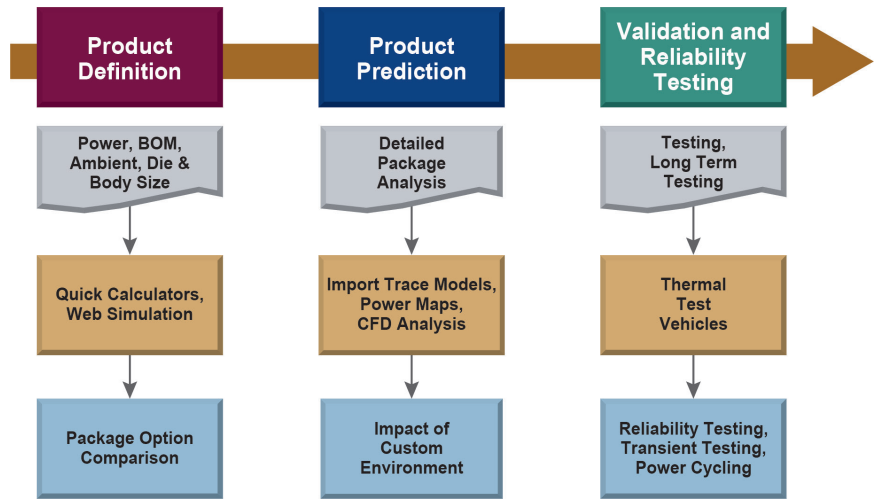# Thermal Package Characterization

Amkor Technology offers advanced thermal test measurement and state-of-the-art modeling capabilities supporting all major electronic packaging styles and system level characterization.

AMKOR'S THERMAL CAPABILITY OFFERINGS

▶ Detailed leadframe analysis

▶ Detail package level analysis including substrate traces and via layout

▶ Model air flow effects with CFD analysis

▶ Model radiation and conduction

▶ ANSYS Mechanical Enterprise and Icepak modeling software and Mentor FloTHERM software

▶ Transient models

▶ Compact thermal models (Delphi)

▶ Thermal conductivity measurements

▶ Reliability testing and impact on thermal resistance

▶ Thermal prototyping

▶ System level testing

▶ Impact of manufacturing processes on thermal performance

▶ Wind tunnel testing

▶ Still air testing

Product Definition	Product Prediction	Validation and Reliability Testing
Power, BOM, Ambient, Die & Body Size	Detailed Package Analysis	Testing, Long Term Testing
Quick Calculators, Web Simulation	Import Trace Models, Power Maps, CFD Analysis	Thermal Test Vehicles
Package Option Comparison	Impact of Custom Environment	Reliability Testing, Transient Testing, Power Cycling

Amkor Thermal Testing Capability

Standard JEDEC still air and forced testing facilities available.
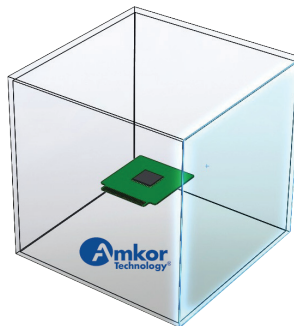
**Still air chamber
12" x 12" x 12"
closed container**

▶ Amkor's closed-loop wind tunnel is capable of controlling airflow from 50 to 1600 LPM and air temperature from 18°C to 65°C

▶ The tunnel spatial uniformity of velocity is ±1% of the mean value. The test section is 12" x 12" with a contraction area of 6.5:1

Amkor Technology®

Test Boards

Amkor maintains a library of JEDEC standard leaded and array format 1S0P and 1S2P test boards. Custom board design capabilities are also available.

