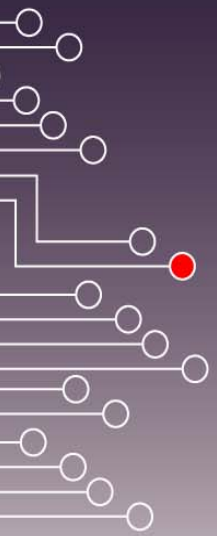


GAISLER RESEARCH

Next Generation Microprocessors for Space Applications – ROUND TABLE

High performance processors for space applications

GAISLER RESEARCH

MISSION

To provide processors for commercial and aerospace applications, including full development infrastructure

COMPANY INFORMATION

- Located in Gothenburg, Sweden
- Private Company
- Management team with 40 years combined experience in the space sector:
  - Per Danielsson: CEO
  - Jiri Gaisler: Founder and CTO
  - Sandi Habinc: System Design
- 12 design engineers with expertise within electronics, ASIC and software design
- Complete design facilities in-house for ASIC and FPGA design

LEON CAPTURING THE MARKET

- The LEON (non FT) processor is used in numerous products (50+) ranging from consumer electronics to critical industrial applications. The LEON3 has been licensed to 10 companies in the past 6 months.
- The LEON2-FT samples are now available from Atmel (AT697E).
- LEON3-FT flight devices are available from Gaisler Reserach using the Actel RTAX2000S device.
- LEON3-FT/RTAX200S will be used in
  - ARGO (Taiwan)
  - Prisma (Sweden)
  - SIR-2 (India)
  - Bepi Colombo (ESA)
  - Not able to disclose (US)

BENEFITS FROM CAPTURING THE MARKET

- Larger user base gives a more stable product
- Gaisler Research is now recognized by all major tool and software vendors. This gives us access to the latest versions of tools and enables us to port various software environments. Example, the cooperation with Windriver for VxWorks 6.X would not have been possible without the success on the non-space market.
- The larger market share enables Gaisler Research and other vendors to maintain and make additions to the development environment:
  - Compilers
  - Operating systems
  - Simulators and debuggers
  - Development boards
- The LEON3-FT will be implemented by a number of vendors, thus providing a second source to the AT697.
- Maintain the critical mass for processor development. 80% of our revenue from licenses and 20% from ESA contracts.

SPACE PROCESSORS COMPARISON

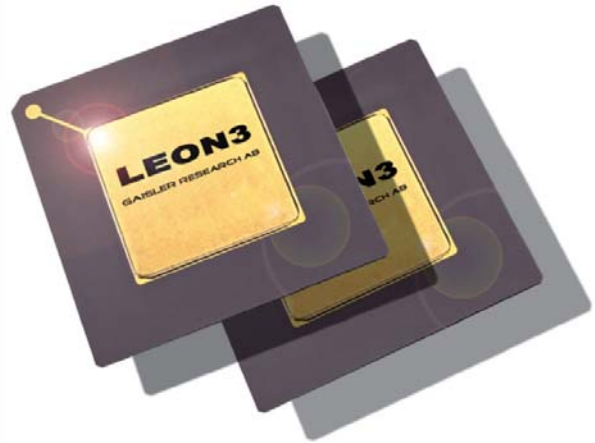
Processor	MA31750	ERC32	LEON3	LEON2	LEON2	LEON3	LEON3	Power PC	Power PC	LEON3
Identifier		AT695	RTAX2000	SpWRTC	AT697F	DARE	UT699RH	RAD750	RHPPC	GINA
Foundry	Dynex	Atmel	Actel	Atmel	ATMEL	UMC	Aeroflex	BAE	Honeywell	TBD
Clock frequency	16	25	25	50	100	125	150	133	150	250
MIPS	2	20	20	40	86	100	130	240	210	1000
Cache I/D	No	No	8/4	4/4	32/16	8/8	16/16	32/32	16/16	16/16
MMU	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Spacewire	No	No	0-3	2	No	3	4	No	No	4
CAN	No	No	0-1	2	No	No	1	No	No	2
1553	No	No	0-2	No	No	No	2	No	No	No
Availability	Yes	Yes	Yes	2007***	2007**	2008***	2007	Yes*	Yes*	2008 TBC

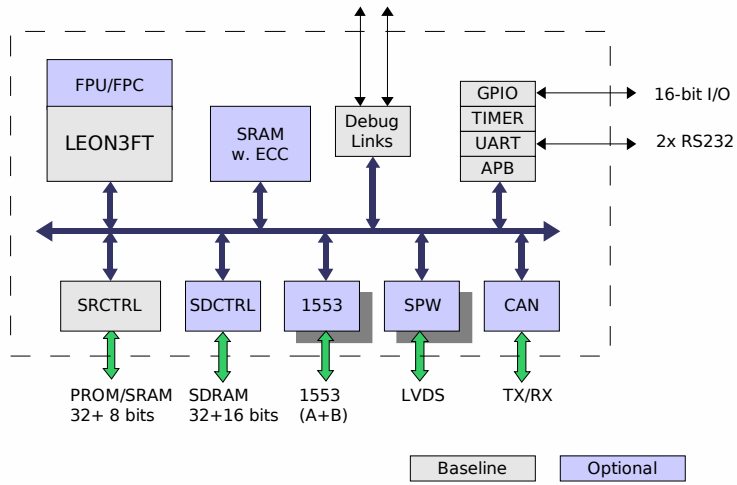
* Only available mounted on PCI board ** Available today as prototype *** Will require commercialization

