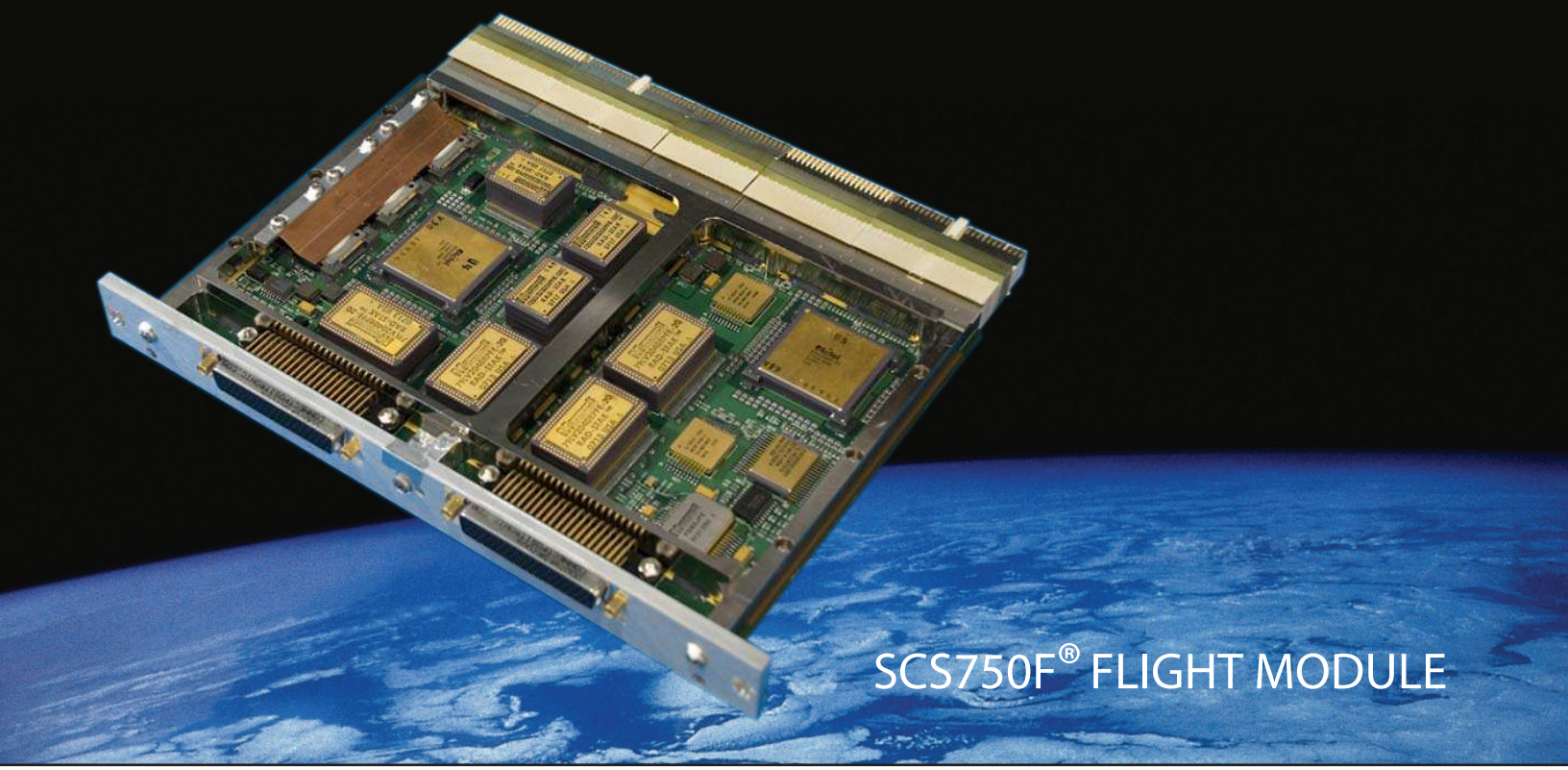
SCS750®

SUPER COMPUTER FOR SPACE



SCS750F® FLIGHT MODULE

Overview of Specifications

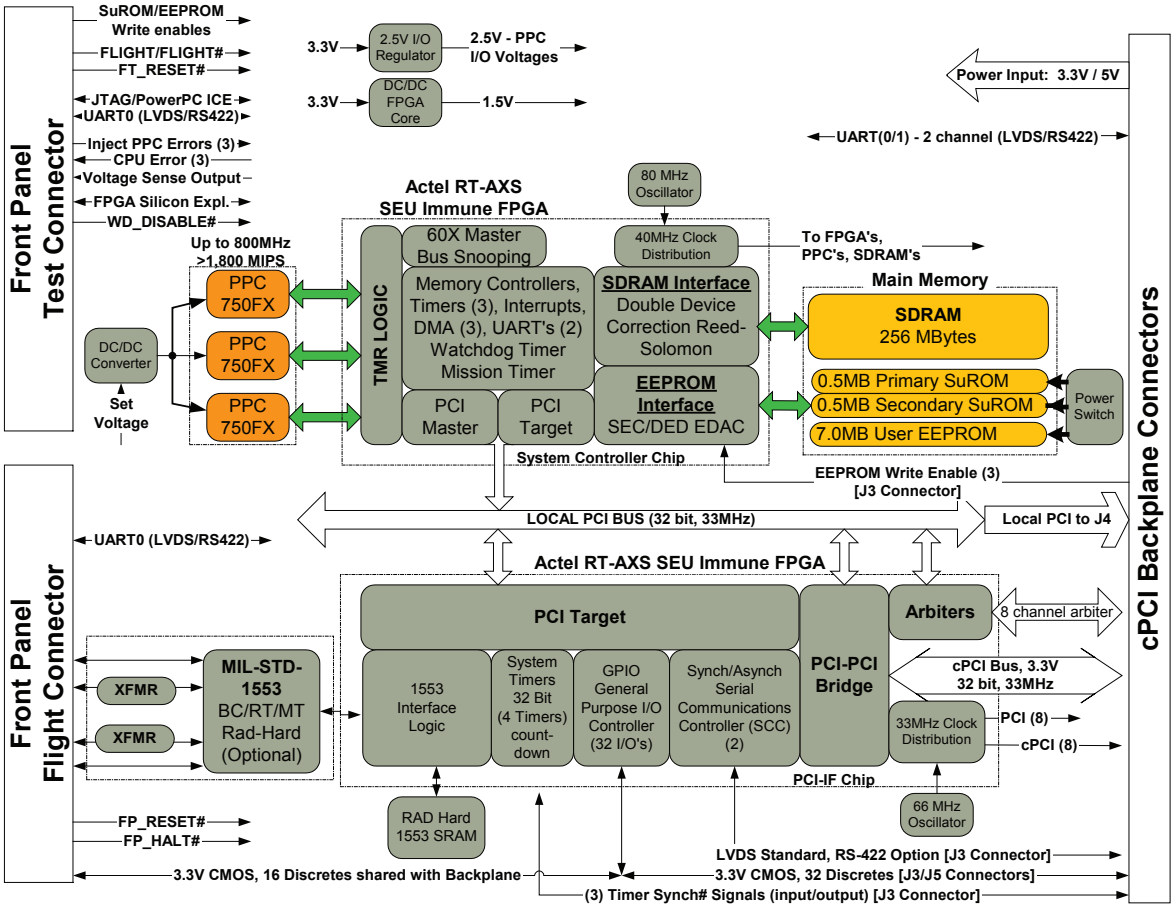
- One board upset every 100 years in a GEO or LEO Orbit
- Up to 1000X Better Performance Than Current Space Processor Boards
- Highest Space-Qualified Performance @1800 MIPS
- Demonstrated Radiation Tolerance
  - Silicon-On-Insulator (SOI) Processors
  - Actel RTAX-S Radiation Tolerant FPGAs
  - RAD-PAK® & RAD-STAK™ Packaged Memories
- Triple Modular Redundant Processing
- Advanced Error Corrected SDRAM
- Ultimate Upgradeability
- Software Selectable Power Consumption from 7-25 watts typical
- Standard Development Platform – Compatible with IBM's PowerPC750™

