FIRST LIGHT
ADVANCED IMAGERY

C-RED 2

Data Sheet

November 2018

HIGH SPEED LOW NOISE
InGaAs CAMERA

MAIN FEATURES

- **Cooled sensor for very low dark: 600 e-/p/s @ -40°C**
- 640 X 512 InGaAs sensor
- 0.9 µm to 1.7 µm (70% QE)
- 15 µm pixel pitch
- Windowing
- USB 3 interface or Camera Link® for better performances
- Optical interface: C-Mount
- On Board IMRO mode
- On Board Non Uniformity Correction:
  - Bias
  - Flat
  - Bad Pixels
- 400 FPS Full Frame
- **NEW OPTION : 600 FPS Full Frame**
- < 30 e- Read Out Noise
- < 5 µs electronic shutter
- Cooling: Air or Liquid (Ambiant)
- Size: L 140 mm x W 75 mm x H 55 mm
- Weight: 0.9 kg

THEORY OF OPERATION

C-RED 2 is a revolutionary ultra high speed low noise camera designed for high resolution Short Wave InfraRed imaging. Thanks to its state of the art electronics, software, and innovative mechanics, C-RED 2 is capable of unprecedented performances: up to 600 images per second with a read out noise under 30 electrons.

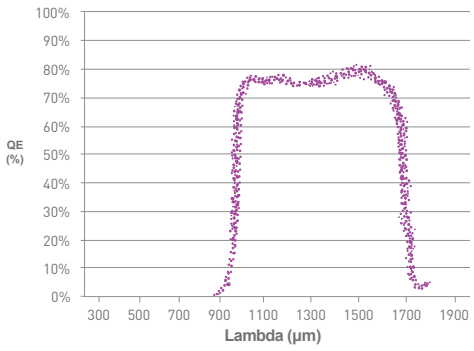
To achieve these breakthrough performances, C-RED 2 integrates a 640 x 512 InGaAs PIN Photodiode detector with 15 µm pixel pitch for high resolution, which embeds an electronic shutter with integration pulses shorter than 5 µs. C-RED 2 is also capable of windowing, allowing faster image rate while maintaining a very low noise, and multiple on board functionalities (cf. Frame Rate Table below).
The software allows real time applications, and the interface is CameraLink full and superspeed USB3.
C-RED 2 is designed to be updated remotely, and needs no human assistance to manage the cooling. The camera can operate in very low-light conditions as well as remote locations.

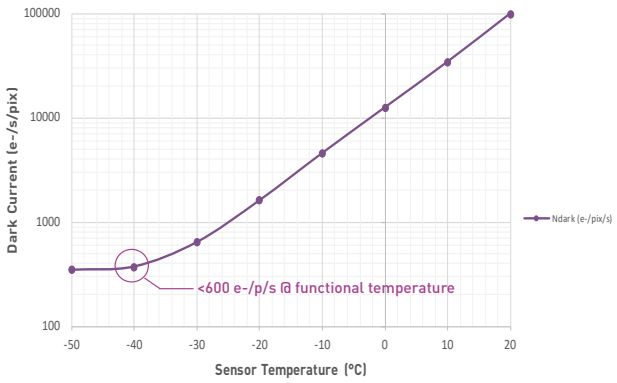
Designed for high-end and scientific SWIR applications, smart and compact, with a very low dark current of 600 electrons / pixel / second at -40°C, C-RED 2 is operating from 0.9 to 1.7 µm with over 70% Quantum Efficiency, offering new opportunities for industrial or scientific applications.

C-RED 2 PERFORMANCES

Test measurement	Result	Unit
Maximum speed Full Frame (with CL output)	602	FPS
Readout Noise at 600 FPS (50 µs exposure)	< 30	e-
Dark current @ -40°C (in e-/p/s) (typical)	556	e-
Quantization	14	bit
Detector Operating Temp. with liquid cooling	-40	C°
Detector Operating Temp. with air cooling	-15	C°
Flat Quantum Efficiency from 0.9 to 1.7 µm	> 70	%
Operability	99.5	%
Image Full well capacity at low gain, 600 FPS	1400	ke-
Image Full well capacity at high gain, 600 FPS	43	ke-
Maximum speed in 32 x 4 (min)	32066	FPS
Maximum speed in 320 x 256	1779	FPS

