



## NIRvana: 640LN

The NIRvana: 640LN from Princeton Instruments is a scientific-grade, deep-cooled, large format InGaAs camera for low-light scientific SWIR imaging and spectroscopy applications. The camera uses a 640 x 512 InGaAs array with greater than 75% response between 1.3  $\mu\text{m}$  and 1.55  $\mu\text{m}$ . The detector is liquid nitrogen cooled to 83 K (-190° C) to minimize thermally generated noise and to improve signal-to-noise ratio for the most demanding SWIR applications. It offers 16-bit digitization and low read noise for outstanding dynamic range.

FEATURES	BENEFITS
640 x 512 InGaAs array	High resolution imaging in the SWIR region; Offers 4X more pixels over 320 x 256 sensor
20 $\mu\text{m}$ x 20 $\mu\text{m}$ pixels	High spatial resolution
Response from 0.9 $\mu\text{m}$ to 1.6 $\mu\text{m}$ with 70% (typical) peak quantum efficiency between 1.3 $\mu\text{m}$ to 1.6 $\mu\text{m}$	Excellent SWIR sensitivity for demanding imaging applications, e.g. SWIR astronomy, semiconductor failure analysis
Liquid nitrogen (LN) cooling	Delivers lowest dark noise and allows integration time of > 60 minutes
Integrated cold-shield	Special “cold-shield” limits the ambient thermal background
Electronic shutter	Provides integration times from 100 $\mu\text{s}$ to ~ 60 minutes
Two readout modes	Standard readout mode Non-destructive readout mode (NDR)
F-mount	Standard lens interface compatible with numerous lenses (spectrometer adapters available)
Fused silica window	Fused silica window for high transmission in SWIR range
GigE interface	Industry standard for fast data transfer over long distances, up to 50 m
<b>Optional:</b> LightField® (for Windows 8/7, 64-bit) Or WinView/Spec (for Windows 8/7/XP, 32-bit)	Flexible software packages for data acquisition, display and analysis; MATLAB and LabVIEW support. LightField offers intuitive, cutting edge user interface, IntelliCal® and more.
SITK® for LabVIEW™	Easy integration into complex experimental setup
PICAM (64-bit) / PVCAM (32-bit) software development kits (SDKs)	Compatible with Windows 8/7/XP, and Linux; Universal programming interfaces for easy custom programming.

NIRvana: 640LN shown with lens, sold separately.

*NOTE: Export of this camera outside of the United States is prohibited by law unless accompanied by a valid Export License as issued by the United States Department of Commerce.*

### Applications:

Semiconductor Failure Analysis, SWIR Astronomy,  
Emission Microscopy, Biological Deep-Tissue Imaging

