



NEAR INFRARED (0.9 μm - 1.7 μm) 640x512 InGaAs Focal Plane Array

FPA640x512_P15-TE1 (Badger-T1): with 1-Stage High Voltage Thermoelectric Cooler
FPA640x512_P15-TE1X (Badger-T1X): with 1-Stage High Current Thermoelectric Cooler
FPA640x512_P15-TE2 (Badger-T2): with 2-Stage Thermoelectric Cooler

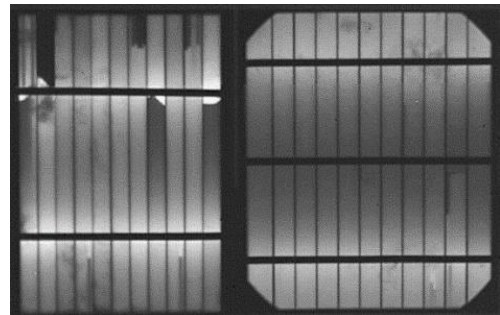
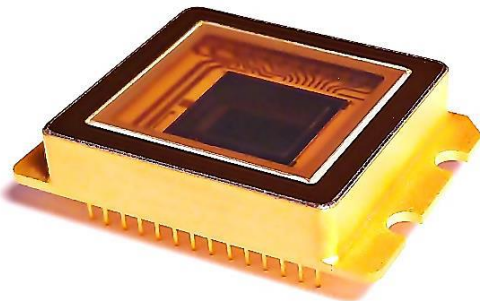
FEATURES

- 640 x 512 Array Format
- 0.9 μm - 1,7 μm Spectral Range
- 28-pin Metal SDIP Package
- Embedded Thermoelectric Cooler
- Typical Pixel Operability > 99.5 %
- Quantum Efficiency > 70 %
- Built-in Temperature Sensor
- Snapshot ITR¹/IWR² and IMRO³ Readout Modes
- 2, 4 or 8 Outputs with up to 18 MHz Pixel Rate
- Windowing Capability

APPLICATIONS

- Near-infrared Imaging
- Covert Surveillance
- Semiconductor/Solar Panel Inspection
- Medical Science and Biology
- Fiberoptic Telecommunication
- See through Fog/Smoke
- Ice/Slush/Moisture Mapping
- Industrial Thermal Imaging
- Astronomy and scientific

¹ITR: Integrate-Then-Read - ²IWR : Integrate-While-Read - ³IMRO : Integration with Multiple ReadOut



GENERAL DESCRIPTIONS

PARAMETER	UNIT	VALUE
Sensor Technology	--	Planar InGaAs PIN
Spectral Range	μm	0.9 – 1.7
Actual Pixel Array	--	640 x 512
Effective Pixel Array	--	636 x 508
Pixel Pitch	μm	15
Image Size	mm	9.6 x 7.68
Package Type	--	28-pin Metal SDIP Package
Package Size L x W x T	mm	36.1 x 25.4 x 7.3 (without pins)
Weight	g	19.5 (± 0.5) (all models)



SPECIFICATIONS (ITS¹ = 20°C)

PARAMETER		UNIT	TYPICAL VALUE	COMMENTS
Dark Current ^{2,3}		fA	≤ 20	Photopixel Biased @ -0.5 V
Quantum Efficiency (QE _{EFF}) ^{2,3}		%	≥ 70	λ = 1.0 μm - 1.6 μm
Response Nonuniformity ^{2,3}		%	≤ 5	At 50 % Well Occupation
Response Nonlinearity ^{2,3} (Max. Peak-to-Peak Deviation)		%	≤ 2	15 % - 85 % Well Occupation Range
Charge Capacity ^{3,4} (Option 2 ROIC)	@ High Gain, 46.2 μV/ e ⁻	Me ⁻	0.041	ROIC Specifications
	@ Mid Gain, 16.2 μV/ e ⁻		0.118	
	@ Low Gain, 1.39 μV/ e ⁻		1.380	
Readout Noise		e ⁻	≤ 65	High Gain, Integration Time = 3.33 ms
Noise-Equivalent Irradiance (NEI)		photons / cm ² s	≤ 1.1 x 10 ¹⁰	High Gain, Integration Time = 3.33 ms, λ = 1.55 μm
Mean Detectivity		cm√Hz / W	≥ 5.7 x 10 ¹²	
Output Swing		V	2.3	
Minimum Integration Period ³		μs	< 1	
Pixel Operability ^{2,3}		%	≥ 99.5	Percentage of Pixels with QE _{EFF} Deviation within ±20%*(QE _{EFF} Mean)
Maximum Cooling Capability ⁵ (ΔT _{MAX})	FPA640x512_P15-TE1(X)	°C	≥ 40	T _{Heatsink} = 20°C
	FPA640x512_P15-TE2		≥ 60	

