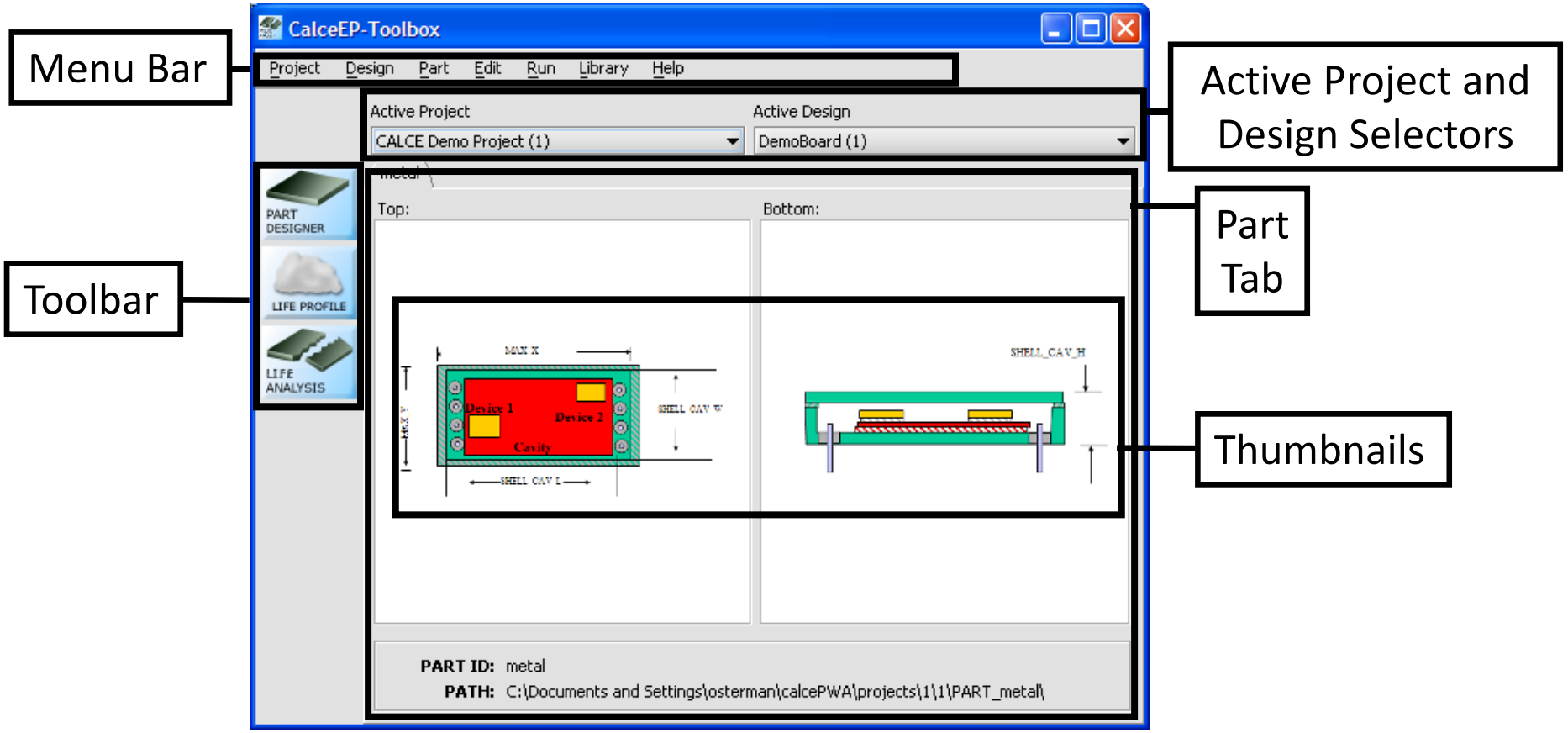
calceEP

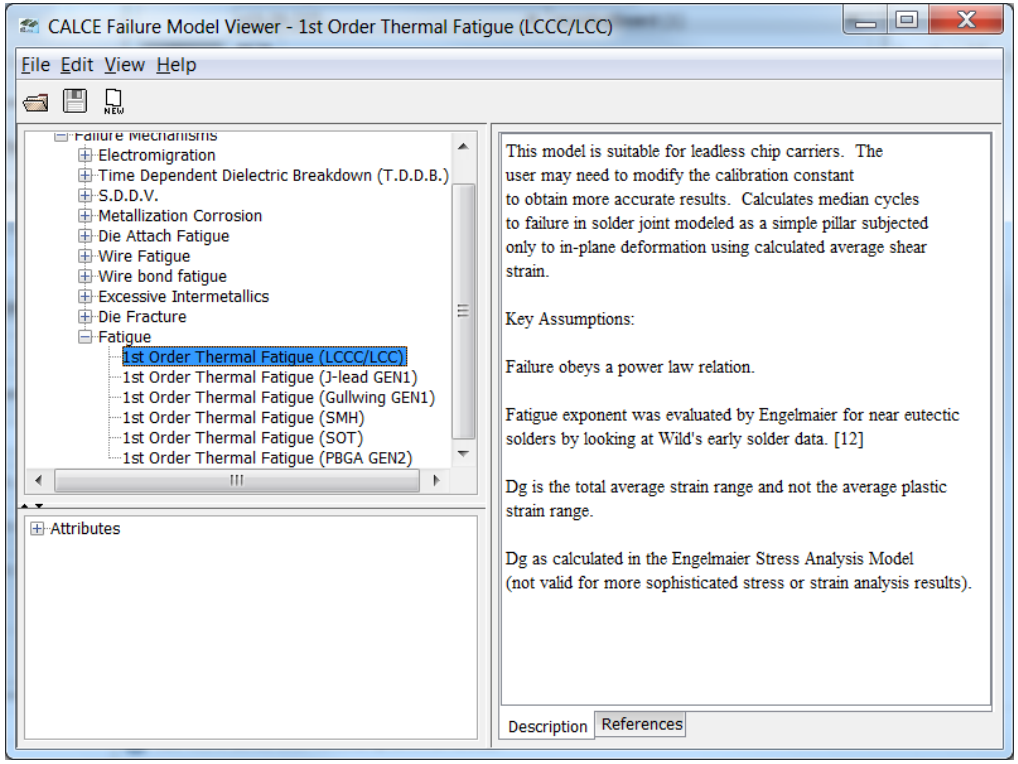
CalceEP is a modeling and analysis environment for package and devices in the calceSARA software.

