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IMPROVED SPICE MACROMODELS OF INSTRUMENTATION AMPLIFIER WITH PSRR EFFECTS

Elena Shoikova, Ivailo Pandiev

***Abstract:** An improved SPICE based macromodels of monolithic instrumentation amplifiers (in-amps) is presented in which the power supply rejection ratio (PSRR) frequency effects are modelled. The simulation models are developed through modifying the existing macromodels employing the mechanism of controlled sources and subcircuits. The macromodels are independent from actual technical realizations and are based upon compromises regarding the representation of exact circuit structures in the models. The equivalent circuits of the models principally contains linear passive RLC elements and controlled voltage and current sources. Model parameters are extracted for the IC AD8221 from Analog Devices and INA114 from Texas Instruments as examples. Simulation results and selected diagrams are compared with the manufacturer's data.*

EXTRACTION OF PARAMETERS OF PLANAR SPIRAL INDUCTORS USING GENETIC ALGORITHMS

Elissaveta Gadjeva, Vladislav Durev

***Abstract:** An approach for extraction the model parameters of spiral inductors is proposed in the paper. The extraction is realized via the S-parameters of the corresponding models using optimization, based on Genetic Algorithm. The approach is useful in RF model design, as the S-parameters can be easily measured for a given microelectronic technology.*

EXTRACTION OF PARAMETERS OF PLANAR TRANSFORMERS USING GENETIC ALGORITHMS

Elissaveta Gadjeva, Vladislav Durev

***Abstract:** An approach for extraction the model parameters of planar transformers is proposed in the paper. The extraction is realized via the S-parameters of the corresponding models using optimization, based on Genetic Algorithm. The approach is useful in RF model design, as the S-parameters can be easily measured for a given microelectronic technology.*

SINUSOIDAL AND IMPULSE GENERATOR, BUILT ON THE BASES OF A DIRECT DIGITAL SYNTHESIZER

Aleksandar Yordanov

***Abstract:** This paper describes a variant of sinusoidal and impulse generator, built on the bases of a direct digital synthesizer. Usage of such kind of generator for testing and researches is of frequent occurrence. There are strong requirements to this generator, which are difficult to be implemented in a single device. Usually the variation in its basic parameters i.e. frequency and output amplitude, have to be done in rather wide limits with a minimal step. Due to these requirements, the schemes are very complicated and a generator has limited characteristics. The direct digital synthesizers (DDS), give the possibility to create a generator with output frequency, varying from mHz to GHz with a constant step of change - mHz. In this paper is demonstrated a variant of generator, on the bases of DDS architecture, controlled by microcontroller connected with personal computer.*

AN APPROACH TO AUTOMATIC CIRCUIT DESIGN USING GENERAL-PURPOSE CIRCUIT SIMULATORS

Boriana Mihova

***Abstract:** In this work an approach to automated design of the analog circuits is developed using the standard circuit simulator OrCAD PSpice. The realization of this approach is based on the principles of analog behavioral modeling. The input data, the design conditions and limitations are described using the possibilities of the Spice input language, which allows the inclusion of the complex functional dependencies between the design quantities. The different design stages are presented using the corresponding modules: calculation of the nonlinear distortion coefficient and the standard value determination of a capacitor. These modules are realized by autonomous computer modules and can be used in different design procedures.*

OPTIMIZATION AND SIMULATION OF THE EKV MODEL USING MATLAB

George Angelov, Katya Asparuhova

***Abstract:** This paper presents a parameter extraction and optimization method of an EKV model implementation in MATLAB. Open source modules provide direct access to model equations and parameters. Thus, parameters can be easily extracted and characteristics optimized for circuit design purposes. Validation against conventional BSIM3v3 model for AMS 0.35 μm CMOS technology is performed and a good agreement is observed.*

APPLICATION OF GENERAL-PURPOSE CIRCUIT SIMULATORS TO AUTOMATED DESIGN AND INVESTIGATION OF CLASS E POWER AMPLIFIERS

Olga Antonova, Marin Hristov, Elissaveta Gadjeva

***Abstract:** In the present paper an approach is proposed to computer-aided design and investigation of class E power amplifier using the possibilities of general-purpose circuit analysis programs such as PSpice. Power amplifiers performance is rated in terms of the characteristics concerning the amplifier efficiency.*

