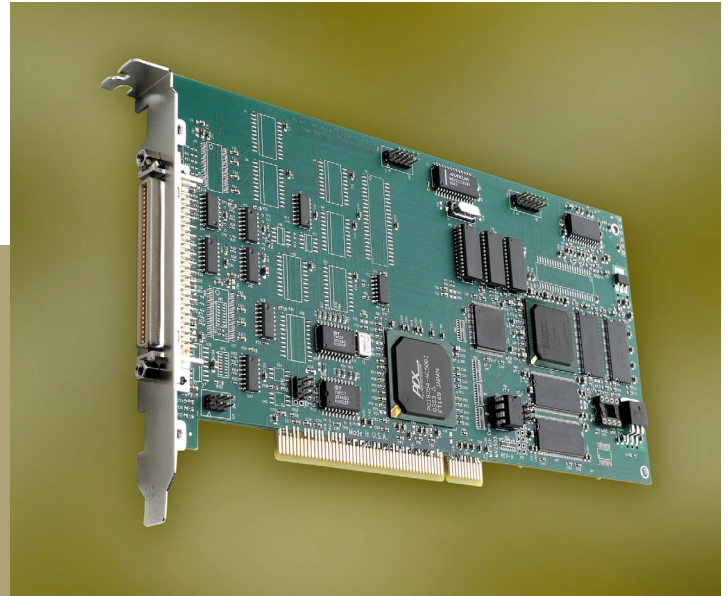


## M-Vision 2500 Series Digital Linescan/ Frame Grabbers

### Features

- LVDS 16 Bit Camera I/F (MV-2500)
- Camera Link I/F (MV-2600)
- Monochrome/RGB Video
- Non-Standard Video Support
- Frame Scan/Line Scan Cameras
- Supports Asynchronous Reset Cameras
- Up to 90 MHz Pixel Rate
- Input LUTs for Monochrome & RGB
- Programmable Grab Window Control
- H/V Scaling 1:1 to 8:1
- H/V Mirroring on Captured Image
- 32/128 MB of On Board Memory Buffer
- Up to 130 MB/S DMA to System Memory
- Multiple Groups of Event/Trigger Inputs
- Multiple Strobe Outputs
- Supports Multiple Boards in a System
- PCI V2.2 Compliant I/F Chip
- Windows 9X/NT/2K/XP Support
- Software Development Kit Available
- RS-232 Signal for Camera Control



### Applications

- Machine Vision
- Industrial Inspection/Gauging
- Medical Biomedical Imaging
- Video Sequence Capturing
- Scientific Image Processing
- Traffic Control/Monitoring

### Description / Summary

The M-Vision 2500 is a series of digital frame grabber boards which interface with color/monochrome digital cameras either with Camera Link or LVDS digital parallel interfaces. The MV-2500 connects to LVDS digital parallel interfaced cameras. The MV-2600 works with Camera Link digital cameras. Other than the Input Interface, the MV-2500 and MV-2600 have the same architecture. Both boards capture digital video data from the camera, pack the pixels and store the image(s) to the on board SDRAM memory. The captured video data may be DMAed to the system memory simultaneously. MV-2500 boards all have the capability to capture high speed video sequences to either on board memory or system memory in real time. The boards come with 32 or 128MB of buffer memory which can store from a few lines of video to a frame or many frames of video at the users' control. The MV-2500 boards all support monochrome (8 to 16 bits per pixel) digital cameras, including 2 taps at 8 bits per pixel. The MV-2600 can also take RGB digital video (8/10 bits per color). The MV-2500 boards use PCI 2.2 compliant 32 bits, 33 MHz Master Interfaces, which is capable of transferring the video data at up to 130 MB/S. The MV-2500

boards also provide connections for camera sync signals, event inputs, strobe outputs, trigger inputs as well as sync and timing outputs to drive the camera.