1. Readings from integrated temperature sensor (ITS).
2. These items are defined for central effective pixel array (636x508). Their values correspond to default operation conditions.
3. Contact us for further information.
4. These values are ROIC-version dependent.
5. Adequate heatsink and thermal interface material are the prerequisites for stable operation.



ABSOLUTE MAXIMUM RATINGS

PARAMETER		UNIT	MIN.	MAX.
Operation Temperature ⁶		°C	-40	+70
Storage Temperature ⁶		°C	-40	+70
Power Consumption ⁷		mW	--	200
TEC Bias ⁸	FPA640x512_P15-TE1	V		12
	FPA640x512_P15-TE1X			6
	FPA640x512_P15-TE2			10
TEC Current ⁸	FPA640x512_P15-TE1	A		1.4
	FPA640x512_P15-TE1X			2.6
	FPA640x512_P15-TE2			2.1

6. Non-condensing environment.

7. Without powering the thermoelectric cooler.

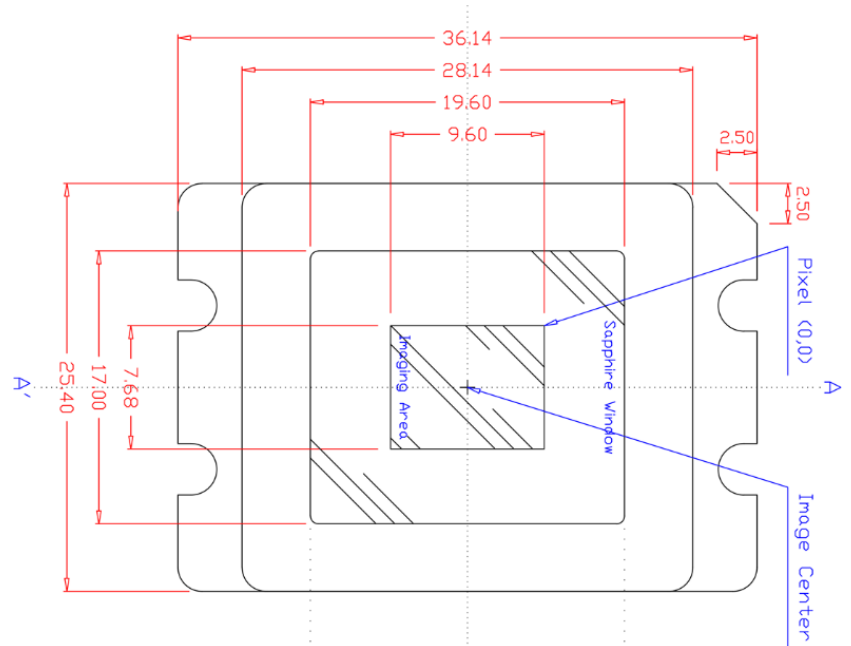
8. Applied to Pin-1 for cooling operation. Operation above these maximum ratings causes excessive (local) heat accumulation and may result in permanent damage to the cooler.