SYNTHESIS OF SINEWAVE OSCILLATOR BASED ON THE MODIFIED VAN DER POL EQUATION USING MELNIKOV THEORY

Zhivko Georgiev, Todor Todorov, Emil Manolov, Irina Karagineva

***Abstract:** The paper presents a method for synthesis of a sinewave oscillator governed by the modified Van der Pol equation. The synthesis is based on the Melnikov theory, whereupon the generated sinusoidal oscillations have in advance assigned amplitude and frequency. A Simulink model of the oscillator is proposed and investigated.*

DESIGN OF FPAA PROTOTYPE FOR PRACTICAL STUDYING OF MODIFIED VAN DER POL EQUATION

Emil Manolov, Todor Todorov, Zhivko Georgiev, Irina Karagineva

***Abstract:** The paper proposes and investigates FPAA prototype of sinusoidal oscillator based on the modified Van der Pol equation. Formulas for determination of basic parameters of the oscillations are presented. The proposed circuit is implemented and investigated by using AN221E04 Evaluation board of Anadigm Inc. The obtained experimental results demonstrate the basic theoretical relations and the possibilities for control of frequency and amplitude of the signal by using appropriate configuration and programming of FPAA blocks of the circuit.*

SOME PECULIARITIES OF THE E-MANAGEMENT ENVIRONMENT, VERSION 6

Rossen Radonov, Valentin Videkov

***Abstract:** The paper presents the new capabilities of the environment for control and management of the auditorium based educational process – E-management. Since its new version 6 the environment follows the policy related to its implementation on a faculty level. The procedures for setting up and results reading are enhanced and made easier. Some of the results of its implementation are shown.*

SHAREPOINT SERVER 2007 DEPLOYMENT FOR ELECTRONICS EDUCATION

Elena Shoikova, Malinka Ivanova, Anatoly Peshev

***Abstract:** SharePoint Server 2007 is an integrated suite of server capabilities built on top of Windows SharePoint Services and it is a solution for improving the organizational effectiveness. The portal technologies enable universities to improve the efficiency and effectiveness of different activities, including communication and collaboration, document management, information access and sharing, and assessment and reporting by connecting their people, information and services. The team of the Technical University - Sofia R&D Laboratory “eLearning Technologies” is running a project aimed at developing and deploying of a learning portal that meets educational needs in electronics. It is based on the scalable learning platform based on Microsoft products and technologies: SharePoint Server 2007, SharePoint Services 3.0, SharePoint Learning Kit, Class Server and integrates originally developed Computer-Aided Learning Design System for SharePoint.*

EDITOR FOR ELECTRONIC NOTES IN SHARED COLLABORATIVE SPACE

**Ivan Furnadziev, Vassilii Tchoumatchenko, Tania Vasileva,
L. Benmerqui**

***Abstract:** The IST KP-Lab project focuses on creating a Shared Space learning system aimed at facilitating innovative practices of sharing, creating and working with knowledge in education and workplaces based on triological learning theory. The paper outlines the design and implementation of a Note editor end-user application for document centred collaboration tightly integrated with Shared space. It covers features, architecture and user interface of the Note editor tool. This tool helps in organizing learning activities around shared objects and in providing means for interaction between personal and community levels of activity.*

MUSCLE EFFORT DEGREE MEASUREMENT

Diyana Vasileva, Ivo Iliev, Emil Dimitrov

***Abstract:** Indicating the muscle effort degree is useful to determine sensible loading of the muscle and obtain objective estimation of muscle fatigue.*

In this paper an effort meter for indicating the applied effort from the loading muscle is proposed and described. The developed effort meter consists of strain gauge – sensor element to detect the applied effort, amplification circuit and indicating circuit. The apparatus is easy to realize and with low cost. The designed device can be used for investigation of muscle fatigue for example in the fitness centers.

