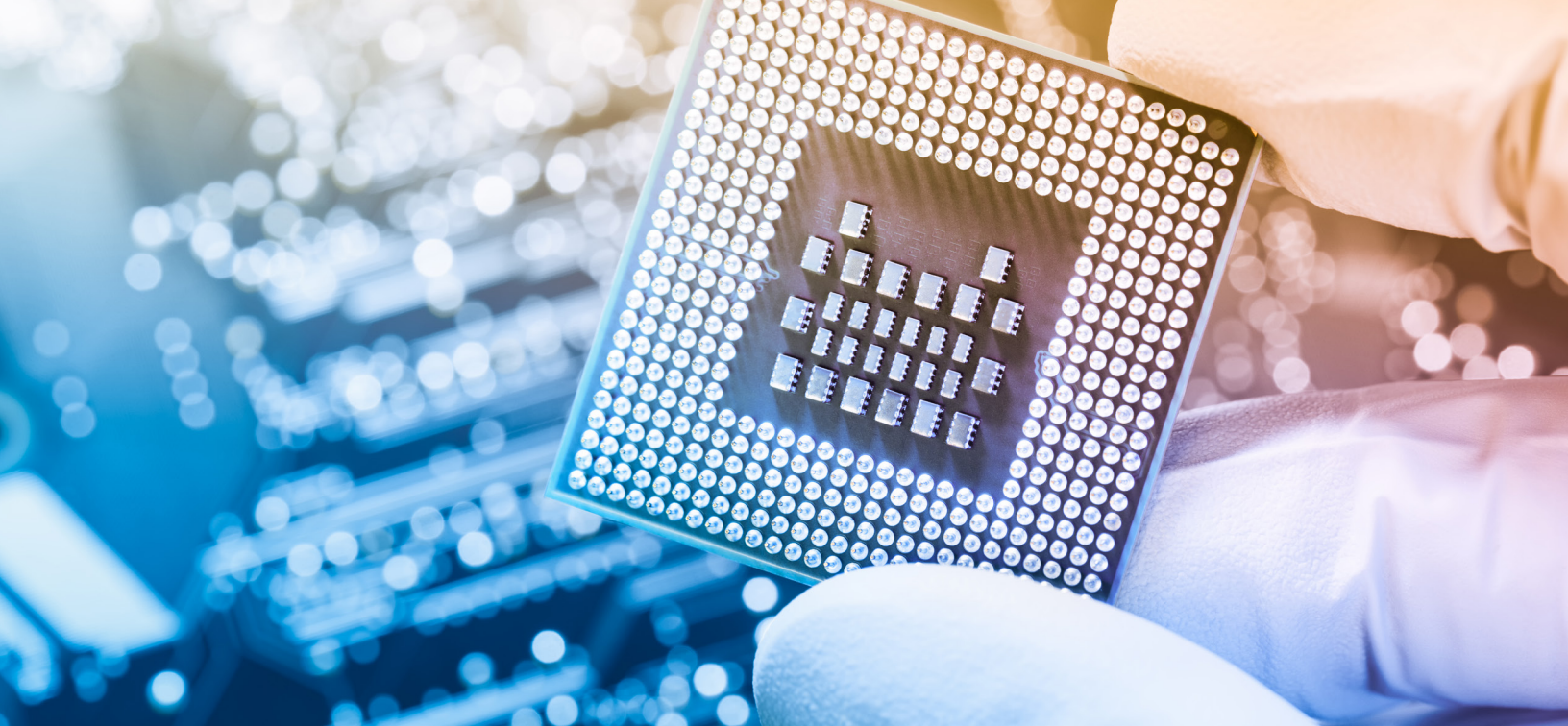




6SigmaET
by Future Facilities

Accelerate Your Thermal Design

Thermal Simulation for Electronics



Why Switch to 6SigmaET?

