



**Engineering**  
solutions

**DESIGN AND  
ANALYSIS  
SERVICES FOR  
ELECTRONICS**



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*CEO/Founder*  
*Engineering Solutions*



Engineering Solutions provides the services of contract development of electronic devices.

**Our services:**

- circuit design and analysis;
- PCB design and analysis;
- enclosure and box design;
- design and development for electronic devices.

Each item is scrupulously verified via analysis and simulation to reduce time and money spent on debugging and development.

We deliver the highest quality within the shortest time.

World's best practices show that analysis helps identify and resolve issues during the development stage, providing the following benefits:

- lower cost of the product's lifecycle;
- reliability and performance of the product and the system as a whole;
- decrease of the number of iterations needed for the sample product to meet all the technical requirements;
- high probability of passing the actual-use test on the first try;
- strong correlation between modelling and EMI tests results.

We offer analysis as a separate service to build an engineering team with our clients.

**To secure our Customers' project files we sign a non-disclosure agreement.**



### Quality Guarantee

Support is provided up to the production stage



### Express service within two (working) days



### Customer-oriented approach

Project cost management



### Recommendations

based on design and manufacturing experience



We use the Cadence Sigrity tool for Printed Circuit Board (PCB) analysis. The powerful set of Sigrity simulation and verification tools allows testing power supply systems, high-speed interfaces, EMC, etc.

**The CAD type is not a constraint**, the PCB project data can be imported from any well-known CAD system (Altium, Cadence, Mentor Graphics, etc.)

# CIRCUIT ENGINEERING



Our company designs circuits for a variety of devices:

## High reliability electronic products

Our circuit design considers the following operating conditions of a device:

- wide temperature range (from  $-60^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ );
- increased loads;
- high loads strong electromagnetic influences;
- unstable power supply.

The devices are robust reliable, fail safe, and long-lasting.

## Products for Industrial Purposes

Our circuit design considers the following operating conditions of a device:

- industrial temperature range (from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ );
- broad range of input voltage;
- electromagnetic interference;
- periodic loads;
- harsh environmental conditions.

The devices are used in industrial automation, automotive electronics and special tool engineering.

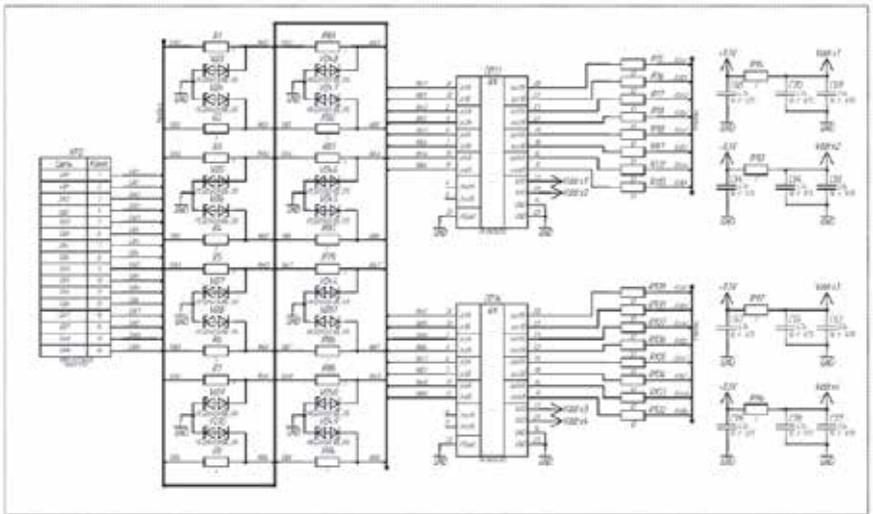
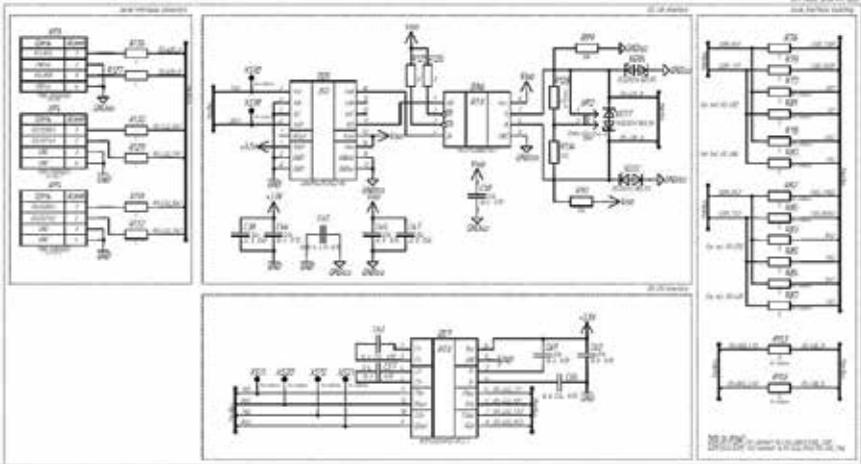
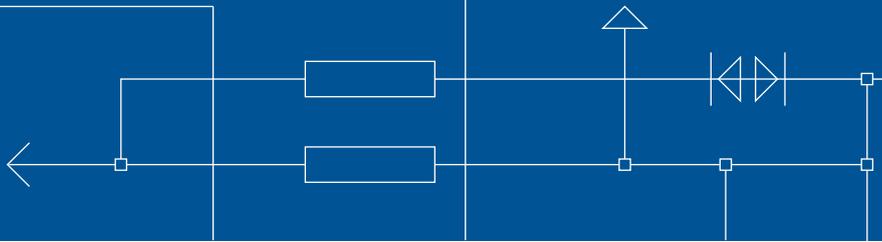
## Devices of general and commercial use