INVESTIGATION OF FIR FILTERS SUITABLE FOR POWER-LINE INTERFERENCE EXTRACTION FROM ECG

Georgy Mihov

***Abstract:** Ten non-recursive filters were investigated for power-line interference extraction from appropriate ECG segments. This extraction is a part of the subtraction procedure for interference cancellation, which is known to not affect the own signal frequency components overlapped by the interference band. The filters were tested in equal conditions defined by a set of real ECG signals mixed with 50 Hz synthesized interference. The impulse, the frequency and the phase responses of the filters were analysed. The filter efficiency is evaluated on the base of several errors, which were calculated as differences between the ECG signals before and after applying the subtraction procedure.*

SUBTRACTION METHOD FOR REMOVING A POWERLINE INTERFERENCE FROM ECG: CASE OF POWERLINE FREQUENCY DEVIATION AND NON-MULTIPLE SAMPLING

Georgy Mihov, Ratcho Ivanov, Chavdar Levkov

***Abstract:** Extension of the subtraction method for removing from ECG signals a power-line interference, which deviates around rated value and non-multiple sampling rate, is proposed. A permanent criterion for finding linear segments in ECG is used and a new modification of the linear criterion is introduced that retains needed features for non-multiple sampling. Simplified formulas for extrapolating the interference in non-linear segments of ECG and for dynamic recalculation of filter's coefficients are derived too. A simplified algorithm is elaborated and experimented. The existing version is improved and adapted to the dynamic deviations around the rated power-line frequency. Experiments with 60 Hz power-line frequency show that the proposed procedure successfully compensates abrupt and gradual changes of the power-line frequency allowed by the standards.*

HEMOCARE ANNOUNCEMENT SYSTEM FOR PEOPLE HAVING INJURES

Ivo Iliev, Serafim Tabakov

***Abstract:** The idea of applying high technology in homecare is to improve the medical services and facilitate the recovery of the patient. During the recent years, there was a rapid growth in the development of maintenance telemedicine systems and monitoring devices for patients with chronic diseases and those requiring continuous telemonitoring treatments. Wireless technologies hold great promise for using in this area, which requires high mobility and where physically wired connections are not a feasible solution. In this paper a system for assistance of elderly and people having injuries is presented. The aim was using wireless technologies to develop simple and user-friendly system directed to improve the life style of this group (more than 7%) of people. In addition a proposed collision free protocol for data transfer is discussed in details.*

AUTOMATIC ANALYSIS AND VISUALIZATION OF MULTILEAD LONG-TERM ECG RECORDINGS

Vessela Krasteva, Ivo Iliev

Abstract: Long-term ECG data collected during physical exercises (stress tests) and ordinary daily activity (holter recordings) are necessary for extended diagnosis of ischemia and transient cardiac arrhythmias. Owing to the computer-assisted systems, the cardiologist decision is considerably facilitated by fast methods for automated ECG analysis. The main requirements to such sophisticated system are high accuracy for identification of each normal and abnormal cardiac contraction, correct measurements over the beats' waveform, as well as adequate visualization of the results in the context of easy diagnostic interpretation. This work presents a PC-based application for automatic analysis of multilead ECG recordings. It implements fast algorithms for multilead QRS detection and classification of the QRS waveforms considering each user-selected channel. Categorized long-term diagrams are plotted showing the timing of each consecutive beat. The RR-interval trend is also provided. Signal-averaged technique is applied to obtain noise-free and stable P-QRS-T pattern at preset time-intervals during physical exercise. Continuous measurements of the P-QRS-T patterns allow the tracing of any changes provoked over time. Adequate graph representation facilitates the iterative visual identification of such changes. The basic software is opened for cardiologist-assistant supplements.

EMBEDDED SYSTEM FOR VIDEO AND SIGNAL PROCESSING

Slavy Mihov, Dimitar Dimitrov, Krasimir Stoyanov, Doycho Doychev

Abstract: Embedded microprocessor systems are becoming more and more widespread in techniques and machinery. In this paper, is made a description of a custom built system based on Analog Devices Blackfin processor family (ADSP-BF531/2/3). The system operates under Linux, which gives it flexibility and universality as an embedded solution for several of tasks. Some typical applications of such a device are: processing of audio and video signals, Ethernet connectivity (routers, switches gateways, access points and embedded servers), specialized systems for monitoring and control and so on. The involved hardware provides essential computation power at reasonable cost, which makes the system applicable in scenarios with high requirements. It's up to the software what the exact functions of the embedded device will be. The use of an operating system is a great benefit for it, allowing high level control of the available resources.