### Digital Camera Interface

The Digital Interface of the MV-2500 series boards connects to the digital cameras via a digital cable. It takes the digital video data together with the sync and timing signals from the camera. It can provide the sync and master clock to the camera if needed. The boards also have connections for control and communication signals to/from the cameras for the purpose of resetting the camera, controlling the exposure/integration time and triggering by the camera.

The MV-2500 uses a traditional LVDS parallel digital interface to connect to digital cameras. It supports single tap monochrome video from 8 to 16 bits per pixel or two tap monochrome video of 8 bits per pixel. Normally, a custom digital cable for a particular camera is required with the MV-2500 board.

The MV-2600 uses the Camera Link interface. It supports the Base Configuration and the Medium Configuration of the Camera Link in the formats of 8 bit x 4 and 30 bit RGB. It has two MDR-26 Camera Link Connectors. One or

two standard Camera Link Cables can be used with the MV-2600 board. For more information please refer to the Camera Link Specification.

### Digital Video Data Processing

Digital data passes an on-board LUT (look up table) which has multiple banks for fast switching. The LUT supports 8/8 mapping for color video, or 8/8 up to 16/16 mapping for B/W video. The pixels are then packed into DWORDs and stored into the on-board video buffer. Before being put in the memory the image may be sub-sampled and/or mirrored. For multi-tap digital data the pixels will be re-arranged into the correct order in this stage. The storage of the image(s) in the video buffer is programmable by software and very flexible. They may be stored as a group of lines, fields, frames or in a sequence of many frames. This architecture provides the maximum flexibility to the user.

### Host Interference & DMA Controller

The host interface of the MV-2500 series is fully PCI 2.2 compliant and transfers data at up to 130 MB/S. It supports scatter/gather capability for paged memory architecture. The main DMA controller uses a control linked list to specify the sources and destinations for the

# M-Vision 2500 Series Digital Linescan/Frame Grabbers

transfers. Multiple user-specified AOIs on a captured frame may be transferred to separate individual memory locations in the system for highly efficient processing.

The utilization of a ping-pong architecture on the SDRAM interface makes possible that the transfer of the frames (currently being captured) can start as soon as a few lines have been captured (no need to wait until the end of the current frame). This is advantageous in time critical machine vision applications. Interrupts may be generated at various times related to the video timing or the transferring, so the user application is notified for action.

## Displaying Video

The MV-2500 series is an input only device. Captured video may be displayed on the VGA screen using DirectDraw support. MuTech provides many functions to simplify the DirectDraw Interface. See MV-2XXX Software Development Guide for details.

## Sync and Timing

The MV-2500 series is designed to handle non-standard syncs. The video sync and clock signals are inputs from the camera interface. The boards can accept separate Hs, Vs and

Pixel Clock. The primary clock used by the Boards can be either the Pixel Clock from the digital camera or Regenerated P. Clock which is generated by a very high precision PLL (Phase-Locked Loop). The PLL can use either the Pixel Clock Input or the Hs as its reference. The jitter of the Regenerated P. Clock is less than 1 ns and highly stable. This results in very accurate video digitizing and high quality image(s).

## Other Input/Output Signals

The MV-2500 Series provides many General Purpose I/O Signals on the Digital Connectors, which are software programmable for interfacing to specific digital cameras. In addition, a Hirose Connector on the boards provides 3 signals which can be programmed to be inputs/outputs and to be different signal levels (TTL or LVDS or Optical Isolated).

Input signals can be used to accept notification of an event from the outside world and/or may be configured to generate an IRQ to the system or a Strobe to control a camera.

Output signals are programmable to have user defined widths. The width may be defined in terms of video lines, fields, or frames. The

signals can also be defined by software to be a certain length of time. They may be delayed (or not delayed) after an event. These signals are often used to control the camera exposure/integration time, or to fire a strobe light.

The Trigger is generally used to indicate a field/frame is ready from the camera, and to control the MV-2500 series to start the triggered capture of that field/frame.

