BLUEBIRD ANALOG – SDI ADAPTER

AHD/HD-TVI/CVBS to SDI

- AHD/HD-TVI/CVBS to HD/SD-SDI conversion
- HD-SDI video output up to 1080p30
- 3 input channels
- VISCA commands for control and status inquiries

FEATURES

- 2 single ended analog video inputs, one differential analog input
- Input channel selected by configuration pin or VISCA command
- U.FL connector for SDI output
- Single board-to-board multi-way connector for all other signals
- TTL serial communications link
- VISCA commands for input control/status reporting
- VISCA controlled test pattern output
- Compact 23mm x 26mm size
- Evaluation board available

OVERVIEW

The **BlueBird Analog – SDI Adapter** (AS-ADP-AHD-001-A) is a compact interface solution from Active Silicon's BlueBird series of video adapters. It converts 75Ω single ended or 100Ω differential analog (AHD/HD-TVI/CVBS) video signals into a low-latency HD/SD-SDI output. Selection of the active input is made at power-up by external signals or by VISCA command. The SDI output has the same resolution and frequency as the analog input signal. A 3.3V TTL serial channel is used to support VISCA commands for selecting the active input and communicating adapter board status to a host system.

A U.FL connector is used for the SDI output and a 20-way board-to-board connector is used for the power, TTL serial, three analog video inputs and the configuration signals to select the active input channel when the adapter is powered up.

To assist users with the design of a matching carrier board to power and supply video feed to the adapter, Active Silicon provides a separate design guide document. Active Silicon can also design and manufacture a custom carrier board for your application via our custom design service.

The **BlueBird Analog – SDI Adapter** can be easily evaluated using the BlueBird Analog – SDI Evaluation Board (AS-AP31C02-001-A). The BlueBird Analog – SDI Evaluation Board connects to the Analog – SDI Adapter and carries two BNC input sockets (for single ended analog video input), a differential analog video input connector, DIP switches for selection of input channel at start-up and a mini-USB connector for serial communications (USB-UART) and board power supply.

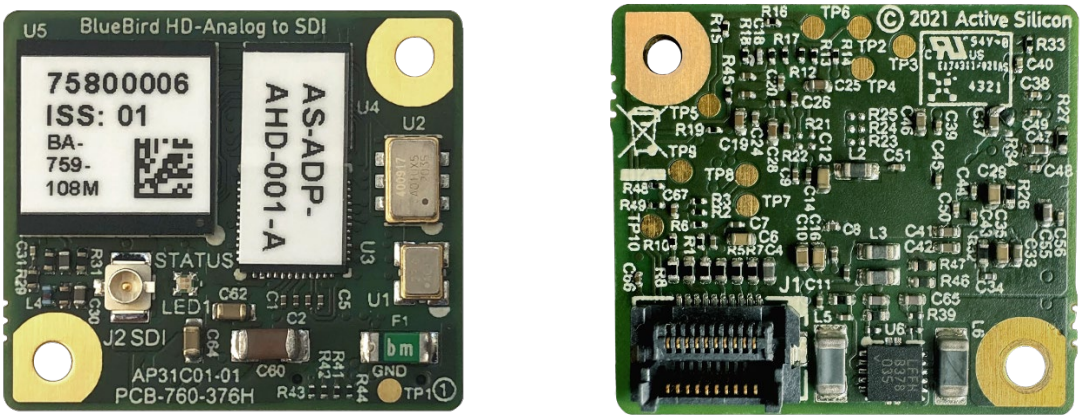

Figure 1. BlueBird Analog – SDI Adapter, front and rear.

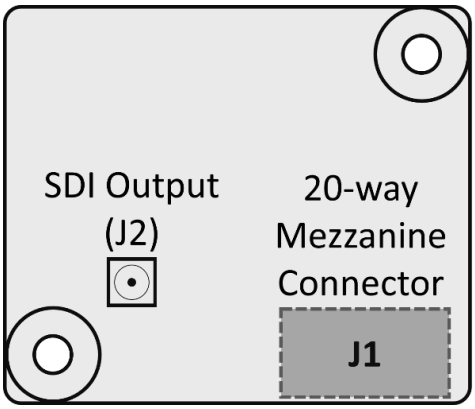

Figure 2. Overview BlueBird Analog – SDI Adapter.

