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INNOVATIVE NAVIGATION AND CONTROLS
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MIDG IIC SPECIFICATIONS

(SIS90031C and SIS90031C-SR)

December 15, 2011

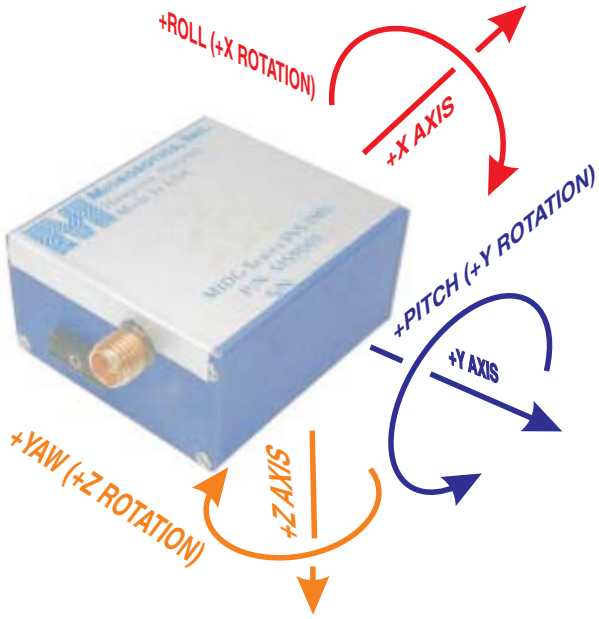
The MIDG IIC is a GPS aided inertial navigation system (INS) for use in applications requiring attitude, position, velocity, acceleration, and angular rates for navigation or control. An internal GPS receiver measures position and velocity and passes this information to the data fusion processor to be combined with the inertial data to generate an optimal solution. An internal three-axis magnetometer provides a magnetic heading reference when needed.

A build option (SIS90031C-SR) uses Pin 8 as a Time Mark input to allow GPS time tagging of the rising edge of an input signal pulse.

Features

- Full INS Solution
- Low Power
- Light Weight
- Small Size

Standard Sensor Axes (can be changed by user)



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MIDG IIC Specifications [1]

Power Requirements

Input Voltage	10 VDC - 32 VDC
Power	1.2W max (including GPS antenna)

GPS Antenna [2]

Connector Type	50-Ohm SMA, right hand thd
Antenna Power	+5V at center conductor, 25 ma max
RF Power Input	-145 dBm min, -61dBm max
Antenna Pre-Amplifier	45 dB maximum gain

Measurements

Angular rate (all axes)	
Range	±300 °/sec
Non-Linearity	0.1% of FS
Noise Density	0.1 °/sec / √Hz
3dB Bandwidth	20 Hz
Acceleration (all axes)	
Range	±6 g
Non-Linearity	0.3% of FS
Noise Density	150 µg / √Hz
3dB Bandwidth	20 Hz
Attitude Accuracy (pitch and roll, with GPS)	0.4° (1 σ)
Heading Accuracy (with GPS and maneuvering)	2° (1 σ)
Position Accuracy	2m (CEP) with WAAS/EGNOS available, 3 m (CEP) otherwise
Velocity Accuracy	< 0.2 m/s
Altitude Accuracy	3m (SEP) with WAAS/EGNOS available, 5m (SEP) otherwise
Data Output Rates	Position , Velocity, attitude, rates, accelerations – 50 Hz GPS measurements – 4 Hz

Environment

Temperature	-40° C to 85° C, operating and storage
Humidity	10% to 90% RH, non-condensing
Survival Shock	100 g, 8ms., ½ sine
Survival Vibration	6 g_{rms}, 10 Hz to 2000 Hz, random

[1] Typical values.
[2] See section on active/passive antennas.

Output

Electrical	RS422 async., 115200 baud (configurable), 8-N-1
Pulse Per Second [3]	Complementary pair, each side TTL compatible
Data Format	Microbotics Binary Protocol

Physical

Size	1.500” W x .810” H x 1.725” D
Weight	55 grams

[3] One side used for Trigger Input when Time Mark Option ordered (SIS90031C-SR).

