M-G364PD

High Stability IMU (Inertial Measurement Unit)

■ GENERAL DESCRIPTION

The M-G364PD is a small form factor inertial measurement unit (IMU) with 6 degrees of freedom: triaxial angular rates and linear accelerations, and provides high-stability and high-precision measurement capabilities with the use of high-precision compensation technology. A variety of calibration parameters are stored in memory of the IMU, and are automatically reflected in the measurement data being sent to the application after the power of the IMU is turned on. With a general-purpose SPI/UART supported for host communication, the M-G364PD reduces technical barriers for users to introduce inertial measurement and minimizes design resources to implement inertial movement analysis and control applications.

The features of the IMU such as high stability, high precision, and small size make it easy to create and differentiate applications in various fields of industrial systems.

■ FEATURES

- Small Size, Lightweight   : 24x24x10mm, 10grams
- Rugged Metal Body / High Vibration Resistance
- Low-Noise, High-stability
    - ➢ Gyro Bias Instability   : 2.2 deg/hr
    - ➢ Angular Random Walk   : 0.09 deg/$\sqrt{\mathrm{hr}}$
- Initial Bias Error   : 0.1 deg/s
- 6 Degrees Of Freedom
    - ➢ Triple Gyroscopes   : ±100 ／ ±200 deg/s *
    - ➢ Tri-Axis Accelerometer   : ±3 G
- 16/32bit Data Resolution
- Digital Serial Interface   : SPI / UART
- Calibrated Stability (Bias, Scale Factor, Axial alignment)
- Data Output Rate   : to 2k Sps
- External Trigger Input / External Counter Reset Input
- Delta Angle/Delta Velocity Output
- Calibration Temperature Range   : −40°C to +85°C
- Operating Temperature Range   : −40°C to +85°C
- Single Voltage Supply   : 3.3 V
- Low Power Consumption   : 18mA (Typ.)

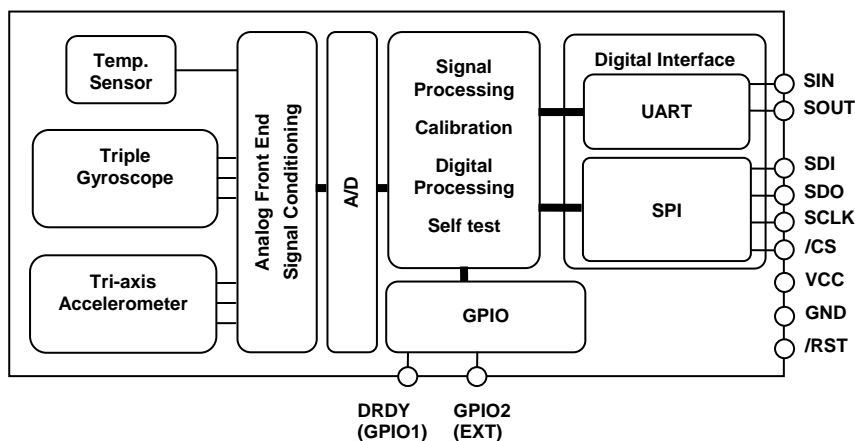*The gyro dynamic range is determined by part number ordering code

■ APPLICATIONS

- Antenna and Platform Stabilization
- Camera Gimbals
- Motion Analysis and Control
- Navigation Systems
- Vibration Control and Stabilization
- Pointing and Tracking Systems

■ FUNCTIONAL BLOCK DIAGRAM

■ SENSOR SECTION SPECIFICATION

T_A=25°C, VCC=3.3V, angular rate=0 deg/s, ≤±1G, unless otherwise noted.

