

Image Sensors

Providing comprehensive solutions for industrial, professional, consumer, and medical imaging from ON Semiconductor.







ON Semiconductor Image Sensor Solutions

ON Semiconductor develops and markets high-performance CMOS image sensors, based on patented technologies and extensive experience in this domain. The company creates CMOS active pixel sensors through innovative design approaches using standard CMOS processing technologies.

ON Semiconductor offers a wide range of standard and custom designed CMOS image sensors, with long lifecycles and on-time deliveries.

For over 15 years, the company has provided proven solutions for multi-megapixel digital photography, large area sensors up to wafer scale, ultra-high-speed sensors, imaging for machine vision, linear and 2D barcode scanning, medical X-ray imaging, single-chip camera integration, radiation-tolerant CMOS image sensors for space and nuclear applications, and linear contact image sensor modules and light sensors.



Mapping Applications to ON Semiconductor Sensor Solutions

ON Semiconductor develops and markets a range of high-performance CMOS image sensors:

VITA sensor family of true synchronous snapshot shutter sensors. The highly programmable, footprint compatible, HDR, and powerful windowing capabilities make it an extremely versatile family for a wide variety of applications.

LUPA high-speed sensors combine true synchronous snapshot shutter with very high frame rates, for use in applications such as motion analysis, scientific high-speed image analysis and for industrial inspection applications demanding higher speed.

STAR sensors combine high sensitivity with excellent image quality and a unique tolerance to the harsh environment and radiation in space. Typical applications: satellite optical attitude and communication sensors, airplane visual monitoring, and nuclear power plant inspection

IBIS4/MANO sensors have 3-transistor and shared 4-transistor pixels and employ a rolling electronic shutter. Typical applications include document scanning, industrial vision, medical imaging, and biometric applications. MANO sensors are specifically tailored for biometric applications.

Contact Image Sensor Modules may be used for scanning applications, such as printers, scanners, currency verification, gaming and balloting applications.

Light Sensors are widely deployed in mobile devices to optimize battery life, and enable new features, such as gesture detection for smart phones, and hue sensing for LED TVs. ON Semiconductor provides a variety of integrated and discrete Proximity Sensor (PS) and Ambient Light Sensor (ALS) products tailored to these applications.

End Markets	IBIS	VITA	MANO	LUPA	STAR, HAS	Contact Modules	Light Sensors	Custom Design
Industrial	~	~		~		~		~
Barcode								~
Biometrics	~		~					~
High Speed				~				~
Space & Nuclear					~			~
ITS		~		~				~
Medical		~		~				~
Military		~		~	~			~
Cine/BCst								~
Automotive								~
High End Security								~
Printers/Scanners						~		~
Mobile Devices/LED TV							~	

VITA

FEATURES

- 1.3 to 25 megapixel resolution
- Pipelined and triggered global shutter with dual slope readout
- Rolling shutter with CDS
- Up to 150 fps full frame readout
- Configurable operation modes
- Ease of operation
- LVDS or CMOS outputs
- 10-bit or 8-bit accuracy
- Multiple parallel window readout
- Mono and color variants

VITA Standard Image Sensors

The growing demand for new applications is opening up exciting opportunities for high-performance CMOS image sensors. Besides high-end machine vision, there is a rapidly expanding market for 2D barcode readers, high-end security solutions, and a new breed of intelligent traffic management systems. The needs of these new markets can be addressed by the VITA family from ON Semiconductor. VITA offers configurability, flexibility and ease of operation.