The **SCS750** single board computer is Maxwell's answer to the space industry's need for high-performance computing and on-board data processing while providing excellent reliability/upset immunity. There is a trend to perform data management and manipulation on the spacecraft, which requires a large amount of processing power. This next generation super computer will enable future satellite designs to dramatically increase error-free, on-board data processing, mission planning and critical decision-making.

The **SCS750** has been designed to operate in a cPCI system targeting high performance computing and memory for the most demanding space applications. Its design decisions have been driven by a guarantee of the highest reliability and performance. Maxwell has developed a comprehensive radiation mitigation strategy to provide total dose hardness, latchup immunity and upset error mitigation for the **SCS750**.

Maxwell's SCS750 has become the benchmark of which all future space processor boards will be measured.

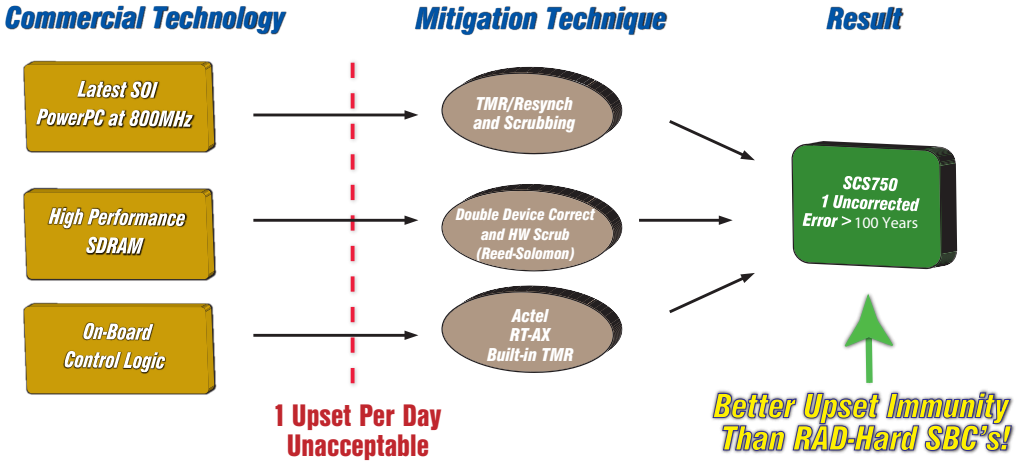
Maxwell TECHNOLOGIES™



Auto Controller/Peripheral Configuration
Cold Sparing Capable

Processor & SDRAM Error Logging
Front Panel Test Connector
Front Panel Flight Connector

