

# Quatro<sup>®</sup> 4301/4302 Family

CONNECT  
SHARE  
ENTERTAIN™

DVD  
DIGITAL CAMERA  
DIGITAL TV  
**DIGITAL PRINTING**  
MOBILE  
IP CORES

PROGRAMMABLE SOC SOLUTION

## Product Brief

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## Overview

The Quatro 4301 and 4302 are highly integrated SOC solutions for inkjet AIOs and direct-connect inkjet and dye-sub photo printers. Based on Zoran's advanced Quatro architecture featuring an ARM9 RISC CPU and Zoran's Quatro SIMD DSP, the 4301 and 4302 provide OEMs with a flexible and cost-effective platform for implementing AIO and printer controllers with a range of features and performance.

The 4301 and 4302 build upon Zoran's Quatro 4201 and 4202 SOC's, with more processing power and connectivity enhancements. The 4301 and 4302 are ideal for AIOs and photo printers with advanced features such as wireless and Ethernet connectivity, output to a TV and a connection to IDE hard disk.

## Benefits

**Cost-effective solution**—Highly integrated system-on-a-chip with both PC and non-PC interfaces, enabling the lowest possible cost

**Fast time-to-market**—Programmable platform for rapidly deploying innovative features, associated image processing pipelines and new mechanisms

**High performance**—Quatro DSP image processing core paired with the industry-leading ARM9 CPU core

### Two series tailored to the needs of specific segments:

- 4301 series for premium-photo inkjet AIOs
- 4302 series for direct-connect photo inkjet and dye-sub printers

## Key Features

- 295/220 MHz ARM9 CPU core
- 295/220 MHz Quatro 4-datapath SIMD DSP core
- Integrated 16-bit scanner AFE supporting CCD and CIS sensors (4301 only)
- USB 2.0 Hi-Speed device interface
- Three USB 2.0 Hi-Speed host interfaces
- Memory Card interfaces
- Graphical LCD interface
- NTSC/PAL video output
- Programmable interfaces to control inkjet and dye-sub print heads, mechanisms and scanner assemblies
- Real time clock
- Complete development tool suite
- Complete reference design
- Compatible with code bases developed for other Quatro SOC's
- Extensive image processing library

## Description

### Print Appliances

The market for print appliances, including AIOs and direct-connect photo printers continues to grow rapidly. Driving this growth are lower prices, innovative features, and the proliferation of image-rich content from digital cameras, scanned documents, and the Web. Increasingly, all but the simplest entry-level products now require sophisticated features, including color LCDs, sophisticated photo processing functions and expanded wireless connectivity.

The 4301 and 4302 answer the need for these sophisticated feature requirements at very low-cost. With full programmability and fast processing performance, the 4301 and 4302 provide OEMs with a flexible and cost-effective platform for implementing differentiated products.

### Programmable Platform

The 4301 and 4302 are highly integrated SOC solutions for appliance printers that OEMs can program to implement the features and associated image processing required across a range of products.

Because they are programmable, the 4301 and 4302 offer OEMs both significant time-to-market advantages and differentiation over conventional ASIC solutions.

### Quatro Architecture

The 4301 and 4302 are based on Zoran's Quatro architecture. Quatro is a scalable, extensible platform for constructing programmable SOC solutions in imaging and printing device.

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

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

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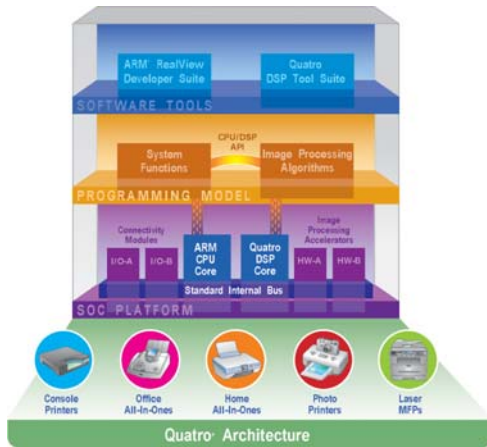
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### Description (continued)



By pairing the ARM CPU core with the Quatro DSP core, the Quatro solution provides OEMs with a unique combination of high-performance processing and easy-to-use programmability. The ARM 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 in the 4301 and 4302 builds on over 10 years of Zoran Quatro DSP technology. The 4-datapath parallel processing Single Instruction, Multiple Data (SIMD) architecture is specifically tailored for imaging applications, delivering unmatched performance. The Quatro DSP offers up to 1.2 billion multiply-accumulates (MACs) per second at 295 MHz, allowing new imaging features to be quickly implemented without changing hardware, enabling rapid time-to-market and minimizing development expense.

### Programming Environment

The programming environment for the 4301 and 4302 is based on the ARM RealView Developer Suite, widely recognized as one of the best embedded development tool sets available. To these proven ARM tools Zoran integrates a set of tools for programming the Quatro DSP—C compiler assembler, simulator, debugger, and libraries. Using the ARM CPU and Quatro DSP simulators, an OEM's complete system—both system functions and image processing pipelines—can be fully developed and simulated on a PC. 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 AIO. The reference design includes both a controller board and firmware. The reference controller board also serves as a development board that OEMs can use to prototype their own system code.

### Processing Modules

- 295/220 MHz ARM926 32-bit RISC CPU core with MMU
- 295/220 MHz Quatro 4-datapath SIMD DSP core
- 295/220 MHz JBIG compression/decompression core
- 295/220 MHz JPEG assist module

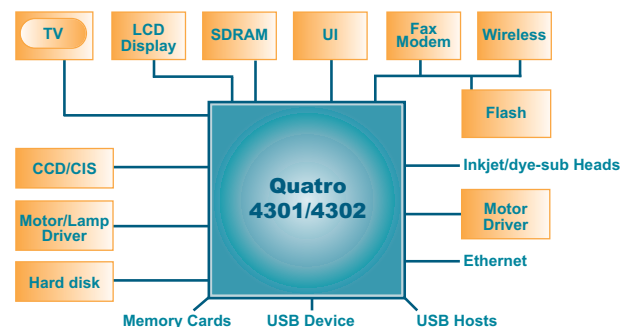
### Interface Modules

- DDR1/DDR2-SDRAM interface
- USB 2.0 Hi-Speed (480 Mbps) device interface (including PHY)
- USB 2.0 Hi-Speed (480 Mbps) 3-port host interface (including PHY)
- Memory card interface: CompactFlash (including Microdrive), Memory Stick, Memory Stick PRO, Secure Digital, xD-Picture Card, MultiMediaCard, and SmartMedia
- Integrated 25MSPS 16-bit scanner AFE supporting CCD and CIS scanners
- Programmable scanner control interface with 8-bit flexRISC processor
- Programmable printer control interface with 8-bit flexRISC processor
- 12-channel, 3 MHz 10-bit A/D converter
- System bus interface
- General-purpose I/O interface
- Serial port
- JTAG interface
- Graphical LCD interface
- NTSC/PAL video output
- 10/100 Ethernet MAC
- IDE interface
- Thermal (dye-sub) print-head interface

### Key Specifications

- 352-pin and 296-pin BGA packages
- On-chip PLLs with EMI reduction
- Core voltage 1.0V
- I/O voltage 2.5V and 3.3V
- Power dissipation <3.0W @ 295 MHz
- Sleep mode

### Quatro 4301/4302 Controller Block Diagram



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