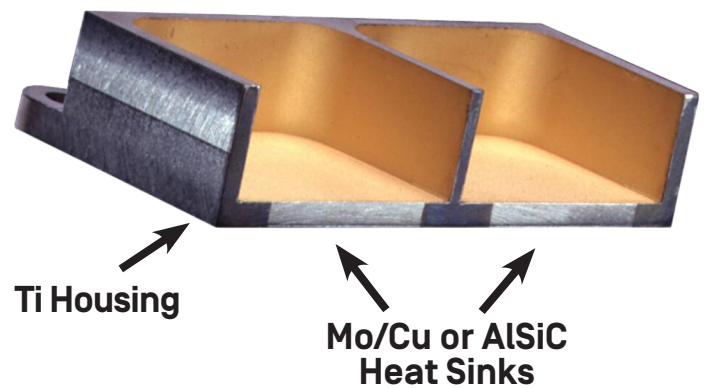


Thermal Composite Electronic Packaging

Overview

PA&E has been providing customers with the most advanced hermetic connector and packaging technologies available. With the introduction of its new titanium composite packaging, this trend continues. The new technology uses titanium as the primary housing material and integrates composite heat-sinks composed of molybdenum/copper [Mo/Cu] or aluminum/silicon carbide [AlSiC] into strategic locations of the structure for excellent heat dissipation capabilities.



Technical Advantages

The combination of titanium and Mo/Cu or AlSiC are ideal for achieving lightweight, low-coefficient of thermal expansion (CTE), and high-thermal-conductivity electronic packages. Pins can be hermetically sealed directly into the titanium using PA&E's Kryoflex® ceramic. Alternately, hermetic connectors made from explosively bonded dissimilar metals can be laser welded into position.

Ti Benefits

Titanium is the material of choice for housings because of its commercial availability along with its characteristics that allow for conventional machining and low-density attributes. Titanium's CTE is compatible with direct attachment of aluminum oxide and gallium arsenide electronic circuitry. Titanium is 300% stiffer than

aluminum and can remain hermetic with walls as thin as .010". This means an existing aluminum package can be redesigned to be stiffer, lighter weight, more reliable, and better thermally, by integrating PA&E's titanium composite technology. Titanium is compatible with both resistance and laser welding processes for flexibility in connector integration and cover sealing.

Titanium is an ideal material for electronic packages, even though it has low thermal dissipation characteristics. By utilizing our titanium composite packaging technology (incorporating Mo/Cu or AlSiC composite heat sinks) that characteristic becomes a non-issue. During the initial design phase, the electronic circuitry is mapped against the housing floor where hot spots are identified. The Mo/Cu or AlSiC composite heat sinks are metallurgically bonded only at the locations where the housing comes into contact with the high-power devices. This limited use of the heat sink material minimizes the overall package mass.



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Bi-Metal Connector Construction

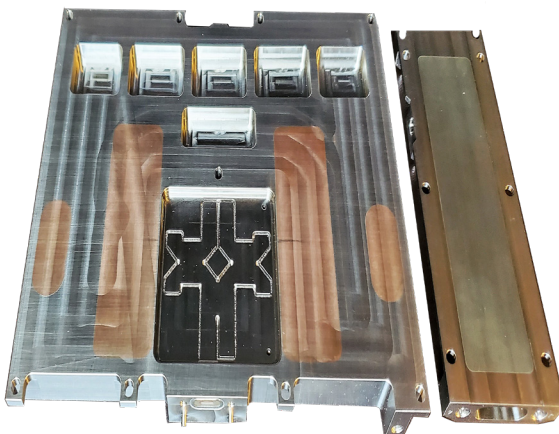
PA&E has manufactured dissimilar metal connectors for years, providing customers an alternative to traditional solder-in connectors and feedthrus. This technology is made possible by a combination of explosion metal bonding and laser welding. Explosion bonding is a method of joining dissimilar metals by driving them together with an explosive detonation.

Ferrous, Non-Ferrous Metals Joined

The product of this procedure is a sheet consisting of atomically bonded layers of different metals. In the case of the titanium, composite packaging, the connectors are fabricated from an explosion bonded sheet, where one of the layers within the sheet is titanium and the other layer is a ferrous metal (often stainless steel) compatible with laser welding. This explosion bonded sheet is then used to fabricate connector shells made of titanium on one side and a ferrous alloy on the other side.

Hermetic Seal

The ferrous side receives a group of feedthru pins that have previously been hermetically sealed into a ferrous insert. This insert is then laser welded to the ferrous portion of the connector shell while the titanium portion is welded to the titanium package. This process allows for a hermetic seal between the connector and the housing without solder.



A titanium composite package is the best solution for today's high-powered airborne electronic packaging demands, which require lightweight, low CTE and high thermal conductivity.

The titanium composite material does not require mold tooling or diamond machining, hence, the technology can be incorporated into new designs with very limited nonrecurring tooling costs, making the prototype phase more economical than would be possible with alternative technology.

If a titanium composite package, complete with cover and integrated hermetic connectors and feedthrus, could solve your thermal management issues, PA&E is ready to build your custom solution.