Single Event Upset Mitigation

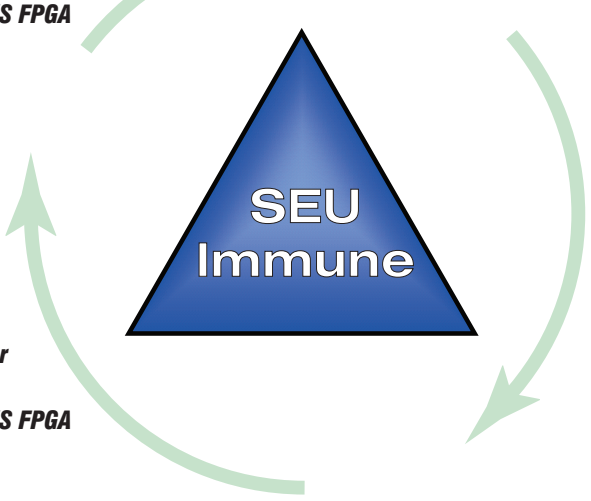


Triple Redundant Processing

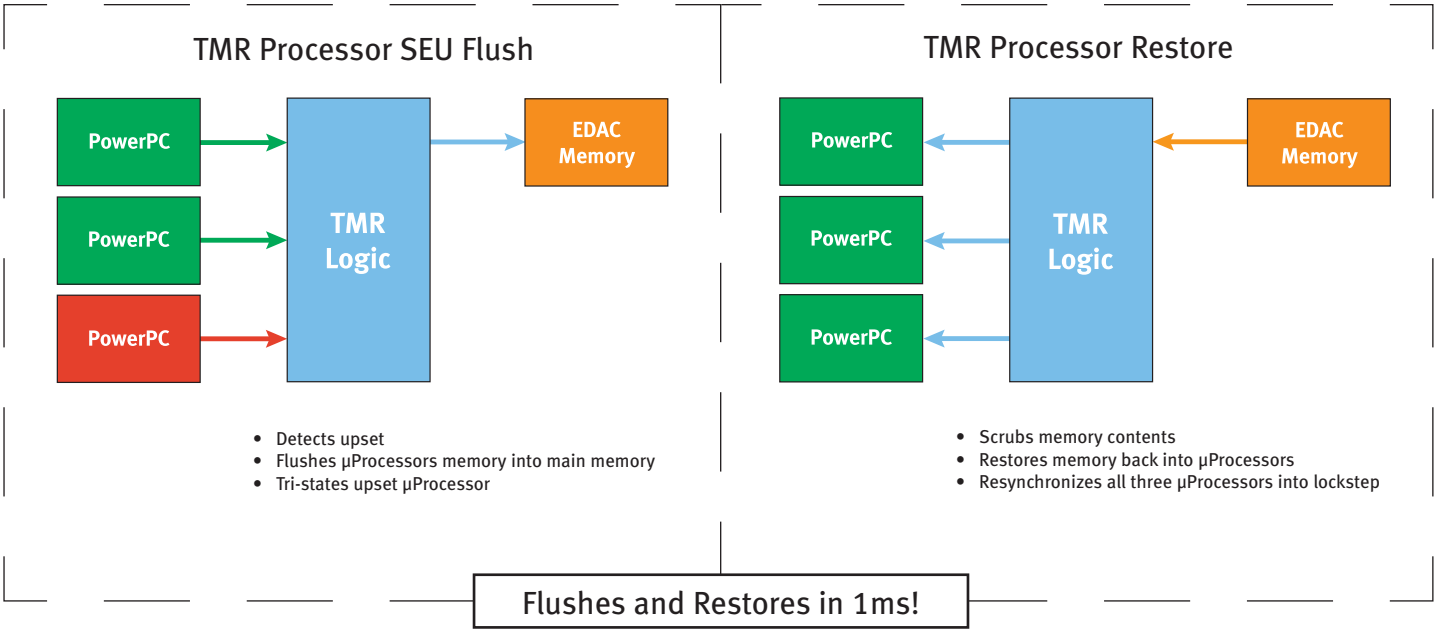
TMR Voting
Correct operation EVERY cycle
Hardware function in RTAXS FPGA

Resynchronization & Scrubbing
Complete User Control in Software
Resynchronization – application initiated
Scrubbing – performed periodically
Software adjustable to meet mission needs
Software/Hardware Process
- *Store processor image in SDRAM*
- *Reset all three processors*
- *Restore image to all three processors*
- *Restore fully synchronized operation*

