EASYLOGIX.DE
PCB-Investigator

PCB-Investigator PHYSICS

Thermal Management made easy

PCB-Investigator PHYSICS Version

➔ You are looking for a tool for the thermal management of your PCB?

➔ You are, however, overwhelmed by the overloaded tools that can simulate almost everything?

➔ Your goal is to quickly deliver reliable results to avoid later thermal problems?

Then...

Then the Edition PHYSICS of PCB-Investigator is exactly the right choice for your specific needs. Particularly hardware engineers and electronic designers appreciate PHYSICS for its easy handling and its specialized applicability in their everyday work.

The PHYSICS version includes all functionalities of the DEVELOPER version and additionally offers the possibility of thermal simulation during the layout phase of circuit boards. As a result, you can tackle the thermal management of your design even in the design phase and work with reliable results to avoid delays and unnecessary costs. **The primary focus remains on the simple handling to provide you, the customer, the highest possible benefit.**

PCB-Investigator PHYSICS

As an electronics designer or a hardware engineer...

you may be working in an innovative industry such as LED lighting, electric mobility or renewable energy. Creating products for the modern world means constantly pushing the limits of PCB technology and design techniques while testing the limits. Consequently, the development of power electronics has followed the same trend for many years. The components are becoming ever faster, smaller and more effective. Not only the requirements for electromagnetic compatibility (EMC) are thus increasing, but a concept for thermal management needs to be developed, too. Power semiconductors such as MOSFETs and IGBTs, for example, block increasingly larger voltages, the current densities become progressively higher while they switch ever faster.

Heat output as a quality factor

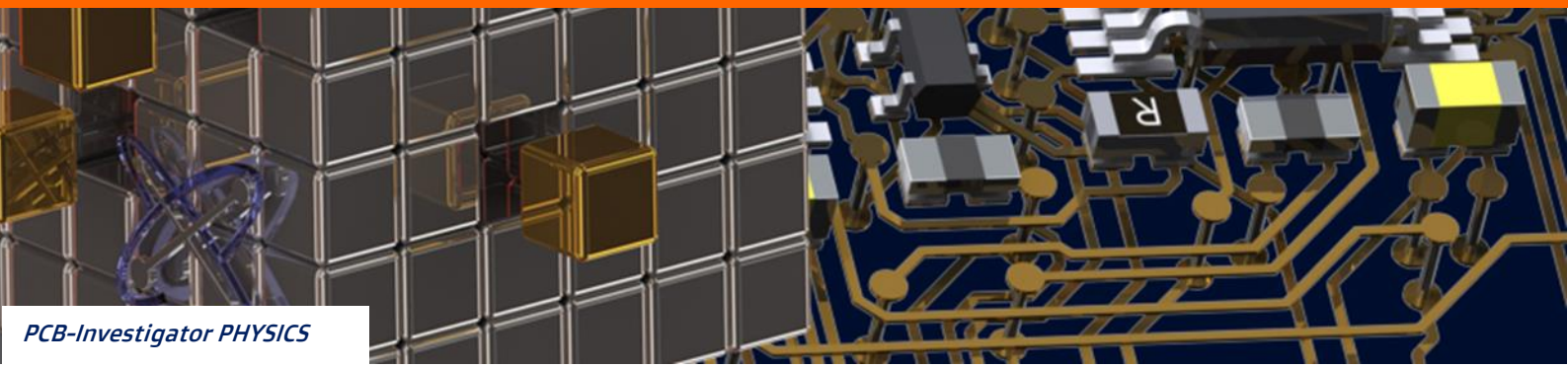
Given the general trend towards miniaturization with increasing power loss density, the thermal output of an assembly becomes an important quality factor in electronics production that cannot be ignored any longer. In addition, interest in power electronics is growing constantly, since the corresponding industries are also experiencing increasing demand. The need for electrical power management and control is rising (Smart Grid) while renewable energy generation and control (wind power, photovoltaics) has become an enormously fast-growing sector, not only because of the emerging environmental awareness. The sector of electric transport and electric mobility (electric cars) is also following this trend and is currently booming. Moreover, there is a desire to steadily push operating efficiency. In these sectors, power electronic converters are widely used to vary voltage, current or frequency. The power output ranges from a few milliwatts in e.g. smartphones to many megawatts in high-voltage direct current transmission (HVDC). In other words, power electronics is less about information transmission, which is supposed to reach ever higher speeds. The main focus is on high efficiency and the associated low power losses

What are the reasons for the failure of electronic systems?

