



## Shortwave-Infrared (1.2 - 2.2 $\mu$ m) 640x512 InGaAs Focal Plane Array

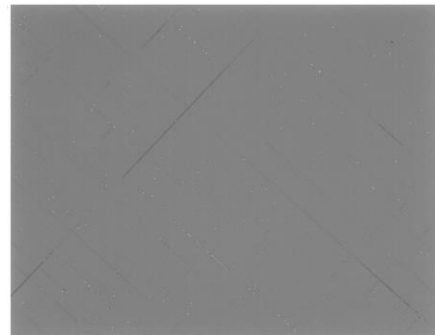
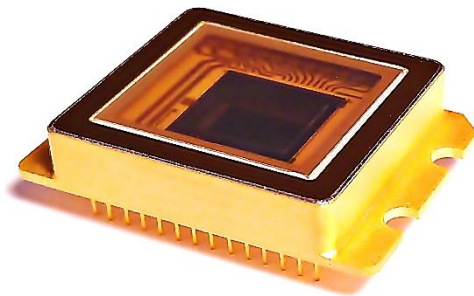
**Badger-2.2-T2 (FPA640x512\_P15-2.2-TE2) with 2-Stage Thermoelectric Cooler, high power**  
**Badger-2.2-T2a (FPA640x512\_P15-2.2-T2a) with 2-Stage Thermoelectric Cooler, low power**

### FEATURES

- 640x512 Array Format
- 28-pin Metal SDIP Package
- Embedded Thermoelectric Cooler
- Built-in Temperature Sensor
- 1.2 $\mu$ m-2.2 $\mu$ m Spectral Range
- Quantum Efficiency >70% at 1.9 $\mu$ m
- Typical Pixel Operability >98%
- Snapshot ITR/IWR and IMRO Readout Modes
- 2, 4 or 8 Outputs with up to 18MHz Pixel Rate
- Windowing Capability

### APPLICATIONS

- Shortwave-Infrared Imaging
- Hyper-/Multi-Spectral Imaging
- Semiconductor Inspection / Process Monitoring
- Waste Recycling
- Medical Science and Biology
- Ice/Slush/Moisture Mapping
- High-Speed Industrial Thermal Imaging
- See through Fog/Smoke
- Laser Beam Profiling
- Mineral Identification



Raw Image @ -40°C

### GENERAL DESCRIPTIONS

PARAMETER	UNIT	VALUE
Sensor Technology	---	Planar InGaAs PIN
Spectral Range	$\mu$ m	1.2 - 2.2
Actual Pixel Array	---	640 x 512
Effective Pixel Array	---	636 x 508
Pixel Pitch	$\mu$ m	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 ( $\pm$ 0.5)



## SPECIFICATIONS ( <sup>1</sup>ITS = -40°C )

Parameter		Unit	Typical Value	Conditions
<sup>2,3</sup> Dark Current		fA (=6250 e <sup>-</sup> /s)	≤ 500	Photopixel Biased @ -0.1 V Mean Value
<sup>2,3</sup> Quantum Efficiency * Fill Factor (QE <sub>EFF</sub> )		%	≥ 60	λ = 1.4 μm – 2.1 μm
<sup>2,3</sup> Response Nonuniformity		%	≤ 10	At 50% Well Occupation
<sup>2,3</sup> Response Nonlinearity (Max. Peak-to-Peak Deviation)		%	≤ 4	15% - 85% Well Occupation Range
<sup>4</sup> Charge Capacity	@High Gain, 46.2 μV/e <sup>-</sup>	Me <sup>-</sup>	0.041	ROIC Specifications
	@Mid Gain, 16.2 μV/e <sup>-</sup>		0.118	
	@Low Gain, 1.39 μV/e <sup>-</sup>		1.380	
<sup>4</sup> Readout Noise Floor		e <sup>-</sup>	< 35	In High Gain Mode
<sup>3</sup> Noise-Equivalent Irradiance (NEI)		ph# / cm <sup>2</sup> -s	≤ 4.5 x 10 <sup>10</sup>	In High Gain Mode Integration Time = 3.33 ms λ = 1.9 μm
<sup>3</sup> Mean Detectivity		cm-√Hz / W	≥ 1.7 x 10 <sup>12</sup>	
Output Swing		V	2.25	
<sup>3</sup> Minimum Integration Period		μs	<1	
<sup>2,5</sup> Pixel Operability		%	≥ 98	Percentage of Pixels with Response Output Deviation within ±30% of Mean Value.
<sup>6</sup> Maximum Cooling Capability (ΔT <sub>MAX</sub> )		°C	≥ 55	T <sub>Heatsink</sub> = 20°C

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. FPA with pixel operability lower than 98% (<98%) is categorized as a test-grade device, which, if available in stock, can be provided on request.
6. Adequate heatsink and thermal interface material are the prerequisites for stable operation.

