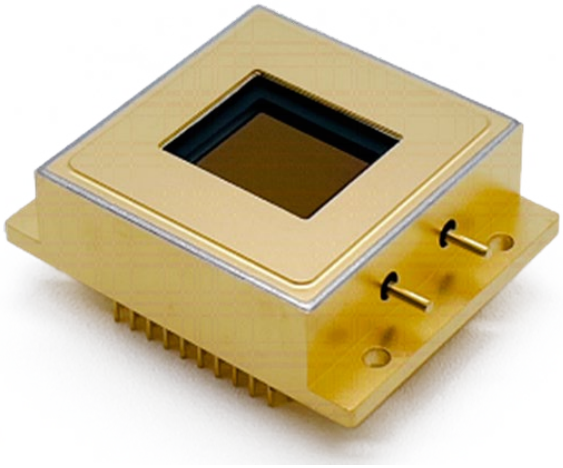
640×512 InGaAs array detector



Description:

The 640 ×512 InGaAs array detector is mainly composed of low noise readout circuit (ROIC), P-I-N structure InGaAs photosensitive chip and primary thermoelectric cooler (TEC), and is packaged in metal form.The detector is available in two types: conventional type and open window type. This manual only describes the product of open window type B.

Features:

- Scale 640 × 512 yuan
- Working band 0.95~1.7 μm
- High detection rate
- Room temperature

Applications:

- Industrial testing
- Machine vision
- Spectral analysis
- Material sorting

Specifications:

Names of Index	Typ
Response spectrum (μm)*1	0.95 ±0.05~1.7 ±0.05
Pixel filling rate(%)	100
Peak quantum efficiency(%)	≥70@1.55μm
Peak detection rate*2(cm·Hz/w)	≥5 × 1012
Peak sensitivity(A/W)	≥0.8
Effective pixel rate(%)*3	>99.5
Response heterogeneity(%)	≤5
Playback mode	IWR, ITR, ITR+CDS, NDRO, IMRO
Readout rate (MHz)	Range 2 to 22, typical 12
Number of readout channels	2 , 4 , 8, optional
Full frame rate(Hz) *4	350
Gain gear	3
Conversion gain(μV/e-)	1 (LG), 25 (MG), 110 (HG)
Dynamic range(dB)	≥55 (MG)

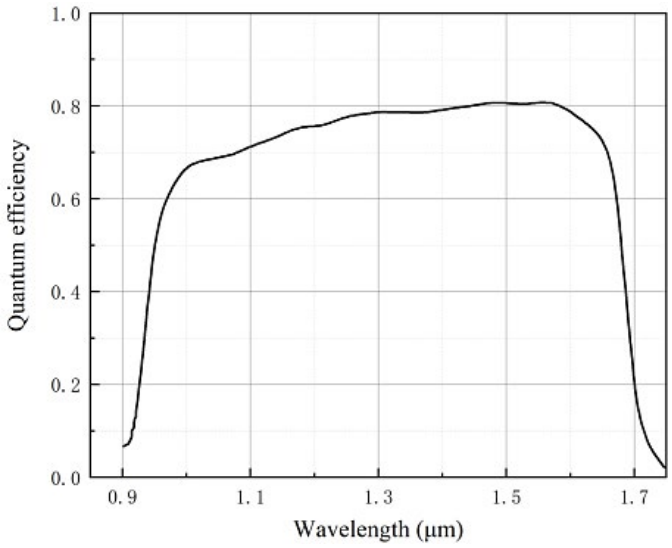
*1 Focal plane temperature=25℃

*2 Focal plane temperature=20℃, Mid-range gain, integration time 8ms, signal amplitude close to half-well condition

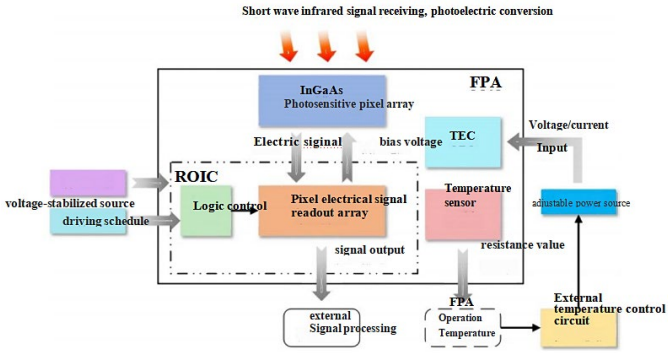
*3 The percentage of pixels for which the response signal deviates less than 50% from the mean for the near-half-well condition

*4 The number of readout channels =8, the readout mode is IWR, and the readout rate is 20MHz.