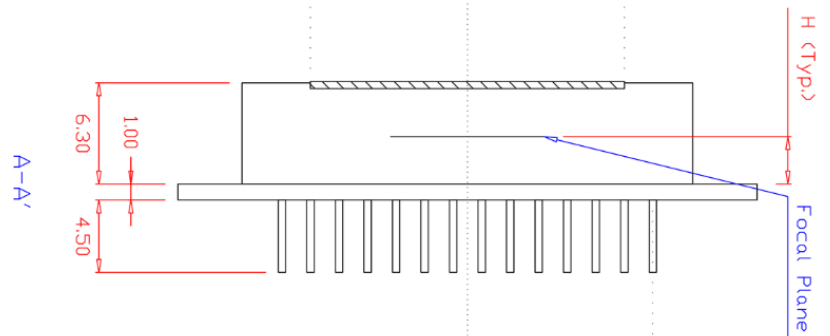
PACKAGE OUTLINE (Unit: mm)

28-pin Metal SDIP Package. The Serial Number is printed on the flank of the package.

TOP VIEW

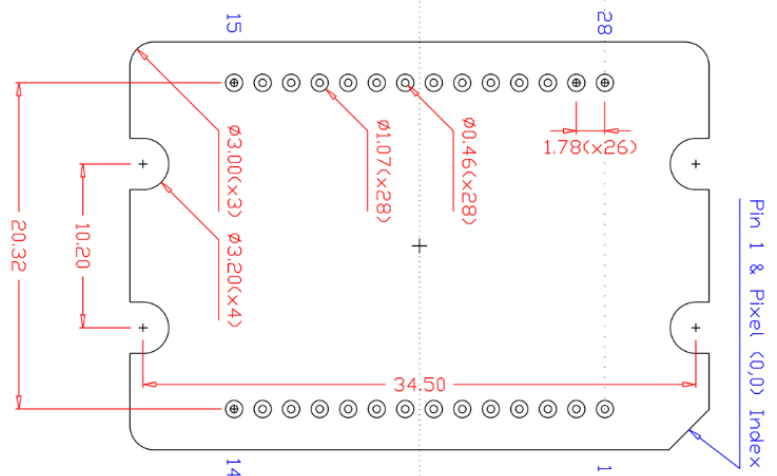


SIDE VIEW



Model	H
FPA640x512_P15-TE1(X)	2.95
FPA640x512_P15-TE2	4.05

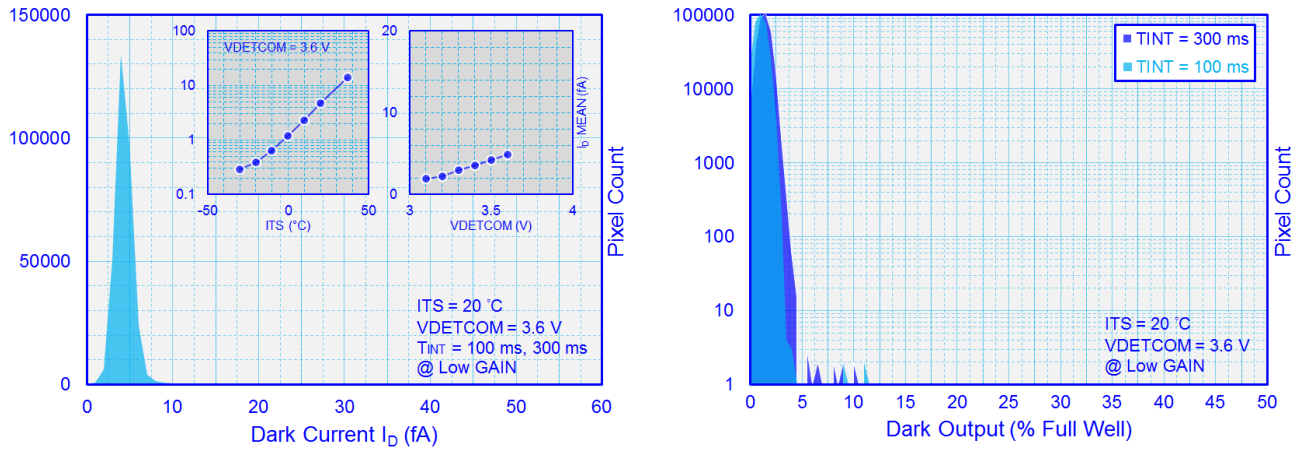
