TIM Characterization Tools

Thermal Test Chips

The **TTC-1002** thermal test chip is designed to provide a maximum of flexibility for thermal characterization of semiconductor packages, assembly processes and thermal interface materials. The unit cell, approximately 2.5mm X 2.5mmm, can be used individually or in a square or rectangular array with strategically placed, individually addressable multiple diode temperature sensors in each cell. The two heating resistors on each cell can be powered individually or wired in a series or parallel configuration for operation from a single power supply. In an array configuration, the resistors can be set up for either uniform heating or individually powered to produce specific temperature profiles.

The **TTC-1002 Wafer** is available in either wire-bond or bump (flip-chip) Versions. The former is designed with metal interconnection between die to eliminate inter-cell wire bond requirements. The unit cells in the latter version are completely isolated from each to provide access to each individual heating resistor. The bump version is used to make TEA's Thermal Test Vehicles. Arrays as large as 8X8 unit cells provide a 20.5mm X 20.5mm chip with 128 heating resisors and 256 temperature sensors.

Thermal Test Vehicles

TEA offers TTVs in flip-chip, bare die, BGA packages for a variety of TIM characterization activities. Selective unused balls are sequentially connected together for daisy-chain applications.

The TTVs are 27mm X 27mm BGA packages with 1mm pitch, 0.6mm diameter balls in a partially populated 26X26 array (386 balls). Twelve strategically placed ball sets are available for daisy-chain applications.

- **TTV-1100 series** **(for odd arrays)**

Available in versions with three different TTC array sizes –
TTV-1101 → 1X1 (2.5X2.5mm)
TTV-1102 → 3X3 (7.65X7.65mm)
TTV-1103 → 5X5 (12.8X12.8mm)

- **TTV-1200 series** **(for even arrays)**

Available in versions with two different TTC array sizes –
TTV-1201 → 2X2 (5.08X5.08mm)
TTV-1202 → 4X4 (10.23X10.23mm)

All the chips on all the TTVs are 381µm (0.015") thick with approximately 1,000Å thick Au flash on the backside and are underfilled. Other array sizes and configurations, thickness and back-side treatment are optionally available on a custom basis.

Direct-Attach Thermal Test Boards

Designed to generally conform to the JEDEC JESD51 Thermal Standards, these boards are designed for direct attachment of the TTV-1100 series and TTV-1200 series packages.

The boards are designed for universal wiring – the user can hardwire any TTV ball connection to any high-density edge finger. The user can also wire groups of heating resistors in series or parallel to simulate different heating levels in different portions for the TTV chip. The universal nature of these boards provides for substantial flexibility.

The **TTB-5101** accepts the TTV-1100 series and TTV-1200 series packages. The board is 101.5mm X 114.5mm (4" X 4.5") X 1.57mm thick with 2.03mm wide, 2.54mm pitch edge fingers for a total of 50 contacts. Each finger is rated for 3A continuous current.

Boards are fabricated from FR-370HR material and will operate in a 150ºC sustained temperature range. Through holes are provided for heat sink mechanical mounting. A backing plate for is optionally available.

Dedicated circuit wiring, alternative connector(s) and other custom features are optionally available. A mating connector mounted on a wire cable breakout board is also available

Socketed Thermal Test Boards

Similar to the direct-attach thermal test boards, the TTB-6000 series boards provide the same capabilities with a high quality, multi-insertion, open-top, burn-in-quality test socket.

The **TTB-6101** board will accept the TTV-1000 series packages and can be hardwired in either a dedicated or universal fashion.

Sockets for either board are zero-insertion force types to improve socket lifetime and to avoid TTV ball damage.

The socketed boards will operate in a 120ºC sustained temperature environment and have an open-top configuration for heat sink mounting. A backing plate for the socket is optionally available.

Dedicated circuit wiring, alternative connector(s) and other custom features are optionally available, A mating connector mounted on a wire cable breakout board is also available.