Quantum efficiency (typical value):



Schematic diagram of detector working principle and connection mode:



Mechanical capacity:

Name of index	TYP
Length x width x height (mm)	32 ×25.5 ×7.9
Weight(g)	~21
Focal plane scale	640 ×512
Pixel center distance(μm)	15
Pixel Size(μm)	15 × 15
Sensing Area(mm)	9.6 ×7.68

Environment and power consumption parameters are used:

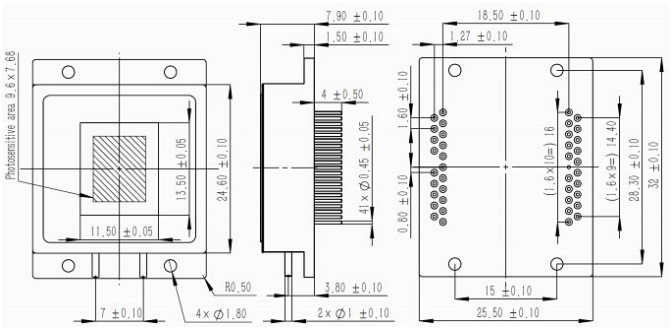
Name of index	Typ
Operation Temperature(℃)	-20~+60
Storage Temperature (℃)	-40~+70
Typical power(W)*	<0.35
Temperature cycling, random vibration	Comply with the GJB 548B-2005 standard design

Dimensions and Pin definitions:

Mechanical Specifications

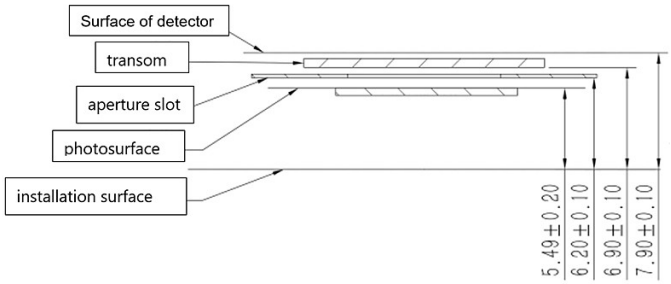
The detector is In the form of metal packaging, filled with atmospheric pressure and high purity nitrogen gas, the metal shell is made of FeNiCoSi alloy, the surface is electroplated with Ni/Au layer, the window welding method is IN brazing, and the capping form is resistance welding.The overall dimensions of the detector are 32mm (L)×25.5mm (W)×7.9mm (H). There are 41 pins Φ0.45mm on the shell from the bottom, the use of bilateral double rows of "product" layout, single side adjacent two rows of pins spacing is 1.27mm, a single row of pin spacing is 1.6mm, used for focal plane power and command input, focal plane detection signal and temperature sensor electrical extraction; Two pins of Φ1.0mm on the side are used for the connection of the thermoelectric refrigerator. Four via holes of Φ1.8mm distributed on both sides of the tube shell are used for the fixation of the detector.

The appearance and size of the mechanical interface are shown below.

