



PRODUCTS

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1 INFRARED DETECTORS AND DETECTION MODULES – SELECTED LINE

We present VIGO's most popular **infrared detectors** and **integrated detection modules**. These devices are suitable for both laboratory research as well as tests, prototyping, R&D stage, and in a variety of MWIR and LWIR industrial applications.

Main features

- High performance and reliability
- Very good repeatability in mass production
- Cost-effective solutions
- Fast delivery

Selected infrared detectors

Photo	Detector type	Photo	Detector type
	PVI-4-1x1-TO39-NW-36		PVM-10.6-1x1-TO39-NW-90
	PVI-5-1x1-TO39-NW-36		PCI-3TE-12-1x1-TO8-wZnSeAR-36
	PVI-2TE-6-1x1-TO8-wZnSeAR-36		

Selected infrared detection modules

	Photo	Detection module type		Photo	Detection module type
LabM series – laboratory, programmable		LabM-I-4	UHSM series – ultra high-speed		UHSM-10.6
		LabM-I-5			UHSM-I-10.6
		LabM-I-6-01	UM universal		UM-I-10.6
		LabM-I-10.6	micro-size		microM-10.6
			Small, OEM		SM-I-12

Applications

VIGO infrared detectors and detection modules presented in the table are typical products recommended for listed applications.

Infrared detectors and detection modules	Infrared detectors					Infrared detection modules								
	PVI-4-1x1-TO39-NW-36	PVI-5-1x1-TO39-NW-36	PVI-2TE-6-1x1-TO8-wZn-SeAR-36	PVM-10.6-1x1-TO-39-NW-90	PCI-3TE-12-1x1-TO8-wZn-SeAR-36	LabM-I-4	LabM-I-5	UM-I-10.6	LabM-I-6-01	LabM-I-10.6	UHSM-I-10.6	UHSM-I-10.6	microM-10.6	SM-I-12
Gas detection, monitoring and analysis	●	●	●			●	●	●	●				●	
Flue gas denitrification	●		●			●			●					
Explosion prevention	●	●				●	●		●					
Flame detection		●					●							
Combustion process control		●	●				●		●					
Solids analysis		●					●							
Contactless emperature measurements (railway transport, processes monitoring)		●	●				●		●					
Breath analysis	●	●	●			●	●		●					
Dentistry				●						●				
Glucose monitoring										●				
FTIR spectroscopy and spectrometry					●									●
CO ₂ laser measurements (power monitoring and control, beam profiling and positioning, calibration)				●				●		●	●	●	●	
Threat warning systems		●					●							
Semiconductor manufacturing										●				
Dual-comb spectroscopy											●	●		
Heterodyne detection											●	●		
LIDAR											●	●		
Object scanners											●	●		
Time-resolved fluorescence spectroscopy											●	●		
Free space optical communication											●	●		
Telemetry												●		

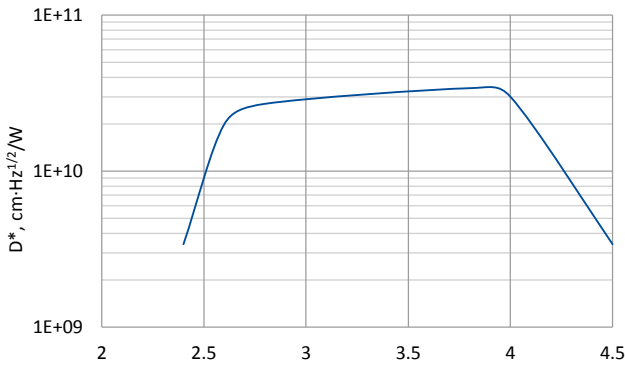
To get the information about specific parameters and applications of each detector and detection module type please see particular datasheets.

1.1 PVI-4-1×1-TO39-NW-36

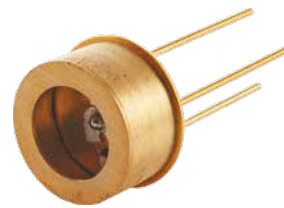
1.1.1 2.4 – 4.5 μm HgCdTe ambient temperature, optically immersed photovoltaic detector

PVI-4-1×1-TO39-NW-36 is an uncooled IR photovoltaic detector based on sophisticated HgCdTe heterostructure for the best performance and stability. The device is optimized for maximum performance at 4 μm. The detector element is monolithically integrated with hyper-hemispherical GaAs microlens to improve the performance of the device. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.



Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type
	PVI-4-1×1-TO39-NW-36
Active element material	epitaxial HgCdTe heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	2.4±0.5
Peak wavelength λ_{peak} , μm	3.4±0.5
Optimum wavelength λ_{opt} , μm	4.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	4.5±0.3
Detectivity $D^*(\lambda_{\text{peak}})$, cm·Hz ^{1/2} /W	≥3.4×10 ¹⁰
Detectivity $D^*(\lambda_{\text{opt}})$, cm·Hz ^{1/2} /W	≥3.0×10 ¹⁰
Current responsivity $R_i(\lambda_{\text{peak}})$, A/W	≥1.7
Current responsivity $R_i(\lambda_{\text{opt}})$, A/W	≥1.0
Time constant τ , ns	≤150
Resistance R, Ω	≥600
Optical area A_o , mm×mm	1×1
Package	TO39
Acceptance angle Φ	~36°
Window	none

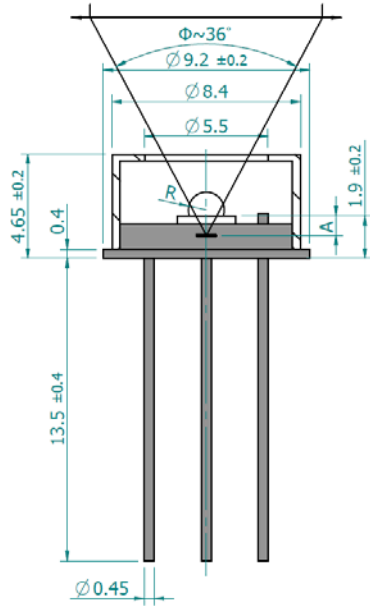
Features

- Wide dynamic range
- Convenient to use
- Very small size
- Cost-effective solution
- Quantity discounted price
- Fast delivery

Applications

- Gas detection, monitoring, and analysis (CH₄, C₂H₂, CH₂O, HCl, NH₃, SO₂, C₂H₆)
- Breath analysis
- Explosion prevention
- Flue gas denitrification
- Emission control (exhaust fumes, greenhouse gases)

Mechanical layout, mm

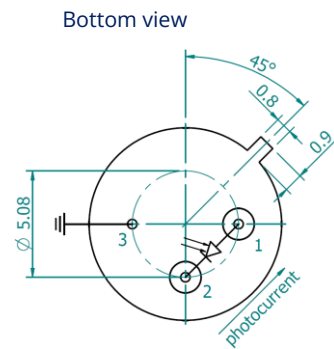


Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_o , mm×mm	1×1
R, mm	0.8
A, mm	2.4±0.2

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane

Precautions for use and storage

- Standard ohmmeter may overbias and damage the detector. The bias of 10 mV can be used for resistance measurements.
- Operation in 10% to 80% humidity and -20°C to 30°C ambient temperature.
- Beam power limitations for optically immersed detector:
 - irradiance with CW or single pulse longer than 1 μ s irradiance on the apparent optical active area must not exceed 2.5 W/cm²,
 - irradiance of the pulse shorter than 1 μ s must not exceed 10 kW/cm².
- Storage in a dark place with 10% to 90% humidity and -20°C to 50°C ambient temperature.



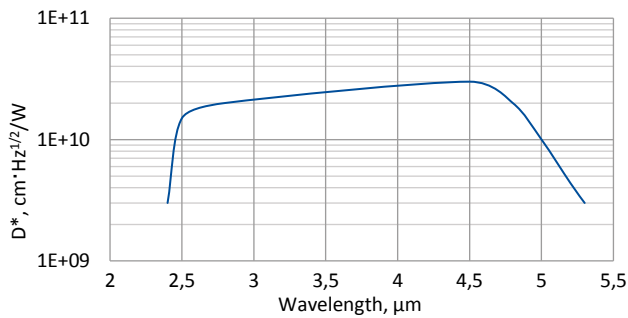
Function	Pin number
Detector	1, 2
Reverse bias (optional)	1(-), 2(+)
Chassis ground	3

1.2 PVI-5-1×1-TO39-NW-36

1.2.1 2.4 – 5.5 μm HgCdTe ambient temperature, optically immersed photovoltaic detector

PVI-5-1×1-TO39-NW-36 is an uncooled IR photovoltaic detector based on sophisticated HgCdTe heterostructure for the best performance and stability. The device is optimized for maximum performance at 5 μm. The detector element is monolithically integrated with hyper-hemispherical GaAs microlens to improve the performance of the device. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.



Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type
	PVI-5-1x1-TO39-NW-36
Active element material	epitaxial HgCdTe heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	2.4±0.5
Peak wavelength λ_{peak} , μm	4.2±0.5
Optimum wavelength λ_{opt} , μm	5.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	5.5±0.3
Detectivity $D^*(\lambda_{\text{peak}})$, cm·Hz ^{1/2} /W	≥3.0×10 ¹⁰
Detectivity $D^*(\lambda_{\text{opt}})$, cm·Hz ^{1/2} /W	≥1.0×10 ¹⁰
Current responsivity $R_i(\lambda_{\text{peak}})$, A/W	≥2.0
Current responsivity $R_i(\lambda_{\text{opt}})$, A/W	≥1.0
Time constant τ , ns	≤150
Resistance R, Ω	≥100
Optical area A_{ov} , mm×mm	1×1
Package	TO39
Acceptance angle Φ	~36°
Window	none

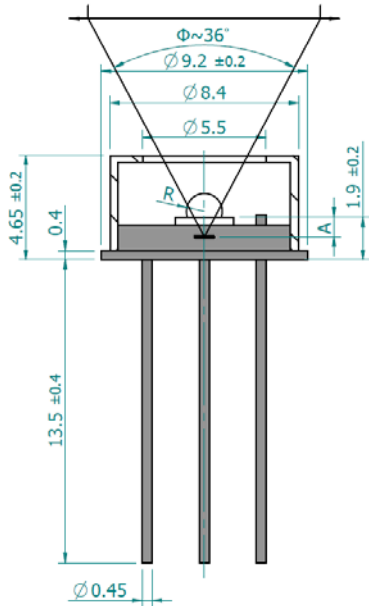
Features

- Wide dynamic range
- Convenient to use
- Very small size
- Cost-effective solution
- Quantity discounted price
- Fast delivery

Applications

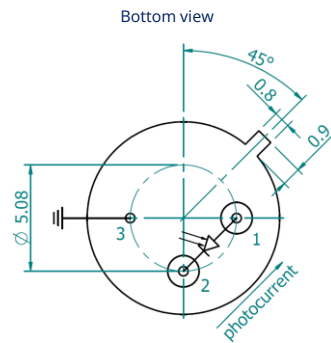
- Contactless temperature measurements (railway transport, industrial and laboratory processes monitoring)
- Flame and explosion detection
- Threat warning systems
- Gas detection, monitoring, and analysis (CO, CO₂, NO_x)
- Breath analysis
- Solids analysis
- Leakage control in gas pipelines
- Combustion process control

Mechanical layout, mm



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ov} , mm×mm	1×1
R, mm	0.8
A, mm	2.4±0.2

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane



Function	Pin number
Detector	1, 2
Reverse bias (optional)	1(-), 2(+)
Chassis ground	3

Precautions for use and storage

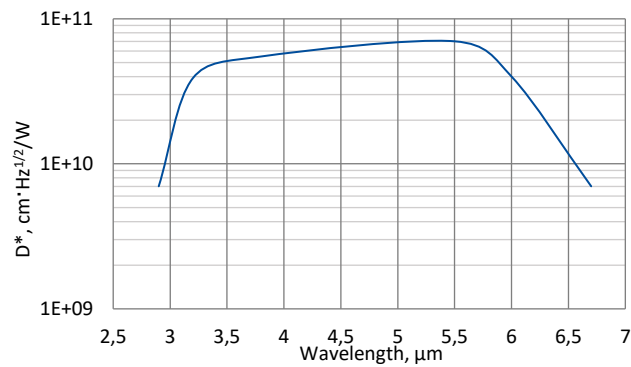
- Standard ohmmeter may overbias and damage the detector. The bias of 10 mV can be used for resistance measurements.
- Operation in 10% to 80% humidity and -20°C to 30°C ambient temperature.
- Beam power limitations for optically immersed detector:
 - irradiance with CW or single pulse longer than 1 μ s irradiance on the apparent optical active area must not exceed 2.5 W/cm²,
 - irradiance of the pulse shorter than 1 μ s must not exceed 10 kW/cm².
- Storage in a dark place with 10% to 90% humidity and -20°C to 50°C ambient temperature.

1.3 PVI-2TE-6-1×1-TO8-wZnSeAR-36

1.3.1 3.0 – 6.7 μm HgCdTe two stage thermoelectrically cooled, optically immersed photovoltaic detector

PVI-2TE-6-1×1-TO8-wZnSeAR-36 is a two-stage thermoelectrically cooled IR photovoltaic detector based on sophisticated HgCdTe heterostructure for the best performance and stability. The device is optimized for maximum performance at 6 μm. The detector element is monolithically integrated with hyperhemispherical GaAs microlens to improve the performance of the device. Reverse bias may significantly increase response speed and dynamic range. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^{\circ}\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type
	PVI-2TE-6-1x1-TO8-wZnSeAR-36
Active element material	epitaxial HgCdTe heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	2.4±0.5
Peak wavelength λ_{peak} , μm	5.2±0.5
Optimum wavelength λ_{opt} , μm	6.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	6.7±0.3
Detectivity $D^*(\lambda_{\text{peak}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥7.0×10 ¹⁰
Detectivity $D^*(\lambda_{\text{opt}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥4.0×10 ¹⁰
Current responsivity $R_i(\lambda_{\text{peak}})$, A/W	≥2.7
Current responsivity $R_i(\lambda_{\text{opt}})$, A/W	≥1.5
Time constant τ , ns	≤50
Resistance R , Ω	≥200
Active element temperature T_{det} , K	~230
Optical area A_o , mm×mm	1×1
Package	TO8
Acceptance angle Φ	~36°
Window	wZnSeAR

Features

- High performance
- Wide dynamic range
- Versatility
- Quantity discounted price
- Fast delivery

Applications

- Gas detection, monitoring, and analysis (CO, CO₂, NH₃, NO_x)
- Flue gas denitrification
- Fuel combustion monitoring at power plants and other industrial facilities
- Contactless temperature measurements

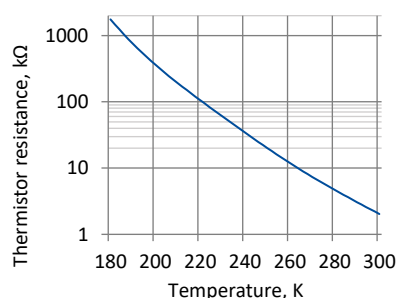
Related product

- UM-I-6 detection module

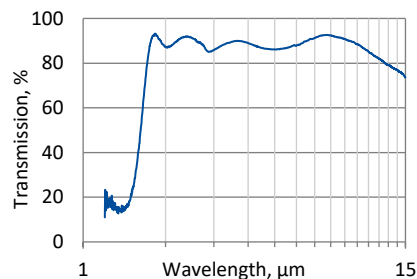
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~230
V_{max} , V	1.3
I_{max} , A	1.2
Q_{max} , W	0.36

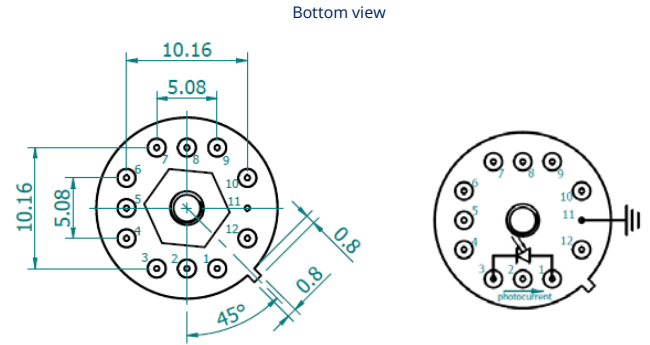
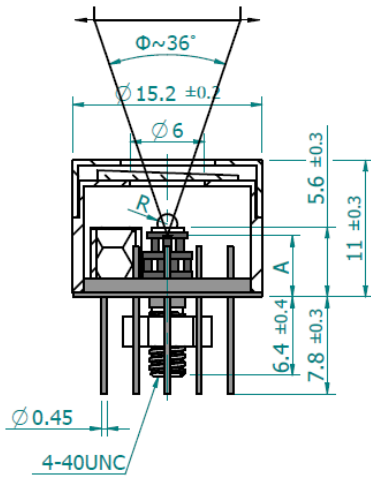
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)



Mechanical layout, mm



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{opt} , mm×mm	1×1
R, mm	0.8
A, mm	3.2±0.3

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of the ZTE-TO8 header to the focal plane

Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Precautions for use and storage

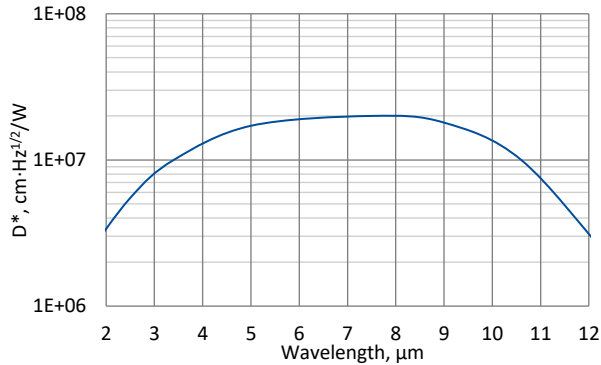
- Standard ohmmeter may overbias and damage the detector. The bias of 10 mV can be used for resistance measurements.
- Heatsink with a thermal resistance of ~2 K/W is necessary to dissipate heat generated by 2TE cooler.
- Operation in 10% to 80% humidity and -20°C to 30°C ambient temperature.
- Beam power limitations for optically immersed detector:
 - irradiance with CW or single pulse longer than 1 μs irradiance on the apparent optical active area must not exceed 2.5 W/cm²,
 - irradiance of the pulse shorter than 1 μs must not exceed 10 kW/cm².
- Storage in a dark place with 10% to 90% humidity and -20°C to 50°C ambient temperature.

1.4 PVM-10.6-1x1-TO39-NW-90

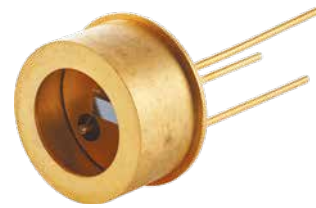
1.4.1 2.0 – 12.0 μm HgCdTe ambient temperature photovoltaic multiple junction detector

PVM-10.6-1x1-TO39-NW-90 is uncooled IR photovoltaic multiple junction detector based on sophisticated HgCdTe heterostructure for the best performance and stability. The device is designed for the maximum performance at 10.6 μm and especially useful as a large active area detector to detect CW and low frequency modulated radiation.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.



Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type
	PVM-10.6-1x1-TO39-NW-90
Active element material	epitaxial HgCdTe heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤2.0
Peak wavelength λ_{peak} , μm	8.5±1.5
Optimum wavelength λ_{opt} , μm	10.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	≥12.0
Detectivity $D^*(\lambda_{\text{peak}})$, cm·Hz ^{1/2} /W	≥2.0×10 ⁷
Detectivity $D^*(\lambda_{\text{opt}})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁷
Current responsivity $R_i(\lambda_{\text{peak}})$, A/W	≥0.004
Current responsivity $R_i(\lambda_{\text{opt}})$, A/W	≥0.002
Time constant τ , ns	≤1.5
Resistance R, Ω	≥30
Active area A, mm×mm	1×1
Package	TO39
Acceptance angle Φ	~90°
Window	none

Features

- Wide spectral range from 2.0 to 12.0 μm
- Large active area 1×1 mm²
- No bias required
- No flicker noise
- Short time constant ≤ 1.5 ns
- Operation from DC to high frequency
- Sensitive to IR radiation polarisation
- Very small size
- Convenient to use
- Versatility
- Cost-effective solution
- Quantity discounted price
- Fast delivery

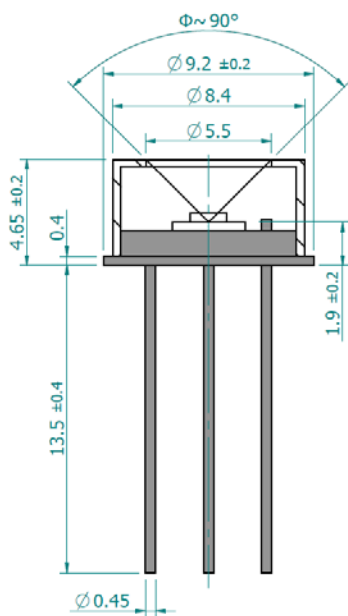
Applications

- CO₂ laser (10.6 μm) measurements
- Laser power monitoring and control
- Laser beam profiling and positioning
- Laser calibration
- Dentistry

Related product

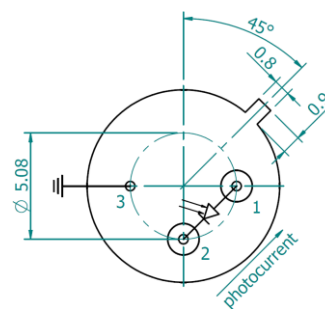
- microM-10.6 detection module

Mechanical layout, mm



Φ - acceptance angle,

Bottom view



Function	Pin number
Detector	1, 2
Chassis ground	3

Precautions for use and storage

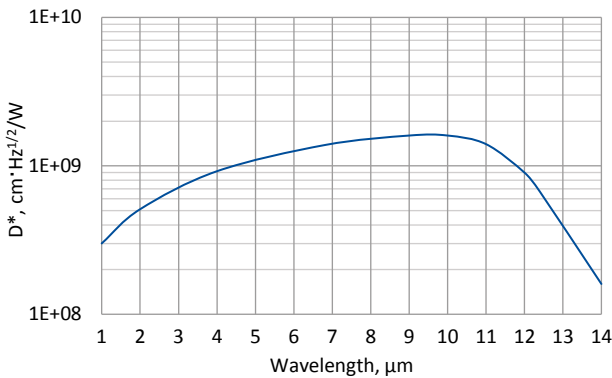
- Operation in 10% to 80% humidity and -20°C to 30°C ambient temperature.
- Beam power limitations:
 - irradiance with CW or single pulse longer than 1 μs irradiance on the apparent optical active area must not exceed 100 W/cm²,
 - irradiance of the pulse shorter than 1 μs must not exceed 1 MW/cm².
- Storage in dark place with 10% to 90% humidity and -20°C to 50°C ambient temperature.

1.5 PCI-3TE-12-1×1-TO8-wZnSeAR-36

1.5.1 1.0 – 14.0 μm HgCdTe three stage thermoelectrically cooled, optically immersed photoconductive detector

PCI-3TE-12-1×1-TO8-wZnSeAR-36 is a three-stage thermoelectrically cooled IR photoconductor, based on sophisticated HgCdTe heterostructure for the best performance and stability. The device is optimized for the maximum performance at 12 μm. Detector element is monolithically integrated with hyperhemispherical GaAs microlens in order to improve performance of the device. Photoconductive detector should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response (T_a = 20°C)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.



Specification (T_a = 20°C)

Parameter	Detector type
	PCI-3TE-12-1×1-TO8-wZnSeAR-36
Active element material	epitaxial HgCdTe heterostructure
Cut-on wavelength λ _{cut-on} (10%), μm	≤2.0
Peak wavelength λ _{peak} , μm	10.0±0.2
Optimum wavelength λ _{opt} , μm	12.0
Cut-off wavelength λ _{cut-off} (10%), μm	14.0±0.2
Detectivity D*(λ _{peak}), cm·Hz ^{1/2} /W	≥1.6×10 ⁹
Detectivity D*(λ _{opt}), cm·Hz ^{1/2} /W	≥9.0×10 ⁸
Current responsivity R _i (λ _{peak}), A/W	≥0.11
Current responsivity R _i (λ _{opt}), A/W	≥0.07
Time constant τ, ns	≤5
Resistance R, Ω	≤300
Bias voltage V _b , V	≤1.8
1/f noise corner frequency f _c , kHz	≤20
Active element temperature T _{det} , K	~210
Optical area A _o , mm×mm	1×1
Package	TO8
Acceptance angle Φ	~36°
Window	wZnSeAR

Features

- Wide spectral range from 1.0 to 14.0 μm
- High responsivity
- Large dynamic range
- Excellent long term stability and reliability
- Quantity discounted price
- Fast delivery

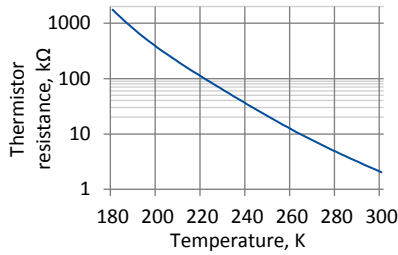
Applications

- FTIR spectroscopy and spectrometry

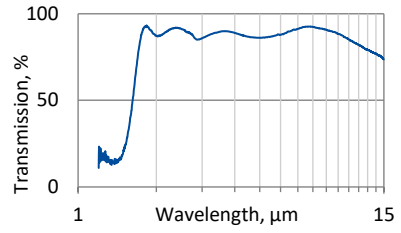
Three-stage thermoelectric cooler parameters

Parameter	Value
T _{det} , K	~210
V _{max} , V	3.6
I _{max} , A	0.45
Q _{max} , W	0.27

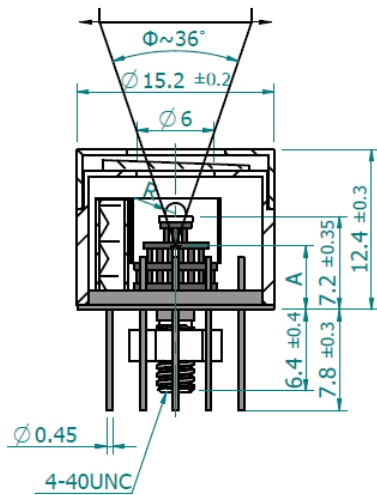
Thermistor characteristics



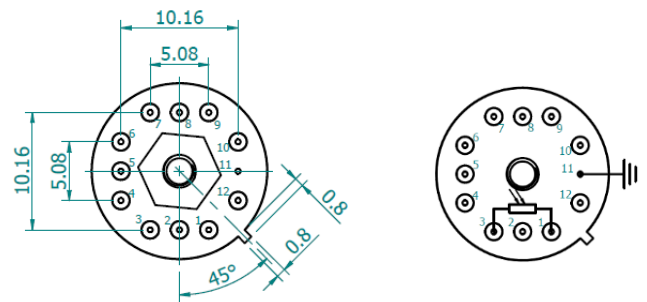
Spectral transmission of wZnSeAR window (typical example)



Mechanical layout, mm



Bottom view



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{opt} , mm×mm	1×1
R, mm	0.8
A, mm	4.8±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of the 3TE-TO8 header to the focal plane

Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Precautions for use and storage

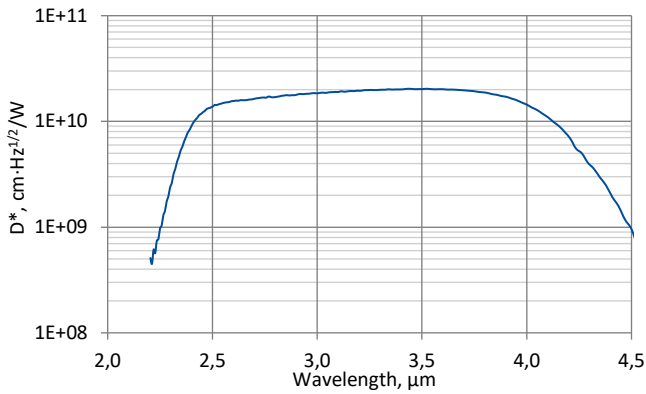
- Heatsink with thermal resistance of ~2 K/W is necessary to dissipate heat generated by 3TE cooler.
- Operation in 10% to 80% humidity and -20°C to 30°C ambient temperature.
- Beam power limitations for optically immersed detector:
 - irradiance with CW or single pulse longer than 1 μs irradiance on the apparent optical active area must not exceed 2.5 W/cm²,
 - irradiance of the pulse shorter than 1 μs must not exceed 10 kW/cm²
- Storage in dark place with 10% to 90% humidity and -20°C to 50°C ambient temperature.

1.6 LabM-I-4

1.6.1 2.4 – 4.3 μm and over 5 MHz HgCdTe programmable, laboratory IR detection module with optically immersed photovoltaic detector

LabM-I-4 is a laboratory IR detection module with optically immersed photovoltaic detector based on HgCdTe heterostructure, integrated with transimpedance, programmable preamplifier. 3° wedged sapphire window prevents unwanted interference effects. For proper operation programmable „smart“ VIGO thermoelectric cooler controller PTCC-01 (sold separately) and Smart Manager Software (freeware) are required. LabM-I-4 module comes complete with PTCC-01 and Smart Manager is the best solution for prototyping and R&D stage in a variety of MWIR applications. This set provides flexible approach to different needs of system designers.

