FireWire

OPERA Series
Hardware Manual

Alkeria Opera OEM - IEEE-1394 digital camera module

Thank you for buying an Alkeria product.

This manual will guide you through using the camera module, including electrical connections, enclosure requirements and assembly options.

Please read this manual carefully before using your new camera.

OPERA OEM Specifications

	OPERA 414	OPERA 205	OPERA 285	OPERA 274
Sensor Type	CCD 1/2" 0.33 MegaPIXEL (SONY ICX414AQ)	CCD 1/2" 1.3 MegaPIXEL (SONY ICX205AK)	CCD 2/3" 1.3 MegaPIXEL (SONY ICX285AQ)	CCD 1/1/8" 2 MegaPIXEL (SONY ICX274AQ)
Cell Size	9.9 µm x 9.9 µm	4.65 µm x 4.65 µm	6.45 µm x 6.45 µm	4.4 µm x 4.4 µm
FWC	27000 e^-	10000 e^-	18000 e^-	9000 e^-
A/D Conversion	14 bits per pixel	14 bits per pixel	14 bits per pixel	14 bits per pixel
Interface	IEEE 1394 FIREWIRE DCAM V1.30	IEEE 1394 FIREWIRE DCAM V1.30	IEEE 1394 FIREWIRE DCAM V1.30	IEEE 1394 FIREWIRE DCAM V1.30
Transfer Rate	400 Mb/s	400 Mb/s	400 Mb/s	400 Mb/s
Data Format	RGB 24 bit YUV 4:2:2	RGB 24 bit YUV 4:2:2	RGB 24 bit YUV 4:2:2	RGB 24 bit YUV 4:2:2 / YUV 4:1:1
IR Filter Cutoff	700 nm	700 nm	700 nm	700 nm
Colour Processing	BAYER CFA on-board processing greatly reduces CPU load and yields unparelled chromatic results	BAYER CFA on-board processing greatly reduces CPU load and yields unparelled chromatic results	BAYER CFA on-board processing greatly reduces CPU load and yields unparelled chromatic results	BAYER CFA on-board processing greatly reduces CPU load and yields unparelled chromatic results
Resolution	Up to 640 x 480	Up to 1360 x 1036	Up to 1360 x 1036	Up to 1600 x 1200
Lens Adapter	C-mount standard	C-mount standard	C-mount standard	C-mount standard
Controls	Brightness, contrast, saturation, hue, white balance (auto/man), shutter (auto/man), gain	Brightness, contrast, saturation, hue, white balance (auto/man), shutter (auto/man), gain	Brightness, contrast, saturation, hue, white balance (auto/man), shutter (auto/man), gain	Brightness, contrast, saturation, hue, white balance (auto/man), shutter (auto/man), gain
Power Supply	8-35V through IEEE 1394 cable or external power supply device. Max power consumption: 3.5W	8-35V through IEEE 1394 cable or external power supply device. Max power consumption: 3.5W	8-35V through IEEE 1394 cable or external power supply device. Max power consumption: 4.5W	8-35V through IEEE 1394 cable or external power supply device. Max power consumption: 4.5W
Look-Up Table	3 x 2048 Programmable entries (one independent LUT for each color)	3 x 2048 Programmable entries (one independent LUT for each color)	3 x 2048 Programmable entries (one independent LUT for each color)	3 x 2048 Programmable entries (one independent LUT for each color)
Frame Buffer	64 MBytes (optional)	64 MBytes (optional)	64 MBytes (optional)	64 MBytes (optional)
Video Formats	640 x 480 RGB 30 fps 640 x 480 RAW 70 fps 640 x 480 YUV 50 fps	1280 x 960 RGB 7.5fps 1360 x 1036 RGB 7.5fps 1360 x 1036 RAW 12fps 1360 x 1036 YUV 11.75fps 1280 x 960 YUV 10fps	1280 x 960 RGB 7.5fps 1360 x 1036 RGB 7.5fps 1360 x 1036 RAW 15fps 1360 x 1036 YUV 11.75fps	1600 x 1200 RGB 6fps 1600 x 1200 YUV 8.2 fps
Shutter Control	100µs to 4 sec, 100µ steps	100µs to 4 sec, 100µ steps	100µs to 4 sec, 100µ steps	100µs to 4 sec, 100µ steps
I/O	4 general purpose IN + 4 general purpose OUT. Also available as Trigger Inputs or Sync Outputs	4 general purpose IN + 4 general purpose OUT. Also available as Trigger Inputs or Sync Outputs	4 general purpose IN + 4 general purpose OUT. Also available as Trigger Inputs or Sync Outputs	4 general purpose IN + 4 general purpose OUT. Also available as Trigger Inputs or Sync Outputs
Dimensions	55 mm x 55 mm x 32 mm (LxWxH OEM board version, no lens)	55 mm x 55 mm x 32 mm (LxWxH OEM board version, no lens)	55 mm x 55 mm x 32 mm (LxWxH OEM board version, no lens)	55 mm x 55 mm x 32 mm (LxWxH OEM board version, no lens)

