

SWOBODA IMU SENSOR MODULES FOR AUTOMOTIVE CHASSIS APPLICATIONS



The family of the Swoboda IMU sensor modules is perfectly suitable for various chassis applications.

INTRODUCTION

Acceleration sensors are used in a wide variety of commercial, industrial and automotive applications. They help to control and regulate different comfort & safety relevant applications especially in electrical vehicles.

The Swoboda IMU sensor module is scalable up to 6 degree of freedom that can measure high accelerations with excellent accuracy. The sensor is fully automotive qualified and can be tailored to customer specific design and building space requirements.

FEATURES & BENEFITS

- Capacitive MEMS technology
- Available output configurations: CAN
- Scalable sensor module with up to 6 degree of freedom:
3x acceleration and/or 3x gyroscope
Optional: with temperature sensor
- Mechanical design upon customer requirements
- Measurement range: $\leq \pm 8g$
- Sensitivity: 4096 LSB/g
- Bandwidth: up to 77 Hz
- Functional safety (ISO 26262): up to ASIL-B
Redundant design for ASIL-C or higher possible
- Power supply: 12 V
- Current consumption: max. 120 mA
- Overvoltage, short circuit and reverse polarity protection
- Temperature range: -40 °C to +85 °C
- Protection class (typical application): IP6K8 / IP6K9K
- Fully automotive qualified

ADVANTAGES

- One sensor housing and form factor for different applications
- Flexible transfer functions with high measurement range
- Fully EOL calibrated with offset & sensitivity correction

APPLICATION AREAS

- ADAS systems
- Active suspension systems
- Air suspension systems
- Radar and Lidar stabilisation
- Insurance vehicle tracking

Any questions about this product?

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PRINCIPLE OF OPERATION

The Swoboda IMU sensor module consists of up to two sensor IC types, an accelerometer and a gyroscope with up to 3 degrees of freedom each. Both sensors IC are using the capacitive MEMS technology. During the operation a spring-loaded weight inside the IC is changing its position. One end of the spring is attached to the casing of the comb-type capacitor, and the other end to the mounted weight. Under the force acting on it, the weight on the springs moves, changing the distance between the capacitive element and the mass, and with it the capacitance. The change of the capacitance is correlating to the acceleration.

AVAILABLE PRODUCTS

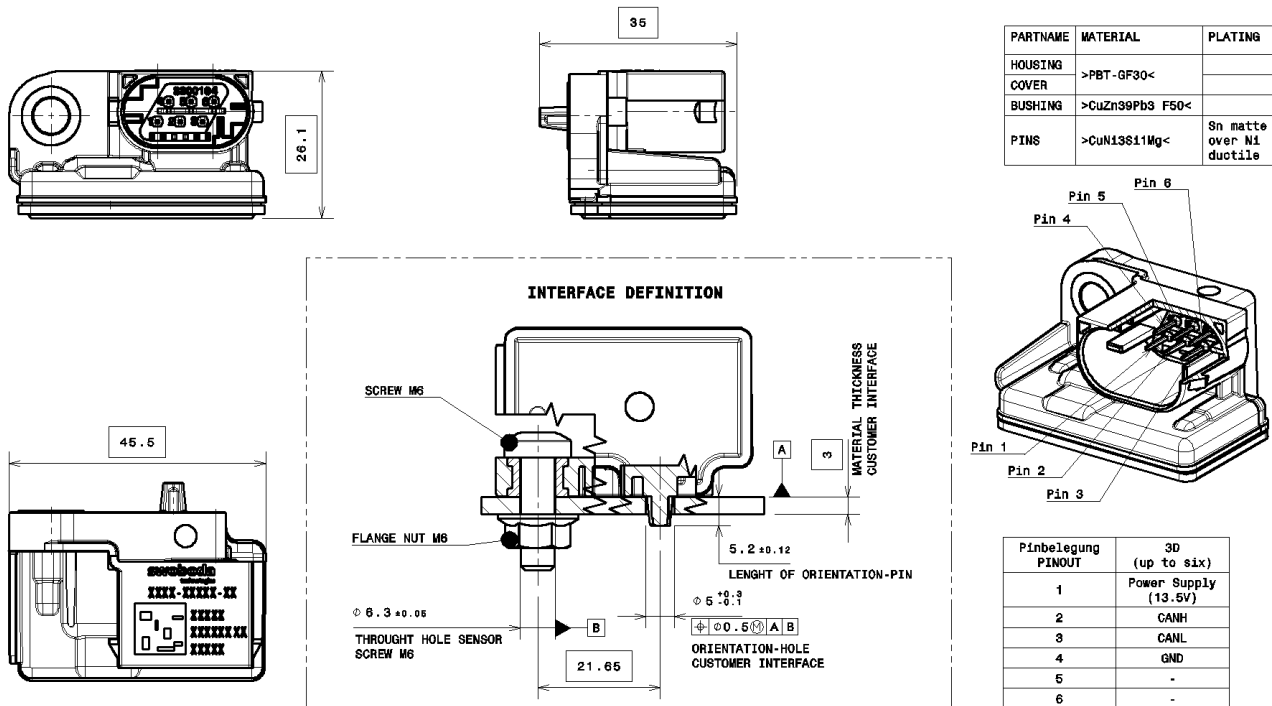
Swoboda acceleration sensors are customer-specific and optimized for the customer application. In general a sensor module consist of three or four single units, which can be combined and configured according to customer requirements:

