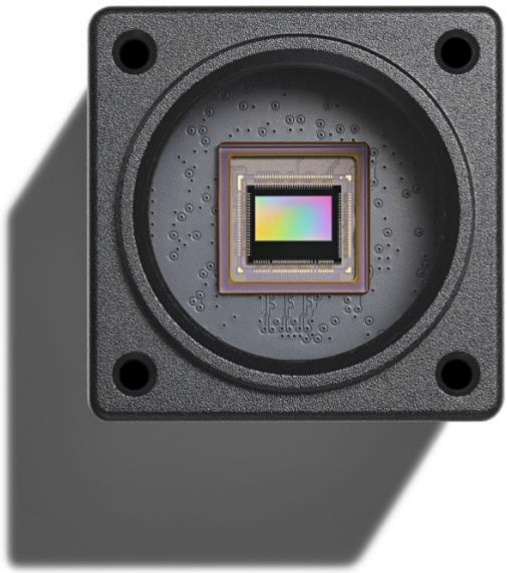
PROPHESEE
METAVISION TECHNOLOGIES



EVK5 HD
CAMERA MANUAL

Prophesee Metavision® EVK5 HD is your perfect entry point to Event-based Vision, by the inventors of the world's most advanced neuromorphic vision systems. This high-speed, compact, light and full-featured platform is compatible with free Metavision® Intelligence software suite. It features at its core the revolutionary IMX646 HD high-speed Event-based Vision sensor, realized in collaboration between SONY and PROPHESEE. With its CS-mount, USB 3.0 and 4 pin connector as well as multiple attachment points, it is the ideal flexible tool for your advanced experiments. Welcome to our global inventor's community, we can't wait to see what frontiers you will be pushing.

Version 1.0
Last change: Sept 1st, 2023
Product: EVK5 HD

REVISION HISTORY
Release date: Sept 1st, 2023
Revision: 1.0
Description of changes: Initial version

CONTENTS

1. OVERVIEW

PROPHESEE EVK5 - HD is a flexible vision system that enables evaluation of the IMX646 HD high-speed stacked Event Based Vision sensor, realized in collaboration between SONY and PROPHESEE. This compact and lightweight camera has been designed to be easily embedded in diverse application environments.

The sensor outputs encoded events over a 2-lane MIPI interface compliant with the MIPI-CSI2 specification. Inside the camera, the data stream is transferred from MIPI to the USB3.0 interface.

The camera and its multiple applications can be quickly accessed using Event-Based Vision software Metavision® Intelligence from PROPHESEE (4.2 onward).

Metavision® Intelligence Studio can be used to control sensor parameters, to visualize and record data. In addition, users can easily start developing from an extensive set of algorithms tested with this camera.

In addition to a USB Type-A connector for power and data, the EVK5 – HD provides a dedicated connector to allow triggering and synchronization with compatible hardware.

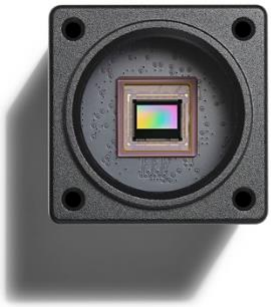


Figure 1 - EVK5 – HD (CS-Mount optics)

