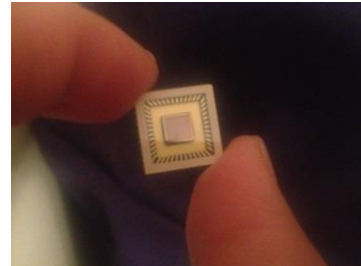


Product overview

The Anitoa ULS24 is an ultra-low-light CMOS image sensor. Its low cost, small form factor and high level of integration make it optimally suited for use in a portable device in medical, scientific and industrial applications. An example of such application is a field portable nucleic-acid-test (NAT) system that performs molecular sensing based-on fluorescence or chemiluminescence signaling principles.



ULS24 is built on 0.18um CMOS process at a world-leader specialty semiconductor foundry.

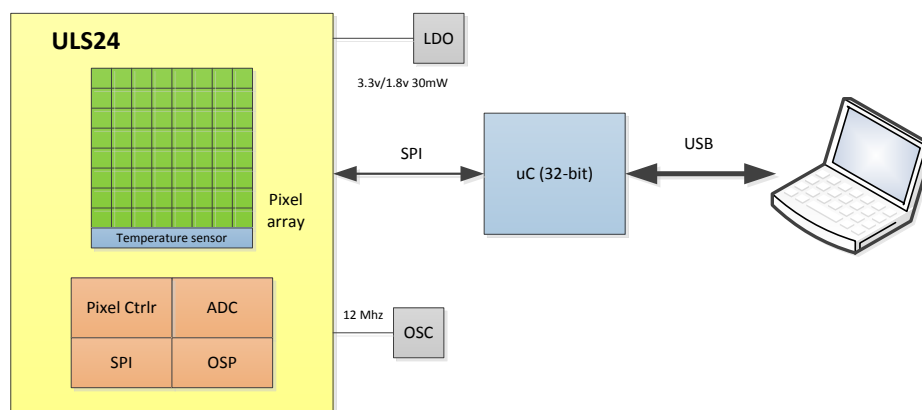


Figure 1. ULS24 Chip Application Block Diagram

Features

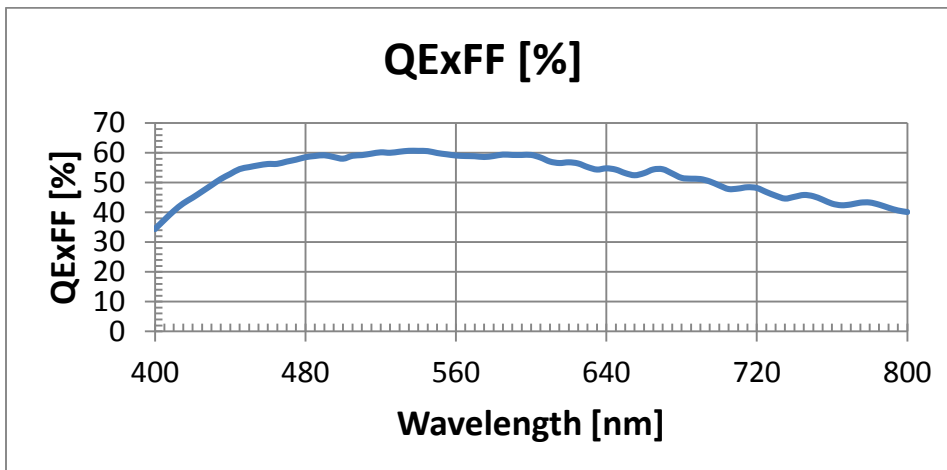
- Ultra low-light sensitivity. Detection threshold $\sim 3.0 \times 10^{-6}$ lux.
- Low dark current, high SnR (>13dB at detection threshold).
- 12-bit ADC. Dual gain mode.
- Wide dynamic range (> 85dB). Excellent linearity (<0.6%).
- Digital interface through Serial Peripheral Interface (SPI).
- Built-in junction temperature sensor.
- 3.3V and 1.8V power supply, 30mW max power.
- Operating temperature range -15 °C – 85 °C¹.

¹ The image sensor can meet noise spec at junction temperature up to 55 °C.

Key parameters

Imager size	4.9mm x 4.8mm; Sensing area: 3.6mm x 3.6mm
Active pixels	24x24
Pixel size	150um x 150um (4 can be combined into a 300um x 300um "big pixel")
Integration time	100us - 100 seconds, software controlled
ADC resolution	12-bit
Signal Interface	Serial Peripheral Interface (SPI), 4 wires
Responsivity	135V/lux-sec @550nm in high-gain mode 540V/lux-sec @550nm in high-gain 4-bin mode 4200V/lux-sec with 2850k light in high-gain 4-bin mode
Detection threshold (550nm)	$\sim 3.0 \times 10^{-6}$ lux or $\sim 4.4 \times 10^{-7}$ uW/cm ²
Dynamic range	>85dB, in dual gain mode
SnR	13dB minimum at detection threshold
Non-linearity error	Low gain mode: <0.5%; high gain mode: <0.6%
Supply	3.3V (analog); 1.8V (digital)
Power consumption	< 30mW
Operating temperature	-15 – 85 °C (up to 55 °C to meet optical performance spec).
Temperature sensor spec	± 0.3 °C accuracy. -15 to 85 °C range. Need calibration.
Packaging	48-pin CLCC

