



## Nano-SWIR™ 640C Camera

### Mil-Rugged, High-Sensitivity, Small SWaP InGaAs SWIR Camera

The C-Platform is Sensor Unlimited's next generation SWIR compact video cameras designed for applications requiring small Size, Weight, and Power (SWaP). These cameras feature a 640x512 pixel, high-sensitivity InGaAs imager that does not require thermal stabilization and utilize Sensor Unlimited's proprietary parameterized non-uniformity corrections algorithms to produce high quality imagery. The elimination of thermoelectric coolers enable the packaging of imagers and associated electronics for applications requiring very small size and low power draw. The camera provides real-time daylight to low-light imaging in the Short Wave Infrared (SWIR) wavelength spectrum for persistent surveillance, laser detection, and penetration through fog, dust, and smoke. On-board Automatic Gain Control (AGC) is employed to address the challenges of day to night imaging. Camera Link® digital output provides for plug-and-play video with 12-bit images for digital image processing or transmission. The light-weight and compact size enables easy integration into aerial, mobile and hand-held surveillance systems. Optional NIR/SWIR technology is available to extend the sensitivity of Sensor Unlimited cameras down to 0.7  $\mu\text{m}$ , offering the advantage of both Near Infrared (NIR) and Short Wave Infrared wavelength response.

#### FEATURES

- 640 x 512 pixel format, 15  $\mu\text{m}$  pitch
- 30 Hz full frame rate
- 1.7 W power consumption
- High sensitivity 0.9 to 1.7  $\mu\text{m}$  spectrum response imager; NIR/SWIR, from 0.7 to 1.7  $\mu\text{m}$
- Partial moonlight to day time imaging
- Compact size less than 1 in<sup>3</sup>
- All solid-state InGaAs imager
- On-board, real time non-uniformity corrections
- Digital 12-bit base Camera Link® output
- Automatic Gain Control (AGC)
- Local Area Processing (LAP) dynamic range enhancement
- Available mounting accessories

#### APPLICATIONS

- Low-light level imaging
- Covert surveillance with 24 hr/7 day operation
- Multi-laser spotting and tracking
- Imaging through atmospheric obscurants
- Small size facilitates integration into UASs, handheld, and soldier-mounted systems

# P R E L I M I N A R Y

## MECHANICAL SPECIFICATIONS

<b>Dimensions (width x height x depth) (includes connectors, excludes lens)</b>	25.4 x 25.4 x 25.3 mm 1.00 x 1.00 x 0.995 in
<b>Weight</b>	< 27 g
<b>Lens mount</b>	M15 x 0.5
<b>Camera Link Connector</b>	Airborn NK-2B2-025-225-TH00
<b>Power Input Connector</b>	Airborn NK-2B2-015-225-TH00
<b>Pixel Pitch</b>	15 $\mu$ m
<b>Focal Plane Array Format</b>	640 x 512 pixels
<b>Active Area</b>	9.6 mm x 7.7 mm x 12.3 mm diagonal
<b>Focal Plane Array Format</b>	640 x 512 pixels
<b>Active Area</b>	16 mm x 12.8 mm x 20.5 mm diagonal

## ENVIRONMENTAL & POWER SPECIFICATIONS

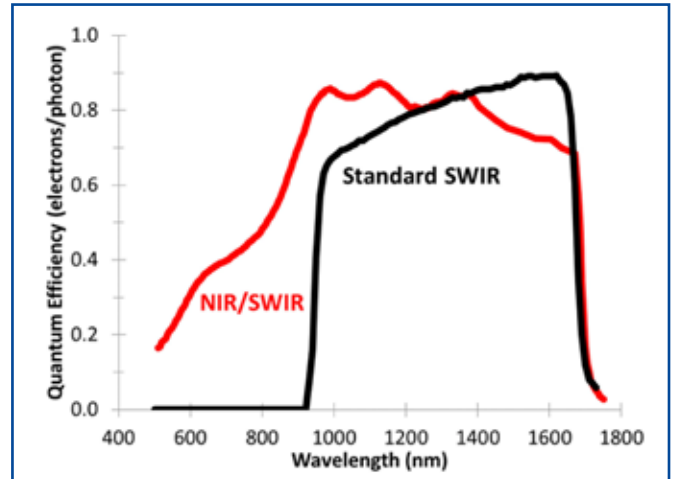
<b>Operating Case Temperature</b>	-35°C to 71°C
<b>Storage Temperature</b>	-54°C to 85°C
<b>Humidity</b>	20-80% relative humidity
<b>Power Requirements:</b>	
<b>DC Voltage</b>	+4-8 V
<b>Power</b>	1.7 W at 20°C case temperature, 5 V input voltage
<b>Functional Shock, Random Vibration, Thermal Shock</b>	MIL-STD-810G compliant design
<b>Conducted &amp; Radiated Emissions</b>	FCC Part 15, MIL-STD-461F CE102 and RE102
<b>CE compliance</b>	EN 61326-1:2006, Class A, EN 61000-3-3:2006, and EN 61000-3-3:1995 A1:2001, A2:2005
<b>Mean Time Between Failure</b>	$\geq$ 10,000 hours, MIL-HDBK-217F N2
<b>Fungus-Inert Material</b>	MIL-HDBK-454B

## ELECTRICAL SPECIFICATIONS

<b>Optical Fill Factor</b>	100%
<b>Spectral Response</b>	Standard, 0.9 $\mu$ m to 1.7 $\mu$ m NIR/SWIR, 0.7 $\mu$ m to 1.7 $\mu$ m
<b>Quantum Efficiency</b>	Standard, > 65 % from 1 $\mu$ m to 1.6 $\mu$ m NIR/SWIR, > 65 % from 0.9 $\mu$ m to 1.6 $\mu$ m
<b>Mean Detectivity, <math>D^*</math> <sup>1</sup></b>	$1.8 \times 10^{13}$ cm <sup>2</sup> /Hz/W (typical)
<b>Noise Equivalent Irradiance <sup>1</sup></b>	$1.1 \times 10^9$ photons/cm <sup>2</sup> xs (typical)
<b>Noise (RMS) <sup>1</sup></b>	65 electrons (typical)
<b>Dynamic Range <sup>1</sup></b>	300:1 (high gain), 1000:1 (low gain) (minimum)
<b>Non-Uniformity Corrections</b>	14 pre-configured operational settings (OPRs)
<b>Operability <sup>2</sup></b>	> 99%
<b>Exposure Times</b>	63 $\mu$ s to 33 ms
<b>Image Correction</b>	Goodrich proprietary parameterized non-uniformity corrections which compensate for temperature and illumination intensity
<b>Output Format</b>	12 bit base Camera Link <sup>®</sup>
<b>Digital Output Frame Rate</b>	30 fps
<b>Scan Mode</b>	Continuous
<b>Scan Mode</b>	Continuous, or 4 externally triggered modes, or ROI windowing mode

<sup>1</sup>  $\lambda$  = 1.55  $\mu$ m, exposure time = 33 ms, case temperature = 20°C, highest sensitivity gain setting, no lens, x1 digital gain with enhancement, AGC, and correction off

<sup>2</sup> The fraction of pixels with responsivity deviation between +/- 35% from the mean



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