HARRIER IP CAMERA INTERFACE BOARD

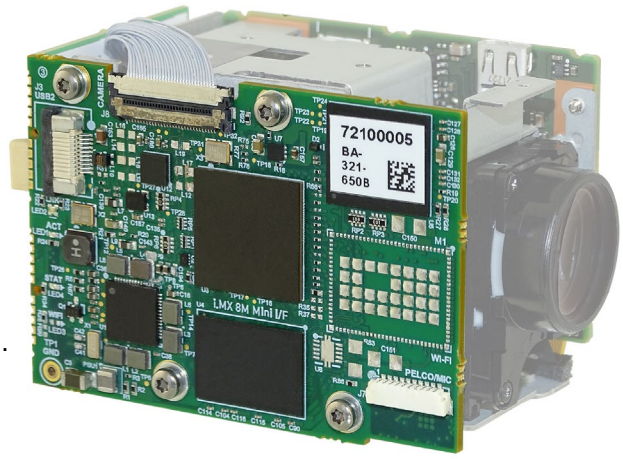
For LVDS AF-Zoom Block Cameras

Active Silicon
COMPUTER IMAGING PRODUCTS

- **IP interface board for Tamron, Sony and Harrier AF-Zoom cameras**
- **Low latency H.264 1080p60 video over IP**
- **Supports ONVIF/RTSP/RTP/VISCA/Pelco-D**
- **PoE and WiFi options for reduced cabling**

FEATURES

- Supports Tamron, Sony FCB-EV-series, Harrier 10x, 36x and 40x AF-Zoom cameras and other LVDS compatible cameras.
- Support for 1080p60/30 video.
- Low latency H.264 RTP streaming video.
- RTSP and ONVIF Profile S.
- Graphical overlay support (text and images).
- Onboard recording to micro SD card.
- Built-in webserver for setup and configuration.
- Software API support for direct (VISCA) camera control.
- Support for audio input.
- Optional PoE and WiFi support.
- Pelco-D serial port to drive local camera pan & tilt.



OVERVIEW

The **Harrier IP Camera Interface Board** (AS-CIB-IP-SOC-001-A or AS-CIB-IP-SOC-002-A) is an interface solution from Active Silicon's Harrier series of camera interface boards; it provides IP (Ethernet) output for Tamron, Sony FCB-EV-series and Harrier 10x/36x/40x AF-Zoom cameras, as well as other LVDS compatible autofocus-zoom (AFZ) block cameras. The interface board is based on a powerful SoC processor that delivers a low latency H.264 video stream over RTP. In addition to the Harrier IP Camera Interface Board (SoC processing board), this IP solution may include an Ethernet connection board. Both boards can be compactly mounted onto a block camera. The camera and SoC board are connected via a KEL 30-way cable. The LVDS video signal is compressed (H.264) and streamed over RTP to the Ethernet connection board (via FFC cable). The Ethernet connection board carries magnetics that enable physical connection to external Gigabit Ethernet systems using CAT5/6 Ethernet cables. A version of the Ethernet connection board that supports Power over Ethernet is available. The SoC board implements ONVIF (Profile S) based control; application examples of how to display text and graphical overlays to the live video stream and send VISCA commands to the camera enabling full camera control via the ONVIF interface are available on request.

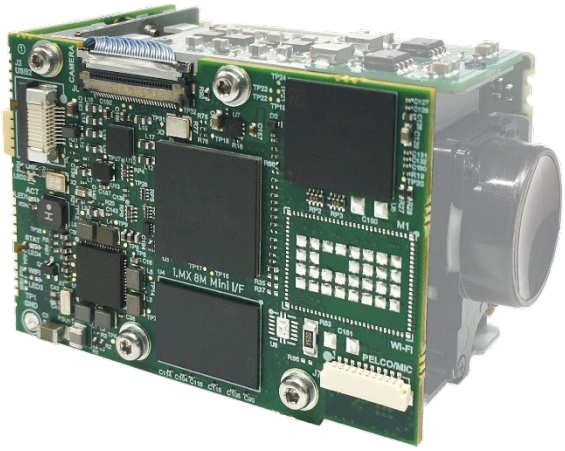


Figure 1. Harrier IP Camera Interface Board and Harrier Ethernet Connection Board mounted on a Tamron camera.

