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Effects of Offsets on Low-Frequency Noise Behavior in Bipolar Magnetotransistors

William Kung† and Arokia Nathan

Electrical and Computer Engineering, University of Waterloo,
Waterloo, Ontario N2L 3G1, Canada

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In this paper, we show that the differential output noise in dual-collector magnetotransistors is strictly limited by offsets or mismatches in external load resistances employed in biasing, despite a high correlation in output collector noise currents (voltages). Thus the correlation as retrieved from measurements of the differential noise spectrum is not truly representative of the true coherence in output collector noise. The differential output noise increases with increasing offset and for devices with large offset, the output noise magnitude is controlled by the offset at all frequencies, despite the degradation in coherence at higher frequencies due to white noise in the collector epiregion. Measurement results, presented for various device geometries, are in excellent agreement with predicted values based on small-signal analysis.

1. Introduction

The offset in dual-collector magnetotransistors, viz., a nonzero differential output in the absence of an external field, is highly undesirable since it limits the minimum detectable field at low frequencies. The offset current or voltage and the useful static-field-induced output signal become indistinguishable.[1] Offsets in magnetotransistors (MTs) are predominantly due to photolithographic imperfections (mask alignment errors) which lead to geometrical asymmetries. In addition,

†Current Address: Semiconductor Components Group, Northern Telecom Ltd., 185 Corkstown Road, Nepean, Ontario K1Y 4H7, Canada