



SPACE BRIEF



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Welcome to Microsemi's Space Brief quarterly newsletter. In this edition, highlights include Microsemi announcing the RTG4 lead customer program, a new solution for Space applications the Space System Manager (SSM). We will also give an update on our rad-hard products, our recent product notifications and all the events Microsemi has attended and will be organizing throughout the year. 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.

Recent Product News

RTG4 Lead Customer Program

RTG4™ is Microsemi's next generation radiation-tolerant FPGA family using a 65nm low power flash process, which is immune to changes in configuration due to radiation effects. The RTG4 family comprises radiation-tolerant versions of Microsemi's fourth generation of flash-based FPGAs, hence the name RTG4. The family is currently in development to provide designers with a selection of high-density and high-performance FPGAs for signal processing applications in radiation environments.

An application example is the future remote-sensing space systems which are expected to have dramatically increased sensor resolution. However, the bandwidth available for the transmission of sensor data to ground stations is not expected to increase at the same rate as sensor resolution. Consequently, architects of future space systems are looking for ways to perform as much processing on-board remote sensing satellites as possible, to minimize the amount of data that needs to be transmitted to the ground. In such an application, RTG4 is intended to satisfy the requirement by providing ample logic resources, hardwired high-speed multiply-accumulate blocks, copious embedded memory, and high-throughput serial transceivers, with the reliability, qualification and radiation-tolerance required for space deployment.

In order to provide customers with opportunities to evaluate RTG4 FPGAs, the RTG4 Lead Customer Program (LCP) was created, and currently is open to new participants. By joining the RTG4 LCP, customers will have access to early RTG4 software and the collateral needed to design the FPGAs into their satellite systems. We are extending the invitation to participate in this program to any customer in need of a high-performance FPGA for radiation environments. The RTG4 LCP is free of charge. To sign up for the LCP, contact RTG4_LCP@microsemi.com



Ken O'Neill

Director of Marketing, Space and Aviation,
SoC Products Group

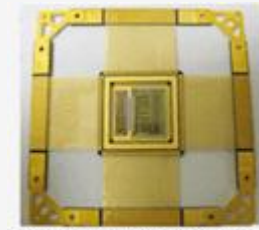


Minh U. Nguyen

Marketing Manager, Space and Aviation,
SoC Products Group

Space System Manager Solution and Telemetry Controller Demonstration Success

Microsemi is offering a new solution for Space applications: The Space System Manager (SSM). The SSM is a combination of a special purpose analog companion integrated circuit (IC) with a FPGA. The companion IC integrates commonly used analog interface functions, while the FPGA provides digital control for sequencing, signal conditioning and communication back to the system computer. The resulting solution significantly reduces board space and weight that is crucial to satellite programs.



The LX7730 Radiation-Tolerant Telemetry Controllers

There are currently two SSM analog ICs in development: the LX7730 Telemetry Controller and the LX7720 Position and Motor Controller. The first member of our Space System Manager Product Family, the LX7730 Rad-Tolerant Telemetry Controller, is now available for demonstration. The demonstration utilizes the first silicon of the device combined with a GUI to simulate FPGA communication. General sampling of the LX7730 is scheduled for November 2014. The LX7720 will follow with samples available in the third quarter of 2015.

For more information, email Dorian Johnson at Dorian.Johnson@microsemi.com



Dorian Johnson

Product Marketing Manager, AMS Products Group

Recent Product Updates and Notifications

Re-Categorization of ITAR-Controlled FPGAs

On June 27, 2014, a significant change to the International Traffic in Arms Regulation (ITAR) came into effect that is important for our international customers. The change in regulation is summarized below:

1. FPGAs that were previously considered ITAR-controlled and covered by the US Munitions List included the following Microsemi families: RTSX™-SU, RTAX-S/SL/DSP, RT ProASIC®3, and RTG4. Under the change in the law effective June 27, 2014, these device families will no longer be considered ITAR-controlled and instead will be controlled by the Export Administration Regulation (EAR). FPGAs that were previously considered EAR will continue to be covered under EAR.
2. Customers purchasing EAR products must complete an End Use Statement (EUS) in its entirety. Two new End Use Statement forms are available from the Microsemi sales team.
3. Here is the procedure to be followed for all orders:
 - o Customers must first place a purchase order with Microsemi;
 - o After the order has been booked and appears on the backlog report, the EUS must be submitted to Microsemi SoC Export Compliance by the Microsemi sales team;
 - o SoC Export Compliance will review the EUS and will advise if any further action is needed;
 - o If no further action is needed, the order will be scheduled and released from the export license hold.