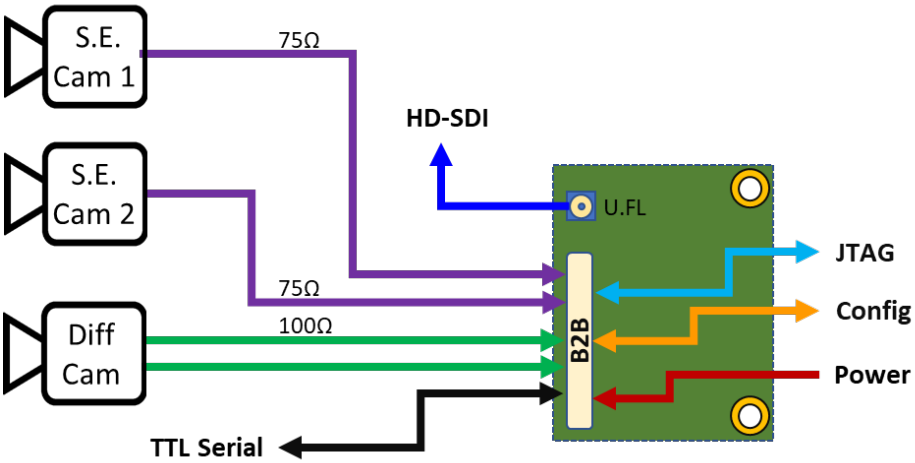

Figure 3. BlueBird Analog – SDI Adapter block diagram.

Adapter Start-up

When the power is turned on the adapter board will initialize and then scan for a valid video signal on the input channel selected by the input configuration signals (LED will flash slowly). When a video signal is detected, the board will autodetect the format of the video signal and lock into it (LED will flash quickly). Once the input video format has been identified the board will start to convert the analog video input into SDI video output (run mode); the LED will be constantly on and VISCA communication will be enabled.

Status LED ("LED1")

This LED illuminates when the Analog – SDI adapter is powered, the LED indicates the status of the adapter. The LED function can be disabled using the VISCA adapter control command.

Slow Flashing Green:	The adapter is seeking a video signal on the selected channel.
Fast Flashing Green:	The adapter is detecting the video mode on the selected channel.
Solid Green:	The adapter is powered and working correctly.

SDI Video Input/Output Mode

On power-up, reset or change of selected video input channel, the mode of the incoming video will be detected and converted to an equivalent SDI output. The video is not rescaled.

INPUT	RESOLUTION	FREQUENCY	OUTPUT
AHD/HD-TVI 1080p30	1920x1080	30 Hz	HD-SDI (1080p30)
AHD/HD-TVI 1080p25	1920x1080	25 Hz	HD-SDI (1080p25)
NTSC	720x480	59.94Hz	SD-SDI (480i)
PAL	720x576	50Hz	SD-SDI (576i)

Table 1. BlueBird Analog – SDI Adapter - supported video input/output modes

Video Input Channel Selection

The adapter board has two configuration input signals on the J1 multi-way connector. These are 3.3V CMOS level inputs with weak pullups to 3.3V; it is recommended that the configuration inputs are actively driven to 0V or 3.3V as required. When the adapter powers up, or the system is reset, the configuration inputs are read and the appropriate video channel selected. Selection of the video input channel can also be made using a VISCA command (this will override the initial selection made by the configuration inputs). For more information see the section on Analog – SDI adapter VISCA Commands settings below.

CONFIG1	CONFIG0	VIDEO INPUT CHANNEL SELECTION
GND	GND	Output Video Test Pattern (1080p30)
GND	3.3V	Channel 1 (single ended)
3.3V	GND	Channel 2 (single ended)
3.3V	3.3V	Channel 3 (differential)

Table 2. BlueBird Analog – SDI Adapter video input selection on power-up using configuration signals.

