Xpedition Design for Reliability (DfR) - Virtual HALT

Xpedition®

DATASHEET

Overview

Industry statistics indicate field failure rates of up to 15%-20% in the first year of newly launched electronic products, resulting in warranty claims and high levels of field returns. Xpedition® DfR enables PCB design weaknesses to be detected early in the design phase, reducing costs and shortening design time.

Xpedition DfR provides two options for quick PCB design simulation:

- Vibration calculates relative stress and deformation values to pinpoint weak links in contact areas of leads and pins of PCB components in your design. The results are later translated to probability of potential component failure.
- Constant Acceleration is a linear static analysis that allows constant acceleration to be applied to the PCB design to calculate von-Mises stress, deformation, and safety factors, which are later translated to pass/fail values for components.

Xpedition Enterprise users have an easy and intuitive integration to Xpedition DfR simulations. Simulation results are simplified, allowing the electrical engineer to quickly identify the problematic areas and resolve them within their design.

PRODUCT BENEFITS:

- **Design** with more than 4.5 million parts in our 3D starter library.
- **Visualize** and immediately identify problematic parts with our simplified results.
- **Simulate** during the design process to determine PCB reliability and reduce field failure rates.
- **Detect** components on the threshold of failure that would be missed during physical testing.
- **Analyze** pin-level Von-Mises stress and deformation to determine failure probability and safety factor.
- **Automated** simulation setup, up to 100X faster than existing methods.

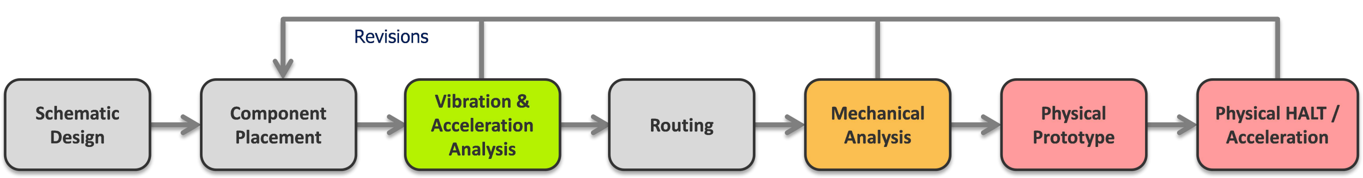

Figure 1 - By augmenting mechanical analysis and physical testing with vibration and acceleration simulation early in the design process, design teams can improve product reliability and reduce time to market.

3D Component Library

Data preparation is streamlined with Xpedition's 3D library. Xpedition DfR includes a starter library with over 4.8 million parts and 4000 unique 3D solid models. Not only do these models have a photorealistic view, but also contain the physical parameters in order to run an accurate simulation. You will no longer need to dig up datasheets and contact manufacturers to get the material and physical properties of the model. With the 3D starter library you will be able to analyze your design immediately.

As well as providing a large 3D library, users will have access with 3D parametric tools to quickly model their component with no mechanical design experience! The automatic component generator allows users to simply use our 3D model templates to automatically generate a model using defined dimensions.

