ON Semiconductor®

AVNET® SILICA

Capture the formerly unseen

PYTHON – GLOBAL SHUTTER CMOS IMAGE SENSORS

PYTHON

GLOBAL SHUTTER CMOS IMAGE SENSORS

With resolutions from VGA to over 25 megapixels, the PYTHON family of image sensors addresses the needs of general-purpose industrial imaging applications such as machine vision inspection and motion monitoring, security, surveillance, and intelligent transportation systems (ITS). Combining flexibility in configuration and resolution with high speed and high sensitivity, these devices capture fast moving scenes without distortion by combining low read noise and high sensitivity with full resolution frame rates up to 815 fps.

All members of the PYTHON family share common optical and electrical characteristics, simplifying and standardizing camera designs. In addition, all resolutions can be supported using only two PCB designs, allowing camera manufacturers to leverage a single camera design to provide a full family of cameras. The family includes ten separate devices, ranging in resolution from VGA to 25 megapixels and in frame rate from 80 to over 800 frames per second. Devices are available in monochrome, color, and extended near-infrared (NIR) configurations, with some resolutions also available in low-power, low-cost configurations or with protective tape. These devices also support small form factor camera designs based on their LCC 48-84 and µPGA-355 pin package configurations.

The PYTHON image family also provides very high bandwidth – with 4, 8, 16, or 32 LVDS channels each running at 720 MHz that provide up to twice the speed of single channel USB 3.1 or 10 GigE connections. And since high speed inspection also requires stop-motion image capture, all of the PYTHON devices are designed with an efficient global shutter pixel design. When combined, this high level of standardization allows a large family of cameras to be developed efficiently.

				HD ready	1080 Full HD		4K Ultra HD		
SPEC / Type	**PYTHON 480**	**PYTHON 300**	**PYTHON 500**	**PYTHON 1300**	**PYTHON 2000**	**PYTHON 5000**	**PYTHON 12K**	**PYTHON 16K**	**PYTHON 25K**
Resolution	SVGA	VGA	SVGA	SXGA	WUXGA	QSXGA	HXGA	>DCI 4k	>5k / UHD+
Resolution (x,y)	800 x 600	640 x 480	800 x 600	1280 x 1024	1920 x 1200	2592 x 2048	4096 x 3072	4096 x 4096	5120 x 5120
Resolution (Mp)	0.48	0.3	0.5	1.3	2.3	5.3	12.5	16.8	26.2
Imaging Diagonal (mm)	4.8	3.8	4.8	7.9	10.9	15.9	23	26.1	32.6
Optical Format	1/3.6"	1/4"	1/3.6"	1/2"	2/3"	1"	4/3"	APS-C	APS-H
Max. Frame Rate (10 bit)	120	815	545	210	225	100	160	120	80
Shutter Type	Global		Global		Global			Global	
Pixel Size (µm)	4.8		4.8		4.8			4.5	
Responsivity (V/lux*s)	7.7		7.7		7.5			5.8	
Full Well Capacity (e-)	10,000		10,000		10,000			12,000	
Dark Noise (e-)	11		9		11			14	
Dynamic Range (dB)	60		60		60			59	
SNR max (dB)	40		40		40			41	
PLS	1/6200		1/8000		1/5000			1/5000	
Channel Mux	1		4,2,1		8,4,2,1			32,16,8,4	
Package Options	67 CSP		48 LCC		84 LCC, 128 LGA			355 µPGA	
ADC Bit Depth	10-bit, 8-bit		10-bit, 8-bit		10-bit, 8-bit			10-bit, 8-bit	
CFA Option	Mono, Color		Mono, Color, Extended NIR		Mono, Color, Extended NIR			Mono, Bayer, Extended NIR	
Low Cost Option				•		•			
Protective Tape Option	•	•	•	•	•	•			
Evaluation Kit	•	•	•	•	•	•	•	•	•

PYTHON

SCALABILITY

The scalable design of the PYTHON family allows camera manufacturers to leverage one design to support multiple products. All devices share common electrical design requirements, and all resolutions can be supported using only two PCB designs.

Multiple devices share common package

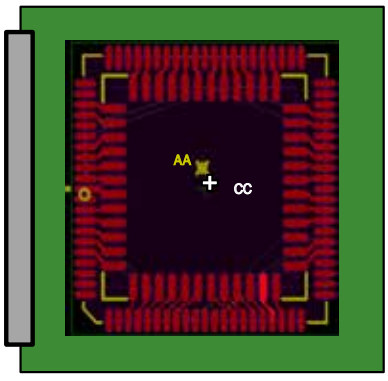
- 0.3 to 1.3 MP (3 devices) → 48 pin LCC
- 2 MP and 5 MP (2 devices) → 84 pin LCC
- 2 MP and 5 MP (2 devices) → 128 pin LGA
- 12 MP to 25 MP (4 devices) → 355 pin µPGA

Available PCB support

- ISP8 for devices from VGA to 5 MP
- ISP32 for devices from 10K to 25K
- Common optical centers

