

## Product Brief

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The PM-22 is a next-generation Codec device that leverages Zoran's years of experience to provide the ultimate in performance for today's multifunction peripherals. With features such as a 75 MHz clock speed, an internal 16 KB of SRAM, an internal Phase-Locked Loop (PLL), a 32-bit I/O

interface, JBIG compression and streamlined multi-tasking, the PM-22 offers the most sophisticated bitonal image compression capabilities available today.

### Benefits

- **Ultimate performance**—bitonal image compression device
- **Unparalleled throughput**—Processes 600 dpi documents in less than 150 milliseconds
- **Highly integrated**—Internal SRAM and Phase-Locked Loop (PLL)
- **Improved I/O**—32-bit interface
- **Multi-standard support**—ITU G3, G4 and JBIG
- **Improved system performance**—Enhanced multi-tasking

### Key Features

- 75 MHz clock speed for high throughput
- Integrated SRAM (16 KB) and Phase-Locked Loop (PLL)
- 32-bit I/O interface mode
- Support for ITU G3, G4 and JBIG bitonal image data formats
- Enhanced multi-tasking
- 3.3 Volt power supply
- 16 KB internal SRAM
- High-speed rotation assist function, concurrent with decompression
- Flexible I/O modes include Burst, FIFO, and Full Duplex DMA operation
- Programmable output palette
- Large image size capacity—handles up to 64 K pixels per line, up to 64 K lines
- Programmable bit, byte and word ordering on input and output

### Description

#### High Throughput

The PM-22 can handle letter-sized 300 dpi documents in less than 45 milliseconds and 600 dpi documents in less than 150 milliseconds. With a maximum clock speed of 75 MHz, the PM-22 delivers a typical throughput of 225 Mpixels/second for ITU G3 and G4 data. The worst-case throughput for any compression/decompression standard is 75 Mpixels/second.

#### Integrated SRAM and PLL

To maximize cost-effectiveness, the PM-22 has integrated SRAM and Phase-Locked Loop (PLL). The PM-22's 16 KB of integrated SRAM reduces overall system cost. Its integrated PLL enables the PM-22 to generate its main internal clock frequency from a lower-frequency signal for reduced emissions and simplified board design.

#### 32-bit I/O Interface

The PM-22 features a new interface mode that enables it to be connected directly to 32-bit system busses. It allows use of a 32-bit host port for input, output or both. An 8-bit or 16-bit peripheral port is also provided. Input and output data bit and byte reordering functions have been expanded in the PM-22 to include word-swapping.

#### JBIG Compression

JBIG offers compression ratios up to four times higher than with two-dimensional ITU Group 4 encoding methods. This improvement significantly increases system performance and reduces image storage and transmission costs.

## Multifunction Image Processor

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**Descriptions (continued)****Enhanced Multi-Tasking**

Like previous PM-2x Codecs, the PM-22 fully supports multi-tasking for interrupt-driven image processing in multi-function peripherals. In addition, multi-tasking has been optimized on the PM-22 to reduce host processor interrupts during JBIG operations.

**PM-22 Capabilities**

The PM-22 enables the following combinations of operations to be performed on the data stream during one pass through the device:

- Decompress, scale, and clip the resulting bitonal data
- Decompress, scale to gray, and clip the resulting data
- Decompress, clip and rotate to any multiple of 90 degrees
- Clip and compress bitonal input

Scale factors for pass-through or decompression operations range from 1:256 to 255:1 in increments of 1/256. The PM-22 supports any combination of bit and byte ordering on both input and output ports. In addition, the PM-22 supports "fast" padding for improved output formatting operations.

**The Role of Multi-Tasking**

Effective multi-tasking will increase processor efficiency by reducing the overhead involved in multiple simultaneous compression/decompression processes. The PM-22 is capable of halting a process at the end of any line and cleanly restarting. When the processor is halted, the internal state can be read and stored. The PM-22 can then be reconfigured and restarted, either with a process that has been suspended or with an entirely new process.

**Design Considerations**

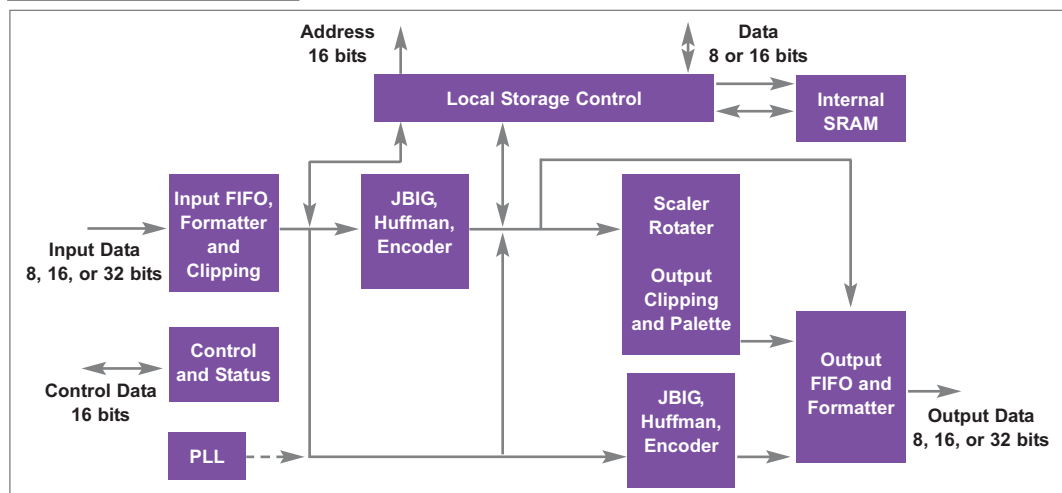
The PM-22 requires little in the way of external support chips. The PM-22 includes 16 KB of internal SRAM, sufficient to support most common coding or decoding operations. Rotation, scaling and multi-tasking operations may require an external SRAM (8 KB minimum; supports up to 128 KB), which serves as a local buffer during processing operations. Multi-tasking systems are able to use either internal or external SRAM for any task that fits into available memory.

**PM-22 Specifications***Storage Formats Supported*

- ITU Group 3 1D (Modified Huffman coding)
- ITU Group 3 2D (Modified READ coding, programmable K-factor)
- ITU Group 4 2 D (Modified Modified READ (MMR) coding)
- IBM MMR coding
- TIFF Type 2
- JBIG (ISO IS 11544 compliant) Single progression sequential, Adaptive pixel, Typical prediction, 2 or 3 Line template, Variable stripe size

*Electrical Specification*

- 3.3 Volt power supply
- 5 Volt tolerant I/O (TTL-compatible I/O)
- Designed and fabricated in 0.35 micron standard cell technology
- Available in industry-standard 28mm 160 PQFP package
- Also available in lead-free "green" packaging

**PM-22 Block Diagram**

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