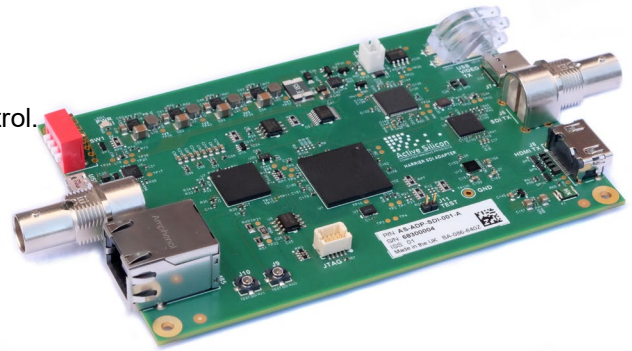
BLUEBIRD SDI ADAPTER

3G-SDI/HD-SDI to USB 3.1 & HDMI

- 3G-SDI/HD-SDI acquisition & display - coax and twisted pair inputs
- SuperSpeed USB Video Class output
- HDMI output and 3G-SDI output
- Automatic HD-VLC™ decoder for long cable length applications

FEATURES

- Single channel host-end acquisition solution for 3G/HD-SDI.
- Compatible with Active Silicon's Camera Interface Boards for Harrier, Tamron and Sony block cameras.
- Auto-sensing and decoding of HD-VLC™ compressed input signals for long cable length applications.
- BNC input connector for coaxial cable applications.
- RJ45 input connector for twisted pair cable applications.
- Auto-sensing of active input.
- SuperSpeed USB Video Class (UVC) v1.1 output.
- HDMI output.
- 3G/HD-SDI BNC output with separate HD-VLC™ control.
- Simultaneous display on all outputs.
- RS-485 remote camera control via USB-UART.
- Built-in standalone test pattern generator.
- Mode selection switches and status LEDs.
- Compliant with SMPTE 274M and SMPTE 296M.
- Powered via USB connectors or header.
- RoHS compliant.



OVERVIEW

The **BlueBird SDI Adapter** is an interface for the acquisition of 3G-SDI and HD-SDI video streams. The input signal is supplied over coaxial cable via the BNC connector, or over twisted pair via the RJ45 connector. Three outputs are provided: 3G-SDI / HD-SDI / HD-VLC output (via BNC), HDMI output, and SuperSpeed USB (Type-C) output providing USB Video Class (UVC) v1.1 compliant video streaming. A remote camera may be controlled using RS-485 comms via the USB-UART Micro-B interface. The RS-485 communication port and twisted pair video input are both connected to the RJ45 connector. As well as standard 3G/HD-SDI streams, the unit automatically decodes HD-VLC encoded video streams which may typically come from a Harrier, Tamron or Sony block camera fitted with one of Active Silicon's Harrier camera interface boards. Use of this end-to-end HD-VLC solution enables the use of longer cable lengths (see Active Silicon's White Paper on long-reach HD digital video solutions with this technology).

The unit is available as a board (as above) or housed in a rugged metal enclosure (see Figure 1).

Figure 1. Enclosed version of the BlueBird SDI Adapter (enclosure size:127mm x 86mm x 31mm)

Power Options

In both the board and the enclosed versions, the unit may be bus powered from either USB port. The board version also has a power header for a fixed system power supply. If multiple power sources are connected the unit automatically selects the source with the following priority:

1. System power header.
2. USB 3 Type-C port.
3. USB 2 Micro-B port.

Application Information

For maximum cable length applications, the input signal should be supplied to the BNC input using a good quality coaxial cable. For shorter cable length applications, the input signal may alternatively be supplied to the RJ45 input using twisted pair cable.

The unit auto-detects which input is connected, and if both are connected it gives priority to the BNC.

The input video format and frame rate are automatically detected, as is HD-VLC compression. The selected input, speed (3G/HD) and use of HD-VLC are indicated on the status LEDs.

The RS-485 communications to the camera may be controlled via the USB Micro-B control port. This selection is made via DIP switch.

