Microsemi
Power Matters.

SPACE BRIEF

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Welcome to this special edition of Microsemi's Space Brief quarterly newsletter featuring our unique Space Forum 2015 series of global technical conferences. Read about these upcoming Microsemi Space Forum events in a region near you with a very comprehensive agenda including details of our partner participation. In this edition, we will also give the latest product introduction news as we launch our next generation RTG4 family using a 65nm low-power flash process, as well as our companion radiation hardened analog mixed signal ASICs for telemetry and motor control. We will highlight the upcoming space events Microsemi will attend and we look forward to meeting you there. We hope you find our newsletter useful and encourage you to pass this edition to your colleagues. Instructions for registering to receive this quarterly space brief are included at the end of the newsletter or click on the newsletter archives to explore past editions.

Recent Product News

RTG4 Radiation Tolerant FPGAs Solve Signal Processing Congestion Problems

Satellite operators have an insatiable thirst for data, and are specifying remote-sensing satellites with ever-increasing sensor capabilities. Imagers are required to have higher resolution and cover broader spectra; radiation and particle detectors are required to collect enormous amounts of data to detect rare events; and synthetic aperture radar systems need to achieve higher resolution. While sensor develops have been able to meet the need with increasingly sophisticated and capable sensors, the available bandwidth to transmit data back to the earth has not been increasing as quickly. This creates an increasing requirement to perform signal processing on board the satellite, so that downlink bandwidth is used efficiently.

Microsemi's RTG4 FPGA family offers a new approach to solving this signal processing congestion problem. RTG4 FPGAs combine an architecture which is optimized for signal processing applications with a 65nm Flash process which is intrinsically hard against loss of configuration due to radiation in space. Architectural features which support high speed signal processing in RTG4 include a flip-flop rich programmable fabric which support high-speed pipelining, abundant embedded multiply-accumulate blocks, two different sizes of memory blocks, and up to 24 high-speed serial transceivers capable of operating up to 3.125 Gb/sec. The architecture also includes abundant routing resources, to enable efficient use of all available logic and embedded features.

Microsemi's Libero SoC development software suite supports RTG4 design. Further details are available on the RTG4 web page http://www.microsemi.com/products/fpga-soc/radtolerant-fpgas/rtg4

Contact Ken O'Neill and Minh Nguyen for additional information ken.oneill@microsemi.com and minh.u.nguyen@microsemi.com
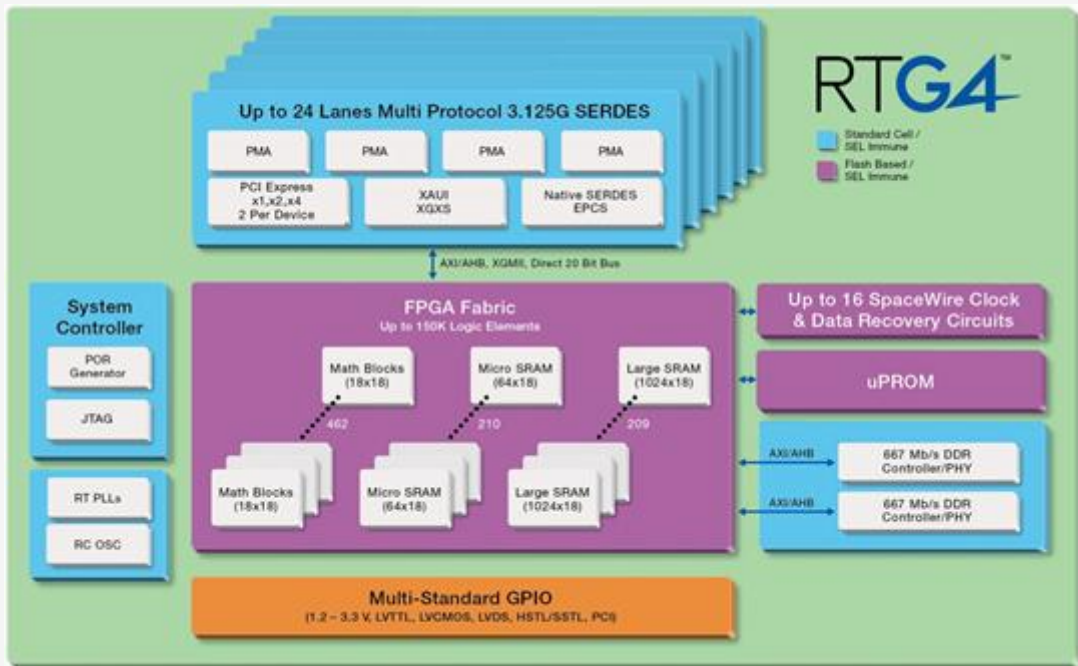
Ken O'Neill
Director of Marketing, Space and Aviation,
SoC Products Group

