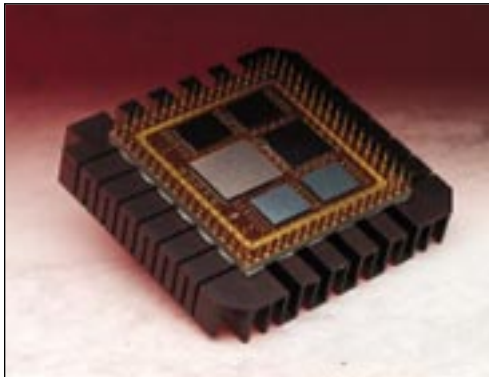
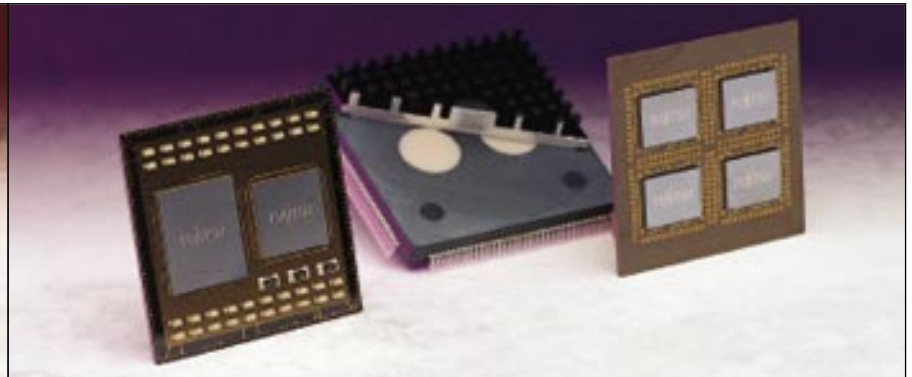


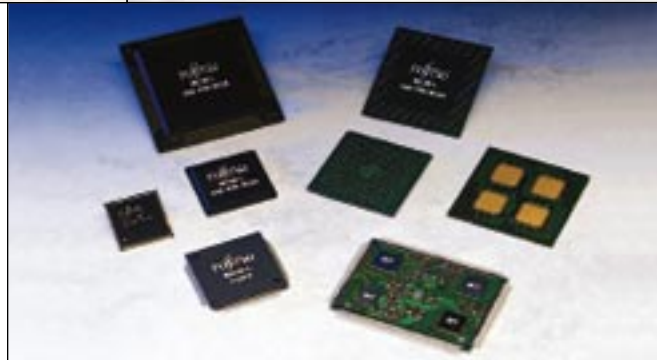
MULTICHIP MODULES



MCM-D: 125 MHz microprocessor, cache controller & SRAMs



MCP-C/D: Double-sided mount, 100 MHz microprocessor, cache controller & SRAMs



Fujitsu's MCP family of available packaging options, including BGAs

THE FUJITSU ADVANTAGE

- Vast design and manufacturing capabilities and locations throughout the world
- Complete (standard and/or custom) multichip packages are available
- Extensive component mounting processes and techniques, including 3-D die-stacking
- The industry's highest density is achieved by mounting components on both sides of the substrate
- Commitment to our customers in selecting the best choice from an array of solutions

Fujitsu offers the widest range of multichip module (MCM) and multichip package (MCP) technology available in the industry today. MCM is a completely custom solution that creates a specialized module. MCP offers multiple chips in a standard package and form factor.

As the world class leader in enabling technologies, we have continually demonstrated how to reduce our customers' systems cost and time-to-market. With today's high demands, the use of MCM/MCP technology allows designers to achieve the maximum performance through size and space reductions.

The MCM/MCP solution provides several clear and distinct advantages over the conventional ASIC approach. In addition to time savings, the MCM/MCP solution can easily incorporate mixed technologies, using the existing commonly available building blocks, i.e. semiconductors. Since most of the existing devices all have support tools, the need for simulation is minimized. Merging even slightly different technology onto a single ASIC is costly and very difficult at best.