Board Options

A Harrier IP interface solution is usually composed of two boards – a processing/SoC board (**AS-CIP-IP-SOC-001-A**) and an Ethernet connection board. These two boards are connected by an FFC cable (see figure 2) and can be mounted directly on to a block camera or stacked on top of each other. The boards are available separately, as a set or mounted on a camera (see below).

A version of the SoC board that supports wireless connectivity is available (**AS-CIP-IP-SOC-002-A**). There are also two versions of the connection board, the Ethernet connection board (**AS-CIP-IP-IFETH-001-A**) and a Power over Ethernet enabled version (**AS-CIP-IP-IFPOE-001-A**). For the specifications of the Ethernet connection board, please refer to the Harrier Ethernet Connection Board datasheet on the Active Silicon website (download section of the Harrier IP Camera Interface Board).

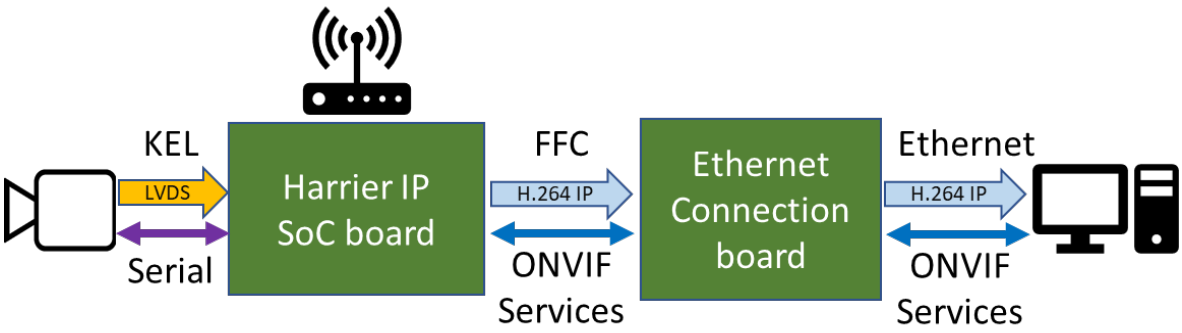


Figure 2. Harrier IP camera system functional block diagram (wireless/PoE features are optional)

The processor and interface boards can be ordered together as shown below:

PART NUMBER	WIRELESS	ETHERNET	COMPONENT BOARDS
AS-CIB-IP-001-A	N	Ethernet	AS-CIP-IP-SOC-001-A + AS-CIP-IP-IFETH-001-A + FFC
AS-CIB-IP-002-A	Y	Ethernet	AS-CIP-IP-SOC-002-A + AS-CIP-IP-IFETH-001-A + FFC
AS-CIB-IP-003-A	N	PoE	AS-CIP-IP-SOC-001-A + AS-CIP-IP-IFPOE-001-A + FFC
AS-CIB-IP-004-A	Y	PoE	AS-CIP-IP-SOC-002-A + AS-CIP-IP-IFPOE-001-A + FFC

Each of these systems can be purchased ready assembled on an autofocus-zoom block camera (with required connectors and bracket). For these products a code for the model of the camera is added to the system part number.

PART NUMBER	SYSTEM+CAMERA
AS-CIB-IP-001-10LHD-A	AS-CIB-IP-001-A + Harrier 10x AF-Zoom Camera
AS-CIB-IP-001-36GLHD-A	AS-CIB-IP-001-A + Harrier 36x AF-Zoom Camera
AS-CIB-IP-001-40LHD-A	AS-CIB-IP-001-A + Harrier 40x AF-Zoom Camera
AS-CIB-IP-001-3010-A	AS-CIB-IP-001-A + Tamron MP3010M-EV camera
AS-CIB-IP-001-1010-A	AS-CIB-IP-001-A + Tamron MP1010M-VC camera
AS-CIB-IP-001-7520A-A	AS-CIB-IP-001-A + Sony FCB-EV7520A camera
AS-CIB-IP-001-7520-A	AS-CIB-IP-001-A + Sony FCB-EV7520 camera

