



**Small - simple - ingenious:  
Analog goes Guppy**

## Guppy F-033 B/C

## Guppy F-036 B/C

## Guppy F-038 B/C

<b>Image device</b>	Type 1/3 (diag. 6 mm) progressive scan SONY IT CCD ICX424AL/AQ	Type 1/3 (diag. 5.35 mm) progressive scan CMOS Micron/Aptina MT9V022	Type 1/2 (diag. 8 mm) interlaced SONY CCD ICX418ALL/AKL
<b>Picture size</b>	656 (H) x 494 (V) (full frames)	752 (H) x 480 (V)(full frames)	768 (H) x 492 (V) (full frames)
<b>Cell size</b>	7.4 µm x 7.4 µm	6 µm x 6 µm	8.4 µm x 9.8 µm
<b>Resolution depth</b>	8 bit (10 bit ADC)	8 bit (10 bit ADC)	8 bit (12 bit ADC)
<b>Lens mount</b>	C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)
<b>Digital interface</b>	IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port
<b>Transfer rate</b>	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s
<b>Frame rates</b>	Up to 58 fps (full frames)	Up to 64 fps (full frames)	Up to 30 fps (60 fields per second)
<b>Gain control</b>	Manual: 0 - 24 dB, auto gain (select. AOI)	Manual: 0 - 24 dB, auto gain	Manual: 0 - 24 dB, auto gain
<b>Shutter speed</b>	129 µs ... 67s, auto shutter (select. AOI)	179 µs ... 979 ms	62 µs ... 67s, auto shutter (select. AOI)
<b>External trigger shutter</b>	Programmable, trigger level control, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable, programmable trigger delay	Programmable, bulk mode (1 trigger, n shots), programmable trigger delay
<b>Smart features</b>	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	Only b/w: binning (average); b/w and color: AGC (auto gain control), mirror, LUT, 1 config. input, 3 config. out- puts, RS-232 port (serial port, IIDC v.1.31); only color: AWB (auto white balance)	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)
<b>Power requirements</b>	DC 8 V – 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V – 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V – 36 V via IEEE 1394 cable or 8-pin HIROSE
<b>Power consumption</b>	Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)
<b>Dimensions</b>	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens
<b>Mass</b>	50 g (without lens)	50 g (without lens)	50 g (without lens)
<b>Operating temperature</b>	+5 ... +45° Celsius without condensation	+5 ... +45° Celsius without condensation	+5 ... +45° Celsius without condensation
<b>Storage temperature</b>	-10 ... +60° Celsius without condensation	-10 ... +60° Celsius without condensation	-10 ... +60° Celsius without condensation
<b>Regulations</b>	CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)
<b>Options</b>	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux

### Go digital! Now it's easier than ever

Getting started with digital image processing has never been so simple or cost-effective as it is now. With the Guppy, Allied Vision Technologies is presenting a whole range of digital cameras in the FireWire category. Their most striking feature is their outstanding value for money and the way they make the transition from analog to digital image processing even more attractive. Allied Vision Technologies can supply users with a range of products that meet almost all the requirements of a very wide range of image applications, a range that must surely be the most significant pioneer worldwide of FireWire camera technology in industrial and scientific image processing.

### FireWire – the new standard for image processing

The digital connection technology presented to the computer industry by Apple as long ago as 1994 is now marching triumphantly forward through industrial image processing. The industry standard designated as IEEE 1394 (FireWire™ or i.Link™) facilitates the simplest computer compatibility and bi-directional data transfer using the plug & play process. Further development of the IEEE 1394 standard has already made 800 Mbit/second possible - and the FireWire roadmap is already envisaging 1600 Mbit/second, with 3.2 Gbit/second as the next step. Investment in this standard is therefore secure for the future; each further development takes into account compatibility with the preceding standard, and vice versa, meaning that

IEEE 1394b is reverse-compatible with IEEE 1394a. Your applications will grow as technical progress advances.