Features of MCM-L Technology

- The MCM-L substrate and your PWB share the same materials, so no TCE mismatch occurs.
- Substrate material can be a standard FR-4 glass-epoxy or the more performance and thermally enhanced materials such as BT-Resin, Polyimide, Cyanate Ester or PTFE.
- Tailored for low to mid range performance applications such as handheld computers, wireless communication and portable test equipment.
- Due to the mature infrastructure, MCMs/MCPs can be produced in very high volumes with excellent yields and affordable costs.

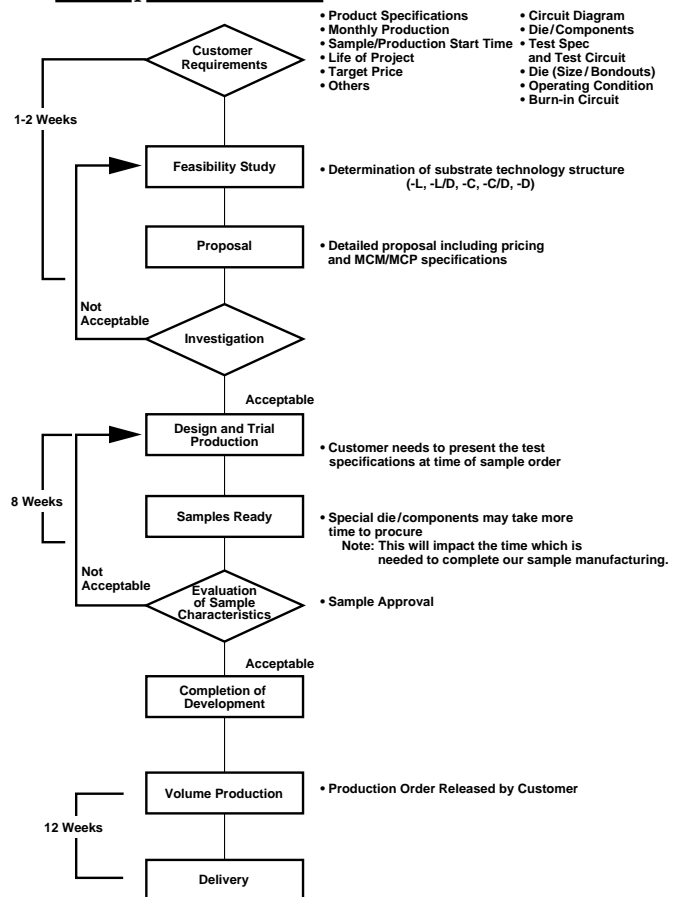
Features of MCM-C Technology

- Evolved from the mature, proven hybrid technology with substrate density and performance enhancement capabilities.
- Excellent mechanical and thermal characteristics with good redistribution of signal interconnects and grid / power requirements.
- Improved (silicon to substrate) TCE match with good thermal conduction media.

Features of MCM-D Technology

- Significant reductions in the module size with dramatic increases in your substrate routing density to eliminate circuit ringing. Additional performance gains through the use of strip-line techniques.
- Reduces I/O driving requirements due to shorter interconnections and lower metal loading, which in turn reduces the overall power dissipation of your system.
- Utilizes materials with the lowest dielectric constant possible to reduce your signal propagation delays.
- Improves routability and pin escapes especially for array and fine pitch devices.
- Your system cost is reduced by utilizing substantially smaller substrate size and signal routing layers.

Development Flowchart



Summary

A cohesive effort has been long established to come up with the most cost-effective method of meeting today's high performance packaging requirements. With continuous process and material improvement in our MCMs/MCPs, this technology remains the solution of choice.

Understanding the significance of MCMs/MCPs, Fujitsu has committed to take on an active role in promoting this technology. We are continuing to provide solutions for many of our market leading customers, and as the demand for more complex solutions increases, Fujitsu will be there to meet your needs. For more information, please contact your local Fujitsu representative.

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