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NASA TECH BRIEF

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Multichip Packaging with Thermal Insulation



The problem:

In the emerging development of electronic chip usage, a significant advance is being made in space compression by high concentration of chips within a single package. However, thermal cross-coupling has been a limiting factor where low and high molecular power components have been combined in the same package.

The solution:

A thermal insulation technique that permits low and high molecular power components to operate in the same package without thermal cross-coupling.

How it's done:

The low power chip is mounted on a gold tab which is, in turn, mounted to the package on alumina glass, as shown in the lower sketch. The high power chip is mounted on a Kovar substrate and an alumina glass shield is interposed between the two chips. The alumina glass shield with a thermal conductivity of 0.043 tends to thermally isolate the chips while the Kovar substrate with a thermal conductivity of 0.193 acts as a heat sink to remove the heat from the high power chip.

The upper figure depicts a typical multichip molecular package with a resistor on one chip and a (continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights. high current transistor on the other, with no thermal isolation. In tests, a power dissipation change of 250 mw in the transistor resulted in a 7.7% value change in the resistor. The same test, performed with the thermally isolated component depicted in the lower figure resulted in only a 0.15% value change in the resistor.

Note:

Inquiries concerning this innovation may be directed to:

> Technology Utilization Officer Marshall Space Flight Center Huntsville, Alabama 35812 Reference: B68-10119

Patent status:

No patent action is contemplated by NASA. Source: W. G. Mend and R. G. McInturff of Westinghouse Electric under contract to Marshall Space Flight Center (MFS-14076)