Test Pattern

A video test pattern output can be enabled on power-up/reset by setting the configuration input signals or (at any time) by sending the appropriate VISCA command over the serial communications channel.

When set using the VISCA command the test pattern uses the same video mode as the currently selected video input channel, provided there is a valid signal present; if there is no valid signal there will be no test pattern. For more information see the section on Analog – SDI adapter VISCA Commands settings below.

BlueBird Analog - SDI Adapter VISCA Commands

The VISCA protocol can support connection of up to 8 cameras/devices in a network; each camera is assigned a separate address. The default device address is normally 81. To differentiate adapter specific commands from other VISCA device commands, the adapter is pre-assigned a fixed VISCA address of **83**. VISCA commands are composed of a series of hexadecimal format numbers that are sent to VISCA enabled devices. In this document the commands are formatted with a blank space between each byte to aid legibility, but the numbers sent to the camera / interface board must be sent without blank spaces.

The adapter supports one VISCA command (Adapter Control) and two inquiries (Adapter Version, Adapter Status).

Adapter Control Command:			83 01 00 ***ab cd*** FF
Command Response:			B0 41 FF B0 51 FF (Acknowledge, Complete)
BYTE	**BIT**	**FUNCTION**	**DETAILS**
a b	1:0	Select video input channel (b)	00 = read configuration inputs and set selected input 01 = Single Ended Video channel 1 10 = Single Ended Video channel 2 11 = Differential Video channel 3
	2	Reserved	-
	3	Test Pattern (b)	0 = off, 1 = on (same video mode as selected input)
	4	Crosshair (a)	0 = off, 1 = on
	5	Status LED (a)	0 = normal operation, 1 = off
	6	SDI Output (a)	0 = on, 1 = off
	7	Reset (a)	0 = normal operation, 1 = reset
c d	0	Reserved	-
	7:1	Reserved	-

Table 3. BlueBird Analog – SDI Adapter - VISCA Adapter control command.

Adapter Version Inquiry:			83 09 00 FF
Command Response:			B0 50 ***pq rs tu*** FF
BYTE	**BIT**	**FUNCTION**	**DETAILS**
p q	3:0	Hardware variant (q)	q (values: 0 to 7)
	7:4	Hardware revision (p)	p (values: 0 to 3)
r s	7:0	Firmware major revision	rs : major version number (values: 0 to 254)
t u	3:0	Firmware sub-minor revision (u)	u : sub-minor version number (values: 0 to 14)
	7:4	Firmware minor revision (t)	t : minor version number (values: 0 to 14)

Table 4. BlueBird Analog – SDI Adapter - VISCA Adapter version Inquiry.

Adapter Status Inquiry:			83 09 02 FF
Command Response:			B0 50 ***pq rs tu*** FF
BYTE	**BIT**	**FUNCTION**	**DETAILS**
p q	1:0	Selected Input Channel (q)	00 = video test pattern 01 = single ended video channel 1 10 = single ended video channel 2 11 = differential video channel 3
	2	External Config Input (q)	Returns state of configuration input CFG0
	3	External Config Input (q)	Returns state of configuration input CFG1
	7:4	Video Input Mode (p)	0x0 = unknown 0x1 = 487i59 0x2 = 576i50 0x3 = reserved 0x4 = reserved 0x5 = 1080p25 0x6 = 1080p30 0x7 to 0xF = reserved
r s	2:0	Video Input Standard (s)	0x0 = unknown 0x1 = CVBS 0x2 = AHD 0x3 = TVI 0x4 to 0x7 = reserved
	3	Reserved	
	4	Power Good 1V2 (r)	0 = fault, 1 = good
	5	Power Good 3V3 (r)	0 = fault, 1 = good
	6	AHD Rx Lock (r)	0 = loss of lock, 1 = locked
	7	SDI Tx Lock (r)	0 = loss of lock, 1 = locked
t u	1:0	Adapter State (u)	00 = initialisation (u=0) 01 = waiting for signal (u=1) 10 = run (u=2) 11 = error (u=3)
	3:2	Reserved (u)	
	5:4	Reserved (t)	
	7:6	Reserved (t)	

Table 5. BlueBird Analog – SDI Adapter: VISCA Adapter status inquiry.

