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Power Reduction of Hall-Effect Sensor by Pulse Width Modulation of Spinning-Current

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Abstract : This work presents a method to reduce spinning current of a Hall-effect sensor for low-power magnetic sensor applications. Spinning current of a Hall-effect sensor changes the direction of bias current periodically and can separate signals from DC-offset. The bias current is proportional to the sensor sensitivity but also increases the power consumption. To achieve both high sensitivity and low power consumption, the bias current can be pulse-width modulated. When the bias current duration Tb is reduced by a factor of N compared to the spinning current period of $T_s/2$, the total power consumption can be saved by N times. N can be large as long as the Hall-effect sensor settles down within Tb. The proposed scheme is implemented and simulated in a 0.18um CMOS process, and the power saving factor is 9.6 when N is 10. Acknowledgements: This work was supported by Institute for Information & communications Technology Promotion (IITP) grant funded by the Korea government (MSIP) (20160001360022003, Development of Hall Semi-conductor for Smart Car and Device).

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