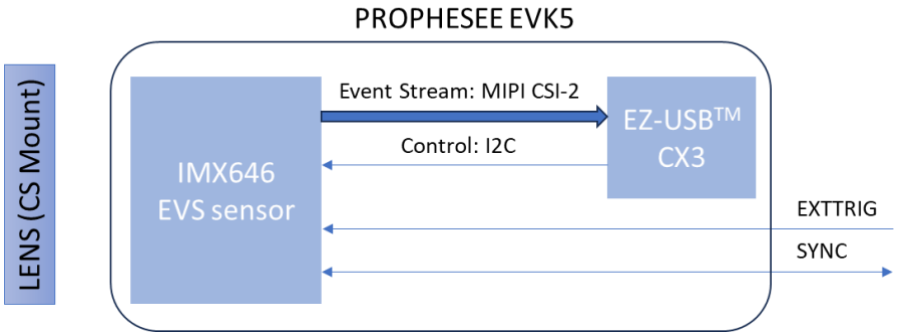


Figure 2 – Block Diagram

2. SPECIFICATIONS

1. General Specification

Event Based Sensor	**Model**	IMX646 realized in collaboration between Sony and Prophesee
	Resolution (H x V Pixels)	HD: 1280 x 720
	Sensor format	½.5"
	Pixel size	4.86um x 4.86um
	Aspect Ratio	16 / 9
	Sensor diagonal	7.14 mm
	High Dynamic Range	110dB
	Pixel Typical Latency	800us
	Nominal contrast threshold	25%(In)
	Maximum ReadOut throughput	3 Gevents/s
Output	**Interface (event data & control)**	USB 3.0 Vendor ID: 0x04b4 Product ID: 0x00c4
	Raw format	EVT2.1/ EVT3 (default)
	Max Camera Bandwidth	1.6 Gbps
	Interface (Sync/Trigger)	
Camera	**Lens mount type**	CS Mount
	Dimensions (W-H-D) w/o lens	35mmx35mmx35.27mm
	Weight	95g +/- 2g (excluding optics)
	Accessories	1x USB-A to USB-A, 1x CS to M12 adapter, 1x transformer bracket with tripod screw hole, 1x EVS Trigger Cable.
	Power consumption	617mW (Typ), 750mW (Max)
Optic	**Model**	SE1-SA-USB-H130LC
	Focal Length	2.6mm
	F/NO	2.0-C
	H-FOV	134.2°
	V-FOV	72.6°
	D-FOV	158.9°
	Focus distance	0.3m
	Mount	CS-Mount
Software	Prophesee Metavision® Intelligence Suite 4.2 onward Evaluation version available on Linux Ubuntu 20.04 and 22.04 64-bit and Windows 10 64-bits.	

2. Electrical Specifications

		Min	Typ	Max
V_{in}	**Input Supply Voltage**	4.5V	5.0V	5.5V
V_{IL}	**Input Low Voltage SYNC In, EXTTRIG, TDRSTN**		0V	0.8V
V_{IH}	**Input High Voltage SYNC In, EXTTRIG, TDRSTN**	2.2V		3.3V
V_{OL}	**Output Low Voltage SYNC Out**			0.4V
V_{OH}	**Output High Voltage SYNC Out**	2.9V		
I_{IH}	**Input High Current EXTTRIG, TDRSTN**	0.1mA		
I_{OL} /I_{OL}	**Source/Sink Current SYNC ***			+/-0.02mA

* Sync is a bidirectional signal using an auto direction sense level shifterwith a limited drive strength buffer (designed to drive capacitive loads of up to 70pF).

3. Mechanical specifications

Prophesee EVK5 - HD evaluation kit is easy to embed with 4x M3 on the front (hole depth 3mm) + 2x M3 fixing point on the top (hole depth 3mm) + 2x M3 fixing point on the bottom (hole depth 3mm) + 2x M3 H2.5 fixing points at the back (hole depth 5mm).