Circuit development is based on generic principles and the Customer's technical specifications.

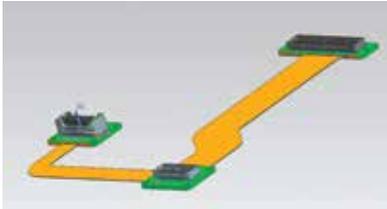
Our engineers are highly skilled in:

- developing electronic devices based on FPGA, ASICs, microcontrollers, and microprocessors;
- designing DDR and high-speed interfaces (PCIe, SATA, Gigabit Ethernet etc.).

**Circuit documentation meets the industrial Standards. For device development we use widely available components.**



# PCB LAYOUT SERVICE



We offer design and routing of PCB of any complexity. We can design a PCB from scratch, or a Customer's underway project, or a circuit that we have already designed for the Customer in the previous work stage.

## **Our PCB designers pay a particular attention to the following:**

- obtaining the PCB-outline dimensions from the Customer;
- definition of the PCB class;
- selection of materials, in the view of further manufacturing;
- PCB assembly type: automatic, selective, manual;
- number of layers and PCB stack-up, considering the necessary values of the trace impedances;
- application of precise 3D models of components in order to construct a full 3D model of the PCB and use it for enclosure testing;
- pre-routing analysis of the digital and complex analog nets;
- meeting high-speed interfaces requirements;
- design according to IPC standards (IPC-2221, IPC-7351) and manufacturers' recommendations;
- post-routing analysis of the power nets, high-speed interfaces, and analog signals;



- maximum test coverage via additional technological elements for JTAG (IEEE 1149), peripheral scanning, and external measurement equipment;
- preparation for PCB production;
- panelization;
- uploading Gerber and drilling files;
- issuing documentation for assembly;
- support in the production stage and in the spare part selection.

**All documentation meets the industry standards. Our company works in cooperation with local and international PCB manufacturers and component suppliers.**



# EXTERIOR DESIGN: ENCLOSURES



**Our designers work on projects of any level of complexity.**

They design:

- device structure;
- enclosures, boxes, and cases;
- assembly components.

