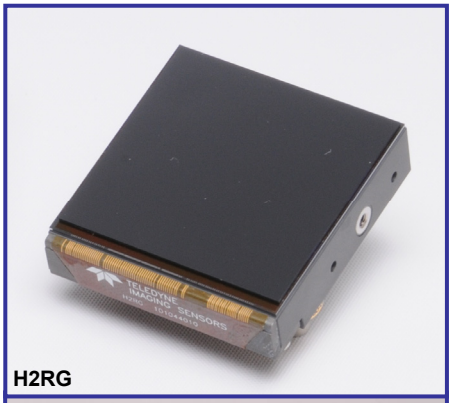
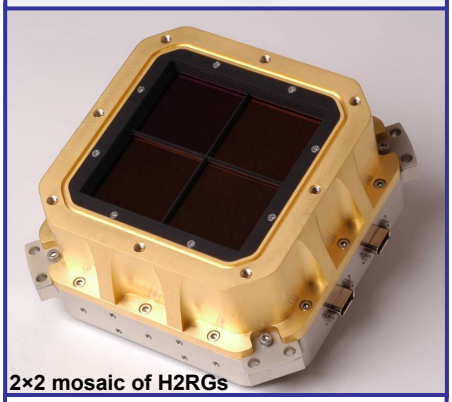
Teledyne Imaging Sensors
H2RG™
Visible & Infrared Focal Plane Array

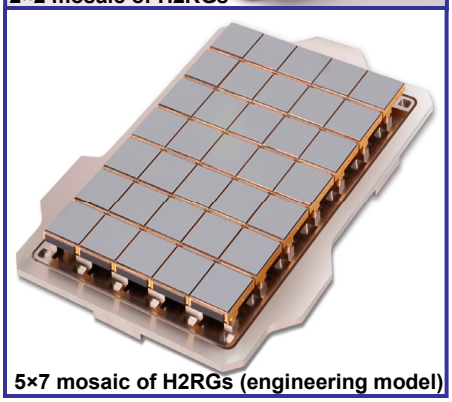
The 2048×2048 pixel H2RG™ is the state-of-the-art readout integrated circuit for visible and infrared astronomy in ground-based and space based applications.

- Large (2048×2048 pixel) array with 18 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 10 µm.
- Standard product HgCdTe cutoffs are 1.75 µm, 2.5 µm, and 5.3 µm.
- Substrate-removed HgCdTe enhances J-band quantum efficiency (QE), enables response through the visible spectrum, 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 location and size 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, or 32) and user-selectable scan directions provide flexibility in data acquisition.
- Full-frame readout rates from less than 0.1 Hz to 76 Hz.
- Built with modularity in mind – the array is 4-side-buttable (with 3-side close buttable) to allow assembly of large mosaics of 2048×2048 H2RG modules, such as Teledyne's 4096×4096 pixel mosaic and larger mosaics.
- Fully compatible with the Teledyne's SIDECAR™ ASIC Focal Plane Electronics.

  Packaging materials available: Invar, molybdenum, or silicon carbide.


H2RG


2×2 mosaic of H2RGs


5×7 mosaic of H2RGs (engineering model)

H2RG™ specification table for infrared arrays

Parameter	Unit	Value		
		1.7μm	2.5μm	5.3μm
Array Format [1]		2048 x 2048 pixel, 18 μm pitch		
Number of Outputs	#	Programmable 1, 4, 32		
Frame rate	Hz	3 (slow mode, 480 Kpix/sec/output, 32 outputs) 76 (fast mode, 10 Mpix/sec/output, 32 outputs)		
Power Dissipation	mW	≤ 4 [2] / ≤ 300 [3]		
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	μm	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)
Median Readout Noise, reset - read at 10 MHz pixel readout rate		≤ 100 (goal is ≤ 70)		
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 [4]	%	≤ 2 (goal is ≤ 1)		≤ 4 (goal is ≤ 2)
Operability [5]	%	≥ 95 (goal is ≥ 99)		
Cluster: 50 or more contiguous inoperable pixels	%	≤ 1 (goal is ≤ 0.5) of array		
SCA Flatness [6]	μm	≤ 20 (goal is ≤ 10)		

(1) There are 2040 x 2040 pixels for light detection plus 4 rows and columns of reference pixels on each side of the array
(2) At 100 kHz pixel read-out rate, unbuffered, 32 outputs. Does not include external current source; power has to be optimized with respect to the system in which the device is used
(3) At 10 MHz pixel read-out rate, buffered, 32 outputs
(4) Crosstalk includes both optical (charge diffusion) and electrical (interpixel capacitance) components
(5) A pixel is considered operable if QE ≥ 35%, dark current ≤ 0.1 e-/sec, and single correlated double sample (CDS) noise is ≤35 e-
(6) Maximum variation (peak-to-valley) to best fit plane