Mechanical Description

Your camera module is composed by two stacked PCB (the camera *body*) and a smaller PCB (the camera *head*), connected by a FFC (flat flexible cable).

The PCB mechanical dimensions are shown in the following picture:

- Body Dimensions: 55mm X 55mm , height:15mm (0.6")
- Head Dimensions: 40mm X 50mm , height:9mm (0.36")

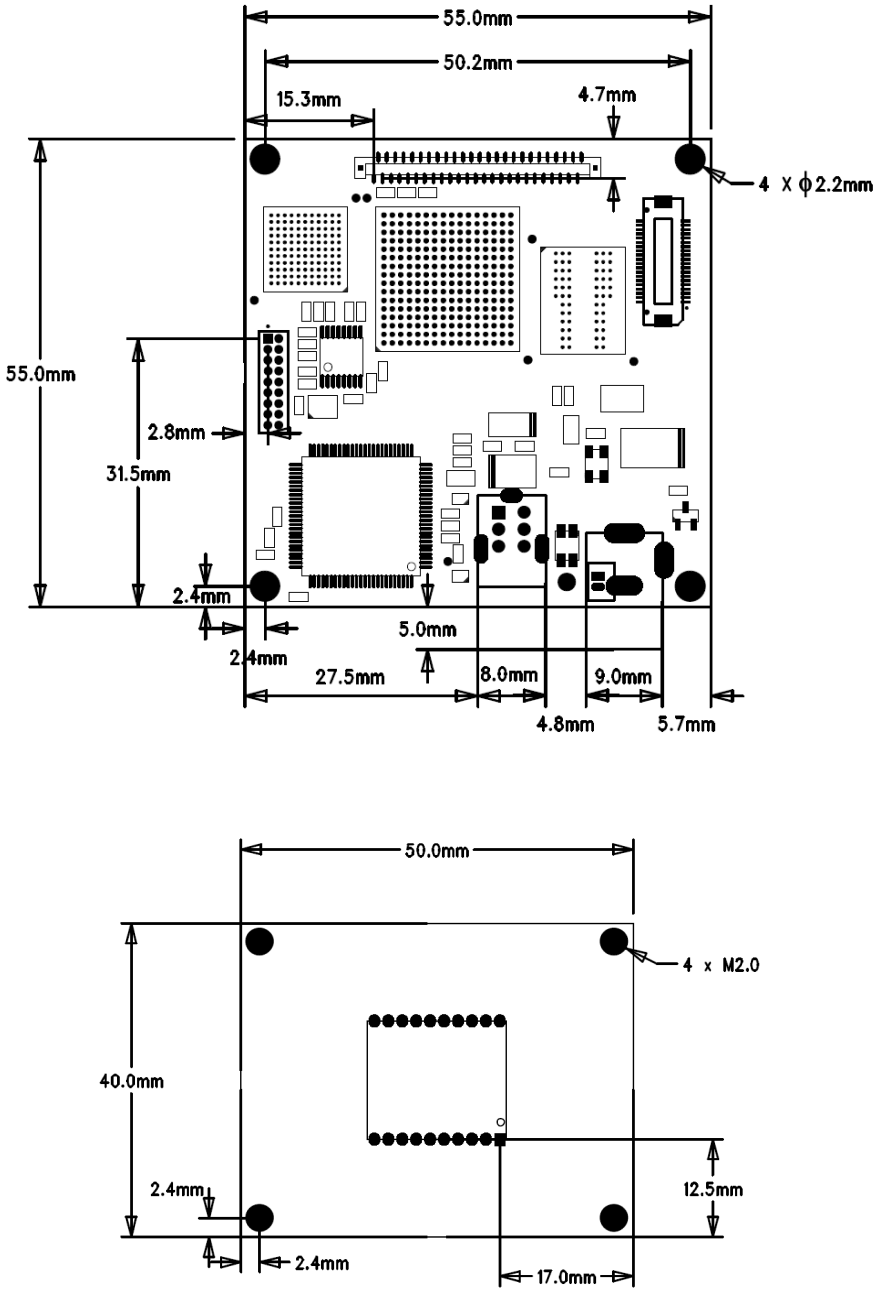

Fig.1 Boards Layout

IEEE-1394 pinout

Opera cameras can be interfaced to a controlling PC via the onboard six poles IEEE-1394 socket (J5). As stated in the IEEE-1394a specification, the IEEE-1394 cable can be live inserted without causing problems to the PC or to the camera.

