Mini PCIe 8-Channel Frame Grabber
User's Manual
Model 1012 | Rev.0 | March 2014

SENSORAY | embedded electronics

Designed and manufactured in the U.S.A

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Limited warranty

Sensoray Company, Incorporated (Sensoray) warrants the hardware to be free from defects in material and workmanship and perform to applicable published Sensoray specifications for two years from the date of shipment to purchaser. Sensoray will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The warranty provided herein does not cover equipment subjected to abuse, misuse, accident, alteration, neglect, or unauthorized repair or installation. Sensoray shall have the right of final determination as to the existence and cause of defect.

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Special handling instructions

The circuit board contains CMOS circuitry that is sensitive to Electrostatic Discharge (ESD).

Special care should be taken in handling, transporting, and installing circuit board to prevent ESD damage to the board. In particular:

- Do not remove the circuit board from its protective anti-static bag until you are ready to install the board into the enclosure.

- Handle the circuit board only at grounded, ESD protected stations.

- Remove power from the equipment before installing or removing the circuit board.

Introduction

Model 1012 is a PCI-Express Mini Card version of 8-channel frame/video capture device designed for the applications requiring high capture rate from multiple input video channels. It supports capturing from NTSC/PAL/SECAM video sources.

For the need of audio capturing, the Model 1012 provides eight channels of mono audio capturing associated with eight channels of video respectively.

For each video channel, the capturing frame rate is up to 30 fps for NTSC and 25 fps for PAL/SECAM. It makes total frame/video capturing rate up to 240 fps for NTSC and 200 fps for PAL/SECAM. The capturing resolution can be from followings: D1.N (NTSC), D1.P (PAL), VGA, QVGA, QQVGA, SIF, 2SIF, 4SIF, CIF, QCIF, SQCIF, 4CIF.

A single +3.3V power supply through Mini PCI-Express bus is required to power the 1012 card.

Model 1012 is implemented with a single-lane (x1) PCI-Express interface. It can be plugged into any full Mini PCI-Express slot(s) on a regular PC motherboard or a SFF (Small Form Factor) SBC (Single Board Computer).

Feature Summary

- Mini PCI-Express Video/Audio Capture

- Video input: 8 individual input video channels (Composite)

- Audio input: 8 mono channels

- Resolution (Max): Full-D1:

  NTSC: 720 x 480 @ 30 fps x 8   (Total: 240 fps)
  PAL: 720 x 576 @ 25 fps x 8   (Total: 200 fps)

- Other supported video Resolution:

  D1.N: 720 x 480   D1.P: 720 x 576   D.5:   480 x 352
  SIF: 352 x 240   2SIF: 704 x 240   4SIF: 704 x 480
  VGA: 640 x 480   QVGA: 320 x 240   QQVGA: 160 x 112
  CIF: 352 x 288   QCIF: 176 x 144   SQCIF: 128 x 96
  4CIF: 704 x 576

- Frame/Video capturing:

  Raw frame capturing and/or Raw video capturing:

  UYVY/Y422, YUYV/YUY2, YUV420, RGB555/565

  up to 30 fps x 8, for NTSC   (Total: 240 fps)
  up to 25 fps x 8, for PAL   (Total: 200 fps)

- Audio capturing:

  Raw audio capturing:

  Audio sampling rate: 8 / 16 / 32 / 44.1 / 48KHz
  Audio word length: 8 / 16-bit
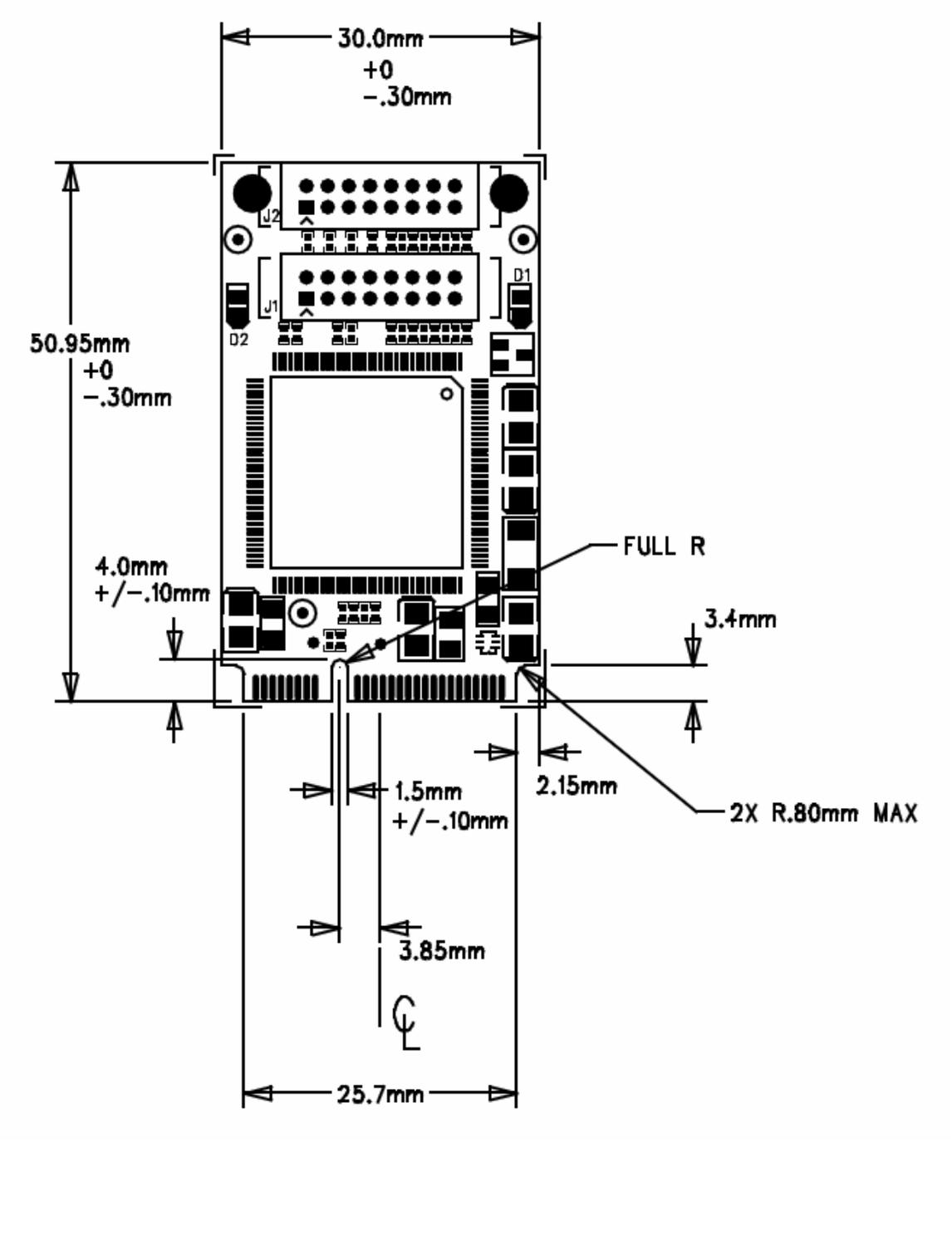
- Software encoding:

  JPEG frame, MPEG-1/2/4, H.264, or MJPEG A/V capturing:

  Can be done with 3rd party software, or OSS software, library and
  tools like FFMPEG, MEncoder, GStreamer, and etc.

- Driver and SDK for Windows: XP, Win7, and Win8

- Driver and SDK for Linux: API complies with V4l2

Reference

Board Dimension and Connector Layout

Connector List

P1	Mini PCI-Express Connector
J1	16-pin Connector: Composite Video Input for Channel-1, 2, 3, and 4 Mono Audio Input for Channel-1, 2, 3, …, and 8
J2	16-pin Connector: Composite Video Input for Channel-5, 6, 7, and 8 Mono Audio Input for Channel-1, 2, 3, …, and 8

Connector Pin & Signal Definitions

PCI-Express Bus Connector: P1

Pin – Top	Signal	Pin – Bottom	Signal
1	WAKE# *	2	+3.3V
3	RSVD *	4	GND
5	RSVD *	6	+1.5V *
7	CLKREQ# *	8	RSVD *
9	GND	10	RSVD *
11	REFCLKn	12	RSVD *
13	REFCLKp	14	RSVD *
15	GND	16	RSVD *
(C-Key)		(C-Key)	
17	RSVD *	18	GND
19	RSVD *	20	RSVD *
21	GND	22	PERST#
23	PERn0	24	+3.3Vaux
25	PERp0	26	GND
27	GND	28	+1.5V *
29	GND	30	SMB_CLK *
31	PETn0	32	SMB_DATA *
33	PETp0	34	GND
35	GND	36	USB_D- *
37	RSVD *	38	USB_D+ *
39	RSVD *	40	GND
41	RSVD *	42	LED_WWAN# *
43	RSVD *	44	LED_WLAN# *
45	RSVD *	46	LED_WPAN# *
47	RSVD *	48	+1.5V *
49	RSVD *	50	GND
51	RSVD *	52	+3.3V

Note:

RSVD   Reserved
GND   Ground
*   Not Connected
C-Key   Connector Key

Video & Audio Input Connector: J1 (16-pin)

Pin	Signal	Pin	Signal
1	Audio (Mono) Input Channel-1	2	Audio (Mono) Input Channel-2
3	Audio (Mono) Input Channel-3	4	Audio (Mono) Input Channel-4
5	Audio (Mono) Input Channel-5	6	Audio (Mono) Input Channel-6
7	Audio (Mono) Input Channel-7	8	Audio (Mono) Input Channel-8
9	Composite Video Input Channel-4	10	GND (Ground)
11	Composite Video Input Channel-3	12	GND (Ground)
13	Composite Video Input Channel-2	14	GND (Ground)
15	Composite Video Input Channel-1	16	GND (Ground)

Video & Audio Input Connector: J2 (16-pin)

Pin	Signal	Pin	Signal
1	Audio (Mono) Input Channel-1	2	Audio (Mono) Input Channel-2
3	Audio (Mono) Input Channel-3	4	Audio (Mono) Input Channel-4
5	Audio (Mono) Input Channel-5	6	Audio (Mono) Input Channel-6
7	Audio (Mono) Input Channel-7	8	Audio (Mono) Input Channel-8
9	Composite Video Input Channel-8	10	GND (Ground)
11	Composite Video Input Channel-7	12	GND (Ground)
13	Composite Video Input Channel-6	14	GND (Ground)
15	Composite Video Input Channel-5	16	GND (Ground)

LED

Power-OK Indicators: D1 and D2

The LED D1 and D2 are used for indicating on-board Power-OK status.