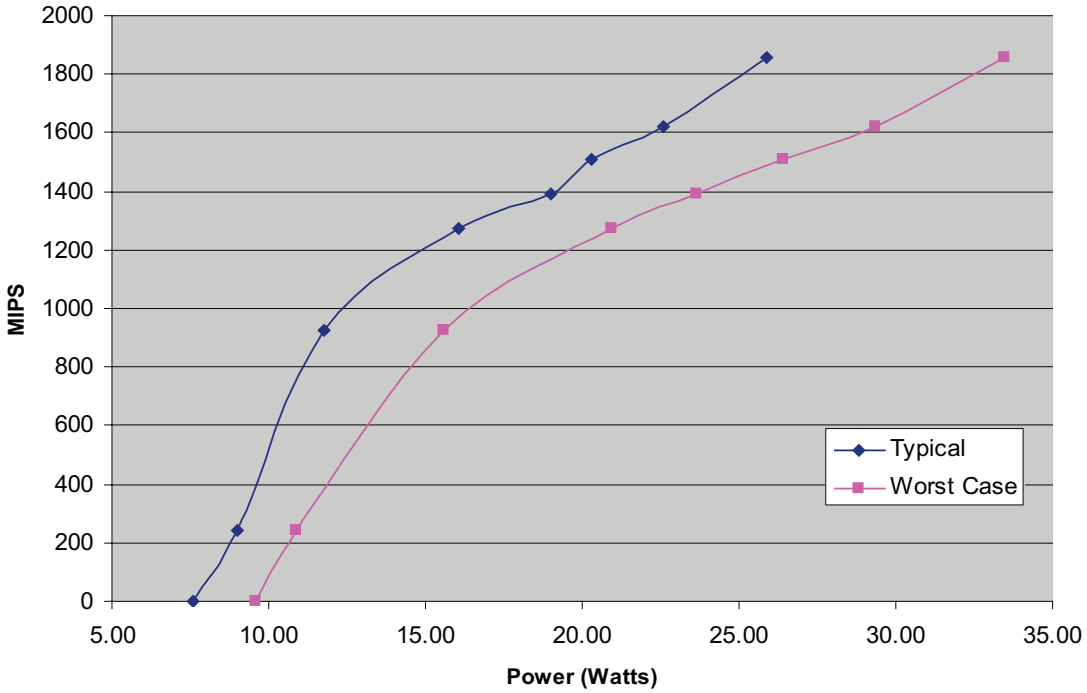
No roll-back required
No missed operations



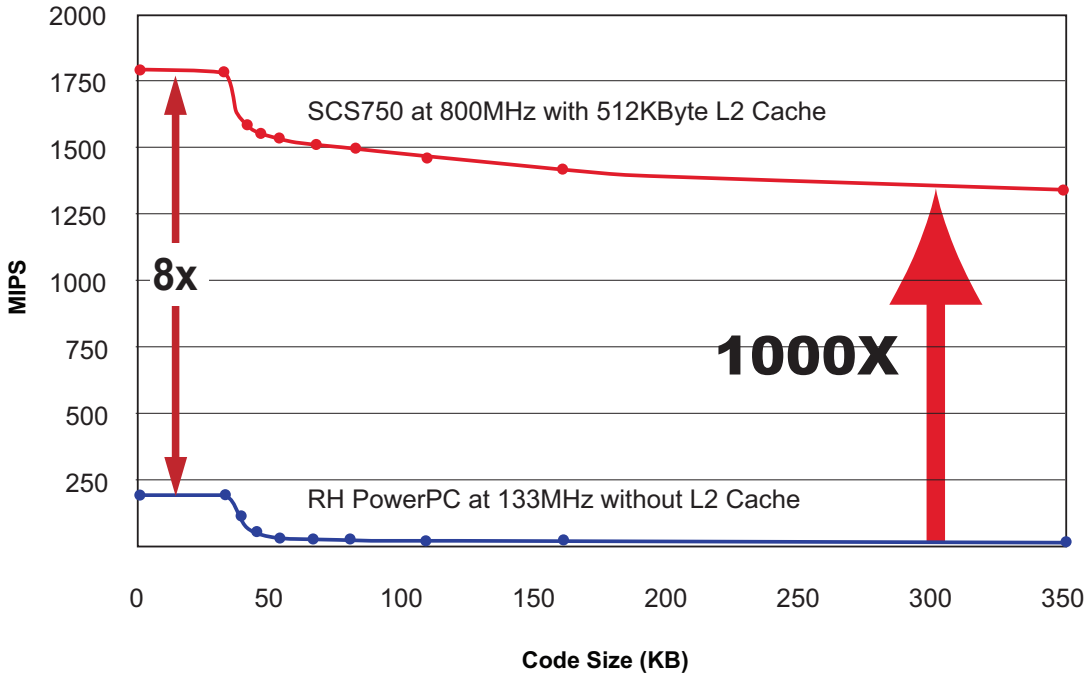
Error Detection
Isolate processor with error
Put in reset mode
Hardware function in RTAXS FPGA