Even if the six poles IEEE-1394 connector is designed to provide both power and data connection between your Opera camera and the PC, some applications may require an alternate power supply source. This is what usually happens when a camera is connected to a laptop computer. When power supply is not available via the IEEE-1394 connector, an auxiliary power supply jack socket is provided (J6).

Two I/O connectors (J2 and J3) are located on the top of the camera. The default camera configuration provides four user inputs and four user outputs. The camera can be factory configured to have six user inputs and two outputs on request.

Connector locations are shown in figure 2

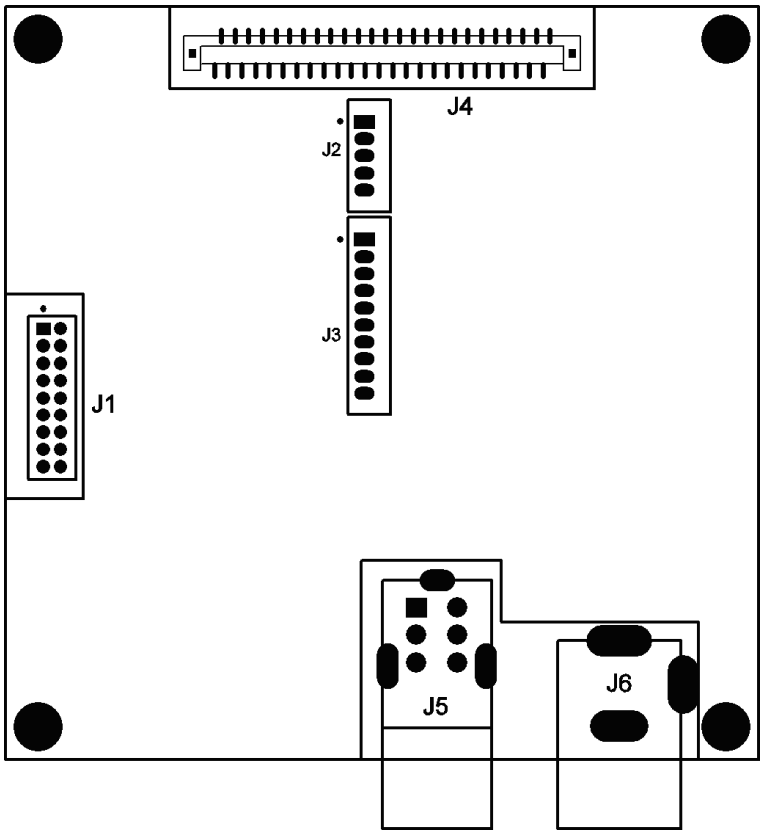

Fig.2 Connector Locations

IEEE-1394 port pin assignment (J5)

The IEEE-1394 plug is designed to comply IEEE-1394a specification and is well suited for industrial use. The connector pinout is shown in table 1. As you can note from figure 3, power supply gets connected first and disconnected last during male connector operation, due to the female plug having data contacts shorter than power ones.

This allows for full *plug and play* capability of the IEEE-1394a interface.

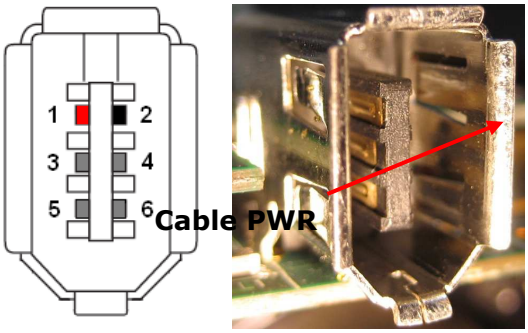

Fig.3 IEEE-1394 Connector Pinout

PIN	SIGNAL	PIN	SIGNAL
1	Cable PWR	4	TPB+
2	Cable GND	5	TPA-
3	TPB-	6	TPA+

Tab.1 IEEE-1394 Power Connections

Auxiliary power plug (J6)

When no power is available via the six poles IEEE-1394a connector, the power can be supplied using the ancillary power plug. An AC power supply adapter providing stabilized 12VDC/500mA output must be used. The required power supply must have a low residual ripple (less than 1%) and be provided with a 6.3 mm jack (positive pole located insidewards).

