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"Cool Products for Hot Applications"

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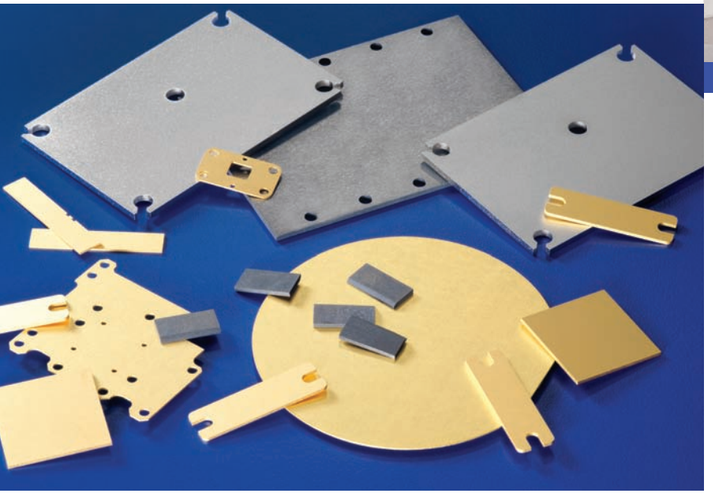
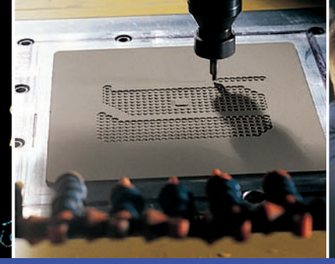
Thermal Transfer Composites, LLC

Electronic Components

Where over seven decades of experience, advanced materials, thermal management, innovation and quality come together.

Cool products for hot applications.





www.thermaltc.com

Since its founding in 2004 ***Thermal Transfer Composites, LLC (TTC)*** *has rapidly become one of the world leaders of advanced thermal management materials and solutions for the electronics industry. Today TTC produces thermal management and structural products for systems ranging from telecom satellites and military hardware, to high performance microprocessor assemblies and IGBT power conversion modules for traction and next generation hybrid and fuel cell vehicles.*

With over seventy years of combined experience in metal matrix and ceramic engineering, TTC's management and employees are focused on a drive for excellence through continuous improvement of its cutting edge technologies, development of innovative products, and a pursuit of perfection in customer service. With this synergy, TTC has the foresight and capability to provide its customers with the highest quality products to meet the thermal management challenges of today and tomorrow.

Thermal Management Solutions with no Compromises

TTC provides system and product engineers the ability to solve thermal and structural problems with high performance material-based solutions, combined with maximum design flexibility. In the past, such problems were typically solved with metal or ceramic solutions, often compromising product performance and/or design. However, TTC approaches the problem differently by combining metals and ceramics to create materials having properties that can meet multiple performance and design specifications, while improving overall system reliability. The results are materials having the unique combination of high thermal conductivity – over 250 W/mK, tailorable thermal expansion – 4.5 to 16 ppm/K, low mass – 3 g/cm^3, high stiffness 250 to 330 Gpa, and no thermal cycle aging effects (debonding of the filler and matrix over long-term thermal cycling) - i.e., no compromise solutions!

PRIMECOOL™ and PRIMEFLO™ Composite Components – Exceed Expectations

One of TTC's goals is to solve customers' problems with affordable technology. To meet this goal, TTC offers two complementary lines of thermal management components.

PRIMECOOL™ components are designed for systems requiring conduction cooling, while PRIMEFLO™ components are designed for high-efficiency systems requiring active air or liquid cooling. PRIMECOOL™ and PRIMEFLO™ components are widely used in a variety of applications where improved reliability and system performance are desired, including:

- IGBT Power Module Base Plates
- LDMOS and LED Heat Spreaders
- Laser Diode Mounts
- Microprocessor Package Lids
- Printed Wiring Board Cores
- Carriers and Hybrid Package Bases

Advanced Manufacturing Technologies and Production Facilities

TTC's aluminum silicon carbide (AI/SiC) products are based upon novel, cost-effective processes that have broken new ground in metal matrix composite manufacturing:

PRIMEX™ Pressureless Metal Infiltration Process infiltrates particulate preforms with molten aluminum to produce components ranging typically from 55 to over 80 volume percent silicon carbide.

