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Contact us

System design

PROSE defines system requirements in line with both the customer's needs, as well as relevant standards such as EN 50129 and 50155. For safety-related devices, PROSE conducts a hazard analysis and on that basis assesses safety and functional requirements specification (SFRS). For non-safety-related devices, PROSE evaluates the hardware architecture specification (HAS) directly and then produces the hardware requirements specification (HRS).

Schematic design

To implement the HRS, PROSE performs the following tasks: electronic component definition (including for microprocessors, integrated circuits and resistors), circuit simulation, partial circuit test in laboratory (breadboard, 1000-hole board) and library component drawings. Once we have completed these tasks, we draw the schematics.

Design of the printed-circuit board

Once PROSE has implemented the system and schematic designs, we perform printed-circuit-board (PCB) design, including the definition of layout and number of layers, clearance and creepage distance, route width, galvanic isolated zones and footprint placement. We then route the PCB and deliver the Gerber files ready for mastering. We also deliver 2D and 3D PCB drawings.

Mechanical design

Mechanical design is another fundamental stage of the electronic engineering process. PROSE designs the board's external layout in line with EN 50121 for EMC/EMI compatibility. In keeping with our comprehensive approach, we also design the front panels, serigraphy, earthing and connector coding.

Firmware design

When creating very-high-speed integrated circuits (VHSIC), PROSE uses the VHSIC hardware description language (VHDL) to design the firmware of complex, programmable-logic devices (CPLD) and field-programmable gate arrays (FPGA). Our extensive expertise also enables us to perform low-level software design and test-application design.

Prototyping

To produce a prototype of an electronic device, PROSE buys the electronic components needed to build it and sends the Gerber files and components to the manufacturer in charge of producing the PCBs and mounting the components on them. Once the prototype boards have been built, PROSE loads the software onto them - including the firmware, low-level driver software, final application or test-application software.

Functional test

In the functional test phase, PROSE first performs a bench test to simulate the work environment of the device, including rolling-stock inputs and outputs, speed-sensor signals and communication. We then perform a functional test of the device's interfaces. If some functional tests fail, we fix the hardware bugs in the laboratory and report them on the schematic, and, if necessary, also on the PCB routing or in the firmware VHDL programming. We then issue the next hardware release. If required, PROSE also conducts functional tests in the field. If the device passes all functional tests, the so-called freezing of the hardware takes place at the end of this phase and the prototype is ready for the type tests.

Type tests

When the prototype has passed all functional tests, PROSE conducts a variety of type tests concerning issues such as conducted-voltage emissions, radiated emissions, immunity to electrostatic discharge, radio frequency electromagnetic fields, fast transient bursts, surges, conducted-radio-frequency electromagnetic fields, supply overvoltage, performance, insulation, dry heat, low temperature, stress screening and vibration. If the prototype passes these tests, it is ready for mass production.