calceEP Toolbox



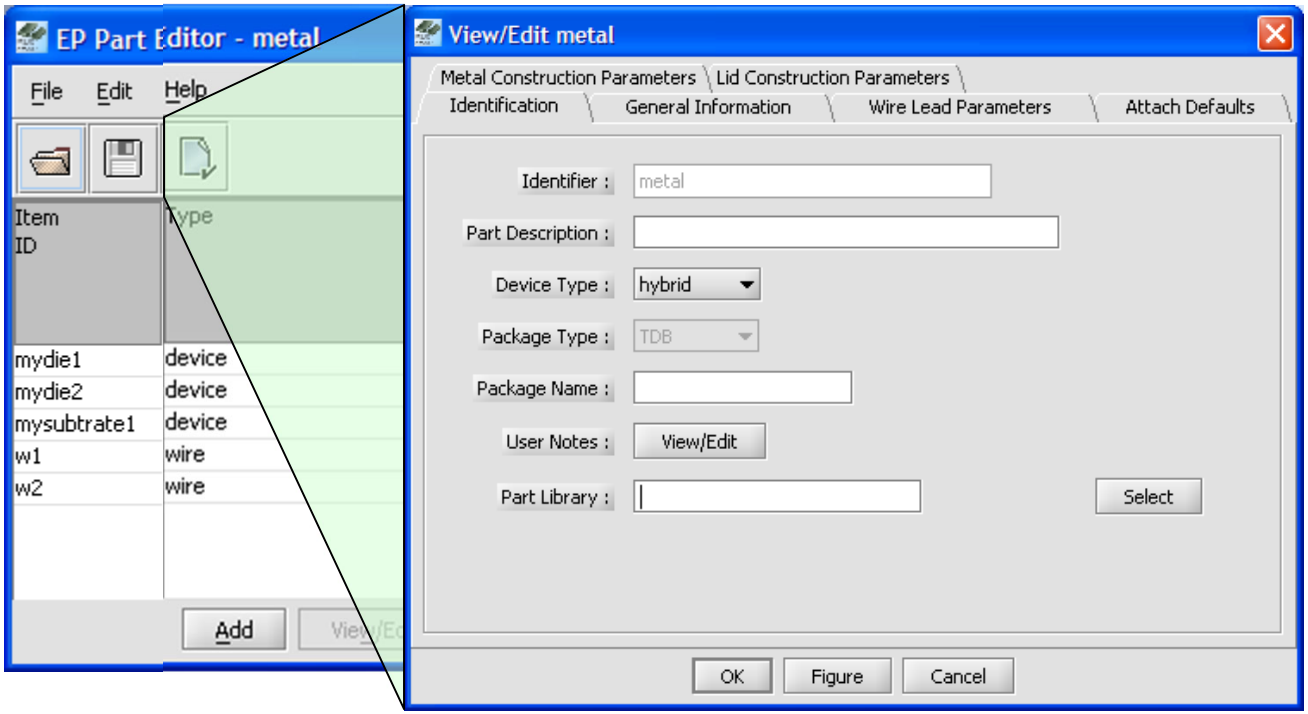
The calceEP Toolbox uses the current calcePWA file system. The software can be used to create and edit parts under an existing calcePWA design and works in a modal fashion: design and assessment tools apply to the active part.

Added Failure Mechanism Model



- Surface Mount Solder Interconnect Failure Models have been added to the calceEP failure mechanism list. This change allows users to access temperature cycling induced surface mount solder interconnection failures in calceEP.

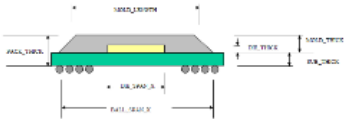
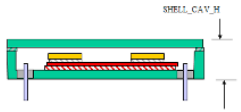
EP Part Editor



