Long-Term Commitment to the Space Industry

With nearly 30 years of experience in the space industry, Atmel was recognized for delivering leading-edge and highly integrated technology and solutions. In 2016, Atmel was acquired by Microchip Technology Inc., a leading provider of microcontroller and analog semiconductors, providing low-risk product development, lower total system cost and faster time to market for thousands of diverse customer applications worldwide. Microchip is committed to continuing to support the space industry, delivering the same solutions and services customers expect for Atmel flight heritage Rad-Hard parts.

Fully designed, assembled, tested and qualified in Europe, Microchip’s offering of rad-hard digital Application-Specific Integrated Circuits (ASICs) is one of the most attractive and competitive on the market for the most critical applications. In order to meet the needs of next-generation satellites and launchers, our ASIC platforms include:

- **ATMX150RHA**: improve integration with adaptable technology: a mixed-signal strategy with logic, Analog, 5V compatibility, embedded Non-Volatile Memory (NVM) option, high-voltage option and qualified IPs.
- **AT65RHA**: improve integration and computing power with thinner technology and high-speed links, reduction of power consumption, offering a high level of system integration and increased computing power. The device is designed in 65 nm technology, with up to 50 Mgates and more embedded features such as very high-speed serial links.

Questions? Email the Hotline at aerospace@nto.atmel.com.

### ASIC Overview

<table>
<thead>
<tr>
<th></th>
<th>ATC18RHA</th>
<th>ATMX150RHA</th>
<th>AT65RHA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process</strong></td>
<td>Bulk CMOS</td>
<td>SOI CMOS</td>
<td>Bulk CMOS</td>
</tr>
<tr>
<td><strong>Feature Size (µm)</strong></td>
<td>0.18</td>
<td>0.15</td>
<td>0.065</td>
</tr>
<tr>
<td><strong>Library</strong></td>
<td>Digital</td>
<td>Mixed-Signal</td>
<td>Digital</td>
</tr>
<tr>
<td><strong>Gates (equivalent NAND2)</strong></td>
<td>7M</td>
<td>22M</td>
<td>50M</td>
</tr>
<tr>
<td><strong>Maximum Toggle Frequency</strong></td>
<td>7.5 GHz</td>
<td>7.5 GHz</td>
<td>30 GHz</td>
</tr>
<tr>
<td><strong>Gate Delay @25°C (ps)</strong></td>
<td>40</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td><strong>Signal I/Os</strong></td>
<td>&gt;400</td>
<td>&gt;700</td>
<td>&gt;1,000</td>
</tr>
<tr>
<td><strong>Flip-Chip I/O Available</strong></td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>5V and HV (25/45/65V) Option</strong></td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td><strong>Specific I/Os</strong></td>
<td>LVDS, PCI</td>
<td>LVDS, PCI, HSSL</td>
<td>HSSL, LVDS, PCI</td>
</tr>
<tr>
<td><strong>Supply Voltage Core – I/Os</strong></td>
<td>1.8–3.3/2.5V</td>
<td>1.8–2.5/3.3/5V</td>
<td>1.2–1.8/2.5/3.3V</td>
</tr>
<tr>
<td><strong>Power Consumption (nW/gate/MHz) @20% Duty Cycle</strong></td>
<td>&lt;10</td>
<td>&lt;10</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td><strong>Analog IPs</strong></td>
<td>PLL</td>
<td>ADC, DAC, PLL, BG, MLX, COMP...</td>
<td>PLL, Temp Sense</td>
</tr>
<tr>
<td><strong>RAM Compiler</strong></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>NVM</strong></td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td><strong>Rad Hardness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Functional TID (krads(Si))</strong></td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td><strong>Latch Up (MeV/mg/cm²)</strong></td>
<td>&gt;95 @125°C*</td>
<td>&gt;95 @125°C</td>
<td>&gt;60 @125°C</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>Now</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td><strong>Qualification</strong></td>
<td>ESCC QML, QML-Q, QML-V, QML-V RHA</td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>Qualified wire-bonding hermetic offer</td>
<td>Qualified wire-bonding hermetic offer</td>
<td>Flip Chip hermetic offer</td>
</tr>
<tr>
<td></td>
<td>• COFP up to 352</td>
<td>• COFP up to 352</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CLGA/CCGA 329, 472, 625</td>
<td>• CLGA/CCGA 329, 472, 625 and 896 with European Columns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dedicated package development on request</td>
<td></td>
</tr>
</tbody>
</table>
Benefits of Microchip's Rad-Hard ASICs

