

3DM-CV5™ -25

Attitude and Heading Reference System (AHRS)

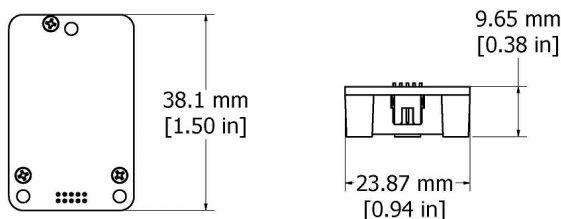


3DM-CV5™-25-miniature, industrial-grade attitude and heading reference system (AHRS) with integrated magnetometers, high noise immunity, and exceptional performance

The LORD Sensing 3DM-CV5 family of industrial-grade, board-level inertial sensors provides a wide range of triaxial inertial measurements and computed attitude and navigation solutions.

In all models, the Inertial Measurement Unit (IMU) includes direct measurement of acceleration and angular rate. In models that include computed outputs, sensor measurements are processed through an auto-adaptive estimation filter algorithm to produce high accuracy computed outputs under dynamic conditions. Compensation options include automatic compensation for magnetic anomalies, gyro and accelerometer noise, and noise effects. The computed outputs vary between models and can include pitch, roll, yaw, a complete attitude and heading reference solution (AHRS), or a complete position, velocity and attitude solution (PVA), as well as integrated GNSS outputs. All sensors are fully temperature-compensated and calibrated over the operating temperature. The use of Micro-Electro-Mechanical System (MEMS) technology allows for highly accurate, small, light-weight devices.

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, and 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
- Smallest and lightest industrial AHRS with Adaptive Kalman Filter available
- High-performance, low-cost solution
- Direct PCB mount or chassis mount with ribbon cable
- Precision mounting alignment features

Ease of Use

- User-defined sensor-to-vehicle frame transformation
- 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, pressure altimeter, temperature sensors		
Data outputs	Inertial Measurement Unit (IMU) outputs: acceleration, angular rate, magnetic field, ambient pressure, deltaTheta, deltaVelocity 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.		
Inertial Measurement Unit (IMU) Sensor Outputs			
	Accelerometer	Gyroscope	Magnetometer
Measurement range	±8 g (standard) ±2 g, ±4 g, ±20 g, ±40 g (optional)	±500°/sec (standard) ±250° ±1000°/sec (optional)	±2.5 Gauss
Non-linearity	±0.04% fs	±0.06% fs	±0.3% fs
Bias instability	±0.04 mg	8°/hr	--
Initial bias error	±0.004 g	±0.1°/sec	±0.003 Gauss
Scale factor stability	±0.05±%	±0.05%	±0.1%
Noise density	100 µg/√Hz	0.0075°/sec/√Hz (300°/sec)	100 µGauss/√Hz
Alignment error	±0.05°	±0.05°	±0.05°
Adjustable bandwidth	500 Hz (max)	500 Hz (max)	-
Offset error over temperature	0.2% (typ)	0.1% (typ)	--
Gain error over temperature	0.05% (typ)	0.06% (typ)	--
Scale factor non-linearity (@ 25° C)	0.04% (typ) 0.2% (max)	0.04% (typ) 0.15% (max)	±0.0015 Gauss
IMU filtering	Digital averaging filter (user adjustable) sampled at 2 kHz and scaled into physical units; coning and sculling integrals computed at 1 kHz		
Sampling rate	2 kHz	2 kHz	50 Hz
IMU data output rate	1 Hz to 1000 Hz (sensor direct mode)		
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: ±0.5° RMS roll and pitch, ±1° RMS heading (typ) CF outputs: ±0.8° RMS roll and pitch, ±2° RMS heading (typ)
Attitude heading range	360° about all axes
Attitude resolution	0.05°
Attitude repeatability	0.5°
Calculation update rate	500 Hz
Computed data output rate	EKF outputs: 1 Hz to 500 Hz CF outputs: 1 Hz to 500 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	200 mW (typ)
Operating temperature	-40 °C to +85 °C
Mechanical shock limit	500 g
Physical Specifications	
Dimensions	38 mm x 24 mm x 9.7 mm
Weight	8 grams
Enclosure material	Aluminum
Regulatory compliance	ROHS, CE
Integration	
Connectors	Data/power output: Samtec FTSH Series (FTSH-105-01-F-D-K)
Software	MIP Monitor, MIP Hard and Soft Iron Calibration, Windows XP/Vista/7/8/10 compatible
Compatibility	Protocol compatibility across 3DM-GX3, GX4, RQ1, GQ4, and GX5 product families
Software development kit (SDK)	MIP data communications protocol with sample code available (OS and platform independent)

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