ELECTRICAL DESIGN OF THREE-PHASE BRIDGE DIODE RECTIFIERS WITH ACTIVE-CAPACITIVE LOAD BY MATLAB

Evgeniy Popov, Liliya Pindeva

***Abstract:** Three-phase bridge diode rectifiers with active-capacitive load can be applied for energy conversion in simple wind power generators or in controlled a.c. electrical drives with squirrel-cage induction motors. They pose specific problems to the engineers. The known methods (the "eastern", based on the assumption that the voltage across the filtering capacitor is almost even and the "western") are generally created for electrical design of single phase diode rectifiers. They are graphic-analytical and of course suffer from limited accuracy and waste of time. The r.m.s. value of the rectifier supplying current is specified. The standard supplying power related to the d.c. power, the output (load) characteristic, the harmonic components related to the first harmonic and the distortion coefficient of the supplying current are also obtained. MATLAB programs for exact graphical representation of the functions, participating in the full electrical design of the rectifiers and for computer-aided design implementation are created. PSPICE simulations confirm the results for some practical examples.*

INFLUENCE OF INPUT INDUCTANCE OVER DYNAMIC CHARACTERISTICS OF SINGLE-PHASE SHUNT ACTIVE POWER FILTER

Mariya Petkova, Mihail Antchev

***Abstract:** This paper presents the influence of input inductance over dynamic characteristics of a single-phase active power filter. Mathematical description is made and relationship among filter inductance, response time and other parameters of the system load – active power filter is derived. 3D graphics built using found formulas, simulation and experimental results are presented.*

SPECIAL OPERATION FEATURES OF THE OUTPUT TRANSFORMER OF SERIES ACTIVE POWER FILTERS

Vanjo Gurgulitsov, Mihail Antchev, Mariya Petkova

***Abstract:** This paper examines several special operation features of the output transformer included in the schematic of a series active power filter. Results enabling to found an output data to design the transformer are included. Also, graphics from a computer simulation and oscilograms from experimental study of a laboratory model are presented.*

IMPROVING THE PARAMETERS OF AN INDUCTIONAL SURFACE HARDENING FOR ONE FREQUENCY AND DIFFERENT SPECIFIC POWERS PER CM²

Pany Karamanski, Tsvetozar Hristov

***Abstract:** One of the main purposes of this article is to make a comparison among inductional heating for one working frequency of 30 kHz and different specific powers per cm². Another task is to make a volume analyze of the surface and the whole volume of the hardened object and at the same time to define the quality of the hardening and the one of the internal part of the dense cylindrical detail.*

GPRS SYSTEM FOR MONITORING OF BREAK - DOWN AND TRANSIENT PROCESSES AT CURRENT SOURCE PARALLEL INVERTERS

Vladislav Veselinov

***Abstract:** This article is dedicated to the realization of a GPRS system for monitoring of break-down and transient processes of a converter for induction heating. A structural scheme and an algorithm of work are represented and the influence of the system for control upon the security of work of the power electric device is summarized. The main parameters which the system can follow and which determine the arising of a break-down process are described. Due to this the main ways for reduction of the heating influence of the break-down current through the undamaged devices after a failure are defined. The suggested algorithm can be used for development of systems for control.*

A SIMPLE METHOD FOR STABILIZATION OF ARBITRARY SPECTRA

Ludmil Tsankov, Mityo Mitev

***Abstract:** A method is proposed for stabilization of spectral data with arbitrary form. The method is based on the hypothesis that the successive measurements of a spectrum represent the same statistical distribution but in different X-scales. The transformation between X-scales is found by calculation of the moments of the distributions. It can be further used for either recalculation of the spectral data in order to be processed together, or as a feedback signal for online stabilization of the data acquisition system. The calculations are extremely simple in the case of a linear transformation between both X-scales; in that case they can be performed directly on a microcontroller. The method is illustrated for long series of spectral records of the gamma-radiation using scintillation detectors.*

