# 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.

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# Aldec Re-programmable Solution

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

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# A3PE1500/3000-CQ256 Adaptor

**Capacitors**

**A3PE1500-FGG484
or
A3PE3000-FGG484**
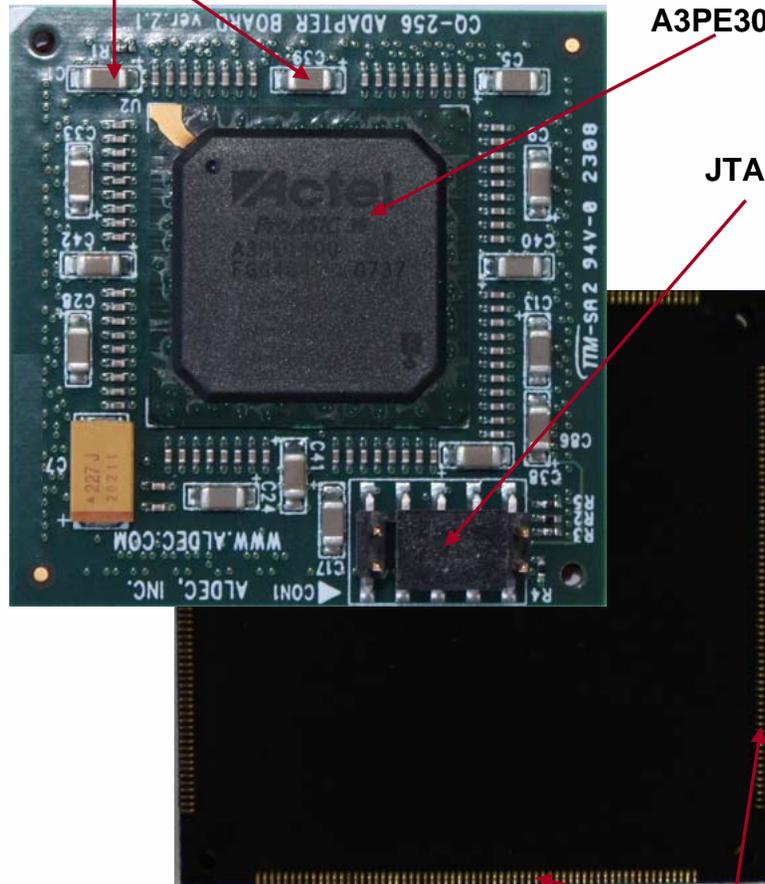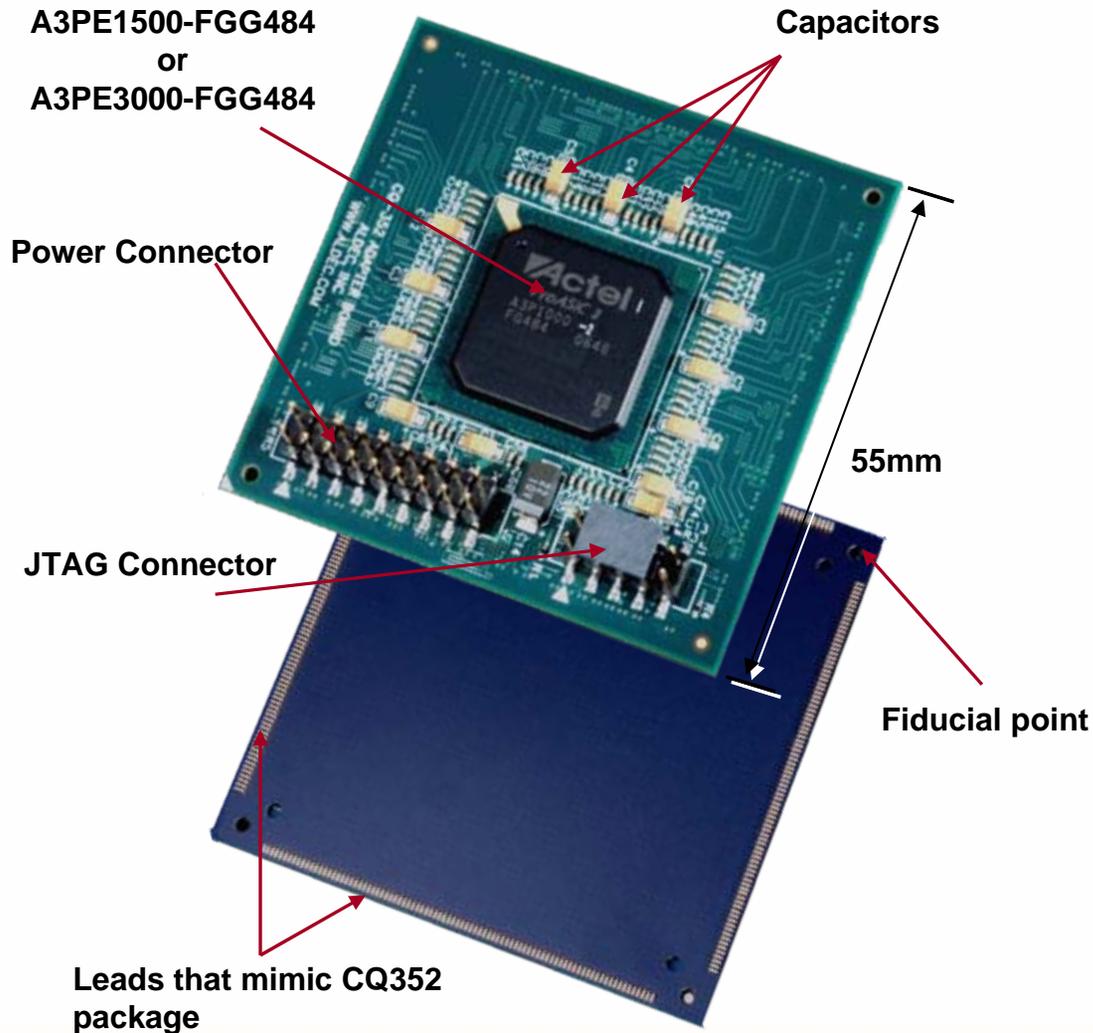
**JTAG Connector**



