CUBESAT ACS SOLUTION

PERFORMANCE

NACS-001

INTEGRATED FUNCTIONALITY			
- Three-axis magnetic field sensor (coarse measurement)			
- High dynamic resistance GPS receiver			
- MEMS inertial rate sensor (triple-mode redundant configuration)			
- SRAM + microSD support for data storage capability			
GPS PERFORMANCE			
Frequency Band	L1 (1575.42 MHz)		
Position Accuracy [1σ]	<10 m		
Velocity Accuracy [1σ]	<25 cm/s		
Update Rate	1 Hz		
EXTERNAL SUBSYSTEM SUPPORT			
UNIT	SUBSYSTEM	INTERFACE	COMMUNICATIONS
6	Digital Sun Sensor	nano-D	SPI
3	Magnetic Actuator (torquer)	nano-D	PWM Control
1	Magnetic Field Sensor	nano-D	SPI, RS-485
1	Stellar Gyroscope	nano-D	SPI
1	GPS Antenna	SMC	RF
PHYSICAL CHARACTERISTICS			
Dimensions	96 mm x 91 mm x 18 mm		
Mass (core module only)	<150 g		
ENVIRONMENTAL CHARACTERISTICS			
Thermal (operational)	-25 °C to +50 °C		
Vibration (qualification)	14 g_{RMS} (random)		
INTERFACES			
Power supply	+5 V_{DC}		
Data	SPI, I2C, UART		
Connector	nano-D, socket-type		
Mechanical	4 x M3 (through hole)		

NEWSPACE SYSTEMS

CONFIGURATION MANAGEMENT: *Specifications are subject to change. Please refer to latest version.*

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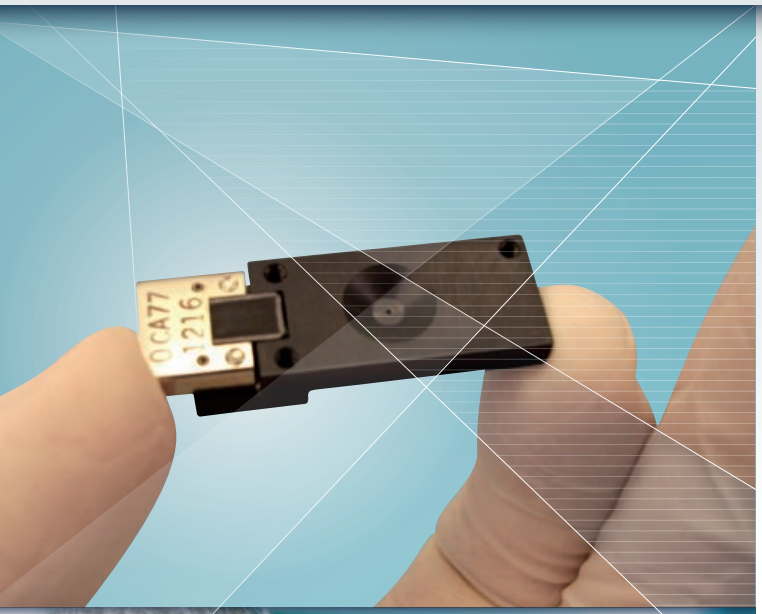

FEATURES

- Single PC104 form factor
- Low power
- I2C and UART interfaces
- Can be populated to mission requirements

APPLICATIONS

- High accuracy in eclipse
- Earth Observation missions
- Spin stabilised three axis control
- Simple magnetic control
- Acquiring stabilisation and orbital information

QUALIFICATION

The CubeSat ACS Board flew on the TDS-1 in 2014 and has also been selected by a number of other CubeSat clients.

UTILITY

A CubeSat Attitude Control System (ACS) measures orbit position, absolute attitude, spacecraft rates and can also control the orientation of the satellite through either magnetic actuation or wheel based solutions.

The NewSpace Systems (NSS) ACS board is a single PC104 board (15mm height) that physically integrates three high accuracy sun sensors, a magnetometer, MEMS gyros, a stellar gyro and two magnetorquer rods. Additionally, external interfaces allow for a further three sun sensors, the momentum or reaction wheels, as well as the Z-axis torquer rods.

The NSS ACS solution recommends Combining the data from the MEMS gyros with a stellar gyro as this achieves precision rate knowledge with no drift, allowing exceptional performance during eclipse periods at a fraction of the cost of a star mapper solution. The +/-0.5 degree accurate sun sensors and precision magnetometer provides an absolute pointing solution when sunlit. In eclipse, the attitude is propagated by the gyro combination, with the stellar gyro permitting a drift of typically less than 0.1 degree throughout the entirety of this orbit phase.

Furthermore, a GPS receiver can also be integrated to the NSS ACS board, with the addition of a mezzanine board, to allow orbit position knowledge. This increases the fidelity of the magnetometer by improving position knowledge compared to an orbit propagator. The NSS GPS is independently controlled through a UART interface with all other functionality controlled via a single I2C interface.

Ultimately, the NSS ACS board can be supplied either partially populated, for example with sensors and actuators for simple magnetic stabilisation or safe mode control, or as a complete solution. Depending on the functionality required by the client, a fit-for-purpose board can be customised. Additionally, each of the NSS sensors and actuators as well as the GPS receiver are available individually to complement a client's existing suite of components. Individual datasheets for these products are available on request.

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