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System Solution Guide - Preview

Machine Vision

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Table of Contents

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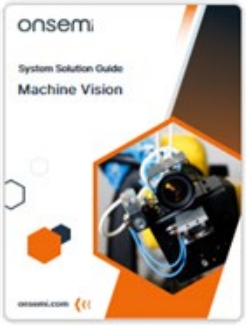


1

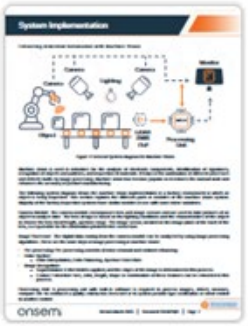
2

3

4

5

6



7

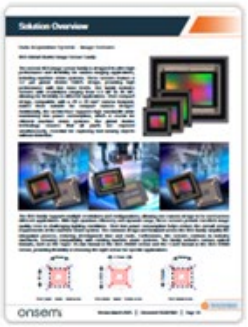
8

9

10

11

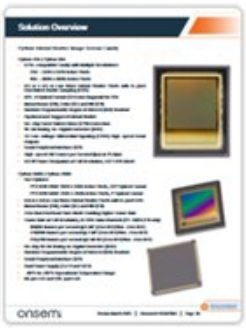
12



13

14

15

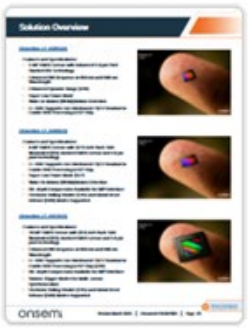


16

17

18

19



20

Block Diagram - Machine Vision

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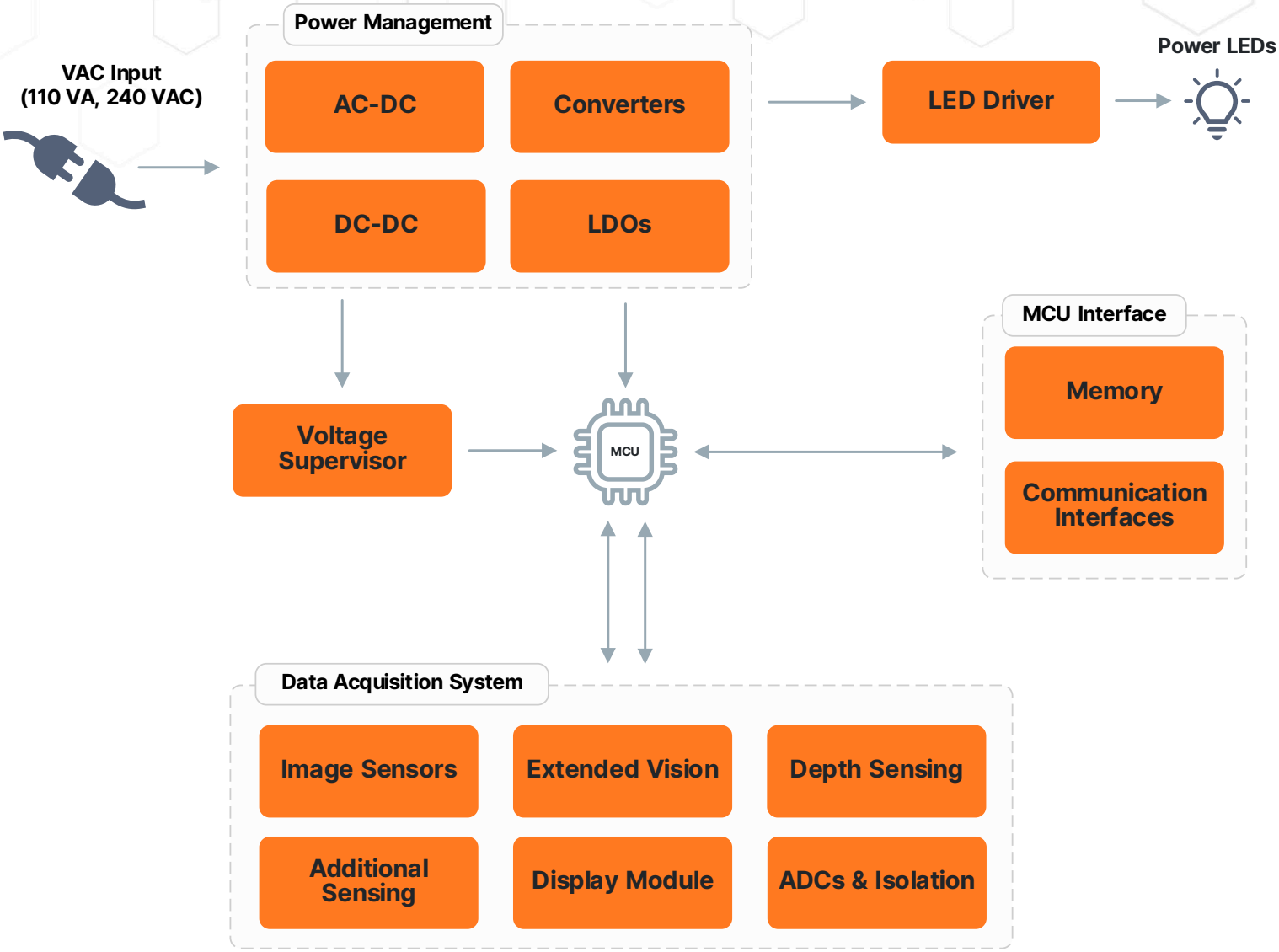
Block Diagram - Drone