Intelligent Thermal Modeling for Design, Verification & Optimization

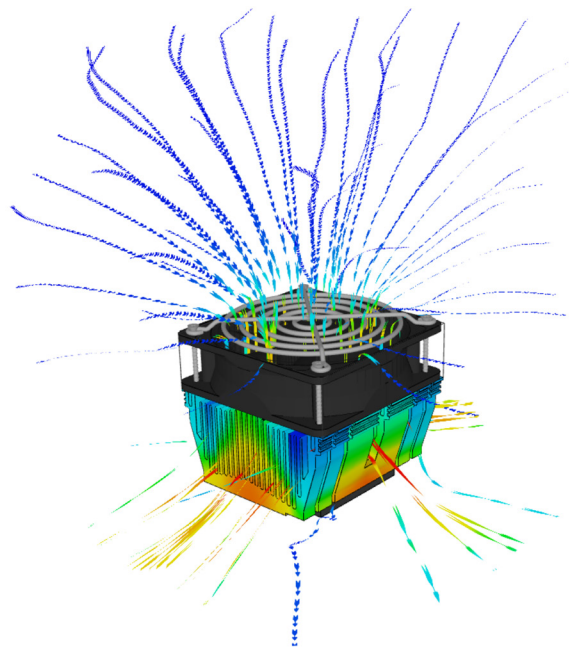
6SigmaET is a thermal modeling tool that uses advanced computational fluid dynamics (CFD) to create accurate models of electronic equipment.

Designed specifically for the electronics industry, our software ushers in unparalleled intelligence, automation and accuracy to help you meet your requirements and to help you overcome thermal design challenges.

Thermal simulation is a key element of the engineering design process. Our software enables you to create and solve models quickly, verify electronic designs before manufacturing, and optimize the best thermal performance while reducing your time to market. This level of intelligence and automation enables designers to spend more time on design, and less time on software operations.

The result? A shortened learning curve, increased design productivity, and tighter integration with design and manufacturing.

6SigmaET's versatility allows it to span across many industries including LEDs, Consumer Electronics, Servers and Racks, Aerospace, Automotive and more.

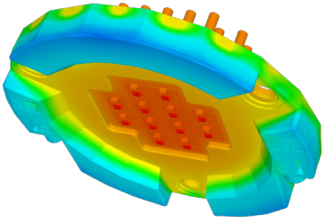


Streamlines and heatsink surface temperature plots modeled in 6SigmaET

6SigmaET in the Electronics Industry

Thoughts from Industry Leaders

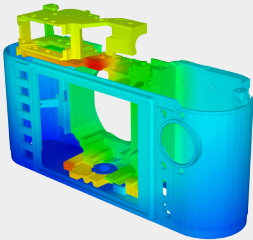
LEDs



"A comprehensive standalone tool, 6SigmaET doesn't need additional MCAD software for data entry, which means it is especially straightforward to use. The software is fast, fits our thermal modeling needs perfectly, and experimental testing in our laboratories has proven that the simulation results predict component temperatures with accuracy."

Norbert Engleberts, Director, OTS

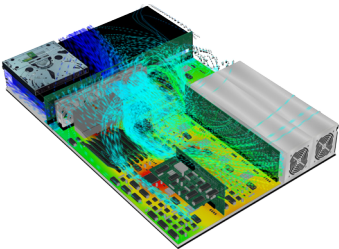
Consumer Electronics



"Over and above thermo-fluid modeling, 6SigmaET's library feature affords access to a PDM-like database for simulation models, making them accessible and shareable across the enterprise. This capability increases efficiencies, and brings consistency and reproducibility to our processes. The suite of features is user friendly, easy to use, and provides good resolution and accuracy in modeling."