Software Selectable Power Consumption



Estimated MIPS vs. Code/Data Size



Technical Specifications

RADIATION TOLERANCE

- One Board upset Every 100 Years in LEO or GEO Orbit
- TID: › 100 krad (Si) - Orbit dependent
- SEL (th): › 80 MeV-cm^2/mg - All parts except SDRAM
  ≈ 50 MeV-cm^2/mg - SDRAM

PROCESSORS

(3) FULLY TMR PROTECTED PROCESSORS
- PowerPC 750FX™ on Silicon on Insulator (SOI), 0.13um
- 2.32 Dhrystone MIPS/MHz
- › 1800 Dhrystone MIPS @ 800MHz
- 400 to 800MHz - Software Selectable Core Clock Rate

L1 CACHE
- 32 KByte Instruction with Parity
- 32 KByte Data with Parity

L2 CACHE
- 512 KByte on-chip with ECC @ CPU Core Clock Rate

MEMORY

VOLATILE
- 256 MByte SDRAM - Reed-Solomon Protected - Double Device Correction

NON-VOLATILE
- 8 MByte EEPROM - ECC Protected
  - 7.0 MByte EEPROM available to user
  - 0.5 MByte Primary SuROM
  - 0.5 MByte Secondary SuROM (Autoswap on Primary Failure)

INTERFACES

cPCI BUS
- 6U
- 3.3V
- 32 bit, 33MHz
- Master/Target & Syscon/Peripheral

1553
- BC/RT/MT
- SEU Immune

SERIAL
- UART (Asynchronous), LVDS
- (2) USRTs (Synchronous), LVDS

PROGRAMMABLE I/O
- 32 Programmable General Purpose I/O (GPIO)

POWER

- 7 - 25 watts (typical) dependent on clock rate/MIPS requirements
- 5V for 1553 interface, 3.3V for rest of board

OPERATING SYSTEM

- VxWorks, Tornado

TEMPERATURE

- -30°C to +65°C (Acceptable Levels)
- -40°C to +70°C (Qualification Levels)

MECHANICAL

- 6u x 160mm
- 1.5 Kg (3.3 Lbs.) Max

MODELS

SCS750F - FLIGHT CONFIGURATION
- Rad-Tolerant, Class "S" or Equivalent Components
- Conduction Cooled
- 2 ACTEL RTAX FPGAs

SCS750E - ENGINEERING CONFIGURATION
- Parts Identical to Flight (Not screened to flight level)
- Conduction Cooled
- 2 ACTEL RTAX FPGAs

SCS750D - ENGINEERING DEVELOPMENT CONFIGURATION
- Commercial Components, ACTEL FPGAs
- Full Hardware & Software Compatibility w/ E & F Models
- Convection Cooled

SCS750P - PROTOTYPE CONFIGURATION
- Commercial Components, Xilinx FPGAs
- Similar functionality to D, E & F Models
- Convection Cooled

All models are available with an optional 1553 interface

Board Support Package

- Detailed Specification
- User Manual
  - Interface Control Documents
  - Software User's Manual (SUM)
- VxWorks® Runtime License
- Certificate of Conformance
- Startup ROM Source Code
- Functional Test Procedure
  - Test Plan
  - Test Log
- Functional Test Report
- Environmental Test Procedure (Flight Only)
  - Test Plan
  - Test Log
- Environmental Test Report (Flight Only)

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All specifications are subject to change.

For the most current information on Maxwell products, visit: www.maxwell.com

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