CalcePWA Software

A simulation based failure assessment solution of printed wiring assemblies.

![CalcePWA Toolbox](image)

Figure 1 CalcePWA Toolbox

What Is CalcePWA Software?

The calcePWA software is used to perform simulation based failure assessment of printed wiring assemblies. The software includes thermal analysis, vibration analysis and failure assessment capabilities. The algorithms implemented within the software are based on existing scientific knowledge that has been assembled through review of text books, published articles, and research conducted within the CALCE Consortium. The software is developed and maintained by the CALCE Electronic Products and Systems Center at the University of Maryland and is available to members of the CALCE Consortium.

Capabilities of calcePWA

The calcePWA software provides facilities to create a computer model of a printed wiring assembly. Modeling is facilitated by form driven interfaces and the ability to create re-usable data libraries of material and part data. Model development is also facilitated by import
routines for common electronic computer aided design software used in generating printed wiring board layouts including:

Mentor Boardstation - Mentor Neutral Files
PADS PCB – Ascii text files
Zuken-Recal – CADIF files
Cadence Allegro – IDF files
and others.

Thermal Analysis

Steady state temperature of individual printed wiring board layers and components can be determined using the calcePWA thermal analysis module. The software allows simulation of conduction, natural convection (vertical and horizontal), radiation, forced convection, and air cooled cold plates. Thermal analysis performed using a finite difference approach and control volume theory.

Vibration Analysis

Dynamic characterization of a printed wiring assembly including up the first six fundamental frequency and mode shapes is available through the calcePWA vibration analysis module. The software provides response assessment for a random vibration or a shock input and determines curvature and out of plane displacement of the circuit card. Vibration module provides support for simple, clamped, rotational and translational spring boundary
conditions. The vibration analysis is conducted using finite element modeling approach with a modified plate element.

![Figure 3 Vibration Analysis Display](image)

Failure Assessment

Failure assessment is conducted on a defined printed wiring assembly and defined life cycle loading conditions. Based on the hardware and the loading condition, individual failure sites are identified and time to failure is estimated. This assessment is conducted based on a defined set of failure mechanism models that have prescribed input requirements that are extracted from the design and loading data. Failure mechanism models include:

- Package to board interconnect failure due to temperature cycling, vibration, and shock.
- Plated through hole (PTH) failure due to temperature cycling.
- Die metallization failure due to corrosion in under temperature humidity bias.
- Die metallization failure due to electromigration under temperature humidity bias.
- Die oxide failure due to time dependent dielectric breakdown under temperature, humidity, bias.
Figure 4 Failure Assessment Display

Supported Computer Hardware and Operating Systems

Software is designed to run on modern computers and workstations including:


- Sun Sparc workstations running Sun Solaris 9.

More Information

For more information regarding the calcePWA software, please contact visit the CALCE Software Web site at

http://www.calce.umd.edu/software

or contact

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