Martin Pais, Fellow & Director, Motorola

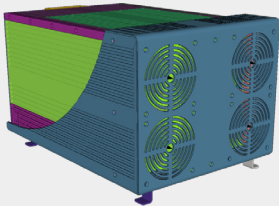
Servers & Racks



"6SigmaET's ability to import complex CAD files, coupled with its robust meshing and solving capabilities, significantly reduces our modeling time. We especially like the itemized results for heat distribution and the predefined thermal thresholds, which provide an easy snapshot of the simulation conditions."

Saket Karajgikar, Manager, Thermal Design Group at Hye Solutions

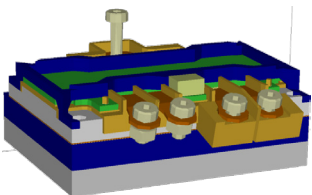
Aerospace



"Using the quick and accurate thermal simulation features in 6SigmaET, we were able to cut our modeling time by 30%. The platform's high-performance, cloud based solving allowed us to scale without hardware limitations, giving us the opportunity to double the number of projects we can take on."

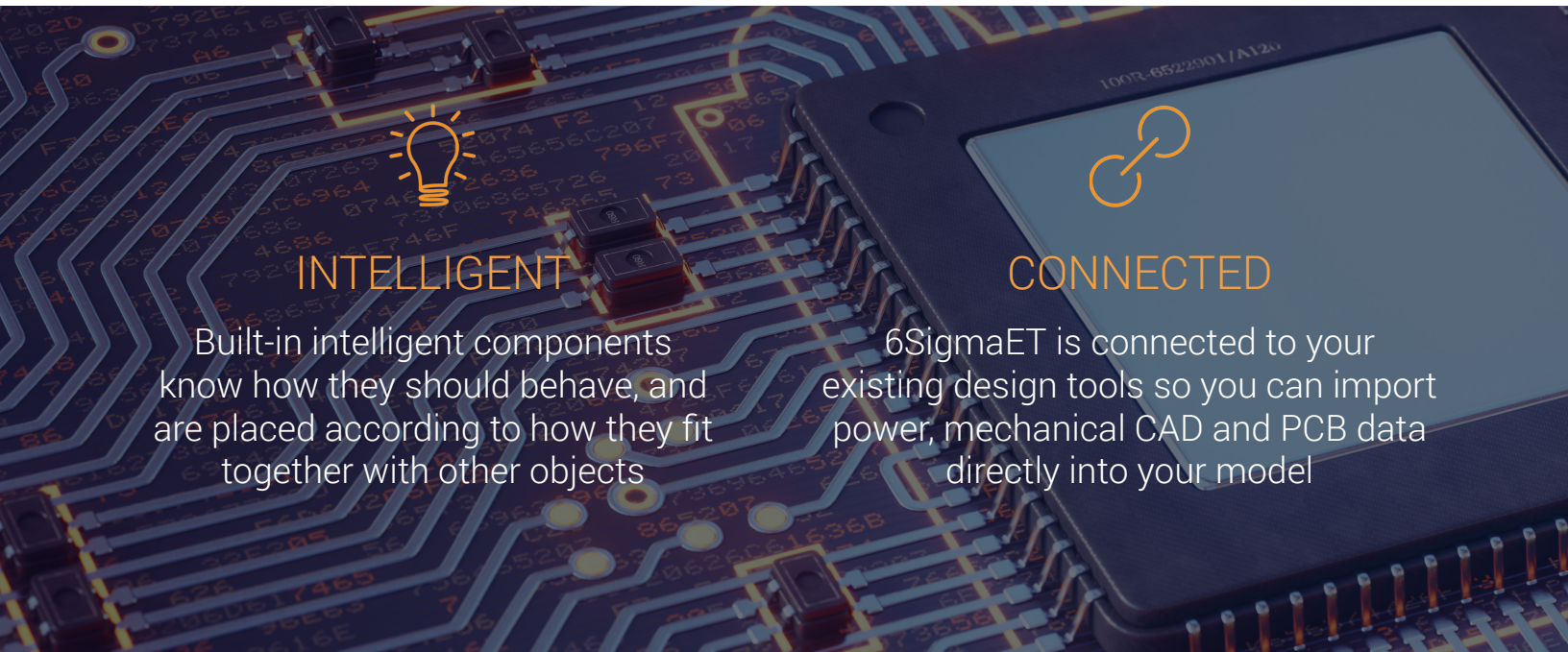
William Villers, CTO & Director of Engineering, TEN TECH LLC