Parameter	Test Conditions / Comments	Min.	Typ.	Max.	Unit
GYRO SENSOR					
Sensitivity					
Dynamic Range [*3]	—	—	±100 ╱±200	—	deg/s
Scale Factor [*3]	16bit	Typ-0.2%	0.00375 ╱0.0075	Typ+0.2%	(deg/s)/LSB
Temperature Coefficient	1 σ, −40°C ≤ T_A ≤ +85°C	—	15	—	ppm/°C
Nonlinearity	1 σ, Best fit straight line	—	0.05	—	% of FS
Misalignment	1 σ, Axis-to-axis, Δ = 90° ideal	—	0.02	—	deg
Bias					
Initial Error	1 σ, −40°C ≤ T_A ≤ +85°C	—	0.1	—	deg/s
Temperature Coefficient (Linear approximation)	1 σ, −40°C ≤ T_A ≤ +85°C	—	0.0005	—	(deg/s)/°C
In-Run Bias Stability	Average		2.2		deg/hr
Angular Random Walk	Average	—	0.09	—	deg/$\sqrt{hr}$
Linear Acceleration Effect	Average		0.005		(deg/s)/G
Noise					
Noise Density	Average , f = 10 to 20 Hz	—	0.002	—	(deg/s)/$\sqrt{Hz}$, rms
Frequency Property					
3 dB Bandwidth	—	—	200	—	Hz
ACCELEROMETERS					
Sensitivity					
Dynamic Range	—	±3	—	—	G
Scale Factor	16bit	Typ-0.2%	0.125	Typ+0.2%	mG/LSB
Temperature Coefficient	1σ, −40°C ≤ T_A ≤ +85°C	—	15	—	ppm/°C
Nonlinearity	1 σ,≤ 1G, Best fit straight line	—	0.1	—	% of FS
Misalignment	1 σ, Axis-to-axis, Δ = 90° ideal	—	0.01	—	deg
Bias					
Initial Error	1 σ, −40°C ≤ T_A ≤ +85°C	—	5	—	mG
Temperature Coefficient (Linear approximation)	1 σ, −40°C ≤ T_A ≤ +85°C	—	0.02	—	mG/°C
In-Run Bias Stability	Average	—	0.05	—	mG
Velocity Random Walk	Average	—	0.025	—	(m/sec)/$\sqrt{hr}$
Noise					
Noise Density	Average, f = 10 to 20 Hz	—	0.06	—	mG/$\sqrt{Hz}$, rms
Frequency Property					
3 dB Bandwidth	—	—	200	—	Hz
TEMPERATURE SENSOR					
Scale Factor [*1]	Output = 2634(0x0A4A) @ +25°C	—	-0.0037918	—	°C/LSB

*1) This is a reference value used for internal temperature compensation. We provide no guarantee that the value gives an absolute value of the internal temperature.
*2) This is the temperature scale factor for the upper 16bit (**TEMP_HIGH**).
*3) The parameter is fixed and determined by part number option selected at the time of order.
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.
Note) The Typ values in the specifications are average values or 1σ values.
Note) Unless otherwise noted, the Max / Min values in the specifications are design values or Max / Min values at the factory tests.

■ RECOMMENDED OPERATING CONDITION

Parameter	Condition	Min	Typ	Max	Unit
VCC to GND		3.15	3.3	3.45	V
Digital Input Voltage to GND		GND		VCC	V
Digital Output Voltage to GND		−0.3		VCC +0.3	V
Calibration Temperature Range	Performance parameters are applicable	−40		85	°C
Operating Temperature Range		−40		85	°C

■ OUTLINE DIMENSIONS
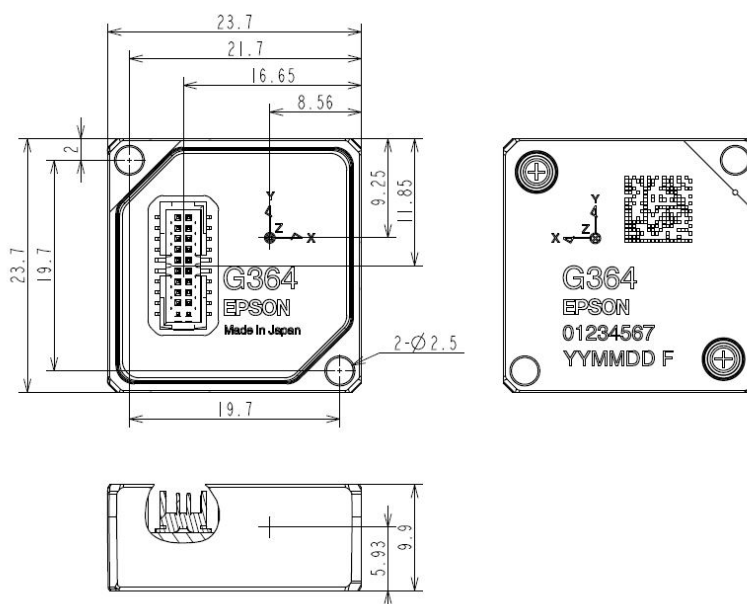
Outline Dimensions (millimeters)