Operation

When connected to a suitable power supply the Harrier IP Camera Interface Board will boot and then power-up the camera. Once the camera has initialized it will start transmitting a video stream; the camera interface board will compress the video (H.264), convert it to RTP format, and stream it to the Ethernet port. Any RTP/ONVIF compatible application (e.g. VLC player or GStreamer) can then receive and display the video. ONVIF services can be used to control the camera and video stream settings.
When the interface board is connected to the network, any ONVIF compatible application, such as the ONVIF Device Manager (https://sourceforge.net/projects/onvifdm/), can be used to discover the IP address of the board/camera and control the camera/video settings.

IP Address

By default, the Harrier IP Camera Interface Board is automatically assigned an IP address using DHCP, but it can be set to a fixed IP address using the Harrier IP Camera Interface Board web administration page or the ONVIF Device Management Service.

ONVIF and RTSP Services

The Harrier IP Camera Interface Board platform supports an RTSP server for streaming video and the ONVIF profile S standard for camera control. The RTSP server enables connected host devices to receive and control the H.264 video stream.

ONVIF is a SOAP webservice that standardises the network interface for network video products. The ONVIF services include the following areas:

- IP configuration
- Device discovery
- Device management
- H.264 encoder configuration
- Camera control

The ONVIF and RTSP services can be consumed from many programming languages and several software frameworks already exist to use those services.

For example:

- ONVIF can be readily used from C# using Visual Studio's 'Add Service Reference' utility.
- There are several Python modules available to consume ONVIF services
    - Valkka – "Python Media Streaming Framework for Linux" – supports both ONVIF and RTSP https://elsampsa.github.io/valkka-examples/_build/html/onvif.html
    - Zeep is a SOAP client for Python, which can be used to consume the ONVIF WSDL files. https://docs.python-zeep.org/en/master/client.html
- The GStreamer library includes an RTSP client and can be used to decode and display the live video. GStreamer is a C library with C# and Python bindings.

Visual Studio can load the WSDL files that describe the various ONVIF SOAP services and generate a C# class with methods for the various ONVIF functions.

The ONVIF services supported are listed below:

- Device Management service: allows control of the platform (e.g. set time and date, etc.).
- Media service: Media configurations are used to determine the streaming properties of requested media streams; this enables control of the H.264 encoder and on-screen displays (OSD).
- Imaging service: provides configuration and control data for imaging specific properties.
- DeviceIO service: provides direct communication to the camera serial port (this enables VISCA communication with an attached camera to allow full control of the camera and all its features).

For detailed information on these services please refer to the ONVIF documentation at https://www.onvif.org/profiles/specifications/ .

Camera Control

The camera video mode and H.264 compression parameters can be managed using the ONVIF media service. The ONVIF Imaging service enables any ONVIF-compliant third-party software/application to control the camera settings. However, most AF-zoom block cameras have many more settings than those available through the ONVIF Imaging service. These additional settings are usually changed using VISCA commands sent over a serial interface. The Harrier IP Camera Interface Board supports direct serial communication with cameras and applications can access this serial interface via the ONVIF DeviceIO service: function SendReceiveSerialCommand(). This function allows applications to send, and optionally receive, data to/from the camera. Please refer to the ONVIF DeviceIO specification for the complete documentation of this function. This means that all camera features supported by the VISCA protocol can be controlled by the end application over the Ethernet interface. For examples, please refer to the Harrier IP Example Software. For more information on VISCA control and camera features, please refer to the documentation for your camera.

Administration Web Pages

The Harrier IP Camera Interface Board hosts a website which can be used to control the board and camera.

When the board is connected, the website can be accessed by connecting to the IP Address of the camera in a web browser.