PRIMEX Cast™ Composite Casting Process uses conventional aluminum casting processes to produce components ranging typically from 20 to 40 volume percent silicon carbide.

Over the past two decades these novel technologies have moved from the laboratory and developed into the cornerstones of TTC's high-volume commercial manufacturing processes. By building upon these concepts, TTC is addressing the demands of the automotive and semiconductor components markets, while still meeting the needs of the military and aerospace industries.

By incorporating the PRIMEX™ and PRIMEX Cast™ processes with state-of-the-art manufacturing techniques, TTC operates one of the world's most advanced metal matrix production facilities, producing components with the highest quality at the lowest possible cost. TTC's production processes are based upon an integrated semi-continuous manufacturing system, coupled with flexible manufacturing concepts:

Design: Beginning with CAD/CAM workstations, TTC engineers can quickly input product specifications and design parameters to initiate prototypes, as well as production tooling fabrication.

Preform Fabrication: For preform based applications tape casting, low pressure injection molding, high-volume dry pressing and green-machining operations provide the lowest cost preform options currently available.

Flexible Manufacturing: Part flow through the PRIMEX™ infiltration based production line is continuous regardless of shape, size or complexity, thereby minimizing costs and down times typically required for tooling changes. In addition, unlike competing MMC technologies, TTC's pressureless process does not require a tool to contain the preform during infiltration, which leads to further cost savings.

Casting Operations: For PRIMEX Cast™ requirements, TTC supplies AI/SiC concentrate to approved casting companies to provide die, investment and permanent mold cast components meeting TTC's high-quality physical and thermal requirements.

Surface Finishing: Using proprietary plating processes, TTC offers nickel, gold, silver, copper, tin, and cadmium surface finishing. These processes yield excellent surface coverage, solderability, solder joint reliability, and corrosion protection. TTC's nickel and nickel-gold plated AI/SiC components have been successfully tested blister-free up to 450°C in air, suitable for even the most demanding solder bonding requirements. In addition, anodizing, chemical conversion coatings, and epoxy primer coatings are also available.

Custom Part Fabrication: Although the production facilities are optimized for high-volume part fabrication, TTC maintains a complete machine shop with state-of-the-art CNC machining centers that include: milling, grinding, water-jet cutting and electro-discharge machining operations, for quick turn prototype and low-to-moderate volume component production.

Quality Systems

With many of TTC's components being used in mission critical systems, quality is viewed in equal measure to the manufacturing operations. TTC has based its quality systems on modern statistical quality assurance procedures, using the latest in product characterization and inspection equipment. For military and aerospace applications, the quality systems fully comply with (United States) MIL-I-45208A. For commercial and industrial applications, ISO-9001:2000* quality procedures are followed.

* ISO-9001:2000 certification is scheduled for mid-2007.

Technical Support

TTC maintains both in-house and external characterization capability to certify thermal expansion, thermal conductivity, and mechanical properties for all of its metal matrix materials and products. TTC also draws upon its engineers' years of experience to help customers in their material selection and component design requirements. In addition, a recent strategic partnership agreement between TTC and Rogers Corporation reinforces TTC capabilities with access to Rogers' corporate research and development groups and process engineering talents. With this combination, TTC's customers receive technical support that is second to none.

Our Commitment to Our Customers

At TTC, our customer commitment starts well before the first part is fabricated and lasts long after the final part is delivered. We seek long-term cooperative relationships with our customers and emphasize "design for manufacturing" concepts early in the product design phase, thereby reducing costs and delivery times. With our belief in continuous improvement, we work with our customers even after production has begun to further reduce costs and improve overall product quality and performance. We also believe that excellence in customer service is the key to success, and with our global sales and support personnel we stand ready to meet the challenge.

TTC's products are changing the way the electronics industry solves thermal management problems. We invite you to find out more about TTC and our exciting PRIMECOOL™ and PRIMEFLO™ components – truly cool products for hot applications!