We believe the change in regulations will relieve our international customers of some of the paperwork burden associated with purchasing ITAR products, and that they will find the new regulations less restrictive. For more information, email Ken O'Neill at Ken.O'Neill@microsemi.com

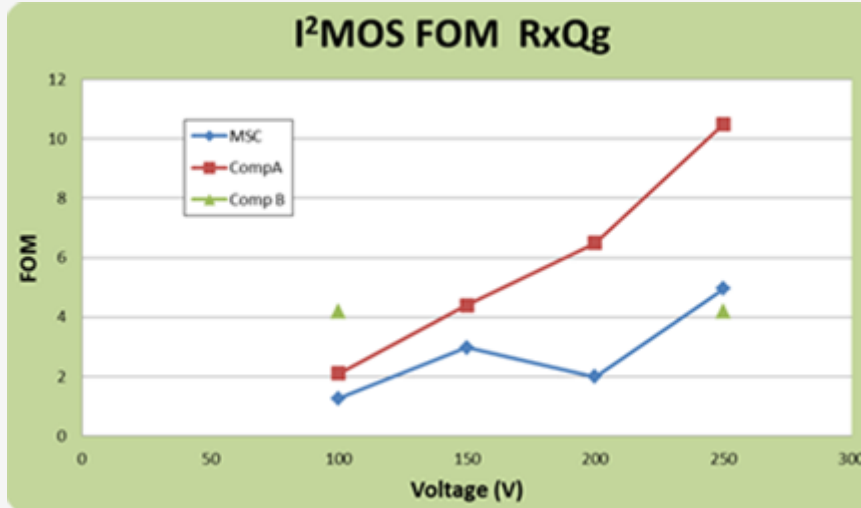
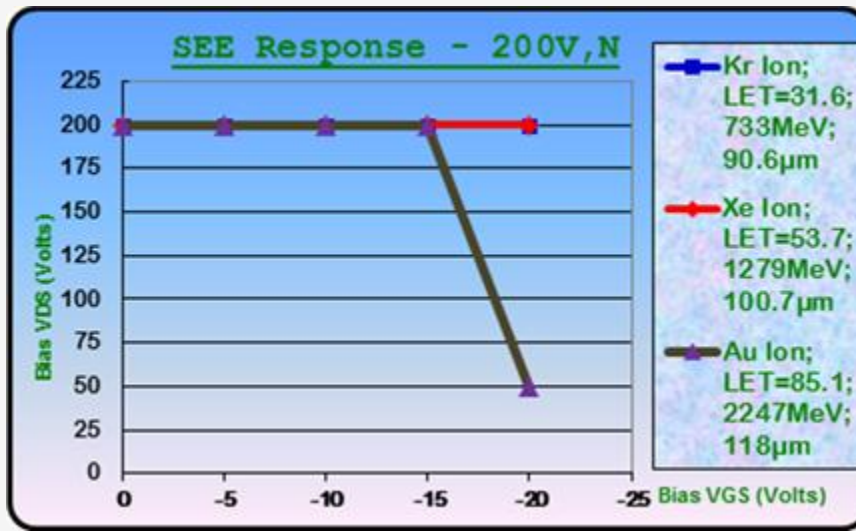


Ken O'Neill

Director of Marketing, Space and Aviation, SoC Products Group

RAD-Hard Product Update

I²MOS™ Microsemi second generation of Rad-Hard MOSFET's are now available for prototyping. Engineering samples of 150 V and 200 V I²MOS are currently available in small quantities. I²MOS products are "True Rad-Hard" MOSFET's with TID radiation ratings as high as 300 krad and Single Event (SEE) ratings > 85 MeV!. The new Generation 2 (Gen2) products were tested at Texas A&M University under worst-case conditions, at highest LET, and at full-rated Bias. These products exceed the competition FOM and SEE performance. See below for the 200 V SEE chart and the Merit (FOM) performance figure:



Microsemi's Rad-Hard products group will be releasing engineering samples of additional voltages throughout 2014. New product plans will include products ranging from 30 V to 250 V for 2014 and 2015. Shown below is a roadmap of the prototype's availability.