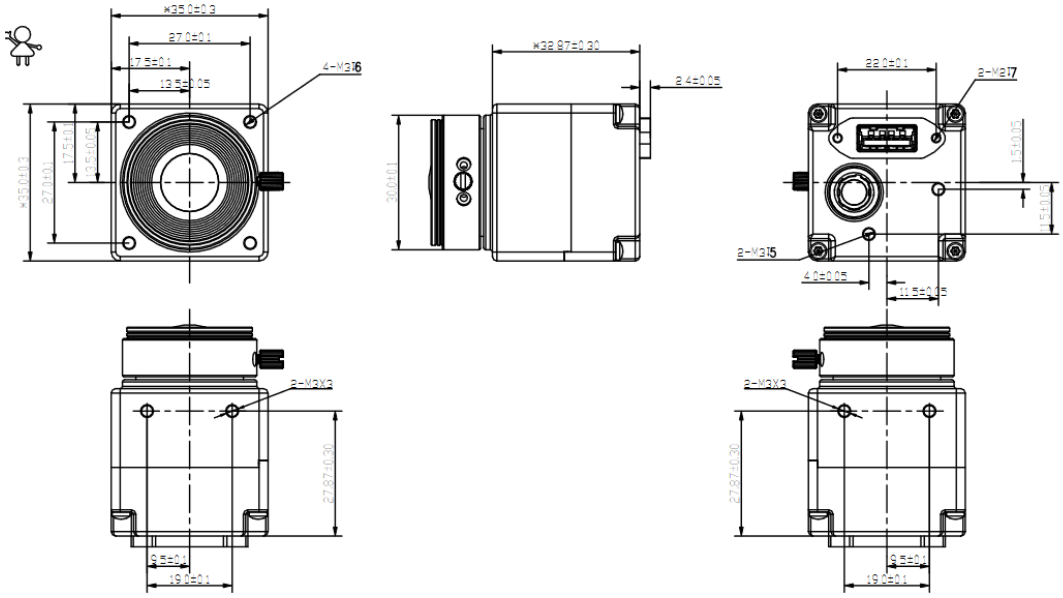


Figure 3 – EVK5 Mechanical drawing

A transformer bracket with 2x tripod screw holes can be attached to the camera. The screw thread sizes correspond to the Unified Thread Standard (UTS) 1/4-20 UNC and 3/8-16 UNC. Two M3 H2.5 screws to attach the transformer to the camera are part of the delivery.

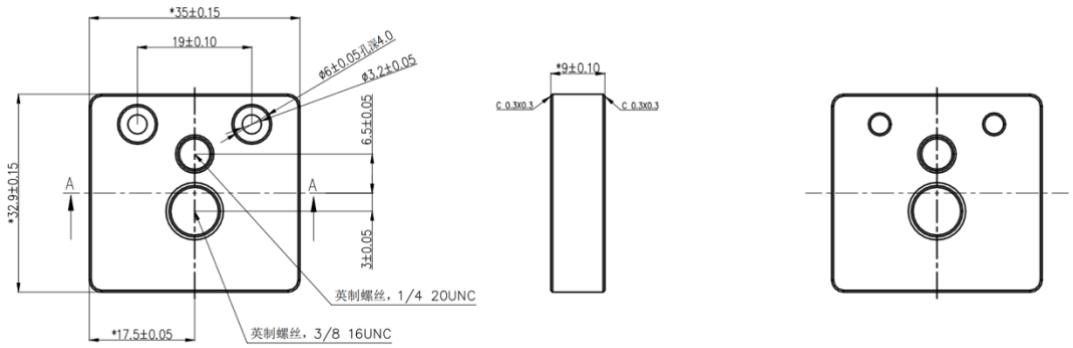


Figure 4 – Transformer bracket

It is possible to adapt the CS-mount to M12-mount by using an adapter with external threading and locking provided with the camera. Further details of mechanics and lens holders can be found in the Prophesee Knowledge Center.

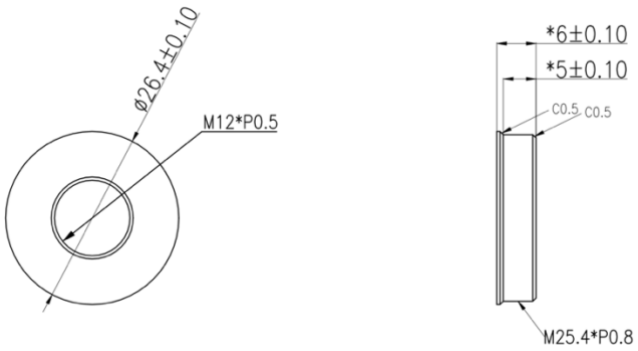


Figure 5 – CS-mount to M12-mount adapter.

3. REQUIREMENTS

1. Electrical requirements

The EVK5 - HD is bus powered from the USB 3.0 Type-A connector from the host PC. The user must ensure the USB port of the host PC is USB 3.0 SuperSpeed compatible to provide the necessary communication bandwidth and power.

Input voltage	5V +/- 0.5V (From USB connector)
Max Input current:	150 mA
Input current (standby)	95 mA
Input current (streaming 20 Mev/s)	125mA

2. Environmental requirements

The camera has been designed to endure IEC certifications (T° / Heat / Shocks / Electrostatic discharge).