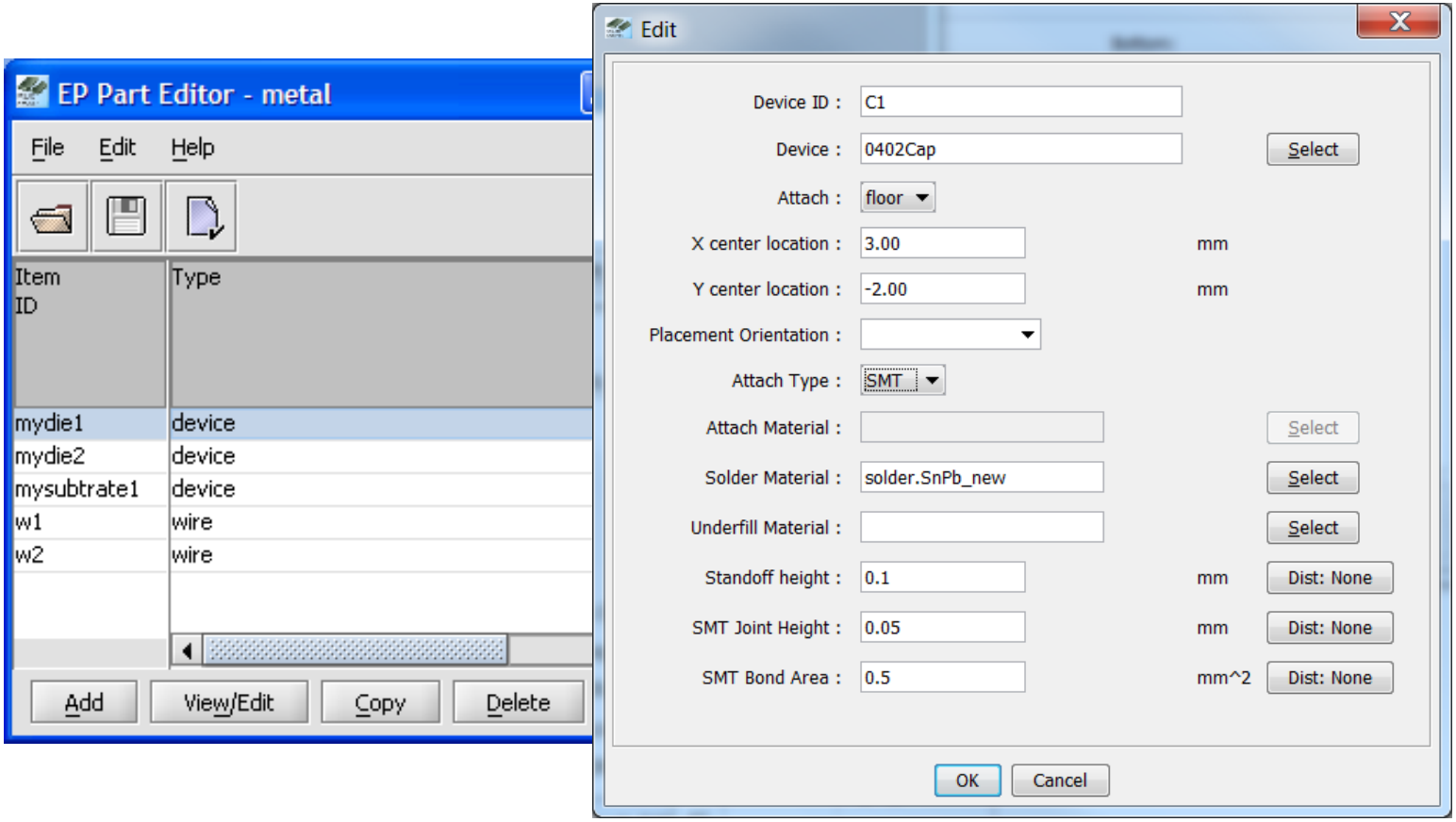
The **EP Part Editor** is used to define the package geometry and materials as well as to define devices (instances of parts) and wire bond interconnects within the part. The overall part geometry and features are defined by the package template chosen for the part.

Supported Package Templates

calceEP supports five common package formats:

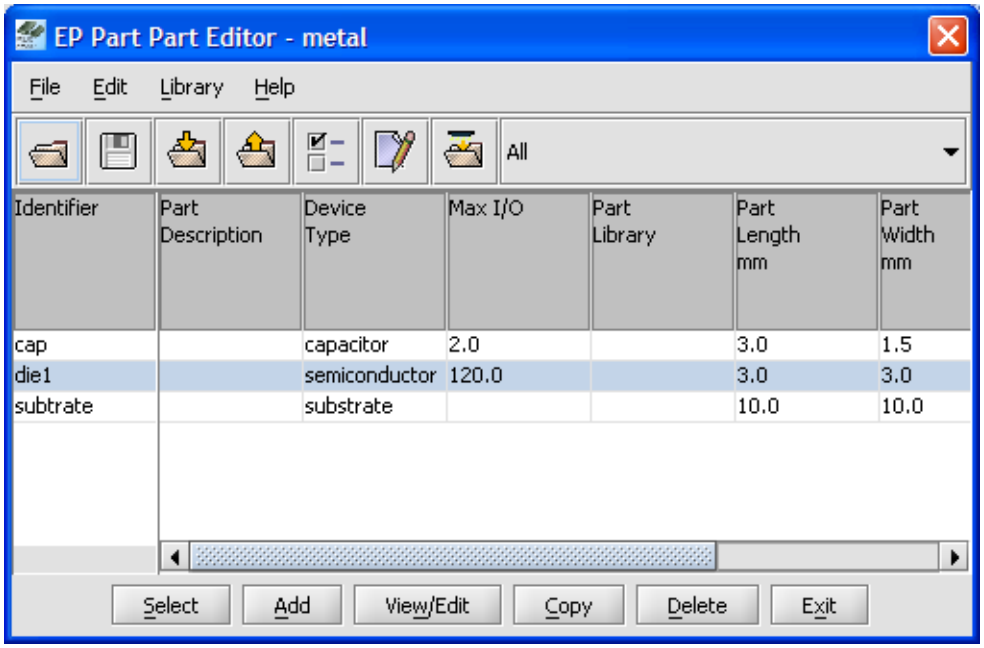
ID	Description	Side View	Interconnect
PLCC	Plastic Leaded Chip Carrier		J-Lead
PQFP	Plastic Quad Flat Package		Gullwing
PBGA	Plastic Ball Grid Array		Solder ball
Metal	Metal		Pin
LCCC	Leadless Ceramic Chip Carrier		NA

Modeling Part Devices



A device is an instance of one part located within another part. A device definition includes a unique identifier, a *reference* to a predefined part, a location relative to the containing part, and attachment properties.