VITA 25K

Parameter	VITA 1300	VITA 2000	VITA 5000	VITA 25K
Active Pixels	1280 (H) x 1024 (V)	1920 (H) x 1200 (V)	2592 (H) x 2048 (V)	5120 x 5120
Pixel Size	4.8 μm x 4.8 μm	4.8 μm x 4.8 μm	4.8 μm x 4.8 μm	4.5 μm x 4.5 μm
Shutter Type	Global and Rolling shutter			
Master Clock	62 MHz (PLL)	62 MHz (PLL)	62 MHz (PLL)	310 MHz (10-bit output)
Windowing	8 randomly programmable ROI. Normal, sub-sampled and binned readout modes.	8 randomly programmable ROI. Normal, sub-sampled and binned readout modes.	8 randomly programmable ROI. Normal, sub-sampled and binned readout modes.	32 randomly programmable ROI. Normal, sub-sampled and binned readout modes.
ADC Resolution	10-bit, 8-bit	10-bit, 8-bit	10-bit, 8-bit	10-bit, 8-bit
LVDS Output	4 data + sync + clock	4 data + sync + clock	8 data + sync + clock	32 data + sync + clock
CMOS Outputs	10-bit parallel output, frame valid, line valid, clock	10-bit parallel output, frame valid, line valid, clock	NA	NA
Power Dissipation	475 mW in 10-bit mode	510 mW in 10-bit mode	1000 mW in 10-bit mode	3.5 W in 10-bit mode
Package	LCC-48	LCC-52	LCC-68	μPGA-355
Optical Format	1/2 inch	2/3 inch	1 inch	35 mm
Frame Rate	150 fps (LVDS) 37 fps (CMOS)	90 fps (LVDS) 22 fps (CMOS)	75 fps	53 fps
Responsivity @ 550 nm	4.58 V/lux.s, 23.82 LSB10/nJ/cm ²	4.58 V/lux.s, 23.82 LSB10/nJ/cm ²	4.58 V/lux.s, 23.82 LSB10/nJ/cm ²	3.3 V/lux.s, 18.16 LSB10/nJ/cm ²
FPN	0.5% RMS	0.5% RMS	0.5% RMS	0.5% RMS

IBIS/MANO Standard Image Sensors

ON Semiconductor provides several solutions to address the needs of a growing number of high-end biometric applications, such as fingerprint, palm print, and iris detection. The IBIS and the new MANO sensor serve these needs with a combination of frame rates, high resolution, and high SNR performance. In addition, the new MANO 9600 offers configurability, ease of operation and pin compatibility with VITA 2000.

Other applications include inspection, scanning, biometry and medical systems.





IBIS4 6600

MANO 9600

Parameter	IBIS4 6600	MANO 9600
Active Pixels	2210 x 3002	3840 x 2500
Pixel Size	3.5 μm	2.4 μm
Optical Format	1"	2/3"
Shutter Type	Rolling	Rolling
Master Clock	40 MHz	62 MHz
Windowing	1 randomly programmable ROI. Windowed, and sub-sampled readout possible.	Randomly programmable ROI.
ADC Resolution	10-bit	10-bit, 8-bit
LVDS Output	-	4 data + sync + clock
CMOS Output	10-bit parallel	10-bit parallel output, frame valid, line valid, clock
Power	190 mW	510 mW
Package Type	LCC-68	LCC-52
Frame Rate	5 fps	20 fps
Responsivity @ 550 nm	0.5 V/lux.s 3 LSB 10/nJ/cm ²	0.5 V/lux.s 3 LSB 10/nJ/cm ²
FPN	0.2% RMS	0.5% RMS

IBIS MANO

FEATURES

- 6.6 to 9.6 megapixel resolution
- Configurable operation modes
- Rolling shutter with CDS
- Ease of operation
- LVDS or CMOS outputs
- 10-bit or 8-bit accuracy

LUPA

FEATURES

- Frame rates up to 500 fps at several megapixel resolutions
- Unprecedented sensitivity
- Pipelined global shutter
- Low power dissipation
- High resolution
- No blooming or image lag
- Mono and color variants

LUPA Standard Image Sensors

The LUPA family is a result of in-depth research and extensive experience developing high speed CMOS image sensors.

LUPA devices offer resolution as high as 2048 x 2048 and frame rates up to 500 fps. These features, combined with power consumption as low as 150 mW with absolutely no blooming or lag, create a perfect foundation for highly reliable, high sensitivity image sensors.



