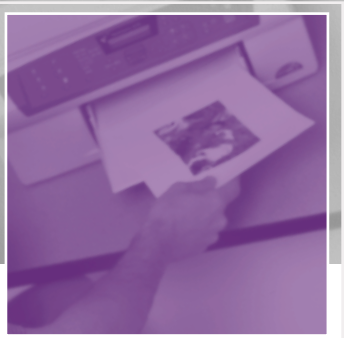
PM-44i™

Programmable Imaging DSP



High-performance, low-cost peripheral imaging solution

- **Unmatched price/performance**
  Third-generation SIMD parallel processing architecture
- **Flexible platform**
  Software development kit that enables OEMs to quickly add features and deploy proprietary intellectual property
- **Fast time-to-market**
  Complete suite of customizable software image pipelines for MFPs
- **Superior image quality**
  Advanced image processing algorithms
- **Cost-effective solution**
  Embedded SRAM and small package ideal for high-volume color inkjet and monochrome laser MFPs

The PM-44i is a high-performance, programmable digital signal processor (DSP) designed specifically for image processing in low-cost multi-function peripherals (MFPs). The PM-44i provides superior price/performance over conventional DSPs and greater flexibility over custom ASICs. Combined with Oak Technology's Fusion-series image pipelines, the PM-44i delivers a complete, customizable image processing solution for low-cost MFPs.

High-Performance Imaging Platform

The low-cost MFP market is growing at an increasingly rapid pace. New features such as high quality copying, color fax, and Internet fax are quickly making current models obsolete. Delivering these new features with ever shorter time-to-market requires a high-performance, programmable imaging platform.

The PM-44i is that platform. The PM-44i provides the price/performance of a custom ASIC with all the time-to-market advantages of a programmable DSP. Based on a single instruction, multiple data-path (SIMD) architecture designed specifically for high-throughput image processing, the PM-44i succeeds where conventional DSPs fail.

The programmable PM-44i enables MFP designers to quickly implement their image processing algorithms and pipelines. For OEMs who want a total image processing solution, not just a platform, Oak Technology provides a complete suite of customizable image pipelines available as either source or object code.

Monochrome Laser MFP Solution

Image processing represents a key challenge in developing a low-cost MFP. The PM-44i is the ideal platform for implementing the complex image processing required to achieve high-quality copying, scanning, and faxing on inexpensive scanner and printer components. A single PM-44i delivers up to 15 monochrome laser copies per minute.

Color Inkjet MFP Solution

With the PM-44i, OEMs can quickly implement their own image pipelines or use Oak Technology's image pipelines—CopyFusion™, ScanFusion™, and FaxFusion™. Utilizing proprietary algorithms, CopyFusion, FaxFusion, and ScanFusion deliver superior image quality, improved compression ratios, and faster inkjet printing. A single PM-44i delivers up to 8 color inkjet copies per minute.

Key Features

- 2,000 MIPS and 500 MMACS at 125 MHz internal operating frequency
- 4 parallel pipelined processors
- Up to 15 monochrome laser copies or 8 color inkjet copies per minute
- Programmable via downloadable code
- Internal 64 KB synchronous SRAM
- Phase-locked loop (PLL) enables the PM-44i to generate its main internal clock frequency from a lower-frequency signal
- High-speed flexible input and output ports with programmable widths of 8 to 16 bits
- Interface to low-cost SDRAM
- Flexible I/O — enables connections to scanner or printer engines, or to PM-22™ and PM-36™ compression chips
- 3.3 volt supply with TTL-compatible I/O video rate: 33 MHz

A Superior Alternative

The PM-44i offers important advantages over other chip alternatives:

- Conventional DSPs—The PM-44i provides much higher imaging performance at much lower costs than other DSPs.
- FPGAs—The PM-44i offers much lower costs, higher performance, and a simpler code-based development process.
- Custom ASICs—The PM-44i offers the time-to-market and low-cost advantages of a software-based solution. Its programmable design simplifies algorithm changes, reduces time-to-market by significantly reducing development time, and enables product upgrades and scalable architectures for entire product families.

