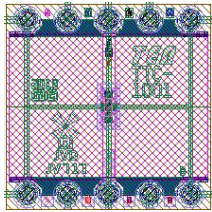


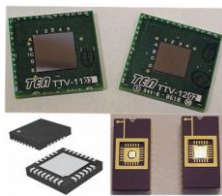
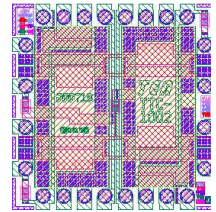
THEMAL ENGINEERING ASSOCIATES, INC.

A central source for semiconductor thermal test vehicles and thermal measurement instruments and services

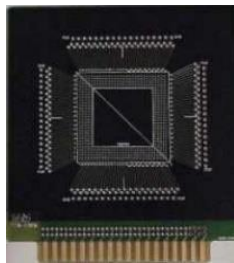
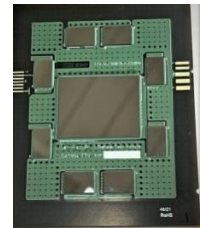
TEA product offerings include JEDEC JESD51-4 standard Thermal Test Chips (TTC), Thermal Test Vehicles (TTV), Thermal Test Boards (TTB), and equipment for thermal measurements.



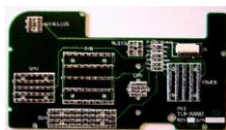
Thermal Test Chips (TTC) are tools for thermal characterization and comparison of semiconductor packages, and thermal simulation of semiconductor devices. As a tool in the component and system level thermal management design, the TTC can provide uniform or configurable “hot spot” power distribution with integrated temperature sensors. The TTC is electrically easy to use and is more thermally well-defined than application chips.



Thermal Test Vehicles (TTV) are packaged versions of the TTC. The packages can be either single chip or multi-chip, and either standard packages or custom designed to meet specific application requirements. Electrical connection can be BGA, LGA, or wire-solder pads. Stiffeners and lids are optionally available.



Thermal Test Boards (TTB) fall into two groups – standards-based and application-based. The former adheres to the JEDEC standards for semiconductor package and device characterization, while the latter is designed to simulate a package/chip combination mounted on a board that simulates an actual application design.



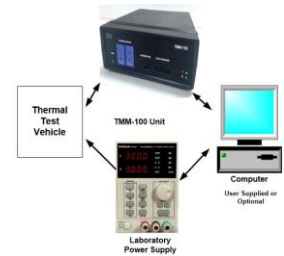
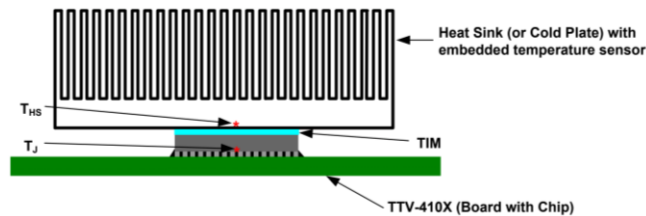
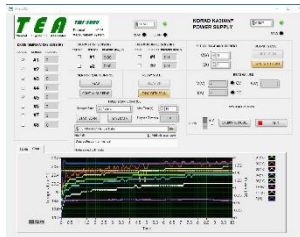
Thermal Load Boards (TLB) are system-level thermal management design tools for concurrent design of mechanical, electrical, and thermal aspects of electronic systems. The TLB is custom designed to provide a close simulation of actual thermal load conditions using resistive and TTC Heat Source Simulators (HSS).



The **Thermal Measurement Module (TMM)** is a USB unit that is designed to simplify the gathering of data from two 10KΩ NTC thermistors, two Type-T thermocouples, and eight TTC temperature sensing diodes (TSD). The unit provides precision current sources for supplying diode measurement current (I_M). The supplied software can collect and store data resulting from operations of single-shot readings, continuous readings, or controlled time-based readings.



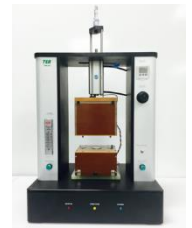
Thermal Measurement Systems (TMS), consisting of the TMM and one or more heater power supplies, are automated systems for measurement of thermal impedance and resistance of semiconductor packages, thermal interface materials (TIM), heat sinks, vapor chamber heat spreaders, and heat pipes, using TTC/TTV. A TMS version offers extended power cycling capability for TIM reliability and stability measurements.



Thermal Test Systems (TTS) conform to Mil-Std 750, Mil-Std 833, and JEDEC JESD51 thermal test methods, enabling accurate thermal resistance measurements of different semiconductor devices and packages. Thermal Environments & Fixtures conform to JEDEC JESD51 Standard Environments for thermal measurements.



The **TIM Measurement System** is an accurate, low-cost, ASTM DM5470-based system for measurement of various thermal interface materials – paste, grease, pad, etc. – and other materials, such as metals, plastics, graphite, and 3D-printed metals. With built-in self-calibration and ease of use, the system can be used for laboratory, manufacturing, and incoming inspection applications.



*With a comprehensive portfolio of thermal measurement solutions and supplies, combined with thermal engineering and testing services, **TEA** can assist you in meeting ever increasing thermal requirements for semiconductors and electronic systems.*

*For further information and a discussion of your specific needs, please contact **TEA** at:*

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