

# NOIP1SN010KA, NOIP1SN012KA, NOIP1SN016KA, NOIP1SN025KA



## PYTHON High Resolution Image Sensors

ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

### Features

- A Sensor Pin-compatible, Multiple Resolutions Family
- Multi-resolution:
  - ◆ 25 MP = 5120 x 5120 Active Pixels
  - ◆ 16 MP = 4096 x 4096 Active Pixels
  - ◆ 12 MP = 4096 x 3072 Active Pixels
  - ◆ 10 MP = 3840 x 2896 Active Pixels
- 4.5  $\mu\text{m}$  x 4.5  $\mu\text{m}$  Square Low Noise Global Shutter Pixels with In-pixel CDS
- Frame Rate at Full Resolution (LVDS)
  - ◆ 85/60 frames per second @ 25 MP (Zero ROT/Normal ROT)
  - ◆ 130/85 frames per second @ 16 MP (Zero ROT/Normal ROT)
  - ◆ 175/115 frames per second @ 12MP (Zero ROT/Normal ROT)
  - ◆ 195/120 frames per second @ 10 MP (Zero ROT/Normal ROT)
- Random Programmable Region of Interest (ROI) Readout
- 35 mm Optical Format for 25 MPix
- Monochrome (SN), Color (SE) and NIR (FN)
- Pipelined and Triggered Global Shutter
- 32 Low-voltage Differential Signaling (LVDS) High-speed Serial Outputs
- Serial Peripheral Interface (SPI)
- 3.75 W Power Dissipation at Full Resolution
- Operational Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 355-pin  $\mu\text{PGA}$  Package
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Machine Vision
- Inspection
- Intelligent Traffic Systems (ITS)
- Pick and Place Machines

### Description

The PYTHON 10/12/16/25 Megapixel global shutter CMOS image sensors all share the same patented high performance 4.5  $\mu\text{m}$  x 4.5  $\mu\text{m}$  in-pixel Correlated Double Sampling (ip-CDS) pixel that combines global shutter capability with high sensitivity, low dark noise and good shutter efficiency in a compact pixel geometry. All 4 resolutions are pin compatible (same package) and use the same data, control and optical interface, with optical center (x-, y- and z- direction) at the exact same location in the package. The result is a hardware scalable solution, allowing

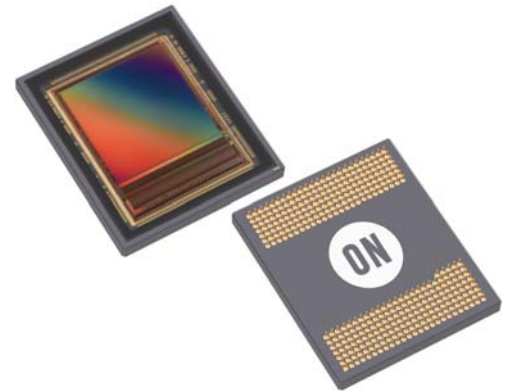


Figure 1. Python xK Photograph

development teams to rapidly roll-out multiple resolutions to the market with minimized development effort.

The image data interface can be configured to work with 4, 8, 16 or 32 LVDS lanes, facilitating maximum frame rates ranging from 195 frames per second for the 10 MP sensor down to 85 frames per second for the 25 MP. Each channel runs at 720 Mbps. A separate synchronization channel containing payload information is provided to facilitate the image reconstruction at the receiving end. Up to 32 regions of interest (ROI) can be programmed, achieving even higher frame rates.

PYTHON sensors have been designed with focus on versatility and ease of use. This is not only realized by the highly attractive speed and optical performance, HW scalability and operational support for industrial temperature range ( $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ), but also by its extended reconfigurability. A four wire serial peripheral interface (SPI) controls features like trigger options (master/slave), on-chip automatic exposure control loop (AEC) controls, and fast on the fly updates to integration time, gain settings and ROI configuration without any visible image artifact. The image's black level is either calibrated automatically or can be adjusted by adding a user programmable offset.

The PYTHON high resolution sensors are packaged in a 355-pin  $\mu\text{PGA}$  package and are available in monochrome and color versions. For NIR version or more information, please email us at [imagesensors@onsemi.com](mailto:imagesensors@onsemi.com).

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## SPECIFICATIONS

### Key Specifications

**Table 1. GENERAL SPECIFICATIONS**

Parameter	Specification
Frame rate Zero ROT / Normal ROT mode	25 MP: 85/60 fps 16 MP: 130/85 fps 12 MP: 175/115 fps 10 MP: 195/120 fps
Pixel size	4.5 $\mu\text{m}$ x 4.5 $\mu\text{m}$
Pixel type	In-pixel CDS, Global shutter pixel architecture
Master clock	360 MHz (10-bit) 288 MHz (8-bit)
Windowing features	32 Randomly programmable windows. Normal, sub-sampled and binned readout modes
ADC resolution	10-bit, 8-bit
Number of LVDS outputs	32 data + 1 sync + 1 clock Support for 2:1, 4:1 and 8:1 mux
Data rate	32 x 720 Mbps (10-bit) 32 x 576 Mbps (8-bit)
Power Consumption	3.75 W
Package type	355 $\mu\text{PGA}$
Color	RGB color, mono

**Table 2. ELECTRO-OPTICAL SPECIFICATIONS**


Parameter	Specification
Active pixels	25 MP: 5120 (H) x 5120 (V) 16 MP: 4096 (H) x 4096 (V) 12 MP: 4096 (H) x 3072 (V) 10 MP: 3840 (H) x 2896 (V)
Optical format	25 MP: 35 mm recommended 16 MP: 35 mm recommended 12 MP: 35 mm recommended 10 MP: 4/3"
Conversion gain	0.11 LSB $_{10}$ /e $^{-}$ , 140 $\mu\text{V}/\text{e}^{-}$
Dark noise	<1.1 LSB $_{10}$ , 10e $^{-}$
Responsivity at 550 nm	31.5 LSB $_{10}$ /nJ/cm $^2$ , 5.8 V/lux.s, 4100 V/s/W/m $^2$
Parasitic Light Sensitivity (PLS)	<1/6000 at 550 nm
Full well charge	9500 e $^{-}$
Quantum efficiency (QE) x FF	50% at 550 nm
Row FPN	0.2 LSB $_{10}$
Column FPN	1.0 LSB $_{10}$
Dynamic range	60 dB
Signal-to-Noise Ratio (SNR)	40 dB
Dark signal	14 e $^{-}$ /s, 0.9 LSB $_{10}$ /s at +30°C

To receive a detailed product data sheet and supporting documentation, visit the CISP Extranet at [www.onsemi.com/MyON](http://www.onsemi.com/MyON).

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