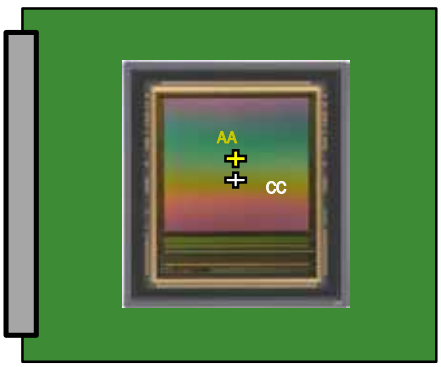
ISP8

LVDS Sync
8 x LVDS
Data
LVDS Clk
SPI
Trigger
Monitor
Ref CLK
Reset
Supply

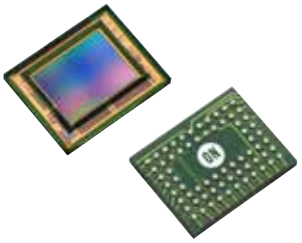


ISP32

LVDS Sync
32 x LVDS
Data
LVDS Clk
SPI
Trigger
Monitor
Ref CLK
Reset
Supply



PYTHON 480



PYTHON PERFORMANCE IN COMPACT CSP PACKAGE

Features

- Resolution 0.48 Mpixels
- 808 x 608 Active Pixels, 1/3.6" Optical Format
- 4.8 µm x 4.8 µm Low Noise Global Shutter Pixels with In-pixel CDS
- Monochrome (SN), Color (SE)
- Frame Rate at Full Resolution (LVDS): up to 120 fps
- Frame Rate at Full Resolution (CMOS): up to 120 fps
- On-chip 10-bit Analog-to-Digital Converter (ADC)
- 8-bit or 10-bit Output Mode
- One Low Voltage Differential Signaling (LVDS) High Speed Serial Output or Parallel CMOS Output
- Random Programmable Region of Interest (ROI) Readout
- Serial Peripheral Interface (SPI)
- Automatic Exposure Control (AEC)
- Phase Locked Loop (PLL)
- Dual Power Supply (3.3 V and 1.8 V)
- -40°C to +85°C Operational Temperature Range
- 67 pin CSP
- 248 mW / 186 mW Power Dissipation (LVDS 120 fps / 60 fps)
- Pb-Free and RoHS Compliant

Applications

- Machine Vision
- Motion Monitoring
- Security

The PYTHON 480 image sensor utilizes high sensitivity 4.8 µm x 4.8 µm pixels that support low noise "pipelined" and "triggered" global shutter readout modes. In global shutter mode, the sensor supports correlated double sampling (CDS) readout, reducing noise and increasing dynamic range. The image sensor has on-chip programmable gain amplifiers and 10-bit A/D converters. The integration time and gain parameters can be reconfigured without any visible image artifact. Optionally the on-chip automatic exposure control loop (AEC) controls these parameters dynamically. The image's black level is either calibrated automatically or can be adjusted by adding a user programmable offset. A high level of programmability using a four wire serial peripheral interface enables the user to read out specific regions of interest. Up to four regions can be programmed, achieving even higher frame rates. The image data interface consists of one LVDS lane, facilitating frame rate up to 120 frames per second. A separate synchronization channel containing payload information is provided to facilitate the image reconstruction at the receiving end. The device also provides a parallel CMOS output interface at reduced frame rate. The PYTHON 480 is packaged in a 67-pin CSP package and is available in monochrome and Bayer color configurations.

Sensor	Resolution	Pixel	Format	Framerate	Variants
PYTHON 480	800 x 600	4.8 µm GS	1/3.6"	120 fps	BW/RGB

PYTHON 300/500/1300

LOW RESOLUTION PYTHON GS CMOS FAMILY

Features

- PYTHON 300: 640 x 480 active pixels, 1/4" optical format
- PYTHON 500: 800 x 600 active pixels, 1/3.6" optical format
- PYTHON 1300: 1280 x 1024 active pixels, 1/2" optical format
- 4.8 µm x 4.8 µm low noise global shutter pixels with In-pixel CDS
- Monochrome (SN), Color (SE) and NIR (FN) configurations
- Zero ROT mode enabling higher frame rate
- Frame rate at full resolution (LVDS)
  - 210/165 frames per second @ SXGA (Zero ROT/Normal ROT)
  - 545/385 frames per second @ SVGA (Zero ROT/Normal ROT)
  - 815/545 frames per second @ VGA (Zero ROT/Normal ROT)
- Frames rate at full resolution (CMOS)
  - PYTHON 1300: 43 frames per second
- On-chip 10-bit Analog-to-Digital Converter (ADC)
- 8-bit or 10-bit output mode
- Four/Two/One Low Voltage Differential Signaling (LVDS) high speed serial outputs or parallel CMOS output
- Random programmable Region of Interest (ROI) readout
- Serial Peripheral Interface (SPI)
- Automatic Exposure Control (AEC)
- Phase Locked Loop (PLL)
- High Dynamic Range (HDR) up to 90 dB
- Dual power supply (3.3 V and 1.8 V)
- −40°C to +85°C operational temperature range
- 48-pin LCC and bare die
- 620 mW power dissipation (LVDS)
- 420 mW power dissipation (CMOS)
- Pb-free and are RoHS compliant

Applications

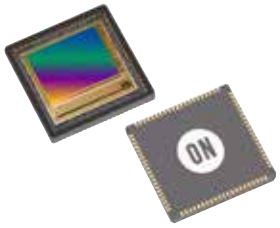
- Machine vision
- Motion monitoring
- Security
- Barcode scanning (2D)

The PYTHON 300, PYTHON 500, and PYTHON 1300 image sensors utilize high sensitivity 4.8 µm x 4.8 µm pixels that support low noise "pipelined" and "triggered" global shutter readout modes. In global shutter mode, the sensors support correlated double sampling (CDS) readout, reducing noise and increasing dynamic range. The image sensors have on-chip programmable gain amplifiers and 10-bit A/D converters. The integration time and gain parameters can be reconfigured without any visible image artifacts. Optionally the on-chip automatic exposure control loop (AEC) controls these parameters dynamically. The image's black level either is calibrated automatically or can be adjusted by adding a user programmable offset. A high level of programmability using a four wire serial peripheral interface enables the user to read out specific regions of interest. Up to eight regions can be programmed, achieving even higher frame rates. The image data interface of the P1-SN/SE/FN devices consists of four LVDS lanes, facilitating frame rates up to 210 frames per second in Zero ROT mode. Each channel runs at 720 Mbps. A separate synchronization channel containing payload information is provided to facilitate the image reconstruction at the receiving end. P2-SN/SE devices provide a parallel CMOS output interface at a reduced frame rate. The devices are provided in a 48-pin LCC package and are available in monochrome, Bayer color, and extended near-infrared (NIR) configurations.