Thermal Test Reports

Amkor has gathered more than 200 thermal test reports covering a wide array of packages ranging from power application packages such as a PSOP3, leaded packages such as LQFP, exposed pad packages such as MLF® and array packages such as PBGA. Thermal data includes Theta JA over a range of power levels at flow velocities from 0.0 to 2.5 m/s. Psi JT, Psi JB and Theta JC data are available in many of the thermal reports.
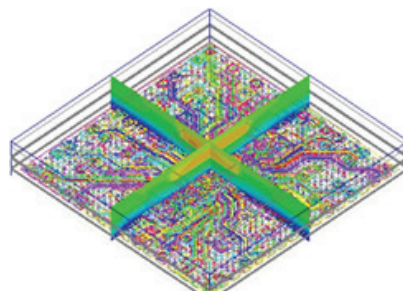
Material Characterization Testing
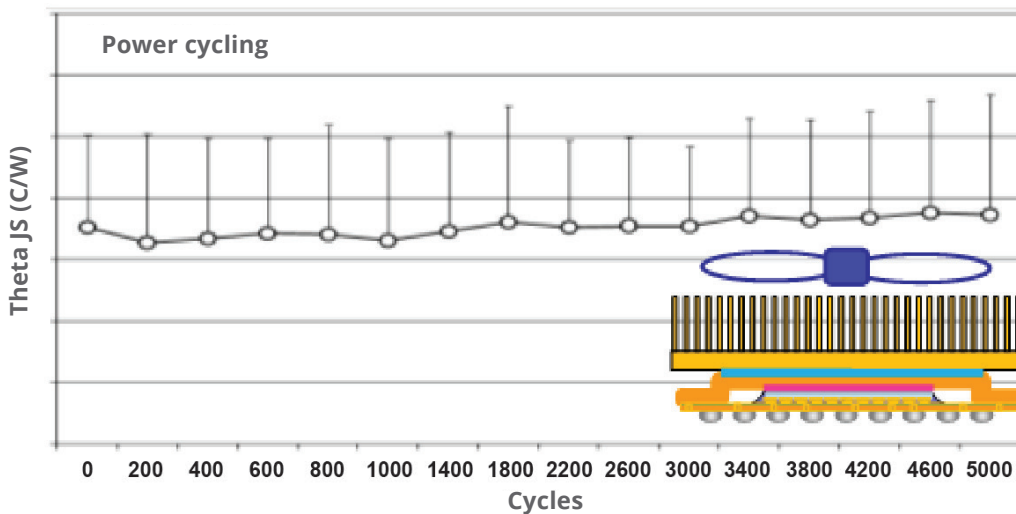
Long-term testing of thermal interface materials to quantify reliability under realistic use conditions
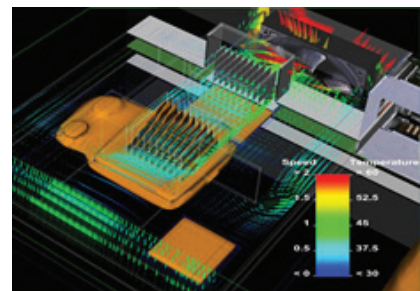
Detail Models

Amkor employs advanced thermal modeling techniques using Finite Element Analysis (FEA). ANSYS Mechanical Enterprise and Icepak modeling software as well as Mentor FloTHERM software are supported. Detailed trace routing is incorporated into package analyses.
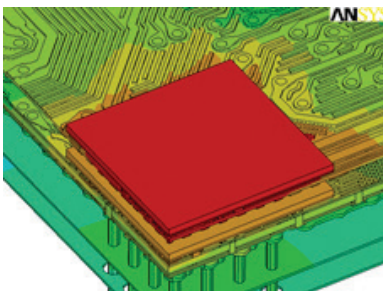
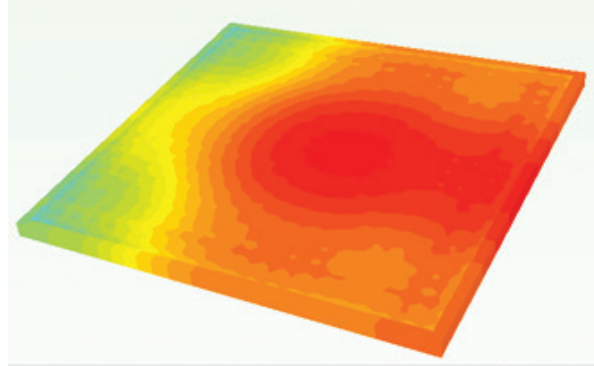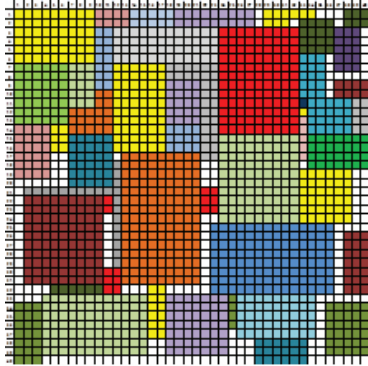**ANSYS Mechanical Enterprise**   **ANSYS Icepak**   **Mentor FloTHERM**

