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A Magnetotransistor Structure with Offset Elimination

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A new magnetotransistor structure allowing control of offset is proposed. The unique feature of this structure is the placement of p^+-stripes between the emitter and each of the collectors. This enables the confinement of the emitter injection to the bottom of the emitter-base junction and the shifting of the center of injection towards one of the collectors in order to reduce offset effects. This is achieved by applying different potentials to the p^+-stripes with respect to the emitter.

1. Introduction

An important aspect of the performance of magnetic field sensors is resolution, i.e., the minimum field intensity that can be detected. One cause of limited resolution is offset, viz., the signal at the output of the sensor at zero measurand (see e.g. 1). This type of error is particularly critical when a static magnetic field is measured because the offset signal of the output is indistinguishable from the useful signal. Hence, consideration of the offset is often one of the crucial problems for designers of systems involving sensors.

The main causes of offset are imperfections in the process technology including mask misalignment[2] and strain introduced by packaging and aging.[3] Thus, one of the approaches for offset reduction is based on the improvement of process technology, but because of technological limitations it is not possible to eliminate offset completely. Other offset-reduction methods are: calibration,[4] which demands the presence of a known value of the measurand; compensation,[5] which demands use of two sensors where one of them is used as an offset reference; and the sensitivity-variation offset-reduction method.[6,7] Each of these approaches has