Quantum Efficiency





MEASURED RESULTS

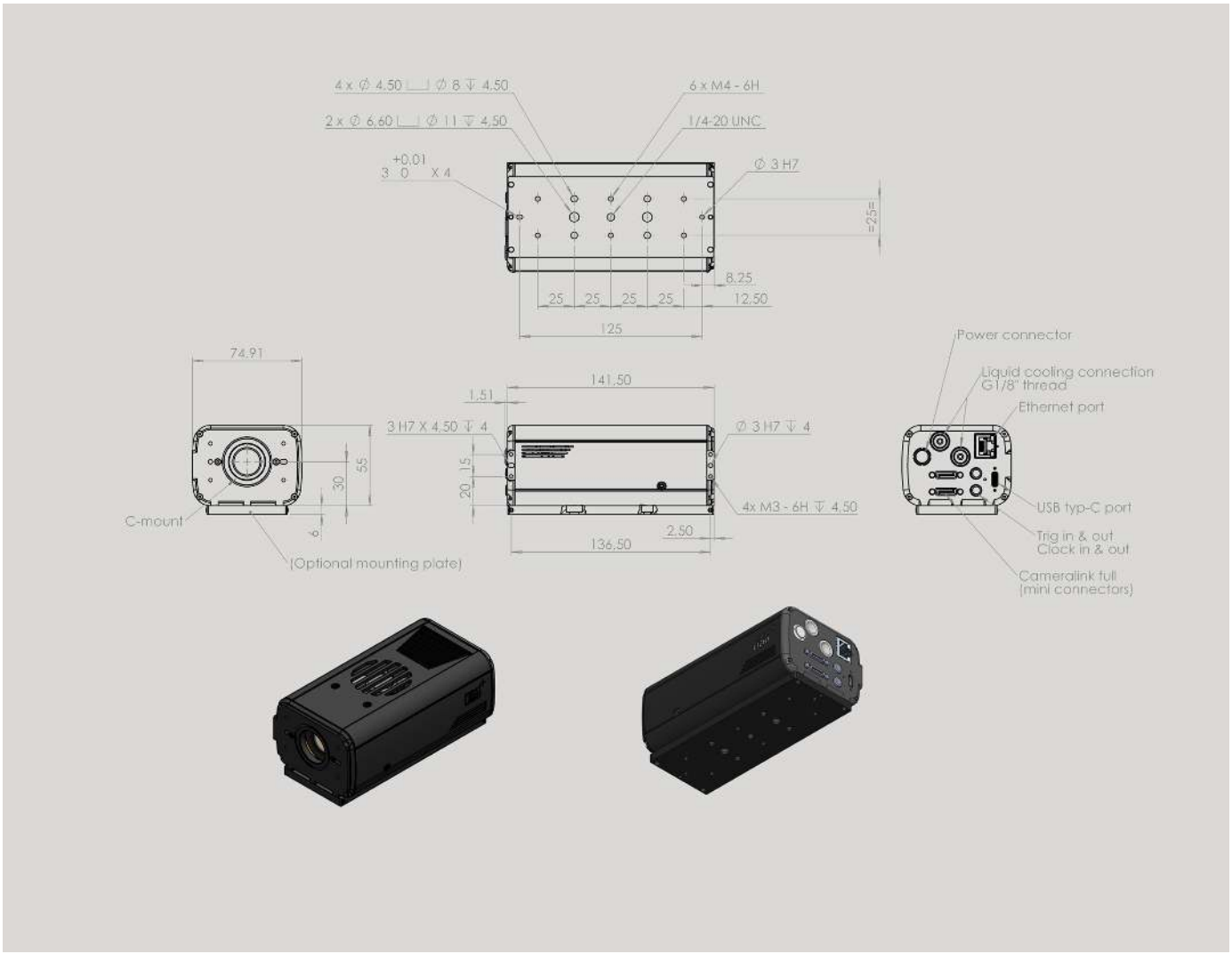
Frame Rate Table at 600 FPS Readout Speed
Camera Link® Output

		Columns					
		32	64	128	256	512	640
Lines	4	32 066	31 512	30 458	28 548	25 367	24 029
	8	28 108	27 348	25 945	23 532	19 840	18 397
	16	22 542	21 631	20 015	17 413	13 819	12 526
	32	16 147	15 254	13 736	11 455	8 599	7 646
	64	10 302	9 596	8 440	6 801	4 898	4 297
	128	5 975	5 509	4 765	3 752	2 632	2 291
	256	3 247	2 975	2 547	1 978	1 367	1 184
	512	1 697	1 549	1 319	1 016	697	602

Frame Rate Table at 600 FPS Readout Speed
USB 3 Output

		Columns					
		32	64	128	256	512	640
Lines	4	9 999	9 999	9 999	9 999	9 999	9 999
	8	9 999	9 999	9 999	9 999	9 999	9 999
	16	9 999	9 999	9 999	9 999	9 999	9 999
	32	9 999	9 999	9 999	9 999	8 599	7 646
	64	9 999	9 596	8 440	6 801	4 898	4 297
	128	5 975	5 509	4 765	3 752	2 632	2 291
	256	3 247	2 975	2 547	1 978	1 367	1 184
	512	1 697	1 549	1 319	1 016	697	600

C-RED 2



APPLICATIONS

- Adaptive Optics for Astronomy
- Astronomical Observations
- Hyper Spectral Imaging
- Spectroscopy
- Raman Spectroscopy
- Laser Communications
- Semiconductor Inspection
- Solar Cells Inspection
- OCT Imaging
- Bio Imagery
- Quality control
- Production control

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OUR COMPANY

First Light Imaging designs and manufactures state of the art scientific cameras that combine extreme sensitivity and high speed for both visible and infrared spectra.
Coming from European academic research institutes, already multiple award-winning, First Light Imaging is recognized for the high performance of its products.
We develop our cameras around cutting-edge sensors. EMCCD, e-APD or InGaAs, we integrate the most challenging, difficult to harness detectors in complex optics systems.
Already at the heart of the Adaptive Optics systems for the world's biggest telescopes, our technology and detectors are also used in Life Sciences and Industry.

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FIRST LIGHT ADVANCED IMAGERY

Région Provence-Alpes-Côte d'Azur

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