Parameter	LUPA 300	LUPA 1300-2	LUPA 3000	LUPA 4000
Active Pixels	640 (H) x 480 (V)	1280 (H) x 1024 (V)	1696 (H) x 1710 (V)	2048 x 2048
Pixel Size	9.9 µm x 9.9 µm	14 μm x 14 μm	8 µm x 8 µm	12 μm x 12 μm
Shutter Type	Pipelined and Triggered Global shutter			
Master Clock	80 MHz	315 MHz	206 MHz	33 MHz
Windowing	1 randomly programmable ROI. Windowed, mirrored and sub- sampled readout possible.	4 randomly programmable ROI. Windowed, mirrored and sub- sampled readout possible.	1 randomly programmable ROI. Windowed, mirrored and sub- sampled readout possible.	1 randomly programmable ROI. Windowed, mirrored and sub-sampled readout possible; voltage averaging in the x-direction.
ADC Resolution	10-bit	10-bit	8-bit	NA
Power Dissipation	190 mW	1350 mW	1100 mW	150 mW
Package	LCC-48	μPGA-168	μPGA-369	PGA-127
Data Rate	80 Mbps	12 x 630 Mbps	32 x 412 Mbps	1 x 66 MSps (analog) or 2 x 33 MSps (analog)
Optical Format	1/2 inch	1 inch	1 inch	35 mm
Frame Rate	250 fps	500 fps	485 fps	15 fps
Responsivity @ 550 nm	3.2 V/lux.s	10.2 V/lux.s	3.8 V/lux.s	2.8 V/lux.s
FPN	2.5% RMS	2% RMS	2% RMS	1.25% RMS

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STAR/HAS Standard Image Sensors

The STAR family is a result of extensive research and irradiation experiments in developing radiation-tolerant CMOS pixels and readout electronics. These structures are qualified up to a total dose irradiation of 300 krad.

Radiation tolerant CMOS image sensors play an important role in radiation environments where normal CMOS or CCD imagers cannot survive, and where CRT image tubes are too expensive, too heavy, or too large.





STAR 1000



HAS2

STAR HAS

FEATURES

- High radiation tolerance
- High sensitivity
- Low noise
- Up to 1 megapixel resolution
- Space qualified (ESCC-9020)
- STAR1000 available in color

Parameter	STAR 250	STAR 1000	HAS2
Active Pixels	512 x 512	1024 x 1024	1024 x 1024
Pixel Size	25 µm x 25 µm	15 µm x 15 µm	18 µm x 18 µm
Shutter Type	Rolling shutter	Rolling shutter	Rolling shutter
Master Clock	8 MHz	12 MHz	5 MHz
Windowing	1 randomly programmable ROI. Windowed and sub-sampled readout possible.	1 randomly programmable ROI. Windowed and sub-sampled readout possible.	40 randomly programmable ROI. Windowed and sub-sampled readout possible.
ADC Resolution	10-bit	10-bit	12-bit
Power Dissipation	350 mW	400 mW	122 mW
Package	JLCC-84	JLCC-84	JLCC-84
Data Rate	8 MSps	12 MSps	5 MSps
Optical Format	1 inch - 35 mm	1 inch - 35 mm	35 mm
Frame Rate	29 fps	11 fps	4 fps
Responsivity @ 550 nm	5.4 V/lux.s	2.7 V/lux.s	9.6 V/lux.s
FPN	0.10% RMS	0.60% RMS	0.12% RMS

Linear Contact Image Sensor Module and Light Sensor Products

CIS Modules	Light Sensors	Photo-Diode Arrays
 Banking Gaming Balloting ID Mark Readers 	 Ambient Light Sensor Proximity Sensor Medical/SPO₂ Devices 	 Drug Discovery and Development Drug MFG/QA-QC

Linear Contact Image Sensor Modules

ON Semiconductor utilizes proprietary active pixel technology providing superior noise performance. Due to design expertise and flexibility, the company can provide quick turn around times from concept to production.