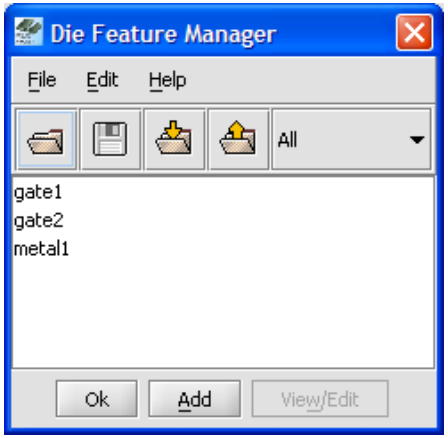
EP Part Part Editor



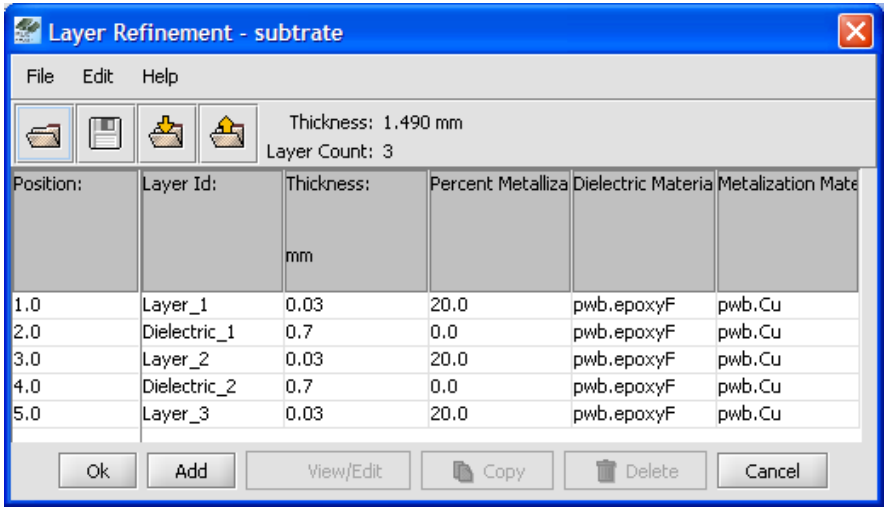
The **EP Part Part Editor** is used to manage part models that are referenced by devices within a calceEP part. A part model provides the physical description of those devices that reference that part. Use the **EP Part Part Editor** to create parts, view/edit part parameters, add/modify/edit part features, and import/export parts to the CALCE Parts Library.

Part Features

Additional data items, called *part features*, define further information for certain classes of parts.