LED	Description
D1	Core Power, 1.2V Power-OK Status (for the Video Decoder Chipset TW6869, core power status monitoring)
D2	Main Power, 3.3V Power-OK Status

Software

Device Driver and SDK

As 1012 is a Mini PCIe version of the 812, it uses the SDKs and device driver for the Model 812. The SDKs including device driver, API & demo application programs are available for both Windows and Linux.

Windows

Sensoray Company provides 812 WDM driver and DirectX filter for Windows platform. The SDK includes the Windows driver, DLL, Demo application & app source code, etc. It is packaged in a "s812_Vxyz.zip" file for distribution and/or for the customer(s) to download from Sensoray's website.

Refer to the "Model 812 Windows SDK User's Manual" for the SDK, DLL, API, and programming guide details.

Since the driver is a pre-built and based on the WDM BDA and DirectShow oriented architecture, the Microsoft GraphEdit utility can be used for building the A/V preview and/or capturing application. Also, some 3rd party freeware/shareware like VLC player and AMCap software can be used for live video capturing (preview and/or recording) or still image capturing.

Linux

The device driver for Linux is provided by Sensoray Company, and supports most of the commonly used or popular Linux distributions, including Ubuntu, Fedora, Linux-Mint, openSUSE, …, etc., with kernel version => 2.6.27. The API complies with standard V4L2 (Video for Linux Version 2), formerly known as V4L (Video for Linux). The API spec and capturing sample program can be found/downloaded online from following websites:

http://www.linuxtv.org/downloads/legacy/video4linux/API/V4L2_API/spec-single/v4l2.html
http://linuxtv.org/downloads/v4l-dvb-apis/
http://v4l.videotechnology.com/dwg/v4l2.pdf
http://v4l2spec.bytesex.org/spec/capture-example.html
http://linuxtv.org/downloads/v4l-dvb-apis/capture-example.html

In addition to the application samples from V4L/V4L2 spec online, Sensoray Company provides some other customized capturing sample/demo programs that demonstrates raw frame capture and A/V (Video+Audio) capture. Also, a "Sensoray Model 812 Quick-Start Instruction – Linux" manual is provided in a "SDK-812-Linux" package.

For live video preview and/or capturing, commonly used V4L2 application programs like XawTV, tvtime, VLC, MPlyaer, GStreamer, …, etc., can be used for capturing/previewing from each channel of the 1012/812.

For capturing JPEG frames, MPEG-1/2/4, H.264 or MJPEG video, with Sensoray Model 1012/812, some 3rd party and OSS libraries/CODECs can be used/integrated in end-user's applications and programs. As a good example, the FFMPEG (refer to: http://ffmpeg.org/ or http://en.wikipedia.org/wiki/FFmpeg) is a well-known and highly recommended OSS that can be used for A/V (Video or Audio) capturing. A few others, like VLC, MEncoder, and GStreamer OSS apps, can be used too for capturing raw or compressed Video and/or Audio from 1012/812.

Specifications

Video Formats	NTSC, PAL, SECAM
Video Inputs	8 input channels, simultaneously: 8 Composite video, via two 16-pin connector, 75 Ohms

Audio Inputs	8 input channels, simultaneously:
	    8 mono for each channel, via a 16-pin connector;
	    Signal level: Line-in level, +/- 1.0V

Capturing Mode	Raw: UYVY/Y422, YUYV/YUY2, YUV420, RGB555/RGB565
Capture rate	Up to: 240 (30x8) frames/sec for NTSC/RS-170/CCIR 200 (25x8) frames/sec for PAL/SECAM
Frame/Video Encoding	Could be done by software and/or 3rd party's CODEC: JPEG, MPEG-1/2/4, MJPEG, and H.264

Resolution	Up to Full-D1:
	    NTSC: 720x480 PAL: 720x576
	Supported:
	    D1.N: 720x480 D1.P: 720x576 D.5: 480x352
	    SIF: 352x240 2SIF: 704x240 4SIF: 704x480
	    VGA: 640x480 QVGA: 320x240 QQVGA: 160x112
	    CIF: 352x288 QCIF: 176x144 SQCIF: 128x96
	    4CIF: 704x576

Bus	PCI-Express Mini:
	    PCI-Express lane x1, compliant with
	    PCI-Express Base Specification Revision 1.1 and 2.0

OS Platform	Windows and Linux
Power	<1W, +3.3V @ 300mA
Temperature	0 °C to +70 °C (Standard/Commercial version) -40 °C to +80 °C (Extended/Industrial version)
Board Size	50.95mm x 30mm