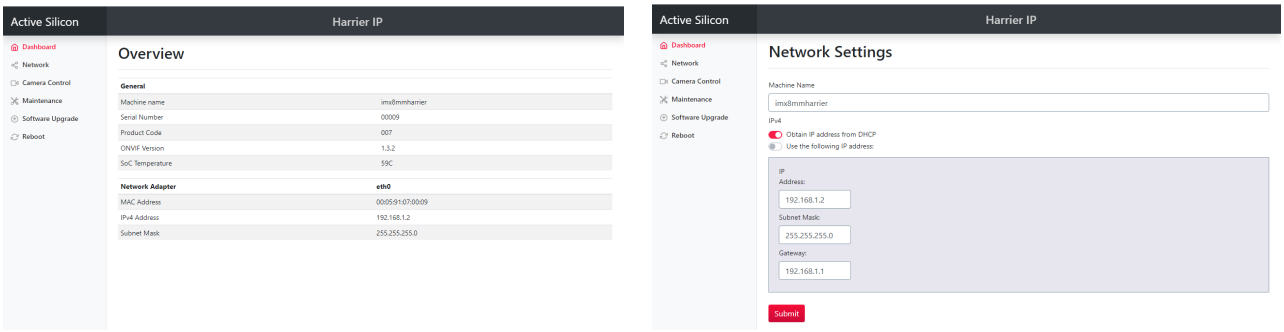


Figure 3. Harrier IP web pages - Dashboard and Network settings pages

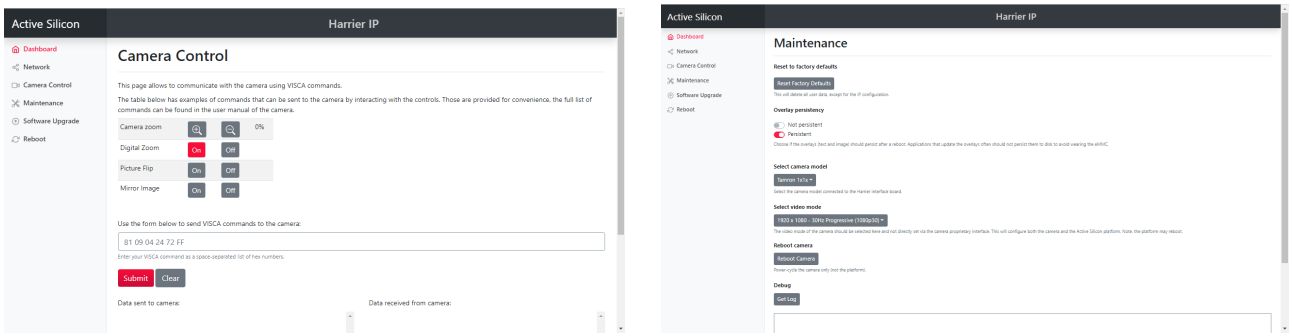


Figure 4. Harrier IP web pages: Camera Control and Maintenance pages

Video Graphical Overlay Control

The Harrier IP Camera Interface Board is able to superimpose graphics and text on the live video stream. This includes graphics with transparent/alpha blended pixels. The application manages these overlays using an API from the ONVIF Media service. The overlays can be stored in system memory (volatile) or in the flash on the platform (non-volatile). The flash has a high but limited number of guaranteed writes, hence in applications where the overlays are frequently changed it is recommended that the volatile setting be used. The functions CreateOSD() and SetOSD() of the media profile have had an optional boolean element added to select if the OSD should be volatile (saved to memory) or not (saved to flash).

This element goes in the ‘any’ element listed in media.wsdl for those functions and takes this form:

```
<xs:element name="IsPersistent" type="xs:boolean"/>
```

Below, an example of the SOAP envelope containing the element.

```
<s:Envelope
      xmlns:s=http://www.w3.org/2003/05/soap-envelope>
    <s:Header>
    </s:Header>
    <s:Body
          xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
          xmlns:xsd=http://www.w3.org/2001/XMLSchema>
         <CreateOSD
              xmlns=http://www.onvif.org/ver10/media/wsdl>
               <OSD>
                     <Type
                      xmlns=http://www.onvif.org/ver10/schema>
                      Text
                     </Type>
                     <Position
                      xmlns=http://www.onvif.org/ver10/schema>
                          <Type>
                          UpperRight
                          </Type>
                     </Position>
                     <TextString
                      xmlns=http://www.onvif.org/ver10/schema>
                          <Type>
                          Plain
                          </Type>
                           <PlainText>
                          Hello
                           </PlainText>
                     </TextString>
               </OSD>
               <IsPersistent
                  xmlns=http://www.onvif.org/ver10/schema>
                  1
               </IsPersistent>
         </CreateOSD>
    </s:Body>
</s:Envelope>
```