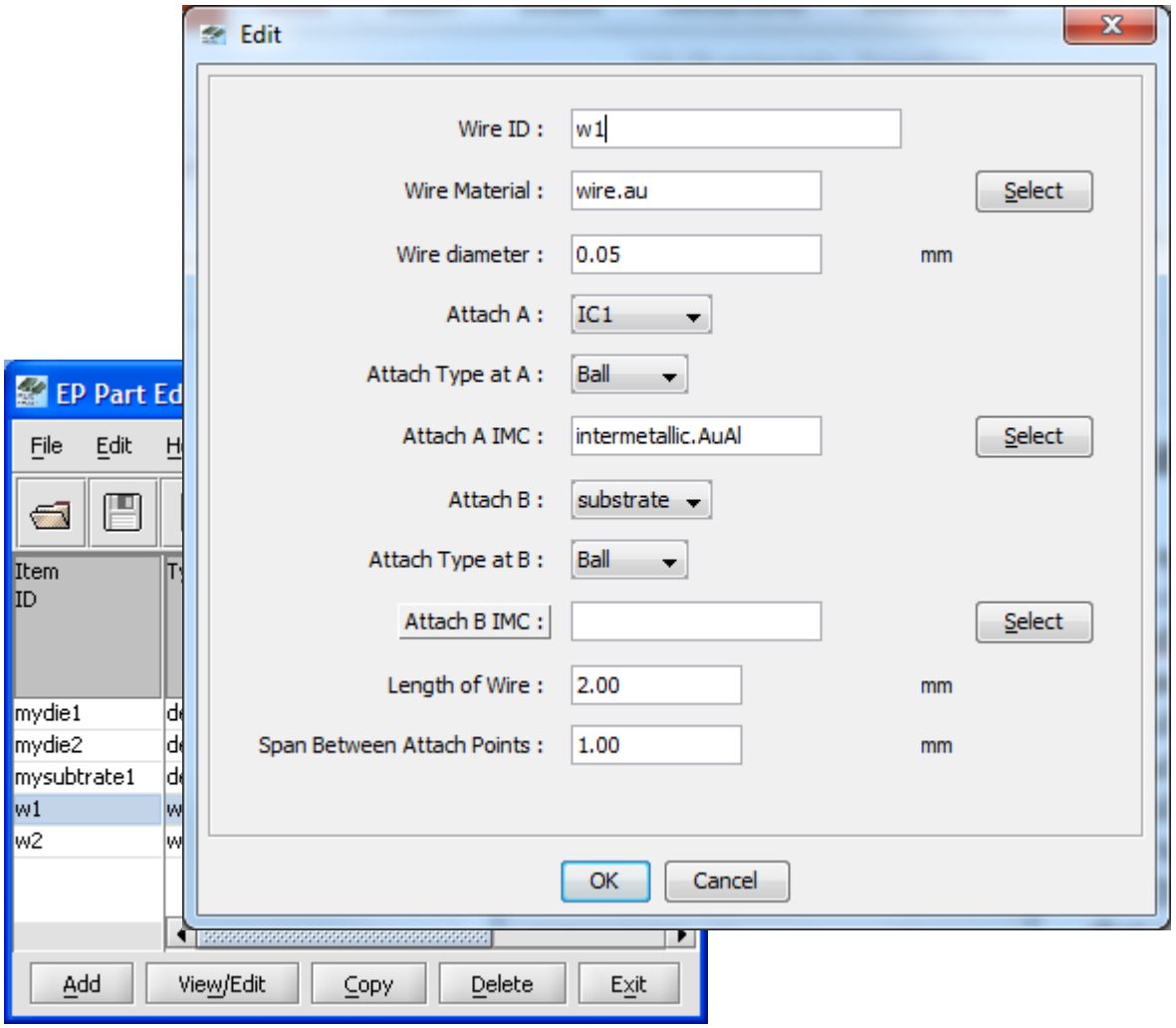


Die features include metal oxide, gate and die metallization.



Substrate feature allows you to define a multiple-layer material composite.

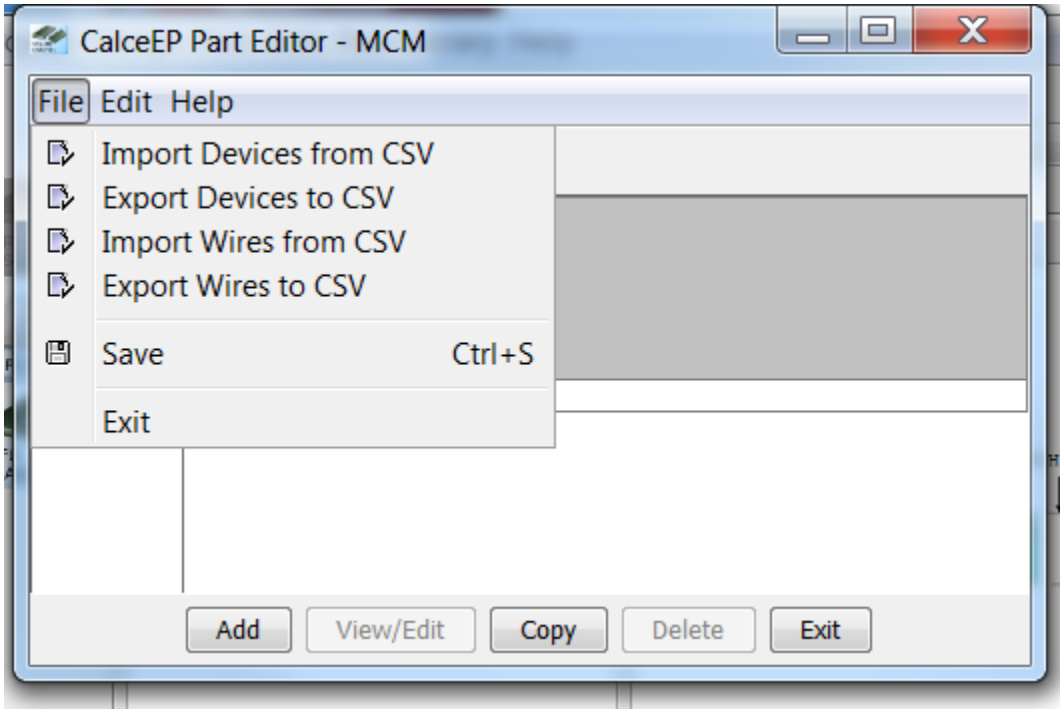
Wire Bonds



In addition to devices, the **EP Part Editor** allows you to defined multiple wirebonds within a part. The wirebond definition includes wire material, wire diameter, wire length, and interconnection span.

Wire and wire bond failure mechanism models are included to evaluate life expectancy under temperature cycling loading conditions.

