

# USB Audio/Video Codec Model 2253 Hardware Manual

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SENSORAY | embedded electronics



Designed and manufactured in the U.S.A

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## ***Limited warranty***

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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.

# ***Introduction***

Model 2253 is an audio/video capture device designed for embedded applications that benefit from extremely small size and low power consumption.

The board's unique features, such as a capability to produce two concurrent output video streams, open up a variety of possible applications. The streams could be any combination of compressed and uncompressed. For compressed stream(s) the choice of H.264, MPEG-4 ASP, or MJPEG video compression types is available. Compression type, target bitrate and resolution could be set independently for each of the two output streams. There is a bandwidth limitation in case of two uncompressed streams: the total amount of data can not exceed approximately that of one full resolution YUV stream. Reducing resolution, or color depth, or frame rate for one or both streams may be necessary.

Model 2253 captures audio from a microphone or a stereo line input. Output audio formats are uncompressed PCM, G.711, or AAC.

The output containers are mp4 for H.264, and AVI for MPEG-4 ASP and JPEG. Elementary video and audio streams are available as well.

The board can perform as a decoder for all supported compression types.

Model 2253 supports 3 general purpose input/output signals (GPIOs): 2 inputs and 1 output. One of the inputs and the output are optoisolated.

The board implements USB 2.0 high speed interface which also provides power for the device.

**Note: The following features are not supported in Model 2253 Software Ver. 1.1.x:**

- **audio/video decoding;**

**Please contact Sensoray for availability information.**

# ***System Requirements***

A basic Model 2253 application (capture of a compressed stream and preview of the uncompressed) will work on a Pentium III class processor since no significant processing is required from the host. However the board requires a High Speed USB 2.0 port.

RAM size is dictated more by an operating system and application requirements. An average desktop should not have problems running a 2253 application. Embedded CPUs sometimes are limited by the peripherals performance. Please contact Sensoray for an evaluation 2253 unit to test it with an embedded CPU of your choice.

# Connectors

The board's mechanical drawing is presented on Fig.1.

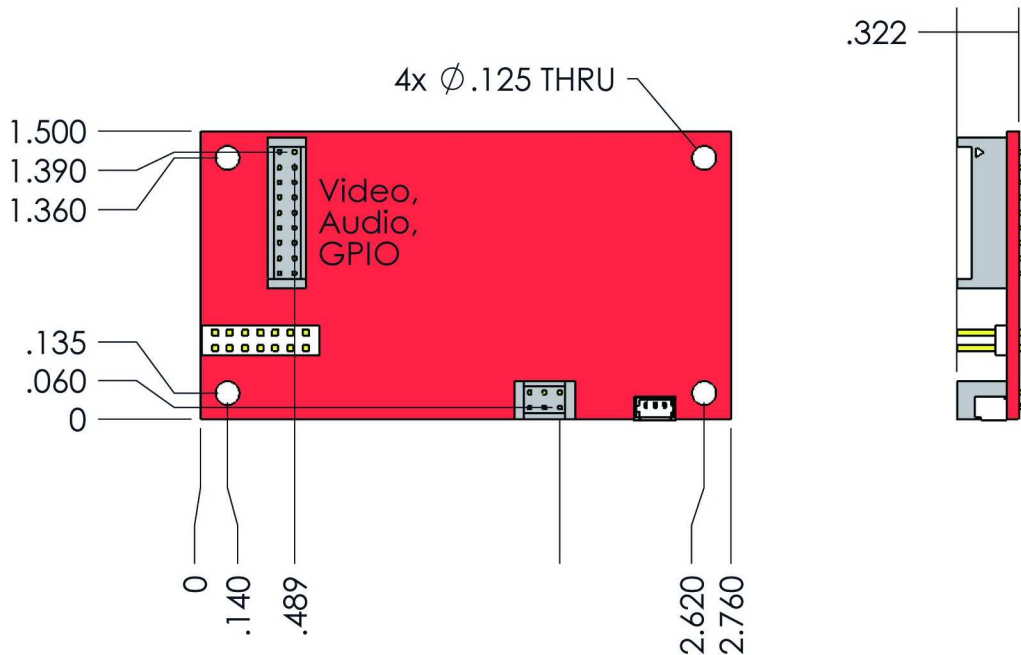


Fig. 1 Model 2253 mechanical drawing.