BlueBird Analog - SDI Adapter Serial Port

The serial port is 3.3V TTL compatible input/output with the following settings:

Setting	Value	Setting	Value
Baud:	38400	CTS handshaking:	OFF
Parity:	None	DSR handshaking:	OFF
Data Bits:	8	DSR sensitivity:	OFF
Stop Bits:	1	DTR circuit:	OFF
Timeout:	ON	RTS circuit:	OFF
XON/XOFF:	OFF		

Table 6. BlueBird Analog – SDI Adapter: serial port settings.

CONNECTOR SPECIFICATION

Mezzanine Connector: 20-way (J1)

The BlueBird Analog – SDI Adapter interfaces to external systems via a 20-way, 2mm height, hermaphroditic board to board mezzanine connector. Mating connectors can have heights of 2mm, 2.5mm or 3.5mm giving mated stack height options of 4mm, 4.5mm, 5.5mm (board-to-board distance). Connection direction in the following tables is with reference to the adapter, i.e. a connection labelled input is an input to the adapter, outputs are outputs from the adapter (to the mated carrier board).

Connector type:	20-way Amphenol Mezzostak connector 10106813-021112LF
Mating part:	20-way Amphenol Mezzostak connector 10106813-021112LF

Note: The tables below list the pinout of the adapter, due to the hermaphroditic nature of these connectors the pinout on the connector mounted on a mating connector/carrier board will be mirrored (odd and even pins will swap. E.g. pin 1 on the adapter will connect to pin 2 on the carrier board, pin 2 on the adapter will connect to pin 1 on the carrier board, and so on).

PIN NO.	FUNCTION	SIGNAL LEVEL	PIN NO.	FUNCTION	SIGNAL LEVEL
1	1.2V ref. output	10mA max.	2	JTAG TMS	-
3	Diff. Input -ve	100Ω analog	4	JTAG TDI	-
5	Diff. Input +ve	100Ω analog	6	JTAG TDO	-
7	GND	-	8	JTAG CLK	-
9	Video Input 2	75Ω analog	10	3.3V ref. output	10mA max.
11	GND	-	12	Config 0	Input (pull down)
13	Video Input 1	75Ω analog	14	Config 1	Input (pull down)
15	GND	-	16	5V	Input
17	Tx	3.3V TTL compatible output	18	5V	Input
19	Rx	3.3V TTL compatible input (not 5V tolerant)	20	GND	-

Table 7. Multi-way mezzanine connector (J1) pinout

SDI Output (J2)

The adapter board is fitted with a Hirose U.FL Micro Coaxial Connector (50 Ohm).

Connector type	Hirose Micro Coaxial Connector (Receptacle), part number U.FL-R-SMT
Solid Red:	Various height and cable width options from Hirose: U.FL-LP-040, U.FL-LP-066, U.FL-LP(V)-040, U.FL-LP-062, U.FL-LP-088. See Hirose documentation “Ultra Small Surface Mount Coaxial Connectors – 1.9mm or 2.4mm mated height”.

BlueBird Analog – SDI Evaluation Board

The BlueBird Analog – SDI Evaluation board (**AS-AP31C02-001-A**) has been designed to enable fast and effective evaluation of the BlueBird Analog – SDI Adapter. The adapter board plugs directly into the BlueBird Analog – SDI Evaluation Board and can be secured using M2 screws. The evaluation board is fitted with a 2mm height/spacing mezzanine connector (J101) and M2x4mm spacer/posts.

The evaluation board supplies power from the USB connection and gives easy access to all the signals on the adapter board mezzanine connector (adapter-J1, evaluation board-J101). The evaluation board has two BNC connectors (J104, J103) for single ended analog video input. A three-way connector (J105, input 3) is available for differential video input. An external AHD balun (commercially available) can be used to convert a single ended 75Ω signal into a 100Ω differential signal suitable for video input 3. The U.FL socket on the adapter can be connected to the U.FL socket (J102) on the evaluation board, J102 connects to a standard BNC connector (J106) to give easy access to the SDI output of the adapter.

