



## CYCLONE PRODUCT BACKGROUNDER

### Introduction

Altera's new Cyclone™ devices are the world's lowest-cost FPGAs. Designed to make the benefits of programmable logic more accessible to a broader market, Altera developed Cyclone devices specifically for high-volume applications that previously were driven by cost pressures to standard products or ASICs. The Cyclone device family has the perfect mix of features, density, and performance at less than \$1.50 per 1,000 logic elements (LEs)—half the cost of competing FPGAs shipping today. Finally, system designers building high-volume applications in the consumer, communications, computer peripheral, industrial, and automotive markets have access to the flexibility, economic efficiencies, and time-to-market advantages of programmable logic.

### Low Cost by Design

The increasing complexities of ASIC design and verification are proving to be prohibitive for companies trying to get to market quickly with a competitive product. Without clear visibility into end-market demand, companies are finding it more difficult to justify costly up-front non-recurring engineering (NRE) charges that ASIC development requires. Consequently, system manufacturers are searching for a risk-free alternative that will get them to market in less time and for less money.

Sensing this opportunity, and with the belief that timing is everything, Altera designed the Cyclone device family using a product definition methodology that successfully produced the high-performance Stratix™ FPGA family. Involving customers at the early stages to identify the threshold price points, key features, and performance, Altera built Cyclone devices from the ground up. Today, just 15 months from concept to silicon, Altera has delivered Cyclone production devices, with the perfect blend of features, density, and performance at a price point that makes FPGAs viable in high-volume markets. The inherent value of FPGAs—off-the-shelf availability, easy customization with no upfront costs, and no minimum order quantities—is now in the hands of cost-conscious designers in search of a flexible, scalable option for their high-volume requirements.

### Key Features

Cyclone devices are supported by both the full version and free Web Edition of the Quartus® II design software version 2.2, service pack 1. When combined with Altera's extensive intellectual property (IP) portfolio and new low-cost serial configuration devices, Cyclone devices are the lowest-cost complete system-on-a-programmable-chip (SOC) solution available in the industry today.

- Densities range from 2,910 to 20,060 LEs and feature up to 288-Kbits of embedded memory.
- Cyclone devices are built on an all-layer-copper 1.5-V SRAM process, optimized for maximum logic capacity at the lowest cost.
- Featuring up to two phase-lock loops (PLLs) per device and a hierarchical clocking structure, Cyclone FPGAs offer an extensive on- and off-chip clock management circuitry for complex designs.
- Each Cyclone device is integrated with dedicated circuitry to interface with high-performance external single data rate (SDR) SDRAM and double data rate (DDR) SDRAM and FCRAM memory devices.
- Cyclone devices support a variety of single-ended I/O standards such as LVTTTL, LVCMOS, PCI, and SSTL-2/3, and have up to 129 channels of LVDS compatible I/O interfaces, each capable of operating at 311 Mbps.
- To complement the Cyclone devices, Altera also offers specialized flash serial configuration devices priced for volume applications at less than 10 percent of the corresponding Cyclone device.
- Version 3.0 of the Nios® embedded processor fully supports the Cyclone device family. The Nios processor takes advantage of Altera's simultaneous multi-master Avalon™ switch fabric, and includes custom instruction capabilities and advanced debugging solutions. For as low as \$2 for the logic required to embed a Nios processor and its peripherals into the smallest Cyclone device, designers can have a 32-bit, 50 Dhrystone MIPS RISC processor that is less expensive than most stand-alone microprocessors or microcontrollers.

For a complete description of the Cyclone device feature set, please see the Altera® web site at [www.altera.com/cyclone](http://www.altera.com/cyclone).

| <b>Feature</b>                           | <b>EP1C3</b> | <b>EP1C4</b>   | <b>EP1C6</b> | <b>EP1C12</b> | <b>EP1C20</b> |
|--|--------------|----------------|--------------|---------------|---------------|
| <b>Logic Elements (LEs)</b>              | 2,910        | 4,000          | 5,980        | 12,060        | 20,060        |
| <b>M4K RAM Blocks (4 Kbits + parity)</b> | 13           | 17             | 20           | 52            | 64            |
| <b>Total RAM Bits</b>                    | 59,904       | 78,336         | 92,160       | 239,616       | 294,912       |
| <b>Phase-Locked Loops (PLLs)</b>         | 1            | 2              | 2            | 2             | 2             |
| <b>Maximum User I/O Pins</b>             | 104          | 301            | 185          | 249           | 301           |
| <b>Production Device Availability</b>    | April 2003   | September 2003 | Now          | Now           | Now           |

### **Pricing, Packaging & Availability**

The Cyclone device family includes 5 members ranging in density from 2,910 to 20,060 LEs. Low-cost packages are available for the Cyclone devices including thin quad flat pack (TQFP), plastic quad flat pack (PQFP), and FineLine BGA® packages.

| <b>Device</b> | <b>Price (1)</b> | <b>Price (2)</b> |
|---------------|------------------|------------------|
| <b>EP1C3</b>  | \$5              | \$4              |
| <b>EP1C4</b>  | \$11             | \$7.50           |
| <b>EP1C6</b>  | \$13             | \$8.95           |
| <b>EP1C12</b> | \$27             | \$25             |
| <b>EP1C20</b> | \$60             | \$40             |

(1) Pricing based on 50K unit volumes for end 2003

(2) Pricing based on 250K unit volumes in 2004 timeframe