Spectral response ($T_a = 20^{\circ}\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C, default module settings)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	2.4±0.5
Peak wavelength λ_{peak} , μm	3.5±0.5
Optimum wavelength λ_{opt} , μm	4.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	4.3±0.3
Detectivity D* (λ_{peak} , 25 kV/A), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥2.0×10 ¹⁰
Detectivity D* (λ_{opt} , 25 kV/A), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥1.2×10 ¹⁰
Output noise density v_n (10 MHz), $\text{nV}/\text{Hz}^{1/2}$	≤300
Electrical parameters	
Voltage responsivity R_v (λ_{peak} , 25 kV/A), V/W	≥3.5×10 ⁴
Voltage responsivity R_v (λ_{opt} , 25 kV/A), V/W	≥2.3×10 ⁴
Low cut-off frequency f_{lo} , Hz	DC/10 (adjustable)
High cut-off frequency f_{hi} , Hz	≥5M (adjustable)
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	1 ($R_{\text{load}} = 50 \Omega$)
Output voltage offset V_{off} , mV	max ±20
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{opt} , mm×mm	1×1
Window	wAl ₂ O ₃
Acceptance angle Φ	~36°
Ambient operating temperature T _a , °C	10 to 30
Signal output socket	SMA
Power supply and TEC control socket	LEMO (female) ECG.0B.309.CLN
Mounting hole	M4
Fan	yes

Features

- High performance and reliability
- DC offset compensation
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery

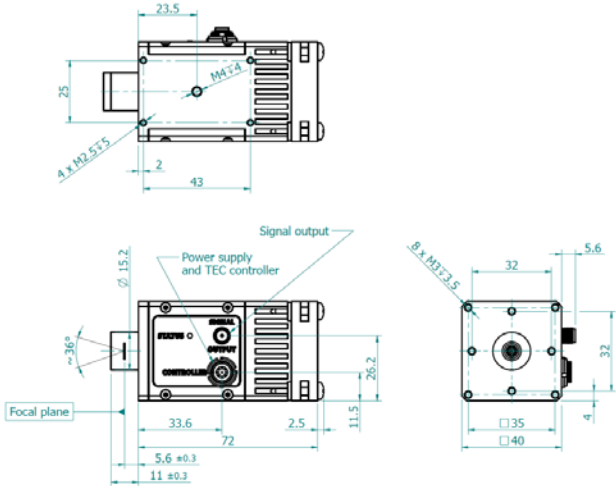
Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth (1.5 MHz / 5 MHz)
- Coupling AC/DC
- Detector's parameters (temperature, reverse bias etc.)

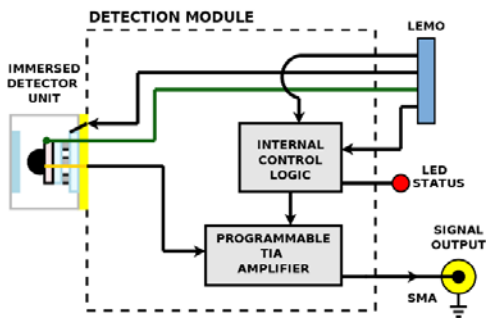
Applications

- Gas detection, monitoring and analysis (CH₄, C₂H₂, CH₂O, HCl, NH₃, SO₂, C₂H₆)
- Breath analysis
- Explosion prevention
- Flue gas denitrification
- Emission control (exhaust fumes, greenhouse gases)

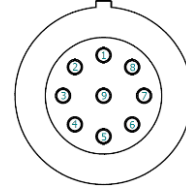
Mechanical layout, mm



Schematic diagram



**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9

Included accessories

- SMA-BNC, LEMO-DB9 cables

Dedicated accessories

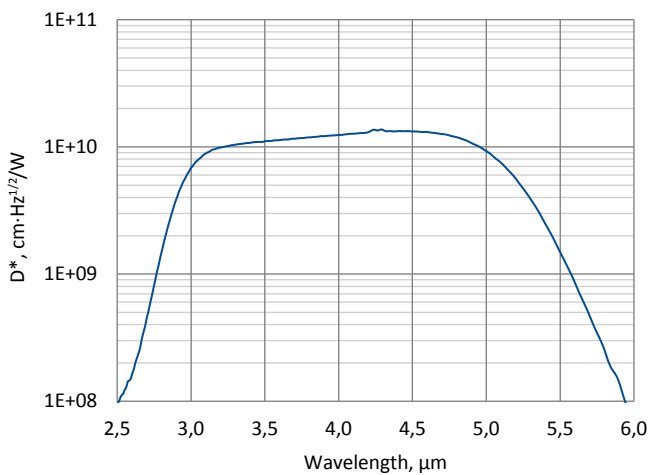
- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB, KK2-POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

1.7 LabM-I-5

1.7.1 2.9 – 5.5 μm and over 15 MHz HgCdTe programmable, laboratory IR detection module with optically immersed photovoltaic detector

LabM-I-5 is a laboratory IR detection module with optically immersed photovoltaic detector based on HgCdTe heterostructure, integrated with transimpedance, programmable preamplifier. 3° wedged sapphire window prevents unwanted interference effects. For proper operation programmable „smart“ VIGO thermoelectric cooler controller PTCC-01 (sold separately) and Smart Manager Software (freeware) are required. LabM-I-5 module comes complete with PTCC-01 and Smart Manager is the best solution for prototyping and R&D stage in a variety of MWIR applications. This set provides flexible approach to different needs of system designers.

Spectral response ($T_a = 20^{\circ}\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C, default module settings)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	2.9±1.0
Peak wavelength λ_{peak} , μm	4.2±0.5
Optimum wavelength λ_{opt} , μm	5.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	5.5±0.3
Detectivity D* (λ_{peak} , 25 kV/A), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥1.4×10 ¹⁰
Detectivity D* (λ_{opt} , 25 kV/A), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	≥1.0×10 ¹⁰
Output noise density v_n (10 MHz), $\text{nV}/\text{Hz}^{1/2}$	≤500
Electrical parameters	
Voltage responsivity R_v (λ_{peak} , 25 kV/A), V/W	≥4.8×10 ⁴
Voltage responsivity R_v (λ_{opt} , 25 kV/A), V/W	≥3.2×10 ⁴
Low cut-off frequency f_{lo} , Hz	DC/10 (adjustable)
High cut-off frequency f_{hi} , Hz	≥15M (adjustable)
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	1 ($R_{\text{load}} = 50 \Omega$)
Output voltage offset V_{off} , mV	max ±20
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{ov} , mm×mm	1×1
Window	wAl ₂ O ₃
Acceptance angle Φ	~36°
Ambient operating temperature T _a , °C	10 to 30
Signal output socket	SMA
Power supply and TEC control socket	LEMO (female) ECG.0B.309.CLN
Mounting hole	M4
Fan	yes

Features

- High performance and reliability
- DC offset compensation
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery

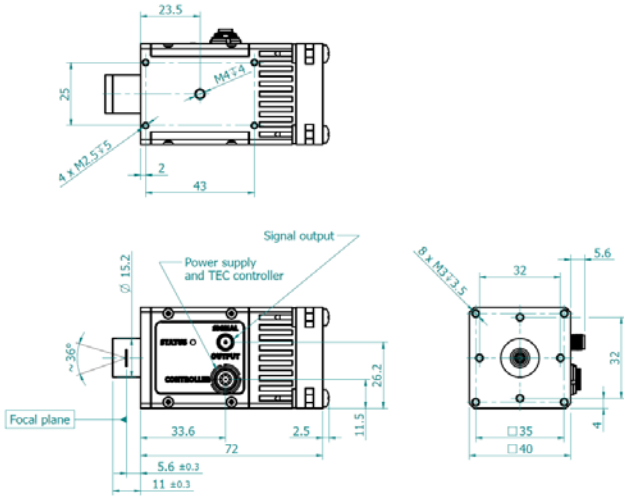
Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth (1.5 MHz / 15 MHz)
- Coupling AC/DC
- Detector's parameters (temperature, reverse bias etc.)

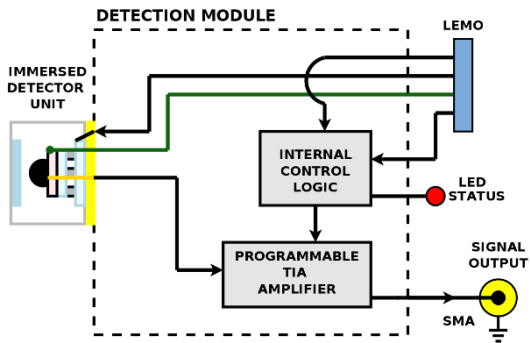
Applications

- Contactless temperature measurements (railway transport, industrial and laboratory processes monitoring)
- Flame and explosion detection
- Threat warning systems
- Gas detection, monitoring and analysis (CO, CO₂, NO_x)
- In-vivo alcohol detection
- Breath analysis
- Solids analysis
- Leakage control in gas pipelines
- Combustion process control

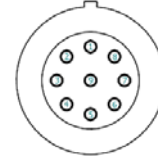
Mechanical layout, mm



Schematic diagram



**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9

Included accessories

- SMA-BNC, LEMO-DB9 cables

Dedicated accessories

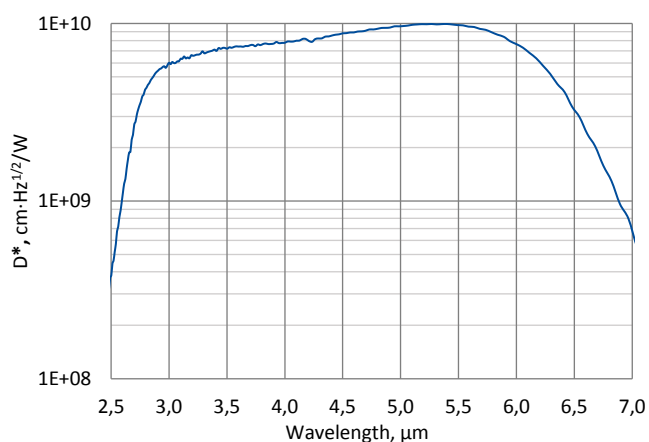
- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB, KK2-POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

1.8 LabM-I-6-01

1.8.1 2.5 – 7.0 μm and over 3 MHz HgCdTe programmable, laboratory IR detection module with optically immersed photovoltaic detector

LabM-I-6-01 is a laboratory IR detection module with optically immersed photovoltaic detector based on HgCdTe heterostructure, integrated with transimpedance, programmable preamplifier. 3° wedged zinc selenide anti-reflection coated window prevents unwanted interference effects. For proper operation programmable „smart“ VIGO thermoelectric cooler controller PTCC-01 (sold separately) and Smart Manager Software (freeware) are required. LabM-I-6-01 module comes complete with PTCC-01 and Smart Manager is the best solution for prototyping and R&D stage in a variety of MWIR applications. This set provides flexible approach to different needs of system designers.

