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PNP Bipolar Lateral Transistor as Magnetic Field Sensors

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The relative sensitivity of a pnp lateral magnetotransistor (LMT) fabricated by means of bipolar technology is studied. Two different devices, one with an n^+-buried layer and the other without, were designed. The LMT with the n^+-buried layer exhibits a higher current gain in comparison to the other device. However, its sensitivity is one order of magnitude lower than that of the device without the n^+-buried layer.

1. Introduction

Generally, magnetotransistors (MTs) can be divided in two groups. Those MTs that depend on the vertically flowing carriers for their magnetic operation can be classified as vertical magnetotransistors[1–3], and those MTs that depend on the lateral flow of carriers can be classified as lateral magnetotransistors (LMTs)[4–8]. It is interesting to note that MTs are mainly designed as npn devices[1–3,6–8], because the higher mobility of electrons yields higher sensitivity. It is also interesting to note that vertical MTs are usually fabricated by means of bipolar technology[2,3] and LMTs by means of CMOS technology[7,8]. Finally, it should be noted that the npn LMT has been intensively investigated recently because of a number of attrative characteristics: high sensitivity and linear response[9], offset elimination[10], and capability of two-dimensional[11], and three-dimensional measurement of magnetic