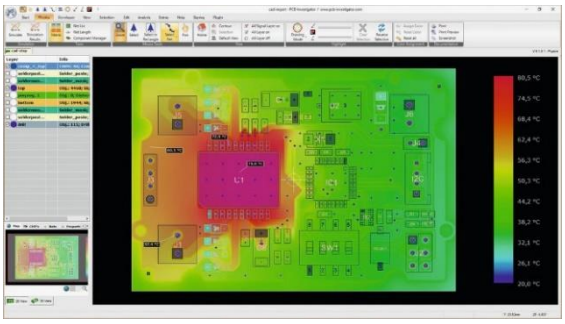
Besides dust, humidity and vibrations, temperature is an enormous influential factor. In order to drive the reliability of power electronic systems to a maximum and to be able to virtually exclude temperature-related failures, an efficient concept for thermal management is absolutely essential. As the trend towards miniaturization continues, the heat output per unit area is also on the rise, meaning that more and more heat is being dissipated onto an ever-smaller surface area. Let's take as a striking example high-power LED system, which are used for lighting in the majority of modern households due to their high efficiency and long service life, alongside other areas such as vehicle headlights and signaling technology. However, at the same time, in this example about 60% of the electrical power is converted into heat instead of light. Consequently, it is necessary to consider this heat output in the production of LEDs. It also has to be taken into account that these systems may no longer be safe to touch due to the heat emission and that a lack of thermal management or the resulting efficient dissipation of heat increases the probability of failure and may potentially lead to a reduction in service life. Components like soldering and bonding wire connections suffer enormously from the high thermal stress they are exposed to.

Avoid thermal problems in time

With PCB-Investigator PHYSICS we are able to offer you a tool allowing you to perform a thermal simulation right when creating the PCB layout to



avoid thermal problems before they can even occur. So, you can guarantee the thermal management of your PCB at an early stage of the manufacturing process and thus avoid high costs through the production of prototypes, which may have to be redesigned due to for instance hotspots. This also leads to saving time, as you can eliminate thermal problems at an early stage.



The image shows a thermoscan as a result of the simulation with PCB-Investigator PHYSICS.

Thermal simulation simplified

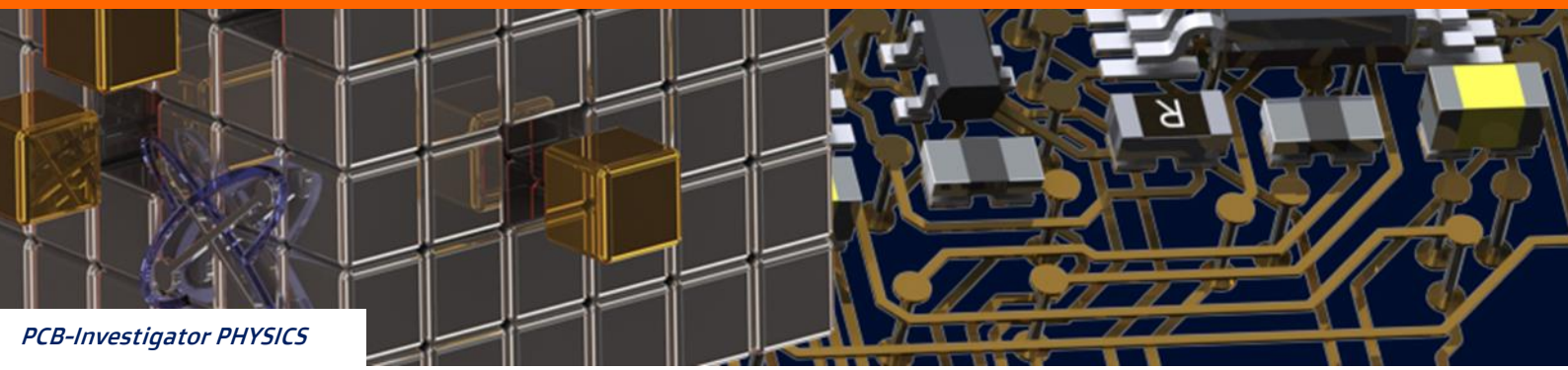
So far, thermal simulation has mostly been the task of specialized physicists or part of the mechanical evaluation of PCB design. In most cases, such software programs proved to be very difficult to use and included such a great number of functions so that this has often led to the exclusion of this task as a special field of analysis.

A quick familiarization with the tool or the short-term generation of reliable findings regarding heat management were not possible. Rather, this caused long waiting times until a result was received from the responsible department and you knew whether there were any changes are to be made or not. PCB-Investigator PHYSICS is designed to simplify this cumbersome work and to provide a simulation tool for the development process of the printed circuit board, that is easy to use and exclusively dedicated to the specific area of PCB design. The aim is to help every electronics developer to carry out a thermal simulation of his design independently and without too much effort. Waiting times are a thing of the past and the time-to-market can be increased significantly. As a developer, you can now discover the problematic heat development of the later product very early in the development process and systematically avoid it. Embedded in the CAD/CAM software, the thermal simulation is at your disposal at the push of a button - without the need to consult an additional expert.