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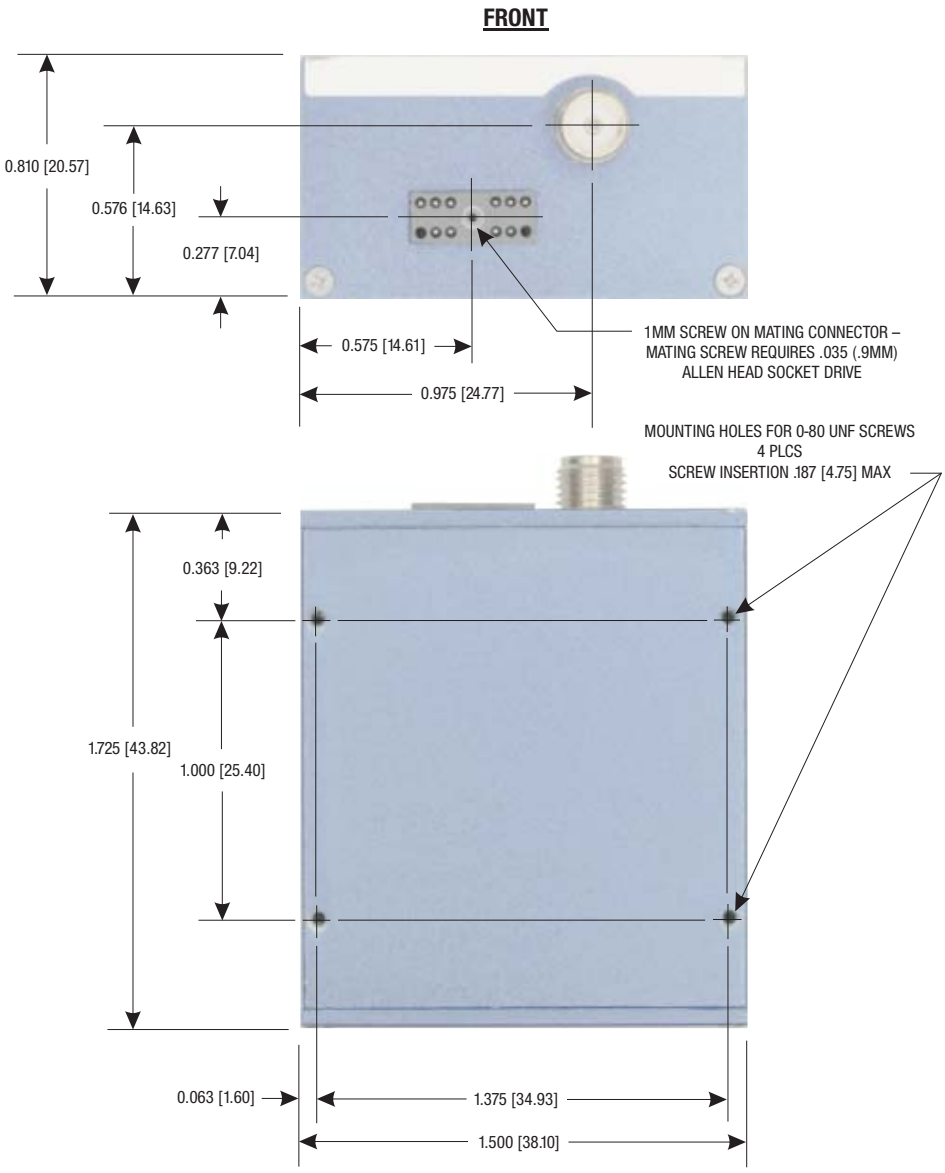
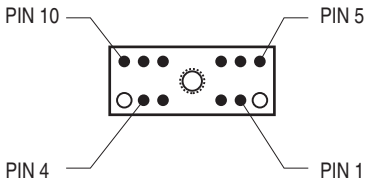
MIDG IIC MOUNTING DIMENSIONS



MIDG IIC CONNECTOR PIN-OUT



(VIEWED FROM FACE OF MIDG CONNECTOR)

