Atmel Aerospace: Reprogrammable FPGA with Built-in SEU and SET Protections

Atmel® Aerospace components are all fully designed, assembled, tested, and qualified in Europe. The Atmel reprogrammable FPGA platform combines innovative techniques with industry-leading expertise in radiation hardened (rad-hard) by design technology. For low-gate-count designs and low power consumption applications, Atmel offers the reprogrammable AT40K FPGA. For designs requiring more gates, Atmel has significantly increased the gate count with the ATF280.

Benefits of the Atmel reprogrammable FPGA family include:

- Unlimited reprogrammability — Allows implementation of multiple design iterations at no additional cost
- Rad-hard by design
- Innovative built-in SEU protection — Users can design without using mitigation techniques, saving gate count and development resources
- Embedded memory blocks
- Configuration auto-checks
- Easy development flow with no NRE cost, shorter time to market, no minimum order quantity

Atmel reprogrammable FPGAs for space applications have been developed and supported by the French and European space agencies. For your designs, Atmel offers a catalog of IP including UART, SpW, 1553 and CAN. We also provide Place and Route services, starting from your RTL all the way to validation of your application on board.

**Atmel ATF280 Rad-Hard Performance**

Produced on the Atmel rad-hard 0.18μm CMOS process, the Atmel ATF280 combines rad-hard capabilities over the full military temperature range.

- Total dose higher than 300 kRads
- Latch-up threshold higher than 95 MeV.cm²/mg
- Configuration SRAM SEU low sensitivity, resulting in an upset rate lower than 1E-6 error per device per day, in the worst orbit conditions

**ATF280 Configuration**

Configuring the ATF280 requires a 4Mb maximum bit stream. Atmel not only offers use of four Atmel AT17LV010 devices, a 1Mb serial 3.3V EEPROM qualified for space use, but also the AT69170, a 4Mb version qualified for space use.

### Product Overview

<table>
<thead>
<tr>
<th>Features</th>
<th>AT40</th>
<th>ATF280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlimited reprogrammability</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FreeRAM™ access time</td>
<td>18ns</td>
<td>10ns</td>
</tr>
<tr>
<td>System speed</td>
<td>20MHz</td>
<td>50MHz</td>
</tr>
<tr>
<td>Configuration auto-checks</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of cells (one 4-input LUT and one HDIFF)</td>
<td>2,304</td>
<td>14,400</td>
</tr>
<tr>
<td>Equivalent ASIC gates</td>
<td>40K</td>
<td>280K</td>
</tr>
<tr>
<td>User-configurable RAM (FreeRAM)</td>
<td>18432 bits</td>
<td>115200 bits</td>
</tr>
<tr>
<td>Cold-sparing and PCI-compliant I/Os</td>
<td>233</td>
<td>308</td>
</tr>
<tr>
<td>Transceivers/receivers LVDS</td>
<td>-</td>
<td>8/8</td>
</tr>
<tr>
<td>Availability</td>
<td>QML-Q and QML-V with 5962-03250 and ESCC with 9304/008</td>
<td>QML-Q and QML-V with 5962-12225</td>
</tr>
</tbody>
</table>
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Multi-Chip Module
To reduce size and weight, Atmel has combined 2 ATF280 FPGAs and 2 AT69170 EEPROM into one multicompartment package. This cost saving solution, the ATFee560, is available for prototypes and qualified for space applications in 2015.

The ATFee560, combining the ATF280 with the AT697 processor, permits to enhance the AT697 capabilities with interfaces such as SpW. This cost saving solution is available for prototypes and qualified for space applications.

Development Tools and Software

Atmel FPGA Development Kits
- Fast and economical product development
- Can be used to run simple demonstrations or a complete application
- A 6U C-PCI board with Atmel Aerospace EEPROMs and SRAMs and a full set of peripherals

Space Programmer
- Multi-platform software tool with USB interface for in-situ programming of the FPGA and EEPROM

IDS System Designer
- Integrated development system for logic synthesis from a VHDL model entry or direct gate-level entry, for place and route, back annotation and final simulation

Mentor Graphics Precision®
- Comprehensive synthesis tool for Atmel FPGAs

Hotline: radhard-fpga@nto.atmel.com