Quantum efficiency (QE) x Fill factor (FF) vs. Wavelength:



ULS 24 Solution Kit

The ULS24 Solution Kit is available as an “out of box” solution to allow the user to conveniently evaluate ULS24. The ULS 24 Solution Kit includes the ULS24 Sensor IC, an interface board, and software (ULVision). This solution kit can readily interface with a PC via USB.

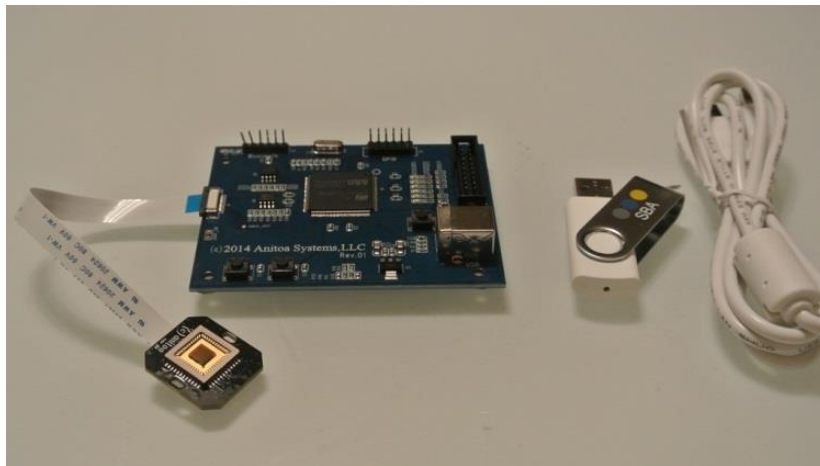


Figure 2. ULS24 Solution Kit

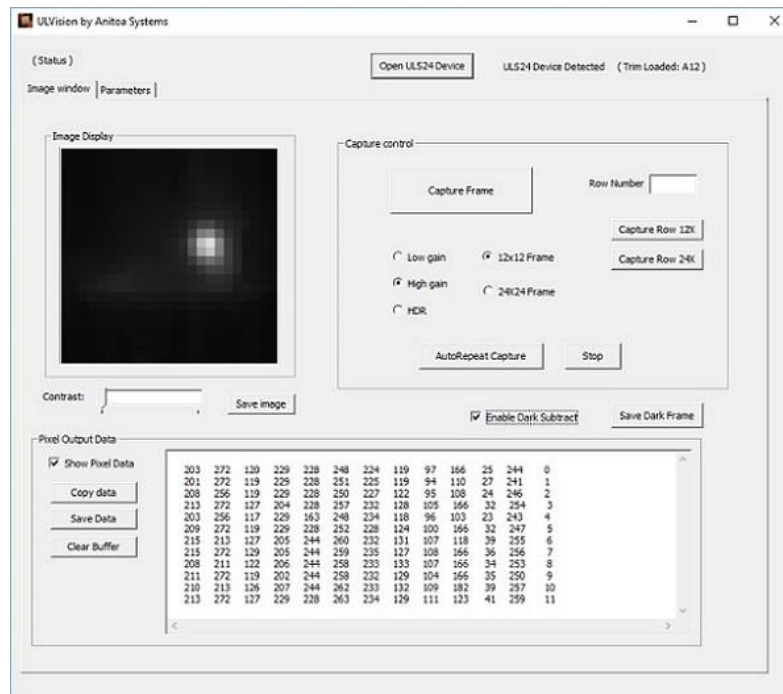


Figure 3. ULVision software

Applications

Biomedical and life science

Molecular sensing/imaging based fluorescence and chemiluminescence signaling principles.

- DNA and RNA quantification, fluorescent-based
- Miniaturized qPCR system or digital qPCR
- Fluorescence or chemiluminescence-based Immunoassay/ELISA
- DNA or Protein microarray
- Pyro-sequencing
- Capillary electrophoresis
- Cell sorting/Imaging flow cytometry
- Fluorescence Images Guided Surgery (FIGS)

Industrial and scientific

- Quantum dot spectrometer
- Hazard and chemical-threat detection instruments

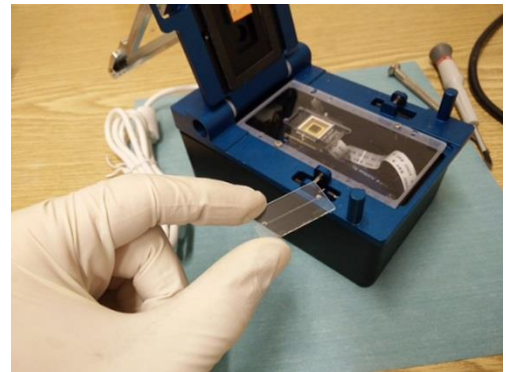


Figure 4. ULS24-based fluorescence and chemiluminescence cameras. Left top: 1-channel system fluorescent imager with ULS24, with filter installed; and ULS24 with C-mount lens interface for chemiluminescence imaging. Left bottom: 2 channel imager with integrated 2 channel UV excitation LED for tissue imaging. Right: ULS24 used in a lensless configuration for chemiluminescence read out in a microfluidic application.