SD Card interface

The SD card interface supports all standard micro SD cards (up to 512GB) and operates them in SDR25 mode. High data rates that come with UHS II cards are not supported and UHS II cards will operate in UHS I modes (lower data rate). The SD card can be used to store recordings of the camera video.

Harrier IP Example Software

The Harrier IP Example Software from Active Silicon contains sample application code that shows how to use the ONVIF services for adding text and graphical overlays to the live video stream and sending VISCA commands to the camera to enable full camera control.

Status LEDs (“LED1/2/3/4”)

The Harrier IP Camera Interface Board is fitted with several multi-color LEDs that indicate board status.

- LED1 – ACT
  - indicates activity on the Ethernet link (flashing=activity, steady on=no activity).
- LED2 – LNK
  - indicates the state of the Ethernet link (Green=1G link OK, Red= 10/100 link OK, Off=no link).
- LED3 – WiFi
  - TBD.
- LED4 – STAT
  - indicates the status of the board system (steady green=board has booted successfully).

CONNECTOR SPECIFICATION (Rev. 1 board)

Power Connector: 2-way (J1)

The Harrier IP Camera Interface Board is fitted with a 2-way JST connector for connection to an external power supply. Power is also supplied by J2 so this connector is not used when the camera interface board is connected to an Ethernet connection board.

Connector type: JST - BM02B-SRSS-TB(LF)(SN)

Mating cable: JST - A02SR02SR30KW152A (SHR-02V-S-B - ASSHSSH28K152)

PIN	SIGNAL	PIN	SIGNAL
1	Power (8.25V to 12.25V)	2	GND

Ethernet Connection Board Connector: 24-way (J2)

The Harrier IP Camera Interface Board is fitted with a 24-way 0.5mm pitch vertical FFC connector (with clamp) for connection to a Harrier Ethernet Connection Board or a Harrier Ethernet Connection Board (PoE version).

Connector type: Valcon - FFC5-24-VSM-TR

Mating cable: 24-way 0.5mm pitch FFC with same side connection

PIN	SIGNAL	PIN	SIGNAL
1	GND	13	GND
2	ETH_TRX0_P	14	I2C2_SDA
3	ETH_TRX0_N	15	I2C2_SCL
4	GND	16	GND
5	ETH_TRX1_P	17	GND
6	ETH_TRX1_N	18	GND
7	GND	19	GND
8	ETH_TRX2_P	20	NC
9	ETH_TRX2_N	21	Power (8.25V to 12.25V)
10	GND	22	Power (8.25V to 12.25V)
11	ETH_TRX3_P	23	Power (8.25V to 12.25V)
12	ETH_TRX3_N	24	Power (8.25V to 12.25V)

USB Connector: 10-way (J3)

The Harrier IP Camera Interface Board is fitted with a 10-way 0.5mm pitch FFC connector for connection to external devices. Support for this interface is in development.

Connector type: Samtec - ZF5S-10-01-T-WT

Mating cable: 10-way 0.5mm pitch FFC

PIN	SIGNAL	PIN	SIGNAL
1	GND	6	GND
2	USB VBUS	7	USB Data +
3	USB VBUS	8	GND
4	GND	9	USD ID
5	USB Data -	10	GND

Micro SD socket (J5)

The Harrier IP Camera Interface Board is fitted with a standard micro SD socket.

External Micro SD extension socket (J6)

The Harrier IP Camera Interface Board is fitted with a 12-way 0.5mm pitch FFC connector to enable connection to external/remote SD card sockets.