Please refer to figure 4 for the correct jack choice.

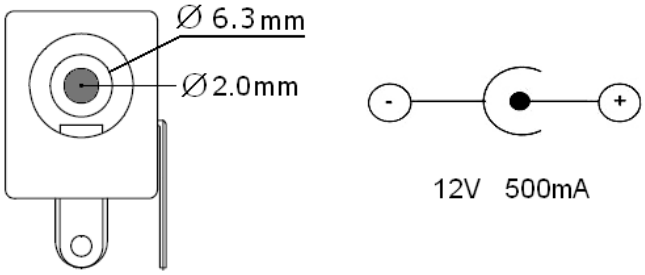

Fig.4 Power Jack

⚠	**SAFETY WARNING:** the external AC adapter must be a double isolation type. These can be easily identified by having only TWO AC power connectors and NO GROUND connection. Be sure to check the presence of the double isolation symbol shown in figure 5 on the adapter before connecting it to the camera. Ignoring these warnings may result in severe personal injury.
⚠	**WARNING:** reversing power supply polarity may damage permanently your Opera camera. Please double check your cable polarity if you use an external AC adapter.

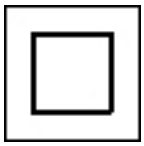

Fig.5 Double Isolation Symbol

I/O Connectors

Opera cameras are equipped with 4 user inputs and 4 user outputs which can be accessed through 2 connectors (J2, Molex-type 53047-0510 (J2) and J3, Molex-type 53047-1010), located on the top side of the camera. Please use Molex type 51021 as mating connectors. Both inputs and outputs are optoisolated to prevent damages to the camera. See Table 2 and Figures 6,7 for input/output port pin assignments.

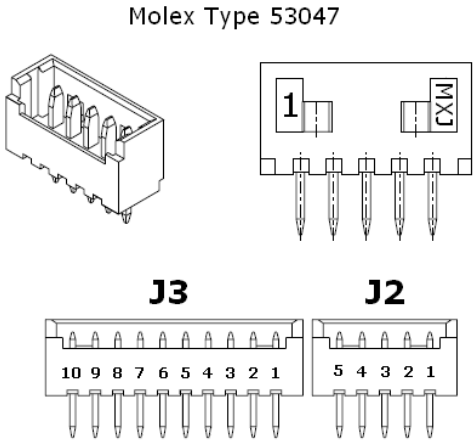

Fig.6 I/O Connectors

PIN J2	SIGNAL	PIN J3	SIGNAL
1	DIN4	1	DIN3
2	DIN5	2	DIN2
3	EXTGND	3	DIN1
4	PWR IN	4	DIN0
5	GND	5	EXTGND
		6	VEXT
		7	DOUT3
		8	DOUT2
		9	DOUT1
		10	DOUT0

Table 2 J2/J3 Pin assignment

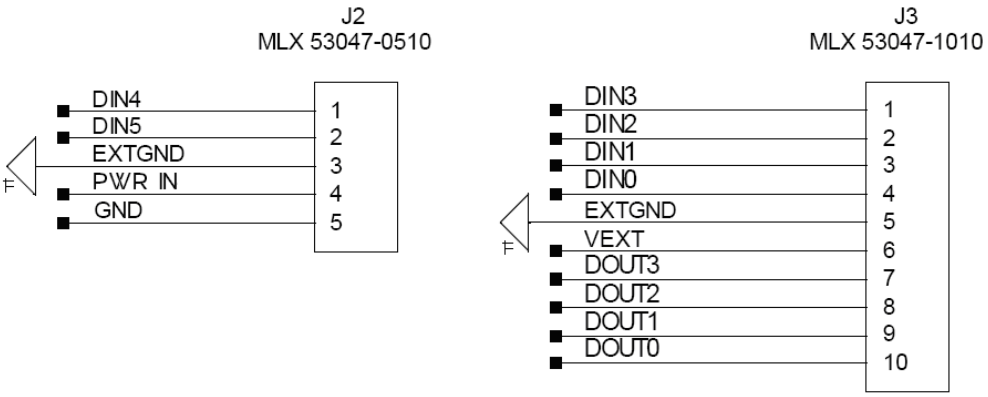

Fig. 7 Input/Output Connections

Input port operations

Alkeria Opera cameras are equipped with 4 user input ports named DIN0, DIN1, DIN2 and DIN3. Figures 7 and 8 show input schematics and connections.

