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On the $1/f$ Noise and Noise Correlation in Magnetotransistors

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Experimental results of a comparative study of low-frequency noise ($1/f$) in single and differential lateral magnetotransistors, fabricated in a standard CMOS technology, are presented. The differential lateral magnetotransistors are designed as dual collector devices. The results show that the noise level in the differential lateral magnetotransistors is higher than the noise level in the single lateral magnetotransistors, and there is no positive correlation between the noise signals in the differential devices. This is just the opposite of the recently published results for vertical magnetotransistors. Furthermore, the results also suggest that the higher differential noise can be attributed to the base region and collector-base junctions rather than to the events localized at the emitter-base junction vicinity.

1. Introduction

The presence of noise severely limits the resolution of sensors. Therefore, the device characterization with respect to noise plays an important part in the investigation and optimization of different structures used as sensors. This is especially true when there is a lack of information, as in the case of magnetotransistors. For example, the lateral magnetotransistor appears to be the most favorable structure for a magnetic field sensor because of its high sensitivity,[1] linear response,[1,2] low offset,[3] and ease of fabrication in both CMOS[4] and bipolar technology.[5] However, there is a lack of information regarding its noise characteristics.