A pair of DIP switches on the evaluation board (SW101) enable configuration of the default video input channel to be selected on power-up. The switch settings are only detected on power-up and cannot be used to change the input channel during operation.

A USB_UART module enables an easy connection to the adapter serial communications for VISCA control of the adapter. The same module can be used for JTAG programming of the adapter firmware.

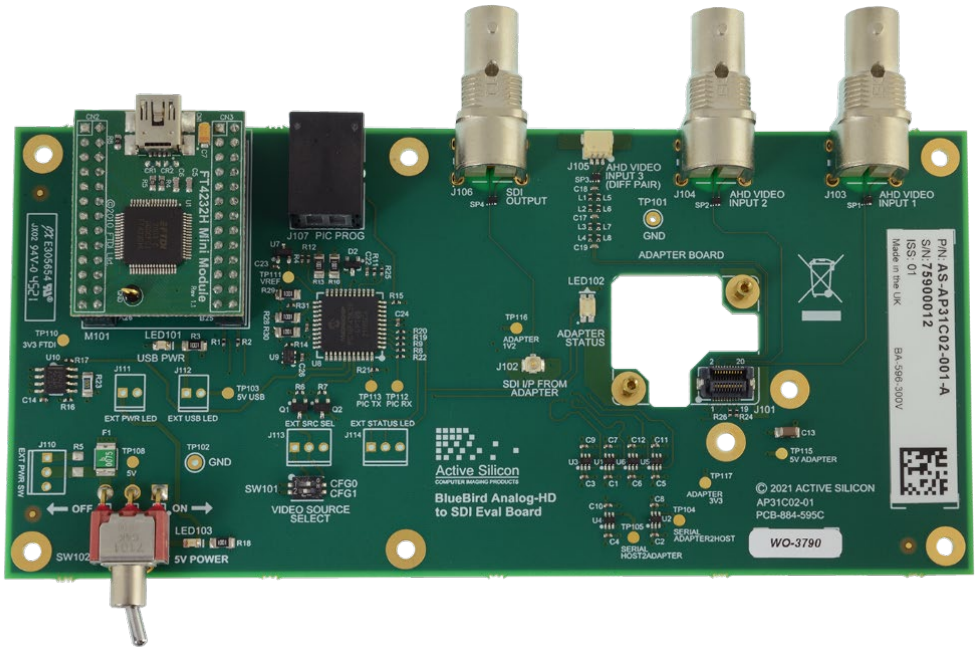

Figure 4. BlueBird Analog – SDI Evaluation Board.

Once the BlueBird Analog – SDI adapter is fitted and all the input/outputs connected, switch the power switch (SW102) ON to power up the board. The adapter will scan the configuration DIP switch (SW101) signals and then read the selected video input channel. While the adapter is doing this, the LED will flash green. If the adapter does not locate a valid input signal, it will timeout and switch to the next input channel and repeat the search. It will continue to search all of the channels for a valid video signal until it finds one. Once a valid video input has been found, the LED will switch to a steady green/ON state and the input video will be converted to an SDI signal of the same resolution and frame rate that will sent to the U.FL connector (J2) on the adapter. If J2 on the adapter is connected to J102 on the evaluation board, the SDI signal will be routed to the J106 BNC connector.