- A qualified supply chain from design to qualified parts
- Digital and mixed-signal ASICs
- Multiple quality assurance levels: QML-Q/QML-V/ESCC
- Robust design library of cells and macros
  - The ASIC platform is supported by a combination of state-of-art third-party and proprietary design tools from: Synopsys, Mentor and Cadence. The tools from these suppliers collectively form the reference tool flows for both the front and back end.
- Robust design flow
- Guaranteed radiation performance
  - Radiation hardening assurance
    - SEL > 95 MeV/mg/cm²
- Configurable RAM compiler, NVM option
- Specific I/Os including HSSL, LVDS, PCI
- Large portfolio of space-qualified packages including CQFP and CLGA/CCGA, as well as custom packages

ATMX150RHA

The ATMX150RHA is a mixed-signal ASIC offering high-performance and high-density solutions for space applications. Covering solutions with up to 22 million routable gates, SRAM/DPRAM generators and 32 KB NVM blocks as well as a set of pre-qualified analog IPs, such as PLL, Analog-to-Digital Converters (ADCs), and Digital-to-Analog Converters (DACs). Regulators and more are under development.

<table>
<thead>
<tr>
<th>Analog Function</th>
<th>Main Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Regulator</td>
<td>Linear 1.8V 50 mA</td>
</tr>
<tr>
<td></td>
<td>Linear 1.8V 200 mA</td>
</tr>
<tr>
<td>Voltage Reference/Monitoring</td>
<td>Bandgap reference</td>
</tr>
<tr>
<td></td>
<td>Temperature sensor</td>
</tr>
<tr>
<td>Clock Synthesizer</td>
<td>PLL 40–50 MHz</td>
</tr>
<tr>
<td></td>
<td>RC oscillator 4/8/10/12 MHz</td>
</tr>
<tr>
<td></td>
<td>RC oscillator 10 MHz</td>
</tr>
<tr>
<td>Signal Conditioning</td>
<td>12-bit ADC</td>
</tr>
<tr>
<td></td>
<td>12-bit DAC</td>
</tr>
<tr>
<td></td>
<td>Analog multiplexer</td>
</tr>
</tbody>
</table>

Space Multi-Project Wafer (SMPW)

To reduce ASIC development costs, a Space Multi Projects Wafer (SMPW) service is used. These quarterly SMPWs are also used to embark, at low cost, customer analog test chips intended for evaluating analog-sensitive areas from the final ASIC. Microchip offers probe/packaging/assembly/test services as well as qualification services (reliability, TID, SEE, etc.).

FPGA Retargeting to ASIC

Retargeting an Field-Programmable Gate Array (FPGA) to an ASIC means benefiting from the technical advantages of ASICs, such as faster and smaller chips with lower power consumption. It also offers improved reliability and radiation performance. Microchip offers an FPGA retargeting service to reduce your cost and design resources.

- From RTL code to QML-certified ASIC
- Pin-to-pin compatibility with existing package
- Optimized replacement cost
- Low NRE cost due to SMPW management
- Lower power consumption
- Full European solution

<table>
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<tr>
<th>RTAX/RTSX Checklist and RTL Code</th>
<th>Feasibility Analysis</th>
<th>DSR Meeting</th>
<th>Retargeting to ASIC</th>
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<tbody>
<tr>
<td>Customer Validation</td>
<td>Prototypes</td>
<td>DR Meeting</td>
<td>Microchip Customer</td>
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Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. For more information, please visit www.microchip.com:
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- Evaluation samples of any Microchip device: www.microchip.com/sample
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- Sales and Global Distribution: www.microchip.com/sales

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If additional training interests you, then Microchip can help. We continue to expand our technical training options, offering a growing list of courses and in-depth curriculum locally, as well as significant online resources.
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