RTG4 Design Resource and Availability

Engineering Silicon
Engineering silicon is available now in the form of Engineering Samples (ES) to help designers evaluate the new RTG4 FPGA family. These devices use the first RTG4 silicon revision. ES devices have received testing at room temperature to validate functionality on features including FPGA Fabric, general purpose I/Os, phase locked loop (PLL), SRAM, DSP mathblocks, SERDES transceivers, DDR controllers and JTAG programming. To learn more about RTG4 ES devices, please download the RTG4 ES Description document:
http://www.microsemi.com/document-portal/doc_download/135031-rtg4-es-description

The RTG4 engineering samples with full military temperature testing (-55C to 125C) are expected in July 2015. These samples are referred to as Mil-temp Engineering Samples (MS). The RTG4 PROTO devices will follow in October 2015 using the same silicon revision as the flight units. The PROTO devices will also be tested across full military temperature. Note that the ES, MS and PROTO devices are intended for hardware functional verification only. They should not be used for space flight or qualification of space-flight hardware.

Design Software
The RTG4 FPGA family is currently supported by Libero SoC RTG4 Launch Release software. This is a comprehensive software tool suites designed to support RTG4 FPGA with enhanced placing and routing. The Libero SoC RTG4 Launch Release software is available for download now:
http://www.microsemi.com/products/fpga-soc/radtolerant-fpgas/rtg4#design-resources

Development Kit
The RTG4 ES development kits provides designers with an evaluation and development platform for applications such as data transmission, serial connectivity, bus interface, and high-speed designs. The development board features a RT4G150 device offering 151,824 logic elements in a Ceramic Ball Grid Array (CBGA) package with 1,657 pins. For more information, visit
http://www.microsemi.com/products/fpga-soc/design-resources/dev-kits/rtg4-development-kit

RTG4 FPGAs and development kits have already shipped to some of the 120+ customers engaged in the RTG4 lead customer program. Flight units qualified to MIL-STD-883 Class B are

expected to be available in early 2016. Microsemi will present more information on RTG4 FPGAs in a live webinar on May 6. To learn more about the new RTG4 technology and upcoming events visit http://www.microsemi.com/products/fpga-soc/radtolerant-fpgas/rtg4 or contact Microsemi's sales team at sales.support@microsemi.com.

Minh U. Nguyen
Marketing Manager, Space FPGAs,
SoC Products Group

Space System Manager Lead Customer Program

Microsemi is now sampling the LX7730 Radiation Tolerant Telemetry Controller IC. The LX7730 is the first member of Microsemi's new Space System Manager (SSM) family of special purpose mixed signal devices that integrate commonly used functions found in satellite systems. Our goal is to leverage over five decades of Microsemi's space heritage and provide our customers with innovative space system solutions solving application specific challenges. Please read our latest press release. Click here

We look forward to engaging with you on these exciting solutions for space applications. For more information, email Dorian Johnson at Dorian.Johnson@microsemi.com

Dorian Johnson
Product Marketing Manager,
Analog Mixed Signal High Reliability ICs

Product Updates and Notifications

Micro-Electronics Facility (Hybrid Group)

In April of 2014 the Hybrid group re-gained MIL-PRF-38534 Certification after moving from Danvers, Massachusetts to Lawrence, Massachusetts. During the past 12 months this facility has been very busy with re-qualification of our standard Space Level product base. This includes switching Point-of-Load (POL) and linear (ULDO) products. Many of our processes have received certification for use in a variety of Rad-Hard space (Satellite) applications. These applications could include: localized bus power supplies, FPGA power, payload power conditioning systems, Single- Board Computers (SBC), etc. Additionally, many of our standard products are being re-classified to EAR or Commerce categories. These new classifications will result in substantially less documentation for our international customers, simplifying the program qualification process. As we move forward, this group will continue to support the Military and Space industries with standard and custom Rad-Hard products qualified to MIL-PRF-38534 performance standards.