Model 2253 has 2 connectors intended for customer use: a 6-pin USB connector (J1), and an 18-pin input/output connector (JP2). A dip-switch SW1 is reserved for future use.

**Note: Do not connect any electric circuits or install any shunts on any connectors other than J1 and JP2.**

## **USB Connector**

USB connector (J1) is Hirose DF11-6DP-2DSA(01) (6-pin header) . The mating part is a crimping socket DF11-6DS-2C with DF11-2428SCFA contacts. The cable has to comply with the requirements of chapter 6.6 of "USB Serial Bus Specification Revision 2".

USB connector pinout is presented in Table 1.

Table 1		
Pin	Signal	Description
1	VBUS	USB: VBUS (+5V from the USB host)
2	D-	USB: D-
3	RSVD	Reserved digital output. Do not connect!
4	D+	USB: D+
5	GND	USB: Ground
6	XLED	External LED.

XLED is a 3.3 V logic signal connected via a 470 Ohm resistor . XLED stays high after the board's internal firmware has started. It goes low momentarily when the data is sent from the board via the USB interface (activity indication). A suggested use for XLED signal is driving an LED with a cathode connected to the ground. Maximum current sourced by XLED is limited by a 470 Ohm resistor, and should not exceed 4 mA.

## **Input/Output Connector**

Input/output connector is Hirose DF11-18DP-2DSA(01) (18-pin header). The mating part is a crimping socket DF11-18DS-2C with DF11-2428SCFA contacts. The recommended adapter cable length should not exceed 10 inches.

Input/output connector pinout is presented in Table 2.

Table 2		
Pin	Signal	Description
1	MICIN	Microphone input
2	MIC-BIAS	Microphone bias
3	GND	Ground
4	AINR	Audio line input, right channel
5	AOUTR	Audio line output, right channel
6	GND	Ground
7	AINL	Audio line input, left channel
8	AOUTL	Audio line output, left channel
9	GND	Ground
10	GPI-C1	General purpose input C1 (galvanically coupled)
11	GPI-A	General purpose input, optoisolated, anode
12	GPI-C	General purpose input, optoisolated, cathode
13	GPO-C	General purpose output, optoisolated, collector
14	GPO-E	General purpose output, optoisolated, emitter
15	GND	Ground
16	CVIN	Composite video input
17	GND	Ground
18	CVOUT	Composite video output

### **Microphone Input**

The microphone input is designed to work with condenser microphones. A microphone bias circuit is provided (2.5 V via a 2.1 K $\Omega$  resistor).

## Audio Line Input

Line inputs are designed to work with standard input levels (0.707 V RMS). The input impedance is 10 K $\Omega$ .

## Audio Line Output

Line outputs provide output levels of 0.707 V RMS into a 10 K $\Omega$  load.

## General Purpose Inputs/Outputs (GPIO)

Model 2253 has 2 general purpose inputs (GPIs), and one general purpose output (GPO). One of the GPIs and the GPO are optoisolated. The second GPI is galvanically coupled.

The optoisolated GPIO and the recommended circuits are shown on Fig.4.