**Leads that mimic CQ256 package**

## 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

**A3PE1500-FGG484 or A3PE3000-FGG484**

**Capacitors**

**Power Connector**

**JTAG Connector**

**55mm**

**Fiducial point**
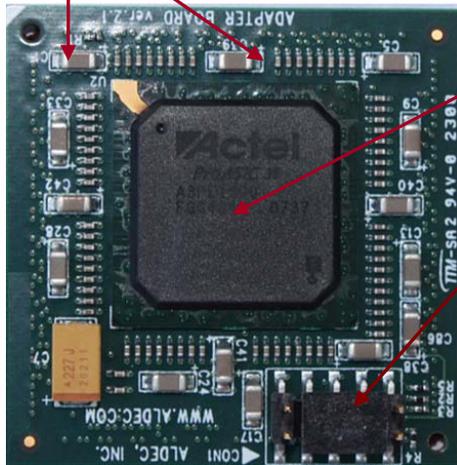
**Leads that mimic CQ352 package**

## 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:

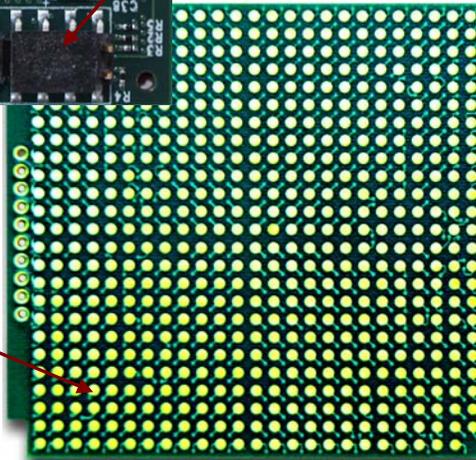- Leads that mimic CQ352 package

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# A3PE3000-CG624 Adaptor

**Capacitors**

**A3PE1500-FGG896**
**or**
**A3PE3000-FGG896**

**JTAG Connector**

**Ball grid array that mimic CG624 package**

## 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

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# Configuration Table

| RTAX-S DEVICE TO PROTOTYPE | ADAPTOR BOARD TO BE USED FOR PROTOTYPING | | | |
|---|---|---|---|---|
| | A3PE1500-CQ256 | A3PE1500-CQ352 | A3PE3000-CQ352 | A3PE3000-CG624 |
| RTAX250S–CQ352 | | ● | ● | |
| RTAX1000S–CQ352 | | ● | ● | |
| RTAX1000S–CG624 | | | | ● |
| RTAX2000S–CQ256 | ●* | | | |
| RTAX2000S–CQ352 | | ●* | ● | |
| RTAX2000S–CG624 | | | | ● |
| RTAX4000S–CQ352 | | | ●* | |

