

Quatro[®] 4500 Family

CONNECT
SHARE
ENTERTAIN™

DVD
DIGITAL CAMERA
DIGITAL TV
DIGITAL PRINTING
MOBILE
IP CORES

PROGRAMMABLE SOC SOLUTION

Product Brief

Zoran Corporation
1390 Kifer Road
Sunnyvale, CA 94086

www.zoran.com

Overview

The Quatro 4500 family of processors feature single-core and dual-core CPU's to drive performance of print language processing for office printers and multifunction peripherals (MFPs).

The dual-core SOC's in the 4500 family integrate multicore CPU technology, a key advancement in achieving high processing speeds while minimizing cost and power consumption. They combine a 400 to 600 MHz ARM11MP dual-core CPU with Level 1 and Level 2 caches to provide fast processing of Zoran's multicore-optimized IPS print language interpreters, enabling printing at speeds in excess of 45 color pages per minute.

Benefits

Cost-effective solution—High level of integration including printer, scanner, USB, Gigabit Ethernet, and PCI Express interfaces

Fast time-to-market—Programmable platform for deploying innovative features and associated image processing pipelines

High performance—Dual-core ARM11MP CPU, 4 imaging DSP's and hardware image processing for copy and scan functionality

Wide Range of Uses—Printers, MFPs, Mono/Color, Scanners

Description

Print Language Processing

PDLs continue to be a key requirement for the office market and help OEMs to meet the stringent interoperability requirements of their customers. The ARM11MP CPU core delivers high-performance system and control processing with industry-leading code density and a high-quality development environment. Combined with Zoran's multicore enabled IPS™ PDL interpreter firmware, the Quatro 4500 achieves new levels of PDL printing performance.

Programmable Platform

The 4500 family is a highly programmable 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 4500's full programmability offers OEMs significant time-to-market advantages over conventional ASIC solutions.

Hardware Image Processing Pipeline

The 4500 family integrates a set of hardware pipeline modules which can be used to implement a full scan or copy pipeline. The hardware pipeline modules may also be augmented by algorithms running on the DSP, in order to maximize performance. The hardware pipeline modules utilize a 1 MB scratchpad memory in order to hold both tables and image data, minimizing latency and accesses to main memory.

The 4500 family provides high-speed scan and copy processing through the combination of a hardware image processing pipeline and four programmable Quatro digital signal processors (DSPs). The 4500 also provides advanced networking features including Gigabit Ethernet, IPv6, and IPsec, which are quickly becoming must-have features in many enterprise and government organizations.

The 4500 family together with the lower end 4305/4310 family offer solutions that span the full range of desktop office scanning, copying and printing devices.

Key Features

- Dual-core ARM11MP CPU up to 600 MHz
- Four quad-processor DSP cores up to 300 MHz
- Hardware image processing pipeline
- Level 2 cache and scratchpad memory
- Scanner interface supporting LVDS inputs
- Programmable printer interface for multipass and tandem print engines
- Gigabit Ethernet
- PCI Express

Multiple Feature / Performance Options

Version	Color PDL Print Performance	Color Copy Performance	Single/Dual CPU
Scanner / AIO			
Quatro 4550/600	45+ ppm	30 cpm	Dual 600 MHz
Quatro 4550/500	35+ ppm	25 cpm	Dual 500 MHz
Quatro 4530/600	30 ppm	30 cpm	Single 600 MHz
Quatro 4530/500	25 ppm	25 cpm	Single 500 MHz
Quatro 4530/400	20 ppm	20 cpm	Single 400 MHz
Printer			
Quatro 4545/600	45+ ppm	NA	Dual 600 MHz
Quatro 4545/500	35+ ppm	NA	Dual 500 MHz
Quatro 4525/600	30 ppm	NA	Single 600 MHz
Quatro 4525/500	25 ppm	NA	Single 500 MHz
Quatro 4525/400	20 ppm	NA	Single 400 MHz

Development Platform

The programming environment for the 4500 family is based on open source tools such as GNU GCC and GDB. The ARM RealView Development Suite can also be used. To these proven ARM11 core 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.