Operating temperature	-30°C ~ +70°C
Storage temperature	-40°C ~ +85°C
Operating humidity range	0 - 80%, relative, non-condensing
Storage humidity range	0 - 80%, relative, non-condensing

The camera is RoHS compliant and passed the following certifications:

3. Software requirements Installation requirements:

- For Linux, Administrator rights (sudo account)
- Internet access (to install dependencies)

The EVK can be operated via Prophesee's Metavision® Intelligence Suite. The software can be downloaded following the instructions at https://www.prophesee.ai/metavision-intelligence/

4. INTERFACES

1. USB interface

The EVK5 - HD provides a USB Type-A connector USB 3.0 interface. It is compliant with USB 3.0 specification 1.0. The camera can operate with a compatible USB-A to USB-A cable connected in either orientation. In addition, two threaded holes are provided on the camera body to securely attach compatible USB cables.

2. Synchronization signals

The EVK5 – HD provides dedicated timing interfaces for multi-sensor synchronization with compatible hardware. These interfaces are provided to the user using an HR10 SERIES CONNECTOR.

Pin No.	Signal	Color	I/0	Signal description
1	EXTTRIG	Red	I	External trigger
2	SYNC	Yellow	I/O	Synchronization
3	Ground	Black	GND	No Use
4	TDRSTN	White	I	TD pixel matrix reset

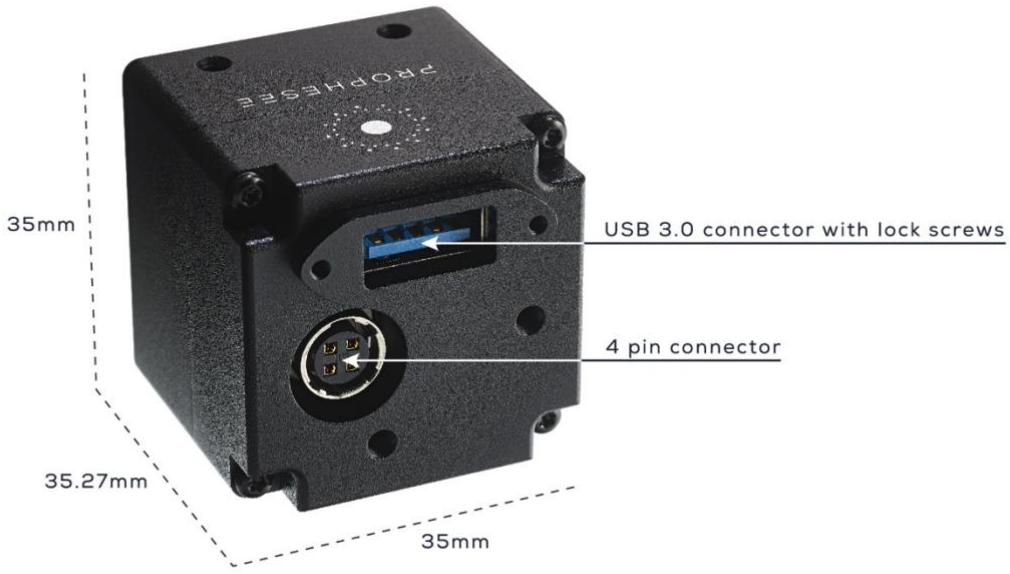


Figure 6– EVK5 dimensions.

The SYNC signal used in input allows a signal source to be connected to the EVK with which the event time base can be synchronized.

This synchronization input can be used in situations where multiple event-based data streams are merged to ensure that time bases are synchronized between sensors. Typically, this signal would be provided as a 1MHz pulse train to correspond to the internally generated 1µs timestamp resolution.

The SYNC signal used In output can be controlled by the user in their application.

Typically, SYNC can be connected to the SYNC connection of another EVK from Prophesee. The SYNC can be configured by software on the master EVK to produce a 1MHz pulse train that is received by the SYNC connection of another EVK. This allows the timestamping of the two event-streams to be synchronized.

Receptacle (EVK5)	HR10 SERIES CONNECTOR [HR10A-7R-4SB(74): HIROSE]
Plug (either for use)	HR10A-7P-4P(74) (HIROSE)
Cable (UTP Cable*)	Cable diameter Φ5mm AWG#26, Core cable diameter Φ0.95~1.05

1. Setup

Once the EVK5 – HD is connected to a host PC, power is supplied via USB and the EVK will initiate enumeration with the host PC. All EVK control and data transfer is made via this USB 3.0 connection. The EVK5 - HD is based on a CX3 controller from Infineon. The VID and PID of the camera refer to this device.