Sensor	Resolution	Pixel	Format	Framerate	Variants
PYTHON 300	640 x 480	4.8 µm GS	1/4"	815 fps	BW/RGB/NIR
PYTHON 500	800 x 600	4.8 µm GS	1/3.3"	545 fps	BW/RGB/NIR
PYTHON 1300	1280 x 1024	4.8 µm GS	1/2"	210 fps (*)	BW/RGB/NIR

(*) See ordering information at the end of this brochure for more information

PYTHON 2000/5000



MEDIUM RESOLUTION PYTHON GS CMOS FAMILY

Features

- Data output options:
  - P1-SN/SE/FN: 8 LVDS Data Channels
  - P3-SN/SE: 4 LVDS Data Channel
- PYTHON 2000: 1920 x 1200 active pixels, 2/3" optical format
- PYTHON 5000: 2590 x 2048 active pixels, 1" optical format
- 4.8 µm x 4.8 µm low noise global shutter pixels with in-pixel CDS
- Monochrome (SN), color (SE) and NIR (FN) configurations
- Zero ROT mode enabling higher frame rate
- Frame rate at full resolution/HD (LVDS)
  - 100/85 frames per second @ 5 MP (Zero ROT/Non-Zero ROT)
  - 230/180 frames per second @ 2 MP (Zero ROT/Non-Zero ROT)
  - 250/200 frames per second @ Full HD (Zero ROT/Non-Zero ROT)
- On-chip 10-bit Analog-to-Digital Converter (ADC)
- 8-bit or 10-bit output mode
- Eight Low Voltage Differential Signaling (LVDS) high speed serial outputs
- Random programmable Region of Interest (ROI) readout
- Pipelined and triggered global shutter
- LVDS channel multiplexing
- On-chip Fixed Pattern Noise (FPN) correction
- Serial Peripheral Interface (SPI)
- Automatic Exposure Control (AEC)
- Phase Locked Loop (PLL)
- High Dynamic Range (HDR)
- Dual power supply (3.3 V and 1.8 V)
- –40°C to +85°C operational temperature range
- 84-pin LCC and 128-pin LGA packages
- 1.5 W power dissipation
- Pb-free and are RoHS compliant

Applications

- Machine Vision
- Motion Monitoring
- Security
- Intelligent Traffic Systems (ITS)

The PYTHON 2000 and 5000 image sensors utilize high sensitivity 4.8 µm x 4.8 µm pixels that support low noise "pipelined" and "triggered" readout modes. In global shutter mode, the sensor supports correlated double sampling (CDS) readout, reducing noise and increasing dynamic range. The sensor has on-chip programmable gain amplifiers and 10-bit A/D converters. The integration time and gain parameters can be reconfigured without any visible image artifact. Optionally the on-chip automatic exposure control loop (AEC) controls these parameters dynamically. The image's black level either is calibrated automatically or can be adjusted by adding a user programmable offset. A high level of programmability using a four wire serial peripheral interface enables the user to read out specific regions of interest. Up to sixteen regions can be programmed, achieving even higher frame rates. The image data interface consists of eight LVDS lanes, enabling frame rates up to 100 frames per second in Zero ROT mode for the PYTHON 5000. Each channel runs at 720 Mbps. A separate synchronization channel containing payload information is provided to facilitate the image reconstruction at the receiving end. The devices are provided in either an 84-pin LCC or 128-pin LGA package and are available in a monochrome, Bayer color, and extended NIR configurations.

Sensor	Resolution	Pixel	Format	Framerate	Variants
PYTHON 2000	1920 x 1200	4.8 µm GS	2/3"	225 fps	BW/RGB/NIR
PYTHON 5000	2592 x 2048	4.8 µm GS	1"	100 fps	BW/RGB/NIR

(*) See ordering information at the end of this brochure for more information

PYTHON 12K/16K/25K

HIGH-RESOLUTION PYTHON GS CMOS FAMILY

Features

- Pin-compatible family with multiple resolutions
  - PYTHON 12K: 4096 x 3072 active pixels, 4/3" optical format
  - PYTHON 16K: 4096 x 4096 active pixels, APS-H optical format
  - PYTHON 25K: 5120 x 5120 active pixels, APS-H optical format
- Frame rate at full resolution
  - 160 frames per second @ 12K
  - 120 frames per second @ 16K
  - 80 frames per second @ 25K
- 4.5 µm x 4.5 µm low noise global shutter pixels with in-pixel Correlated Double Sampling (CDS)
- Monochrome (SN), color (SE) and NIR (FN)
- Random programmable Region of Interest (ROI) readout
- Pipelined and triggered global shutter
- On-chip Fixed Pattern Noise (FPN) correction
- 10-bit Analog-to-Digital Converter (ADC)
- 32 Low voltage Differential Signaling (LVDS) high-speed
- Serial outputs
- Serial Peripheral Interface (SPI)
- 4.6 W power dissipation at full resolution, x32 LVDS mode
- Operational range: –40°C to +85°C
- 355-pin PGA package
- Pb–free and are RoHS compliant

Applications

- Machine vision
- Motion monitoring
- Intelligent Traffic Systems (ITS)
- Pick and place machines
- Inspection
- Metrology

The PYTHON high resolution image sensors utilize high sensitivity 4.5 µm x 4.5 µm pixels that support low noise "pipelined" and "triggered" readout modes. In global shutter mode, the sensor supports correlated double sampling (CDS) readout, reducing noise and increasing dynamic range. The sensor has on-chip programmable gain amplifiers and 10-bit A/D converters. The integration time and gain parameters can be reconfigured without any visible image artifact. Optionally the on-chip automatic exposure control loop (AEC) controls these parameters dynamically. The image's black level either is calibrated automatically or can be adjusted by adding a user programmable offset. A high level of programmability using a four wire serial peripheral interface enables the user to read out specific regions of interest. Up to 32 regions can be programmed, achieving even higher frame rates. The image data interface consists of eight 32 LVDS lanes, enabling frame rates up to 80 frames per second in Zero ROT mode for the PYTHON 25k. Each channel runs at 720 Mbps. A separate synchronization channel containing payload information is provided to facilitate the image reconstruction at the receiving end. The devices are provided in a 355-µPGA ceramic package and are available in monochrome, Bayer color, and extended NIR configurations.