- >400 million units sold with active customers
- Internally owned and operated fabrication facility
- Flatbed, sheet-fed style
- 50 to 1200 dpi
- A3 to A8 and custom scan widths
- IR to UV LED illumination (white, red, green, etc.)
- RGB, single or multiple LED colors in either light pipe or bar
- 1 MHz to 50 MHz scan speed
- Analog, binary, inverted and multi-channel outputs
- Trilinear color sensors
- · Fixed or programmable resolution, high scan speed, extended temperature range
- · Reflective and transmission illumination methods



Light Sensor Products

Light sensors are widely deployed in mobile devices to optimize battery life, and are driving new gesture detection features in smart phones. ON Semiconductor provides a variety of integrated and discrete Proximity Sensors (PS) and Ambient Light Sensor (ALS) products tailored to these applications. Proximity sensors reflect infrared (IR) light off the target to determine motion, distance, and even position of the user's hand or finger.

ALS Features

- Photopic response
- Dark current compensation
- Low light sensitivity to 0.01 lux
- Very low power consumption
- Selectable gain ranges
- Programmable integration times
- Linear response
- Analog and digital (16 bit resolution)
- · Compatible with ON semiconductors LED driver products

PS/APS Features

- Range detection up to 100 mm and beyond with 16-bit effective resolution
- 50 dB proximity threshold range
- 32:1 LED driver range
- IR and ambient light rejection
- Dark current compensation
- I2C digital interface with multiple threshold interrupt strategies and filters

Gesture

 Tracking objects with multiple photo-diode receivers enables the application to triangulate and locate the position and motion of travel of an object of interest near the screen. Direction of travel is determined by examining the time or phase relationship of light arriving at the detectors from the IR LED. Proximity to the screen is determined by the amplitude of the reflected IR signature.



Device	Туре	Output	Vin (V)	PS Operating Current Typ (µA)	PS Average LED Sink Current Typ (µA)	ALS Operating Current Typ (µA)	Standby Current Typ (µA)	Package
NOA1211; NOA1212*	Analog ALS	Current	2.0 - 5.5	_	_	18	0.2	CUDFN-6
NOA1305*; NOA1306	Digital ALS	12C	2.4 - 3.6	_	_	120	1	CUDFN-6
NOA1312*	Digital ALS	I2C	2.4 - 3.6	_	_	140	0.012	CUDFN-6
NOA2301*	PS	12C	2.3 - 3.6	100	75	_	4	CUDFN-6
NOA2302*	PS Slave	12C	2.3 - 3.6	100	75	_	4	CUDFN-6
NOA3301	PS + ALS	12C	2.3 - 3.6	100	75	50	4	CUDFN-8
NOA3313*	PS + ALS	I2C	2.3 - 3.6	100	50	100	4	CUDFN-8
LA0151CS; LA0152CS	Analog ALS	Current	2.5 - 5.5	_	_	150	0.1	ODCSP-4
LV0111CF	Analog ALS	Current	2.3 - 5.5	_	_	75	0.01	ODCSP-4
LV0104CS	Digital ALS	-	2.3 - 3.6	_	_	70	1	ODCSP-4
* Pending 1H13.								

Custom Design Image Sensors

ON Semiconductor offers custom and application-specific CMOS image sensors that help our partners leap ahead of competitors by creating unique products with state-of-the-art performance. Custom designs can be based on internally developed parametric functional blocks or a radical new approach, resulting in previously unseen performance and functionality.

ON Semiconductor design and manufacturing technologies help to optimize key parameters and create the perfect fit for the application. Pixel size, shape and rate, saturation and noise level, dynamic range and sensitivity, frame rates and outputs are custom defined.

Alternatively, semi-custom solutions based on the standard product portfolio are offered to enable unique features and performance for the more demanding applications and markets, with fast time to market.

Custom solutions from ON Semiconductor are used in high resolution photography, high-speed imaging, barcode reading, machine vision, medical imaging, and linear and light sensing applications. Contact ON Semiconductor for any application that needs an array- or linear-sensor solution with low power, smart sensing, or radiation-tolerance.

ADVANTAGES

- Full flexibility in specifications
- · Key differentiator in the end application
- Guaranteed availability throughout the product lifetime
- High level of architectural and operational flexibility resulting in improved performance

APPLICATIONS

- Machine vision
- · High speed
- X-ray
- Endoscopy
- Barcode
- Cinematography
- Banking
- Gaming
- Mobile devices
- Security
- Space/Military



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