Spectral response ($T_a = 20^{\circ}\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C, default module settings)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	3.0±1.0
Peak wavelength λ_{peak} , μm	5.2±0.5
Optimum wavelength λ_{opt} , μm	6.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	6.7±0.3
Detectivity $D^*(\lambda_{\text{peak}}, 25 \text{ kV/A})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.0 \times 10^{10}$
Detectivity $D^*(\lambda_{\text{opt}}, 25 \text{ kV/A})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 7.0 \times 10^9$
Output noise density v_n (10 MHz), $\text{nV}/\text{Hz}^{1/2}$	≤ 500
Electrical parameters	
Voltage responsivity $R_v(\lambda_{\text{peak}}, 25 \text{ kV/A})$, V/W	$\geq 5.0 \times 10^4$
Voltage responsivity $R_v(\lambda_{\text{opt}}, 25 \text{ kV/A})$, V/W	$\geq 3.5 \times 10^4$
Low cut-off frequency f_{lo} , Hz	DC/10 (adjustable)
High cut-off frequency f_{hi} , Hz	$\geq 3\text{M}$ (adjustable)
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	1 ($R_{\text{load}} = 50 \Omega$)
Output voltage offset V_{off} , mV	max ±20
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{opt} , $\text{mm}\times\text{mm}$	1×1
Window	wZnSeAR
Acceptance angle Φ	~36°
Ambient operating temperature T_a , °C	10 to 30
Signal output socket	SMA
Power supply and TEC control socket	LEMO (female) ECG.0B.309.CLN
Mounting hole	M4
Fan	yes

Features

- High performance and reliability
- DC offset compensation
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery

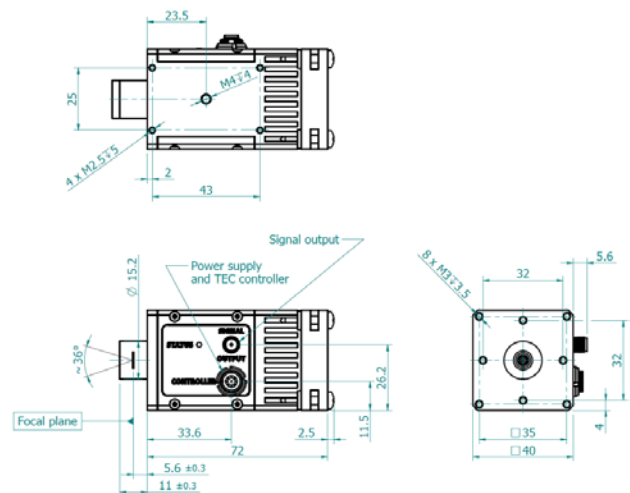
Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth (1.5 MHz / 3 MHz)
- Coupling AC/DC
- Detector's parameters (temperature, reverse bias etc.)

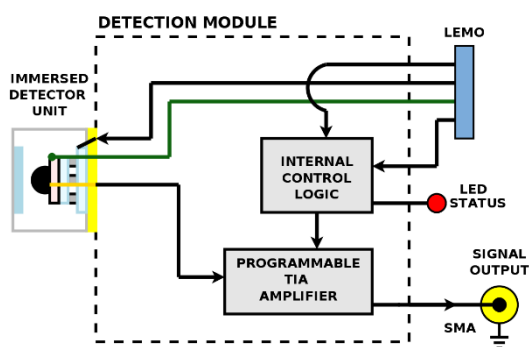
Applications

- MWIR gas detection, monitoring and analysis
- Flue gas denitrification
- Fuel combustion monitoring at power plants and other industrial facilities
- Breath analysis
- Explosion prevention
- Emission control (exhaust fumes, greenhouse gases)
- Contactless temperature measurements

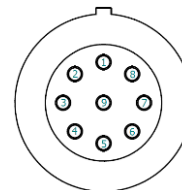
Mechanical layout, mm



Schematic diagram



**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9

Included accessories

- SMA-BNC, LEMO-DB9 cables

Dedicated accessories

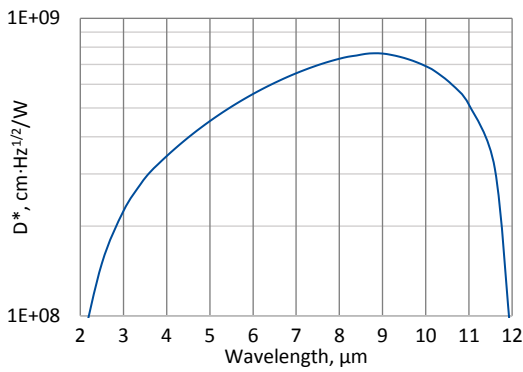
- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB, KK2- POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

1.9 LabM-I-10.6

1.9.1 2.0 – 12.0 μm and DC – 100 MHz HgCdTe programmable, laboratory IR detection module with optically immersed photovoltaic detector

LabM-I-10.6 is a laboratory IR detection module with optically immersed photovoltaic detector based on HgCdTe heterostructure, integrated with transimpedance, programmable preamplifier. 3° wedged zinc selenide anti-reflection coated window prevents unwanted interference effects. For proper operation programmable „smart“ VIGO thermoelectric cooler controller PTCC-01 (sold separately) and Smart Manager Software (freeware) are required. LabM-I-10.6 module comes complete with PTCC-01 and Smart Manager is the best solution for prototyping and R&D stage in a variety of LWIR applications. This set provides flexible approach to different needs of system designers.

Spectral response ($T_a = 20^{\circ}\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C, default module settings)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤ 2.0
Peak wavelength λ_{peak} , μm	9.5 ± 0.5
Optimum wavelength λ_{opt} , μm	10.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	≥ 12.0
Detectivity $D^*(\lambda_{\text{peak}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 7.2 \times 10^8$
Detectivity $D^*(\lambda_{\text{opt}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 6.0 \times 10^8$
Output noise density v_n (10 MHz), $\text{nV}/\text{Hz}^{1/2}$	≤ 400
Electrical parameters	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 2.4 \times 10^3$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 2.0 \times 10^3$
Low cut-off frequency f_{lo} , Hz	DC
High cut-off frequency f_{hi} , Hz	$\geq 100\text{M}$ (adjustable)
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	± 1 ($R_{\text{Load}} = 50 \Omega$)
Output voltage offset V_{off} , mV	max ± 20
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{opt} , $\text{mm}\times\text{mm}$	1×1
Window	wZnSeAR
Acceptance angle Φ	$\sim 36^\circ$
Ambient operating temperature T_a , $^\circ\text{C}$	10 to 30
Signal output socket	SMA
Power supply and TEC control socket	LEMO (female) ECG.0B.309.CLN
Mounting hole	M4
Fan	yes

Features

- Very high performance and reliability
- DC offset compensation
- Sensitive to IR radiation polarisation
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery

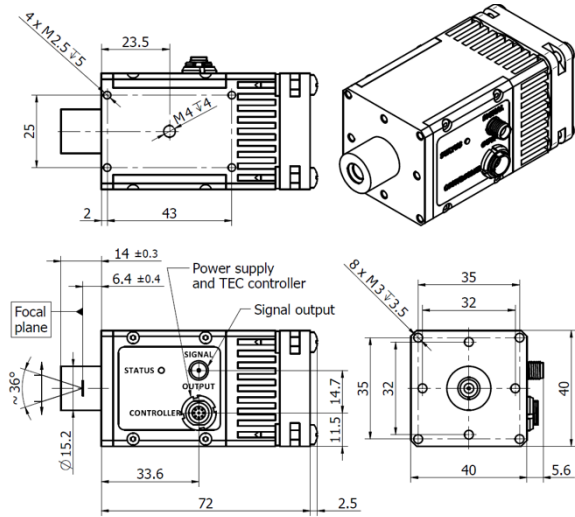
Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth (1.5 MHz/15 MHz/100 MHz)
- Coupling AC/DC
- Detector's parameters (temperature, reverse bias etc.)