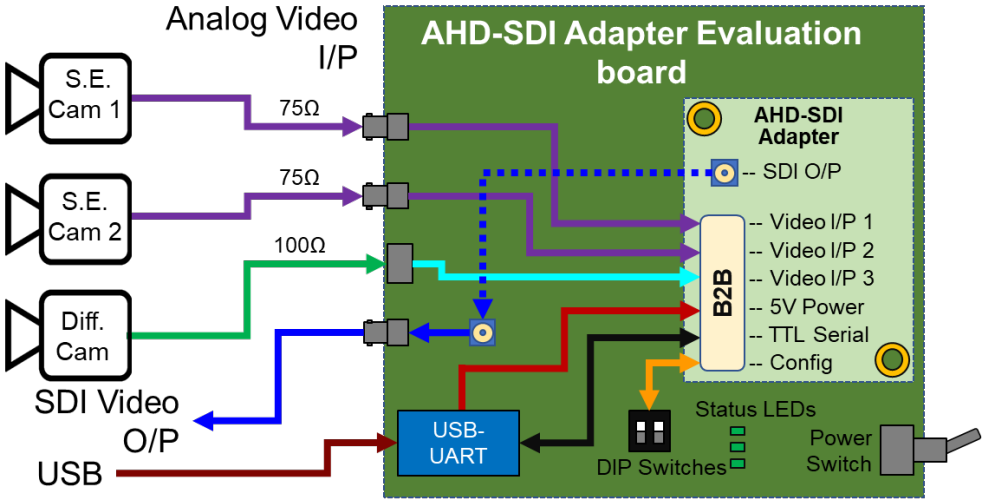

Figure 5. Bluebird Analog – SDI Evaluation Board block diagram.

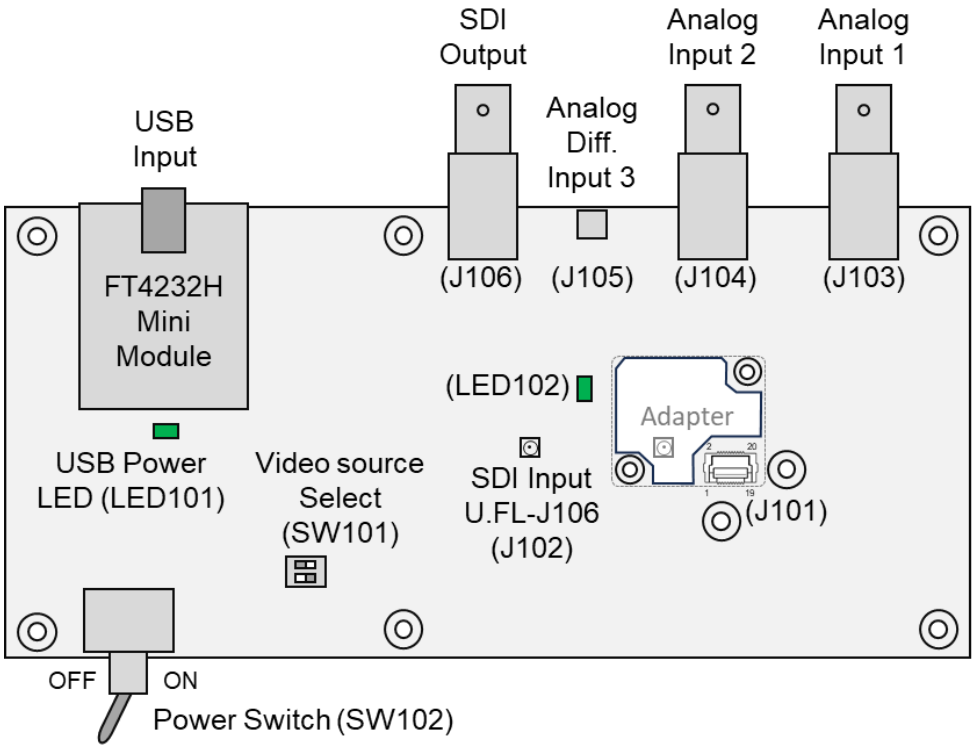

Figure 6. Bluebird Analog – SDI Evaluation Board diagram.

CONFORMANCE

SMPTE: Compatible with SMPTE 274M and SMPTE 296M.

Approvals: Active Silicon makes the following approval statements:

CE In accordance with the CE Marking regulations, the **BlueBird Analog – SDI Adapter** is not a finished product and is supplied for further integration into a finished product that will be CE marked by the final manufacturer/integrator. Therefore, no CE marking or Declaration of Conformity is required or allowed.

RoHS3 This product is compliant with the RoHS3 requirements (Directive 2015/863/EU).

EMC This product is designed to be compliant with the following requirements when housed in a suitable enclosure:

- EN 55022:2010 (Class A) and EN 55024:2010 (EU Directive 2014/30/EU Electromagnetic Compatibility)
- FCC Rules for Class A digital devices

REACH Please contact Active Silicon for the latest formal REACH declaration (EC 1907/2006).