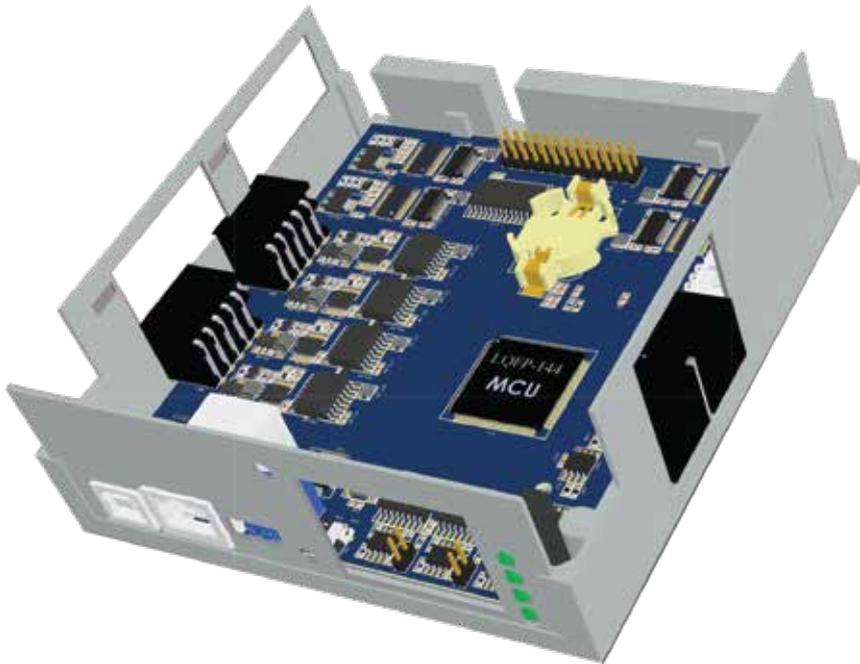
**Our work experience helps us to successfully develop the following boxes and cases:**

- hermetic aluminum enclosures for severe operating conditions;
- light-sheet metal boxes for general use;
- rework of standard commercially available;
- plastic molding;
- customized solutions, for exhibitions or experiments.

**When developing boxes and cases, we consider:**

- durability;
- thermal control;
- screening with additional passive methods for EMC provision;
- convenient assembly, servicing, and cable lining of the device;
- cost efficiency;
- weight and size minimization;
- meeting the cutting-edge requirements of ergonomics and design.

Cases are designed in mechanical CAD systems with a mandatory arrangement of the PCBs inside. Development meets the manufacturer's production requirements.



# ANALYSIS



## Power Integrity

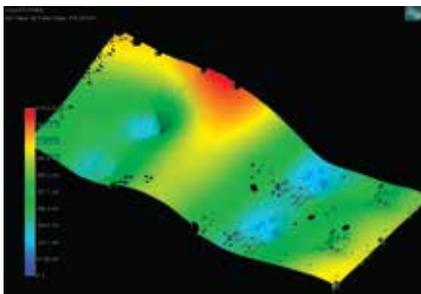
Experienced engineers know that a successful development mostly depends on the power quality.

Analysis of power distribution and electromagnetic radiation, created by the electronic module, helps to significantly improve the stability of high-speed interfaces and eases the adjustment of a device under extreme conditions.

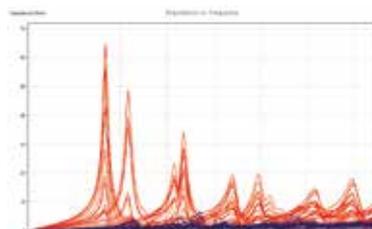
### We offer:

- currents calculation (current density and voltage drop) considering the heat conditions of an electronic module;
- impedance calculation of power nets and identification of resonance frequencies;
- optimization of a matrix of filtering condensers;
- minimization of electromagnetic radiation at operating frequencies.

Power polygons EMI calculation



Optimization of impedance polygons

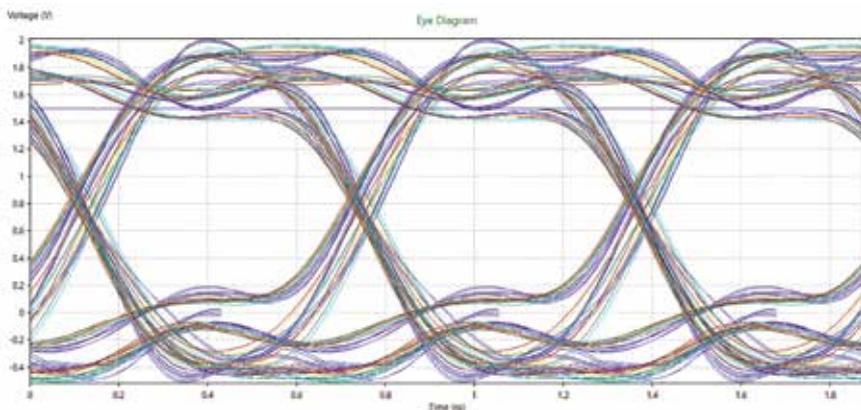


**Electromagnetic compatibility tests are becoming predictable!**

## Signal Integrity (SI)

Modern high-speed interfaces are extremely sensitive to the quality of the signal nets routing. Following all the manufacturer's recommendations might be difficult or, at times, simply impossible.

