

Godovitsyn I. V. *A Novel Surface-Micromachined Tenzoresistive Pressure Sensor* 2

A novel SOI-based surface-micromachined tenzoresistive pressure sensor is presented. The sensor comprises monocrystalline silicon tenzoresistors and polysilicon membrane thus combining key benefits of bulk- and surface-micromachined pressure sensors – high sensitivity and small size. Finite-element simulation of the sensor characteristics is carried out. Simulation results demonstrate sensitivity of $15,4 \text{ mV} \cdot (\text{V} \cdot \text{atm})^{-1}$, temperature coefficient of sensitivity and offset of $-4,15$ and $0,18 \text{ \%}/10 \text{ }^\circ\text{C}$ respectively and non-linearity of $1,54 \text{ \%}$ in range of $0-1 \text{ atm}$. The simulation results of proposed sensor in comparison with parameters of realized sensors are discussed.

Keywords: miniature pressure sensors, surface micromachining technology

Belkin L. M., Belkin M. E. *Unstructured Model of Vertical Cavity Surface Emitting Laser with Microwave Modulation Bandwidth*. 9

An unstructured nonlinear circuit-level model of VCSEL suitable for designers of transmission modules of modern optical fiber-based systems, microwave photonics devices, and IC optical interconnects is proposed. The small-signal modulation parameters are extracted by fitting the experimental voltage standing wave ratio (VSWR) plot and frequency response (magnitude of S_{21}) of a VCSEL mounted in a specific test fixture. The large-signal modulation parameters are extracted from the measured light-current plot. An advanced simulation procedure realized on a microwave E-CAD tool AWR Design Environment (AWRDE) is described. The 3-order and 5-order intermodulation distortion simulation of a wafer-fused long-wavelength VCSEL is produced and validated by the experimental results. The level of linearity of the VCSEL under test in a multichannel microwave-band analog environment is estimated.

Keywords: microwave photonics, vertical cavity surface emitting laser (VCSEL), unstructured model, intermodulation distortions

Abramov I. I., Baranoff A. L., Shcherbakova I. Yu. *Simulation of Single-Electron Devices Based on Molecules*. . 18

Universality of the model for simulation of single-electron devices developed according to the proposed approach is shown. The IV-characteristics of devices including molecules are calculated for this purpose.

Keywords: single-electron device, spatial quantization, molecule

Zarubina A. P., Lukashev E. P., Deev L. I., Parkhomenko I. M., Obratsova E. A., Novoselova L. A., Rubin A. B. *The Evaluation of Carbon Nanomaterials Toxicity Risks*. 21

The effect of single-wall carbon nanotubes (carbon SWNT) on bacterial cells of genetically engineered strain *Escherichia coli K12 TG1* was studied. Using atom force microscopy (AFM) bacterial cell morphological changes were revealed and cell viability decrease was controlled by the number of colony-forming units count. It was shown that prior to these changes we can observe diminishing of the intensity of oxygen consumption and bacterial luminescence. This allows to recommend well-known and easy-to-use bioluminescent test "Ecolum" for initial testing of nanomaterial toxicity.

Keywords: bioluminescence, the bacterial luminescent testing, nanotubes, atomic force microscopy, oxygen consumption

Belozubov E. M., Vasil'ev V. A., Gromkov N. V. *The Improvement of the Thin-Film Nano- and Microelectromechanical Systems with Identical Strain-Sensing Elements and Pressure Sensor on their Base* 27

The possibilities of the improvement of the features thin-film strain gauge nano- and microelectromechanical systems with identical strain-sensing elements and sensors on their base in conditions of the influence transient temperatures are considered.

Keywords: thin-film strain gauge nano- and microelectromechanical systems (Na-MEMS), pressure sensors, identical strain-sensing elements, transient temperature

Kazakov V. K., Obratsov R. M. *Concerning Criteria of Screening Piezoelectric Blocks and Piezoactuators.* . . . 33
There have been posed and substantiated two criteria of screening piezoelectric blocks and piezoactuators. These criteria exclude premature outage of these blocks. These criteria have not been described in technical literature so far. There have been conducted breadboarding and the finite-element modeling of piezoelectric blocks' with defects as the confirmation of the guesses.

Keywords: a piezoactuator, a multilayer structure, a reliability, a screening

Maltsev P. P., Matveenko O. V., Gnatyuk D. L., Lisitskiy A. P., Fedorov Yu. V. *Review of Implementation of 5 GHz Planar Dipole.* 39

5 GHz planar dipole, slot and fractal antennas are examined relying on the criterion of size reduction. It is demonstrated that reviewed fractal antennas do not provide significant size reduction for the given antennas class. Size reduction is resulted from optimization for topology of signal and ground patch and cross location.

Keywords: planar antenna, dipole antenna, slot antenna, fractal antenna

Rathkeen L. S. *Nano & Microsystem Techniques for Laser Industry* 47

The Scientific session of the Common meeting of Russian academy of sciences (RAS), which took place in the middle of December 2010 in Moscow, was dedicated for 50th anniversary of laser techniques. Were discussed the main features of development of laser industry, branch nanotechnological applications, researching of laser thermonuclear synthesis, the fundamental applications of extreme light poles, biological and medical laser information technologies, laser-plasma micro & nanotechnologies and usage of lasers in medical sphere.

Keywords: Russian academy of sciences, RAS, laser, laser thermonuclear synthesis, extreme light poles, biology, laser information technologies, laser-plasma micro- & nanotechnologies, medical sphere

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