P3I_SEC

16-Channel PCI Frame Grabber for Security Applications

16 Analog Camera Inputs

- ↪ Optional JPEG compression hardware
- ↪ On-board scaler
- ↪ PCI performance

Main Features

- Frame grabber for security applications
- Acquires data from analog colour cameras
- 16 Parallel inputs with individual ADCs
- On-board scaling circuit 1:1 to 1:8
- Real-time acquisition of images or image sequences directly into main memory
- Image memory formats include monochrome with 8 or colour with 16/32 bits/pixel
- 4-Channel DMA for up to 4 parallel images
- Optional JPEG compression circuit
- PCI 2.2 compliant

Technical Details

The p3i_SEC is intended for security applications where video images from up to 16 color cameras is acquired into a PC's main memory for storage or the graphics board for display.

An on-board scaling unit can transform full-resolution images to CIF size of smaller for efficient display in split screen applications.

Images are transferred by up to four DMA controllers. Image format can be selected to be luminance / chrominance-separated for optimum video detection or to be RGB for display.

Camera Signals

The frame grabber board interfaces to standard composite video (CVBS) color cameras, conforming to PAL (NTSC / SECAM) standards.

All camera signals are routed to an on-board header-connector with 40 pins, intended for connection to a separate I/O panel with 16 BNCs, e.g.
Also on the connector are 4 general-purpose-I/Os.

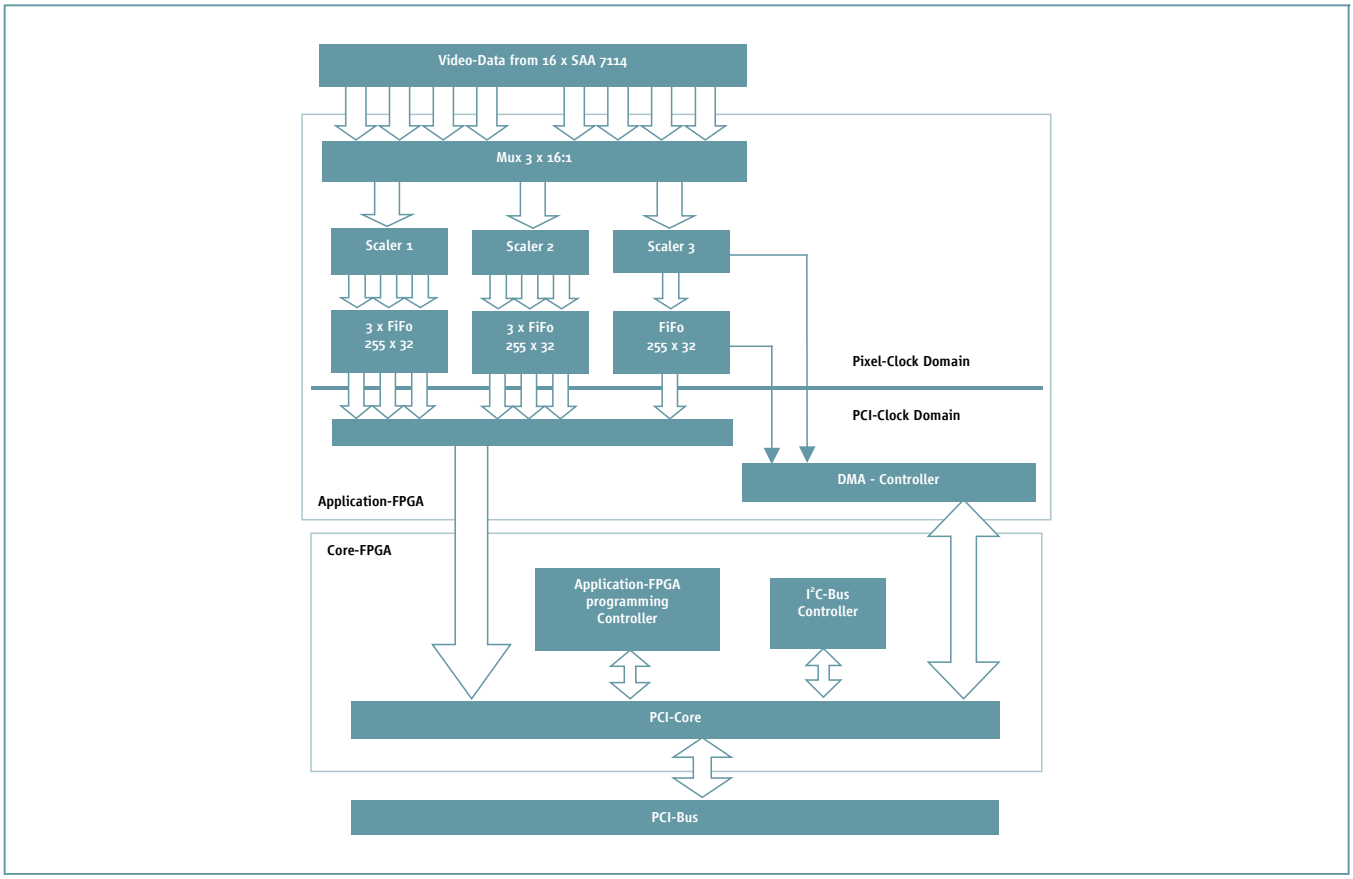
ADCs

There are 16 analog-to-digital converters (ADCs) where up to 16 cameras can be connected to. Each camera has its own ADC (SAA 7114) as well as its own colour separator. This makes it possible to switch cameras in the digital domain, minimizing multiplex times: Since the analog input is not switched, there is no PLL settling delay, which can take up to several frame times in other multiplexing schemes.

