
IP Core Generator

Features

- Schematic Generation (AT40K & AT40KAL)
- Symbol Generation (AT40K & AT40KAL)
- Hard Macro Generation
- User-defined Macro Name
- User-defined Pins
- User-defined Libraries
- Flat Netlist Generation for Simulation
- Check-Out Macro for Modification

Introduction

The IP Core Generator is designed to utilize many innovative features of Atmel's AT40K, AT40KAL and AT94K Field Programmable System Level Integrated Circuit (FPSLIC™) architecture. High-speed custom logic functions can be rapidly created, resulting in significantly improved performance for computation-intensive applications. Since the AT40K architecture is the foundation for AT40KAL and AT94K Series devices, the cores generated are compatible across all three families.

The core generator facilitates quick and easy implementation of over 50 logic and memory cores such as multipliers, adders, accumulators, dual-port RAM, FIFO etc. The design tool will automatically create a hard layout with area information and worst-case speed, it will also generate the schematic, the symbol for schematic-based designs, and a back-annotated VHDL or Verilog netlist for simulation.

The IP cores are parameterized, which means that user-defined macros can be generated by specifying the required parameters. The tool allows designers to create their own user libraries and store the cores generated in the library for current and future designs.

IP Core Application Notes

Table 1 provides the statistics for a sample of generated macros implemented on the AT40KAL architecture. Details of each macro can be found on the Atmel web site, at <http://www.atmel.com/atmel/products/prod318.htm>.



**Programmable
SLI**

AT40K

AT40KAL

AT94K

**Application
Note**



Statistical Summary

Table 1 is a quick reference summary of all of the IP Core generators. Delay values are given for 1 speed grade on the AT94K/AT40KAL architecture.

Table 1. Statistical Summary

| Generator | Name | Speed (Mhz) | Delay (ns) | Cells | Size (x * y) | Latency (Clocks) |
|------------------------|-------|-------------|------------|-------|---------------|------------------|
| Absolute Value | abs16 | 54.8 | 18.2 | 15 | 1 x 15 | 0 |
| | abs8 | 115.7 | 8.6 | 7 | 1 x 7 | 0 |
| Accumulator | acc16 | 38.7 | 25.8 | 36 | 2 x 18 | 0 |
| | acc8 | 61.6 | 16.2 | 20 | 2 x 10 | 0 |
| Adder – Carry Select | acs16 | 47 | 21.3 | 48 | 3 x 19 | 0 |
| Adder – Ripple Carry | arc16 | 49.9 | 20.1 | 16 | 1 x 16 | 0 |
| | arc8 | 95.6 | 10.5 | 8 | 1 x 8 | 0 |
| Comparator | com16 | 56.1 | 17.8 | 16 | 8 x 2 | 0 |
| | com8 | 128 | 7.8 | 8 | 4 x 2 | 0 |
| Counter – Johnson | cjo16 | 98 | 10.2 | 16 | 1 x 16 | 0 |
| | cjo8 | 120.2 | 8.3 | 8 | 1 x 8 | 0 |
| Counter – LFSR | lfs16 | 94.7 | 10.6 | 16 | 1 x 16 | 0 |
| | lfs8 | 110.6 | 9 | 8 | 1 x 8 | 0 |
| Counter – PreScaled | cps16 | 45.2 | 22.1 | 17 | 1 x 17 | 0 |
| | cps8 | 82.1 | 12.2 | 9 | 1 x 9 | 0 |
| Counter – Ripple Carry | crc16 | 45.7 | 21.9 | 16 | 1 x 16 | 0 |
| | crc8 | 83.6 | 12.6 | 8 | 1 x 8 | 0 |
| Counter – Terminal | ctr16 | 85 | 11.8 | 6 | 1 x 16 | 0 |
| | ctr8 | 95 | 10.5 | 5 | 1 x 5 | 0 |
| Decoder | dec16 | 492.6 | 2 | 16 | 1 x 16 | 0 |
| | dec8 | 492.6 | 2 | 4 | 1 x 4 | 0 |
| Deductor | ded16 | 38.7 | 25.9 | 34 | 2 x 18 | 0 |
| | ded8 | 61.5 | 16.3 | 18 | 2 x 10 | 0 |
| Flip Flop – D Type | fdt16 | 598.8 | 1.7 | 16 | 1 x 16 | 0 |
| | fdt8 | 598.8 | 1.7 | 8 | 1 x 8 | 0 |
| Flip Flop – Toggle | fft16 | 598.8 | 1.7 | 16 | 1 x 16 | 0 |
| | fft8 | 598.8 | 1.7 | 8 | 1 x 8 | 0 |
| FIFO | fif16 | 46 | 21.7 | 19 | 7 x 6 | 0 |
| | fif8 | 45.8 | 21.8 | 16 | 7 x 5 | 0 |
| Gray Code | gra16 | 543.5 | 1.8 | 8 | 1 x 8 | 0 |
| | gra8 | 543.5 | 1.8 | 4 | 1 x 4 | 0 |