### The Guppy family at a glance

The AVT Guppy family's distinguishing features are an IEEE 1394 interface and an extremely compact design. It consists of ten different camera variants (each in b/w and in color) and represents the ideal solution with its extremely diverse range of sensors and bandwidths for virtually every imaginable application. The Guppy is available in a choice of a housing and a circuit-board version (on request), and can therefore find room for itself even in the smallest space. A choice of high-quality, high-sensitivity sensors (CCD and CMOS) help the Guppy to achieve outstanding image quality and color

<b>Guppy F-038 B/C NIR</b>	<b>Guppy F-044 B/C</b>	<b>Guppy F-044 B/C NIR</b>	<b>Guppy F-046 B/C</b>
Type 1/2 (diag. 8 mm) interlaced SONY CCD 428ALL/AKL	Type 1/2 (diag. 8 mm) interlaced SONY CCD 419ALL/AKL	Type 1/2 (diag. 8 mm) interlaced SONY CCD ICX429ALL/AKL	Type 1/2 (diag. 8 mm) progressive scan, SONY CCD415AL/AQ
768 (H) x 492 (V) (full frames)	752 (H) x 580 (V) (full frames)	752 (H) x 580 (V) (full frames)	Up to 780 (H) x 582 (V)
8.4 µm x 9.8 µm	8.6 µm x 8.3 µm	8.6 µm x 8.3 µm	8.3 µm x 8.3 µm
8 bit (12 bit ADC)	8 bit (12 bit ADC)	8 bit (12 bit ADC)	8 bit (12 bit ADC)
C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)
IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port
100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s
Up to 30 fps (60 fields per second)	Up to 25 fps (50 fields per second)	Up to 25 fps (50 fields per second)	Up to 49.4 fps (full frames)
Manual: 0 - 24 dB, auto gain	Manual: 0 - 24 dB, auto gain	Manual: 0 - 24 dB, auto gain	Manual: 0 - 24 dB, auto gain (select. AOI)
62 µs ... 67s, auto shutter (select. AOI)	62 µs ... 67s, auto shutter (select. AOI)	62 µs ... 67s, auto shutter (select. AOI)	42 µs ... 67s, auto shutter (select. AOI)
Programmable, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable, trigger level control, bulk mode (1 trigger, n shots), programmable trigger delay
AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)
DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE
Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)
48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens
50 g (without lens)	50 g (without lens)	50 g (without lens)	50 g (without lens)
+5... +45° Celsius without condensation	+5... +45° Celsius without condensation	+5... +45° Celsius without condensation	+5... +45° Celsius without condensation
-10... +60° Celsius without condensation	-10... +60° Celsius without condensation	-10... +60° Celsius without condensation	-10... +60° Celsius without condensation
CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)
Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux

faithfulness. Two additional interlaced versions (EIA and CCIR) make it even more attractive to change from analog to digital image processing. Because of its modularity and its remarkable value for money, the Guppy is the ideal point of entry into digital image processing for many applications.

#### Guppy highlights

- Guppy F-033B/C  
Type 1/3 (diag. 6 mm) progressive scan;  
SONY CCD; 656 (H) x 494 (V); up to 58 fps \*)
- Guppy F-036B/C  
Type 1/3 (diag. 5.35 mm) progressive scan;  
CMOS MT9V022; 752 (H) x 480 (V); up to 64 fps\*)

- Guppy F-038 B/C  
Type 1/2 (diag. 8 mm) interlaced SONY HAD CCD; 768 (H) x 492 (V); up to 30 fps \*)
- Guppy F-038 B/C NIR  
Type 1/2 (diag. 8 mm) interlaced SONY EXview HAD CCD; 768 (H) x 492 (V); up to 30 fps \*)
- Guppy F-044 B/C  
Type 1/2 (diag. 8 mm) interlaced SONY HD CCD 752 (H) x 580 (V); up to 25 fps \*)
- Guppy F-044 B/C NIR  
Type 1/2 (diag. 8 mm) interlaced SONY EXview HAD CCD; 752 (H) x 580 (V); up to 25 fps \*)

- Guppy F-046B/C  
Type 1/2 (diag. 8 mm) progressive scan;  
SONY CCD; 780 (H) x 582 (V); up to 49.4 fps \*)
- Guppy F-080B/C  
Type 1/3 (diag. 6 mm) progressive scan;  
SONY CCD; 1032 (H) x 778 (V); up to 30 fps \*)
- Guppy F-146 B/C  
Type 1/2 (diag. 8 mm) progressive scan; SONY CCD; 1392 (H) x 1040 (V); up to 17.7 fps \*)
- Guppy F-503 B/C  
Type 1/2.5 (diag. 7.13 mm) rolling shutter / global reset release shutter;  
CMOS; 2592 (H) x 1944 (V); up to 6.5 fps \*