Sensor	Resolution	Pixel	Format	Framerate	Variants
PYTHON 12K	4096 x 3072	4.5 µm GS	4/3"	160 fps	BW/RGB/NIR
PYTHON 16K	4096 x 4096	4.5 µm GS	APS-C	120 fps (*)	BW/RGB/NIR
PYTHON 25K	5120 x 5120	4.5 µm GS	APS-H	80 fps (*)	BW/RGB/NIR

(*) See ordering information at the end of this brochure for more information

PYTHON advantages

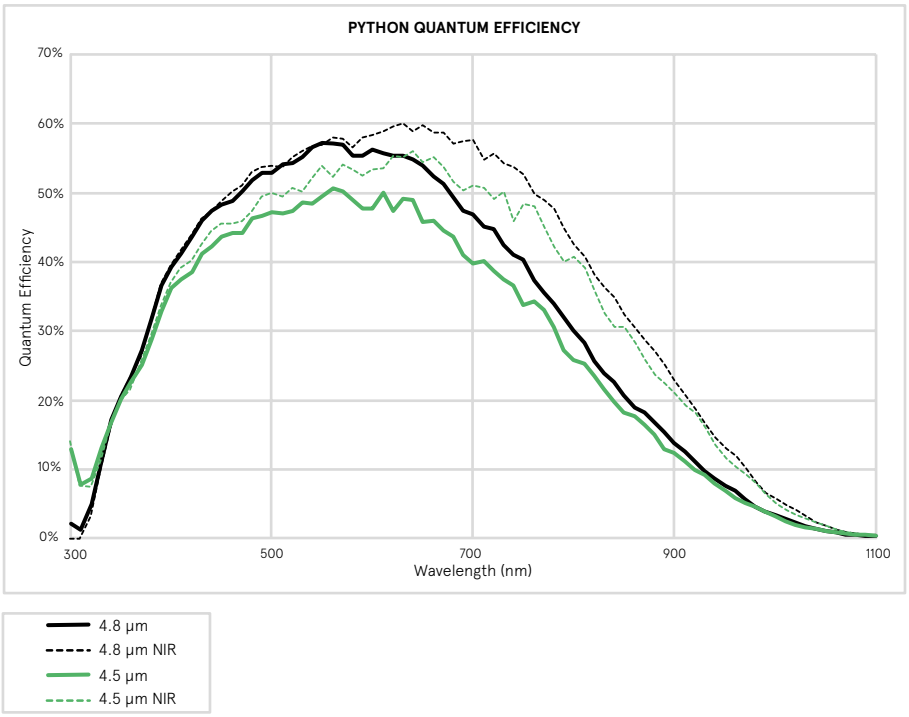
HIGH-RESOLUTION PYTHON GS CMOS FAMILY

- 7.7 V/lux.sec @ 550 nm (PYTHON300/500/1300/2000/5000 mono)
- 5.9 V/lux.sec @ 550 nm (PYTHON 12K/16K/25K mono)

HIGH QUANTUM EFFICIENCY FOR EXCELLENT SENSITIVITY FROM UV TO NIR

Multiple product options

- Monochrome
- Bayer color
- Extended NIR
- Global shutter enables capture of moving objects without motion
- artifacts
- In-pixel Correlated Double Sampling (CDS) provides low readout noise
- On-chip Fixed Pattern Noise (FPN) correction
- 10-bit Analog-to-Digital Converter (ADC)
- 60 dB dynamic range



Applications

FOR PYTHON IMAGE SENSORS

Machine vision

- Scalable performance/cost solutions for both low, medium and high end MV
- Fast frame rates reduce inspection time; speed increase by ROI in both x and y
- High sensitivity and low noise may reduce cost of light (equipment, power)
- Top resolutions:
  - PYTHON 5000 highest resolution fast global shutter sensor in 29 x 29 mm camera
  - PYTHON 25K (5120 x 5120) highly valued for fast high end inspection
- High speeds:
  - PYTHON up to 5 MP takes full advantage of USB3 interface
  - PYTHON 12K and above enable CoaXPress and CameraLink HS bandwidth
- All resolutions come in mono, color, and extended NIR

ITL (Intelligent Traffic Systems)

- Scalable performance/cost solutions for 1, 2, 3 and 4 lanes (1280 pixels / lane)
- High sensitivity and low noise improve imaging under poor light conditions
  - High frame rates provide basics for multi-frame color HDR
  - Single frame mono HDR (multiple slope) supported up to 5 MP
  - Extended NIR available
- Robust outdoor solution:
  - Industrial temperature qualified (-40 to +85 °C)
  - On-chip temperature sensor to tune accordingly
- Fast & versatile sequencer at your availability:
  - Fast frame per frame reconfiguration, no interruption, active at next frame start
  - Automatic odd/even frame or triggered configuration switch capability
  - > 30 fps for all resolutions

High-end security

- Scalable performance/cost solution tailored to the application's needs:
  - Cost effective solutions for iris & face recognition, eye tracking
  - Compact light weight sensors for drones, mid/large resolutions for aerial surveillance
- High sensitivity and low noise improve imaging under poor light conditions:
  - Multi-frame color HDR support (single frame mono HDR supported up to 5 MP)
  - Extended NIR available
- Robust outdoor solution:
  - Industrial temperature qualified (-40 to +85 °C)
  - On-chip temperature sensor to tune accordingly
- Fast & versatile sequencer at your availability:
  - Automatic odd/even frame or triggered configuration switch capability
  - Full area and multi-zoom window support simultaneously
- > 30 fps for all resolutions