BOTTOM VIEW



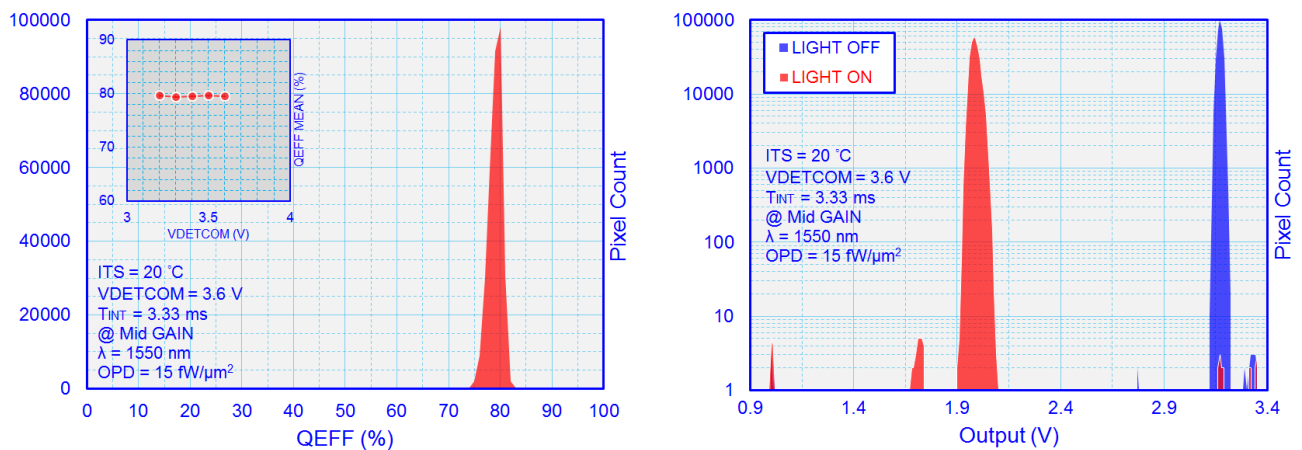


EXAMPLE CURVES

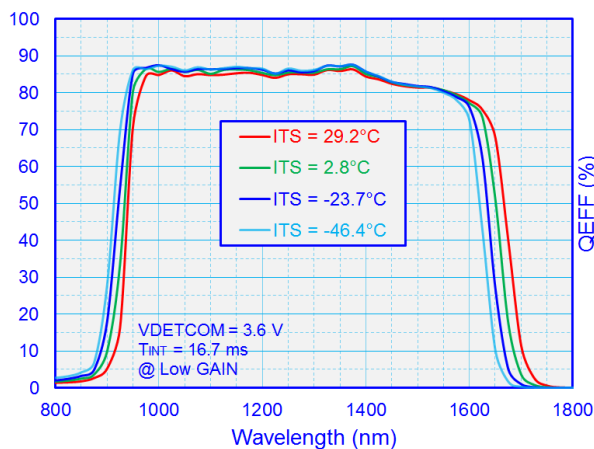
Histograms of Dark Condition



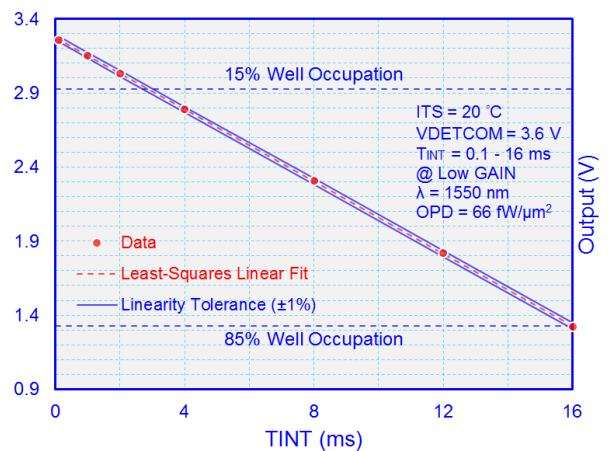
Histograms of Illumination Condition



QEFF Spectrum



Output Linearity



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