Automotive



"Thanks to 6SigmaET we were able to create simulated models of our soldering processes and now predict the behaviour of PCBs inside our manufacturing processes. The software proved to be the best market choice due to its ability to import all BOSCH PCB and product files, by its simulation speed and for its flexibility to adapt to different simulation environments."

Miguel Peixoto, Process Engineer, BOSCH



INTELLIGENT

Built-in intelligent components know how they should behave, and are placed according to how they fit together with other objects

CONNECTED

6SigmaET is connected to your existing design tools so you can import power, mechanical CAD and PCB data directly into your model

What Makes 6SigmaET Unique?

Features

6SigmaET's constantly expanding list of features enables you to design, solve, and analyze your thermal models faster than ever before. With an intuitive user interface tailored specifically for the needs of electronics engineers, you can run multiple iterations and solve problems with ease.

Use existing CAD data and PCB design data to create models quickly and efficiently, create concept models using intelligent modeling objects, quickly identify every component using heat plots, visualize surface temperatures for any object and get the information you need to make the right decisions.



Centralized Libraries

Share objects, assemblies, or even whole models across an organization with centralized network libraries.



Automatic Grid Generation

Our object-based gridding feature determines the best grid for the simulation. Just click Solve and the grid is automatically generated.



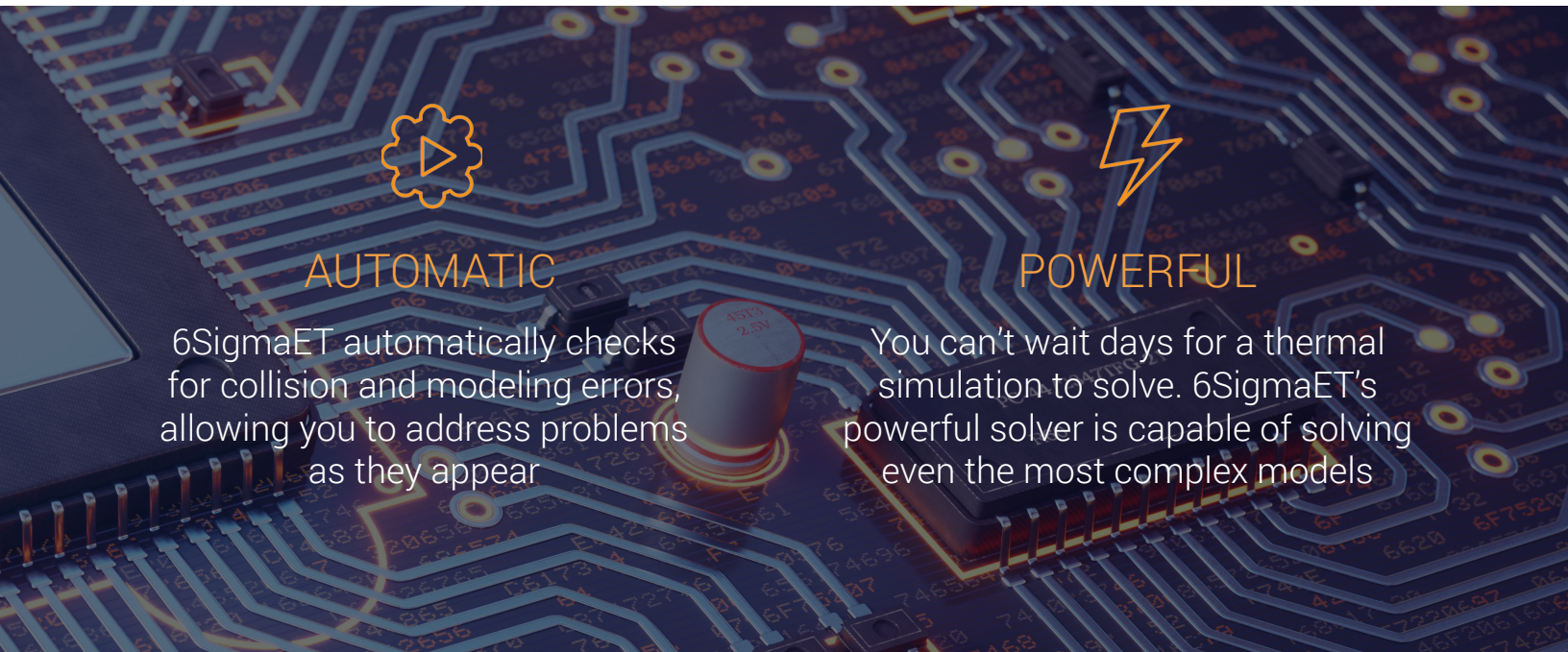
Import & Export CAD

Import CAD designs and export your 6SigmaET models in DWG format, or export model objects as STL files.



PCB Data Import

Import PCB designs via IDF, IDX, XFL and Gerber file formats.



AUTOMATIC