The HDMI and SDI outputs are always enabled. The USB Video output is enabled when the port is connected to a host SuperSpeed USB 3.x port. Trying to stream USB video from the USB Type-C port to a host USB 2.0 port will display an error on the adapter LED.

The SDI output has a separate HD-VLC control, which means the unit can also be used to compress a standard 3G/HD-SDI input video stream. (See Mode DIP Switches (“SW1”)).

Supported Video Formats

The **BlueBird SDI Adapter** supports a range of video input/output formats.

The SDI input and output are compliant with ST292 (HD-SDI) and ST424 (3G-SDI).
The HDMI output complies with v1.4 of the HDMI specification.
The USB video is UVC 1.1, USB 3.1 Gen 1 Super Speed, 5 Gbps.

VIDEO FORMAT	UNCOMPRESSED BIT RATE	HD-VLC BIT RATE	UVC SUPPORT
720p50	1.485 Gb/s	270 Mb/s	Y
720p60/59.94	1.485 Gb/s	270 Mb/s	Y
1080i50	1.485 Gb/s	270 Mb/s	N
1080i60/59.94	1.485 Gb/s	270 Mb/s	N
1080p25	1.485 Gb/s	270 Mb/s	Y
1080p30/29.97	1.485 Gb/s	270 Mb/s	Y
1080p50	2.97 Gb/s	540 Mb/s	Y
1080p60/59.94	2.97 Gb/s	540 Mb/s	Y

Table 1. Supported video modes, associated HD-VLC bit rates and UVC support

USB Video Software

Any UVC compliant video software can be used to display/record the video.

An example Windows application (with full source code) is available from Active Silicon to demonstrate how to receive, record, display and save image data from the USB Video Class driver. This is part of the Active Silicon Harrier USB Software Development Kit (SDK) that is available from the Active Silicon website (see downloads section of the BlueBird SDI Adapter product page).

For support on host computers that are running Linux you will need to ensure that you have installed UVC drivers (e.g. V4L2 drivers) on your Linux system. Please consult the documentation for your Linux distribution. Listed below are some helpful links:

http://www.ideasonboard.org/uvc/

https://www.kernel.org/doc/html/v4.13/media/v4l-drivers/uvcvideo.html

https://www.linuxtv.org/wiki/index.php/How_to_Obtain,_Build_and_Install_V4L-DVB_Device_Drivers

https://help.ubuntu.com/community/Webcam

On the Bluebird SD Adapter, the USB 3.1 video interface is used for delivering video. Control of the camera and video mode settings is achieved by sending VISCA commands over the USB-UART / RS-485 connection. It is possible to control the camera over the UVC connection using the UVC control API but this requires the BlueBird SDI Adapter firmware to hold camera specific information, which has currently not been implemented. If this is critical for your application, please contact Active Silicon.

CONNECTOR SPECIFICATIONS

System Power Header (“PWR”) (J1)

The board can be powered from this connector when USB power is not used/available/required and when the board is not mounted in an enclosure. Issue 01 boards require 5V±5% to power the board but issue 02 boards require a minimum of 8.25V. Issue 02 boards can also be powered at higher voltages (up to 12.25V) so that higher voltage power can be delivered to cameras connected to the RJ45 (J4) connector. If you are doing this, please ensure that you only apply voltages in the range specified by your camera manufacturer to avoid damage to the camera.

Connector type: 2mm pitch, 2-way boxed header, Young Yak YY-100 series (YY-1100-W02ST), Harwin M22-2200246, or compatible part

PIN	SIGNAL	LEVEL	NOTES
1	GND	0V	
2	DC power in	8.25-12.25V	For issue 01 boards this is 4.75-5.25V.

JTAG Connector (J2)

Test connector used in manufacturing for circuit verification.

USB Micro-B Connector (“USB UART”) (J3)

This USB connector provides power for the BlueBird SDI Adapter and a standard USB-UART serial interface for camera control. This is typically used to enable the VISCA camera control protocol to be used with block cameras from Sony and Tamron. On the enclosure it is labelled “CONTROL POWER IN”.

