

## SILICON MAGNETIC SENSITIVITY ELEMENTS AND IC

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Magnetic sensitivity elements on the base of Hall and galvanomagneto-recombination effects were developed. Physical and topological parameters of integrated elements were designed. On the base of developed elements magnetic sensitivity integrated circuit with low temperature drift was fabricated.

The magnetic Hall-effect sensors have a important significance of the all magnetosensitivity devices. Application of Hall-effect sensors improve the parameters of devices on the them based: absence of the mechanical contacts, high sensitivity and reliability, use of the technology integrated circuits, and scope for exploitation in the pollution and explosive atmosphere [1].

The sensitivity of the Hall-effect sensors increased as the mobility of the current carriers, because of silicon non used for fabrication Hall-effect sensors. The employment of epitaxial planar technology of fabrication IC arrange Hall-effect sensors and amplifier on the single chip, and in this case output voltage are suitable for practical purposes.

The development integrated Hall-effect sensor calls for select physical structure ( resistivity and epitaxial film thickness), which fabricate Hall-effect sensors and active and passive elements of IC on the single chip.

On the base of experiments and numerical modelling the physical and topological parameters of sensors were designed. Epitaxial films of n-type conductivity with a resistivity of  $5\Omega\text{cm}$  and thickness  $12\mu\text{m}$  was used. The interval between current contacts was  $300\mu\text{m}$ . The region of the Hall-effect sensors was isolated of the backward -biased p-n junction. The electrical parameters of Hall-effect sensors presented below [2]:

- input resistance -  $4,4\text{ k}\Omega$ ;
- output resistance -  $2,5\text{ k}\Omega$ ;
- magnetic sensitivity -  $50\mu\text{V}/\text{mA}\cdot\text{G}$ .

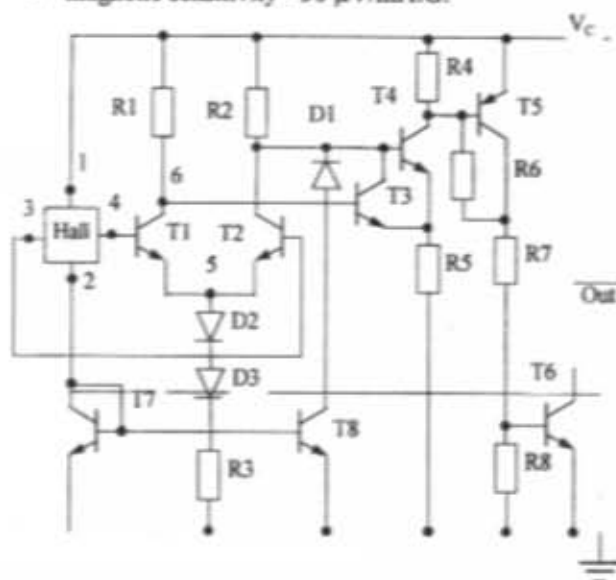


Fig.1. Circuits schematics of magnetic sensitivity logic IC on the base of Hall-sensors.

On the base carried out investigations high magnetic sensitivity differential integrated circuits with logical output which consist Hall-effect sensor, amplifier, comparator, voltage stabiliser and output n-p-n transistor was designed and fabricated (fig.1).

On the base presented data magnetosensitivity IC was improved and high magnetic sensitivity ( $20\text{-}50\text{ G}$ ) and low temperature drift ( $0,1\text{ G}/\text{C}$ ) was reached.

The main application developed IC have in the control device of emergency undershoot of current.

Besides, magnetosensitivity IC to be applied in the electronic unsparing bottom of hand-operated introduction information into computer [3].

Due to high fast acting, nonchatter, nonsparking and non-sensitivity to vibration and shock magnetosensitivity IC find application at the rotation sensor of collectorless electric motors.

On the base developed IC device for definition of wind speed was also fabricated [4].

The investigations of the main features of the circuit engineering, design and technology allowing to reach high sensitivity and temperature stability were conducted.

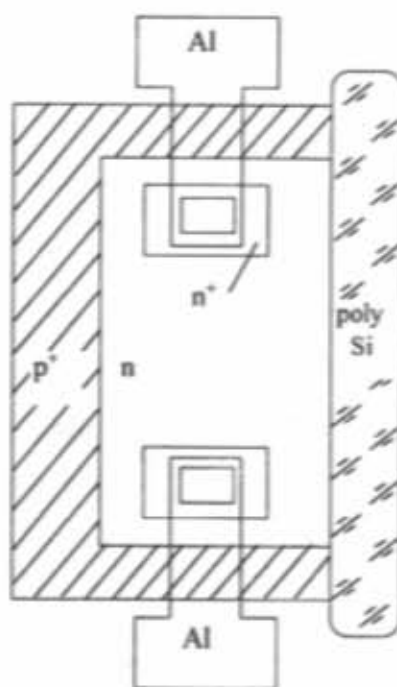


Fig.2. Planar topology of galvanomagneto-recombination element. p+ - surface of low speed of recombination charge carriers. poly-Si-surface of high speed of recombination charge carriers.

It was shown, that integrated galvanomagneto-recombination (GMR) effect circuit featured the lowest time drift [5]. To produce the GMR elements was on the base technology described in [6]. The structures with locally formed epitaxial poly- and monocrystalline silicon n-type conductivity films with  $\rho = 0,5 \Omega \cdot \text{cm}$  and thickness 12 nm on the substrates of the opposite conductivity type were used. Polycrystalline

films acted as lateral surface with high recombination velocity and the reverse biased p-n junction presented the surface with low recombination velocity (fig. 2).

The minimum magnetic threshold of IC was no more than 50 G and temperature drift in the range of  $-60: +125 \text{ C}$  was of the order of 10 G.

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SILISIUM ƏSASINDA MAQNİTƏ HƏSSAS ELEMENTLƏR VƏ İNTEQRAL SXEMLƏR

Holl və qalvanomaqnitrekombinasion effektlərin əsasında silisium inteqral elementlər tədqiq olunub, onların topologiyası və fiziki strukturları müəyyənləşdirilib. Keçirilən tədqiqatların əsasında maqnitə həssas inteqral mikrostem işlənib hazırlanmışdır.

Ф.Ф. Касимова

КРЕМНИЕВЫЕ МАГНИТОЧУВСТВИТЕЛЬНЫЕ ЭЛЕМЕНТЫ И ИНТЕГРАЛЬНЫЕ СХЕМЫ

Исследованы кремниевые интегральные элементы на основе холловского и гальваномангниторекомбинационного эффектов, их конструкция и физическая структура. На основе проведенных исследований спроектирована и изготовлена магниточувствительная микросхема.

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