As a factory configuration option, Opera can feature 2 extra inputs (DIN4 and DIN5); configuring this option disables DOUT2 and DOUT3.

Please note that the input photodiode nominal ON current is 10mA (5mA minimum). Input currents exceeding 15mA may permanently damage your Opera camera.

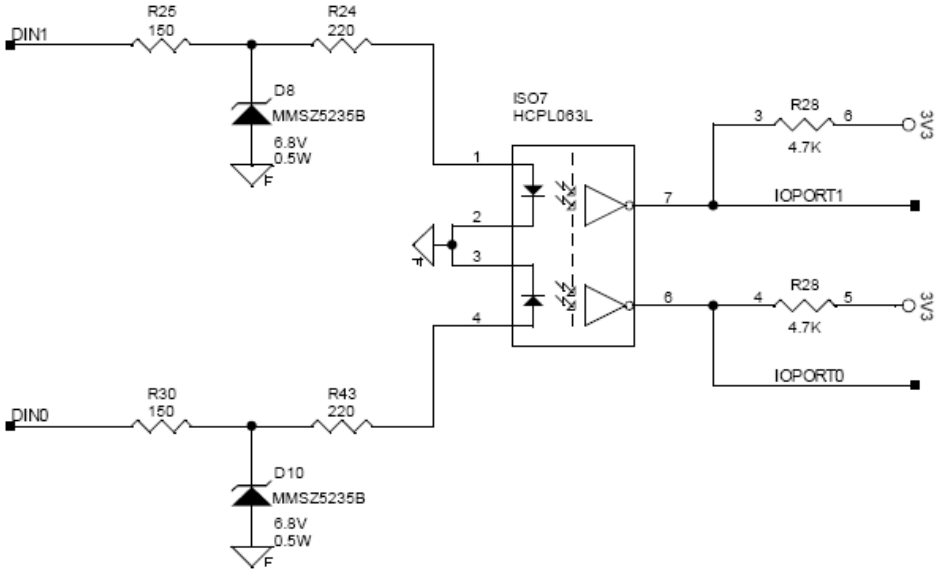

Fig. 8 Input Port Schematic

Output port operations

Alkeria Opera cameras are equipped with 4 user output ports named DOUT0, DOUT1, DOUT2 and DOUT3. The output ports can be accessed via the J3 connector. Figures 7 and 8 show input schematics and connections. Please note that DOUT2 and DOUT3 are not available when DIN4 and DIN5 are factory-enabled.

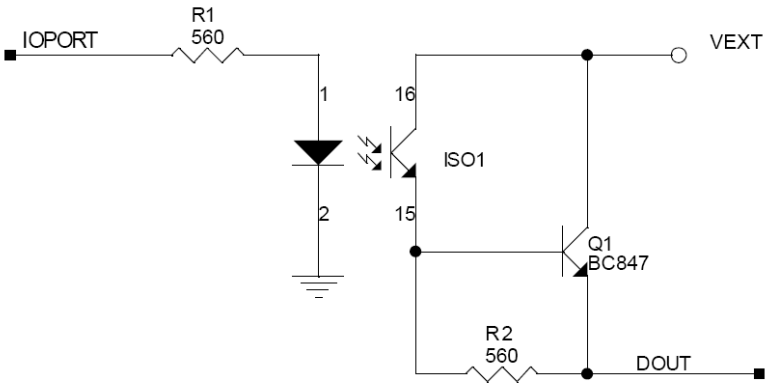

Fig. 9 Output Port Schematic

Output ports feature an optoisolated open-emitter topology.

Internal output transistors require a 2VDC minimum external supply voltage (VEXT) and can withstand a maximum forward voltage of 35 V. The maximum current delivered to the load cannot exceed 100mA per output.

Reversing supply polarity may severely damage your camera. Since the absolute maximum reverse voltage is 6VDC, be sure to protect your outputs through a clamp diode when you drive inductive loads.

⚠	**WARNING:** Exceeding input or output absolute maximum voltage/current ratings can damage your Opera camera input and output ports.

Status Leds

Alkeria Opera cameras are equipped with a dual color LED showing the current camera status. The green light shows that the camera is powered on and idle. The orange light shows that your camera is sending frames to the controlling PC.

A blinking red light indicates a temporary communication problem (such as a missing packet) between your camera and the PC.