Searching for an optimal solution is a time-consuming procedure, which the time-frame of a project does not normally allow for. Therefore, one of the hardest tasks is to ensure within the shortest time that the interface works at maximum speed.



**Our company specializes in simulation of high-speed interfaces (DDR, PCI, PCIe, USB, HDMI, SFP+, etc.).**

### **We provide:**

- extraction of s-parameters of single and differential signal lines (evaluation of insertion loss and return loss, crosstalk);
- modeling of high-speed interfaces, considering inconsistent power supply conditions;
- eye diagram estimation, selection of the best tuning options for the transmitter and the receiver.

## Thermal Analysis

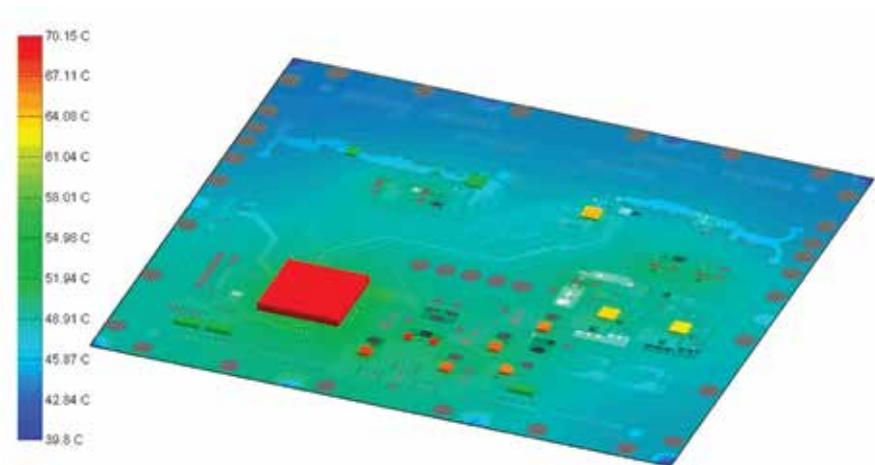
It is a challenging task to ensure a device functionality in the wide temperature range. At  $-60^{\circ}\text{C}$ , the device has to quickly boot up; at  $+125^{\circ}\text{C}$  it has to be cooled to avoid localized overheating.

We offer you cooling (and heating) verification services to support your design engineers during the design phase.

In our thermal simulations of electronic devices, we take into account heating due to electric current.

### We solve the problems related to:

- thermal conductivity in solid bodies;
- hydrodynamics (air or water cooling);
- analysis of the thermal condition of an electronic module taking into account heating due to electric current.



# ENGINEERING CONSULTING



We gladly share our experience in electronics development, providing consulting services. We will help you find the most effective solution and develop a strategy for your project's success at any stage.

## **Our consultants provide you help with:**

- optimization and sequencing of the project stages;
- quality control;
- standardization of the documentation;
- technical and economic justification for the components use;
- pre-production approvals;
- technical and commercial proposals for the project;
- modeling and analysis of a project based on its physical and electrical characteristics.

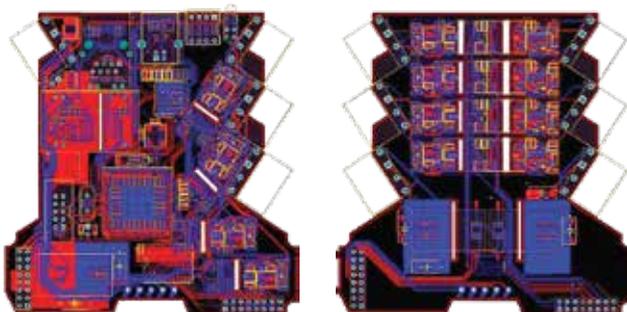


## Customized device development

Our company offers a full range of Research and Development (R&D) services and turnkey solutions for various purposes.

### The scope of our services includes:

- preparation and coordination of technical specification;
- identification of the device's structure and its architecture;
- selection of optimal components;
- schematic design;
- cable system development;
- development and programming of electronic modules;
- layout development;
- development of testing equipment;
- enclosure development;
- manufacturing and launching of a prototype;
- issuing a complete documentation package;
- upgrade of an outdated product using a new component base.





