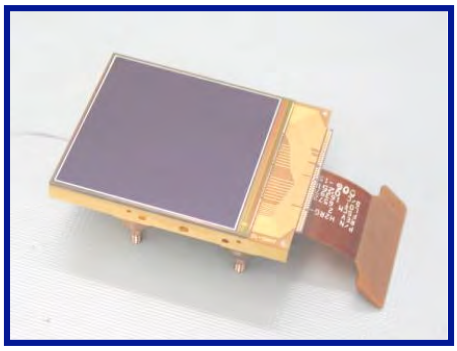
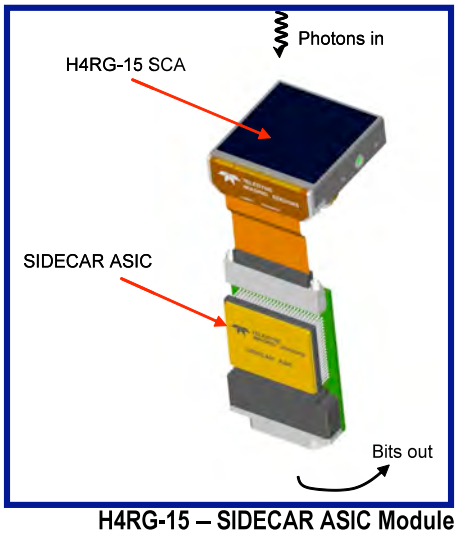
Teledyne Imaging Sensors
HAWAII-4RG™
Visible & Infrared Focal Plane Array

The 4096×4096 pixel HAWAII-4RG™ (H4RG) is the next generation, state-of-the-art readout integrated circuit for visible and infrared instrumentation in ground-based and space telescope applications.

- Large (4096×4096 pixel) array with either 10 µm or 15 µm pixel pitch.
- Compatible with Teledyne Imaging Sensors (TIS) HgCdTe infrared (IR) and silicon PIN HyViSI™ visible detectors, providing sensing of any spectral band from soft X-ray to 5.5 µm.
- Substrate-removed HgCdTe enhances the J-band QE, enables response through the visible spectrum (70% QE down to 400nm), and eliminates fluorescence from cosmic radiation absorbed in the substrate, and eliminates fringing in the substrate material.
- Reference rows and columns for common-mode noise rejection.
- Guide window output – windowing with simultaneous science date acquisition of full array. Programmable window which may be read out at up to 5 MHz pixel rate for guiding. Readout is designed to allow interleaved readout of the guide window and the full frame science data.
- Selectable number of outputs (1, 4, 16, 32 or 64) and user-selectable scan directions provide flexibility in data acquisition.
- Built with modularity in mind – the array is 4-side-buttable to allow assembly of large mosaics of 4096×4096 H4RG modules.
- Fully compatible with the TIS SIDECAR™ ASIC Focal Plane Electronics.



H4RG-10



H4RG-15 – SIDECAR ASIC Module

*For more information, please email **Richard Blank** at **rblank@teledyne.com** or call +1 **805 373-4083.***

HAWAII-4RG™ specification table for infrared arrays

Parameter	Unit	Value		
		1.7μm	2.5μm	5.3μm
Read-out integrated circuit (ROIC)		HAWAII-4RG™		
Number of Pixels [1]	#	4096 x 4096		
Pixel Size	❍m	10 or 15		
Number of Outputs	#	Programmable 1, 4, 16, 32, 64		
Power Dissipation [2]	mW	≤ 10		
Detector Material		HgCdTe		
Detector Substrate		CdZnTe - Removed		
Cutoff wavelength (50% of peak QE): 1.75μm: @ 120 K 2.5μm: @ 77 K 5.3μm: @ 37 K	❍m	1.65 - 1.80	2.45 - 2.65	5.1 - 5.5
Mean Quantum Efficiency (QE) at 800 nm	%	≥ 50 (goal is ≥ 70)	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 1,000 nm	%	≥ 50 (goal is ≥ 70)	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 1,230 nm	%	≥ 70 (goal is ≥ 80)	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 1,500 nm	%	≥ 70 (goal is ≥ 80)	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 2,000 nm	%	0	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 3,500 nm	%	0	0	≥ 70 (goal is ≥ 80)
Mean Quantum Efficiency (QE) at 4,400 nm	%	0	0	≥ 70 (goal is ≥ 80)
Median Dark current: 1.7μm: @ 0.25 V bias and 120 K 2.5μm: @ 0.25 V bias and 77 K 5.3μm: @ 0.18 V bias and 37 K	e-/s	≤ 0.05 (goal is ≤ 0.01)		
Median Readout Noise, correlated double sampling (CDS) at 100 kHz pixel readout rate	e-	≤ 30 (goal is ≤ 15)	≤ 18 (goal is ≤ 12)	≤ 15 (goal is ≤ 12)
Well Capacity at 0.25 V bias (0.175V bias for 5.3μm cutoff)	e-	≥ 80,000 (goal is ≥ 100,000)		≥ 65,000 (goal is ≥ 85,000)
Crosstalk [3]	%	≤ 2 (goal is ≤ 1)		≤ 4 (goal is ≤ 2)
Operability [4]	%	≥ 95 (goal is ≥ 99)		
Cluster: 50 or more contiguous inoperable pixels	%	≤ 1 (goal is ≤ 0.5) of array		
SCA Flatness [5]	μm	≤ 30 (goal is ≤ 10)		
Planarity [6]	❍m	≤ 50 (goal is ≤ 25)		

(1) There are 4088 x 4088 pixels for light detection plus 4 rows and columns of reference pixels on each side
(2) At 100 kHz pixel read-out rate, unbuffered, 32 outputs. Does not include external current source; power has to be optimized by the user with respect to the system in which the device is used
(3) Crosstalk includes optical (charge diffusion) and electrical (interpixel capacitance) components
(4) A pixel is considered operable if QE ≥ 35%, dark current ≤ 0.1 e-/sec, and single correlated double sample (CDS) noise is ≤35 e-
(5) Maximum variation (peak-to-valley) to best fit plane
(6) Parallelism of best fit plane with respect to mounting plane