## Software

The MV-2500 series boards come with the M-Vision 2XXX DEMO/Utility which provides the control/configuration to most features of the boards. The DEMO/Utility works under Windows 9X/NT/2K/XP. Other Operating System support may be added in the future. Several sample camera configuration files for standard/non-standard cameras are included with the Utility.

MV-2XXX Software Development Kit (SDK) for the Windows Platforms is available, which allows full control of all the capabilities of the MV-2500 series Boards. OEM's and System Integrators may develop more specific applications using the SDKs.

## MV-2500 Series Technical Specifications

### MV-2500 LVDS Digital Interface

- LVDS Digital Signal Interface
- 8 to 16 Bit Per Pixel
- Up to 90 MHz pixel rate
- Line Scan or Area Scan Cameras
- MDR-68 High Density Connector
- Accepts Camera Sync & Clock
- Camera Control Signal Outputs

### MV-2600 Camera Link Digital Interface

- Compliant to Camera Link Specification
- 8/10/12 Bit Up to 2 Taps or 16 Bit One Tap
- 8 Bit RGB Digital, One Tap
- MDR-26 Camera Link Connector(s)
- Up to 90 MHz pixel rate
- Line Scan or Area Scan Cameras
- Accepts Camera Sync & Clock
- Camera Control Signal Outputs

### Video Data Processing

- LUT for 16/16 bit or Multiple Banks for 8/8 bit Mapping (Monochrome Video)
- Multiple Banks of LUT on Each Color for 8/8 bit Mapping (RGB Video)
- Programmable Grab Window on Video Screen
- H/V Sub-Sampling (1:1 to 1:8)
- Horizontal/Vertical Mirroring
- Data De-interlacing in On-board Buffer
- Pixel Formats Supported –
  - 8/10/12/16 Bit MONO
  - 16 Bit MONO (YUV format)
  - 32 Bit RGB (XRGB format)

### Sync & Timing

- Accepts Progressive Sync and Clock
- Up to 4 Programmable Sync Inputs (TTL/LVDS)

- PLL Generated P. Clock (5 – 90 MHz)
- < 1ns P. Clock Jitter
- Master/Slave Modes for Sync & P. Clock
- P. Clock, Hd, Vd Outputs (TTL/LVDS)

### Capturing Controls

- Continuous/Single Capture
- Frame/Field Capture on Interlaced Video
- Starting the DMA Before the Complete Frame is Captured in Buffer
- Multiple AOI Supported on a Single Captured Frame
- Triggered Capture
- Start/Stop by Trigger
- Leveled Trigger to Control the Duration of Capture
- User Defined Frames Captured Real Time in Video Sequence

### Video Buffer and DMA Controller

- 32 of SDRAM (128 MB optional)
- Memory Bandwidth – 200 MB/S
- Flexible DMA Controller for Transferring Lines/Fields/Frames/Sequence
- Ping-Pong Architecture for simultaneous Capture and Transfer

### External Signals & Camera Controls

- Separate Hirose 4 Pin Connector for GPIO Signals Programmable as TTL/LVDS Levels
- Multiple I/O Signals, User Configurable
- Multiple Strobe Outputs
- Programmable Strobe Control for Delayed/Non-Delayed Signal
- Flexible Camera Exposure Control
- Support Camera Integration for Long Time Exposure
- RS-232 Signal Interface for Camera Configuration

### Host Interface

- PCI 2.2 Compliant
- Up to 130 MB/S Transfer Speed
- Scatter/gather DMA
- DMA Control Lists Support Multiple AOI and Multiple Destinations
- Directly DMA to VGA Buffer for Display

### Miscellaneous and Software

- 2/3 Sized PCI Boards
- Power Output – +12V (500 MA)
- CE Compliant
- OS Supported: Windows 9X/NT/2K/XP
- Software Included –
  - Windows Device Driver
  - MV-2XXX DEMO Software
  - Sample Camera Configuration Files
  - MV-2XXX Camera Configuration Utility
- Software Available –
  - MV-2XXX Software Development Kit



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