BVDSS (V)	JEDEC Number	Slash Sheet	Package	MSC p/n	Engineering Design Unit	MSC Internal Qual (FY) MIL-PRF-19500
30	2N7479U3	703	SMD-0.5	MRH03N22U3	Nov '14	
30	2N7482T3	702	TO-257AA	MRH03N18T3		
60	2N7495U5	700	LCC-18	MRH06N12U5		
60	2N7492T2	701	TO-39	MRH06N12T2		
60	2N7480U3	703	SMD-0.5	MRH06N22U3	Nov '14	
60	2N7483T3	702	TO-257AA	MRH06N18T3		
100	2N7496U5	700	LCC-18	MRH10N10U5		
100	2N7493T2	701	TO-39	MRH10N12T2		
100	2N7587U3	746	SMD-0.5	MRH10N22U3	Sept '14	Nov '14
100			TO-257	MRH10N22T3		
100	2N7484T3	702	TO-257	MRH10N18T3	Sept '14	
150	2N7589U3	746	SMD-0.5	MRH15N19U3	Aug '14	Nov '14
200	2N7591U3	746	SMD-0.5	MRH20N16U3		Nov '14
200			TO-39	MRH20N12T2	Aug '14	
200			TO-257	MRH20N12T3		
250	2N7499T2	706	TO-39	MRH25N09T2		
250	2N7593U3	746	SMD-0.5	MRH25N16U3	Sept '14	Dec '14

250	2N7494T3	755	TO-257AA	MRH25N12T3		
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Microsemi will ship free sample quantities (up to four units) free of charge. For quantities greater than four units, contact your local Sales Representative for a quote.

For more information, email Al Ortega at Al.Ortega@microsemi.com



Al Ortega
Product Line Manager, High-Reliability Group

Space News

First Flight Heritage for CG1272 Package and the Latest Flight Heritage for RT ProASIC3 FPGAs

On July 14, six ORBCOMM™ Generation 2 (OG2) satellites were launched successfully with RT ProASIC3 FPGAs on-board. OG2 is a constellation of 18 Low Earth Orbit communications satellites. OG2 is intended to supplement and eventually replace the first generation of ORBCOMM satellites, 50 of which are still orbiting the earth today. Microsemi's RT ProASIC3 FPGAs are on the communications payload of each OG2 satellite. The RT ProASIC3 family comprises radiation-tolerant versions of Microsemi's third generation of flash-based FPGAs. This latest flight heritage continues to strengthen Microsemi flash heritage in space, as the next generation of radiation-tolerant flash FPGAs are on their way.

In another successful launch by the US Air Force on July 28, Microsemi's RTAX4000S-CG1272 FPGAs were on-board the ANGELS (Automated Navigation and Guidance Experiment for Local Space) spacecraft. It is an important mission for the Air Force in geosynchronous orbit to study different maneuvering techniques to avoid collision with space debris. Microsemi congratulates the Air Force on this successful launch as it provides the very first flight heritage for the largest Ceramic Column Grid Array (CCGA) package with 1272 columns in Microsemi's current FPGAs portfolio. Large CCGA package flight heritage provides customers with additional levels of assurance to adopt these innovative high-pin count packages in demanding space systems and paves the way for RTG4, which will be offered in high pin-count CCGA packages. For more information, email Ken O'Neill at Ken.O'Neill@microsemi.com or Minh U. Nguyen at Minh.U.Nguyen@microsemi.com



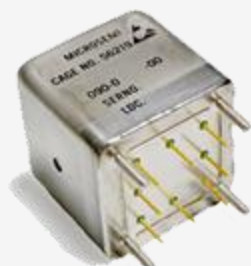
Ken O'Neill
Director of Marketing, Space and Aviation,
SoC Products Group



Minh U. Nguyen
Marketing Manager, Space and Aviation,
SoC Products Group

Microsemi Quick Delivery Space Qualified Oscillators

The Microsemi 9600QT and 9800QT Space Qualified Ovenized Crystal Controlled Oscillators (OCXO) are ideal for space applications, where schedule and delivery are of the utmost criticality. The 9600QT and 9800QT standard configurations are available "off-the-shelf" in a 5, 10, 50 or 100 MHz sine wave output frequency, in as short as four weeks. This standard configuration allows for industry-leading delivery times for space qualified parts. The oscillators have been analyzed for worst-case circuit effects, radiation, thermal and structural analysis, derating and reliability. These oscillators are a part of the 9600, 9700 and 9800 families of oscillators for which more than 400 oscillators have been delivered for military, scientific and commercial satellite applications.



