



## IMU (Inertial Measurement Unit)

## M-G552PR30

- Small size & Light Weight : 65 x 60 x 30 mm<sup>3</sup>, 115 g
- Low-Noise, High-Stability
  - Gyro Bias Instability : 1.2 °/h
  - Angular Random Walk : 0.08 °/√h
 (It is recommended to use the Gyro sensor with 24-bit resolution.)
- Six-degrees-of-freedom Sensor
  - Triple Axis Gyroscope : ±450 °/s
  - Triple Axis Accelerometer : ±8/±16 G
- Calibrated Stability (Bias, Scale Factor, Axial Alignment)
- Interface : RS-422A Interface
- Operating Temperature : -30 °C to +80 °C
- Power Supply Voltage : 9 V to 32 V
- Waterproof and Dustproof : IP67



Product Name and Number  
M-G552PR30: X2G000251000100



## Recommended Application

- Autonomous Vehicle • Navigation Systems
- Vibration Control and Stabilization Pointing and Tracking Systems

## RECOMMENDED OPERATING CONDITION

| Parameter             | Condition                 | Min. | Typ. | Max. | Unit |
|-----------------------|---------------------------|------|------|------|------|
| Power Supply Voltage  | V <sub>IN</sub> to GND *2 | 9 *1 | 12   | 32   | V    |
| Port Input Voltage    | RD+ / RD- to GND          | —    | 5    | —    | V    |
| Operating Temperature |                           | -30  | —    | +80  | °C   |

\*1. When power supply voltage is 9 V or less, the host may not be able to communicate with this node normally even if the LED turns on.

\*2. The power supply voltage must reach the recommended operating condition within 2 seconds after power is applied to this node.

## SPECIFICATIONS

V<sub>IN</sub> = 12 V, T<sub>a</sub> = 25 °C, angular rate = 0 °/s, ±1 G, unless otherwise specified

| Parameter                             | Test Conditions / Comments            | Min.  | Typ.                   | Max.  | Unit           |
|---------------------------------------|---------------------------------------|-------|------------------------|-------|----------------|
| <b>GYRO SENSOR</b>                    |                                       |       |                        |       |                |
| Sensitivity                           |                                       |       |                        |       |                |
| Dynamic Range                         |                                       | —     | ±450                   | —     | °/s            |
| Scale Factor                          | 16 bits                               | -0.2% | 66                     | +0.2% | LSB/(°/s)      |
|                                       | 24 bits                               | -0.2% | 66 x (2 <sup>8</sup> ) | +0.2% |                |
| Nonlinearity (Best fit straight line) | 1 σ                                   | —     | 0.05                   | —     | % of FS        |
| Misalignment                          | 1 σ, Axis-to-axis, Δ = 90° ideal      | —     | 0.1                    | —     | °              |
| Bias                                  |                                       |       |                        |       |                |
| Initial Error                         | 1 σ, -30 °C ≤ T <sub>a</sub> ≤ +70 °C | —     | 360                    | —     | °/h            |
| Repeatability                         | 1 σ, Turn-on to turn-on *3            | —     | 36                     | —     | °/h            |
| Bias Instability                      | Average                               | —     | 1.2                    | —     | °/h            |
| Angular Random Walk                   | Average                               | —     | 0.08                   | —     | °/√h           |
| Linear Acceleration Effect            | Average                               | —     | 18                     | —     | (°/h)/G        |
| Noise Density                         | f = 10 Hz to 20 Hz                    | —     | 6.9                    | —     | (°/h)/√Hz, rms |
| Frequency Property                    |                                       |       |                        |       |                |
| 3 dB Bandwidth                        |                                       | —     | 472                    | —     | Hz             |
| <b>ACCELEROMETERS</b>                 |                                       |       |                        |       |                |
| Sensitivity                           |                                       |       |                        |       |                |
| Dynamic Range                         |                                       | —     | ±8/±16*7               | —     | G              |
| Scale Factor                          | 16 bits, Output Range ±8              | -0.1% | 4                      | +0.1% | LSB/mG         |
|                                       | 16 bits, Output Range ±16             | -0.1% | 2                      | +0.1% |                |
| Nonlinearity (Best fit straight line) | 1 σ, < 5 G                            | —     | 0.1                    | —     | % of FS        |
| Misalignment                          | 1 σ, Axis-to-axis, Δ = 90° ideal      | —     | 0.01                   | —     | °              |
| Bias                                  |                                       |       |                        |       |                |
| Initial Error                         | 1 σ, -30 °C ≤ T <sub>a</sub> ≤ +70 °C | —     | 4                      | —     | mG             |
| Repeatability                         | 1 σ, Turn-on to turn-on *3            | —     | 3                      | —     | mG             |
| Bias Instability                      | Average                               | —     | 24                     | —     | μG             |
| Velocity Random Walk                  | Average                               | —     | 0.02                   | —     | (m/s)/√h       |
| Noise Density                         | f = 10 Hz to 20 Hz                    | —     | 50                     | —     | μG/√Hz, rms    |
| Frequency Property                    |                                       |       |                        |       |                |
| 3 dB Bandwidth                        |                                       | —     | 333                    | —     | Hz             |