UL All printed circuit boards used in this product are manufactured by UL recognized manufacturers and have a flammability rating of 94-V0.

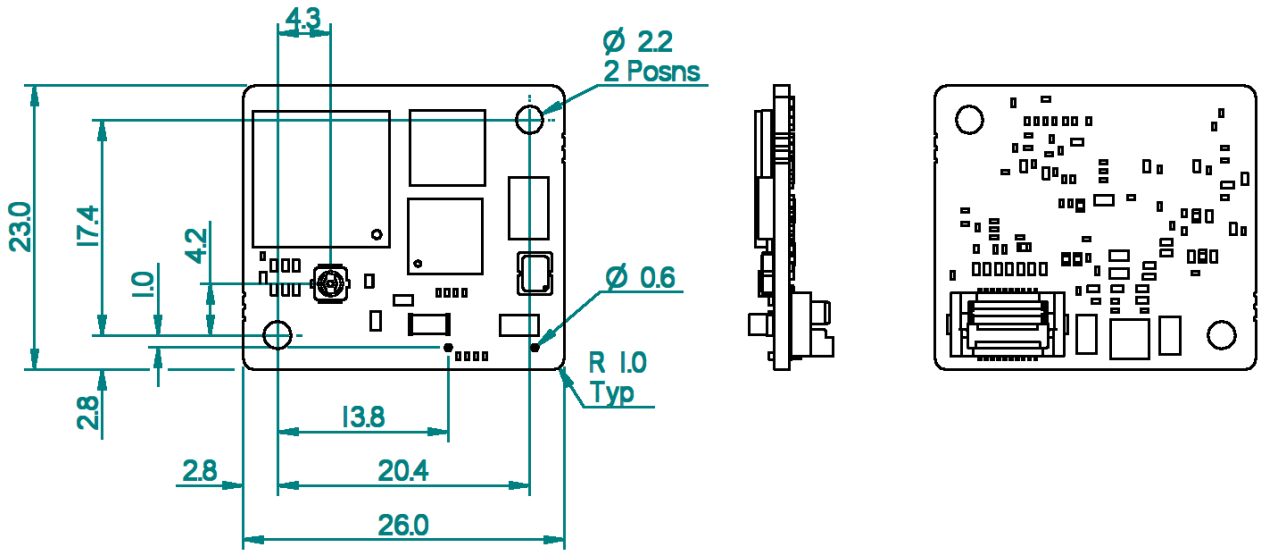

Figure 7. BlueBird Analog – SDI Adapter (AS-ADP-AHD-001-A) mechanical overview (all dimensions in mm).

PHYSICAL AND ENVIRONMENTAL DETAILS

Dimensions:	23mm x 26mm
Weight:	7g
Mounting Holes:	2.2mm (for M2 threaded mounting screws/pillars)
Power Supply:	5V
Power Consumption:	1.05W - typical power at 1080p30, values will vary with video mode.
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).

ORDERING INFORMATION

PART NUMBER	***DESCRIPTION***
AS-ADP-AHD-001-A	BlueBird Analog – SDI Adapter (AHD/HD-TVI/CVBS to HD/SD-SDI video).
AS-ADP-AHD-001-EVAL-A	Evaluation Kit for the BlueBird Analog – SDI Adapter; including the BlueBird Analog – SDI Evaluation Board (**AS-AP31C02-001-A**) with U.FL and USB cable.

Note: The BlueBird Analog – SDI Adapter is warrantied for twelve months from the shipment date.

Active Silicon

CONTACT DETAILS

Head Office:

Active Silicon Ltd
1 Waterside Court, Waterside Drive,
Langley, Berks, SL3 6EZ, UK.

Tel: +44 (0)1753 650600
Email info@activesilicon.com
Website: www.activesilicon.com

North America Office:

Active Silicon, Inc.
479 Jumpers Hole Road, Suite 301,
Severna Park, MD 21146, USA.

Tel: +1 410-696-7642
Email: sales.us@activesilicon.com
Website: www.activesilicon.com