*\* 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.*
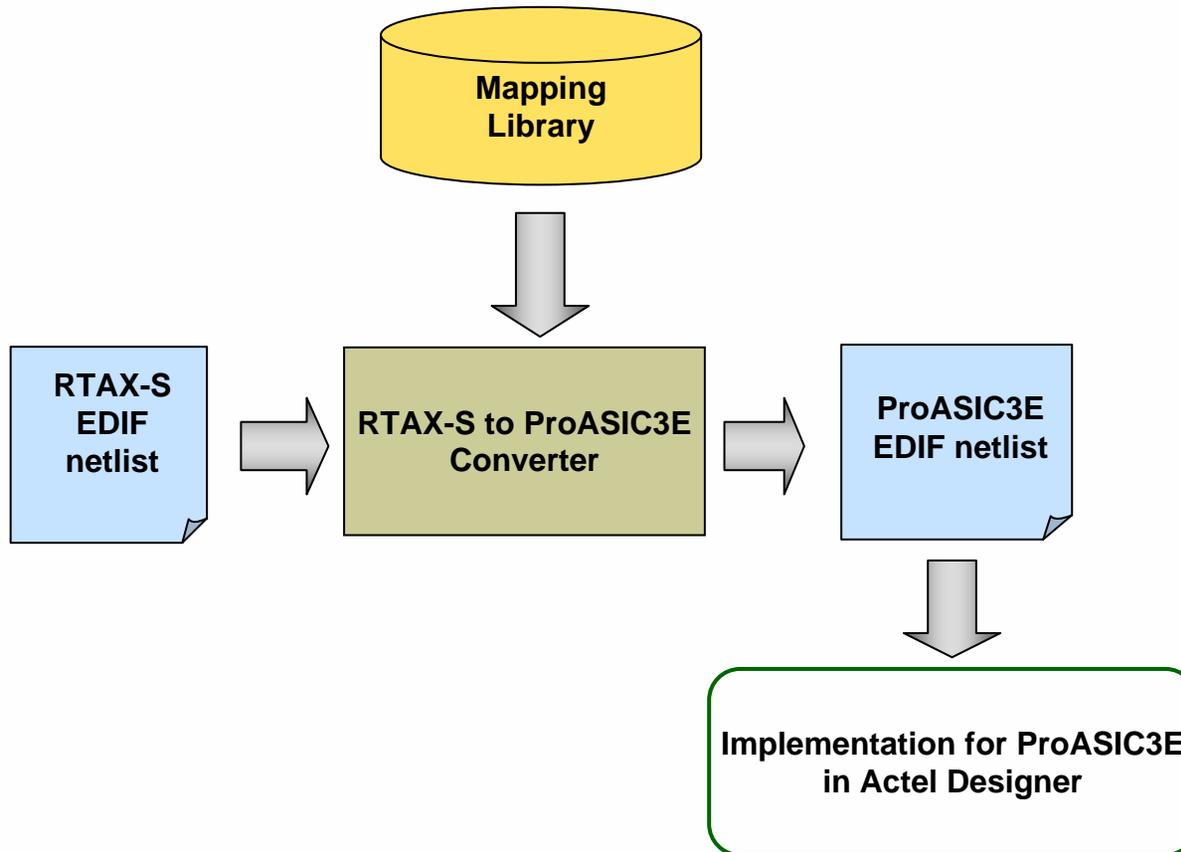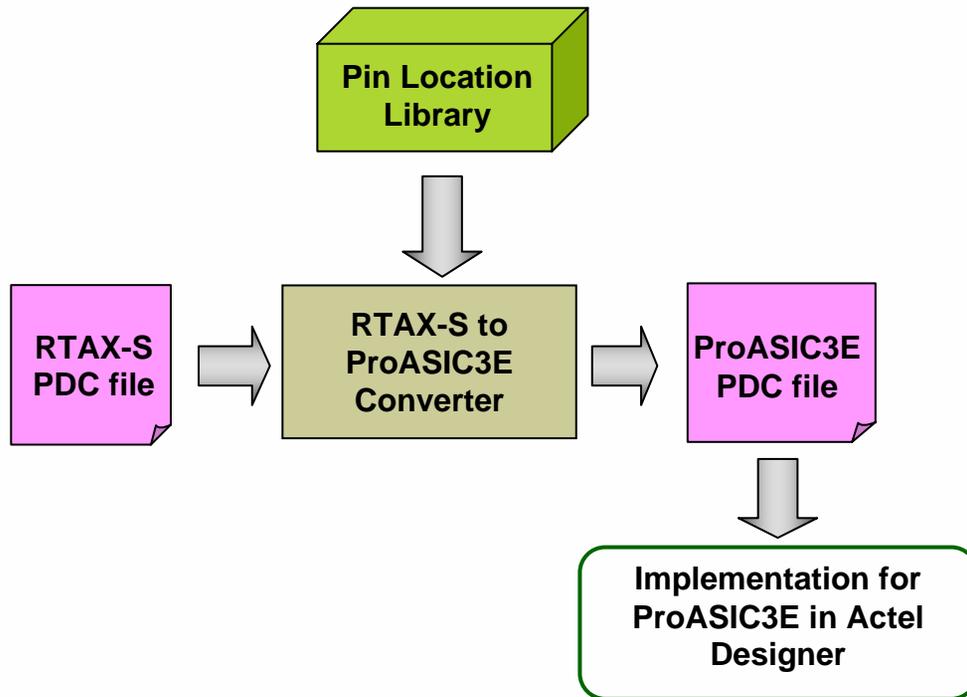
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# RTAX2A3P EDIF Netlist Converter
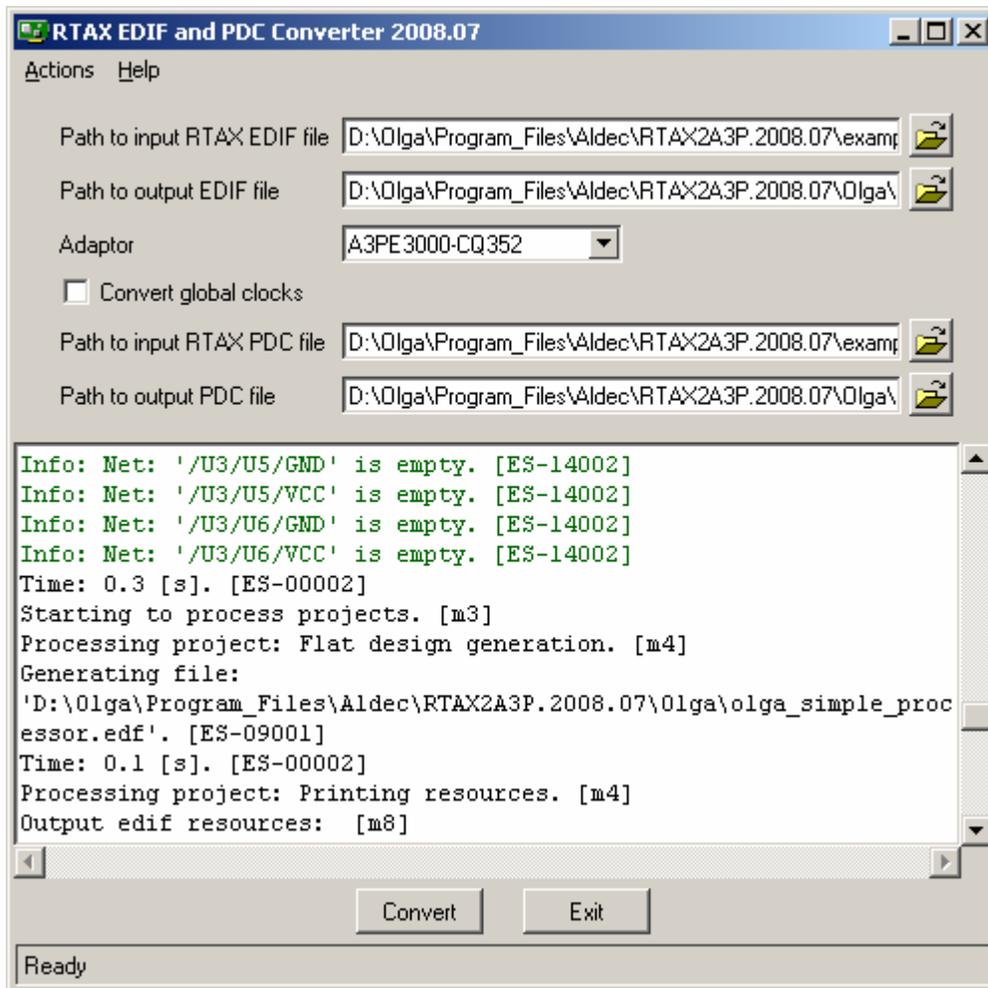


- RTAX2A3P EDIF Netlist Converter performs automatic conversion of the RTAX-S EDIF netlist to ProASIC3E EDIF netlist

- Features:
  - Conversion of combinatorial primitives
  - Conversion of sequential primitives
  - Conversion of I/O macros
  - Memory conversion

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# RTAX2A3P EDIF Netlist Converter

- EDIF Conversion Flow:

# Automatic PDC File Conversion



**Pin Location Library**

**RTAX-S PDC file**

**RTAX-S to ProASIC3E Converter**

**ProASIC3E PDC file**

**Implementation for ProASIC3E in Actel Designer**

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

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# RTAX2A3P EDIF Netlist Converter

- **Primitives Mapping**

|  | Number of RTAX-S primitives | Number of ProASIC3E primitives |
|---|---|---|
| Best Case mapping | 1 | 1 |
| Worst Case mapping | 1 | 2.5 |
| Average mapping | 1 | 1.5 |

# 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.

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# Thank You For Your Attention!