Table 1. Statistical Summary

| Generator | Name | Speed (Mhz) | Delay (ns) | Cells | Size (x * y) | Latency (Clocks) |
|---|--------|-------------|------------|-------|----------------|------------------|
| Incrementor/ Decrementor by 1 | inc16 | 39.4 | 25.4 | 17 | 1 x 17 | 0 |
| | inc8 | 64.8 | 15.4 | 9 | 1 x 9 | 0 |
| Incrementor/ Decrementor by Value | inv16 | 37.6 | 26.6 | 17 | 1 x 17 | 0 |
| | inv8 | 60 | 16.7 | 9 | 1 x 9 | 0 |
| Transparent Latch | ldt16 | 719.4 | 1.4 | 16 | 1 x 16 | 0 |
| | ldt8 | 719.4 | 1.4 | 8 | 1 x 8 | 0 |
| Logic Gates | log16 | 138.9 | 7.2 | 6 | 4 x 2 | 0 |
| | log8 | 304.9 | 3.3 | 3 | 3 x 2 | 0 |
| Look-Up Table | lut16 | 492.6 | 2 | 16 | 1 x 16 | 0 |
| | lut8 | 492.6 | 2 | 8 | 1 x 8 | 0 |
| Multiplier – Serial Parallel | msh16 | 108.3 | 9.2 | 32 | 2 X 16 | 0 |
| | msh8 | 108.3 | 9.2 | 16 | 2 X 8 | 0 |
| Multiplier – Signed | mls16 | 22.2 | 45.1 | 189 | 17 X 17 | 0 |
| | mls8 | 40.8 | 24.5 | 81 | 9 X 9 | 0 |
| Multiplier – Signed, 1 Stage of Pipelining | msh16 | 33.8 | 29.6 | 306 | 17 x 18 | 1 |
| | msh8 | 68.6 | 14.6 | 90 | 7 X 10 | 1 |
| Multiplier – Unsigned | mlu16 | 22.8 | 43.8 | 256 | 16 x 16 | |
| | mlu8 | 42.9 | 23.3 | 64 | 8 x 8 | |
| Multiplier – Unsigned, 1 Stage of Pipelining | mup16 | 38.7 | 25.8 | 272 | 16 x 7 | 1 |
| | mup8 | 84.9 | 11.8 | 72 | 8 x 9 | |
| Mux | mux_16 | 140.6 | 7.1 | 16 | 8 x 2 | |
| | mux_8 | 154.1 | 6.5 | 8 | 4 x 2 | 0 |
| Negate Function | nef16 | 51.4 | 19.4 | 16 | 1 x 16 | 0 |
| | nef8 | 101.6 | 9.8 | 8 | 1 x 8 | 0 |
| Pulse Generator – Fixed | pls16 | 141.5 | 7.1 | 5 | 1 x 5 | 0 |
| | pls8 | 171.5 | 5.6 | 4 | 1 x 4 | 0 |
| Pulse Generator – Loadable | pll16 | 25.2 | 39.8 | 48 | 3 x 17 | 0 |
| | pll8 | 47.9 | 20.9 | 24 | 3 x 9 | 0 |
| RAM – Dual Port | rdp16 | 283.3 | 3.5 | 1 | 7 x 2 | 0 |
| | rdp8 | 283.3 | 3.5 | 1 | 7 x 2 | 0 |
| RAM – Single Port | rsp16 | 283.3 | 3.5 | 1 | 7 x 2 | 0 |
| | rsp8 | 283.3 | 3.5 | 1 | 7 x 2 | 0 |