DOSIMETRIC CONTROL SYSTEM FOR A NUCLEAR ELECTRONICS TRAINING LABORATORY

Mityo Mitev, Emil Dimitrov

***Abstract:** Analyzing the specific nature of working with radioactive sources in the Nuclear Electronics training laboratory we have formulated the precise requirements for the Dosimetric equipment. It has been proven that the stipulated requirements could be met by a dosimeter, functioning by the spectrum weight function method, using a NaI(Tl) scintillation detector. The provided simulation and experimental data confirms the aforementioned conclusions.*

THE POWER QUALITY AND THE MEASUREMENT OF HARMONICS

Angel Stanchev, Stefan Ovcharov

***Abstract:** This paper has a purpose to explain the concept of harmonics at Low Voltage Supply Systems, which are part of the Power Quality Measurements. The work describes the main sources of the harmonic voltages and currents, the effects of harmonics, and the objectives of power quality measurement. In this work are given also the values of individual harmonic voltages in percentage of the nominal voltage correspondent to EN50160. It is shown and described the block diagram of analog front end circuit for measuring the harmonics of three phase 4-wire power supply network. The results of all studies are explained and the conclusion is made at the end of the paper.*

SPICE MODELING OF TAGUCHI SENSORS

Boyanka Nikolova, Georgi Nikolov

***Abstract:** The detection and monitoring of gases with metal oxide type sensors is become a well-established practice. Modern signal processing systems are usually composed of a variety of components, electrical as well as nonelectrical (e.g. sensors and actuators, fibre optics). More complex technical systems and higher levels of integration of electronic circuits lead to new requirements on the design process of modern signal processing systems, especially on modeling and simulation. Besides multi-level-simulation of electronic circuits the analysis of nonelectrical components becomes very important for efficient system design. Methods for describing behavior of nonelectrical systems are essential for their modeling and simulation. This paper presents design methodology for analogue behavior modeling for describing the behavior of metal oxide type sensors for SPICE based simulators, which initially come from the field of circuit simulation. Simulation results of an example gas monitoring system are shown.*

HAZARDOUS GAS MONITORING USING VI SERVER

Georgi Nikolov, Boyanka Nikolova, Marin Marinov

***Abstract:** Today there is a great deal of interest in the development of gas monitoring systems for application of gas leaks, detection of harmful gases in mines, home safety, exhaust gas monitoring etc. In all this fields of investigation, a key matter is the need of flexible and practical virtual instruments, a way to easily expose the gas sensors to hazardous levels of gas concentration. This paper presents a conceptual architecture for a versatile, flexible, cost efficient, portable system for monitoring the gas presence in the air. The software platform – in terms of virtual instruments – is developed under LabVIEW programming environment and to be specific VI Server technologies. VI Server features for internet connectivity are used in order to cover a large monitoring area.*

COMPUTER CONTROLLED SETUP FOR PRECISE ELECTRICAL MEASUREMENTS – A STEP TOWARDS THE VIRTUAL INSTRUMENTATION

Ivaylo Jivkov, Maria Alexandrova, Deyan Dimov, Radostina Kalinova, Vessela Nikolova, Vladimir Denishev

***Abstract:** Virtual instrument for low current and low noise DC electrical measurement based on Keithley 617 electrometer is developed. The software consists of two parts operating in parallel threads – GUI accepting the commands from the operator and a cycle for the data acquisition and control. The device is tested by measurement of resistor with high value of 100 G Ω . Taking the linear regression of the measured data it was found that the value of the conductance obtained is $1.29(\pm 0.001) \times 10^{-11} \Omega^{-1}$, which gives a resistance of 77.6 G Ω . The intercept of 6×10^{-16} A obtained also from the linear regression demonstrates the low offset current of the device and the low leakage current in the whole measuring circuits.*