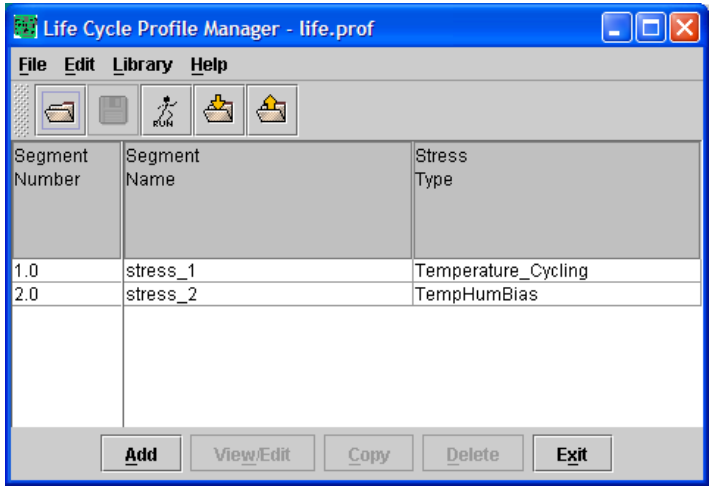
Enhanced Import/Export



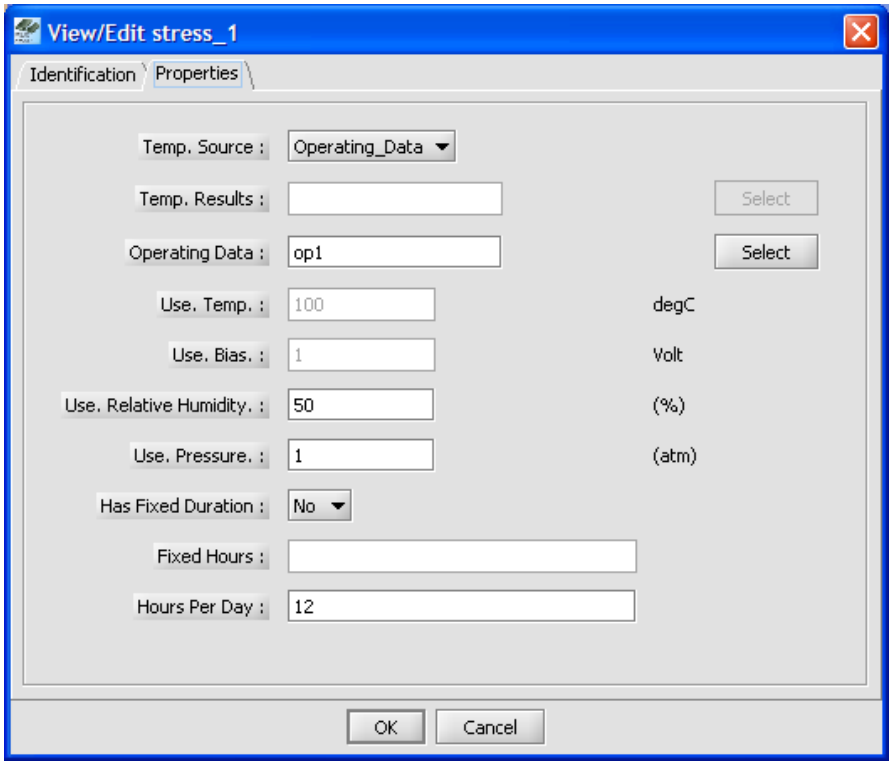
- To facilitate data entry into the calceEP tool, facilities to import and export comma separated variables (.csv) files were added to the part modeling module.
- The import export included devices as well as wires.

calceEP – Life Cycle Profile

The life assessment process requires that anticipated loading to which the part is subjected be modeled. This task is achieved with the Life Cycle Profile Manager.