Connector type: USB Micro-B

RJ45 Input Connector (“SDI RX0”) (J4)

The twisted pair input uses a standard RJ45 connector. This input accepts 3G-SDI, HD-SDI and HD-VLC encoded SDI video streams and is labelled “SDI IN RS-485” on the enclosure.

Connector type: RJ45

PIN	SIGNAL	LEVEL	NOTES
1	DC power out	5-12V	Connected to System Power Header J1 (see notes).
2	DC power out	5-12V	Connected to System Power Header J1 (see notes).
3	GND	0V	Connected to System Power Header J1
4	SDI RX0 +	-	100 Ω differential input
5	SDI RX0 –	-	100 Ω differential input
6	GND	0V	Connected to System Power Header J1
7	RS-485 B	EIA/TIA-485-A	Driven via USB 2 for camera control.
8	RS-485 A	EIA/TIA-485-A	Driven via USB 2 for camera control.
9 & 10	Shield	0V (GND)	

NOTES:

1. The issue 02 BlueBird SDI Adapter only requires 8.25V to power the board. Voltages up to 12.25V can be used on J1 to deliver power to cameras connected to the RJ45 (J4) connector. If you are doing this, please ensure that you only apply voltages in the range specified by your camera manufacturer to avoid damage to the camera. The power output on J4 is protected against short circuit and overload by a polyfuse (PTC) device.
2. On issue 01 circuit boards pins 1 & 2 are not connected and the power supply voltage on J1 is 5V±5%.

BNC Input Connector (“SDI RX1”) (J5)

The coaxial cable input is a standard 75 Ohm BNC. This input accepts 3G-SDI, HD-SDI and HD-VLC encoded SDI video streams and is labelled “SDI IN” on the enclosure.

Connector type: 75 Ohm BNC

BNC Output Connector (“SDI TX”) (J6)

The output BNC is a standard 75 Ohm BNC connector. This provides 3G-SDI, HD-SDI and HD-VLC encoded SDI data and is labelled “SDI OUT” on the enclosure.

Connector type: 75 Ohm BNC

USB Type-C Connector (“USB VIDEO TX”) (J7)

This USB connector provides power for the BlueBird SDI Adapter and a USB Video Class (UVC) video stream for connection to a host PC. The connector is labelled “USB VIDEO OUT POWER IN” on the enclosure.

Connector type: USB Type-C (5Gbps)

HDMI Output Connector (“HDMI TX”) (J8)

This connector provides HDMI output for display and is labelled “HDMI OUT” on the enclosure.

Connector type: HDMI Type A

DIP SWITCH MODE SELECTION AND LED SPECIFICATION

Mode DIP Switches ("SW1")

The unit is fitted with a 4-way DIP switch to select various modes.

SWITCH	FUNCTION	STATE	DESCRIPTION
SW1-1	Test Pattern Enable	OFF	Normal operation.
		ON	Display standalone test pattern.
SW1-2	RS-485 Source	OFF	J7 - USB Video (UVC) is the control source.
		ON	J3 - USB-UART is the control source.
SW1-3	Video output with no SDI/HD-VLC signal input *	OFF	Video output: blank blue screen.
		ON	Video output: blue screen with moving square.
SW1-4	SDI output HD-VLC Enable	OFF	SDI output is standard uncompressed.
		ON	SDI output is HD-VLC compressed.

*: firmware version 2.1 onwards

Status LEDs ("LED1, LED2, LED3, LED4")

The unit is fitted with four LEDs to provide device status.

