

Printed Wiring Board Manufacturing Technology Center-Power Chip-On-Board

PROBLEM / OBJECTIVE

Hermetically sealed military parts are becoming scarce as many semiconductor manufactures are discontinuing their military product lines. Designers of military systems are being forced to use commercial grade Plastic Encapsulated Microcircuits (PEMS). Unlike commercial electronic systems, the avionics systems used in both military and commercial aircraft require high reliability. Systems may operate for fifteen years or more in a harsh environment.

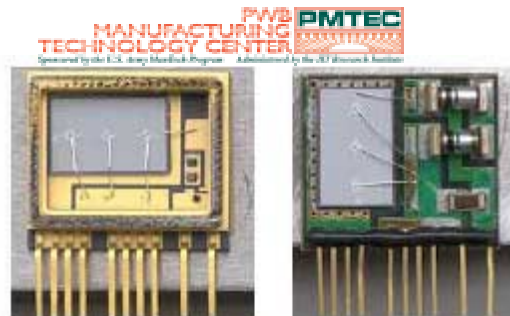
This program was initiated to demonstrate that a wafer-applied, near hermetic Silicon Carbide (SiC) coating can be applied to military power electronics components. This coating combined with advanced Chip-On-Board technology can significantly reduce the costs of packaging for electronic components in military hardware and operate reliably in harsh environments.

ACCOMPLISHMENTS / PAYOFF

Process Improvement: A design and assembly process flow was developed using SiC coated power semiconductor devices mounted on low cost PWB substrates. Standard chip and wire technology was used for fabrication. The developed Power Chip on Board (PCOB) can be used as a direct replacement for hermetic ceramic hybrids in the RAH-66 Comanche and F-22 Raptor power supplies. Environmental testing results using biased HAST and temperature cycling showed that SiC ChipSeal™ coating protects silicon power semiconductor devices against moisture intrusion and contamination during assembly. Testing results also showed that SiC ChipSeal™ combined with a conformal coating prolongs module life.

Implementation and Technology Transfer:

This project demonstrates an enabling technology for implementation of low-cost power devices, which will reduce procurement and life cycle costs. Implementation of this technology is fully supported by the power supply program manager for F-22 and RAH-66. Implementation on RAH-



Current Design

New Design

66 power supplies is planned for early 2003. Boeing will further exploit this technology and apply it across other control hybrid modules where the potential impact of cost avoidance is far greater than for just the PCOB device.

Expected Benefits:

Metrics include cycle time reduction from 3hrs/unit to 2.5 hrs/unit and component cost reduction from \$350 (power baseline hybrid) to \$180 power chip-on-board. The anticipated cost savings for RAH-66 Comanche is \$14.1M and \$11.1M for F-22.

TIMELINE / MILESTONES

Start Date: June 2000
End Date: December 2002

FUNDING

Army ManTech: \$0.370M

PARTICIPANTS

Boeing Phantom Works
U.S. Army Aviation and Missile Command
PMTEC / IITRI (now Alton)