Microprocessor Noise-Immune Signal Transducer for Galvanomagnetic Smart Sensor Devices

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Abstract – **The work considers principles of design and a block diagram of a noise-immune signal transducer of galvanomagnetic smart sensor devices included those based on Hall sensors.**

Keywords – **smart sensor, magnetic field measurement, noise-immunity.**

I. Introduction

Development of measuring and sensory equipment requires further improvement of electronic components including signal transducers [1]. According to the progress trend of electronic equipment signal transducers of smart sensor devices should meet the requirements of USB plug-and-play devices and the standard IEEE 1451.2. One of main requirements that smart devices should meet is high noise-immunity. This work is devoted to principles of development and a block diagram of a noise-immune signal transducer of galvanomagnetic smart sensor devices including that ones based on Hall sensors [2].

II. Main Results

The block diagram of the developed signal transducer is shown in Fig. 1. It is constructed on the basis of a modern microconverter ADuC 841 produced by Analog Devices (USA).

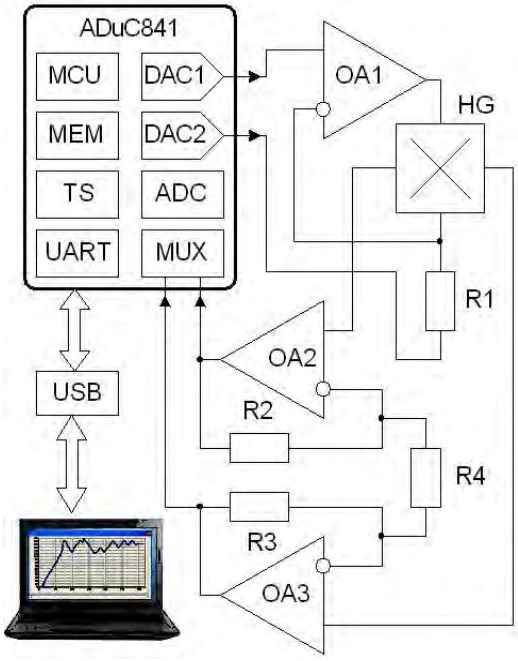

Fig.1 Sensor devise's block diagram

The microconverter contains the following components: input analog multiplexer, analog-digital converter, two digital-analog converters (which are used for resolving the problem of controlling operation mode of sensing devices), integrated temperature sensor, pulse-width modulator, timers, power supply monitor, asynchronous serial UART port and SPI, I^2C interfaces, non-volatile memory of calibration data and controlling code etc.

Along with the microconverter micropower rail-to-rail operational amplifiers AD8551 (OA1-OA3) were used. Compensation for the off-set voltage is provided in the structure of these amplifiers. Connection to a personal computer is performed through a serial UART bus on the basis of a USB controller FT232R produced by Future Technology Devices International.

The operational amplifier OA1 serves as a controlled feed current source of a Hall sensor whereas OA2 and OA3 function as differential amplifiers of its output voltage. The current is controlled by two digital-analog converters DAC1, DAC2 of a microconverter. The differential amplifier's output voltages enter the input of the analog-digital converter ADC through the multiplexer MUX.

The signal transducer's operation is controlled by the microprocessor core MCU. Program codes and data are saved in the non-volatile memory MEM. Furthermore, with the view of temperature compensation temperature measurement is performed by the integrated temperature sensor embedded in the microconverter.

In order to provide noise immunity one performs differential signal measurement at the opposite current directions of a Hall sensor. Such measurement allows obtaining the Hall signal correlating with the current direction. Moreover, the parasitic electromagnetic component which does not depend on the current direction is suppressed.

III. Conclusion

The developed signal transducer of galvanomagnetic sensors meets requirements of USB plug-and-play sensors and possesses high noise immunity.

References

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