Connector type: Samtec - ZF5S-12-01-T-WT

Mating cable: 12-way 0.5mm pitch FFC

PIN	SIGNAL	PIN	SIGNAL
1	SD2_DATA2	7	VDD
2	GND	8	SD2_DATA0
3	SD2_DATA3	9	GND
4	SD2_CMD	10	SD2_DATA1
5	VDD	11	SD2_DET
6	SD2_CLK	12	GND

PELCO/Microphone Connector: 10-way (J7)

The Harrier IP Camera Interface Board is fitted with a 10-way 0.8mm pitch connector to enable connection to a PELCO controller and microphone. Support for this interface is in development.

Connector type: JST - SM10B-SURS-TF(LF)(SN)

Mating cable: JST - A10SUR10SUR32W102A

PIN	SIGNAL	LEVEL	NOTES
1	Analog GND (Mic)		
2	Microphone Input +		With bias voltage (3mA max.) suitable for electret type microphones
3	Microphone Input -		
4	Analog GND (Mic)		
5	GPIO 1	3v3	
6	GPIO 2	3v3	
7	GND		
8	RS-485 -	EIA/TIA-485	
9	RS-485 +	EIA/TIA-485	
10	GND		

KEL30 Connector (“CAMERA”): 30 way (J8)

The Harrier IP Camera Interface Board is fitted with a 30-way miniature connector that is used to connect to compatible LVDS cameras.

Connector type: KEL USL00-30L

Mating cable: KEL USL20-30SS-010-C (100mm length) 30-way micro coaxial cable.
Other lengths also available (subject to minimum order quantities).

SPECIFICATION

Video resolution/rate:	1080p 60/30 fps	**Video Compression:**	H.264
Protocols:	ONVIF, IPv4/v6, HTTP, HTTPS, RTSP, RTP, TCP, UDP, RTCP, ICMP, DHCP	**Wireless Protocols:**	802.11 a b g n and ac Dual 2.4 and 5GHz bands
Camera control:	ONVIF profile S, VISCA (via Ethernet connection and ONVIF DeviceIO service)	**Audio:**	Mono microphone

CONFORMANCE

Ethernet IEEE802.11, POE, RT, ONVIF Profile S

Approvals: The **Harrier IP Camera Interface Board** has been designed to meet EMC and FCC requirements when housed in a suitable enclosure:

CE	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	Please contact Active Silicon for the latest formal REACH declaration (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 recognized manufacturers and have a flammability rating of 94-V0.
FCC	Compliant with FCC Rules for Class A digital devices.