Other applications

- Scalable performance/cost solution tailored to the application's needs:
  - Compact, fast and cost effective PYTHON 480 baseline enabling (S)VGA solutions
  - PYTHON 300, 500 and 1300 complement with resolution and speed grades
- High optical performance and versatility:
  - Up to 7.7 V/lux.s responsivity baseline; color, mono and extended NIR options
  - 10 e- dark noise to address poor light conditions
  - High shutter efficiency performance under all conditions
  - Enables multi-frame color HDR or single frame mono HDR
- Fast & versatile sequencer at your availability:
  - Extended range of master/slave trigger options
  - Automatic odd/even frame or triggered configuration switch capability
  - Full area and multi-zoom window support simultaneously
- Customized options upon request

Development tools

ON SEMICONDUCTOR – PYTHON IMAGE SENSOR EVALUATION KIT EVBUM2294/D

ON Semiconductor PYTHON image sensor evaluation kits enable customers to easily and quickly evaluate the performance of the PYTHON CMOS image sensors without the need to develop a full camera design. When combined with ON Semiconductor Sensor Studio II software, this hardware allows full control of the image sensor's register settings and enables video recording, still image capture, and image analysis. With this level of programmability, CMOS sensor functionality such as global shutter, very fast frame rate, high NIR sensitivity, and multiple regions of interest can be rapidly evaluated.

Features

- Compatible with ON Semiconductor PYTHON CMOS image sensors
- Monochrome image sensor included in kit
- Supports LVDS output devices
- Supports HDR operation & ROI readout capabilities
- High frame rate
- Full access to image sensor register settings
- USB interface for sensor control, image capture,
- and firmware downloads
- Field updating of firmware via sensor studio II
- Socketed sensor for easy sensor replacement
- Includes mount for C lens
- Integrated tripod mount (1/4–20 thread)
- Additional headboards sold separately allowing
- evaluation of multiple PYTHON products, while
- re-using the capture board from the kit
- Optional lens mount kit sold separately to support C
- and F mount lens and also includes an IR cut filter for color imaging and evaluations

Kit includes

- Image capture board with integral tripod mount
- Head board (sensor installed & lens mount affixed)
- USB 3.0 Cable (2 Meter Length)
- Quick Start Guide
- User's Manual available in Sensor Studio II Help Section

General specifications

Parameter	Typical Value
Hardware Interfaces	USB 3.0, USB 2.0
Typical Data Rate (USB 3.0)	86 MB/sec to 300 MB/sec (Depends on USB Adapter)
Output Format: Sensor LVDS Output Clock PYTHON 1300 PYTHON 5000 PYTHON 25K	 720 MHz LDVS x 4 Lanes LDVS x 8 Lanes LDVS x 32 Lanes
Max Frame Rate (Full Resolution): PYTHON 1300 PYTHON 5000 PYTHON 25K	 168 fps 82 fps 35 fps
Display Frame Rate (Full Resolution with USB 3.0): PYTHON 1300 PYTHON 5000 PYTHON 25K	 26 fps 6.8 fps 1.6 fps
On Board Frame Buffer Capacity: 25 MP 16 MP 4 MP 1 MP 0.25 MP	 8 Frames 8 Frames 32 Frames 128 Frames 512 Frames
Optics	PYTHON 1300 and 5000 includes mount for C lenses, PYTHON 25K includes mount for F lenses, Compatible with optional Lens Mount Kit

See ordering information at the end of this brochure for more information

Avnet MicroZed

/MICROZED

EMBEDDED VISION KIT WITH PYTHON 1300 CAMERA MODULE

The MicroZed™ embedded vision kits build on the MicroZed System-On- Module (SOM) by providing a video specifi c carrier card which includes onboard HDMI input/output interfaces, audio CODEC, and a camera connector for optional camera modules. The kits are available as a complete bundle or as a stand-alone carrier card for designers who already have a MicroZed module. The kits provide hardware, software and IP components necessary for the development of custom video applications.

The camera module features ON Semiconductor's PYTHON 1300 color image sensor. The PYTHON 1300 is a 1/2 inch super-eXtended graphics array (SXGA) CMOS image sensor with a pixel array of 1280 by 1024 pixels. Designed to address the needs of generalpurpose industrial image sensing applications, the new global shutter image sensor combines fl exibility in confi guration and resolution with high speed and high sensitivity for the industrial imaging market. The ON Semiconductor PYTHON-1300-C camera module is compatible with the MicroZed embedded vision carrier card, and the smart vision development kit.

MicroZed™ is a lowcost development board based on the Xilinx Zynq®-7000 All Programmable SoC. Its unique design allows it to be used as both a standalone evaluation board for basic SoC experimentation, or combined with a carrier card as an embeddable system-on-module (SOM). MicroZed contains two I/O headers that provide connection to two I/O banks on the programmable logic (PL) side of the Zynq®-7000 All Programmable SoC device.

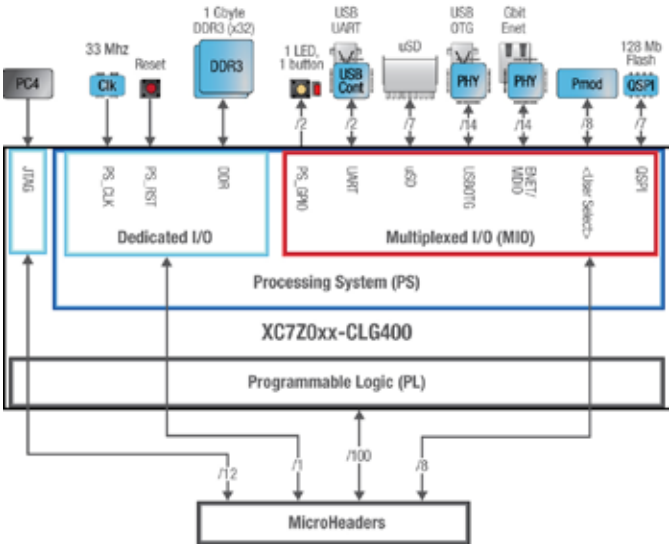
In addition to the evaluation kit, MicroZed is also available for volume purchase as a module only (no cable, license voucher, or uSD card). This system-on-module or SOM version of MicroZed comes in either the Zynq 7Z010 or 7Z020 version. Additional custom-built versions of MicroZed are also available by contacting your local Avnet sales offi ce.