The success of the enumeration can be verified using the lsusb utility on Linux platform. The result of the command is shown below:

$ lsusb

Bus 002 Device 002: ID 04b4:00c4 Cypress Semiconductor Corp.

On Windows, success of the enumeration can be verified by launching “Device Manager” from start menu, and clicking on EVK5 in the “Universal Serial Bus devices” item:

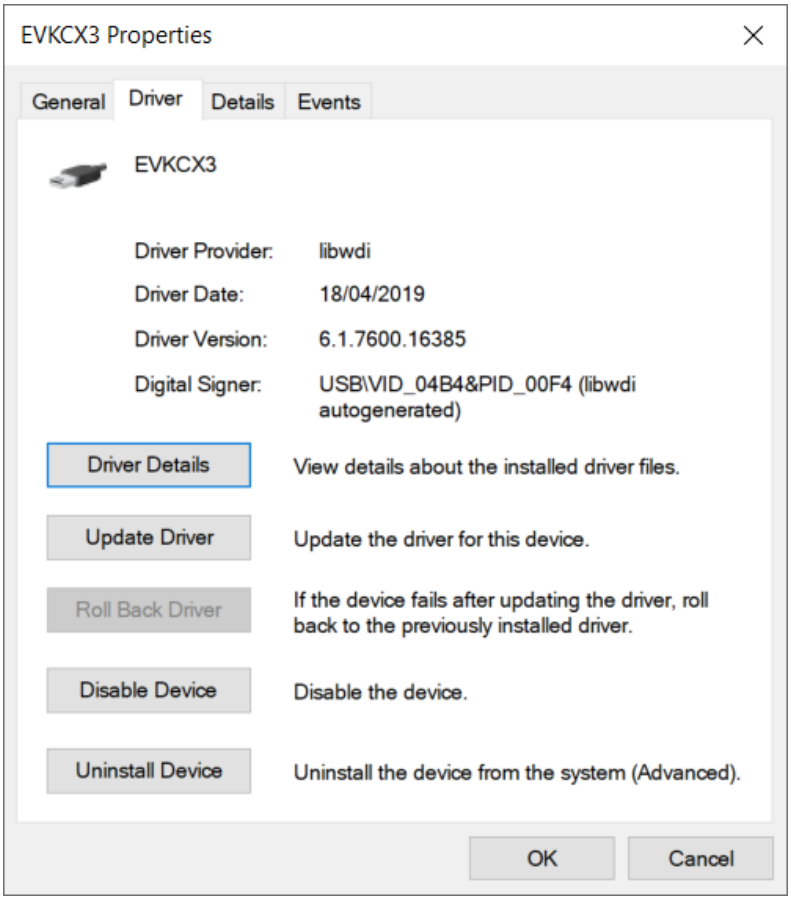


Figure 7– EVK5 driver signature on Windows.

