

Technical Summary

Pacific Microchip Corp. has developed a radiation hardened 3-channel sigma-delta ADC targeted for fluxgate magnetometers which can be used for the NASA’s planetary exploration missions. The ADC achieves 16.5-bit ENOB at 3.2kS/s rate. The ADC can operate over a temperature range from -50°C to 125°C. Radiation hardening is achieved through application of ELT structures, additional guard rings, redundant information storing, readout through majority voting and glitch filtering.

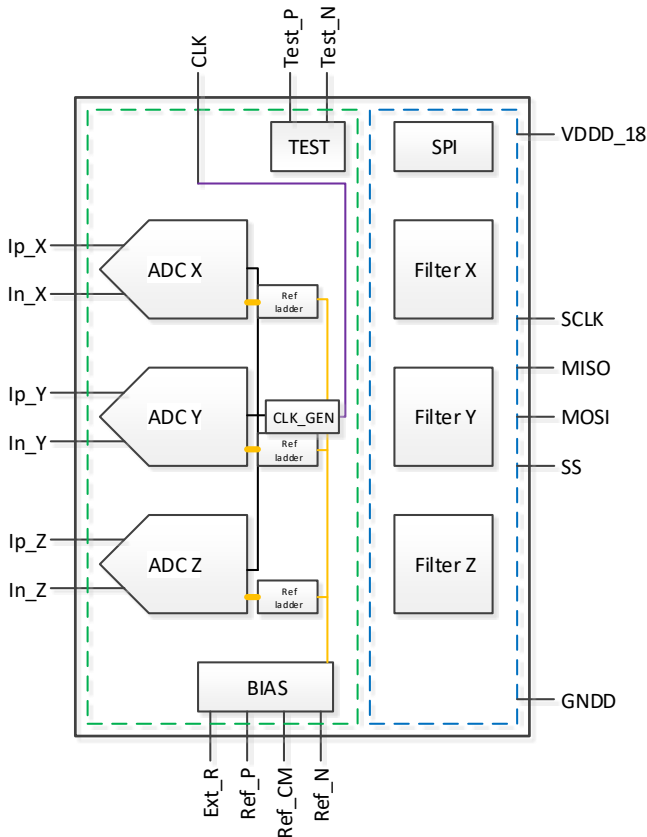


Figure 1. Block diagram of the SD ADC.

The ADC is assembled in a 44-pin CQFP package (Figure 1).

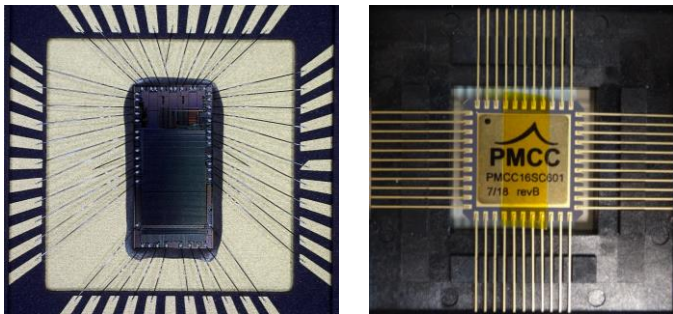


Figure 2. Chip assembly in the package.

Operational Capabilities

The ADC offers radiation hardness and a low power consumption with reasonable conversion rate and accuracy.

The specific capabilities include:

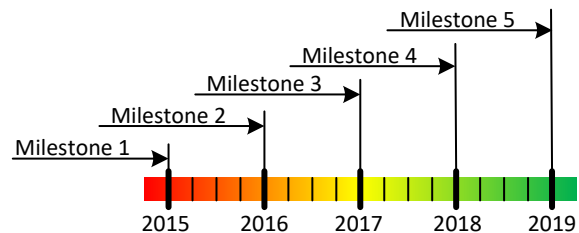
- 3 independently operated channels
- Typical clock frequency 1.6384MHz
- Sampling rate of 3.2KS/s (512 down-sampling factor)
- 2Vpp differential input swing
- ENOB > 16.7-bit
- Input signal bandwidth > 1.6KHz
- Convenient output data interface
- Extended temperature range -40C ... +125C
- Power consumption 21mW/channel
- SPI interface for ASIC control and data output
- 180nm CMOS technology, ELT structures
- 1.8V and 3.3V power supplies
- 44-pin CQFP package

Development Objectives & Milestones

Through a NASA project, Pacific Microchip Corp. designed and fabricated prototype chips, which were tested and characterized. After fixing issues, the final chip was fabricated and tested – required performance was achieved.

The milestones include:

- Milestone 1: Feasibility is proven through simulation
- Milestone 2: Prototype ADC chip is taped out
- Milestone 3: Prototype chip is fabricated and tested
- Milestone 4: Final chip is designed and taped out
- Milestone 5: Final chip is fabricated and tested



Government Applications

Low power, rad-hard high precision applications:

- Space born magnetometers instruments
- Earth and space science missions

Commercial Applications

The ADC will also be relevant to multiple commercial applications including:

- Receivers, space communication and navigation systems
- High precision measurement electronics
- Medical electronics
- Automotive electronics and portable devices