This quarter we received a substantial award from a key customer for multi-year Class K, Rad-Hard custom hybrids. The initial award is a multi-million dollar opportunity bringing in annual revenue for the next 10 years. These products will be utilized in various standard commercial satellite systems.

Each year we strive to improve our technology capabilities with new innovative processes and/or new equipment. Custom hybrid fabrication is a focus area for our group. We utilize the following processes in our production of custom and standard products:

- DBC, Thick and Thin Film technologies
- High-Density Packaging
- Multi-layer substrates
- Mixed-Signal custom circuits
- Eutectic, Solder and Epoxy die-attach
  - 0.7 mil-3 mil Gold wire bonding
  - 1 mil-20 mil Al wire bonding
- Seam seal/ Resistance weld processes
- Lead-Forming
- Environmental Screening and Quality Conformance Inspection to MIL- PRF- 38534
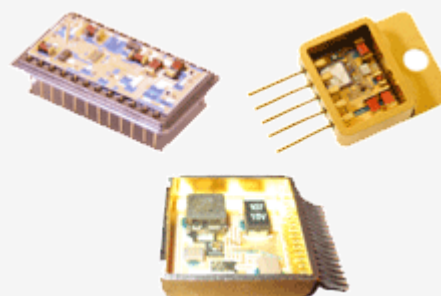
Al Ortega
Product Line Manager, High-Reliability Group

The International Space Station - Applications Support

Customers who are designing equipment that will connect to the ISS 120VDC Power Bus will have many challenges including designing input protection circuits and impedance matching networks. Microsemi has a family of Isolated DC to DC converters for this application. This applications note will help the designer interface the SA50-120 Family of parts to the ISS bus. Click here to view the application note.

Kent Brooten
National Sales Manager,
Power Module Group

Microsemi's Commitment to Space

Mark Your Calendars
and Join Microsemi for Space Forum 2015

East Coast	West Coast	Europe	India	India
June 2nd 2015	June 4th 2015	June 18th 2015	August 11th 2015	August 13th 2015
Westfield's Marriott Washington Dulles Chantilly, VA	Los Angeles Airport Marriott Los Angeles, CA.	The Palace Hotel Noordwijk, Netherlands	Courtyard Marriott Ahmedabad, India	The Leela Palace Bangalore, India

We are happy to announce we will be hosting a series of Space Forum events in 2015 where we will launch some ground breaking new space technologies in your region. These are unique Microsemi one-day technology seminars where technical experts from Microsemi and our ecosystem partners will present information on our latest and most innovative space solutions. We will give updates on our technology roadmaps and demonstrate our extensive capability with state of the art next generation flash based Radiation Tolerant FPGAs with complementary analog mixed signal ASICs, power, timing and RF solutions for next generation space system architectures.

Space Forum Agenda
There will be two highly-educational and informative tracks following the general session. (1) Digital Track and (2) Timing, Mixed Signal & Power Track. Please note your preferred track when you register online.

General Session
Kick-off, Welcome & Agenda Review
Microsemi Update" The New Microsemi"
Key Note Address
Microsemi your Partner for Next Generation Satellite Systems
Digital Track
RTG4 Product Overview
RTG4 Architecture Details
RTG4 Software Features - tips and tricks
RTG4 Packaging Technology
RTG4 BoardLevel Considerations
RTG4 Radiation Test Results and Test Plans
RTG4 Reliability & Qualification
RTG4 Demousing RTG4 Dev Kit
Analog Mixed Signal Space System Manager Solution

LX7730Telemetry Controller: Architecture and Performance
Timing, Mixed-Signal and Power Track
Time & Frequency Product Overview & Key Performance Features (Space GradeQuartz, Hybrid & Ovenized Crystal Oscillators)
Analog Mixed Signal Space System Manager Solution
LX7730 Telemetry Controller, Architecture and Performance & Product Demo
Next Generation Power Solutions; Solving Real World Interface Issues
I2MOSTM Technology Overview - A Truly Rad-Hard MOSFET
Improving the Performance of your DC-DC Forward Converter using I2MOSTMMOSFET Technology
Microsemi Precise Satellite Timing Module for Next Generation Satellite Bus
RTG4 Enabled by Microsemi Power Technology Portfolio
TID versus ELDRS on Transistors - The Whole Picture
Switching High Voltages & High Currents in Space
Partner Sessions
STAR - Dundee – Space Wire and Space Fibre (All locations)
Synopsis - Building High Reliability into Microsemi Designs, the Synplify Way (Alllocations)
e2v – A high efficiency serial interface protocol - ESIstream (US & Europe)
Cobham Gaisler - Fault Tolerant LEON3 Processor and Space Wire Router Standard Products - (Europe)

Click here to view the Space Forum agenda online.