A permanent red status light indicates a hardware camera failure. If your status light is permanently red you must return your camera back to Alkeria for service.

	**WARNING:** The camera performs a self check when powered. The status flashes shortly red during powerup and then becomes green only after the self-check is passed. This is the normal camera operation and the short red flash does not mean that your camera needs assistance.

Assembling the camera

Opera OEM cameras have been especially designed to address the most demanding industrial and scientific applications and must be carefully installed to achieve the best results. Opera cameras have a small detachable sensor head designed to meet tight space constraints. Camera head is only 50mm x 40mm wide and can easily fit into very small spaces. If your application requires smaller device, don’t hesitate to contact Alkeria offices: our technicians will be glad help you solve your problem.

Sensor Head

Sensor head and camera body are connected through a 50-poles FFC (flat flexible cable). The standard cable length is 70 mm. Other lengths are available on request.

To ease the mounting, camera head can be detached from the body by carefully unlocking the FFC connector retention clip.

	**WARNING:** Unlocking the cable connector clip requires extreme care and trained personnel. Be sure that the camera is unplugged from any power source and that the IEEE1394 cable is not plugged in. Gently slip your nail under the brown connector clip and move your finger from side to side making a VERY LIGHT pressure to allow the lock mechanism to release. Once unlocked, the cable can be easily slipped off. If you disregard these instructions, you will permanently damage your camera

If this operation worries you, don't hesitate to contact Alkeria for assistance.

Head mounting

For proper operation, sensor head must be fastened using four M2x4 screws.

The camera head enclosure must have an internal Cu-Be spring touching the gold plated pad on the PCB front side (see fig. 10).

Please consider using a very conductive material for the head enclosure and keep it in perfect electrical contact with the gold plated pad.

When using aluminium, please remember that raw Al is quickly oxided, and Al-oxide is an excellent insulator. Use a conductive surface finishing (e.g. Alodine) to keep Al surfaces conductive over time.

Please note that anodized aluminium surfaces are likewise non-conductive.

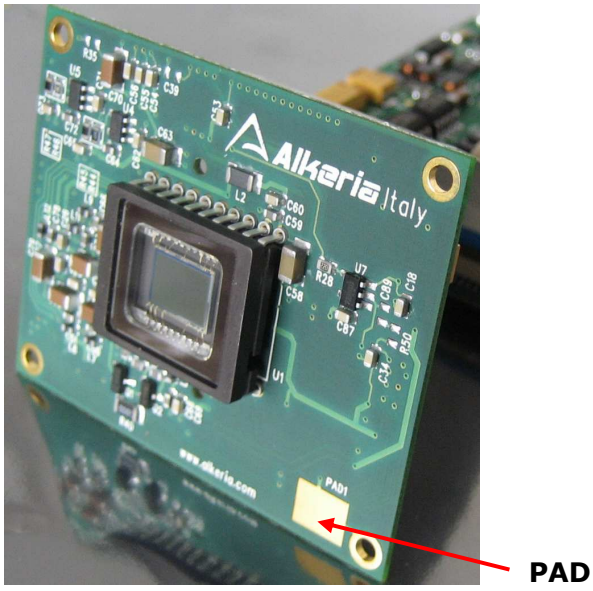

Fig. 10 Gold plated pad

Optional filter and C-Mount assembly

Opera cameras can be supplied with optional C-mount and IR-cutoff filter.

C-mount is a standard ¾" threaded mount widely used for industrial lenses and microscope adapters. Please contact Alkeria for further assistance.

Warranty terms and conditions

Alkeria warrants to the Original Purchaser that the Camera Module provided with this package is guaranteed to be free from material and manufacturing defects for a period of one (1) year. Should a unit fail during this period, Alkeria will, at its option, repair or replace the damaged unit. Repaired or replaced units will be covered for the remainder of the original equipment warranty period. This warranty does not apply to units that, after being examined by Alkeria, have been found to have failed due to customer abuse, mishandling, alteration, improper installation or negligence.

Waste handling information

The symbol on the product or on its packaging indicates that this product may NOT be treated as household waste. Instead it should be handed over to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.

For more detailed information about recycling of this product, please contact your local civic office, your household waste disposal service or the supplier where you purchased the product.

Technical/Sales Assistance

If you have any technical question, please call ALKERIA Customer Support Service!

Our technical support team can be contacted via:

Email: support@alkeria.com

Phone: +39-050-778060

Fax: +39-050-769112

Visit our web site http://www.alkeria.com for additional and up-to-date information.