Reprogrammable Prototyping for Rad-Hard FPGAs

MAPLD ALDEC Presentation, September 2008, Annapolis, MD
Agenda

- Prototyping of RTAX-S/SL FPGAs
- A3PE1500/3000-CQ256 prototyping adaptor
- A3PE1500/3000-CQ352 prototyping adaptor
- A3PE3000-CG624 prototyping adaptor
- RTAX2A3P EDIF Netlist Converter
- Automatic PDC File Conversion
- Summary
Today’s Prototyping Solution

Socket + AX Approach:

Good solution, but several design iterations could require an undetermined amount of Actel AX commercial chips to complete the design.

Disadvantage:

The potential risk for using an infinite amount of AX devices could add to the overall project cost and impact the budget.
The solution utilizes re-programmable ProASIC3E FPGAs for RTAX-S/SL prototyping.

Advantages:

1. Ability to prototype RTAX-S/SL designs using re-programmable Actel Flash ProASIC3E family chips
2. Adaptor board is footprint-compatible with the final RTAX-S/SL device
3. Programming connector (JTAG) on the adaptor board allows reprogramming of the device on-the-fly without detaching the adaptor from the target PCB
4. EDIF netlist converter allows to migrate from RTAX-S/SL to ProASIC3E easily
5. Design efficiency is achieved with savings in time and money
A3PE1500/3000-CQ256 Adaptor

Description:
- Adaptor size: 43.07mm x 43.07mm
- The following elements reside on the top part of the adaptor:
  - Actel ProASIC3E device, A3PE1500-FGG484 or A3PE3000-FGG484
  - JTAG connector
  - Capacitors, resistors
- The following elements reside on the bottom part of the adaptor:
  - Leads that mimic CQ256 package
**A3PE1500/3000-CQ352 Adaptor**

**Description:**
- Adaptor size: 55mm x 55mm
- The following elements reside on the top part of the adaptor:
  - Actel ProASIC3E device, A3PE1500-FGG484 or A3PE3000-FGG484
  - JTAG connector
  - Power connector
  - Capacitors, resistors
- The following elements reside on the bottom part of the adaptor:
  - Leads that mimic CQ352 package

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A3PE3000-CG624 Adaptor

**Description:**

- **Adaptor size:** 32.5mm x 34mm
- The following elements reside on the top part of the adaptor:
  - Actel ProASIC3E device, A3PE3000-FGG896
  - JTAG connector
  - Capacitors, resistors
- The following elements reside on the bottom part of the adaptor:
  - Leads that mimic CG624 package
## Configuration Table

<table>
<thead>
<tr>
<th>RTAX-S DEVICE TO PROTOTYPE</th>
<th>ADAPTOR BOARD TO BE USED FOR PROTOTYPING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A3PE1500-CQ256</td>
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<tr>
<td>RTAX250S–CQ352</td>
<td></td>
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<tr>
<td>RTAX1000S–CQ352</td>
<td></td>
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<tr>
<td>RTAX1000S–CG624</td>
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<tr>
<td>RTAX2000S–CQ256</td>
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<tr>
<td>RTAX2000S–CQ352</td>
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<tr>
<td>RTAX2000S–CG624</td>
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<tr>
<td>RTAX4000S–CQ352</td>
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</table>

* The adaptor can be used to prototype the specified RTAX-S device only if the customer design does not exceed the capacity of the flash device on top of the adaptor.
RTAX2A3P EDIF Netlist Converter

- RTAX2A3P EDIF Netlist Converter performs automatic conversion of the RTAX-S EDIF netlist to ProASIC3E EDIF netlist

- Features:
  - Conversion of combinatorial primitives
  - Conversion of sequential primitives
  - Conversion of I/O macros
  - Memory conversion
RTAX2A3P EDIF Netlist Converter

- EDIF Conversion Flow:

1. RTAX-S EDIF netlist
2. RTAX-S to ProASIC3E Converter
3. Mapping Library
4. ProASIC3E EDIF netlist
5. Implementation for ProASIC3E in Actel Designer
Automatic PDC File Conversion

- RTAX2A3P EDIF Netlist Converter performs automatic conversion of the RTAX-S I/O pin constraint file (PDC) to its ProASIC3E equivalent.
# RTAX2A3P EDIF Netlist Converter

## Primitives Mapping

<table>
<thead>
<tr>
<th></th>
<th>Number of RTAX-S primitives</th>
<th>Number of ProASIC3E primitives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Case mapping</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Worst Case mapping</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Average mapping</td>
<td>1</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Summary

Aldec’s RTAX-S/SL prototyping solution:

- Supports CQ256, CQ352, CG624 packages.
- Provides designers targeting Actel RTAX-S/SL devices with the opportunity to prototype their designs in reprogrammable ProASIC3E devices.
- Bridges the gap between RTAX-S/SL and ProASIC3E device architectures by providing automatic RTAX2A3P EDIF Netlist Converter.
Thank You For Your Attention!