fiXtress™

BQR
Reliable Engineering
Optimized Maintenance

Precise

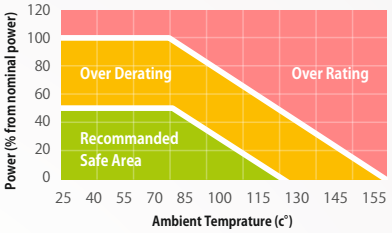
Automated Electrical Stress Analysis for NPI, DfR and Verification Teams

Design for Reliability

- Detects Electrical Stress Analysis (ESA) and design errors before PCB production
- Optimizes component selection
- Provides thermal placement guidance
- Provides actual accurate Mean Time Between Failure (MTBF) and Service Life

BQR's fiXtress Precise replaces the complex implementation of Kirchhoff laws in AC & DC stress calculations with an automated and innovative process, while accounting for component operational modes.

fiXtress Precise identifies over stressed and over-designed components, thermal-placement guidance, accurate stress derating analysis and provides MTBF reports.

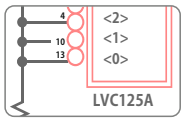


The Ultimate Stress Analysis Method

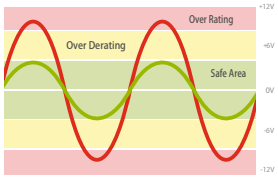
During stress simulation, fiXtress Precise considers the operational mode of each component in order to calculate the actual voltage, current and power derived from each component mode. A transistor, for example, may have three operational modes: Saturation, Off, Linear.

fiXtress Precise creates a model representing the components connected through the Net List and applies each operational mode to calculate the worst-case scenarios. For example, fiXtress check different parameter for different states - Saturation Mode: junction temperature, Off Mode: Vce and Linear: power dissipation.

The results show a full derating profile for each aspect (voltage, current and power) for each operational mode. Over-stressed and over-designed components are identified and recommendations are made for optimal rating.
fiXtress Precise is provided with predefined derating profiles and enables their customization, as needed.



Design error that fiXtress will detect:
The missing connection to pin 10 was blinded by the pin number



Voltage Stress by Oscilloscope

Electrical Stress Analysis (ESA)

ESA includes DC, AC and BUS simulations, provides accurate real operational results, runs on a final design and is used as a final gate for design approval before layout and manufacturing.

- DC simulation accounts for all voltage drops.
- AC simulation uses clock frequencies and other signals that affect power dissipation.
- BUS simulation toggles all digital signals in order to calculate the current required by all the inputs of a single BUS line. In addition, it checks whether the output can provide the required current.

fiXtress Precise can use circuit characteristics stored in the fiXtress Rapid module. in order to save time for Verification teams that can then use this data in fiXtress Precise to perform electrical stress-level simulations

Thermal Design Placement Guidelines

By estimating the average PCB heat level above the PCB environment temperature, fiXtress Precise automatically calculates the exact junction temperature for each semiconductor and IC. This analysis produces thermal design placement guidelines in the form of a Pareto list.

MTBF and Service Life Predictions

fiXtress Precise provides accurate MTBF and service-life predictions based on the actual temperature and electrical stress (voltage, power, current) imposed on each component. This valuable information is extremely useful for planning warranty periods and optimizing spare parts.

BENEFITS

- Accelerates time to market by reducing design cycles
- Optimizes component rating/size selection
- Improves system reliability & MTBF
- Ensures adherence to derating guidelines
- Optimizes thermal design placement
- Reduces potential field failures
- Reduces power consumption, facilitating compliance with Green standards
- Facilitates warranty period and spare parts planning

FEATURES

- Fully automated stress analysis Provides stress levels based on real scenarios
- Detects stress errors before PCB layout
- Enables selection of component ratings based on predefined and customizable derating guidelines
- Implements standard Net-naming guidelines
- Provides thermal placement guidance
- Provides real MTBF calculations based on actual electrical stress and temperature

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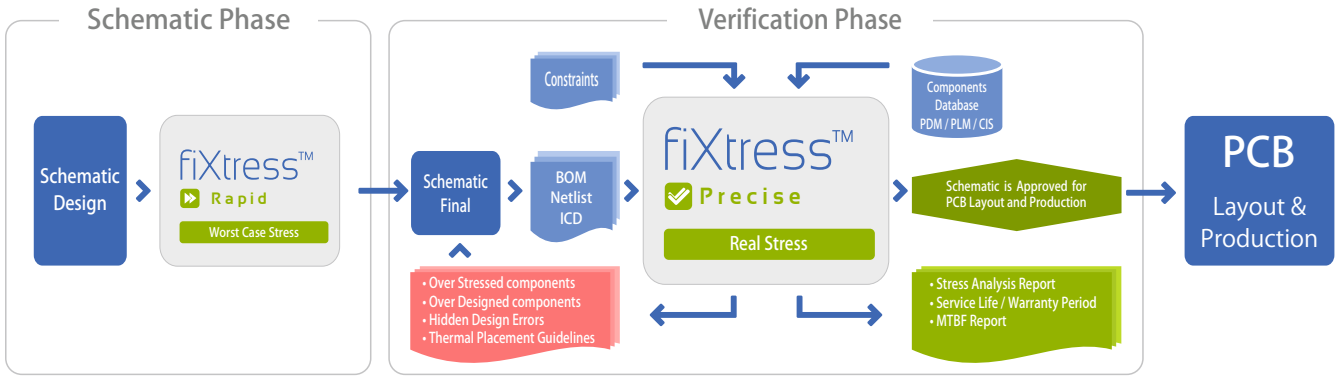
fiXtress Precise Workflow



fiXtress Precise imports:

- **Netlist and BOM Import:** The final Net List and BOM
- **ICD Import:** The Inter-Connect Document (ICD), which defines the power supply source input and circuit loads.
- **DC/DC Converters:** The input, circuit type and required output from the DC to DC converters. For example, Step-Down , Step-Up, Flyback, Inverting, Half-forward and SEPIC.
- **Clock Frequencies:** The Clock rates of the ICs.

fiXtress Precise Analysis

It is recommended to filter out design errors by using fiXtress Schematic Review before performing stress analysis.

- The schematic design, represented by the BOM and Netlist, is used to simulate the electrical stress of the components. These calculations use data from the Components Database, such as stress ratings and stress calculation parameters.
- This data is used to simulate real operational stress parameters, such as power dissipation, voltage, current and junction temperature. These calculations use ICD data for the power input constraints and loads.
- Analysis includes DC, AC, BUS simulation and thermal modeling.
- fiXtress Precise then checks whether the components' stress values meet the derating criteria based on actual operational inputs.

Output

fiXtress Precise uses the stress analysis results to provide the design engineer with the following output:

- A list of over-stressed components
- A list of over-designed components
- Design errors derived from stress issues
- An actual MTBF and service-life report based on real stress
- Thermal placement guidelines in the form of a Pareto list, starting with the components that have the highest temperature, for optimal placement during layout

fiXtress Precise should be used as-needed until the design is completely error-free. Once completed, the design can be approved for PCB layout and production.

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