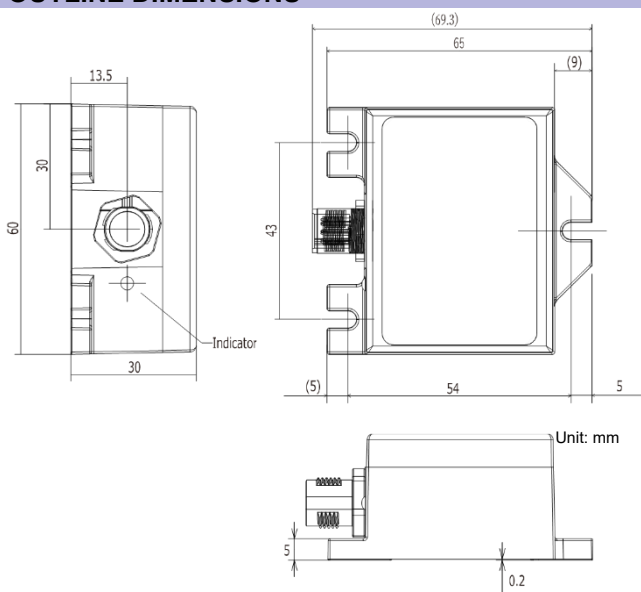
| ATTITUDE OUTPUT    |                                         |      |            |      |         |
|--------------------|-----------------------------------------|------|------------|------|---------|
| Output Range       | Inclination Mode                        | -80  | -          | +80  | °       |
|                    | Euler Mode ANG1: Roll                   | -45  | -          | +45  |         |
|                    | ANG2: Pitch                             | -180 | -          | +180 |         |
|                    | ANG3: Yaw *4                            | -180 | -          | +180 |         |
| Scale Factor       | 16 bits                                 | -    | 0.00012207 | -    | rad/LSB |
|                    |                                         | -    | 0.00699411 | -    | °/LSB   |
| Accuracy*5*6       | 1 $\sigma$ , Static                     | -    | 0.2        | -    | °       |
|                    | 1 $\sigma$ , Dynamic *5 (100 °/s, Max.) | -    | 0.2        | -    |         |
| TEMPERATURE SENSOR |                                         |      |            |      |         |
| Scale Factor *1*2  | Output = 0 @ +25 °C                     | -    | 0.00390625 | -    | °C/LSB  |

- \*1. This is a reference value used for internal temperature compensation. There is no guarantee that the value gives an absolute value of the internal temperature.  
 \*2. This is the temperature scale factor for the upper 16 bits (TEMP\_HIGH).  
 \*3. Turn-on to turn-on / Day by day, estimated variation during 5 consecutive days.  
 \*4. Yaw axis is not compensated for errors caused by drift.  
 \*5. Dynamic accuracy is based on measurement data that has been measured from a stationary state. The accuracy that can be achieved depends on the input movement.  
 \*6. Attitude output accuracy is based on measurement data for GLOB\_CMD2[0x16(W1)], bit[5:4]= 00: mode A.  
 \*7. Selectable by register setting.

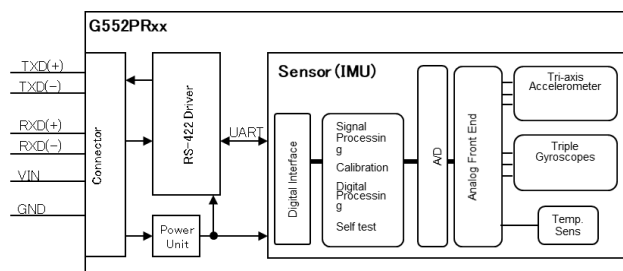
**Note:**

- The values in the specifications are based on the data calibrated at the factory. The values may change according to the way the product is used.
- The Typ. values in the specifications are average values or 1 $\sigma$  values.
- Unless otherwise noted, the Max./Min. values in the specifications are design values or Max./Min. values at the factory tests.
- Acceleration characteristics do not depend on the output range.

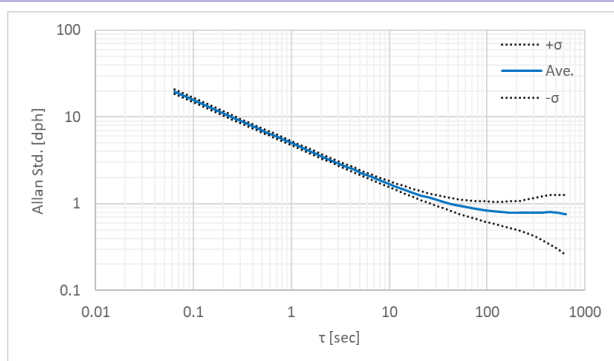
## OUTLINE DIMENSIONS



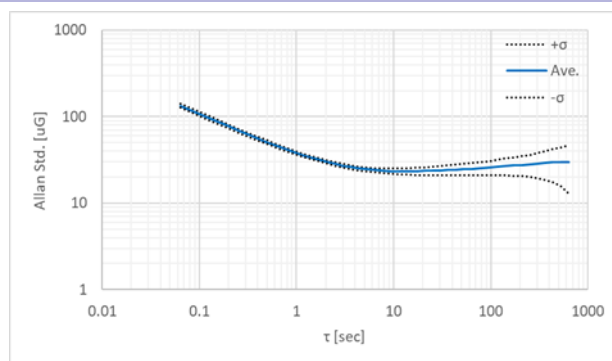
## BLOCK DIAGRAM



## TYPICAL PERFORMANCE CHARACTERISTICS



Gyro Allan Variance Characteristic



Accelerometer Allan Variance Characteristic

The product characteristics shown above are just examples and are not guaranteed as specifications.

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