Product Brief

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The Quatro 4110 is a highly integrated, fully programmable system-on-a-chip (SOC) solution for the emerging class of appliance-type printers. Based on Zoran's Quatro architecture, the 4110 incorporates two proven processors—ARM9E RISC CPU core and Quatro SIMD DSP core—to provide original equipment manufacturers (OEMs) with an easy-to-program, high-performance controller platform. The 4110 is ideal for applications such as color inkjet multi-function peripherals (MFPs), monochrome and color laser MFPs, direct-connect digital photo printers, and set-top box printers—any printer that involves one or more PC-independent functions.

Benefits

Fast time-to-market

Programmable platform for deploying innovative features and associated image processing pipelines

Cost-effective solution

High level of integration including both PC and non-PC interfaces

High performance

Specialized imaging DSP core paired with high-performance ARM9E CPU

Key Features

- 150 MHz ARM9 CPU core
- 210 MHz quad-processor DSP core
- 840 MMACs DSP bandwidth
- USB 2.0 hi-speed device interface
- Memory card interface: CompactFlash (including Microdrive), Memory Stick, Memory Stick PRO, Secure Digital, xD-Picture Card, MultiMediaCard and SmartMedia
- 5 full-coverage color copies per minute at 600 dpi
- 35 full-coverage monochrome copies per minute at 600 dpi
- Complete development tool suite
- Complete reference design
- Extensive image processing library

Description

PC-Independent Printing

The market for personal printers is beginning to undergo a dramatic shift—away from traditional PC-centric printing peripherals and toward new PC-independent printing appliances. Fueling this shift is the rapid growth of digital photography, home Internet, and wireless connectivity. As these fast-expanding technologies make their way into the home, they are driving demand for a new class of appliance-type printers that allow image-rich content such as web pages, digital photos, and scanned documents to be printed without ever using a PC. To meet the more demanding requirements of this emerging class of appliance-type printers Zoran has created the Quatro 4110.

Programmable Platform

The 4110 is a highly integrated SOC solution for appliance-type printers that OEMs can program to implement the features and associated image processing pipeline required across a range of products. Because it is fully programmable, the 4110 offers OEMs significant time-to-market advantages over conventional ASIC solutions.

Quatro Architecture

The 4110 is based on Zoran's Quatro architecture. Quatro is a scalable, extensible architecture for constructing programmable SOC solutions for imaging and printing devices.

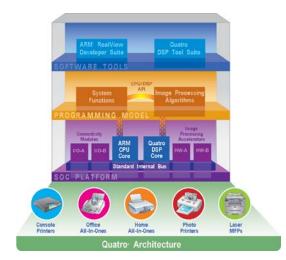At the heart of the Quatro architecture are four key elements:

- ARM9E 32-bit RISC CPU core
- Quatro 4-datapath SIMD DSP core
- Industry-standard internal bus
- Easy-to-use C-based programming environment

**Programmable SOC Solution
for Printing Appliances**

Product Brief
Description (continued)

By pairing the ARM9E CPU core with the Quatro DSP core, the Quatro architecture provides OEMs with a unique combination of high-performance processing and easy-to-use programmability. The ARM9E CPU core, the established leader in embedded CPU cores, delivers high-performance system and control processing with dense code size and a highly regarded software development tool suite.

The Quatro DSP core, the next generation of the parallel processing DSP core used in Zoran's PM-44i and PM-44ix discrete DSPs, delivers unmatched performance in image processing. The Quatro DSP core utilizes an advanced single instruction, multiple data (SIMD) parallel processing architecture to provide very high performance image processing—up to 840 million multiply-accumulates (MACs) per second at 210 MHz.

Programming Environment

The programming environment for 4110 is based on the ARM Developer Suite, widely recognized as one of the best embedded development tool sets available. To these proven ARM9E tools Zoran integrates a set of tools for programming the Quatro DSP—C compiler assembler, linker, simulator, debugger, and libraries. Zoran's extensive library of optimized image processing algorithms makes developing image processing pipelines easy.

Reference Design

To further shorten time-to-market, Zoran provides OEMs with a reference design for an inkjet MFP. The reference design includes both a controller board and firmware. The reference controller board also serves as a development board that customers can use to prototype their own system code.

Processing Modules

The 4110 incorporates the following processing modules:
• 150 MHz ARM9E CPU core
• 210 MHz Quatro DSP core
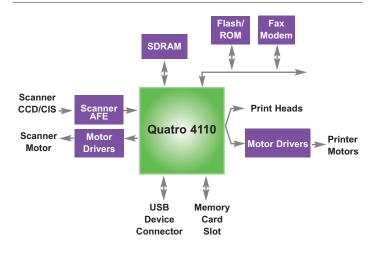• 150 MHz JBIG compression/decompression core

Interfaces

The 4110 provides all the interfaces required in an appliance-type printer:
• 105 MHz 16-bit SDRAM interface
• USB 2.0 hi-speed device interface (including PHY)
• Memory card interface: CompactFlash (including Microdrive), Memory Stick, Memory Stick PRO, Secure Digital, xD-Picture Card, MultiMediaCard and SmartMedia
• Scanner AFE and control interface (supporting CCD and CIS scanners)
• Laser printer interface
• Programmable inkjet printer interface
• SPI serial flash interface
• System bus interface
• General-purpose I/O interface
• Serial port
• JTAG

Key Specifications

• 0.18 micron process
• On-chip PLLs
• Full scan design and on-chip BIST for high production test coverage
• Core voltage 1.8V
• I/O voltage 3.3V (5V tolerant)
• Power dissipation <3W at maximum clock speed

Quatro 4110 Controller Block Diagram

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