These will be invitation only events and unfortunately there will be a limited number of places available in each location so we encourage all of our valued customers to register early. To learn more about Space Forum 2015 visit www.microsemi.com/spaceforum

Registration is now live www.microsemi.com/form/64-microsemi-space-forum-register-now

For more information, email Sylvia Keane at Sylvia.Keane@microsemi.com

Microsemi Space Webpage Launch

Microsemi's Space webpage is now updated showcasing our entire space portfolio with product overviews and detailed block diagrams showing Microsemi as a solution provider for our space partners. Customers can find more information on our Space Forum plans; our Space Brief Newsletter Archives and much more. The space applications webpage is located here.

The RTG4 webpage is located here. Customers can find a product brief, a selection of user guides, white papers, some introduction presentations, the pin description document, package outline drawings, and the power estimator.

For more information, email Sylvia Keane at Sylvia.Keane@microsemi.com

Space Forum Partners

STAR-Dundee is pleased to be part of this year's Space Forum and will be presenting at all five events in the USA, Europe and India. STAR-Dundee is a leading supplier of spacecraft on-board data-handling technology, delivering a comprehensive range of SpaceWire test and development equipment, chip designs and IP cores to the international aerospace industry. SpaceFibre is a new on-board network technology which runs over both electrical and fibre-optic cables. SpaceFibre is capable of fulfilling a wide range of spacecraft onboard communications applications because of its inbuilt quality of service (QoS) and fault detection, isolation and recovery (FDIR) capabilities.

The innovative QoS mechanism provides concurrent bandwidth reservation, priority and scheduled QoS. Novel integrated FDIR support provides galvanic isolation, transparent recovery from transient errors, error containment and "Babbling Idiot" protection. SpaceFibre is backwards compatible with existing SpaceWire equipment at the packet level allowing simple interconnection of SpaceWire devices into a SpaceFibre network. The RTG4 FPGA from

Microsemi supports 400 Mbits/s SpaceWire links and using the inbuilt SerDes is capable of running SpaceFibre at up to 3.125 Gbits/s and above 12 Gbits/s with multiple lanes. Steve Parkes, the editor of the SpaceWire standard and the principal engineer behind SpaceFibre, will introduce SpaceWire and SpaceFibre, describe the IP cores available from STAR-Dundee and provide the performance and footprint figures for their implementation in the RTG4 and other Microsemi FPGAs. Website: https://www.star-dundee.com/

Steve Parkes
Managing Director

Microsemi distributes Synopsys Synplify Pro Microsemi Edition synthesis tools, the Synopsys Identify RTL debugger and Synphony MC High Level Synthesis tools as part of Microsemi's Libero Software Design ToolSuite. The solution helps Microsemi designers to deliver highly optimized results and highly reliable design operation. It also enables the identification of the source of errors that are hard to reach and find. As such, Synopsys views the Microsemi Space Forums as a great opportunity to update Microsemi users on design tool solutions to address key challenges faced by industrial, military and aerospace designers and manufacturers today, such as debug methodologies and design for high-reliability techniques, as well as system-to-silicon verification and time-to-results. Synopsys is participating at all five Space Forum locations: Chantilly VA, Los Angeles CA, Noordwijk, Netherlands and Ahmedabad and Bangalore in India. Synopsys will present on the use of Synplify to "build in" high reliability into Microsemi FPGA designs.

East Coast Presenter
Steve Gercken
Staff Applications Consultant

West Coast Presenter
Douglas Johnson
Staff Applications Consultant

Europe Presenter
Philipp Jacobsoh
Staff Applications Consultant

India Presenter
Sharath Duraiswami
Senior Corporate Applications Engineer

e2v offers high reliability semiconductors for electronic systems within aerospace, defence and high performance industrial markets. e2v have partnered with Microsemi to present at three of the Microsemi Space Forum events. Marc Stackler, an e2v Application Engineer, and Nicolas Chantier, an e2v Data Converter Strategist, will be giving presentations on e2v's new open protocol, ESIstream©. The Efficient Serial Interface (ESIstream©) combines both very high data rate efficiency and simplified hardware implementation for serial data transmission.