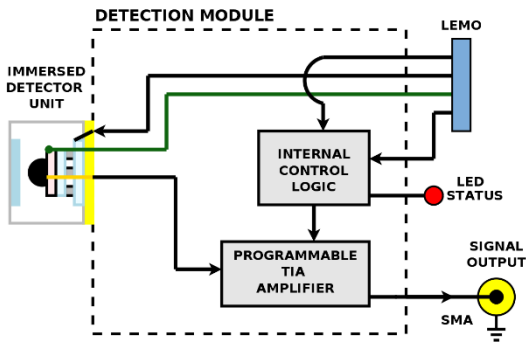
Applications

- Gas detection, monitoring and analysis
- CO₂ laser (10.6 μm) measurements
- Laser power monitoring and control
- Laser beam profiling and positioning
- Laser calibration
- Semiconductor manufacturing
- Glucose monitoring
- Dentistry

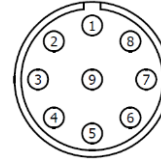
Mechanical layout, mm



Schematic diagram

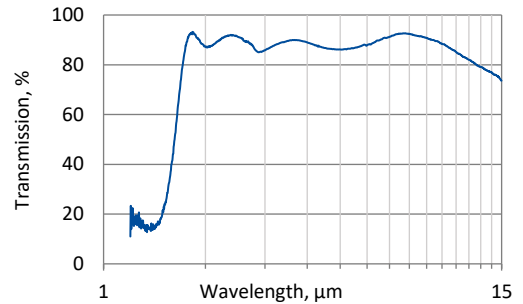


**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9

Spectral transmission of wZnSeAR window (typical example)



Included accessories

- SMA-BNC, LEMO-DB9 cables

Dedicated accessories

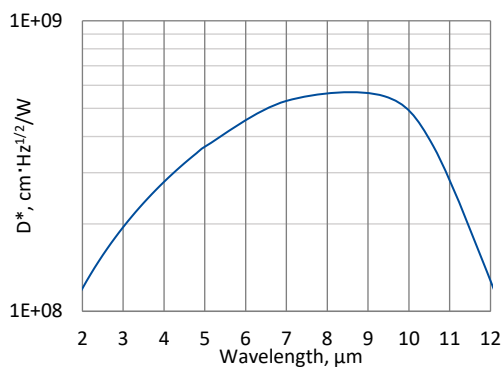
- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB , KK2- POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

1.10 UM-I-10.6

1.10.1 2.0 – 12.0 μm and DC – 100 MHz HgCdTe universal IR detection module with optically immersed photovoltaic multiple junction detector

UM-I-10.6 is universal „all-in-one“ IR detection module. Thermoelectrically cooled, optically immersed photovoltaic detector, based on HgCdTe heterostructure, is integrated with transimpedance, DC coupled preamplifier, a fan and a thermoelectric cooler controller in a compact housing. 3° wedged zinc selenide anti-reflection coated window prevents unwanted interference effects. UM-I-10.6 detection module is very convenient and user-friendly device, thus can be easily used in a variety of LWIR applications.

Spectral response ($T_a = 20^{\circ}\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C)

Parameter	Typical value
Optical characteristics	
Cut-on wavelength $\lambda_{\text{cut-on}} (10\%), \mu\text{m}$	≤ 2.0
Peak wavelength $\lambda_{\text{peak}}, \mu\text{m}$	8.5 ± 1.5
Optimum wavelength $\lambda_{\text{opt}}, \mu\text{m}$	10.6
Cut-off wavelength $\lambda_{\text{cut-off}} (10\%), \mu\text{m}$	≥ 12.0
Detectivity $D^*(\lambda_{\text{peak}}), \text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 5.5 \times 10^8$
Detectivity $D^*(\lambda_{\text{opt}}), \text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 3.7 \times 10^8$
Output noise density V_n (averaged over 1 MHz to f_{hi}), $\text{nV}/\text{Hz}^{1/2}$	≤ 330
Electrical parameters	
Voltage responsivity $R_v(\lambda_{\text{peak}}), \text{V}/\text{W}$	$\geq 9.7 \times 10^2$
Voltage responsivity $R_v(\lambda_{\text{opt}}), \text{V}/\text{W}$	$\geq 6.5 \times 10^2$
Low cut-off frequency f_{lo}, Hz	DC
High cut-off frequency f_{hi}, Hz	$\geq 100\text{M}$
Output impedance R_{out}, Ω	50
Output voltage swing V_{out}, V	$\pm 1 (R_{\text{Load}} = 50 \Omega)$
Output voltage offset $V_{\text{off}}, \text{mV}$	max ± 20
Power supply voltage V_{sup}, V	+5
DC monitor (approx. 0 V offset)	
Voltage responsivity $R_v(\lambda_{\text{peak}}), \text{V}/\text{W}$	$\geq 2.2 \times 10^2$
Voltage responsivity $R_v(\lambda_{\text{opt}}), \text{V}/\text{W}$	$\geq 1.5 \times 10^2$
Low cut-off frequency f_{lo}, Hz	DC
High cut-off frequency f_{hi}, Hz	150k
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area $A_{\text{O}}, \text{mm}\times\text{mm}$	1×1
Window	wZnSeAR
Acceptance angle Φ	$\sim 36^\circ$
Ambient operating temperature $T_{\text{a}}, ^\circ\text{C}$	10 to 30
Signal output socket	SMA
DC monitor socket	SMA
Power supply socket	DC 2.5/5.5
Mounting hole	M4
Fan	yes

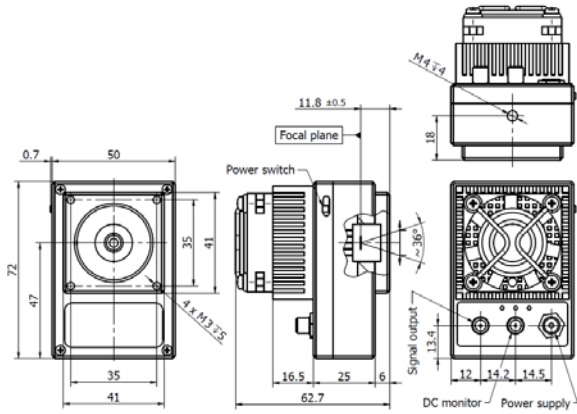
Features

- Integrated TEC controller and fan
- Single power supply
- DC monitor
- Sensitive to IR radiation polarisation
- Optimised for effective heat dissipation
- Compatible with optical accessories
- Cost-effective OEM version available
- Universal and flexible
- Quantity discounted price
- Fast delivery

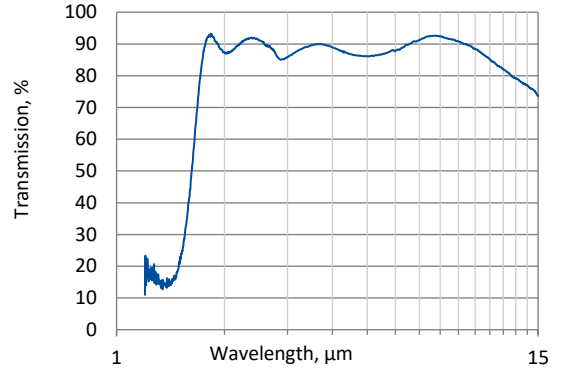
Applications

- Gas detection, monitoring and analysis
- CO₂ laser (10.6 μm) measurements
- Laser power monitoring and control
- Laser beam profiling and positioning
- Laser calibration

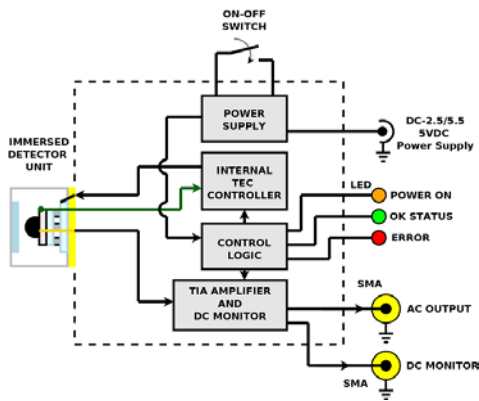
Mechanical layout, mm



Spectral transmission of wZnSeAR window (typical example)



Schematic diagram



Included accessories

- 2×SMA-BNC cables + AC adaptor

Dedicated accessories

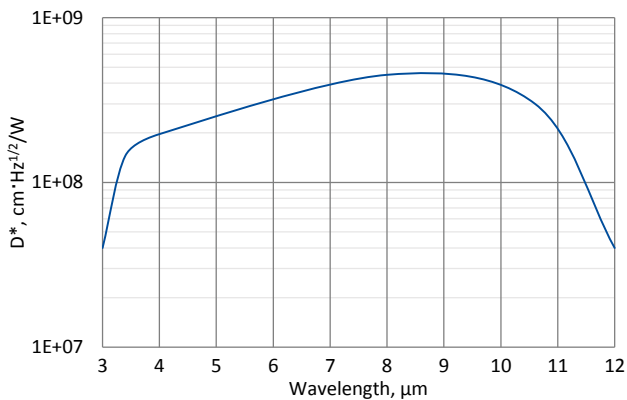
- OTA optical threaded adapter
- DRB-2 base mounting system

1.11 UHSM-10.6

1.11.1 3.0 – 12.0 μm and over 1GHz HgCdTe ultra high speed IR detection module with photovoltaic detector

UHSM-10.6 is ultra high speed „all-in-one“ IR detection module. Thermoelectrically cooled, photovoltaic detector, based on HgCdTe hetero-structure, is integrated with transimpedance, AC coupled preamplifier, a fan and a thermoelectric cooler controller in a compact housing. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects. UHSM-10.6 detection module is very convenient and user-friendly device, thus can be easily used in a variety of LWIR applications requiring wide frequency bandwidth.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤ 3.0
Peak wavelength λ_{peak} , μm	8.0 ± 1.0
Optimum wavelength λ_{opt} , μm	10.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	≥ 12.0
Detectivity $D^*(\lambda_{\text{peak}}$, 100 MHz), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 4.5 \times 10^8$
Detectivity $D^*(\lambda_{\text{opt}}$, 100 MHz), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 3.0 \times 10^8$
Output noise density v^n (100 MHz), $\text{nV}/\text{Hz}^{1/2}$	≤ 70
Electrical parameters (R_{Load} = 50 Ω)	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 4.5 \times 10^3$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 3.0 \times 10^3$
Low cut-off frequency f_{lo} , Hz	300
High cut-off frequency f_{hi} , Hz	$\geq 1.0\text{G}$
Output voltage swing V_{out} , V	± 1
1/f noise corner frequency f_c , Hz	$\leq 10\text{M}$
Power supply voltage V_{sup} , V	+9
DC monitor (approx. 1 V offset, R_{Load} = 100 kΩ)	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 1.7 \times 10^3$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 1.1 \times 10^3$
Low cut-off frequency f_{lo} , Hz	DC
High cut-off frequency f_{hi} , Hz	260
Other information	
Active element material	epitaxial HgCdTe heterostructure
Active area A, mm \times mm	0.05 \times 0.05
Window	wZnSeAR
Acceptance angle Φ	$\sim 80^\circ$
Ambient operating temperature T _{op} , °C	10 to 30
Signal output socket (RF output)	SMA
DC monitor socket	SMA
Power supply socket	DC 2.1/5.5
Mounting hole	M4
Fan	yes