Application data showcase

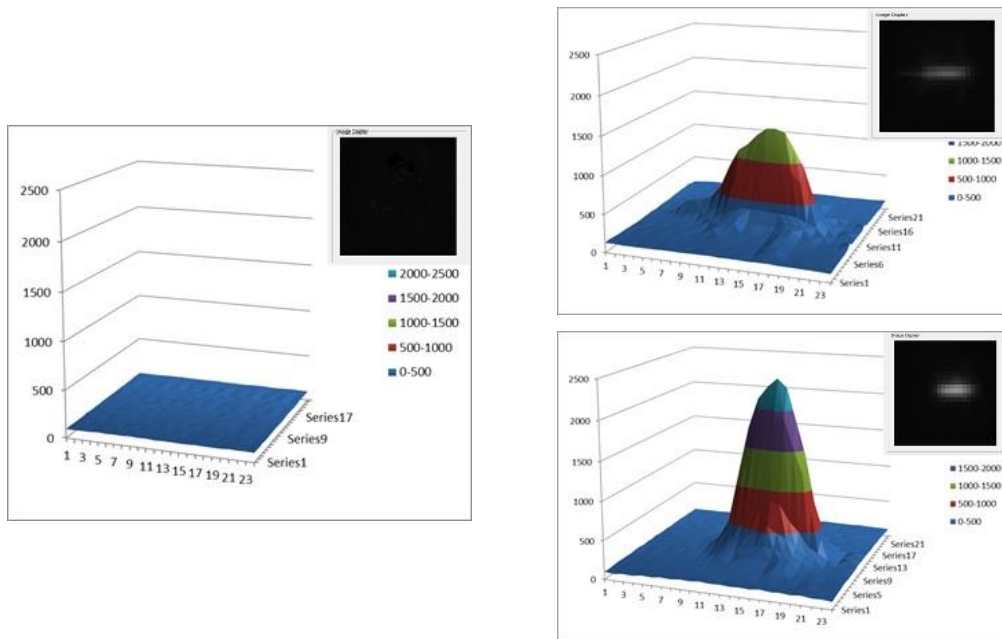


Figure 5. ULS24 measuring fluorescent emission from immunoassay test, at 3 different signal levels. Left: dark input; right top: medium signal level; right bottom: strong signal level

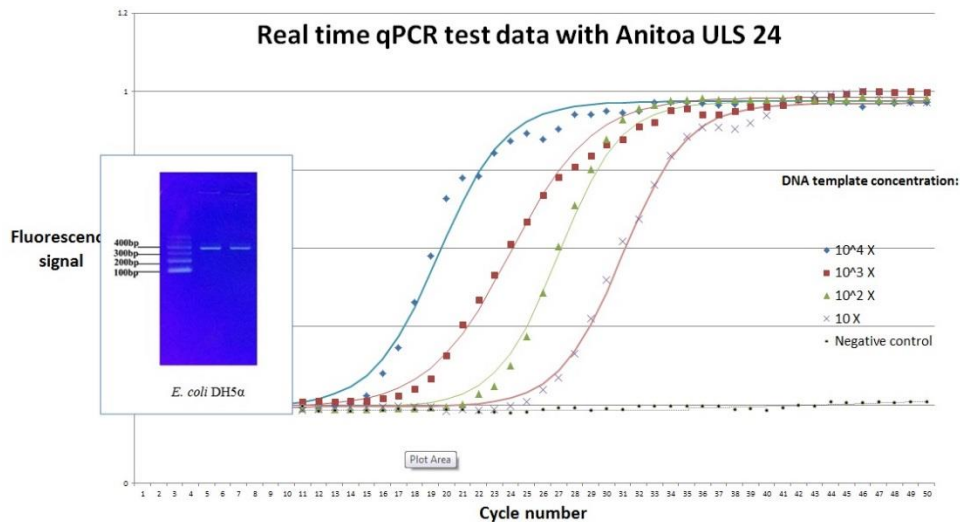


Figure 6, ULS24 successfully applied in qPCR to detect E Coli. (DH5a) bacteria, with as low as 10 copies/reaction detection limit.



Contact

Anitoo Systems, LLC
149 Commonwealth Drive, Suite 1001
Menlo Park, CA 94025
www.anitoo.com
info@anitoo.com