1. Sensor element: 1-6 axis accelerometer and/or gyroscope MEMS transducer (micro-electro-mechanical system)
2. Processing unit: for data processing (slope compensation and bus protocol stack)
3. Output driver: Protected interface driver for bus signals
4. Power supply: Generation of internal supply voltages, input overvoltage and revers polarity protected

IMU SENSOR MODULE EXAMPLES

CONFIGURATION	INTERFACE	SHORT DESCRIPTION
3D accelerometer + 3D gyroscope	CAN	Inertia measurement unit, 12 V power supply
2D accelerometer + 1D gyroscope	CAN	Suspension inertia measurement unit, 12 V power supply

DRAWING



NOMINAL OPERATING CHARACTERISTICS (3D SIMU SENSOR)

	PARAMETER	UNITS	MIN.	NOM.	MAX.	REMARKS	
General	Supply Voltage	[V]	6.6	13.5	18.4		
	Supply Current	[mA]	54	-	120	Bus load dependent	
	Operating Temperature	[°C]	-40	-	85		
Acceleration	Measurement Range	[g]	-2.0	-	2.0	Configurable from $\pm 1.0g$ up to $\pm 8.0g$	
	Sensitivity	[LSB/g]	-	4096	-		
	Scale Factor	[μg /LSB]	-	244	-		
	Bandwidth	[Hz]	0.0	-	77	-3 dB, depending on ECU sampling rate	
	Sensitivity Error	[%]	-3	-	3	Over full temperature range and lifetime	
	Cross Axis Sensitivity	[%]	-	-	5		
	Noise	[mg]	-	-	36	Peak-to-Peak	
	Internal Data Update Rate	[ms]	1.25	-	-		
	Roll Rate	Measurement Range	[°/s]	-300	-	300	
		Sensitivity	[LSB/°/s]	76	80	84	
Scale Factor		[°/s/LSB]	0.0119	0.0125	0.0132		
Bandwidth		[Hz]	-	201	-	-3 dB, depending on ECU sampling rate Configurable (24.6/ 49/ 102/ 201 Hz)	
Sensitivity Error		[%]	-5	-	5		
Linearity Error		[°/s]	-1.0	-	1.0		
Offset Error		[°/s]	-20	-	20		
Cross Axis Sensitivity		[%]	-	-	5		
Noise		[°/s]	-	-	12	Peak-to-Peak	
Internal Data Update Rate	[μs]	-	110	-			

TRANSFER FUNCTION



3D, CAN interface