AUTOMATED SYSTEM FOR INVESTIGATION OF RESISTANCE TEMPERATURE DEPENDENCE OF HIGH TEMPERATURE SUPERCONDUCTORS

Mityo Mitev, Elena Nazarova, Emil Dimitrov, Anton Zahariev, Jordan Georgiev

***Abstract:** The requirements to an automated system for the temperature dependence investigation of resistance in high temperature superconductors (HTSC) were analyzed. The experimental problems within a real sample are shown. The constructed system and the calibration experiments with a superconducting sample of $YBa_2Cu_3O_{7-\delta}$ were described. The achieved measuring accuracy of temperature was 0.05 K and of voltage 1 μV .*

INVESTIGATION OF ELECTRONIC INSTRUMENTS AND METHODS FOR WEB-BASED ENERGY MANAGEMENT SYSTEM DEVELOPMENT

Peter Yakimov, Stefan Ovcharov, Nikolay Tuliev, Emiliya Balkanska

Abstract: *Energy management systems exchange enormous amounts of information requiring quick access and data security. The communication and integration of data from various control centers, power plants, and substations, have become necessary. SCADA (Supervisory Control and Data Acquisition) systems are essential parts of the energy management systems that employ a wide range of computer and communication technologies. The paper presents development an electronic device to be connected to Internet-based SCADA system.*

OPTIC SENSOR FOR THE JOINT OF A WALKING ROBOT

Todor Djamiykov, Mladen Milushev, Marin Marinov

Abstract: *This paper illustrates the process of study and choice regarding a sensor for motioning of walking robots. Typical for all walking machines is the need of a effective force-to-weight ratio. Based on preset parameters a sensor prototype for a six-legged mobile robot joint had been chosen. To meet the requirements all possibilities for reaching the goal by using oprons with air entrance, integral illumination-frequency commuter and photodiode lineal had been investigated. Explicated are the characteristics and the basic conceivable parameters of diverse variants.*

TACHOMETER – CYCLOMETER WITH PROGRAMMABLE LOGIC

Yavor Donkov, Todor Djamiykov, Atanas Rusev

Abstract: *This paper presents the technical decision of tachometer which is realized with program logic. A distinguish feature of the suggestion is the using functional transformation of the number next impulses in order to reach a result in rpm. This way there is no need of mathematical operations multiplication and division. The device is programmed with language from upper level VHDL on Xilinx's crystals.*

ATMOSPHERIC MOISTURE MONITORING USING LABVIEW

Georgi Nikolov, Boyanka Nikolova

Abstract: *This paper is dedicated to design and implementation of a virtual system for atmospheric moisture parameters measurement, monitoring and logging. The main purpose is to demonstrate new developments made with a multifunction data acquisition (DAQ) system, integrated sensors, graphical programming environment and new generation of DAQmx drivers. Initially, the data acquisition can measure and record temperature, absolute pressure and relative humidity. The other parameters related to moisture are derived by appropriate calculation using build in LabVIEW functions. The suggested system can be used for both lab and field measurements. It is especially convenient for field projects since the data acquisition system is portable and light. It is clear that this convenient tool will help faculty in both teaching and research, as well as help engineering students.*

THE LITTLE TRANSISTOR AND THE CCAS REVOLUTION

Alexander Athanassov

Abstract: *A scientific trip through the years - from the birth of the first transistor to the contemporary Computers, Communications and Automation Systems (CCAS). How did the first transistor start the worldwide technology revolution – the microprocessor power, RAM, Global Net and changed the world as a whole.*

BEHAVIOR MODELING OF ELEMENTS OF THE STRUCTURE OF ANALOG ARRAY

Ivan Panayotov, Emil Manolov, Philip Philipov

Abstract: *In this paper the way of creating universal AMS (Analog and Mixed Signals) HDL (Hardware Description Language) models for the elements of the structure of Field Programmable Analog Array (FPAA) chips is discussed. These are programmable chips that perform analog functions and are similar to digital FPGA (Field Programmable Gate Array) chips. They give analog designers flexibility to easily evaluate and prototype different designs. Analog description languages such as VHDL-AMS and Verilog-AMS gain popularity as instruments for mixed signals modeling and simulations. They make it easy to model systems on high behavior level of description, to perform mixed-domain simulations and to design using modern system on chip approach. Building universal models of the elements of FPAA structure will allow more complex simulations to be made with universal HDL-AMS simulators.*