ESIstream© has primarily been designed to interface high speed data converters to FPGA; however it can be used in any system that requires high efficiency data transmission. Data rate efficiency is critical to reduce the number of data transmission lanes and in systems that have data rate limitations. e2v's presentations will focus on ESIstream©'s significant benefit to the satellite industry through optimizing the efficiency of future space systems. They will also speak of ESIstream© reducing the number of logic gates by at least half of that used in other protocols, reducing design time and time to market, as well as power consumption and resource utilization. Contact e2v for more information at www.e2v.com/contact-us/

East Coast and West Coast Presenter	Europe Presenter
Marc Stackler	**Nicolas Chantier**
Application Engineer	Data Converter Strategist

Gaisler have been regularly presenting at the Space Forum since 2008 and found this event to be an excellent opportunity to show our latest FPGA based products and meet with potential customers. This year we will be

exhibiting and presenting in Noordwijk, the Netherlands, where we look forward to meeting our European customers both from the space industry and the European Space Agency located next door. We have recently added support for the IGLOO2/RTG4 FPGA technology in our GRLIB VHDL IP core library, which we will present at the Space Forum, and are also currently

investigating how to use the RTG4 FPGA to create pre-programmed standard products. Website: http://www.gaisler.com/

Sandi Habinc
Managing Director

Appearances and Events

31st Space Symposium
The 31st Space Symposium, formerly called the National Space Symposium, will be held at the Broadmoor Hotel in Colorado Springs, CO on April 13-16, 2015. The event has become widely known as the premier U.S. space policy and program forum, with attendance in excess of 9,000 participants including many from other nations. Microsemi will be presenting a paper "Satellite Timing Modules" on April 14th as part of the Technical Track. For more information, visit http://www.spacesymposium.org/agenda/technical-track or email Peter Cash on Peter.Cash@microsemi.com

32nd Annual HEART Technical Interchange Meeting
Microsemi will be participating in the Hardened Electronics and Radiation Technology (HEART) conference in Chantilly, Virginia on April 20-24, 2015. HEART provides a professional forum specifically for classified research and development investigations. The concentration is on research and development in space radiation and solid-state physics. Microsemi representatives, including Al Ortega and Kent Brooten, will be available during exhibition hours to provide information on Microsemi's solutions stop by and visit us at Booth 27. Minh U. Nguyen will also be presenting in the short course. For further information, visit http://www.heart-conference.org/
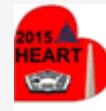
Space Parts Working Group
Later in April 28-29, 2015 is the annual Space Parts Working Group (SPWG). It is sponsored by The Aerospace Corporation in cooperation with the U.S. Air Force Space and Missile Systems Center and the National Reconnaissance Office. In its 44th year, SPWG is an unclassified, international forum for disseminating information to the aerospace industry and for resolving problems with high-reliability electronic piece parts for space applications. Microsemi will be presenting our new product introductions to suppliers, manufacturers and government agencies and we will also be hosting our sponsored luncheon again this year on April 28 during the Space Parts Working Group event. For further information, visit http://www.cvent.com/events/2015-space-parts-working-group/custom-22-670b34db6e9d43c197369467fa73e5ff.aspx

SEE Symposium & MAPLD
Microsemi will be participating in the Single Event Effects (SEE) Symposium coupled with the Military and Aerospace Programmable Logic Devices (MAPLD) Workshop in San Diego, CA on May 18-21, 2015. Microsemi will be exhibiting at booth 14 where we were able to meet with many global industry experts. We will also be presenting the following papers "Single event upset characterization of fabric SRAM in 65 nm RTG4 Flash-Based FPGA" presented by Nadia Rezzak and "Single Event Effects in Microsemi's Radiation-Tolerant reprogrammable RTG4 flash FPGA" presented by by Durwyn Dsilva. For further information visit: http://www.seemapld.org/
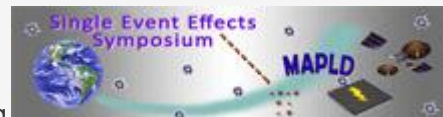
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For more information on how Microsemi is serving the space market, access our brochure at Microsemi Space Solutions Brochure and our space webpage at http://www.microsemi.com/applications/space.

If you have any feedback or content suggestions for the Space Brief Newsletter, email me at SpaceBrief@microsemi.com or click on the "Feedback" link above.

Thank you for your assistance in ensuring Space Brief continues to serve the space market and all employees.

Sylvia Keane
Marketing Executive,
Aerospace and (Space Brief Editor-in-Chief)