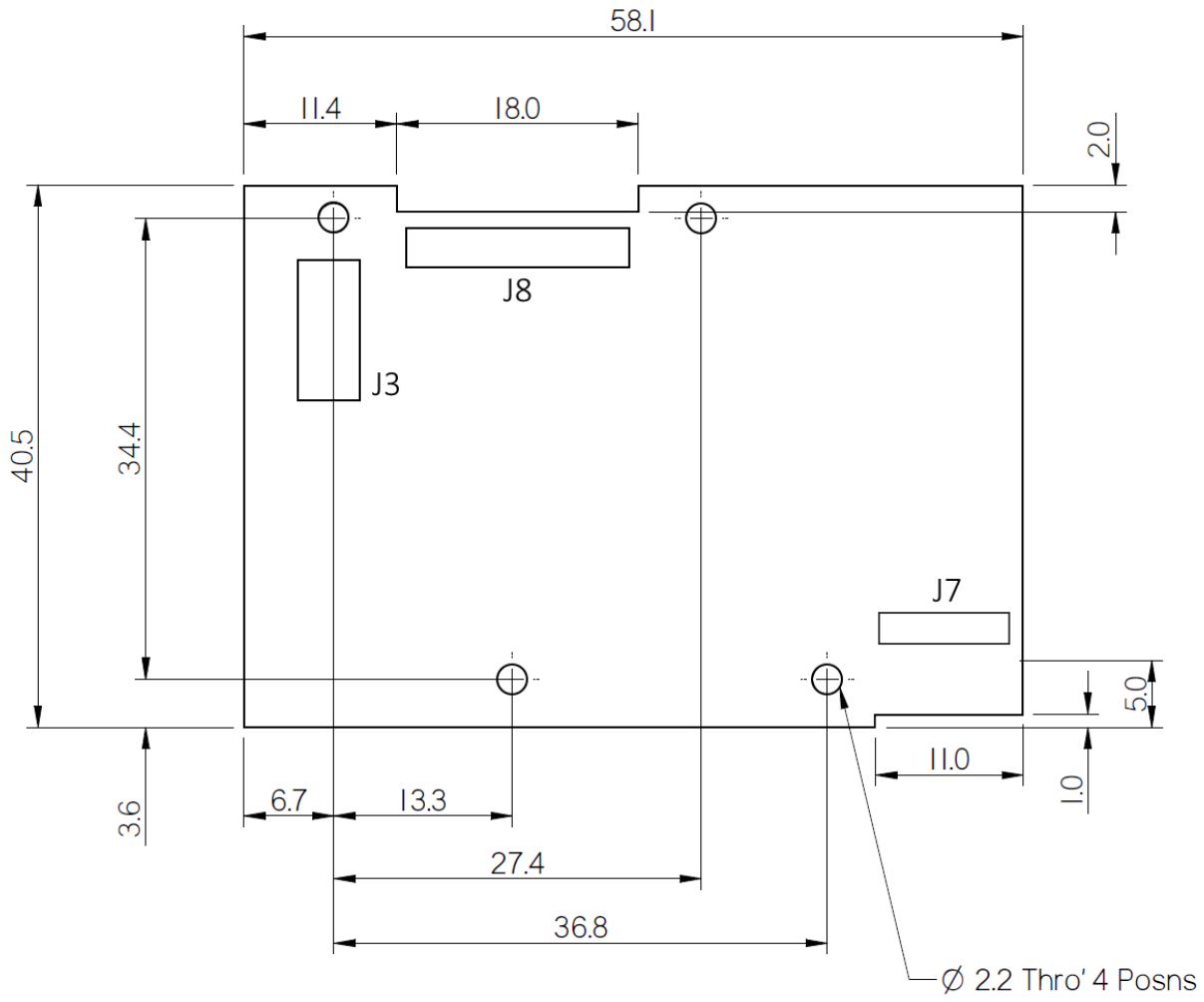


Figure 5. Mechanical overview of the Harrier IP Camera Interface Board; dimensions in mm. (Note – when mounted on a camera, this side usually faces away from the camera)

PHYSICAL AND ENVIRONMENTAL DETAILS

Dimensions:	58.1mm x 40.5mm.
Weight:	12g (interface board and SD card only, no cables).
Power Supply:	8.25V to 12.25V
Power Consumption:	1.9 – 2.1W (typical 1080p30) 2.6 – 2.8W (typical 1080p60) (Note: does not include camera power).
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-CIB-IP-SOC-001-A	Harrier IP Camera Interface Board.
AS-CIB-IP-SOC-002-A	Harrier IP Camera Interface Board (with WiFi module, wireless option).
AS-CIB-IP-IFPOE-001-A	Harrier Ethernet Connection Board (PoE version).
AS-CIB-IP-IFETH-001-A	Harrier Ethernet Connection Board.
AS-CIB-IP-001-A	***AS-CIB-IP-SOC-001-A***, ***AS-CIB-IP-IFETH-001-A*** and FFC cable.
AS-CIB-IP-002-A	***AS-CIB-IP-SOC-002-A***, ***AS-CIB-IP-IFETH-001-A*** and FFC cable.
AS-CIB-IP-003-A	***AS-CIB-IP-SOC-001-A***, ***AS-CIB-IP-IFPOE-001-A*** and FFC cable.
AS-CIB-IP-004-A	***AS-CIB-IP-SOC-002-A***, ***AS-CIB-IP-IFPOE-001-A*** and FFC cable.
AS-CIB-IP-001-3010-A	***AS-CIB-IP-SOC-001-A*** and ***AS-CIB-IP-IFETH-001-A*** supplied mounted on a Tamron MP3010M-EV camera (with connecting cables fitted).
AS-CIB-IP-EVAL-A	Evaluation kit for Harrier IP (does not include boards).

More camera options and custom builds are available, please contact Active Silicon for more information.

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