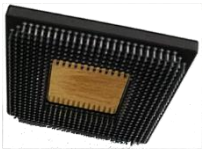
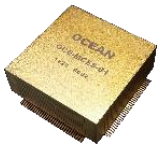
OCE Products



Radiation hardened SPARC LEON4 SOCs

The E698PM radiation hardened processor is a high performance, high reliability, high integration and low power multi-core system-on-chip (SOC). Its symmetric multi-processing (SMP) architecture is compliant with the SPARC V8 standard. Features include:

- Quad-core SPARC V8 LEON4 ASIC, each CPU with IEE-1754 compliant FPU
- Radiation Hardened Design including TMR, EDAC on internal and external memories, 3∂ clock tree with TID > 300K Rad and SEL > 98 Mev-cm2/mg
- Proven space flight heritage
- Qualification to US/ESA standards using MIL-STD-883 tests
- Max clock speed of 600 MHz with performance 2,100 MIPS and 900 MFLOPS
- Low power usage of 2.8W at 600 Mhz
- Operating Temperature -55°C to +125°C
- Software support for Eclipse IDE, SPARC-GCC, OCE DMON debug monitor, RTEMS
- Ceramic Column Grid Array Package
- Level 1 and Level 2 cache
- Multiple Interfaces including 4 x SpaceWire, 2 x 1553B, 2 x CAN, Ethernet, 4 x UART, Dubug support on UART, Ethernet and JTAG, TM/TC interface, GPIO, I2C, SPI
- No export restrictions, ITAR free
- Portable Development Kit with test board, schematics, power supply, software development tools & examples, and documentation



Radiation tolerant SIP memories/OBCs/devices

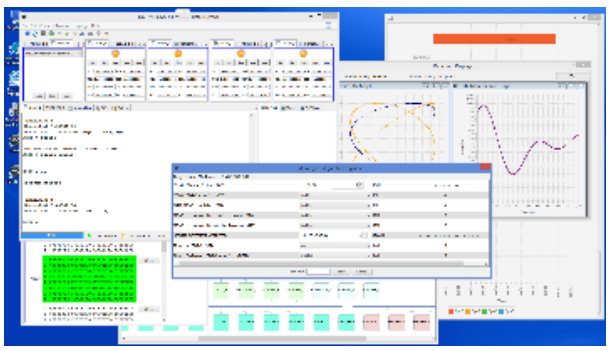
OCE develop and supply System-in-Package (SIP) products and packaging services equivalent and compatible with MCM-V stacking technology widely used in high reliability applications. Features include:

- SIP parts include SDRAM, DDR, FLASH, SRAM, E²PROM, MRAM, PROM, SPARC-LEON modules, Camera modules…
- Standard or Custom SIP solutions
- SIP package sizes - standard IC footprints; CSP, SOP, QFP packaging
- Die stack/Chip Stack/PCB stack (for larger parts)
- Proprietary technology and software IPs
- Screening flows to NASA/ESA standards
- No export restrictions, ITAR free

DMON debug software for SPARC/ARM

DMON helps improve productivity by speeding up debugging of embedded software running on system-on-chips (SOCs) with one or more SPARC/ARM processor cores. It's unique GUI with register drill down, Python/Tcl scripting, data monitoring and remote access features facilitate testing and the quick identification and correction of bugs.

- GUI with unique visualisation of SOC activity
- Drill-down for each IP core detected to register and bit level
- Load and execution of multicore embedded applications
- Breakpoint, watchpoint and disassembly support
- Read/write system memory and device registers
- Support for serial, Ethernet, USB and JTAG debug links
- Integration with IDEs as GDB remote target
- Support for SPARC V8 and ARM processor architectures
- Runs on Windows, Linux, & Cygwin
- Allows applications and data to be written to flash memory
- Support for TCL & Python
- Statistics module with graphing options



Cost benefit examples

Example 1: E698PM Solar Panel control system

A Swiss design house selected OCE's E698PM radiation-hardened system-on-chip to be used for a solar panel control design to be deployed on multiple satellites. OCE's ASIC offered a large performance improvement over the competitor offering at a fraction of the cost. The design also incorporated OCE's system-in-package radiation-tolerant SRAM modules provided with a reference design. ***This is a typical example of a customer designing a satellite subsystem where the OCE solution saved time and money.***

Example 2: SIP SDRAM parts for satellite storage system

A German space organisation designs memory storage systems based on high-performance high-density memory devices. These devices are suitable for storage and retrieval of payload data obtained by high-resolution instruments e.g. SAR, Hyperspectral Cameras, etc. OCE's SDRAM parts were selected for their more consistent high quality and lower price than our competitor. ***OCE's SIP components again provide a more cost-effective higher quality solution for use in space subsystems.***

Example 3: DMON debug software

The European Space Agency discovered an obscure bug during the qualification of its AGGA-4 navigation processor. The ASIC locked up if GNSS registers were accessed before certain initialisation had been performed. Months of investigation had been in progress before OCE's debug tool was deployed. A fix was identified within days. ***This is an example of the type of productivity improvement that can be achieved with OCE's debug software DMON.***

About OCE

O.C.E. Technology is a European company set up to provide high-reliability products and related software and services for demanding applications including aerospace. The company is supported by the Irish government and cooperates with the European Space agency in developing products to improve the productivity of embedded software developers.

Located in Dublin, OCE's products include a debug software tool for SPARC and ARM based systems-on-chip (SOC) devices, a range of radiation hardened SOCs including the Leon4 based E698PM, and system-in-package (SIP) devices.

Products, Capability and Partners

OCE has developed its debugging tool DMON with support from the European Space Agency (ESA,) and recently extended DMON to support ESA's new AGGA-4 SOC. Originally developed for a customer in China, DMON's unique features make it the debugging tool of choice when developing software for systems on a chip based around Sparc or Arm processors. DMON will continue to be developed to support new SOCs, and is available for evaluation from OCE's website. www.ocetechnology.com

Of particular interest in a space context are OCE's system-in-package (SIP) products which are extremely robust, compact, light weight, and in many cases radiation hardened. Only a few companies in the world have mastered this technology. OCE offers a custom SIP design service for companies wishing to produce proprietary OBCs or other systems housed in an SIP package.

OCE has distribution partners in Europe, India, Korea, China and Russia.

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