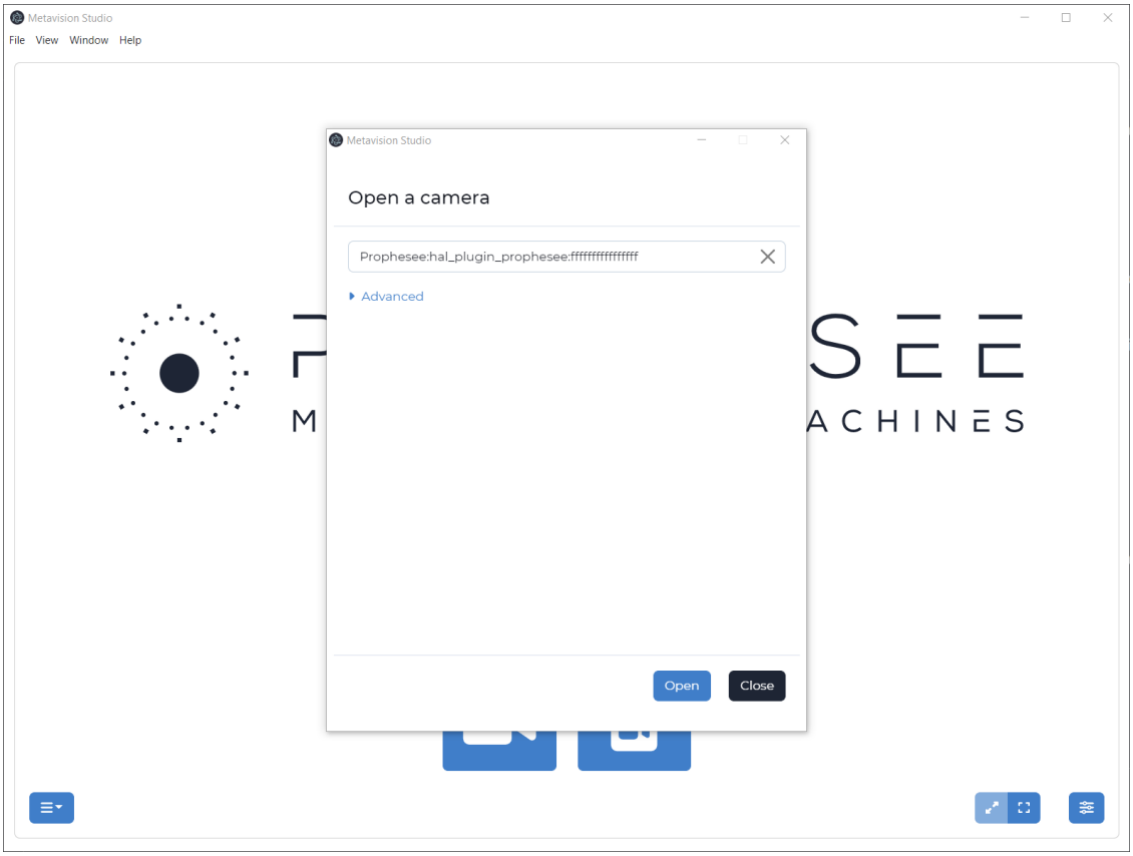


Figure 8– Automatic camera detection using Metavision Studio.

Metavision Studio is an ideal tool to start with and is part of the Prophesee's Metavision® Intelligence Suite. It features a Graphical User Interface allowing users to visualize and record data streamed by Prophesee-compatible event-based vision systems. You can visualize the events, adjust the display parameters and tune all the camera settings. As illustrated below, the command metavision_platform_info returns system information that can be communicated to support@prophesee.ai in case of difficulties:

```
####  SYSTEMS AVAILABLE  ####

## Prophesee IMX646 HD ##

# System information
Available Data Encoding Formats                 EVT3,EVT21
Connection                                      USB
Current Data Encoding Format                    EVT3
EVKCX3 Build Date                               Wed Jul  5 19:12:50 2023
EVKCX3 Release Version                          3.11.0
EVKCX3 Speed                                    5000
Integrator                                      Prophesee
Sensor Name                                     IMX646
Serial                                          ffffffffffffffff
SystemID                                        53
device0 compatible                              psee,ccam5_imx646
device0 name                                    CCam5 Imx646 Event-Based Camera
device1 compatible                              ti,tmp103
device1 name                                    Temperature sensor

# Available device config options
format                                          default: EVT3 values: EVT3 | EVT21
ll_biases_range_check_bypass                    default: 0 values: true | false


# Default Biases
bias_diff                                       0
bias_diff_off                                   0
bias_diff_on                                    0
bias_fo                                         0
bias_hpf                                        0
bias_refr                                       0
```

5. LINKS AND RELATED INFORMATION

Access your online EVK5 Quickstart to get all the information you need to get started: https://www.prophesee-cn.com/en/quickstart/.

Metavision® Intelligence software can be downloaded following the instructions at https://www.prophesee.ai/metavision-intelligence-sdk-download/

Metavision® Intelligence software documentation is available online at https://docs.prophesee.ai/stable/index.html

Product information and support is available at https://support.prophesee.ai/

Prophesee Development Center is community page where Engineers and Researchers can share EB projects, resources, news update and more:
https://www.prophesee.ai/development-center/

6. COPYRIGHT