Key performance features are: excellent short term stability, phase noise, and aging characteristics. In addition to high levels of performance, the 9600QT is available in a 2.54 x2.08 x1.21 inch panel mount/compact size and requires less than 1.5 W of quiescent power in a vacuum. The 9800QT is available in a 1.3 x1.3 x1.3 inch printed circuit board (PCB) mounting configuration.

The lead time for Engineering Models is four weeks and Flight Models are available in twelve weeks.

For more information, email Ashley Pollock at Ashley.Pollock@microsemi.com

Ashley Pollock

Business Development Manager Space, Defense, & Avionics, Frequency & Timing Group



Extensive Testing of Space Grade Electromechanical Relays

Microsemi's Power Management Group in La Mirada, CA has been building space grade relays since 1957. Working closely with customers for more than a half a century, has given us valuable experience in understanding and meeting their testing requirements.

By providing ***IN-HOUSE*** testing, we can accelerate the test suite turnaround time.

Standard testing includes:

Mil-pore clean to NASA EEE-INST-002-R1

Thermal shock Mil-STD-202, Method 107

Vibration MIL-STD-202, Method 214

Shock MIL-STD-202, Method 213

PIND MIL-STD-202, Method 217

Hermetic seal fine leak to MIL-STD-202 Method 112, condition C (1.0X 10⁻⁸ cc/sec)

Gross leak to MIL-STD-883, Method 1014, condition D

Solderability MIL-STD-202, Method 208

Residual gas analysis (RGA) per MIL-STD-883, Method 1018

Additional specialized testing can also be performed on an as-needed basis:

Vibration monitoring - sine and random resonance search external/internal

Load testing resistive, inductive, and capacitive 400 Hz, single-phase and three-phase, 400 Hz AC and DC

Ultra high voltage to 12 KV DC - current leakage and standoff voltage monitoring

Ultra high vacuum sealing capability to 10⁻⁹

For more detailed information, contact Kent Brooten at kent.brooten@microsemi.com

Kent Brooten

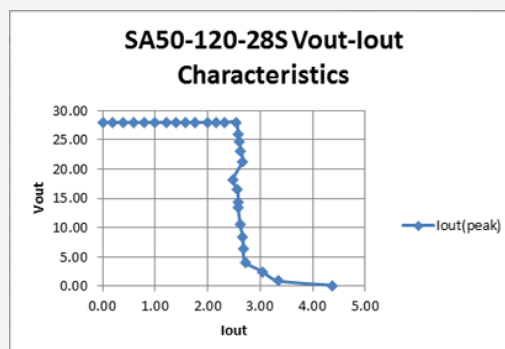
National Sales Manager, Power Module Group



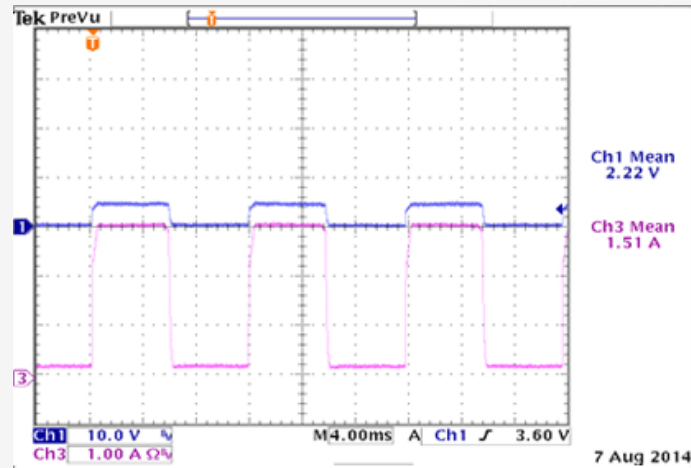
System Load Fault Conditions for DC to DC Converters

Not only do devices have to perform per the data sheet parameters in normal operation, they need to perform in a predictable manner under fault conditions. Recently a customer contacted the PMG team in La Mirada, CA because their present solution was generating unanticipated behaviour during overload. While the average current met the data sheet parameters, the short, high current spikes were causing havoc in their system.

The overload protection feature of the SA50-120-28S module is characterized by the V-I curve plotted below:



If the load fault clamps the output voltage below 20 volts, as would be the case in a short circuit, the converter turns off and then restarts, repeatedly, until the fault is cleared. The on-off interval timing is designed to allow continuous operation in this mode without overstressing the SA50-120-28S module and delivering current with precisely controlled peak and average levels, thus protecting the system.