The clock used for acquisition (13.5 MHz) is generated in the ADC chip. It is phase-locked to the horizontal sync.

JPEG Encoder Option

The optional JPEG encoder can encode two colour video streams in real-time, resulting in motion JPEG films. JPEG has been chosen as the coding scheme, since normal p3i_SEC applications use multiplexed camera data, where inter-frame coding, such as MPEG, is not useful.



When the JPEG option is selected, the four DMA channels can be used either for transmission of 2 JPEG (compressed data) streams and 2 additional uncompressed streams or for four uncompressed streams, provided the PCI bandwidth is not exceeded. In addition, the only scaling functionality usable is in the 7114 ADCs; thus, once data is scaled down, the original non-scaled data is no longer available.

Scaler

An FPGA-based scaler can be used to reduce video data by line / pixeldropping over original pixels in blocks of 1*1, 2*2, 4*4, or 8*8. By using two DMA channels for storing the same video stream, simultaneous storage of scaled and non-scaled data is possible.

Fifo

A fifo associated with every DMA channel provides buffer space (256 B for JPEG, resp. 1 kB for uncompressed data) to ensure uninterrupted acquisition even in situations with high PCI bus loads.

Bus	PCI / Rev 2.2
width	32 bits
speed	33 MHz
bandwidth	>80 MHz (typ.)

DMA Controller

In the last step, image data is transmitted by DMA directly into main memory. This DMA controller consists actually of four independent controllers, capable of transferring the video data stream into memory.

Pixel Packing Modes

To support different cameras and applications, there are several modes of storing pixel data in memory:

Mode	Memory storage
Mono8	One monochrome image, byte-aligned
Y:U:V	YUV/YCbCr components are stored in 4:4:4, 4:2:2, or 4:1:1 mode
RGB	RGB24 uses 24 bits for each RGB pixel, RGB32 uses one zero-filled 32-bit word.

p3i_SEC Software

Software for the p3i_SEC is available in a security-oriented library, optimized for fast input switching and handling many cameras. This library is available in source form for Linux and as a DLL for Windows NT / 2000 / XP (Windows library t.b.d./on request).

Region-of-interest adjustment, camera selection, scaling, colour format conversion, and camera setup files are supported. Permanent (live), single-shot, and double-buffered acquisition of images can be requested and the status of the acquisition (active / finished) can be inquired.

Memory allocation for image buffers is also handled by the DLL at runtime; frame buffers appear in linear memory for easy addressing.
A setup program supports test and configuration of the board under Windows. Display routines using the DirectDraw standard are supplied in source. This software level is intended for users who already have their own software support available, such as image processing libraries, or wish to create application programs by themselves.
The security-oriented library supports a linked-list approach to acquire image sequences from varying cameras, each one with their own setup parameters, such as brightness.

Cameras Supported

All standard colour video camera are supported in hardware and software. The video standards PAL, NTCS, and SECAM can be used.

High-Level Software

Support for 3rd-party imaging tools is available under Windows (on request): The freeware imaging library IPL98 has been tested to work under Windows and Linux; there is a demo source, showing how to use it. The Intel IPP library has also been adapted for use.

Pin	Name	Direction	Description
1	GND	-	Signal ground
2	Video_0	Input	CVBS video input 0
3	GND	-	Signal ground
4	Video_1	Input	CVBS video input 1
5	GND	-	Signal ground
6	Video_2	Input	CVBS video input 2
7	GND	-	Signal ground
8	Video_3	Input	CVBS video input 3
9	GND	-	Signal ground
10	Video_4	Input	CVBS video input 4
11	GND	-	Signal ground
12	Video_5	Input	CVBS video input 5
13	GND	-	Signal ground
14	Video_6	Input	CVBS video input 6
15	GND	-	Signal ground
16	Video_7	Input	CVBS video input 7
17	GND	-	Signal ground
18	Video_8	Input	CVBS video input 8
19	GND	-	Signal ground
20	Video_9	Input	CVBS video input 9
21	GND	-	Signal ground
22	Video_10	Input	CVBS video input 10
23	GND	-	Signal ground
24	Video_11	Input	CVBS video input 11
25	GND	-	Signal ground
26	Video_12	Input	CVBS video input 12
27	GND	-	Signal ground
28	Video_13	Input	CVBS video input 13
29	GND	-	Signal ground
30	Video_14	Input	CVBS video input 14
31	GND	-	Signal ground
32	Video_15	Input	CVBS video input 15
33	GND	-	Signal ground
34	SDA	I/O	I^2C bus data signal, of bus 7
35	SCL	Output	I^2C bus clock signal, of bus 7
36	GPIO_WR	Output	Write strobe, low active
37	GPIO_0	I/O	GPIO signal 0, 3,3V only !
38	GPIO_1	I/O	GPIO signal 1, 3,3V only !
39	GPIO_2	I/O	GPIO signal 2, 3,3V only !
40	GPIO_3	I/O	GPIO signal 3, 3,3V only !

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III Specifications

Connector (on-board header 40-pin)

- 16 * CVBS video + Gnd
- 4 TTL general-purpose I/O
- 2-Line I2C bus

Environmental Conditions

- Storage Temperature: -20 °C - 70 °C
- Operating Temperature: 0 °C - 45 °C (2 m/s forced air cooling)
- Maximum Operating Humidity: 85 % relative

Power Requirements

- 2.8A max., 2.6A typ. at + 5 VDC ± 5 %

MTBF

- T.b.d. hrs (computed after MIL-HDBK-217F)

PCI bus

- PCI 2.2 compliant
- 5V Signal environment
- 3.3V Signal environment on request

Documentation

- Free Internet

Please contact your local sales office for detailed information.