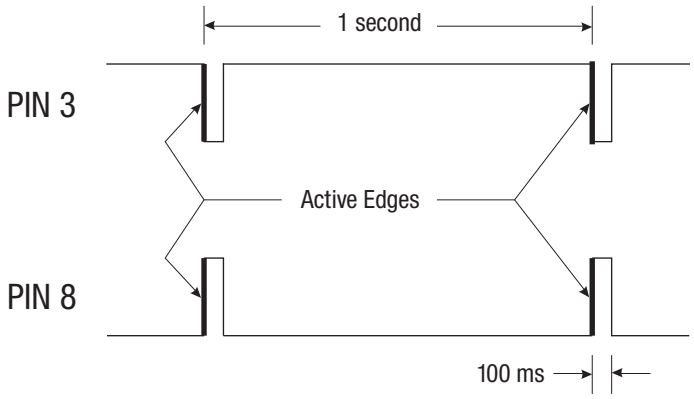
CONNECTOR PIN-OUT
(Colors refer to mating connector cable)

PIN 1	BLACK	Rb (Receive pos: MARK high, SPACE low)
PIN 2	BROWN	Ra (Receive neg: MARK low, SPACE high)
PIN 3	RED	PPS_N (1 PPS pulse: Idle high, falling active edge)
PIN 4	ORANGE	Power In (10-32 VDC, 1.2 w max)
PIN 5	YELLOW	Digital Ground (do not use for Power Return)
PIN 6	GREEN	Tb (Transmit pos: MARK high, SPACE low)
PIN 7	BLUE	Ta (Transmit neg: MARK low, SPACE high)
PIN 8	VIOLET	PPS_P/Aux * (1 PPS pulse: Idle low, rising active edge)
PIN 9	GRAY	Power Return
PIN 10	WHITE	Shield

Note: Power Return and Shield connected to Digital Ground

(* Pin 8 Rising-edge Trigger Input with Time Mark Option – SIS90031C-SR)

STANDARD 1 PPS OUTPUT SIGNALS



*

NOTE: If the MIDG IIC is equipped with the Time Mark option (SIS90031C-SR), pin 8 becomes the Tirigger Input. A rising edge on this input causes the TIM_TM message to be sent by the MIDG IIC indicating the time of the rising edge to within 1 msec. The input is TTL compatible (high recognized above 2V, low recognized below 0.4V, do not exceed 5V).

GPS ANTENNA REQUIREMENTS

1. **Antenna mounting** must be non-magnetic and not use a magnetic mount, as this magnet will interfere with the MIDG magnetometers.

2. **Antenna and Ground Plane.** A GPS antenna ground plane is recommended. Antenna ground plane of 7 x 7 cm (2.75 x 2.75 in.), minimum, is recommended for use with the GPS antenna available from Microbotics, Inc (Part Number A-GPS5-SMA).

3. **Note on Active/Passive Antennas.** *(The following information is supplied by GPS receiver manufacturer.)* Passive antennas contain only the radiating element, e.g. the ceramic patch or the helix structure. The use of an active antenna is always advisable if the RF-cable length between receiver and antenna exceeds about 10 cm. Care should be taken that the gain of the LNA inside the antenna does not lead to an overload condition at the receiver. A gain of 15-21 dB is usually sufficient, even for cable lengths up to 5 m. There's no need for the antenna LNA gain to exceed 26 dB for use with this receiver. With short antenna cables, gains in excess of 25dB may swamp the GPS RF front end.
   When comparing gain measures of active and passive antennas, one has to keep in mind that the gain of an active antenna is composed of two components: the antenna gain of the passive radiator, given in dBic; and the LNA power gain, given in dB. A low antenna gain cannot be compensated by high LNA gain. If a manufacturer provides one total gain figure, it is not sufficient to judge the quality of the antenna. One would need information on antenna gain (in dBic), amplifier gain, and amplifier noise figure.

ALERT REGARDING ANTENNA CONNECTION: 5v power for active antennas is supplied via the MIDG GPS SMA connector. The GPS antenna must never be connected or disconnected while the MIDG is powered. Connecting or disconnecting the GPS antenna with power applied to the MIDG may damage the GPS receiver, and will void the MIDG warranty.