LORD **DATASHEET**

3DM®-GX5-25

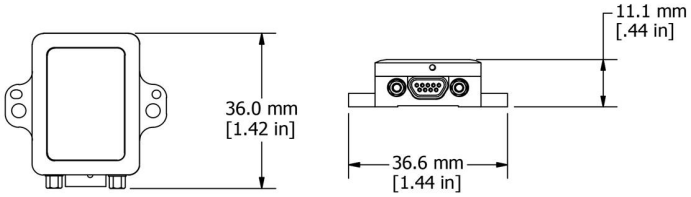
Attitude and Heading Reference System (AHRS)

3DM-GX5-25-*miniature, high-performance, industrial-grade attitude and heading reference system (AHRS) with integrated magnetometers, high noise immunity, and exceptional performance*

The **LORD Sensing 3DM-GX5** family of high-performing, industrial-grade inertial sensors provides a wide range of triaxial inertial measurements and computed attitude and navigation solutions.

The **3DM-GX5-25** is the smallest and lightest industrial AHRS with an Adaptive Kalman Filter available. It features a triaxial accelerometer, gyroscope, magnetometer, and temperature sensors to achieve the optimum combination of measurement qualities. Additionally, the dual on-board processors run a new Auto-Adaptive Extended Kalman Filter (EKF) for outstanding dynamic attitude estimates, making it ideal for a wide range of applications, including platform stabilization and vehicle health and usage monitoring.

The **LORD Sensing MIP Monitor** software can be used for device configuration, live data monitoring, and recording. Alternatively, the **MIP Data Communications Protocol** is available for development of custom interfaces and easy OEM integration.



Product Highlights

- Triaxial accelerometer, gyroscope, magnetometer, temperature sensors achieve the optimal combination of measurement qualities
- Dual on-board processors run a new Auto-Adaptive Extended Kalman Filter (EKF) for outstanding dynamic attitude estimates

Features and Benefits

Best in Class Performance

- Bias tracking, error estimation, threshold flags, and adaptive noise modeling allow for fine tuning to conditions in each application
- Accelerometer noise as low as 25 u*g*/√Hz
- Smallest and lightest industrial AHRS with Adaptive Kalman Filter available

Ease of Use

- Automatic magnetometer calibration and anomaly rejection eliminates the need for field calibration
- Automatically compensates for vehicle noise and vibration
- Easy integration via comprehensive and fully backwards-compatible communication protocol
- Common protocol between 3DM-GX3, GX4, RQ1, GQ4, and GX5 inertial sensor families for easy migration

Cost Effective

- Out-of-the box solution reduces development time
- Volume discounts

Applications

- Unmanned vehicle navigation
- Platform stabilization, artificial horizon
- Health and usage monitoring of vehicles

Specifications

General			
Integrated sensors	Triaxial accelerometer, triaxial gyroscope, triaxial magnetometer, pressure altimeter, and temperature sensors,		
Data outputs	**Inertial Measurement Unit (IMU) outputs:** acceleration, angular rate, magnetic field , ambient pressure, Delta-theta, Delta-velocity **Computed outputs** **Extended Kalman Filter (EKF):** filter status, timestamp,attitude estimates (in Euler angles, quaternion,orientation matrix), linear and compensated acceleration, bias compensated angular rate, pressure altitude, gravity-free linear acceleration, gyroscope and accelerometer bias, scale factors and uncertainties, gravity and magnetic models, and more. **Complementary Filter (CF):** attitude estimates (in Euler angles, quaternion, orientation matrix) stabilized, north and up vectors,GPS correlation timestamp		
Inertial Measurement Unit (IMU) Sensor Outputs			
	Accelerometer	**Gyroscope**	**Magnetometer**
Measurement range	±8 *g* (standard) ±2 *g*, ±4 *g*, ±20 *g*, ±40 *g* (optional)	±300°/sec (standard) ±75, ±150, ±900 (optional)	±2.5 Gauss
Non-linearity	±0.02 % fs	±0.02% fs	±0.3% fs
Resolution	0.02 m*g* (+/- 8 g)	<0.003°/sec (300 dps)	--
Bias instability	±0.04 m*g*	8°/hr	--
Initial bias error	±0.002 *g*	±0.04°/sec	±0.003 Gauss
Scale factor stability	0.03%	±0.05%	±0.1%
Noise density	25 µg/√Hz (2 *g*)	0.005°/sec/√Hz (300°/sec)	100 µGauss/√Hz
Alignment error	±0.05°	±0.08°	±0.05°
Bandwidth	225 Hz	250 Hz	-
Offset error over temperature	0.06% (typ)	0.04% (typ)	--
Gain error over temperature	0.03% (typ)	0.03% (typ)	--
Vibration induced noise	--	0.072°/s RMS/*g* RMS	--
Vibration rectification error (VRE)	--	0.001°/s/g^2 RMS	--
IMU filtering	Digital sigma-delta ADC sampled at 1kHz and 4kHz. 4kHz data averaged to 1kHz nominal sampling rate. Scaled into physical units at 1kHz. User adjustable IIR filter available for 1kHz data. Coning and sculling integrals computed at 1kHz.		
Sampling rate	1 kHz	4 kHz	50 Hz
IMU data output rate	1 Hz to 1 kHz		
Pressure Altimeter			
Range	-1800 m to 10,000 m		
Resolution	< 0.1 m		
Noise density	0.01 hPa RMS		
Sampling rate	25 Hz		

Computed Outputs	
Attitude accuracy	EKF outputs: ±0.25° RMS roll and pitch, ±0.8° RMS heading (typ) CF outputs: ±0.5° RMS roll and pitch, ±1.5° RMS heading (typ)
Attitude heading range	360° about all axes
Attitude resolution	< 0.01°
Attitude repeatability	0.2° (typ)
Calculation update rate	500 Hz
Computed data output rate	EKF outputs: 1 Hz to 500 Hz CF outputs: 1 Hz to 1000 Hz
Operating Parameters	
Communication	USB 2.0 (full speed) RS232 (9,600 bps to 921,600 bps, default 115,200)
Power source	+4 to + 36 V dc
Power consumption	500 mW (typ)
Operating temperature	-40 °C to +85 °C
Mechanical shock limit	500 *g* (calibration unaffected) 1000 *g* (bias may change), 5000 *g* (survivability)
MTBF	(TBD)
Physical Specifications	
Dimensions	36.0 mm x 36.6 mm x 11.1 mm
Weight	16.5 grams
Enclosure material	Aluminum
Regulatory compliance	ROHS, CE
Integration	
Connectors	Data/power output: micro-DB9
Software	MIP Monitor, Windows XP/Vista/7/8/10 compatible
Compatibility	Protocol compatibility across 3DM®-GX3, GX4, RQ1, GQ4, GX5 and CV5 product families
Software development kit (SDK)	MIP data communications protocol with sample code available (OS and platform independent)

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