LORD **DATASHEET**

3DM®-CX5-25

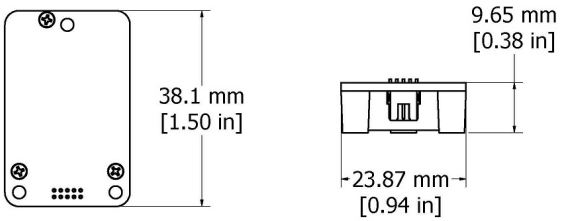
Attitude and Heading Reference System (AHRS)

3DM-CX5-25-*high-performance, industrial-grade attitude and heading reference system (AHRS) with integrated magnetometers, high noise immunity, and exceptional performance*

The **LORD Sensing 3DM-CX5** family of high-performing, industrial-grade inertial sensors provides a wide range of triaxial inertial measurements and computed attitude and navigation solutions.

The **3DM-CX5-25** 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, 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. 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	<0.1 m*g*	<0.003°/sec	--
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 wide band anti-aliasing filter to digital averaging filter (user adjustable) scaled into physical units.		
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) TTL serial (3.0 V dc, 9,600 bps to 921,600 bps, default 115,200)
Power source	+ 3.2 to 5.2 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	38 mm x 24 mm x 9.7 mm
Weight	13 grams
Enclosure material	Aluminum
Regulatory compliance	ROHS, CE
Integration	
Connectors	Data/power output: micro-DB9Samtec FTSH Series
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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