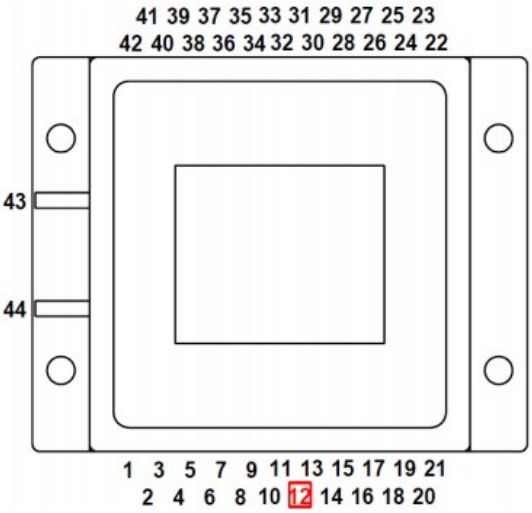


Optical configuation

The detector has a 640×512 element InGaAs focal plane, a pixel center distance of 15μm, a square shape, and a photosensitive size of 15μm× 15μm.The design distance between the detector and the upper surface of the package structure is 2.41 ±0.2mm, the design distance between the detector and the lower surface of the window is 1.41 ±0.2mm, and the design distance between the detector and the lower surface of the diaphragm is 0.71 ±0.2mm. The window material is sapphire, the thickness is 0.6 ±0.02mm, the window refractive index is 1.76, the surface is coated with AR film, and the transmittance in the response band is >. The window transmittance area is 13.5mm× 11.5mm, and the aperture transmittance size is 10.2mm× 8.3mm.The center of the sensitive surface is located at the center of the detector with a relative position offset ≤0.05mm and a relative rotation displacement ≤0.02mm.



Schematic of the detector pin:



Description of the detector pin:

Pin number	Name of pin	Input/output	Pin function	Reference value
1	NC	-	Empty pin, unattached	
2	CLK	Input	Detector master clock	Digital voltage, High level 3.3V, low level 0V
3	ST	Output	The frame output identifier	See Note 3 for details
4	ROW_ST	Output	The line output identifier	See Note 3 for details
5	ERROR	Output	Serial port command word input check bit	See Note 3 for details
6	SERIAL	Input	Serial port command word input	Digital voltage high level 3.3V, low level 0V
7	RESET	Input	External reset input (high level valid)	Digital voltage high level 3.3V, low level 0V
8	NC	-	Same as 1	
9/10	TS	-	Temperature sensor, which measures the electrical resistance value through two pins, to feedback the operating temperature of the focal plane	
11	NC	-	Same as 1	
12	NC	-	No pins, easy to identify the direction	
13	NC	-	Same as 1	
14	NC	-	Same as 1	
15	GNDA	-	Analog power ground, corresponding to VDDA	
16	VDDA	Output	Analog power supply	Simulation 3.6V, Driving current >90mA
17	VDDL	Input	VDCC	Simulation 3.6V, Driving current >90mA
18	VOUT1	Output	Eight-Channel、four channels、The first channel in a two-channel output mode	
19	VOUT2	Output	The first channel in a two-channel output mode The second channel in a two-channel output mode	
20	VOUT3	Output	Eight-Channel, The third channel in a four-channel output mode	
21	VOUT4	Output	Eight-Channel、The fourth channel in a four-channel output mode	
22	VOUT5	Output	The fifth channel in the eight-channel output mode	
23	VOUT6	Output	The sixth channel in the eight-channel output mode	
24	VOUT7	Output	The seventh channel in the eight-channel output mode	
25	VOUT8	Output	The eighth channel in the eight-channel output mode	
26	SUBPV	Input	Detector common terminal	Simulation 2.3V, Driving current >5mA
27	NC	-		Must be suspended
28	VREF	-	reference voltage	See Recommended peripheral circuit for details
29	GND	-	common ground point	
30~34	NC	-	Same as 1	
35	VD33	Input	Digital IO power supply	Simulation 3.3V, Driving current >15mA
36/37	NC	-		Must be suspended
38	GND	-	Same as 29	
39	VD18	Input	Digital logic power supply	Simulation 1.8V, Driving current >30mA
40	VTEMP	Output	Circuit integrated temperature sensor voltage output, voltage gain -6mV/K	
41	INT	Input	Integral control input	Digital voltage High level 3.3V, low level 0V
42	NC	-	Same as 1	
43	TEC-	-	Thermoelectric refrigerator connection foot -	
44	TEC+	-	The thermoelectric refrigerator is connected to the foot +, the foot + is connected to the high electrical potential for refrigeration, and the foot is connected to the low potential for heating	

Matters needing attention:

The DC input directly affects the overall noise of the detector, so the ripple noise of the DC input power supply is required as follows:

1) Each power supply voltage ripple noise requirements:

a) VDDA: < 1mV;

b) VDDL: < 10mV;

c) VD33: <5mV;

d) VD18: <5mV;

2) Signal output (VOUT1~VOUT8) load requirements: Cload<25pf; rload="">100kΩ;

3) Logical output signal range: logical output signal is high and low level digital signal, wherein;

a) low level: 0~0.3V;

b) high level: (VD33-0.3V)~VD33;

c) Logic output load requirements: Cload< 15pF;

4) The reference voltage is internally generated with a typical value of 2.24V.