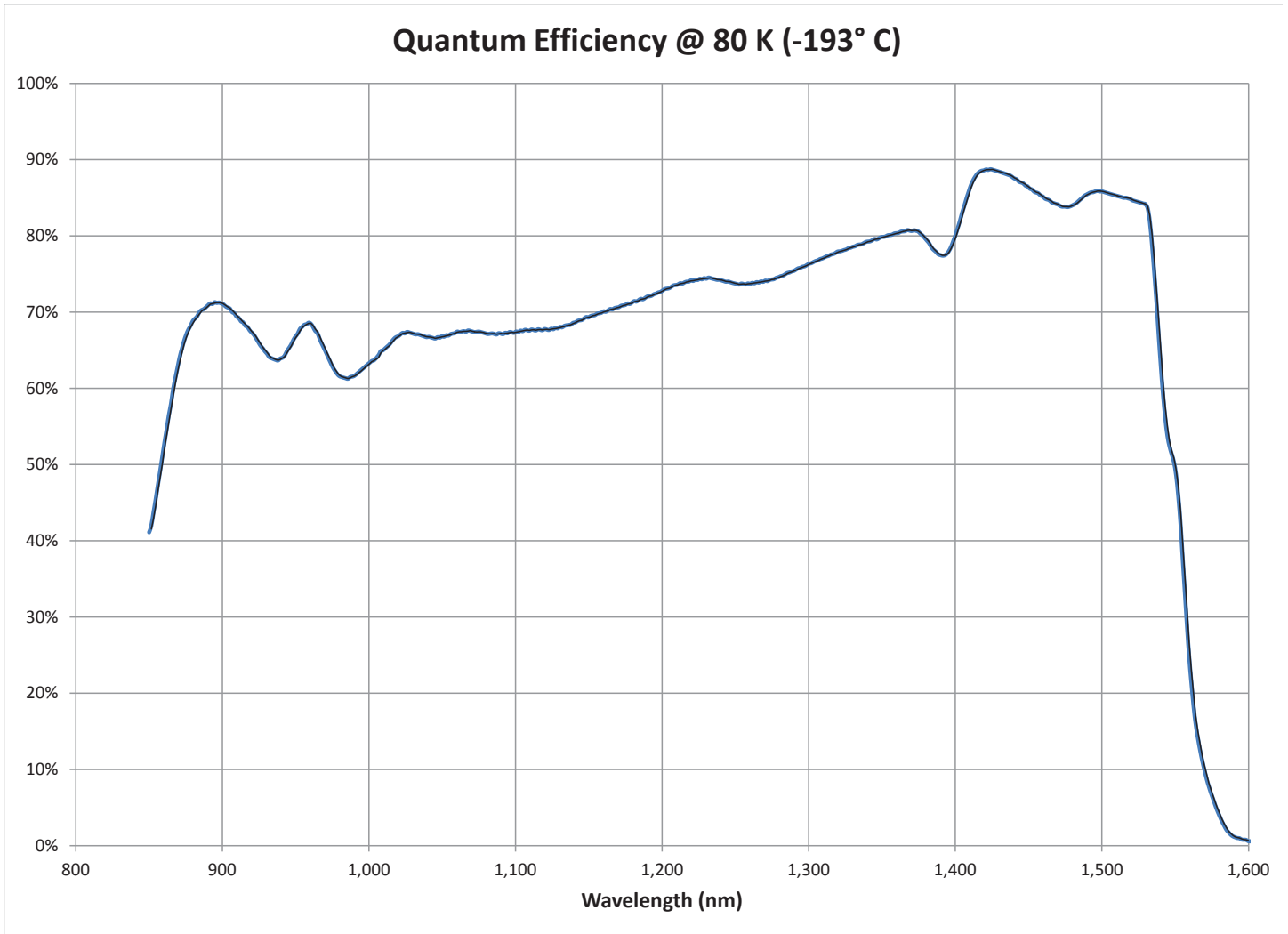
	<b>NIRvana: 640LN</b>
InGaAs image sensor	2D InGaAs focal plane array
Image format	640 x 512 imaging pixels
Image area	12.8 mm x 10.24 mm
Pixel size	20 $\mu\text{m}$ x 20 $\mu\text{m}$
Pixel well	400 $\text{ke}^-$ (typ)
System read noise	15 $\text{e}^-$ (typ)
Cooling temp. @ +20°C ambient	83 K (-190°C) (typ)
Cooling method / Hold time	Liquid nitrogen / >30 hours
Dark current ( $\text{e}^-/\text{p}/\text{sec}$ ) @ 83 K (-190°C)	10 (typ)*
Blemish specification	Grade A: < 2% defects For detailed blemish specifications, contact Princeton Instruments
Gain	7 $\text{e}^-$ / ADU
Digitization	16 bits
Scan rate	250 KHz, 125 KHz
Binning and ROI	Software only
Cold shield	f#/2
Max. exposure time	> 60 min
Window material	Fused silica
Thermostating precision	$\pm 1.0^\circ$ C across entire temperature range
Operating temperature	0° C to +30° C
Certification	CE
Weight	15.43 lbs (7.0 kg) empty, 19.40 lbs (8.8 kg) full
Dimensions	11.65" (295.30 mm) x 8.20" (206.50 mm) x 11.70" (297.20 mm) (l x w x h)

\* Measured with a cold target at 99 K (-174° C)

## Frame Rates

Binning	@ 250 kHz	@125 kHz
1 x 1	2.77 fps	1.75 fps

NOTE: (1) Frame rates measured with 1 ms exposure  
(2) Hardware binning is not available



Comparison of 640 x 512, 20 μm pixel NIRvana-LN, NIRvana and NIRvana-ST			
	Model		
	NIRvana-LN	NIRvana	NIRvana-ST
			
Array Resolution	640 x 512		
Image Area	12.8 mm x 10.24 mm		
Pixel Pitch	20 μm x 20 μm		
Pixel Well	400 ke <sup>-</sup>	≥ 40 ke <sup>-</sup> (HG), ≥ 600 ke <sup>-</sup> (H cap)	
Peak Response range (> 75%)	1300 nm - 1550 nm	900 nm - 1620 nm	
Lens Mount	F-mount / IsoPlane 320	C-mount / Spec mount	
System Noise	15 e <sup>-</sup>	≤ 120 e <sup>-</sup> (HG)	
Readout Modes	Standard	Standard	
	NDR	NA	
Cooling Method	LN (2.3 liters)	TE	
Cooling Temp (°C)	-190	-85	-65
Dark Current (e <sup>-</sup> /p/s)	<b>10 (typ)</b>	≤ 300	≤ 1500
Gain	7 e <sup>-</sup> / ADU		
Frame Rates (fps)	2.77 / 1.75	110 (@ 10 MHz), 55 (@ 5 MHz), 22 fps (@2 MHz)	
Scan Rate	250 KHz , 125 KHz	10 MHz, 5 MHz, 2 MHz	
Cold Shield	f#/2	f#/1.5	
Window Material	Fused Silica		
Max. exposure time	> 60 min	> 1 min.	> 30 sec.
Weight	7.0 kg (empty) / 8.8 kg (full)	9.5 lbs (4.3 kg)	
Size	11.63" x 8.13" x 11.70" (l x w x h) (295.30 mm x 206.50 mm x 297.20 mm)	7.40" x 5.8" x 5.8" (l x w x h) (187.96 mm x 147.32 mm x 147.32 mm)	
Typical Applications	Semiconductor Failure Analysis	Semiconductor Failure Analysis	
	Astronomy	Small Animal Imaging	
		Carbon Nanotube Research / Fluorescence	
		Astronomy	
		Singlet Oxygen Detection	