The load was set at 1.6 ohms resistive. The converter turns on and starts sourcing current. As a result of the low impedance load the output voltage does not rise to an acceptable level and the converter shuts down. After a delay it "hiccups" and tries to start again. The converter can run indefinitely in this mode. These "hiccups" can be highly beneficial in cases where a bypass capacitor has shorted somewhere in the customer's system. From past experience we are aware of an in-orbit failure of a capacitor on a customer's board; the converter was cycled for several hours until finally the capacitor blew and normal system resumed. As can be seen from this example the converter operates in a predictable manner and limits the output current to an acceptable level.

For more detailed information, contact Kent Brooten at kent.brooten@microsemi.com



Kent Brooten
National Sales Manager, Power Module Group

Appearances and Events

NSREC (Nuclear and Space Radiation Effects Conference)



The Nuclear and Space Radiation Effects Conference in collaboration with the RADECS Association was held July 14–18, 2014 in Paris, France. The conference featured a technical program consisting of eight to ten technical sessions of contributed papers describing the latest observations in radiation effects, a Short Course on radiation effects offered, a Radiation Effects Data Workshop, and an Industrial Exhibit. The technical program included oral and poster sessions. Microsemi presented and had two key speakers including: Nadia Rezzak presenting a paper on "Total Ionizing Dose Characterization of 65 nm Flash-Based FPGA" and Max Zafrani who presented a paper on "Single-Event and Radiation Effect on Enhancement

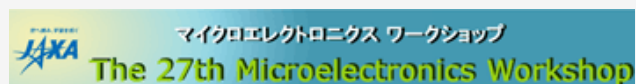
Mode Gallium Nitride FETs". Microsemi also exhibited in the common booth area where we were able to meet with many global industry intellectuals. For further information on NSREC 2015 visit <http://www.nsrec.com/>

To view "Total Ionizing Dose Characterization of 65 nm Flash-Based FPGA" paper please visit: http://www.microsemi.com/index.php?option=com_docman&task=doc_download&gid=134395

To view "Single-Event and Radiation Effect on Enhancement Mode Gallium Nitride FETs" paper please visit: http://www.microsemi.com/index.php?option=com_docman&task=doc_download&gid=134396

JAXA (Japan Aerospace Exploration Agency) - The 26th Microelectronics Workshop

Microsemi will be attending the 27th JAXA Microelectronics Workshop on October 23-24, 2014 at the Tsukuba International



Congress Center in Japan. This is a highly technical workshop discussing the current status of future trends in the space industry. Microsemi will be presenting during the first day of the workshop on "Next Generation radiation tolerant flash FPGA technology provides greatly enhanced signal processing capability in satellite applications". Our Microsemi representative Minh U. Nguyen will be available

during the workshop to provide any information on Microsemi's wide array of products. For further information see https://eepitnl.tksc.jaxa.jp/mews/EN/program_e.htm

Radiation Hardened Electronics Technology (RHET) Meeting

Microsemi will be attending the Radiation Hardened Electronics Technology RHET Meeting October 28-29, 2014 at the Embassy Suites Hotel in Albuquerque, New Mexico. Hosting the event this year will be Microelectronics Research Development Corporation (more commonly known as MRDC or Micro-RDC). RHET is a meeting for the entire space avionics community, with presentations oriented towards requirements, plans, and programs for the space and missile electronic systems technology base. Our Microsemi representative Ken O' Neill will be presenting material on our radiation tolerant flash FPGA technology.

MRQW 2015 - Microelectronics Reliability and Qualification Working Meeting

Microsemi will be participating in the next Microelectronics Reliability and Qualification Working (MRQW) meeting in El Segundo, CA on January 27-28, 2015. MRQW provides a forum for discussion of microelectronics reliability and qualification issues for microelectronics targeted for use in space systems. For more information visit <http://www.cvent.com/events/2013-microelectronics-reliability-qualification-working-meeting-mrqw-/event-summary-9fc30f05eda94bf09763e25c89463df5.aspx>



Microsemi's Commitment to Space



Following the tremendous success of several Space Forums held in North America, Europe and India over the years, Microsemi continues to demonstrate its on-going commitment to our space partners in this region by continuing this user group experience again for 2015. We are currently reviewing locations and we will have specific dates in our next edition of Space Brief, stay tuned!

Register to Receive the Microsemi Space Brief

If you enjoyed reading this Space Brief you can register to receive your own personal copy, delivered directly to your inbox. Follow this link: <http://www.microsemi.com/soc/interact/default.aspx?p=E402>.

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)