LEON3FT-RTAX Overview

FEATURES:

- 32-bit embedded controller implemented on RTAX2000S
- Based on LEON3FT and GRLIB IP Library
- LEON3FT core with separate I/D cache and IEEE-754 FPU
- Dual 100 Mbit/s SpaceWire links
- Dual MIL-STD-1553 BRM
- CAN-2.0 interface
- 8/32-bit memory controller with ECC (BCH and RS)
- 25 MHz, 500 mW
- Delivered as pre-programmed OTS component or custom configuration

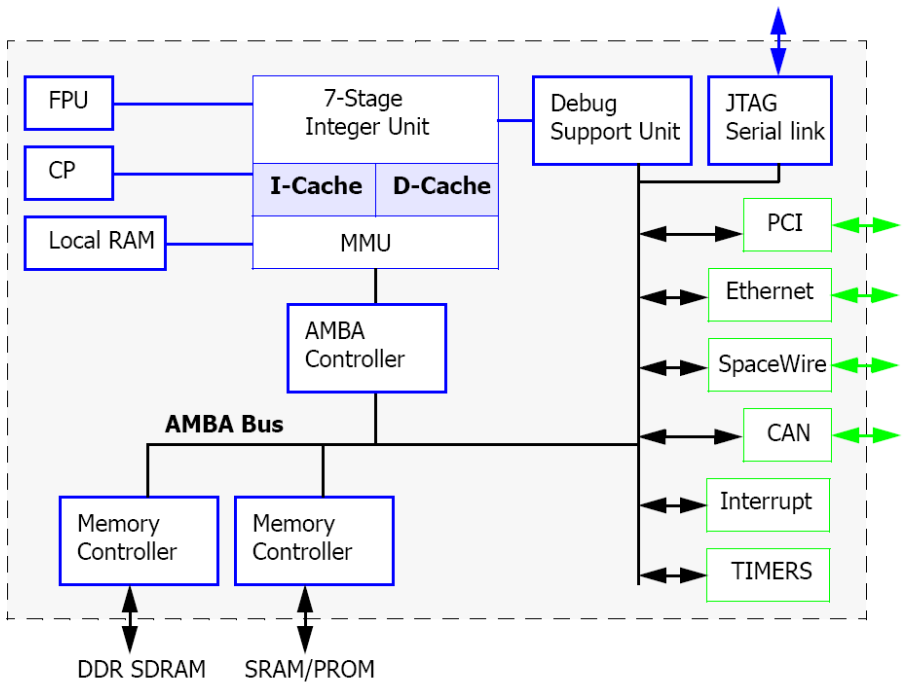




UT699RH– Block Diagram

FEATURES

- Static design allows flexible 1MHz-150MHz clock rate
- Integrated PCI 2.2 compliant core
- Integrated PCI-to-PCI bridge function
- 100Mbs Ethernet port for VxWorks development
- Internally configured clock network
- Integrated multi-protocol SpaceWire core supports RMAP, GAP & GRDDP with Node & Router functions
- On-board programmable Timers &Interrupt Controllers
- High-performance fully pipelined IEEE-754 FPU
- Implemented on a RadHard 0.25µ CMOS Technology
- Power saving 2.5V Core Power supply
- 3.3V I/O compatibility
- Power efficient architecture requires only 15 mW/MHz
- CAN compliant 2.0 Standard Bus
- 10/100 Ethernet Port
- Separate instruction and data cache architecture
- -55°C to 125°C Temperature range
- Capability to embed in custom digital, analog, or mixed-signal ASICs
- Radiation performance
  - Intrinsic total-dose: 100krad (Si) to 300krad (Si)
  - SEL Immune >110 MeV-cm^2/mg
- Packaging options:
  - Ceramic Quad Flatpack
- Standard Microcircuit Drawing TBD
  - QML Q and V



PCI to SPACEWIRE AND 1553 BRIDGE

FEATURES:

- Companion chip for space processors and systems with PCI interface implemented on RTAX2000S
- PCI bus Initiator and Target, 32-bit, 33 MHz
- 3 SpaceWire links with RMAP, 80 MBit/s
- Redundant MIL-STD-1553 BRM
- 2 UART/RS232 interfaces
- 16-bit I/O port
- 16 kbyte EDAC protected on-chip SRAM
- 8-bit EDAC protected bus to external memory
- Timers and watch dog
- CQ352B package
- Power consumption < 500 mW @ 33 MHz