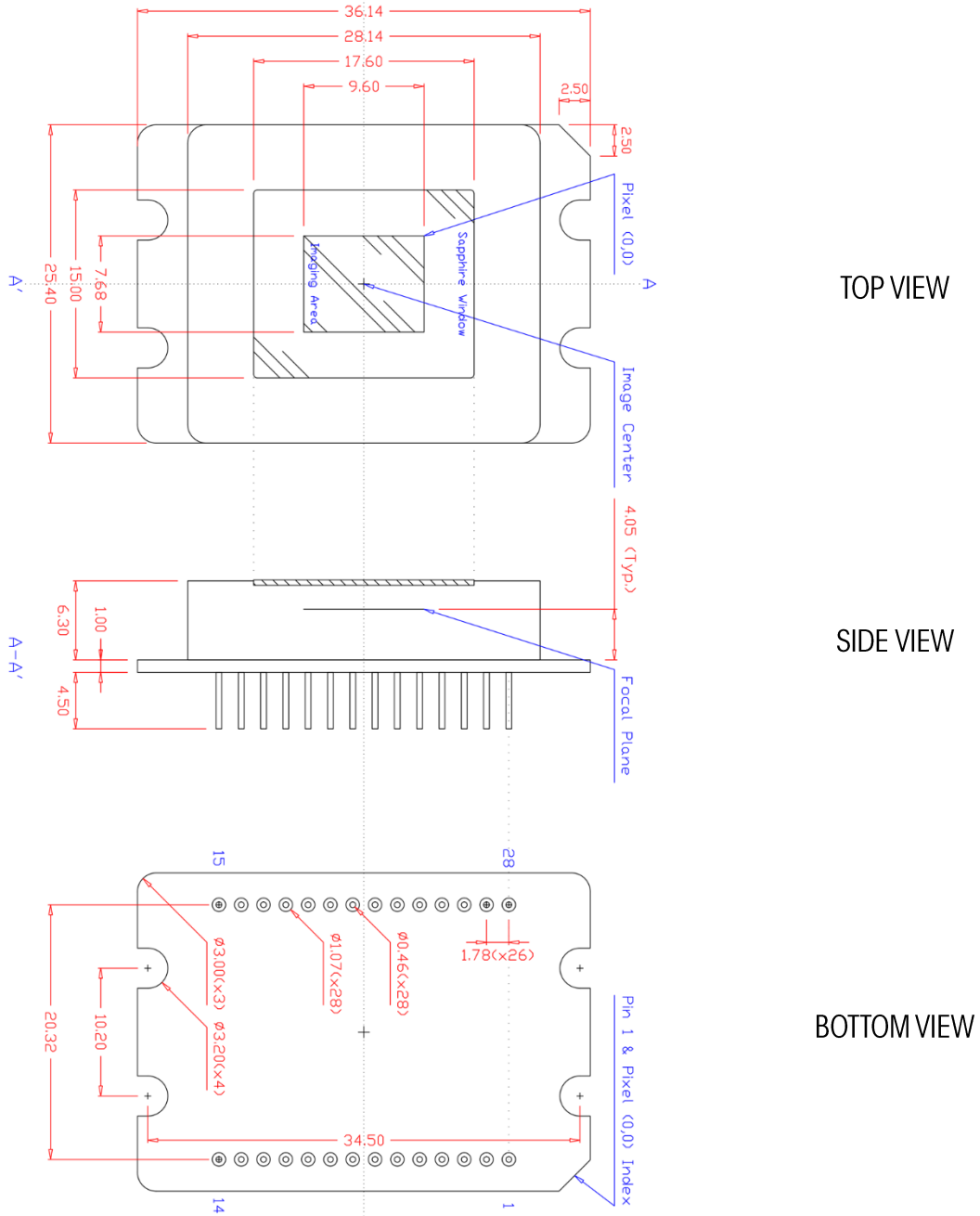
## ABSOLUTE MAXIMUM RATINGS

Parameter		Unit	Min.	Max.
<sup>7</sup> Operating Temperature		°C	-40	+71
<sup>7</sup> Storage Temperature		°C	-40	+80
<sup>8</sup> Power Consumption		mW	---	200
<sup>9</sup> TEC Bias	FPA0640P15F-22-T2	V	---	10
	FPA0640P15F-22-T2a			5
<sup>9</sup> TEC Current	FPA0640P15F-22-T2	A		2.1
	FPA0640P15F-22-T2a			2.1

7. Non-condensing environment.
8. Without powering on the thermoelectric cooler.
9. 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.