\*) full resolution

## Guppy F-080 B/C

## Guppy F-146 B/C

## Guppy F-503 B/C

Type 1/3 (diag. 6 mm) progressive scan, SONY CCD ICX204AL/AK	Type 1/2 (diag. 8 mm) progressive scan SONY CCD ICX267AL/AQ	Type 1/2.5 (diag. 7.13 mm) rolling shutter / global reset release shutter Micron/Aptina CMOS MT9P031	Image device
Up to 1032 (H) x 778 (V)	Up to 1392 (H) x 1040 (V) (full frames)	Up to 2592 (H) x 1944 (V)	Picture size
4.65 µm x 4.65 µm	4.65 µm x 4.65 µm	2.2 µm x 2.2 µm	Cell size
8 bit (12 bit ADC)	12 bit (12 bit ADC)	8 bit (12 bit ADC)	Resolution depth
C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)	C-Mount / CS-Mount (convertible via adapter)	Lens mount
IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port	IEEE 1394a IIDC v. 1.3, single port	Digital interface
100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	100 Mbit/s, 200 Mbit/s, 400 Mbit/s	Transfer rate
Up to 30 fps (full frames)	Up to 17.7 fps (full frames)	Up to 6.5 fps (full frames)	Frame rates
Manual: 0 - 24 dB, auto gain (select. AOI)	Manual: 0 - 24 dB, auto gain (select. AOI)	Manual: 0 - 26 dB, auto gain (select. AOI)	Gain control
54 µs ... 67s, auto shutter (select. AOI)	40 µs ... 67s, auto shutter (select. AOI)	41.8 µs ... ~ 2.3s, auto shutter (select. AOI)	Shutter speed
Programmable, trigger level control, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable, trigger level control, bulk mode (1 trigger, n shots), programmable trigger delay	Programmable; programmable trigger delay	External trigger shutter
AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	AGC (auto gain control), AEC (auto exposure control), only color: AWB (auto white balance), LUT, 1 config. input, 3 config. outputs, RS-232 port (serial port, IIDC v.1.31)	2x - 4x binning or sub-sampling, multi-shot, separate reference AOI for auto features, mirror (vertical and horizontal), blemish correction	Smart features
DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	DC 8 V - 36 V via IEEE 1394 cable or 8-pin HIROSE	Power requirements
Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)	Less than 2 watt (@ 12V DC)	Power consumption
48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	48.2 mm x 30 mm x 30 mm (L x W x H); w/o tripod and lens	Dimensions
50 g (without lens)	50 g (without lens)	50 g (without lens)	Mass
+5 ... +45° Celsius without condensation	+5 ... +45° Celsius without condensation	+5 ... +45° Celsius without condensation	Operating temperature
-10 ... +60° Celsius without condensation	-10 ... +60° Celsius without condensation	-10 ... +60° Celsius without condensation	Storage temperature
CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)	CE, FCC Class B, RoHS (2002/95/EC)	Regulations
Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Board level version, power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Power out (HIROSE), AVT FirePackage / Active FirePackage / Fire4Linux	Options

### The architecture of the Guppy: the maximum range of individual possibilities

The separation from sensor and main boards enables the Guppy series to meet the requirements for a "camera on demand." There are thus virtually no limits to the "design-in" and the scope for adaptation to each application. The highly efficient micro-controller and the FPGA (field-programmable gate array) ensure the swift execution of all camera commands and thus permit an outstanding performance of all functions such as auto white balance or LUT. The Guppy is always up to date. If the application so requires, it can be retrofitted with even larger and more efficient FPGAs, which opens up plenty of scope for additional special functions.

### Interlaced goes digital

Today interlaced sensors can be found almost throughout the analog video and television world; they are probably the most widely used of all CCD sensors. So it goes without saying that these sensors are also very well known in industrial image processing and are used in the majority of applications with analog cameras. This is not surprising, as interlaced sensors offer many interesting benefits: they are extremely sensitive and achieve picture results that cannot be achieved in a shot carried out using a progressive scan sensor. AVT's Guppy camera series is consisting of two interlaced sensor variants.

### What are the benefits of the Guppy interlaced cameras?

They are equipped with the most widely used and most sensitive interlaced sensors.

They allow the conversion to digital camera technology without having to change lenses.

The analysis software can be employed obtaining the familiar picture performance.