**Our distinguishing qualities are:**

- adherence to the project timeline;
- scheduled status reports;
- maximum coverage of development stages and unified project management;
- preparation of the documentation according to industrial standards;
- knowledge of the specifications of the products used for different purposes in various environments;
- one work group deals with both circuit engineering and mechanical design.

## Development of AUTOMATION SYSTEMS

We have highly qualified industrial automation specialists.

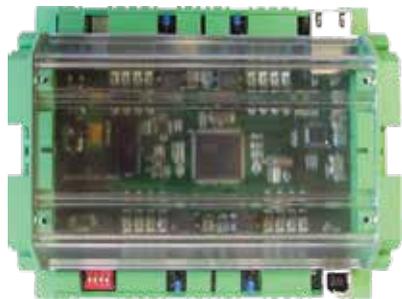
We provide the whole cycle of solutions for automated process control and unified management systems.

In our projects, we use time-tested equipment. If the market does not offer a certain device, our experts develop devices for a specific automation project.

Our extensive experience provides our Customers with ready-made solutions for a variety of industrial sectors: electric power, oil and gas, chemistry, food, and medicine.

### Our services:

- development of architecture for automation systems;
- technical documentation for automation systems;
- selection of control units and equipment for data collection;
- selection of remote field equipment and sensors;
- development of testing equipment;
- software development for automation systems;
- development of imitators and stands for enterprises and educational institutions.



## Development of Computing Devices

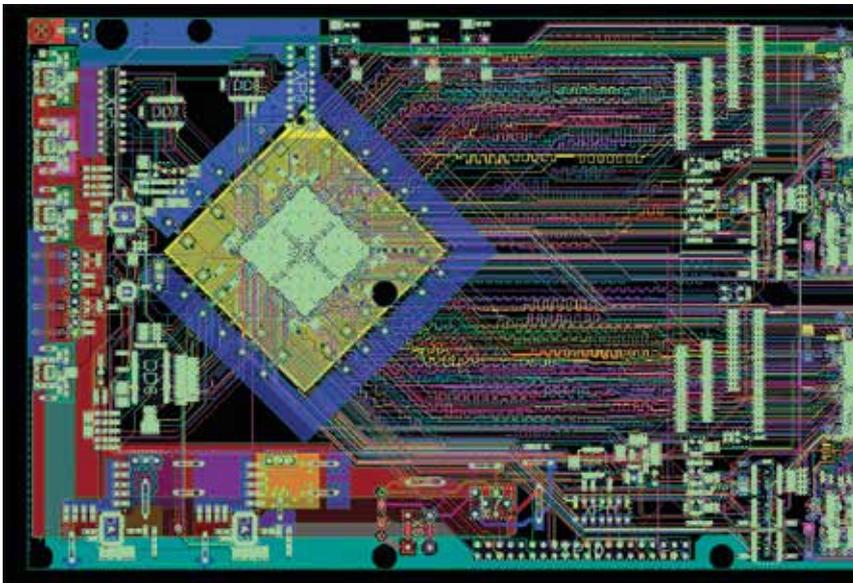
Our engineers develop a wide range of computing devices, from portable and compact (PC-104) to computer stations (form-factor Compact, ATX, etc).

We provide:

- localization of previously developed devices;
- device refinement according to the Customer's requirements.

We analyze Power Integrity (PI) and Signal Integrity (SI) of high-speed interfaces (DDR, PCIe, SATA, HyperTransport, HDMI, USB, SFP+, etc.). We simulate a cooling system, evaluate the thermal condition of the device at the most probable operating scenarios.

Besides the documentation, the Customer obtains interactive instructions on maintenance and repair.



## **Development of Devices for Demanding Application**

Our company has vast experience in developing electronics with requirements of high reliability, fail-safety, and durability. We provide circuit stability at the following operating conditions:

- a wide temperature range (from  $-60^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ );
- increased loads;
- strong EMI;
- unstable power supply.

### **The devices are tested with a variety of computational methods:**

- spice-circuit simulation;
- reliability analysis;
- analysis of Power and Signal Integrity of high-speed interfaces (DDR, PCIe, SATA, DDR, HyperTransport, HDMI, USB, SFP+, etc.);
- optimization of the electromagnetic radiation of an electronic module to provide electromagnetic compatibility;
- calculations of the device's preheating for a cold start;
- evaluation of the cooling system sufficiency for keeping the temperature of the electronic components within the predefined range;
- strength analysis including identification of the resonance frequency identification and structure optimization.

**| Our device design meets the highest customer demands.**

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