BEHAVIOR MODELING OF DC/DC BUCK CONVERTER

Ivan Panayotov, Tihomir Brusev, Marin Hristov, Philip Philipov

***Abstract:** In this paper the implementation of analog extensions of Hardware Description Languages for behavior modeling and simulations of DC/DC converters is described. The design sequence from high level model to block level is examined. The system like description and top-down methodology are considered for behavior verification. The DC/DC converter was considered as entire system, so mathematical equations can be used to model the behavior of its functionality. This will represent the high level behavior model of the circuit. This model gives the ability to analyze functionality of the system on high level assuming different control techniques and characteristics. Particularly the buck converter was examined as it is widely used and with known structure. Hardware description language model reduces simulation time and initial design efforts.*

INVESTIGATION OF THE THERMAL INTERACTION BETWEEN AN ISOTHERMAL CYLINDER AND ITS ISOTHERMAL ENCLOSURE OF AN ELECTRIC JUNCTION

Nadezhda Kafadarova, Anna Andonova, Georgi Georgiev

***Abstract:** This article deals with numerical simulation of air flow and heat transfer in an electric junction box comprising conductive metal wire rods each having a cylinder shape in cross section. Results obtained by a commercial CFD package widely used for electronic system temperature predictions. The paper gives considerable insight into the nature of the enclosure heat transfer and an indication of the accuracy of a widely used predictive code.*

MODIFIED COMPACT MODEL OF MOSFET WORKING UNDER ESD STRESS

**Anna Andonova, Elisaveta Gadjeva, Polyva Draganska,
Galin Pavlov, Ivan Marinov**

***Abstract:** A modified compact model to simulate the high current characteristics of a MOSFET working under ESD stress is developed. The model realized with current source is used to demonstrate the better accuracy of simulated I-V characteristics for the snapback region. The variation of the simulated output I-V characteristics from gate voltage values is presented graphically.*

THE INFLUENCE OF FABRICATION STEPS ON SELECTED PROPERTIES OF POWER DMOS TRANSISTOR

Malinka Ivanova, Daniel Donoval, Juraj Marek, Andrej Vrbicky

***Abstract:** The high-voltage power DMOS transistors are widely used for various power electronic applications as motor controls and power switching supplies. Research and optimization of their characteristics is one of the challenges of power MOS transistor design. The Technology CAD (TCAD) tools support process and device simulation and help to predict the technology parameters for achieving required structure parameters. In presented paper the influence of fabrication steps and structure parameters on the selected properties of power DMOS transistor are analyzed by 2-D numerical modeling and simulation.*

DESIGN AND PRODUCTION OF PRECISE THICK FILM CIRCUITS USING PHOTOLITHOGRAPHIC TECHNOLOGY

Simona Partinova, Tihomir Takov

***Abstract:** Fodel® Photoprintable Thick Film Pastes made by DuPont guarantee that printed circuits made by using these pastes benefit from both the recognized reliability of ceramic materials and the higher image density that is common for the thin film circuits by increasing the density in the X-Y plane by 400-500% compared to the conventional screen printing process. This is achieved without a reduction of technological tolerances by improving lines and spaces resolution and by reducing the size of vias. In this paper we are going to review the design and fabrication of a multichip module (MCM) by using photolithographic methods to create thick film layers in hybrid circuits.*

NANO SEMICONDUCTOR DEVICES, INCLUDING MOLECULAR SEMI- CONDUCTORS

Rostislav Rusev , Boris Atanasov , Tihomir Takov , Marin Hristov

***Abstract:** New types of semiconductors for microelectronics needs are proposed. In the first part of the article single electron transistors, their physical characteristics, constructive features and problems related to its V-PADOX technology construction are described. In the second part colloidal semiconductors in photo-conversion devices are presented. In the third part of the article a description of monolayer chemical technology for construction of organic semiconductors is made. Different organic diodes and transistors, constructed on the base of monolayers, their designs and their physical foundations are shown. A comparison between advantages and disadvantages of known devices and of the new types of semiconductors is made.*