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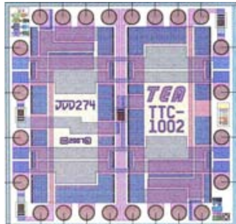
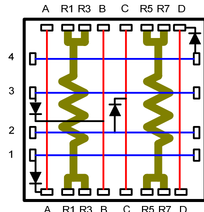
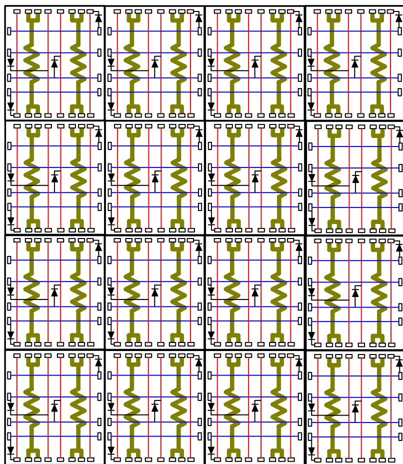
Thermal Test Chips



Actual Unit Cell Top Surface

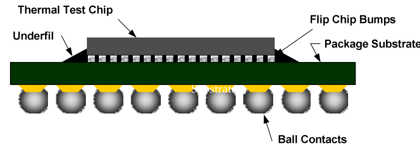


Unit Cell Component Layout

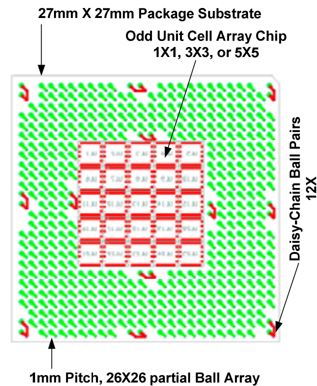


4X4 Unit Cell Array Component Layout

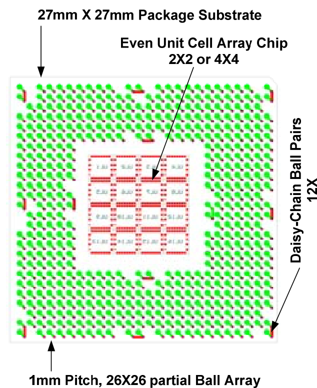
Thermal Test Vehicles



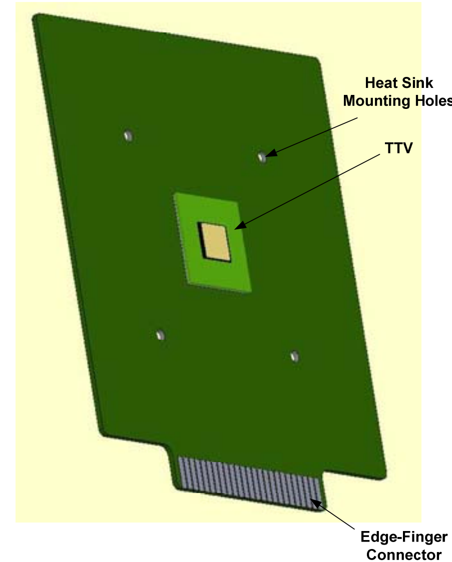
- **TTV-1100 series** (ball-side view)



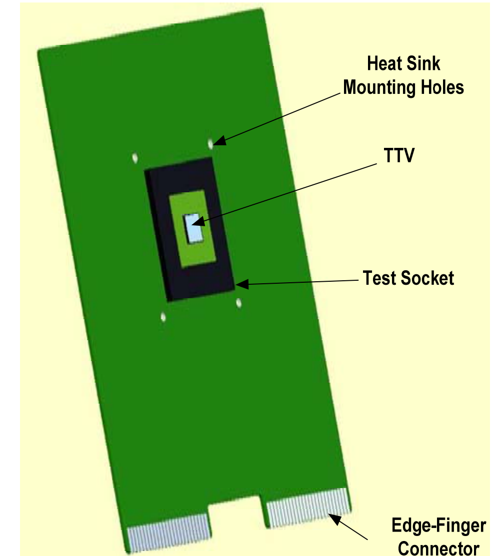
- **TTV-1200 series** (ball-side view)



Direct-Attach Thermal Test Boards



Socketed Thermal Test Boards



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