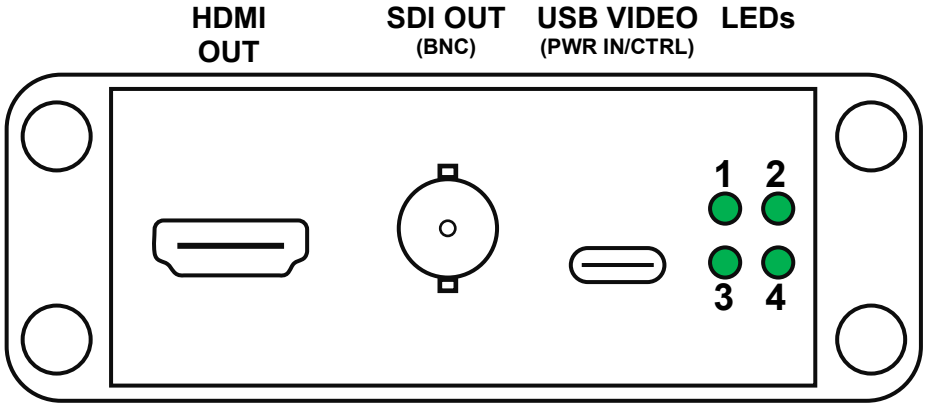


Figure 2. Video output side of housed BlueBird SDI Adapter showing LEDs

LED function on power up

LED test: When the unit powers up the LEDs will quickly flash green and red in sequence (1-4) to verify that all of the LEDS are working correctly.

Firmware version check: Immediately after the LED test, LED1 and LED2 will flash red to indicate the firmware version. LED1 indicates the major version number and LED2 indicates the minor version number. E.g. one flash on LED1 and two flashes on LED2 is version 1.2; two flashes on LED1 and one flash on LED2 is version 2.1.

LED function with no video input

When there is no video input connected, LED1 and LED2 will flash green alternately to indicate that the unit is waiting for a video signal.

LED function with video input or error condition

LED	FUNCTION	STATE	DESCRIPTION
LED1	RJ45 video input RX0 status	OFF	Input is not active / selected.
		Flashing green	Active input is receiving standard video stream. (Slow flashing is HD-SDI, fast flashing is 3G-SDI).
		Flashing yellow	Active input is receiving HD-VLC video stream. (Slow flashing is HD-SDI, fast flashing is 3G-SDI).
		Red	Unidentified signal on SDI RX0 (RJ45)/ Voltage rail out of range.
LED2	BNC video input RX1 status	OFF	Input is not active / selected.
		Flashing green	Active input is receiving standard video stream. (Slow flashing is HD-SDI, fast flashing is 3G-SDI).
		Flashing yellow	Active input is receiving HD-VLC video stream. (Slow flashing is HD-SDI, fast flashing is 3G-SDI).
		Red	Unidentified signal on SDI RX1 (BNC)/ Temperature out of range.
LED3	RS-485 Activity	OFF	No active communication.
		Flashing green	Transmitting data.
		Flashing yellow	Receiving data.
		Red	Communication timeout
LED4	Test Pattern output	OFF	Normal operation.
		Flashing green	Test pattern is enabled.
		Red	USB error

NOTES:

1. The LED numbering on the silk screen of the issue 01 board is incorrect, the numbering shown in Figure 2 is correct.

CONFORMANCE

3G/HD-SDI:	Compliant with SMPTE 274M and SMPTE 296M.
USB Video:	Compliant with SuperSpeed USB 3.1 (UVC).
HDMI:	Compliant with HDMI 1.4a
Approvals:	The **BlueBird SDI Adapter** board has been designed to meet EMC and FCC requirements when housed in a suitable enclosure:
	CE — CE marked and compliant with the relevant EU directives as listed below.
	RoHS — Conforms to RoHS3, the European Union's Restriction on Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment Directive 2015/863/EU.
	EMC — Compliant with EN 55022:2010 (class A) and EN 55024:2010 in accordance with EU Directive 2014/30/EU Electromagnetic Compatibility.
	REACH — Compliant with the requirements of REACH (Registration, Evaluation, Authorization and Restriction of Chemicals, EC 1907/2006), the European Union's chemical substances regulatory framework for Substances of Very High Concern.
	UL — All printed circuit boards used in this product are manufactured by UL recognised manufacturers and have a flammability rating of 94-V0.
	FCC — Compliant with FCC Rules for Class A digital devices.