They offer a fully standardized, digital interface.

Flexibility and functions open up the possibility of performance enhancement while also saving costs.

The Guppy interlaced models open up an unusual, attractive way of converting an analog system to digital camera technology without changing the optical requirements and habits.



Seeing is believing.

## High level: The GUPPY board level version.

The modular concept of the Guppy camera family also encompasses the availability of space-saving and technologically mature board versions (board levels), which are available upon request. A Guppy board level camera is of interest for all those applications in which maximum flexibility is needed for installation in small and difficult-to-reach spaces.

The sensor head, which is separated from the board, can be used in many different ways, and the flexible lens mount offers connections for a variety of different lenses with C-mount, CS-mount, and M12 characteristics.

The Guppy board level has a total of 4 ports and a sophisticated I/O concept: All ports can be used both as input and output. "Pulse width modulation" makes it possible, for example, to address specific lenses. Iris, focus, and zoom control, can be controlled via PC due to the available IEEE1394 register. The board architecture



can accommodate a daisy chain and two 1394a ports, each with a FireWire and a terminal block connector for the use of standardized cables.

Sturdy standard terminal block connectors permit fast, easy installation and also substantially

minimize installation volume compared to standard connectors.

As with the variants with a housing, the Guppy board level cameras also have a rich selection of different CCD and CMOS sensors of the highest quality from VGA to XGA.

## The sensor

The Guppy camera series can provide ten different sensors, all of them highly sensitive. They range from the progressive scan CCD to CMOS and cover virtually all areas of use and individual requirements for an extremely wide range of resolutions and the highest possible image quality. All variants are available in b/w and color versions. As a special feature the Guppy series also includes six digital interlaced Sensor variants; for users with interlaced-based applications they now open up the interesting possibility of carrying out a technology change from analog to digital without any major changeover difficulties.

## Asynchronous image trigger

The Guppy is equipped with an asynchronous external trigger that makes an instant lighting start possible without any significant latency time.

## Flexible AOI / flexible speed (full Format\_7 support)

In addition to a number of different standard formats taken from video technology, the Guppy can also handle "free-style" formats in which the AOI and the frame rate (such as free-run, software trigger, and hardware trigger) can be set at will and altered online.

## Powerful with smart features

Despite its small construction the Guppy is equipped with a large number of interesting "smart" features that give it a huge potential for increasing performance in your system, and at the same time saving system costs.

With the image pre-processing functions such as LUT, white balance and auto exposure the Guppy can optically enhance the camera image and prepare it for later analysis in the PC. This reduces the PC workload and leads to simpler algorithms for the image examination.

With the grabber emulation features the Guppy takes on the tasks of a frame grabber, which not only creates a saving, but actually replaces it. The Guppy provides a large number of interesting trigger and I/O possibilities that make great sense in industrial installations, and can be used for saving costs as well. The Guppy's serial interface enables it to exchange information and instructions with control units in the installation.

## Board level version (optional)

The Guppy is also available as a circuit board version (Guppy F-503B/C on request) and can therefore find room for itself in even the smallest space.

- Small head (sensor board)
- Flexible neck (cable connection)
- Slim mainboard (body)

## Software

Image processing with the Guppy uses the plug & play principle. The software from Allied Vision Technologies supports both still images (TWIN) and video stream (video capture and preview), as well as the integration of the camera via its own API. Digital cameras can be used nowadays just as easily for image processing procedures as, by way of comparison, analog cameras and frame grabbers – plus, of course, the images are better and the speed is higher. AVT software creates the right conditions for the simplest possible integration, and is available from AVT as a comfortable download. AVT can also supply a suitable software development kit (SDK) together with a "viewer" that gives you access to all the tools needed for customer-specific applications.

AVT can currently supply three different software packages for a wide variety of requirements. They are available as a free download from the AVT website: [www.alliedvisiontec.com](http://www.alliedvisiontec.com)

## AVT FirePackage

This enables you to gain 100-percent control over your 1394 bus

## AVT Active FirePackage

For full compatibility with WDM and DirectX

## AVT Fire4Linux

The package for the Linux world

The Guppy family is compatible with all image-processing systems in general use such as National Instruments Labview, MVTec Halcon, MVTec Active Vision Tools, Stemmer Imaging Common Vision Blox, Neurocheck, Scorpion, and Matrox Inspector, which support the FireWire standard.

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