WO₃ THIN FILMS DEPOSITION ON QUARTZ CRYSTAL RESONATORS FOR APPLICATIONS IN GAS SENSORS

Stefan Boyadjiev, Milka Rassovska

***Abstract:** The present research is focused on the preparation and properties of sputtered transition metal oxides thin films. WO₃ films of various thickness were deposited on quartz resonators in order to use the quartz crystal microbalance method for studying their gas sensing properties. The influence of oxygen partial pressure and substrate temperature on the composition, crystal structure and optical properties of the films was investigated. The films' microstructure and physical properties were identified by Raman spectroscopy analysis. To study their optical properties the methods of infra-red spectrometry and laser ellipsometry were also used. The final objective of the research is the application of these thin films in gas sensors.*

“TAILORED” CONDUCTIVITY OF SEGMENTED POLYDIPHENYLACETYLENE THIN FILMS FOR MICROELECTRONIC APPLICATION

Ivaylo Jivkov, Maria Alexandrova, Radostina Kalinova, Christo Jossifov, Elena Runenkina, Georgi Dobrikov, Milka Rassovska

***Abstract:** New types of segmented polymers based on polydiphenylacetylene (PDPA) were synthesized and characterized. Measurement of current-voltage (I-V) characteristics of a representative samples show that bulk charge carrier injection dominate the conductive process rather than contact limited transport. Comparing the I-V characteristics measured from different segmented polymers based on polydiphenylacetylene shows that increasing the length of the non-conjugated part of the molecule decreases the material conductivity. This result demonstrate the possibility of “tailoring” the conductivity by changing the length of the non-conjugated part of the segmented polymer molecule.*

MICROSTRUCTURE AND OPTICAL PROPERTIES OF ITO THIN FILMS INVESTIGATED FOR HEAT MIRRORS IN SOLAR COLLECTORS

Georgy Dobrikov, Milka Rassovska, Stefan Boiadjiev, Kostadinka Gesheva, Peter Sharlandjiev, Albena Koserkova

***Abstract:** The aim of this work is preparation of RF sputtered ITO thin films for application as heat mirrors in solar thermal collectors. The alteration of optical properties and behavior in IR spectra of additionally treated films was investigated. The films were deposited on silicon and glass substrates by RF sputtering on vacuum installation A-400 VL. For deposition of films were used targets with composition indium-tin 90:10 and 95:5 mol%. The films microstructure was studied by TEM and SEM. Optical and electrical properties as well as microstructure of the films change considerably after heat treatment.*

The measurements in IR range of as-deposited ITO layers and heat treated ones were performed by Fourier transform infrared spectrophotometer Shimadzu Prestige 21. The as-deposited ITO films showed 45% in the Infrared, and after annealing at 5000C additional treatment, the films showed reflection in IR range not exceeding 60% at longer wavelengths. The films have high visible transmission measured with CARY 5E – spectrophotometer.

ACCELEROMETER DESIGN

Krassimir Denishev , Mihaela Petrova

***Abstract:** Much effort is being applied to the development of intelligent, autonomous Micro Electro Mechanical Systems (MEMS). One kind of such devices, these are Accelerometers. Nowadays, they find very large applications in different areas of life, science and techniques. Contemporary microelectronics and microelectronic technologies give the possibility to design and to produce an acceleration sensing device, together with the data processing system in the same production cycle, on the same semiconductor substrate, so called “smart sensors”. In the present paper, an explanation of the principles of operation, technological ways of production and application are given. A Microsystems Accelerometer is designed and presented.*

MICROPUMPS FOR MEDICAL APPLICATIONS

Krassimir Denishev, Boryana Trencheva

***Abstract:** Much effort is being applied to the development of autonomous Micro Electro Mechanical Systems (MEMS). In their full and total configuration, Microsystems consist of sensor part, data processing part and actuator part. One kind of actuator devices, these are Microfluidic Pumps. Nowadays, they find very large applications in different areas of life, science and techniques. Contemporary microelectronics and microelectronic technologies give the possibility to design and to produce Microfluidic Pumps, with very small dimensions and weight, low power consumption and very high reliability. In the present paper, an explanation of the principles of operation, technological ways of production and application are given. A Piezoelectric-driven Microfluidic Pump is designed and presented.*