

## Information/History

By far the most common measure of package thermal performance is Theta Ja, the thermal resistance measured (or modeled) from junction to ambient. Theta Ja values are also the most subject to interpretation. Factors that can greatly influence the measurement and calculation of Theta Ja are:

- Board Mounted: Yes / No?
- Traces: Size, composition, thickness, and geometry
- Orientation: Horizontal or vertical?
- Ambient: Volume
- Proximity: Any other surfaces near the device being measured?

In August (1996), the Electronics Industries Association released Standard EIA/JESD51-3 titled, "Low Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages." This Standard provides guidelines for design of the test board used in taking thermal resistance measurements of integrated circuit packages. Prior to release of this Standard, thermal resistance data for similar packages varied greatly across the industry because of the use of different test board designs. In particular, the characteristics of the test board were found to have a dramatic impact on the measured Theta Ja. As the industry converts to using this standard test board design, the variation in thermal resistance data caused by the board should be minimized.

Key features of the standard test board design are:

- Board thickness: 0.062"
- Board dimension: 3.0" x 4.5" for packages < 27.0mm in length
- Board dimension: 4.0" x 4.5" for packages > 27.0mm in length
- Trace thickness: 0.0028"
- Trace length: 0.984" (25.0mm)

ASL product group is now using EIA/JESD51-3 to design the test boards used for thermal resistance measurements. Also, the parameters outlined in this standard are used to set-up thermal models. The thermal model program used in ASL is THERMCAL, a finite difference thermal modeling tool developed by Darvin Edwards of TI SC Packaging.

Thermal resistance (Theta Ja) data is now available for all ASL leaded surface mount packages using the new Jedec standard. Actual data has been generated on several ASL packages with thermal models run on the remaining packages. The data is grouped by package style with values of Theta Ja shown at different airflow levels. Leadframe pad size and die size are indicated along with the data. Comparison of actual thermal

resistance measurements to model data generated using THERMCAL, show that the models are accurate to within 10% of the actual data. In most cases the model data varies from actual data by less than 5%.

Included with the Junction-to-Ambient data is Junction-to-Case (Theta Jc) thermal resistance data. Actual Theta Jc data was generated for the packages tested using the JEDEC pcb. Models have not been generated for Theta Jc using the JEDEC standard. If a value of Theta Jc measured on the JEDEC board does not exist for the package of interest, please use the previously published value of Theta Jc in the last column.