

## Introduction:

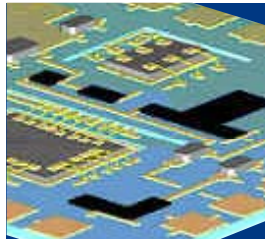
Hybrid or MCM is a well established technology for the fabrication and assembly of high reliability electronics circuits.

In a Hybrid or MCM a ceramic substrate replaces the PCB as the method of component interconnect.

Interconnect can be created by depositing layers of 'thick film' material onto the base ceramic substrate or by a co-fired ceramic process.

The thick film process can include layers of conductors, insulators and resistors. The HTCC substrate is generally limited to conductors and insulators, but provide a higher density of interconnect.

## A Multi-Chip Module (MCM)



A Multi-Chip Module (MCM) is a way of packaging and interconnecting semiconductors.

MCM technology can use many different substrates, but we are focusing on high reliability and therefore the use of either the hybrid thick film substrate or High Temperature Co-fired Ceramic (HTCC) substrates.

For the highest reliability applications MCM are generally hermetic, but lower cost options are possible, depending on the operating environment.

## Some advantages of using High Temperature Cofired Ceramic packages include:

- Harsh environment capability.
- Good thermal properties.
- Greater device density due to more circuit layers.
- Resistance to thermal and mechanical shock.
- Proven in high reliability applications due to robust ceramic substrate and wire bond interconnect.
- Faster switching speeds due to shorter signal paths.
- Reduced space and weight.
- Good dielectric properties for high frequency.
- Reliable high temperature operation. Operation at 150°C is typical and new developments are pushing this beyond 200°C.
- Can be a lower cost solution compared to ASIC for low volume production.
- Commercial Off The Shelf parts can be designed in and qualified for military and avionics environments.

## Examples of customer specific applications

- Digital MCM for Avionics Engine Management.
- Linear MCM for Avionics Engine Management.
- DC to DC Converter for Flight Computers and Displays.
- Power MCM For Wing and Engine De-icing.

## Showcase - Digital MCM for engine management

### Function:

- Engine management (FADEC).
- Custom CPU with Commercial Off The Shelf SRAM, EPROM and Oscillator.
- Hi Reliability >20yrs life.

### Characteristics:

- Operating Temperature -55°C to +150°C.
- Engine mounted.
- High Temperature Co-fired Ceramic (HTCC) substrate.
- Chip and Wire (>1000 wire bonds,>2000 welds).
- High Density – Reduced size and Weight.
- Hermetically sealed and laser marked.
- 136 pin QFP package.