Quatro 4500 Family

CONNECT
SHARE
ENTERTAIN™

DVD
DIGITAL CAMERA
DIGITAL TV
DIGITAL PRINTING
MOBILE
IP CORES

PROGRAMMABLE SOC SOLUTION

Product Brief

Description (continued)

Processing Modules

The 4500 family incorporates the following processing modules:

- Single-core and dual-core ARM11MP CPU with MMU and FPU, 400-600 MHz (Level 1 and Level 2 caches)
- 512 KB Level 2 cache
- Four Quatro DSP cores
- Dual JBIG compression/decompression cores
- JPEG assist module
- AES/SHA-256 hardware encryption modules for IPv6, IPsec
- Hardware image processing for copy/scan pipelines
- 1 MB scratchpad memory

Functions of the hardware pipeline include:

Scan Front Processor

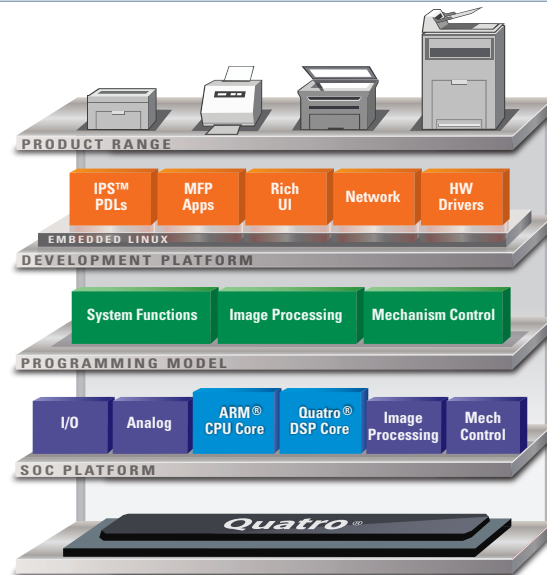
- Shading correction
- On-the-fly 1-D lookup
- Fringing correction
- White/Black point tracking

Scan Back Processor

- White/Black point calibration
- Gamma correction
- RGB-YCC color conversion

Color Conversion (YCC to RGB to CMYK)

- YCC-RGB conversion
- RGB-CMYK conversion



Quatro Architecture

Interface Modules

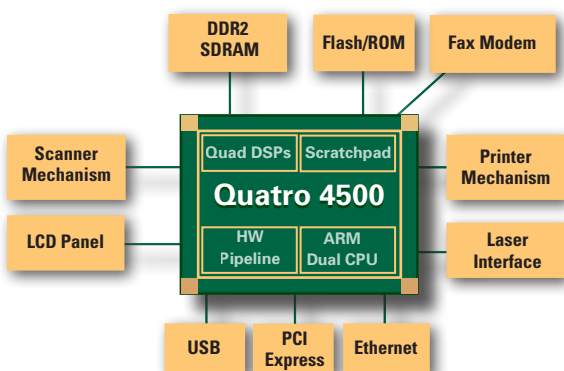
The 4500 family provides all the interfaces required in an office printer/MFP or document scanner:

- 400 MHz 32-bit DDR2 SDRAM interface (DDR2-800)
- USB 2.0 Hi-Speed device interface
- 2 USB 2.0 Hi-Speed host interfaces
- Memory card interface
- Scanner interface supporting LVDS inputs
- Printer interface for multipass and tandem laser/LED print engines
- 3 PCI Express interfaces supporting up to 6 total lanes
- Gigabit Ethernet MAC
- EIDE interface
- Anti-counterfeiting interface
- System bus interface
- LCD interface
- 2 SPI interfaces
- General-purpose I/O interface
- 2 Serial ports
- JTAG

Key Specifications

- 520 ball BGA (27x27mm) - 1.0mm pitch
- Linux OS support
- 80 nanometer process
- On-chip PLLs
- Low-power sleep mode

Quatro 4500 Controller Block Diagram



© Copyright 2009 Zoran Corporation. All rights reserved. Zoran, the Zoran logo, IPS and Quatro are trademarks of Zoran Corporation. All other brand product names and company names are trademarks of their respective owners. The information in this document is believed to be reliable. However, Zoran Corporation makes no guarantee or warranty concerning the accuracy of said information and shall not be responsible for any loss or damage of whatever nature resulting from the use of, or reliance upon it. Zoran Corporation does not guarantee that the use of any information contained herein will not infringe upon patent, trademark, copyright, or rights of third parties. Zoran Corporation reserves the right to make changes in the product and/or specifications, or both, presented in this publication at any time without notice.

Zoran Corporation www.zoran.com

imaging.usa@zoran.com

imaging.japan@zoran.com

imaging.taiwan@zoran.com

imaging.korea@zoran.com