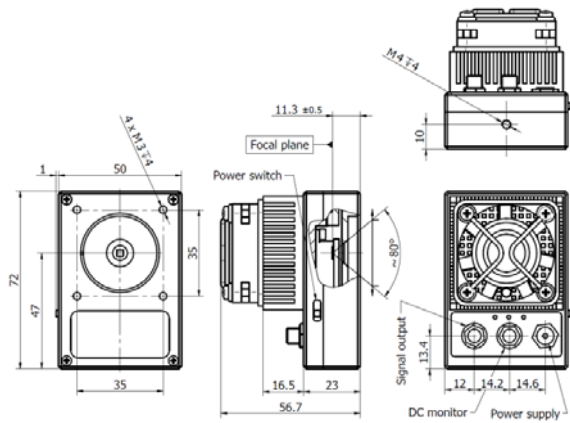
Features

- Wide frequency bandwidth over 1 GHz
- Integrated TEC controller and fan
- Single power supply
- DC monitor
- Optimised for effective heat dissipation
- Compatible with optical accessories
- Fast delivery

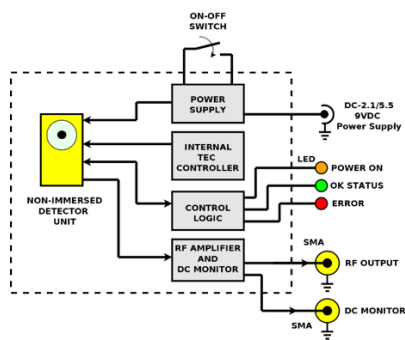
Applications

- Dual-comb spectroscopy
- Heterodyne detection
- Characterization of pulsed laser sources
- LIDAR
- Object scanners
- Time-resolved fluorescence spectroscopy systems
- Free-space optical communication

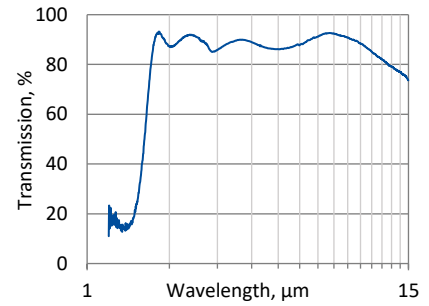
Mechanical layout, mm



Schematic diagram



Spectral transmission of wZnSeAR window (typical example)



Included accessories

- 2xSMA-BNC cables + AC adaptor

Dedicated accessories

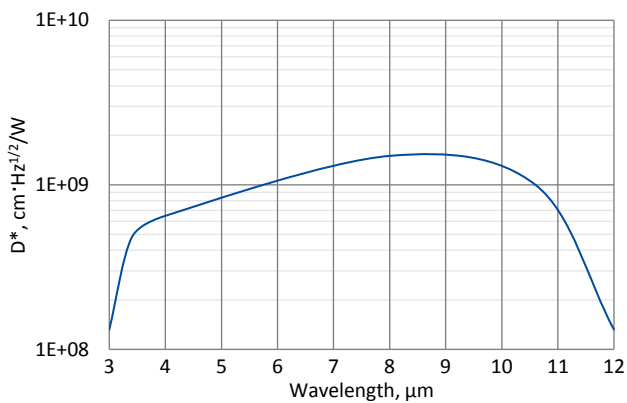
- OTA optical threaded adapter
- DRB-2 base mounting system

1.12 UHSM-I-10.6

1.12.1 3.0 – 12.0 μm and over 700 MHz HgCdTe ultra high speed IR detection module with optically immersed photovoltaic detector

UHSM-I-10.6 is ultra high speed „all-on-one“ IR detection module. Thermoelectrically cooled, optically immersed photovoltaic detector, based on HgCdTe heterostructure, is integrated with transimpedance, AC coupled preamplifier, a fan and a thermoelectric cooler controller in a compact housing. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects. UHSM-I-10.6 detection module is very convenient and user-friendly device, thus can be easily used in a variety of LWIR applications requiring wide frequency bandwidth.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤ 3.0
Peak wavelength λ_{peak} , μm	8.5 ± 0.5
Optimum wavelength λ_{opt} , μm	10.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	12.5 ± 0.3
Detectivity $D^*(\lambda_{\text{peak}}, 100 \text{ MHz})$, $\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$	$\geq 1.5 \times 10^9$
Detectivity $D^*(\lambda_{\text{opt}}, 100 \text{ MHz})$, $\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$	$\geq 1.0 \times 10^9$
Output noise density v_n (100 MHz), $\text{nV} / \text{Hz}^{1/2}$	≤ 90
Electrical parameters (R_{load} = 50 Ω)	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 1.0 \times 10^3$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 7.0 \times 10^2$
Low cut-off frequency f_{lo} , Hz	300
High cut-off frequency f_{hi} , Hz	$\geq 700\text{M}$
1/f noise corner frequency f_c , Hz	$\leq 10\text{M}$
Power supply voltage V_{sup} , V	+9
DC monitor (approx. 1 V offset, R_{load} = 1 MΩ)	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 3.8 \times 10^3$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 2.7 \times 10^2$
Low cut-off frequency f_{lo} , Hz	DC
High cut-off frequency f_{hi} , Hz	260
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{ov} , mm \times mm	1 \times 1
Window	wZnSeAR
Acceptance angle Φ	$\sim 36^\circ$
Ambient operating temperature T_{a} , $^\circ\text{C}$	10 to 30
Signal output socket (RF output)	SMA
DC monitor socket	SMA
Power supply socket	DC 2.1/5.5
Mounting hole	M4
Fan	yes

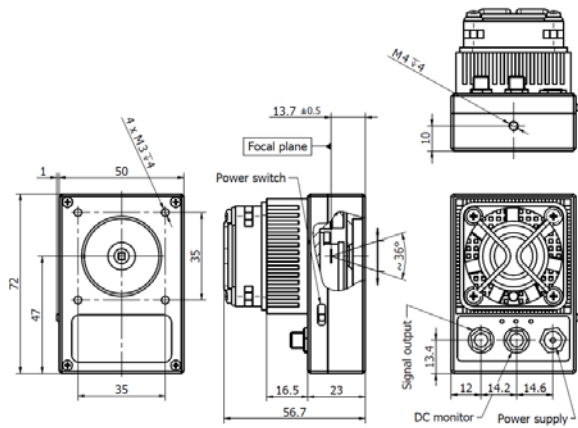
Features

- High S/N ratio
- Wide frequency bandwidth over 700 MHz
- Integrated TEC controller and fan
- Single power supply
- DC monitor
- Optimised for effective heat dissipation
- Compatible with optical accessories
- Fast delivery

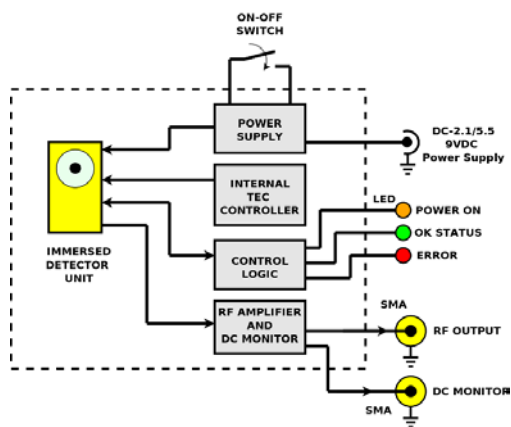
Applications

- Dual-comb spectroscopy
- Heterodyne detection
- Characterization of pulsed laser sources
- LIDAR
- Object scanners
- Time-resolved fluorescence spectroscopy systems
- Free-space optical communication
- Telemetry

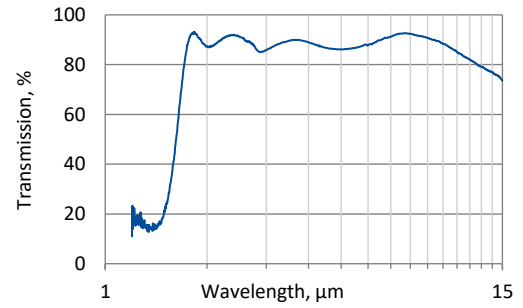
Mechanical layout, mm



Schematic diagram



Spectral transmission of wZnSeAR window (typical example)



Included accessories

- 2×SMA-BNC cables + AC adaptor

Dedicated accessories

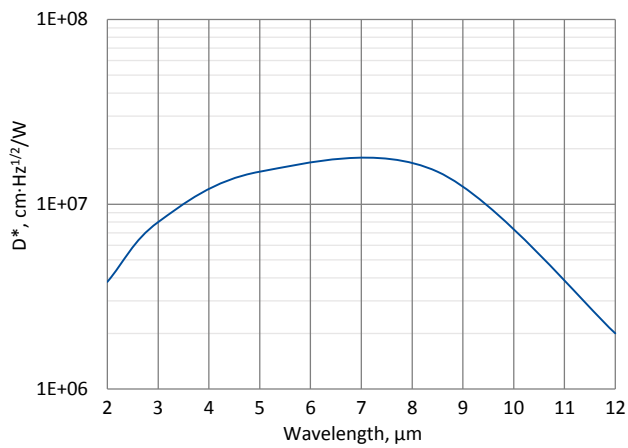
- OTA optical threaded adapter
- DRB-2 base mounting system

1.13 microM-10.6

1.13.1 2.0 – 12.0 μm and DC – 10 MHz HgCdTe micro-size IR detection module with photovoltaic multiple junction detector

microM-10.6 is a micro-size IR detection module. Uncooled photovoltaic multiple junction detector, based on HgCdTe heterostructure, is integrated with transimpedance, DC coupled preamplifier. It is easy to assembly in space limited measuring systems of LWIR applications.