The block diagram below illustrates an industrial machine vision solution featuring recommended products from onsemi. This solution integrates multiple image sensing and depth sensing technologies, utilizing onsemi's Global and Rolling Shutter sensor families. Most of the functional block devices, including power management, communication, and many more, can be sourced from onsemi's comprehensive range of solutions.



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Solution Overview

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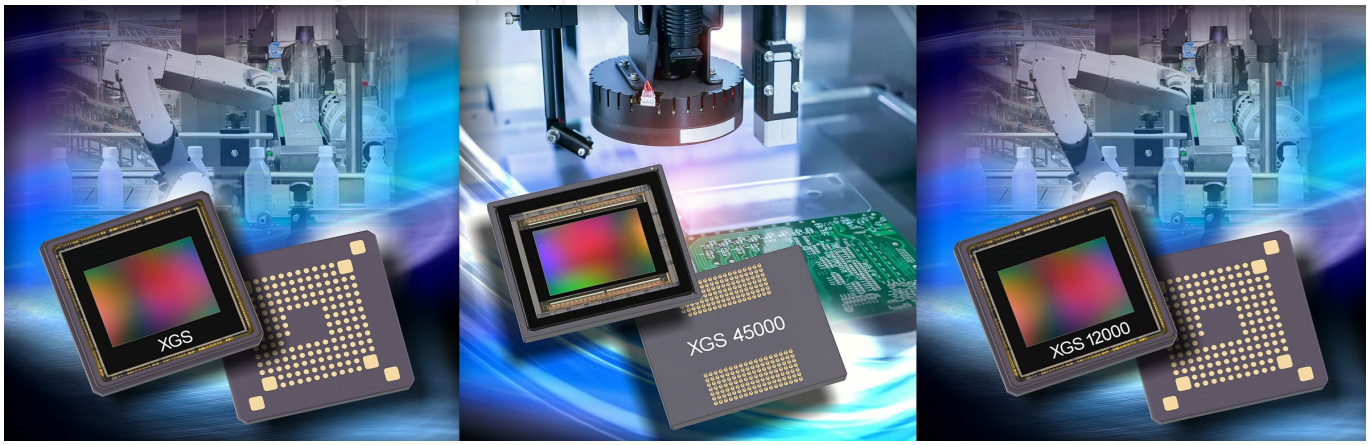
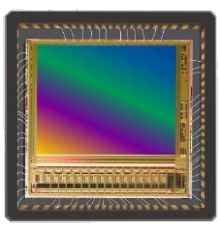
XGS Global Shutter Image Sensor Family