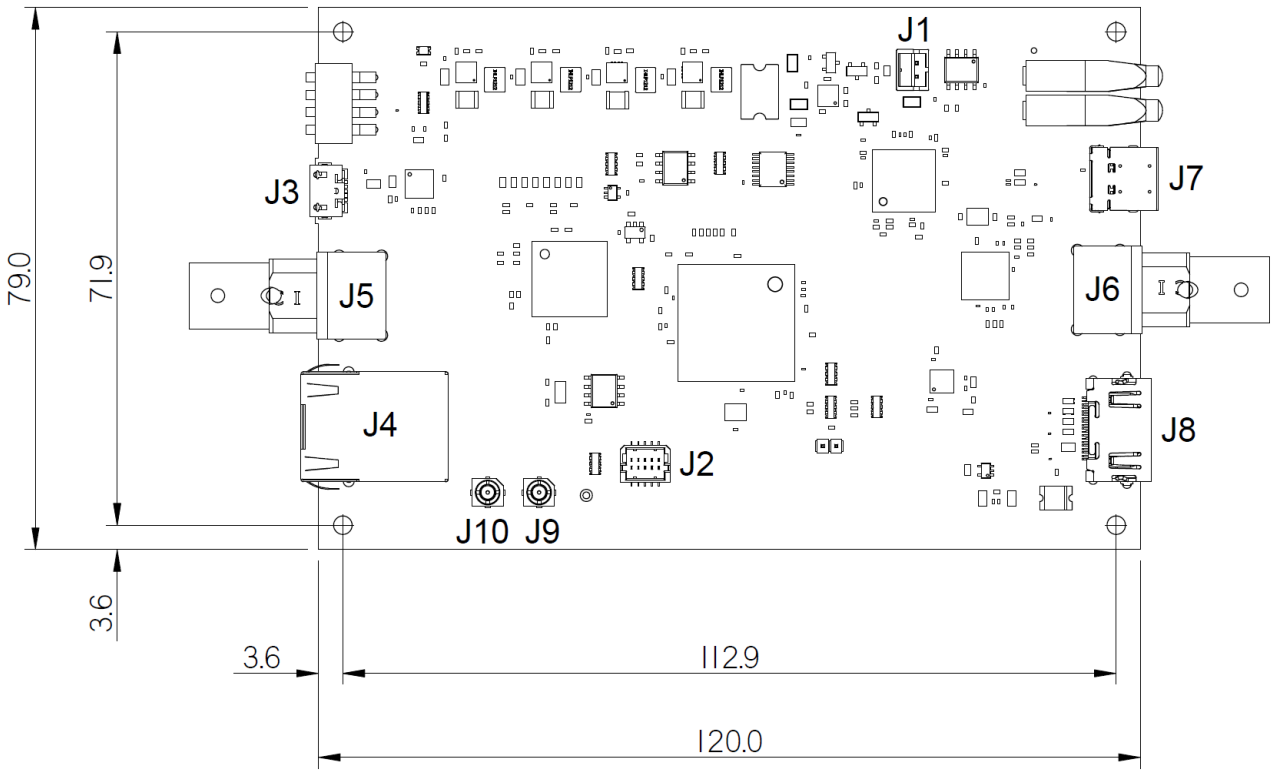


Figure 3. Mechanical Overview

PHYSICAL AND ENVIRONMENTAL DETAILS

Dimensions:	Board only: Enclosure:	120mm x 79mm (not including connectors). 127mm x 86mm x 31mm (not including connectors).
Weight:	Board only: Enclosed unit:	62g 248g
Power Supply:	5V from USB connectors or 5-16V from J1. (1)	
Power Consumption:	J7 (USB Type-C) or J1 (System Power Header): Maximum 3W J3 (USB Micro-B): Maximum 2.5W	
Storage Temperature:	-20°C to +70°C.	
Operating Temperature:	0°C to +60°C (ambient environment).	
Relative Humidity:	10% to 90% non-condensing (operating and storage).	

NOTES:

1. On issue 01 circuit boards the power supply voltage on J1 is 5V±5%

ORDERING INFORMATION

PART NUMBER	*DESCRIPTION*
AS-ADP-SDI-001-A	BlueBird SDI Adapter – Board only.
AS-ADP-SDI-001-A-ENC-A	BlueBird SDI Adapter – Enclosed Version.
AS-ADP-SDI-001-EVAL-A	BlueBird SDI Adapter Evaluation Kit - not including the BlueBird SDI Adapter.

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