Kit includes

- MicroZed 7020 (*)
- Embedded vision carrier card
- 5 V power supply
- MicroHDMI to HDMI cables (2)
- MicroUSB to USB cable
- Ethernet cable
- 4 Gb MicroSD card
- Tripod and adapter
- Quick start card
- Downloadable documentation and reference designs

Kit does not include

- Camera module
- p/n to buy separately:
- AES-CAM-ON-P1300C-G



(*) included only in the complete version of the kit p/n AES-MBCC-EMBV-DEV-G
See ordering information at the end of this brochure for more information

Ordering Information

IMAGE SENSORS

Product Family	Part Number	Description	Mpixels
PYTHON 300	NOIP1SN0300A-QDI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
	NOIP1SE0300A-QDI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
	NOIP1FN0300A-QDI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
	NOIP1SN0300A-QTI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
	NOIP1SE0300A-QTI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
	NOIP1FN0300A-QTI	CMOS Image Sensor, Global Shutter, 0.3 MP (VGA)	0.3
PYTHON480	NOIP1SE0480A-SD	CMOS Image Sensor, Global Shutter, 0.48MP (SVGA)	0.48
	NOIP1SF0480A-SD	CMOS Image Sensor, Global Shutter, 0.48MP (SVGA)	0.48
	NOIP1SN0480A-SD	CMOS Image Sensor, Global Shutter, 0.48MP (SVGA)	0.48
	NOIP1SP0480A-SD	CMOS Image Sensor, Global Shutter, 0.48MP (SVGA)	0.48
PYTHON 500	NOIP1SN0500A-QDI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
	NOIP1SE0500A-QDI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
	NOIP1FN0500A-QDI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
	NOIP1SN0500A-QTI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
	NOIP1SE0500A-QTI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
	NOIP1FN0500A-QTI	CMOS Image Sensor, Global Shutter, 0.5 MP (SVGA)	0.5
PYTHON 1300	NOIP1SN1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP1SE1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP1FN1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP2SN1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP2SE1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP1SN1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP1SE1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP1FN1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA)	1.3
	NOIP3SN1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
	NOIP3SE1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
	NOIP3FN1300A-QDI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
	NOIP3SN1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
	NOIP3SE1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
	NOIP3FN1300A-QTI	CMOS Image Sensor, Global Shutter, 1.3 MP (SXGA), Low Power	1.3
PYTHON 2000	NOIP1SN2000A-QDI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1SE2000A-QDI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1FN2000A-QDI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1SN2000A-QTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1SE2000A-QTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1FN2000A-QTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1SN2000A-LTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1SE2000A-LTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3
	NOIP1FN2000A-LTI	CMOS Image Sensor, Global Shutter, 2.3 MP	2.3

Frame Rate max. (fps)	Optical Format	Pixel Size (µm)	Output Interface	Color	Package Type
815	1/4 inch	4.8 x 4.8	LVDS	Mono	LCC-48
815	1/4 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-48
815	1/4 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-48
815	1/4 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-48
815	1/4 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-48
815	1/4 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-48
120	1/3.6 inch	4.8 x 4.8	CMOS / LVDS	Bayer Color, 1.65° CRA	CSP-67
120	1/3.6 inch	4.8 x 4.8	CMOS / LVDS	Bayer Color, 23.2° CRA	CSP-67
120	1/3.6 inch	4.8 x 4.8	CMOS / LVDS	Mono, 1.65° CRA	CSP-67
120	1/3.6 inch	4.8 x 4.8	CMOS / LVDS	Mono, 23.2° CRA	CSP-67
545	1/3.6 inch	4.8 x 4.8	LVDS	Mono	LCC-48
545	1/3.6 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-48
545	1/3.6 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-48
545	1/3.6 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-48
545	1/3.6 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-48
545	1/3.6 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Mono	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-48
210	1/2 inch	4.8 x 4.8	CMOS (parallel)	Mono	LCC-48
210	1/2 inch	4.8 x 4.8	CMOS (parallel)	Bayer Color	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-48
210	1/2 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Mono	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-48
105	1/2 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-48
225	2/3 inch	4.8 x 4.8	LVDS	Mono	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-84
225	2/3 inch	4.8 x 4.8	LVDS	Mono (protective film)	LGA-128
225	2/3 inch	4.8 x 4.8	LVDS	Bayer Color (protective film)	LGA-128
225	2/3 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective film)	LGA-128

Ordering Information

Product Family	Part Number	Description	Mpixels
PYTHON 5000	NOIP1SN5000A-QDI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1SE5000A-QDI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1FN5000A-QDI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1SN5000A-QTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1SE5000A-QTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1FN5000A-QTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP3SN5000A-QDI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
	NOIP3SE5000A-QDI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
	NOIP3SN5000A-QTI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
	NOIP3SE5000A-QTI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
	NOIP1SN5000A-LTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1SE5000A-LTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP1FN5000A-LTI	CMOS Image Sensor, Global Shutter, 5.3 MP	5.3
	NOIP3SN5000A-LTI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
	NOIP3SE5000A-LTI	CMOS Image Sensor, Global Shutter, 5.3 MP - 4 LVDS Outputs	5.3
PYTHON 12K	NOIP1SN012KA-GDI	CMOS Image Sensor, Global Shutter, 12.5 MP	12.5
	NOIP1SE012KA-GDI	CMOS Image Sensor, Global Shutter, 12.5 MP	12.5
	NOIP1FN012KA-GDI	CMOS Image Sensor, Global Shutter, 12.5 MP	12.5
PYTHON 16K	NOIP1SN016KA-GDI	CMOS Image Sensor, Global Shutter, 16.8 MP	16.8
	NOIP1SE016KA-GDI	CMOS Image Sensor, Global Shutter, 16.8 MP	16.8
	NOIP1FN016KA-GDI	CMOS Image Sensor, Global Shutter, 16.8 MP	16.8
PYTHON 25K	NOIP1SN025KA-GDI	CMOS Image Sensor, Global Shutter, 26.2 MP	26.2
	NOIP1SE025KA-GDI	CMOS Image Sensor, Global Shutter, 26.2 MP	26.2
	NOIP1FN025KA-GDI	CMOS Image Sensor, Global Shutter, 26.2 MP	26.2