# Thermal Package Characterization

Custom Thermal Solutions

Amkor offers custom thermal solutions to optimize component level designs. This may include laminate or leadframe design optimization, material property evaluation, power map and board layout analyses.
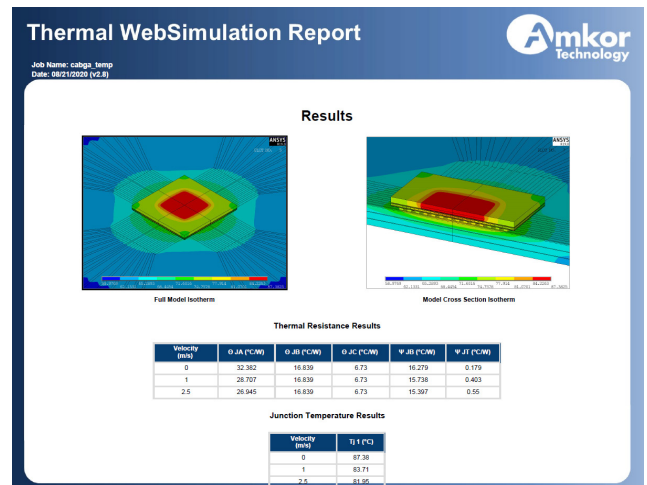

Compact Models

Compact thermal models are available for predicting die temperature in system level performance. They are developed to provide "boundary condition independent" peak die temperature predictions.
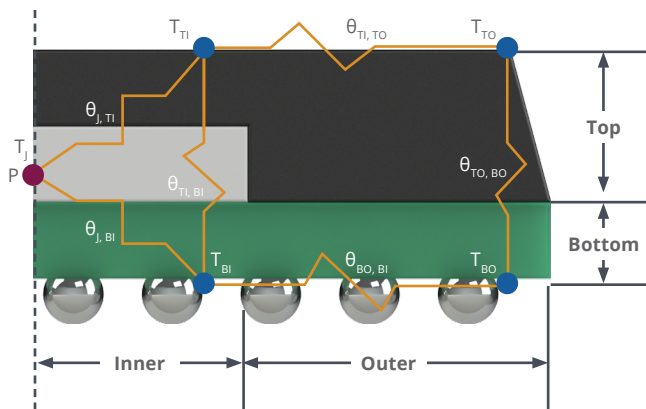
Automated Simulation System

Automated simulation is available for many common package styles. Thermal resistance values can be quickly calculated for a package in the typical JEDEC environment.

Thermal WebSimulation Report

Job Name: cabga_temp
Date: 08/21/2020 (v2.8)

Results

Full Model Isotherm   Model Cross Section Isotherm

Thermal Resistance Results

Velocity (m/s)	θ JA (°C/W)	θ JB (°C/W)	θ JC (°C/W)	Ψ JB (°C/W)	Ψ JT (°C/W)
0	32.382	16.839	6.73	16.279	0.179
1	28.707	16.839	6.73	15.738	0.403
2.5	26.945	16.839	6.73	15.397	0.55

Junction Temperature Results

Velocity (m/s)	Tj 1 (°C)
0	87.38
1	83.71
2.5	81.95