*Sensors and Materials*, 5, 6 (1994) 347–357
MYU, Tokyo

S & M 0149

# Multiple-Gate MOSFET Magnetic-Field Sensing Device and Amplifier

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(Received July 28, 1993; accepted January 17, 1994)

***Key words***: magnetic-field sensor, MAGFET, split drain

A new split-drain MOSFET magnetic-field sensing device is reported, which uses multiple gates to establish a longitudinal electric field in the channel. A relative sensitivity of 0.33/T is obtained for a double-polysilicon, multiple-gate, split-drain MOSFET magnetic-field sensing device with a narrow source design. Triple-drain, multiple-gate MOSFET devices generally have a relative sensitivity of approximately 0.55/T for most biasing conditions but can achieve relative sensitivities greater than 10/T under certain bias conditions. The use of devices with a narrow source design improves the relative sensitivity of both the split-drain and triple-drain magnetic-field sensors. Two amplifier circuits are reported, which allow trimming to cancel amplifier offset. The amplifier circuits achieved an absolute sensitivity of 4.4 V/T for a 50 $\mu$A tail current.

## 1. Introduction

A common method of implementing a magnetic-field sensor is the split-drain MOSFET magnetic-field sensor (MAGFET) which has two drains separated by an isolation region.[1–4] In this device, a magnetic field perpendicular to the channel causes a Lorentz deflection of the current flow towards one of the two drains, and the resulting imbalance in the drain currents is used to sense the magnetic-field strength. The primary attributes of the MAGFET which make it a promising magnetic-field sensor are its compatibility with MOS technology, its good linearity,[3] and its good sensitivity for low bias currents.[4]

A new split-drain MOSFET magnetic-field sensing device was recently reported