ON SEMICONDUCTOR EVALUATION KITS

Part Number	Description
NOIP1SN1300A-QDI-A-GEVK	PYTHON 1300 (1.3 MP) Monochrome Image Sensor Evaluation Kit (Image Sensor Included)
NOIP1SN5000A-QDI-A-GEVK	PYTHON 5000 (5.0 MP) Monochrome Image Sensor Evaluation Kit (Image Sensor Included)
NOIP1SN025KA-GDI-A-GEVK	PYTHON 25K (25 MP) Monochrome Image Sensor Evaluation Kit (Image Sensor Included)
NOIP-48PIN-HEAD-BD-A-GEVB	Head Board Only (Image Sensor Not Included)
NOIP-84PIN-HEAD-BD-A-GEVK	Head Board Only (Image Sensor Not Included)
NOIP-355PIN-HEAD-BD-A-GEVB	Head Board Only (Image Sensor Not Included)
LENS-MOUNT-KIT-C-GEVK	Lens Mount Kit to Support C and F Mount Lenses (Includes IR Cut-Filter)

AVNET MICROZED EMBEDDED VISION KITS

Part Number	Description
AES-MBCC-EMBV-DEV-G	MicroZed Embedded Vision Development Kit
AES-MBCC-EMBV-G	MicroZed Embedded Vision carrier card Kit
AES-CAM-ON-P1300C-G	ON Semiconductor PYTHON-1300-COLOR Camera

Frame Rate max. (fps)	Optical Format	Pixel Size (µm)	Output Interface	Color	Package Type
100	1 inch	4.8 x 4.8	LVDS	Mono	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Mono (NIR)	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective foil)	LCC-84
46	1 inch	4.8 x 4.8	LVDS	Mono	LCC-84
46	1 inch	4.8 x 4.8	LVDS	Bayer Color	LCC-84
46	1 inch	4.8 x 4.8	LVDS	Mono (protective foil)	LCC-84
46	1 inch	4.8 x 4.8	LVDS	Bayer Color (protective foil)	LCC-84
100	1 inch	4.8 x 4.8	LVDS	Mono (protective film)	LGA-128
100	1 inch	4.8 x 4.8	LVDS	Bayer Color (protective film)	LGA-128
100	1 inch	4.8 x 4.8	LVDS	Mono (NIR) (protective film)	LGA-128
100	1 inch	4.8 x 4.8	LVDS	Mono (protective film)	LGA-128
100	1 inch	4.8 x 4.8	LVDS	Bayer Color (protective film)	LGA-128
160	4/3 inch	4.5 x 4.5	LVDS	Mono	CPGA-355
160	4/3 inch	4.5 x 4.5	LVDS	Bayer Color	CPGA-355
160	4/3 inch	4.5 x 4.5	LVDS	Mono (NIR)	CPGA-355
120	APS-C	4.5 x 4.5	LVDS	Mono	CPGA-355
120	APS-C	4.5 x 4.5	LVDS	Bayer Color	CPGA-355
120	APS-C	4.5 x 4.5	LVDS	Mono (NIR)	CPGA-355
80	APS-H	4.5 x 4.5	LVDS	Mono	CPGA-355
80	APS-H	4.5 x 4.5	LVDS	Bayer Color	CPGA-355
80	APS-H	4.5 x 4.5	LVDS	Mono (NIR)	CPGA-355

Compatible Image Sensors (sold separately)
PYTHON 300, PYTHON 500
PYTHON 2000
PYTHON 12K, PYTHON 16K
PYTHON 300, PYTHON 500, PYTHON 1300
PYTHON 2000, PYTHON 5000
PYTHON 12K, PYTHON 16K, PYTHON 25K
PYTHON 300, PYTHON 500, PYTHON 1300, PYTHON 2000, PYTHON 5000

ON SEMICONDUCTOR embedded vision kits are including one image sensor specified in the description. To test different image sensors check the compatibility and order the image sensor separately.

KIT content
Vision kit + MicroZed 7020 (image sensot NOT included)
Vision kit only (image sensot NOT included)
PYTHON 1300-C Camera module

AVNET MicroZed embedded vision kits are not including the image sensor.
Kit composition examples:
AES-MBCC-EMBV-DEV-G + AES-CAM-ON-P1300C-G: complete evaluation system with MicroZed board and image sensor
AES-MBCC-EMBV-G + AES-CAM-ON-P1300C-G: evaluation system with image sensor without the MicroZed board

Notes

Offices

AUSTRIA
Vienna
Phone: +43 186 642 300
Fax: +43 186 642 350
wien@avnet.eu

BELGIUM
Merelbeke
Phone: +32 9 210 24 70
Fax: +32 9 210 24 87
gent@avnet.eu

CZECH REPUBLIC (SLOVAKIA)
Prague
Phone: +420 234 091 031
Fax: +420 234 091 030
praha@avnet.eu

DENMARK
Herlev
Phone: +45 432 280 10
Fax: +45 432 280 11
herlev@avnet.eu

ESTONIA
(LATVIA, LITHUANIA)
Pärnu
Phone : +372 56 637737
paernu@avnet.eu

FINLAND
Espoo
Phone: +358 207 499 200
Fax: +358 207 499 280
helsinki@avnet.eu

FRANCE (TUNISIA)
Cesson Sévigné
Phone: +33 299 838 485
Fax: +33 299 838 083
rennes@avnet.eu

