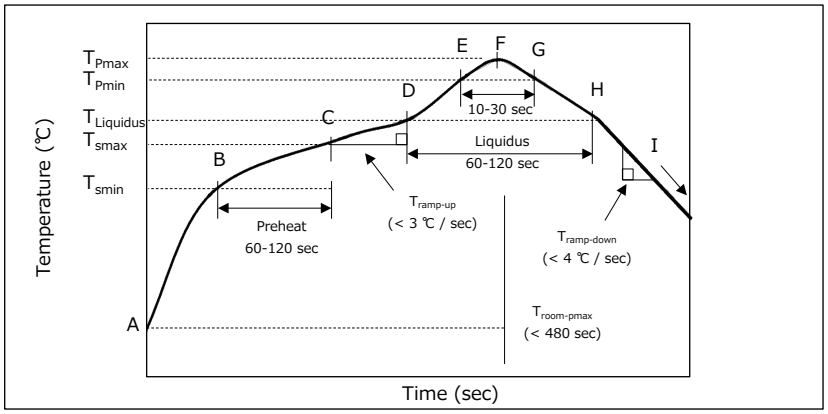
⚠ Application guidelines（6in1 sensor）

1. Soldering

1.1 Reflow soldering

: To avoid the sensor damage, do not apply above 265 ℃ to the top of sensor.
The reflow conditions are recommended as below.



Step	Setting	constraint's		
		Temp (℃)	Time (sec)	Max.Rate (℃/sec)
A	Troom	25	-	-
B	TSmin	150	-	-
C	TSmax	200	60 < tBC < 120	-
D	TLiquidus	217	-	r(TLiquidus-TPmax) < 3
E	TPmin [255℃, 260℃]	255	-	r(TLiquidus-TPmax) < 3
F	TPmax [260℃, 265℃]	260	tAF < 480	r(TLiquidus-TPmax) < 3
G	TPmin [255℃, 260℃]	255	10 < tEG < 30	r(TPmax-TLiquidus) < 4
H	TLiquidus	217	60 < tPH < 120	-
I	Troom	25	-	-

1.2 Reflow soldering number : Two times maximum

1.3 Resist specification : In the land portion, select the normal resist.

1.4 Solder pad of sensor center pad : Air space is needed between PCB and sensor backside. Do not solder sensor backside not to tuoch PCB. Temperature characteristics may fluctuate.

1.5 Terminal connection : Solder NC (Non-connect terminal) to improve the mountability.

2. Cleaning

Do not use ultrasonic clean to the sensor. MEMS may be destroyed by its resonances. Refrain from the cleaning after sensor mounting.

3. Handling

3.1 Do not apply excessive shock(>10,000G) to the sensor.

3.2 Do not use any dropped sensor.

3.3 Before opening the package, store the sensor within 12 months from the packing date at ≦ 40℃, 90%R.h. After opening the package, mount the sensor within 168 h under ≦ 30℃, 60%R.h.(MSL 3)

3.4 This sensor is not designed for the harsh environment, so do not use under the following specific environment because it might damage the sensor performance.

(1) Under any liquid like water, oil, chemical solution and organic solvent
(2) In direct sunlight, outdoor exposure, or dust
(3) In sea breeze or corrosive gas like CI2, H2S, NH3, SO2, NOx
(4) In static electricity, electromagnetic wave, or radiation
(5) Flux cleaning by solvent, water or aqueous solution
(6) Condensation
(7) Pollution

3.5 Usage of underfill, side fill material (adhesive etc.) and potting processing are not recommended.

4. Sensor placement in PCB

4.1 Do not mount the sensor near the substrate edge or the screw hole. The distortion applied to the sensor should or less. Design the position of the sensor more than 15mm from the substrate cutting points.

4.2 Do not mount the sensor around heat generating parts not to affect sensor characteristics. Do not exceed the guaranteed operating temperature range. Sensor should not be mounted near the power control circuit nor high voltage source.

4.3 Do not mount the sensor near high voltage power supply and its control circuit.

4.4 Do not mount parts such as a switch and a connector on the back side of the sensor which is designed on the printed circuit board.

4.5 Do not place the signal lines under the sensor.

4.6 Do not mount the sensor in the area in which the sensor touched othe parts by external vibration.

4.7 PCB substrate resonance by external vibration might destroy MEMS. After installing the sensor to the system unit, make sure it by the vibration test.

5. Compliance for sensor usage

5.1 Although we are making every effort to ensure the quality of this sensor, there are risks to be out of the specifications such as 0 point voltage, sensitivity and instability etc. as a failure mode such as life. Therefore, please consider the influence as a set beforehand for the malfunction of this sensor when you design the system. In case that serious trouble related human life or other serious damage were expected with this sensor product for transportation equipment (train, automobile, traffic signal equipment, etc.), medical equipment, aviation, space equipment, electric heating, combustion and gas equipment, rotating equipment, fire prevention equipment, crime prevention equipment, nuclear power related equipment and machine tools etc. Please take full responsibility for fail-safe design by considering the following guides to ensure safety.

(1) Design protection circuits and functionality to ensure safety as a system

(2) Design redundant circuits to ensure safety as a system so that it will be safe under mulfanction.

5.2 If there is any doubt about the safety of this sensor, please notify us promptly. And please

■ AEC-Q100 compliant

The products are tested based on all or part of the test conditions and methods defined in AEC-Q100.
Please consult with Panasonic for the details of the product specification and specific evaluation test results, etc., and please review and approve Panasonic's product specification before ordering.