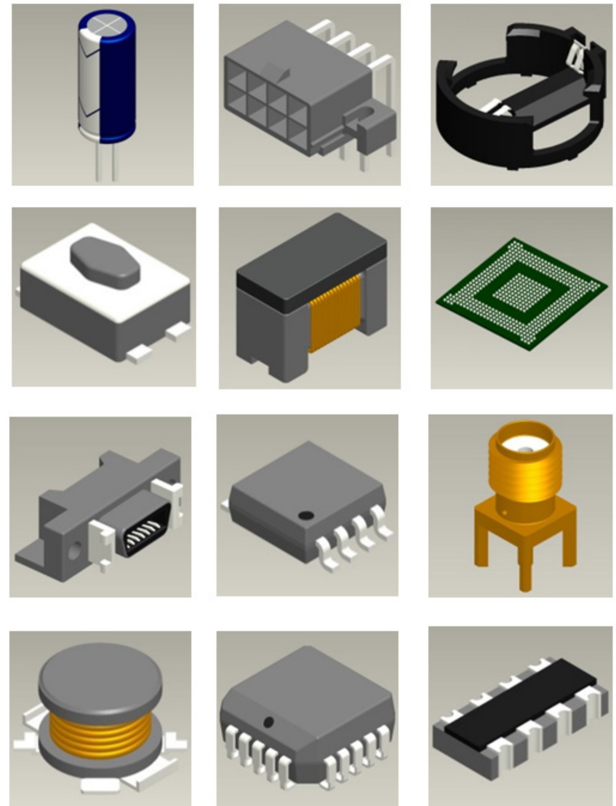

Figure 2 - Mentor's 3D library models

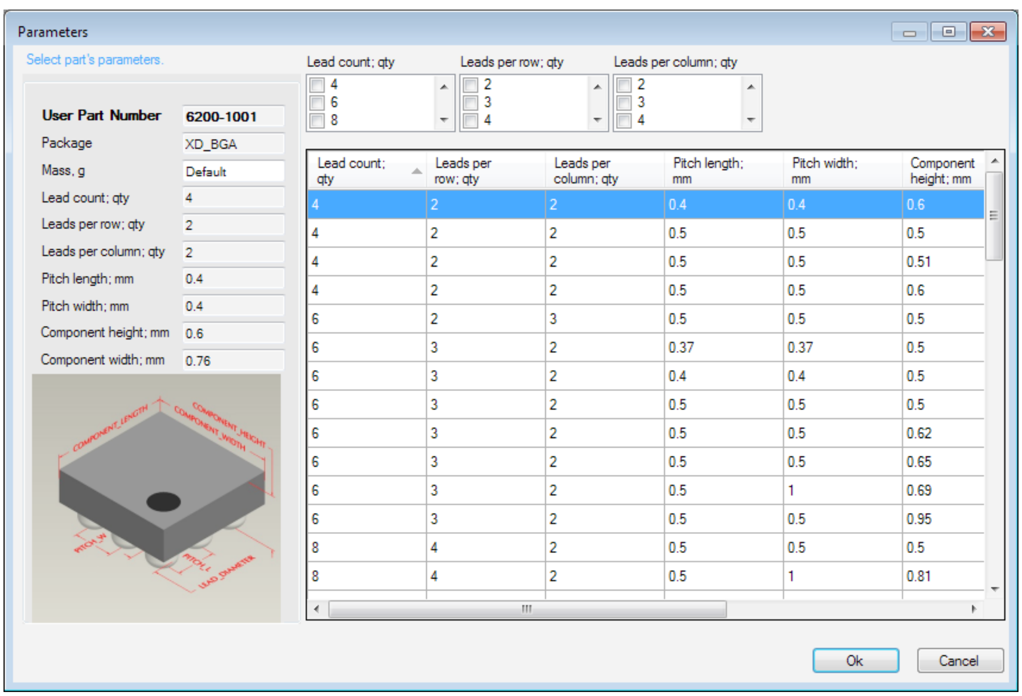

Figure 3 - Xpedition DfR automatic component generator

Preparing for Simulation

With Xpedition DfR, meshing is optimized for the electrical domain, thus reducing setup time and making it easy to identify appropriate issues for your product.

Boundary conditions can be pre-defined using jigs or mounting holes to ensure that the same environment is analyzed when the product is placed in the field. Users can create "what if" scenarios by defining an area they wish to place a boundary constraint, allowing users to identify and potentially resolve high deformation and reliability issues.

Xpedition DfR directly integrates with the physical layout, automatically taking into account the layer stackup from the layout tool for use during simulation. Manufacturing data can be imported directly to generate a virtual prototype