Illkirch
Phone: +33 390 402 020
Fax: +33 164 479 099
strasbourg@avnet.eu

Massy Cedex
Phone: +33 164 472 929
Fax: +33 164 470 084
paris@avnet.eu

Toulouse
Phone: +33 05 62 47 47
toulouse@avnet.eu

Vénissieux Cedex
Phone: +33 478 771 360
Fax: +33 478 771 399
lyon@avnet.eu

Germany
Berlin
Phone: +49 30 214 882 0
Fax: +49 30 214 882 33
berlin@avnet.eu

Freiburg
Phone: +49 761 881 941 0
Fax: +49 761 881 944 0
freiburg@avnet.eu

Hamburg
Phone: +49 40 608 235 922
Fax: +49 40 608 235 920
hamburg@avnet.eu

Holzwickede
Phone: +49 2301 919 0
Fax: +49 2301 919 222
holzwickede@avnet.eu

Lehrte
Phone: +49 5132 5099 0
braunschweig@avnet.eu

Leinfelden-Echterdingen
Phone: +49 711 782 600 1
Fax: +49 711 782 602 00
stuttgart@avnet.eu

Leipzig
Phone: +49 34204 7056 00
Fax: +49 34204 7056 11
leipzig@avnet.eu

Nürnberg
Phone: +49 911 24425 80
Fax: +49 911 24425 85
nuernberg@avnet.eu

Poing
Phone: +49 8121 777 02
Fax: +49 8121 777 531
muenchen@avnet.eu

Wiesbaden
Phone: +49 612 258 710
Fax: +49 612 258 713 33
wiesbaden@avnet.eu

HUNGARY
Budapest
Phone: +36 1 43 67215
Fax: +36 1 43 67213
budapest@avnet.eu

ITALY
Cusano Milanino
Phone: +39 02 660 921
Fax: +39 02 660 923 33
milano@avnet.eu

Firenze
Phone: +39 055 436 039 2
Fax: +39 055 431 035
firenze@avnet.eu

Modena
Phone: +39 059 348 933
Fax: +39 059 344 993
modena@avnet.eu

Padova
Phone: +39 049 807 368 9
Fax: +39 049 773 464
padova@avnet.eu

Rivoli
Phone: +39 011 204 437
Fax: +39 011 242 869 9
torino@avnet.eu

Roma Tecnocittà
Phone: +39 06 413 115 1
Fax: +39 06 413 116 1
roma@avnet.eu

NETHERLANDS
Breda
Phone: +31 765 722 700
Fax: +31 765 722 707
breda@avnet.eu

NORWAY
Asker
Phone: +47 667 736 00
Fax: +47 667 736 77
asker@avnet.eu

POLAND
Gdansk
Phone: +48 58 307 81 51
Fax: +48 58 307 81 50
gdansk@avnet.eu

Katowice
Phone: +48 32 259 50 10
Fax: +48 32 259 50 11
katowice@avnet.eu

Warszawa
Phone: +48 222 565 760
Fax: +48 222 565 766
warszawa@avnet.eu

PORTUGAL
Vila Nova de Gaia
Phone: +35 1 223 779 502
Fax: +35 1 223 779 503
porto@avnet.eu

ROMANIA (BULGARIA)
Bucharest
Phone: +40 21 528 16 32
Fax: +40 21 529 68 30
bucuresti@avnet.eu

RUSSIA (BELARUS, UKRAINE)
Moscow
Phone: +7 495 737 36 70
Fax: +7 495 737 36 71
moscow@avnet.eu

Saint Petersburg
Phone: +7 812 635 81 11
Fax: +7 812 635 81 12
stpetersburg@avnet.eu

SLOVENIA
(BOSNIA AND HERZEGOVINA, CROATIA, MACEDONIA, MONTENEGRO, SERBIA)
Ljubljana
Phone: +386 156 097 50
Fax: +386 156 098 78
ljubljana@avnet.eu

SPAIN
Barcelona
Phone: +34 933 278 530
Fax: +34 934 250 544
barcelona@avnet.eu

Galdàcano. Vizcaya
Phone: +34 944 572 777
Fax: +34 944 568 855
bilbao@avnet.eu

Las Matas
Phone: +34 913 727 100
Fax: +34 916 369 788
madrid@avnet.eu

SWEDEN
Sundbyberg
Phone: +46 8 587 461 00
Fax: +46 8 587 461 01
stockholm@avnet.eu

SWITZERLAND
Rothrist
Phone: +41 62 919 555 5
Fax: +41 62 919 550 0
rothrist@avnet.eu

TURKEY (GREECE, EGYPT)
Kadikoy Istanbul
Phone: +90 216 528 834 0
Fax: +90 216 528 834 4
istanbul@avnet.eu

UNITED KINGDOM (IRELAND)
Berkshire
Phone: +44 1628 512 900
Fax: +44 1628 512 999
maidenhead@avnet.eu

Bolton
Phone: +44 1204 547 170
Fax: +44 1204 547 171
bolton@avnet.eu

Bucks, Aylesbury
Phone: +44 1296 678 920
Fax: +44 1296 678 939
aylesbury@avnet.eu

Stevenage, Herts, Meadway
Phone: +44 1438 788 310
Fax: +44 1438 788 250
stevenage@avnet.eu

ISRAEL
Tel-Mond
Phone: +972 (0)9 7780280
Fax: +972 (0)3 760 1115
avnet.israel@avnet.com

SOUTH AFRICA
Cape Town
Phone: +27 (0)21 689 4141
Fax: +27 (0)21 686 4709
sales@avnet.co.za

Durban
Phone: +27 (0)31 266 8104
Fax: +27 (0)31 266 1891
sales@avnet.co.za

Johannesburg
Phone: +27 (0)11 319 8600
Fax: +27 (0)11 319 8650
sales@avnet.co.za