Memory Structure

The PM-44i is designed to access three different types of memory: instruction memory; embedded memory; and expansion memory. The 2KB instruction memory provides single cycle access times for the most commonly executed instructions.

The PM-44i's embedded 64 KB high-speed SRAM is used for image data storage and secondary instruction storage. The PM-44i data paths operate on image data that is stored in this buffer. Instructions may be stored in the embedded memory and either executed in place, or transferred to the instruction memory for performance improvements.

The PM-44i also has an internal SDRAM controller that supports up to 32 MB of low-cost external SDRAM for use as expansion memory, or as an input/output line buffer for storing image data. Data is transferred between the expansion memory and the embedded memory by internal DMA controllers.

Design Considerations

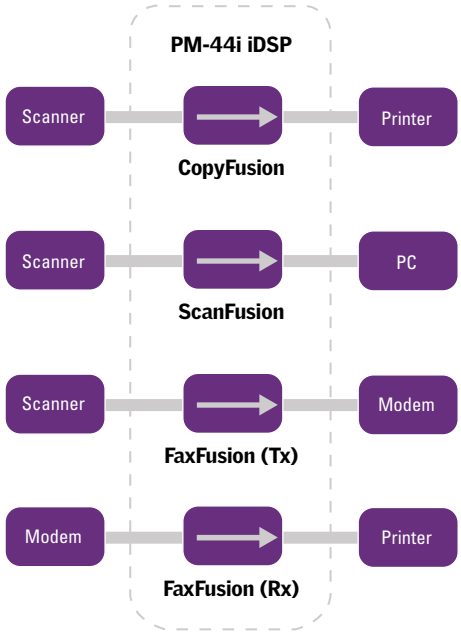
The PM-44i can be easily integrated into a variety of systems. Design features include:

- A simple peripheral interface for use with any standard processor
- High Performance I/O modes, including Burst and Video Burst
- Input and output ports handle synchronous transfer rates of up to 33 MHz with data path widths of 8 to 16 bits
- The PM-44i can be configured to interface to many different types of devices, including multiple PM-44i's, PM-22, and PM-36 iCODECs™
- Interface to up to 32 MB of low cost external SDRAM
- PM-44i SDK programming toolset available

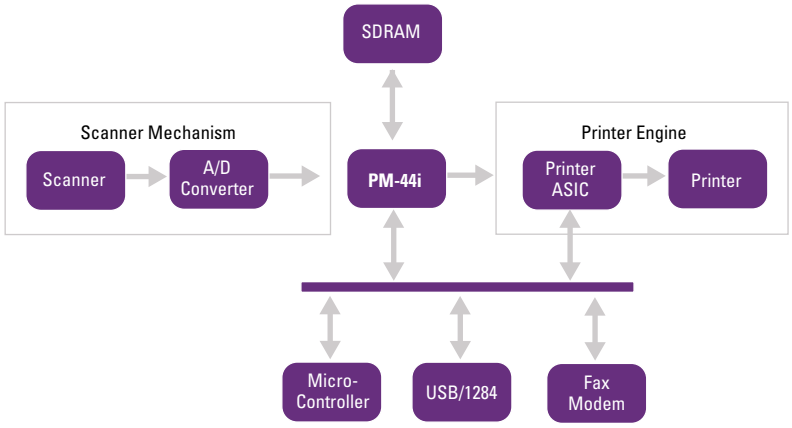
PM-44i Electrical Specifications

- 3.3 Volt supply
- 5 Volt tolerant I/O (TTL-compatible I/O)
- 125 MHz clock speed
- Designed and fabricated in 0.35 micron standard cell technology
- Available in industry-standard 128-pin PQFP package

Single PM-44i Application Running Multiple Pipelines



PM-44i Application



Oak Technology, Inc., 10 Presidential Way, Woburn, MA 01801 phone (781) 638-7500 fax (781) 638-7555 **www.oaktech.com**