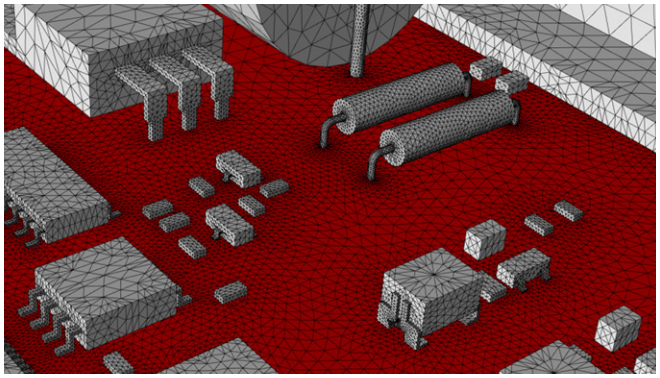

Figure 4 - Automatic PCB assembly solid model mesh

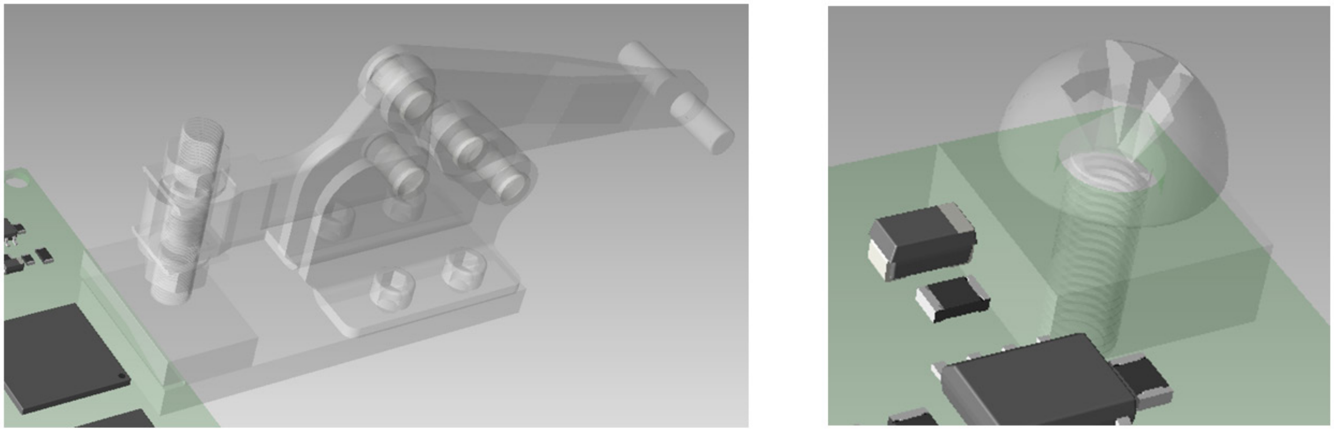

Figure 5 - Boundary conditions can be pre-defined using jigs (left) or mounting holes (right)

Vibration Simulation

Physical vibration testing determines reliability and identifies design and process flaws. Virtual vibration simulation is new novel approach in design for reliability – based on a patented algorithm for failure prediction and a rapid & accurate fully automated finite elements analysis. Xpedition DfR Vibration predicts reliability and failure by simulating simultaneous random vibration in six axes. Similar to physical lab testing, Xpedition DfR Vibration provides information about components' design weaknesses and predicts failure risk.

In addition, Xpedition DfR provides detailed information down to the pin-level, including relative stress intensity, relative deformation intensity, failure frequencies, and vibration-deformed shapes. The output data are more extensive than those generated in the laboratory, providing additional information and extended insight into PCB design weaknesses.

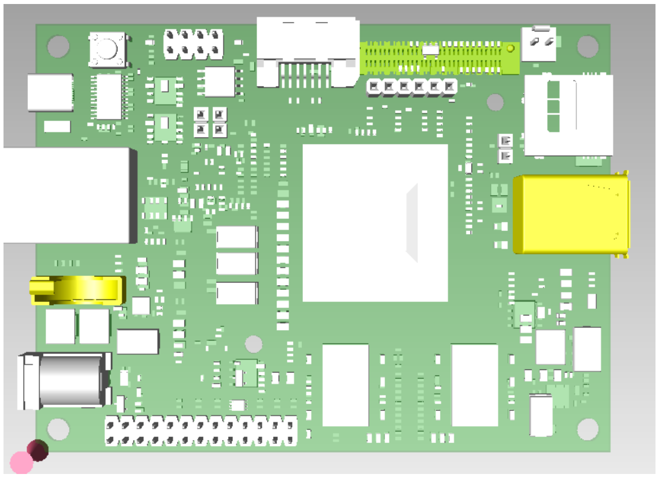

Figure 6 - Vibration simulation provides information on stress intensity, deformation intensity, failure frequencies, and vibration-deformed shapes

Acceleration Simulation

Not only can the designer decipher the part failure prediction, due to vibration by identifying the failure frequency or natural modes in the design. Xpedition DfR can also determine the safety factor of a particular component due to stress. Constant Acceleration is a linear static analysis that enables you to identify reliability issues by applying a force to induce stress onto the board. Acceleration values can be set to any of the X, Y, and Z axes, either separately or simultaneously, to enable simulation of real-life high-acceleration environments. By analyzing the stress induced on the board you will be able to extract information on the safety factor of the part, pin-level Von-Mises stress and pin-level deformation.