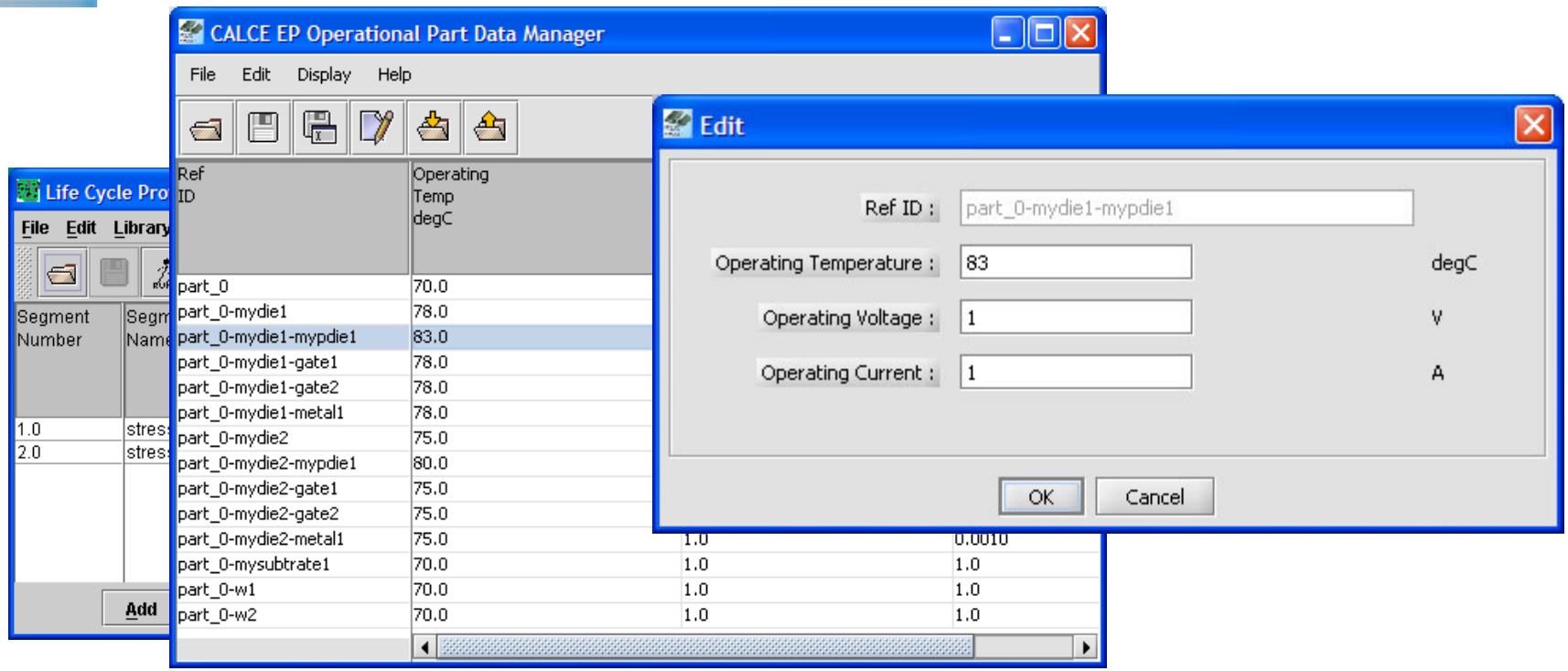


Life Profile Manager



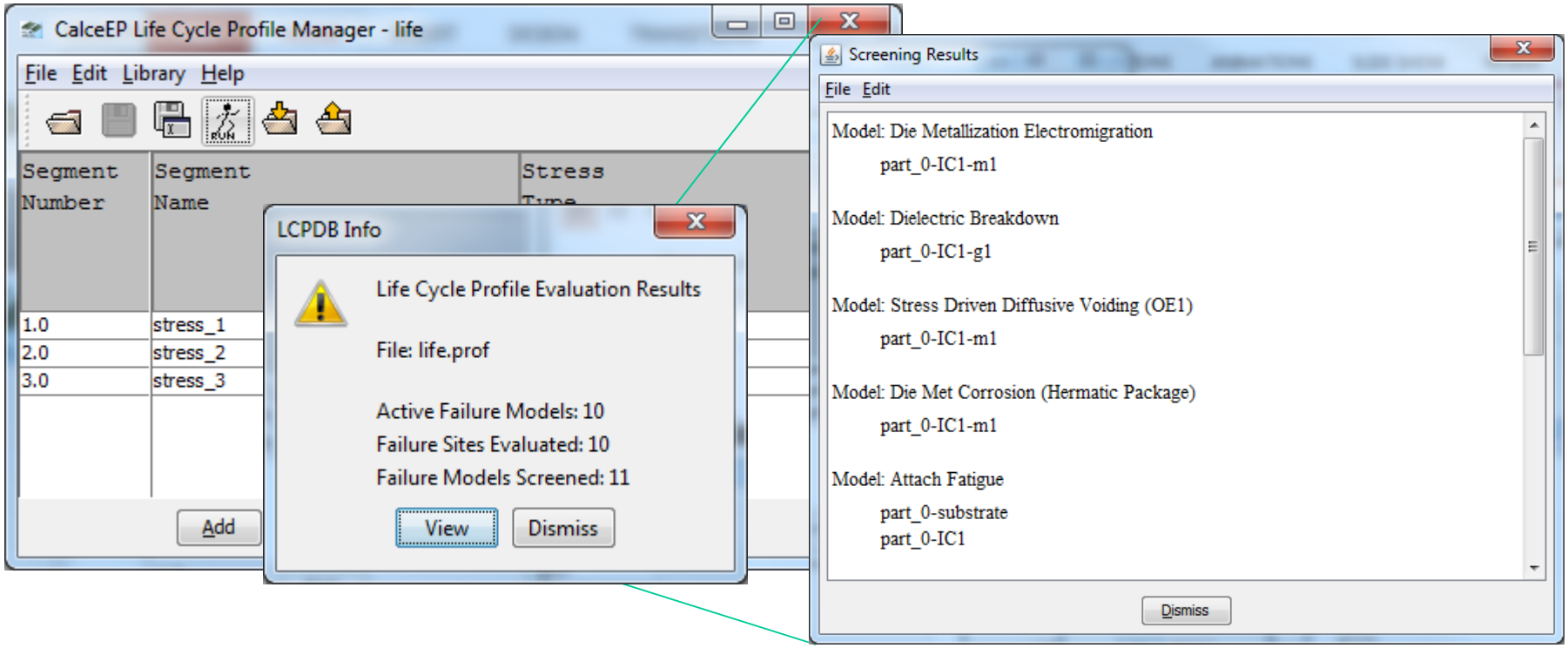
- Temperature Cycling
- Sustained Temperature/Humidity/Bias

Assigning Operating Data



The calceEP software allows you to define operational data for the devices modeled within the part through the **CALCE EP Operational Part Data Manager**, which is accessed from the **Life Cycle Profile Manager**. With this tool, you have the ability to assign temperature, voltage, and current data. You can create multiple operating definitions and reference them when defining a loading segment.

Life Cycle Profile Screening Display



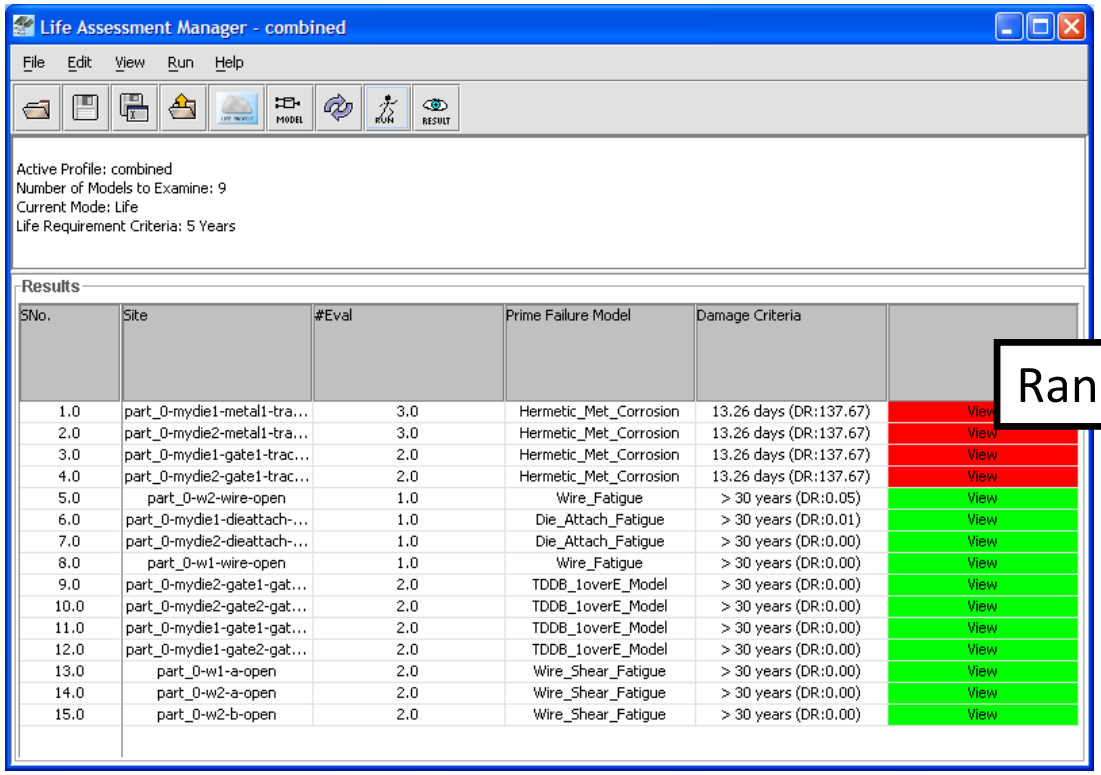
As part of the software update, the ability to examine the active failure models and failure sites for a particular life cycle profile has been added through the addition of the "View" button on the LCPDB Info dialog.