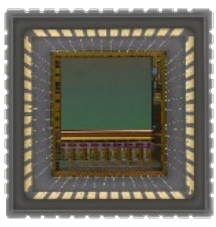
The onsemi XGS image sensor family is designed to offer high performance and flexibility for various imaging applications, including machine vision systems. These sensors feature a 3.2 µm global shutter CMOS design, providing high performance with low noise levels. The family includes sensors with resolutions ranging from 5.3 MP to 45 MP, allowing for flexibility in different applications. Their compact design, compatible with a 29 x 29 mm² camera footprint, makes them suitable for compact camera designs. Additionally, the architecture supports high bandwidth while maintaining low power consumption, which is crucial for efficient machine vision systems. The global shutter technology ensures that all pixels are exposed simultaneously, essential for capturing fast-moving objects without distortion.



PYTHON Global Shutter Image Sensor Family

The PYTHON family of Global Shutter image sensors family is optimized for the most typical Machine Vision applications including detailed inspection, high-speed tracking, measuring and a lot more. This family consists out of 8 resolutions based on a 4.5 um or 4.8 um pixels having resolutions starting at VGA up to 25 Megapixels featuring frame rates starting from 80 fps to 815 fps depending on the resolution. PYTHONs are available as mono, color and NIR enhanced versions while speed and quality grade options are available for selected resolutions.





Quadratic Speed Increase Feature

All PYTHON devices have the unique feature of quadratic speed increase, in which the frame rate increases as function of both vertical and horizontal dimensions of the Region of Interest read out. Entire image sensor family support the readout of multiple Regions of Interest (ROIs), with the PYTHON 25K model handling up to 32 potentially overlapping ROIs. However, due to the column ADC readout architecture, all sensors based on this architecture will only feature a frame rate increase proportional to the reduction in vertical height (y). Limited by the ADC conversion time, reducing the width of the window read (x) has no impact on the frame rate. The PYTHON CMOS Image Sensor family is the only commercially available GS Image Sensor family featuring a number of individual and fast ADCs, such that reducing the width and the height of the ROI will benefit the frame rate.

Solution Overview

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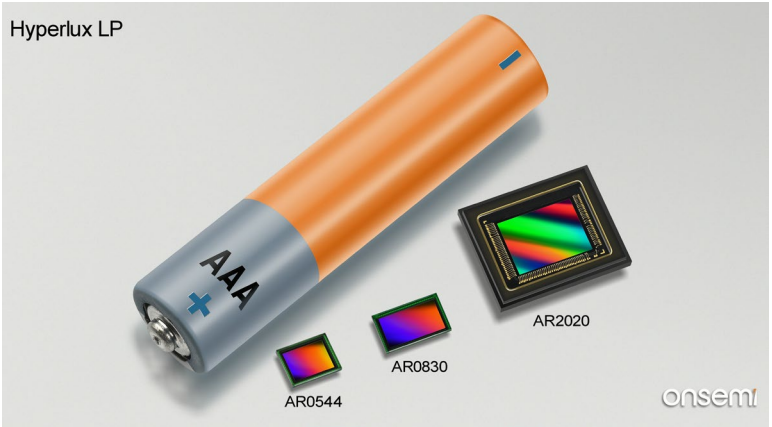
Hyperlux SG – Global Shutter Image Sensor Family

The Hyperlux SG image sensor family from onsemi is revolutionizing machine vision technology with its advanced imaging capabilities tailored for a wide range of applications. Integrating Hyperlux SG image sensors from onsemi into machine vision systems offers numerous advantages. These sensors feature industry-leading global shutter efficiency, ensuring crisp, clear, and distortion-free images of fast-moving objects, which is crucial for applications like barcode scanning and robotics. Operating at up to 120 frames per second, they allow for high-speed image capture, essential for monitoring dynamic industrial processes. Additionally, Hyperlux SG sensors provide high dynamic range and low-light performance, ensuring excellent image quality even in challenging lighting conditions. Their compact design makes them suitable for a wide range of applications, including autonomous mobile robots and other space-constrained environments. The Hyperlux SG family includes sensors with various resolutions, from VGA to 2.3MP, allowing for scalability based on specific application needs.