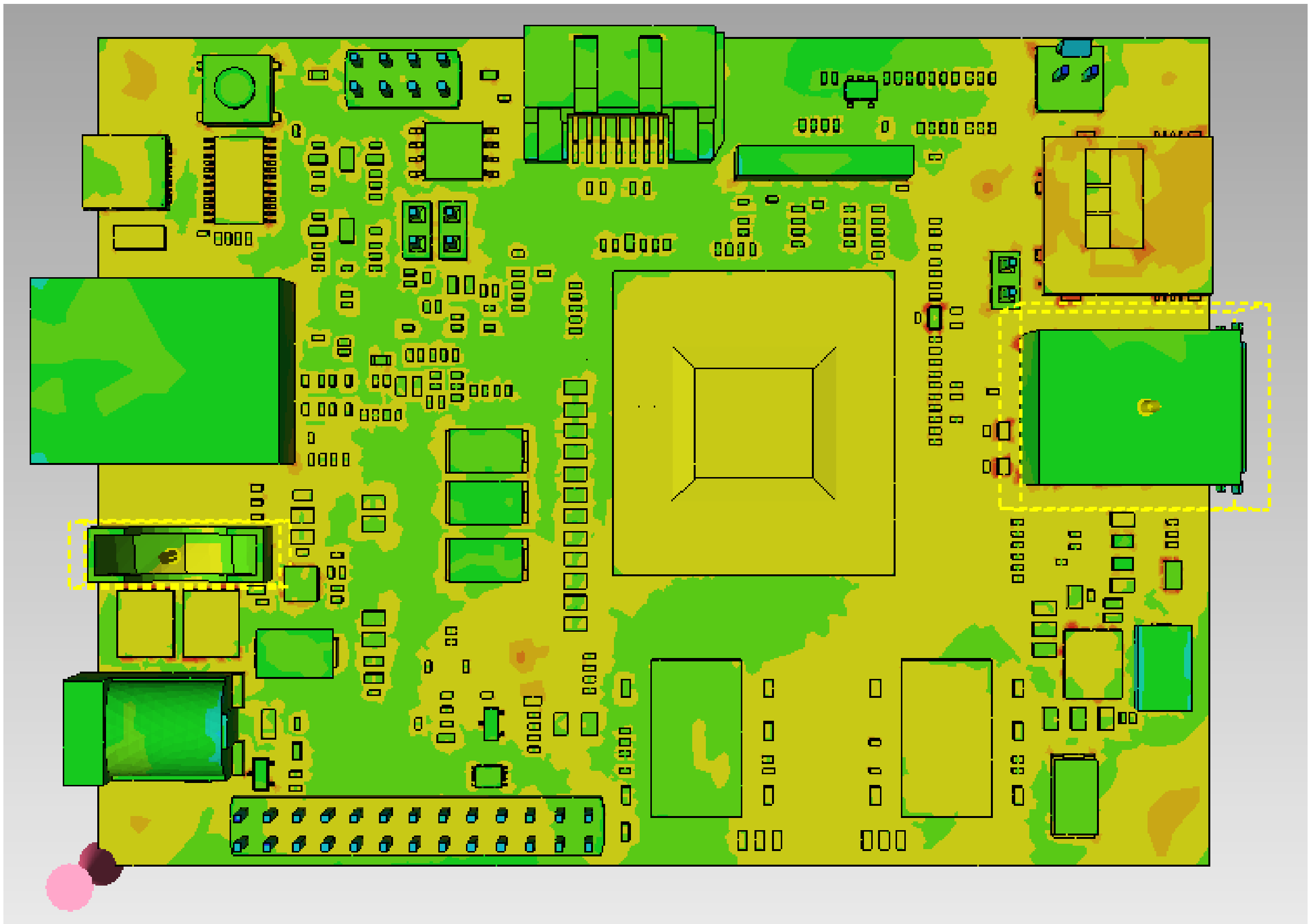

Figure 7 – Xpedition DfR simulated stress intensity

Simulation Results

Xpedition DfR Vibration and Constant Acceleration provide an intuitive two-phase post-processor for each simulation. The simplified post-processor view directly highlights problematic parts allowing users to detect and correct potential component failures in the field. This allows a user with no product reliability expertise to directly decipher fatigue and vibration issues within their design easily. The advanced view mode allows you to dig deeper and identify the direct cause of the product failure. The advanced view plots relative stress intensity distribution in the component pins, balls, or leads, resulting from the simultaneous six axes of random vibration during vibration or linear static acceleration during stress analysis. Documentation is automatically created providing the simulation results and virtual prototype to capture the true design intent and resolve reliability issues within the full design group.

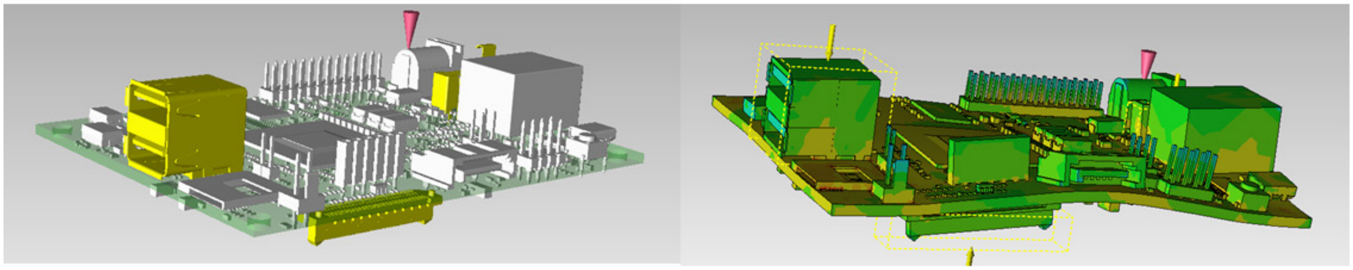

Figure 8 - Simulation results are shown in a two-phase post-processor for each simulation, providing broad input on the PCB's behavior under the defined conditions.

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