Table 1. Statistical Summary

| Generator | Name | Speed (Mhz) | Delay (ns) | Cells | Size (x * y) | Latency (Clocks) |
|---------------------------|-------------|--------------------|-------------------|--------------|----------------------|-------------------------|
| ROM | rom16 | 492.6 | 2 | 8 | 8 x 1 | 0 |
| | rom8 | 492.6 | 2 | 8 | 4 x 2 | 0 |
| Subtractor – Carry Select | scs16 | 47 | 21.3 | 48 | 3 x 19 | 0 |
| Subtractor – Ripple Carry | src16 | 49.9 | 20.1 | 16 | 1 x 16 | 0 |
| | src8 | 95.6 | 10.5 | 8 | 1 x 8 | 0 |
| Shift Register | sre16 | 598.8 | 1.7 | 16 | 1 x 16 | 0 |
| | sre8 | 598.8 | 1.7 | 8 | 1 x 8 | 0 |



Atmel Headquarters

Corporate Headquarters
2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 487-2600

Europe

Atmel SarL
Route des Arsenaux 41
Casa Postale 80
CH-1705 Fribourg
Switzerland
TEL (41) 26-426-5555
FAX (41) 26-426-5500

Asia

Atmel Asia, Ltd.
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimhatsui
East Kowloon
Hong Kong
TEL (852) 2721-9778
FAX (852) 2722-1369

Japan

Atmel Japan K.K.
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
TEL (81) 3-3523-3551
FAX (81) 3-3523-7581

Atmel Operations

Memory

Atmel Corporate
2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 436-4270
FAX 1(408) 436-4314

Microcontrollers

Atmel Corporate
2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 436-4270
FAX 1(408) 436-4314

Atmel Nantes

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
TEL (33) 2-40-18-18-18
FAX (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards

Atmel Rousset
Zone Industrielle
13106 Rousset Cedex, France
TEL (33) 4-42-53-60-00
FAX (33) 4-42-53-60-01

Atmel Colorado Springs
1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906
TEL 1(719) 576-3300
FAX 1(719) 540-1759

Atmel Smart Card ICs
Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
TEL (44) 1355-803-000
FAX (44) 1355-242-743

RF/Automotive

Atmel Heilbronn
Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
TEL (49) 71-31-67-0
FAX (49) 71-31-67-2340

Atmel Colorado Springs
1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906
TEL 1(719) 576-3300
FAX 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF Datacom

Atmel Grenoble
Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
TEL (33) 4-76-58-30-00
FAX (33) 4-76-58-34-80

Atmel Programmable SLI Hotline
(408) 436-4119

Atmel Programmable SLI e-mail
fpga@atmel.com – fpslic@atmel.com

FAQ

Available on web site

e-mail

literature@atmel.com

Web Site

<http://www.atmel.com>

© Atmel Corporation 2002.

Atmel Corporation makes no warranty for the use of its products, other than those expressly contained in the Company's standard warranty which is detailed in Atmel's Terms and Conditions located on the Company's web site. The Company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. No licenses to patents or other intellectual property of Atmel are granted by the Company in connection with the sale of Atmel products, expressly or by implication. Atmel's products are not authorized for use as critical components in life support devices or systems.

Atmel® and Cache Logic® are the registered trademarks of Atmel; FPSLIC™, HDLPlanner™, FreeRAM™ and System Designer™ are the trademarks of Atmel.

VHDL® and Verilog® are the registered trademarks of Cadence Design Systems Inc. Other terms and product names may be the trademarks of others.



Printed on recycled paper.

2421C-FPSLI-02/02C-02/02xM