6SigmaET automatically checks for collision and modeling errors, allowing you to address problems as they appear



POWERFUL

You can't wait days for a thermal simulation to solve. 6SigmaET's powerful solver is capable of solving even the most complex models



Joule Heating

Add electrical boundary conditions to objects, solve for electrical potential, and calculate joule heating values.



Cloud Solving

Solve any model built in 6SigmaET using as many cores as needed without on-site, physical hardware.



Parallel Solver

Scale over 128 cores using a high performance computer (HPC) cluster.



Version Tree

Consolidate various designs and objects in a singular tree, allowing for tighter integration between various models.



Automatic Reporting

Fully customizable reporting allows you to communicate, compare and analyze your simulation results.



Modern User Interface

Utilize the GUI and simple ribbon system to build, solve, and analyze your model.



Transient Simulation

Set up and perform transient simulations with a wide range of time-varying properties.



Multi-Fluid

Model liquid-cooled systems using intelligent objects such as cold plates, pumps, and cooling ducts.



Liquid Cooling in an Airborne Radar Processing Unit

Accelerating Thermal Design for the Aerospace Sector

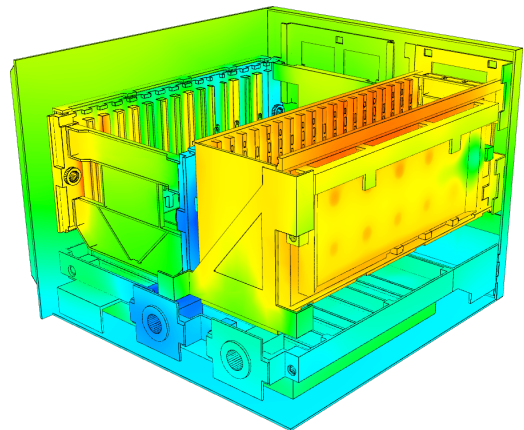
Who is TEN TECH?

TEN TECH LLC, an ITAR-Registered, woman-owned small business headquartered in Los Angeles, provides subject matter expertise in the areas of Structural Dynamics, Fluid Dynamics and Thermal Analysis & Simulation through the use of advanced numerical techniques.

TEN TECH began using 6SigmaET in 2016 for thermal modeling of embedded defense electronics systems such as SBCs, RF & Microwave components and complete rugged chassis for Avionics, Flight Data Recorders, Guidance & Navigation, Radar Processing, Electronic Warfare and C4ISR applications.