Failure Models

Failure models are based on those available in open literature, as well as those internally developed at CALCE. Supported failure mechanisms include:

- Electromigration
- Stress-Driven Diffusive Voiding (SDDV)
- Time-Dependent Dielectric Breakdown (TDDB)
- Metallization Corrosion
- Electrolytic Breakdown
- Dielectric Breakdown
- Die Attach Thermal Fatigue
- Wire Bond Thermal Fatigue
- **SMT Solder Interconnect Temperature Cycling Fatigue**
- **Excessive IMC**

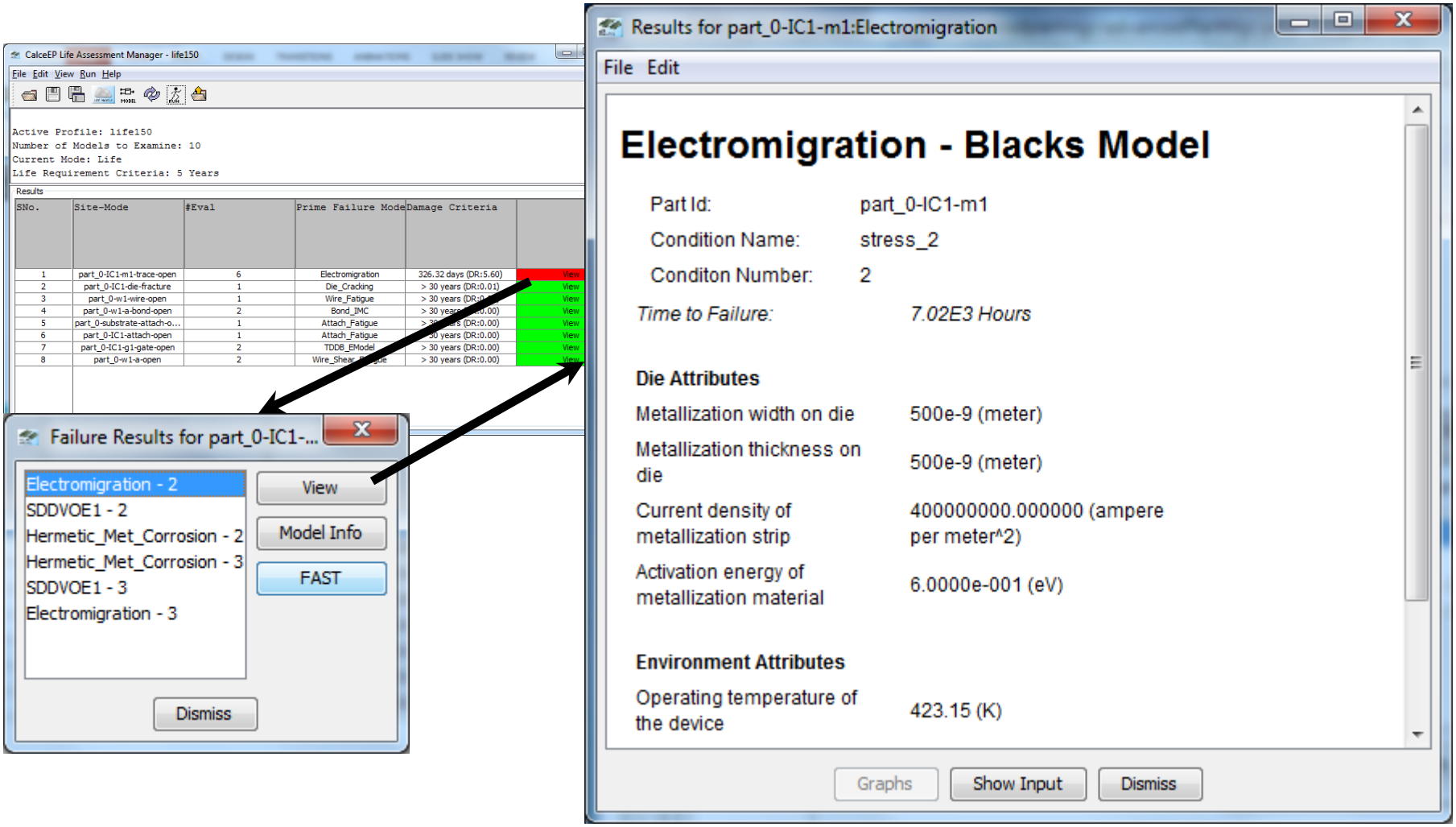
Failure Assessment Manager



Ranked Failure List

The failure assessment is used to select from defined loading scenarios and evaluate the life expectancy of the part based on a set of automatically chosen applicable failure models. The evaluation results are presented in a table with life expectancy sorted in ascending order. You may inspect the results of the individual evaluations by selecting items from within the results table.

Inspection of Failure Sites and Mechanism



The failure model results can be inspected for each failure site and load segment.