Proven technology as a basis

The underlying engine of PCB-Investigator PHYSICS is the specialized software TRM ("Thermal Risk Management") from ADAM Research, well-established and widely recognized throughout the industry for many years. TRM and thus also our tool PHYSICS is designed to include multilayer boards, SMD heat sources, embedded components, pins, inlays, busbars, vias, blind and buried holes in the simulation. The aim is to achieve the highest possible reliability of the results. In comparison, simulation and infrared thermograms of finished PCBs normally agree within ±10% or better. The visualization of the results corresponds to a thermography and in some cases even exceeds it in accuracy. For example, the simulations in PHYSICS show hotspots even in inner layers that cannot be reliably detected on the surface by thermography. Based on the information available in the CAD/CAM software, PCB-Investigator PHYSICS shows the temperature increases caused by component power loss and currents. The current density, such as in copper bottlenecks or in holes, as well as voltage drop and line resistance between pins on each layer are calculated in one step. In addition, time-dependent transient simulations can be performed. This enables you to determine how the PCB heats up and cools down again over time!

Time-dependent switching states and power losses, so-called operating states, are also taken into account. The analyses thus become even more precise and realistic. You are able to show the temperatures that are reached at any given point in time or how long it might take for the PCB or a part of it to reach a critical temperature.



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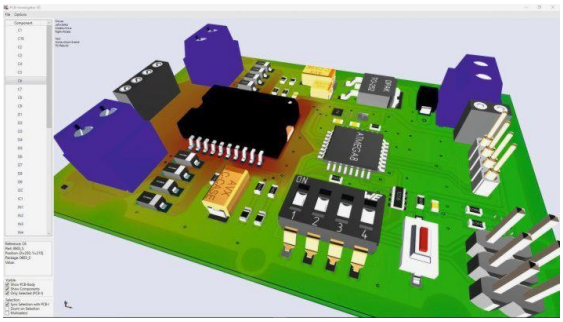
Visualization of the results

For documentation purposes, all simulation results can be saved as an interactive HTML report. Results are visualized as virtual thermal images to get the best possible overview and to additionally facilitate the analysis. Thermal images are provided for each copper and prepreg layer as well as detailed maps of current density, potential and voltage drop, temperature dependent material properties and local heating power. Using this realistic and easy-to-understand presentation, it is easy to convince your management department of the efficiency of PHYSICS.



The image shows a fully assembled board in 3-D view. You can see how the heat accumulates under the big black component.

If you choose the PHYSICS version of PCB-Investigator...

We will equip you with the perfect tool to simulate the physical behavior of your PCBs while still in the development phase. In addition, the PHYSICS version contains all plug-ins of the DEVELOPER version. PHYSICS enables you to find thermal hotspots, critical track resistances and excessive voltage drops - even before prototyping begins and errors can no longer be easily corrected! With the integrated editing functions of PCB-Investigator PHYSICS, you can even optimize the layout and stack-up according to the simulation results to achieve the best possible physical behavior with just a few clicks! After all, one of the most important characteristics of our simulation tool is its ultra-easy operation. Even without days or even weeks of intensive training, you can obtain reliable and meaningful results within a very short time. Save valuable time and prototype costs with PCB-Investigator PHYSICS.

The PHYSICS version contains among others the following functions:

- Transient thermal simulation with operating states
- Current density & voltage drop simulation
- Automation interface and script engine
- Additional import/export formats (e.g. GenCad, IDF, IPC2581)
- Bare Board Analysis (DRC)
- Creepage Analysis
- Capacity & Impedance Calculator
- Hazard Analysis
- Connector Analysis

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About PCB-Investigator

CAD/CAM –Software for Electronics

The best system available to investigate all information of Printed Circuit Boards!

PCB-Investigator can be delivered in six versions. Each is designed for a specific area of application and contains particular plugins to ideally meet the requirements of the respective field of application.

- BASIC version including the main features for visualization and measurement
- ULTIMATE version with access to all plugins for mostly single users
- FABRICATION version to support your production process
- PRODUCTION CONTROL version for the export of machine formats
- ELECTRONIC DEVELOPER version to ensure the best possible functionality of your PCB
- PHYSICS version for thermal management

To test PCB-Investigator in detail, simply download the full version and work with it for a full 30 days, free of charge and without any obligations.

With PCB-Investigator, anyone can find the right edition for their requirements. More information about the editions and demo version can be found at www.pcb-investigator.com.