## Product Brief

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**ZORAN**®

The Quatro 4230 is a highly integrated, fully programmable processor for laser printers, multifunction peripherals, and high speed scanners. Based on Zoran's Quatro architecture, the 4230 combines an embedded ARM11™ RISC CPU core and dual Quatro SIMD DSP cores for high quality copy image processing and page description language (PDL) acceleration, providing original equipment manufacturers (OEMs) with a compelling combination of high-performance and programmability.The 4230 is ideal for applications such as monochrome and color laser MFPs and high-speed document scanners.

## Benefits

**Fast time-to-market**

Programmable platform for deploying innovative features and associated image processing pipelines

**Cost-effective solution**

High level of integration including USB, Ethernet, and PCI interfaces

**High performance**

Specialized imaging DSP cores paired with high-performance ARM11 CPU

PostScript/PCL printing at 16+ ppm color

Raster/GDI printing at 30 ppm (4-bit CMYK)

12 full-coverage color copies per minute at 600 dpi

55 full-coverage monochrome copies per minute at 600 dpi

## Key Features

• 400 MHz ARM11 CPU core with MMU and FPU

• Dual 300 MHz quad-processor DSP cores

• 2400 MMACs DSP bandwidth

• USB 2.0 hi-speed device interface

• USB 2.0 hi-speed host interface

• USB 2.0 full-speed host interface

• 200 MHz 32-bit DDR2 SDRAM interface (DDR2-400)

• 32-bit 66 MHz PCI interface

• Ethernet MAC

• Scanner interface

• Programmable printer interface for multipass and tandem engines, inkjet engines, and dye-sub engines

• Memory card interface: CompactFlash and SmartMedia

• Complete reference design

• Extensive image processing library

## Description

**PDL Support**

PDLs continue to be a key requirement for the office market and help OEMs to meet the stringent interoperability requirements of their customers. The ARM11 CPU core delivers high-performance system and control processing with industry leading code density and a high-quality development environment. The 4230 leverages the ARM processor to power a color laser platform that processes Zoran's PDL interpreter firmware, Integrated Print System (IPS).

**Programmable Platform**

The 4230 is a highly integrated processor solution for desktop office printers and MFPs. OEMs can program the platform's features and associated image processing pipeline as required across a range of products spanning raster and PDL, print-only and MFP, monochrome and color. The 4230's full programmability offers OEMs significant time-to-market advantages over conventional ASIC solutions.

**Quatro Architecture**

The 4230 is based on Zoran's Quatro architecture. Quatro is a scalable, extensible architecture for constructing programmable processor solutions for imaging and printing devices.
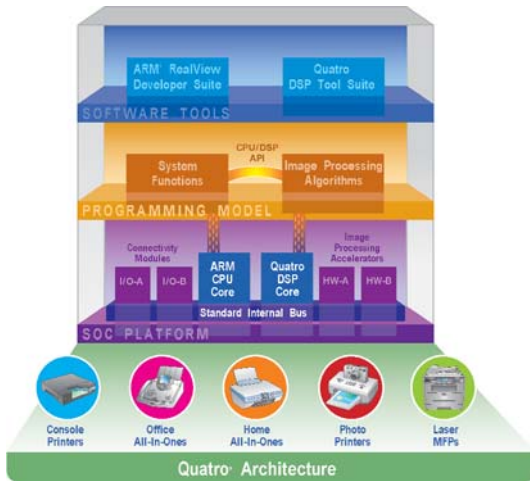
At the heart of the Quatro architecture are four key elements:

• ARM11 32-bit RISC CPU core
• Quatro 4-datapath SIMD DSP cores
• Easy-to-use C-based programming environment
• Common firmware platform

## Product Brief
### Description (continued)



Quatro® Architecture

By pairing the ARM11 CPU core with the Dual Quatro DSP cores, the Quatro 4230 provides OEMs with a unique combination of high-performance processing and easy-to-use programmability. The ARM11 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 same parallel processing DSP core used in Zoran's Quatro 4201 and Quatro 4100, delivers unmatched performance in image processing. The Quatro DSP cores utilize an advanced single instruction, multiple data (SIMD) parallel processing architecture to provide very high performance image processing-up to 2400 million multiply-accumulates (MACs) per second at 300 MHz.

### Programming Environment

The programming environment for 4230 is based on the ARM RealView Development Suite, widely recognized as one of the best embedded development tool sets available. To these proven ARM11 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 Platform

To further shorten time-to-market, Zoran provides OEMs with a reference platform for a laser MFP. The reference platform 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 4230 incorporates the following processing modules:
- 400 MHz ARM11 CPU core with MMU and FPU
- Dual 300 MHz Quatro DSP cores
- 300 MHz JBIG compression/decompression core
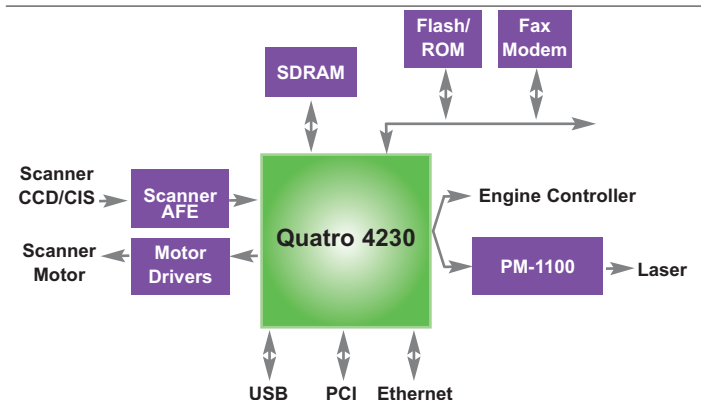- JPEG assist core

### Interfaces

The 4230 provides all the interfaces required in a small/home office type printer/MFP:
- 200 MHz 32-bit DDR2 SDRAM interface (DDR2-400)
- USB 2.0 hi-speed device interface
- USB 2.0 hi-speed host interface
- USB 2.0 full-speed host interface
- Memory card interface: CompactFlash and SmartMedia
- Scanner input and control interface (supporting CCD and CIS scanners)
- Programmable printer interface for multipass and tandem laser engines, inkjet engines, and dye-sub engines
- 32-bit 66 MHz PCI interface
- 10/100 Ethernet MAC
- System bus interface
- SPI interface
- General-purpose I/O interface
- Serial port
- JTAG

### Key Specifications

- 0.11 micron process
- On-chip PLLs
- Full scan design and on-chip BIST for high production test coverage
- Core voltage 1.2V
- DDR2 voltage 1.8V
- I/O voltage 3.3V

## Quatro 4230 Controller Block Diagram

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