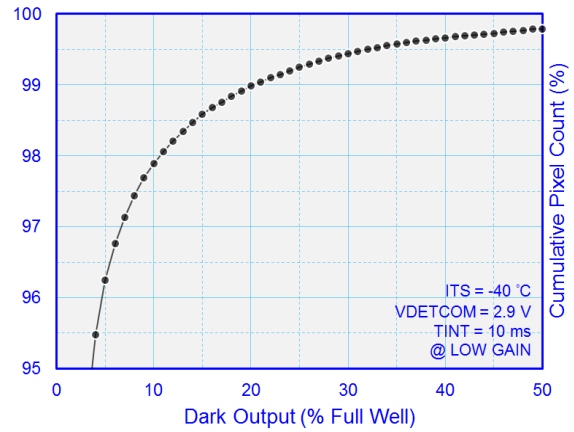
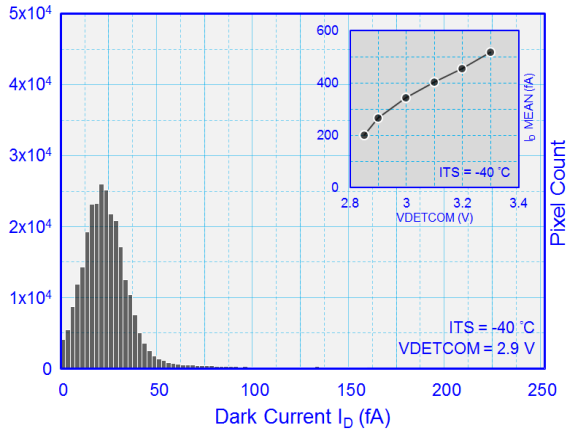
PACKAGE OUTLINE (Unit: mm)



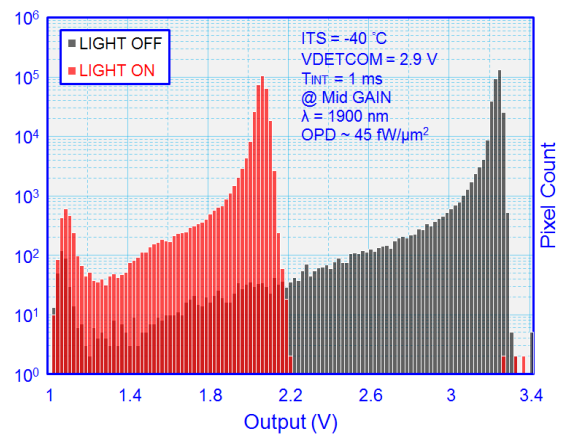
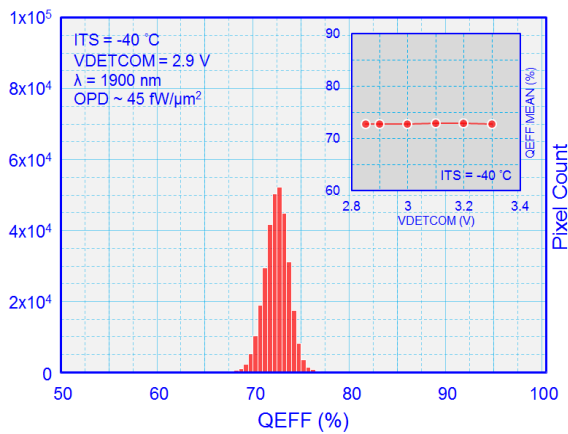


## EXAMPLE CURVES

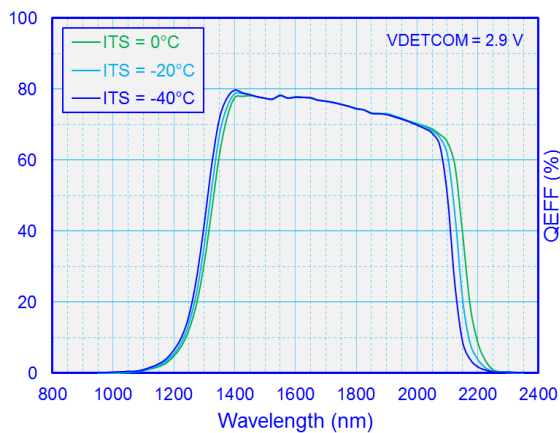
Histograms of Dark Condition



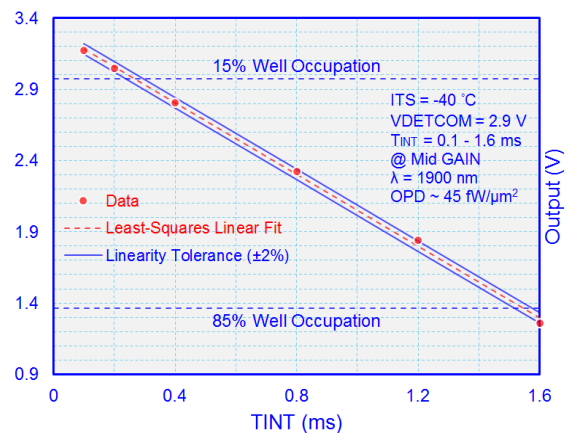
Histograms of Illuminated Condition



QEFF Spectrum



Output Linearity



Note: The example curves are subject to change without notice.