The Challenge

TEN TECH was tasked with helping in the design, verification and qualification of a liquid-cooled airborne radar processing chassis. This high-powered (3kW power dissipation) and tightly packed chassis had to operate at extreme



Liquid-cooled airborne radar processing unit modeled in 6SigmaET

temperatures (-55°C to 125°C) with no cooling mechanism other than the liquid cooling loop.

As typical with military applications, several mission profiles, corresponding to different altitudes, ambient temperatures, liquid cooling pump inlet temperatures and pressure permutations, had to be studied.

The multi-fluid nature of the model in addition to the liquid-cooled cavities posed significant design challenges for TEN TECH. The complex

system was demanding more time than predicted for the project set up, and was quickly deemed impractical for standard CFD tools. While using 6SigmaET, however, these models were set up and solved 8 times faster than the baseline models in previous iterations. TEN TECH soon realized that 6SigmaET was a better match for their needs, allowing them to cut down on labor time and to deliver results more quickly.

The Solution

TEN TECH used 6SigmaET to accelerate their thermal design by significantly reducing time on model building, meshing (grid generation) and solving. They were also able to simulate factors such as different altitudes and ambient temperatures using tools built into the software.

Using 6SigmaET, the cold-plate design was optimized to strike the right balance between pressure drop and heat dissipation by running various designs of the cold plate. The entire analysis was conducted within an hour.

“6SigmaET does what we want as thermal engineers... [integrated features] like liquid cooling are absolutely indispensable.”



William Villers
CTO & Director of Engineering

Once this stage was complete, TEN TECH moved on to understanding the liquid cooling of the system. Using 6SigmaET they modeled the entire chassis, including over 25 high-powered single-board computers (SBCs) and 5 cold plates in a single model. 6SigmaET's ease of

handling intricate details and high-performance parallel solver allowed TEN TECH to accomplish their design goals with impressive efficiency and uncompromised accuracy. They were able to ensure that the entire chassis was properly cooled, that the liquid loop would function correctly, and that each of the SBCs would be within its temperature requirements.

The Results

Using 6SigmaET, TEN TECH was able to achieve their design goals and deliver their project in an unprecedented timescale. With these savings, they were able to explore more design alternatives and distribute their resources efficiently.

About \$50k in Op-Ex Savings

The initial cold plate design provided insufficient cooling and would have resulted in test failure and expensive program delays. By using 6SigmaET, TEN TECH was able to save their client these costs.

50% Reduced Solve Times

6SigmaET's user-friendly GUI and high-performance computing cloud clusters reduced TEN TECH's solve times significantly compared to other traditional modeling tools.

Reduced Time to Delivery

Using 6SigmaET, TEN TECH shortened the project delivery time from an original estimate of 6 weeks to just 3 weeks. This also allowed them more time to explore design alternatives to ensure the highest quality in design.

Labor Cost Savings of Over \$25k

By minimizing the project duration, TEN TECH was able to reduce labor costs for their client by over \$25,000.

About Future Facilities

Engineering Simulation for the Digital Age

We set up Future Facilities to deliver the power of engineering simulation into the hands of an emerging data center industry. We created a suite of tools optimized for data centers, designed to be used by the data center professional, and made it powerful, intelligent, automated and connected.

Five years later, we tuned our technology to deliver the same benefits to the thermal management of electronics and provide an integrated toolset for these two converging industries. In 2015 we were awarded

Product of the Year at the Engineering Simulation Show.

Our client base has grown to include not only design consultants, but electronics and semiconductor manufacturers, investment banking, social media, automotive, aerospace, oil & gas, and government.

Our contribution extends to helping define and improve industry standards by participating in activities organized by leading institutions, professional bodies and academia.



UK Corporate HQ
London
+44 (0) 20 7840 9540



Japan
Shinjuku-Ku, Tokyo
+81 (0) 3 5312 8070



North America
San Jose, CA
+1 408 436 7701

For more information
visit:

6SigmaET.info