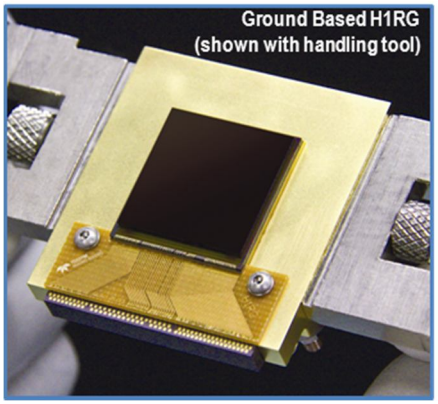
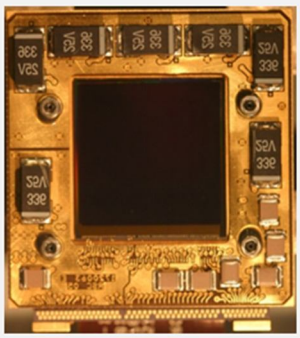
Teledyne Imaging Sensors
H1RG™
Visible & Infrared Focal Plane Array

The 1024×1024 pixel H1RG™ is a large-format readout integrated circuit for visible and infrared astronomy in ground-based and space based applications.




Space Flight H1RG

- Large (1024×1024 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 for guiding. Readout is designed to allow interleaved readout of the guide window and the full frame science data.
- Selectable number of outputs (1, 2, or 16) and user-selectable scan directions provide flexibility in data acquisition.
- Full-frame readout rates up to 132 Hz.
- Fully compatible with the Teledyne's SIDECAR™ ASIC Focal Plane Electronics.
- Qualified for Space applications (NASA technical readiness level 9 (TRL-9)).
- Packaging materials available: molybdenum or invar.

*For more information, please contact **Toni Beck** at **Toni.Beck@teledyne.com** or at +1 (805) 373-4884*

H1RG™ specification table for infrared arrays

Parameter	Unit	Value		
		1.75μm	2.5μm	5.3μm
Array Format [1]		1024 x 1024 pixel, 18 μm pitch		
Number of Outputs	#	Programmable 1, 2, 16		
Frame rate	Hz	6 (slow mode, 480 Kpix/sec/output, 16 outputs) 132 (fast mode, 10 Mpix/sec/output, 16 outputs)		
Power Dissipation	mW	≤ 2 [2] / ≤ 100 [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	1.70 - 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)	Not routinely tested
Mean Quantum Efficiency (QE) at 1,230 nm *	%	≥ 70 (goal is ≥ 80)		
Mean Quantum Efficiency (QE) at 1,500 nm *	%	≥ 70 (goal is ≥ 80)	Not routinely tested	
Mean Quantum Efficiency (QE) at 2,000 nm *	%	Out of band	≥ 70 (goal is ≥ 80)	
Mean Quantum Efficiency (QE) at 3,500 nm *	%	Out of band		≥ 70 (goal is ≥ 80)
Mean Quantum Efficiency (QE) at 4,400 nm *	%	Out of band		≥ 70 (goal is ≥ 80)
Median Dark current:** 1.75μm: @ 120 K 2.5μm: @ 77 K 5.3μm: @ 37	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	e-	≤ 100 (goal is ≤ 70)		
Well Capacity**	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	≤ 25 (goal is ≤ 10)		

(1) There are 1016 x 1016 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, 16 outputs. Does not include external current source; power has to be optimized with respect to the system in which the device is used
(3) Estimated at 10 MHz pixel read-out rate, buffered, 16 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 measured at room temperature
* Average over the band when a curve fit of the AR coating model is fit to the measurements at discrete LED wavelengths
** These specs will be met at one single bias voltage. Typical bias voltage ranges from 0.18V to 1.0V.

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