Hyperlux LP - Image Sensor Family

The **onsemi** Hyperlux LP image sensor family is designed for a range of applications, including the AR2020, AR0544, and AR0830. These sensors offer exceptionally low power consumption, ensuring devices run longer and more efficiently. With the innovative **wake-on-motion feature**, your device can stay in a low-power state until motion is detected, saving even more energy. Additionally, the sensors provide excellent performance in low-light and NIR wavelengths. Moreover, the Smart ROI (Region of Interest) in the AR2020 sensor allows for intelligent focus on specific areas, enhancing performance and precision.



Power Consumption

- In the pre-detect state, Hyperlux™ LP image sensors consume less than **1/100th** of the power consumed in the native mode. This results in substantial power savings and extends the operational cycle of vision systems that are sensitive to power consumption.

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SWIR - Extended View

The **onsemi** SWIR ACUROS series offers cutting-edge short-wave infrared (SWIR) cameras and image sensors, meticulously engineered for high-performance imaging applications. These sensors exhibit remarkable spectral range ranging from 400 nm to 1700 nm (SWIR) and 400-2100 nm (eSWIR), ensuring exceptional depth and clarity across diverse lighting conditions. Equipped with a global shutter and a 15µm pixel size, the ACUROS cameras deliver high-resolution, high-dynamic-range imaging with minimal noise, making them ideal for capturing precise and detailed images.

These advanced capabilities make the ACUROS cameras particularly well-suited for applications such as imaging through opaque materials like plastic, material sorting and recycling, and moisture content analysis (water absorption at 1450 nm). The CQD SWIR advantage allows these cameras to 'see through' many opaque materials, providing higher resolution sensors for larger inspection areas and supporting high frame rates for dynamic imaging tasks.

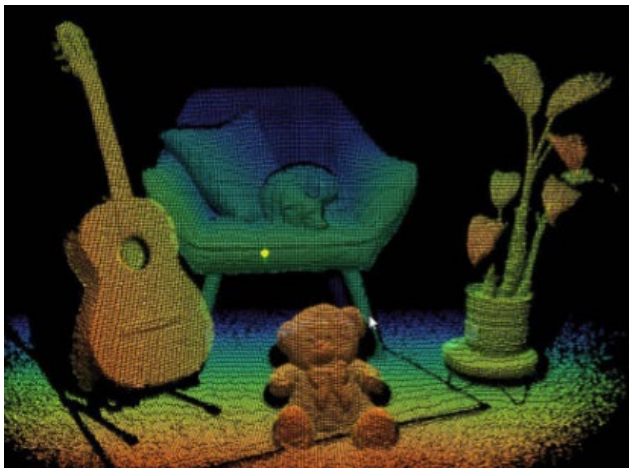
This combination of high sensitivity, robust performance, and superior image quality positions the ACUROS series as a reliable choice for professionals seeking top-tier imaging solutions in various demanding applications.

Smart iToF Global Shutter Depth Sensors - AF0130 & AF0131

onsemi AF0130 and AF0131 Smart Indirect Time of Flight (iToF) 1.2 MP CMOS sensors are designed for exceptional depth sensing and imaging. These sensors feature a 1/3.2-inch optical format and BSI CMOS global shutter technology, including 1.2 MP CMOS Smart iToF Sensor with Advanced 3.5 µm Pixel Stacked BSI Technology, superior low-light and ambient-light performance, enhanced NIR response at 850 nm and 940 nm wavelength (QE > 40%), dual laser operation for increased depth range, and laser eye safety monitoring.

Key features of Hyperlux ID depth iToF sensors include :

- High Depth Accuracy: Provides accurate distance measurements, crucial for tasks requiring precise 3D mapping and object detection.
- High Frame Rates: Capable of capturing fast-moving objects (60 – 100 fps), ensuring reliable performance in dynamic environments.
- Low Power Consumption: Optimized for energy efficiency (400 mW in Mode2.2 (100 MHz) @ 30 fps and 0.35 ms exposure 600 mW in Mode3.2 (100+120 MHz) @ 30 fps and 0.35 ms exposure), making them suitable for battery-powered and multi-sensor systems.



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