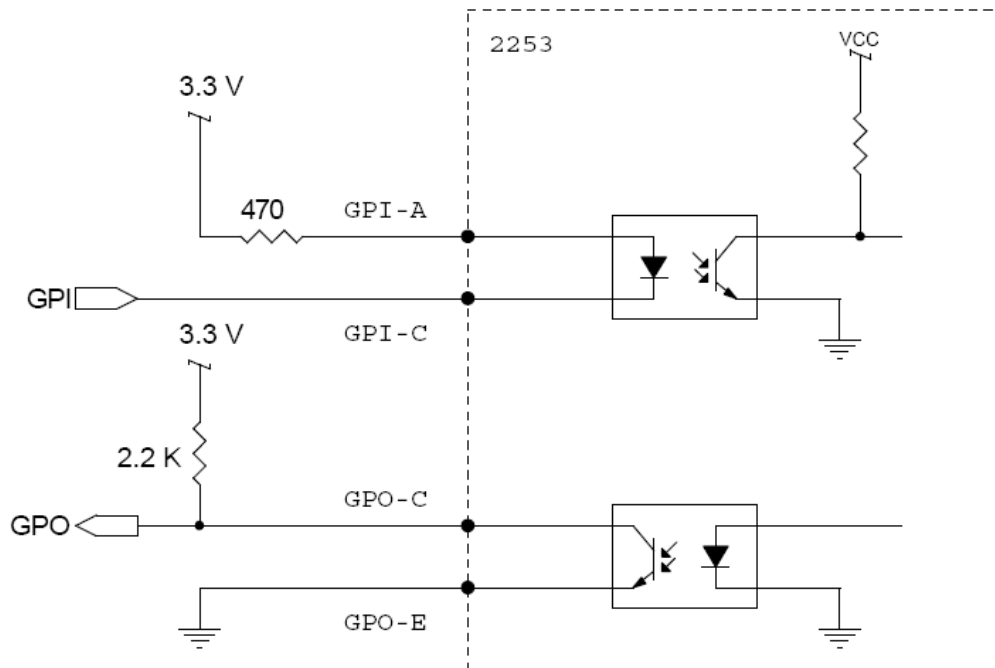


Fig.4. Optoisolated GPIO.

The GPI-C1 is a galvanically connected GPI. It provides a simple way of communicating to the 2253 in the cases when optical isolation is not required, by means of shorting this signal to the ground (pin 15 of GPIO connector). Please see the Software Reference for the details.

## GPIO connections on the breakout board (model 2253TA)

With the 2253 mounted on the breakout board model 2253TA, the GPIO pins are available on the 6 pin terminal block. The pinout of the terminal block is listed in Table 3. Please note that the contacts are labeled differently on the 2253TA board and the back panel of the enclosure.

Label (2253TA)	Label (enclosure)	Signal	Description
TB6	1	GND	Ground
TB5	2	GPI-C1	General purpose input C1 (galvanically coupled)
TB4	3	GPI-C	General purpose input, optoisolated, cathode
TB3	4	GPI-A	General purpose input, optoisolated, anode
TB2	5	GPO-E	General purpose output, optoisolated, emitter
TB1	6	GPO-C	General purpose output, optoisolated, collector

# Specifications

<b>Analog video</b>	
Input	composite, 75 $\Omega$
Input formats	NTSC, PAL
Output	composite, 75 $\Omega$
Output formats	NTSC, PAL
<b>Digital uncompressed video</b>	
Capture rates	Up to full frame rate (30 fps NTSC, 25 fps PAL) . Optional decimation by 5, 3, or 2.
Resolutions	up to 704x480 (NTSC), 704x576 (PAL)
Capture formats	color YUV 422 (UYVY); monochrome 1 byte/pixel (Y800).
<b>Digital compressed video</b>	
Capture rates	Up to full frame rate (30 fps NTSC, 25 fps PAL) . Optional decimation by 5, 3, or 2.
Resolutions	up to 704x480 (NTSC), 704x576 (PAL)
MJPEG	Single snapshots or AVI video.
MPEG-4 ASP	SP@L3, video elementary stream with timestamps; .MP4.
H.264	HP@L3, video elementary stream with timestamps; .MP4.
<b>Digital audio</b>	
Formats	G.711 (A-law, $\mu$ -law); AAC-LC
Sampling rates	8 kHz (G.711, 8 bits per sample per channel), 48 kHz (AAC)
Bitrates	32-512 kbps (AAC), 64/128 kbps (G.711, mono/stereo)
<b>Mechanical, electrical, environmental</b>	
Dimensions	1.50 x 2.76 inches
Weight	14 g
Power	1.5 W (300 mA @ 5 V from USB)
Operating temperature	Commercial: 0 to 70 $^{\circ}$ C Industrial: -40 to 85 $^{\circ}$ C.

## ***Revision history***

Version	Notes
1.0.0, July 2010	Initial release.
1.1.0, December 2010	Information on GPIO pinout of the breakout board (2253TA) is added. Audio support added.
1.1.1, March 2011	Audio specs added.