Spectral response ($T_s = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤ 2.0
Peak wavelength λ_{peak} , μm	8.0 ± 1.5
Optimum wavelength λ_{opt} , μm	10.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	≥ 12.0
Detectivity $D^*(\lambda_{\text{peak}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.5 \times 10^7$
Detectivity $D^*(\lambda_{\text{opt}})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 5.0 \times 10^6$
Output noise density v_n (100 kHz), $\mu\text{V}/\text{Hz}^{1/2}$	≤ 1
Electrical parameters	
Voltage responsivity $R_v(\lambda_{\text{peak}})$, V/W	$\geq 1.2 \times 10^2$
Voltage responsivity $R_v(\lambda_{\text{opt}})$, V/W	$\geq 5.0 \times 10^1$
Low cut-off frequency f_{lo} , Hz	DC
High cut-off frequency f_{hi} , Hz	$\geq 10\text{M}$
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	± 1 ($R_{\text{Load}} = 50 \Omega$)
Output voltage offset V_{off} , mV	max ± 20
Power supply voltage V_{sup} , V	+9
Other information	
Active element material	epitaxial HgCdTe heterostructure
Active area A, $\text{mm}\times\text{mm}$	1×1
Window	none
Acceptance angle Φ	$\sim 85^\circ$
Ambient operating temperature T_a , $^\circ\text{C}$	10 to 30
Signal output plug	SMA
Power supply plug	03T-JWPF-VSLE-S (male)
Mounting hole	none
Fan	none

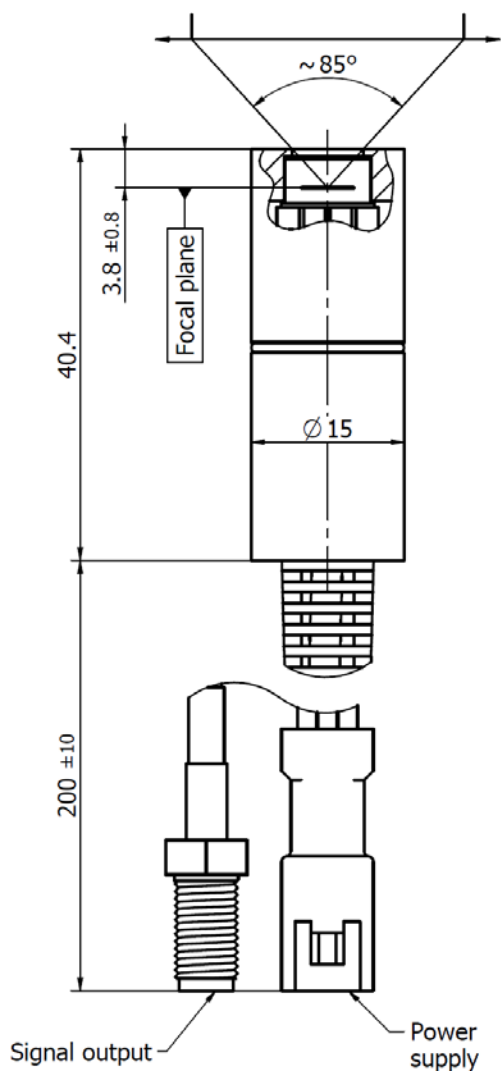
Features

- Very small size
- Convenient to use
- Versatility
- Sensitive to IR radiation polarisation
- Cost effective OEM version available
- Quantity discounted price
- Fast delivery

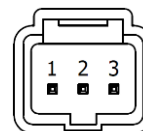
Applications

- Gas detection, monitoring and analysis
- CO₂ laser (10.6 μm) measurements
- Laser power monitoring and control
- Laser beam profiling and positioning
- Laser calibration

Mechanical layout, mm

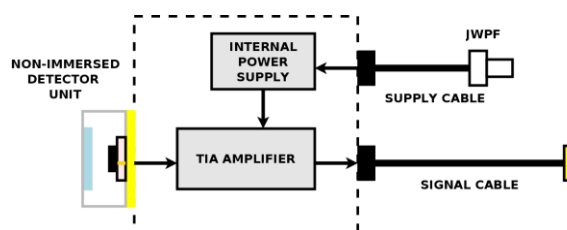


Power supply plug 03T-JWPF-VSLE-S (male)



Function	Symbol	Pin number
Power supply input (-)	$-V_{sup}$	1
Ground	GND	2
Power supply input (+)	$+V_{sup}$	3

Schematic diagram



Included accessories

- SMA-BNC, JWPF-DB9 cables

Dedicated accessories

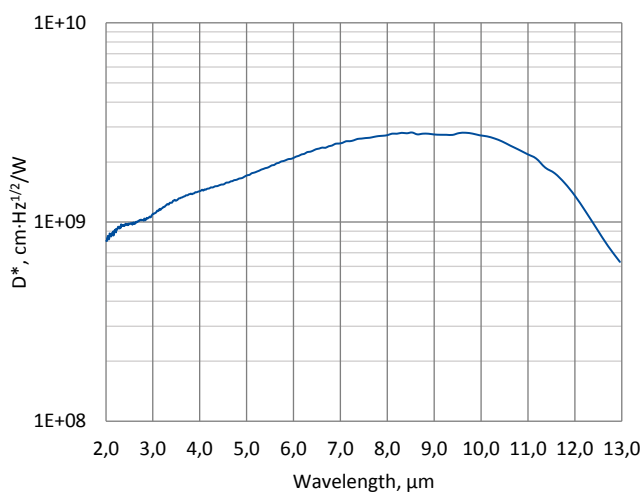
- PPS-03 preamplifier power supply + AC adaptor
- MH-1 module's holder
- DRB-2 base mounting system

1.14 SM-I-12

1.14.1 2.0 – 14.0 μm and 10 Hz – 1 MHz HgCdTe small-size IR detection module with optically immersed photoconductive detector

SM-I-12 is an ultra-small IR detection module. Thermoelectrically cooled, optically immersed photoconductive detector, based on HgCdTe heterostructure (PCI-3TE-12-1 \times 1-TO8-wZnSeAR-36) is integrated with transimpedance, AC coupled preamplifier. There is a possibility to manually adjust gain of the signal. 3° wedged zinc selenide anti-reflection coated window prevents unwanted interference effects. SM-I-12 is easy to assembly in space limited measuring systems of FTIR applications.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification (T_a = 20°C)

Parameter	Typical value
Optical parameters	
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤ 2.0
Peak wavelength λ_{peak} , μm	10.0 ± 0.2
Optimum wavelength λ_{opt} , μm	12.0
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	14.0 ± 0.2
Detectivity D* (λ_{peak} , 20 kHz), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 2.5 \times 10^9$
Detectivity D* (λ_{opt} , 20 kHz), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.3 \times 10^9$
Output noise density v_n (20 kHz), $\mu\text{V}/\text{Hz}^{1/2}$	≤ 6
Electrical parameters	
Voltage responsivity R_v (λ_{peak} , 100 kV/A), V/W	$\geq 1.35 \times 10^5$
Voltage responsivity R_v (λ_{opt} , 100 kV/A), V/W	$\geq 6.30 \times 10^4$
Voltage responsivity R_v (λ_{peak} , 55 kV/A), V/W	$\geq 7.45 \times 10^4$
Voltage responsivity R_v (λ_{opt} , 55 kV/A), V/W	$\geq 3.45 \times 10^4$
Low cut-off frequency f_{lo} , Hz	10
High cut-off frequency f_{hi} , Hz	$1\text{M} \pm 0.1$
Output impedance R_{out} , Ω	50
Output voltage swing V_{out} , V	10 ($R_{\text{load}} = 1\text{M}\Omega$)
Output voltage offset V_{off} , mV	$\text{max } \pm 20$
Other information	
Active element material	epitaxial HgCdTe heterostructure
Optical area A_{op} , mm \times mm	1 \times 1
Window	wZnSeAR
Acceptance angle Φ	$\sim 36^\circ$
Ambient operating temperature T_{op} , °C	10 to 30
Signal output socket	MMCX
Power supply and TEC control socket	AMPMODU 2 \times 4 (male)
Mounting hole	none
Fan	no (external heatsink necessary)

Features

- Wide spectral range from 2.0 to 14.0 μm
- High responsivity
- Large dynamic range
- Very small size
- Convenient to use
- Quantity discounted price
- Fast delivery

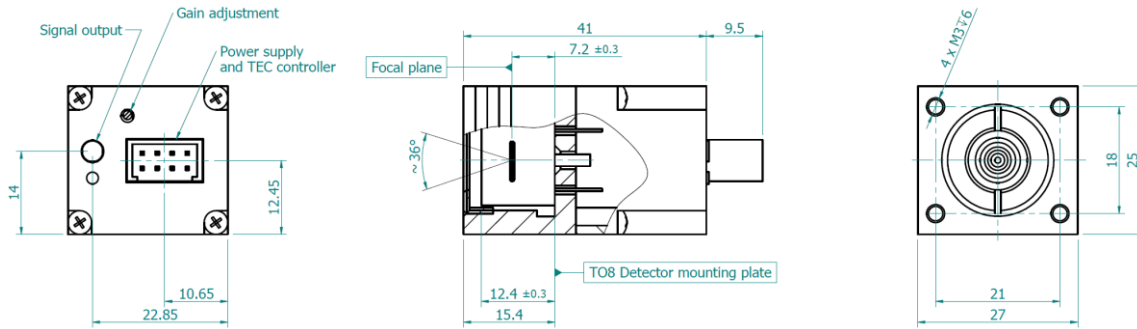
Applications

- FTIR spectroscopy and spectrometry

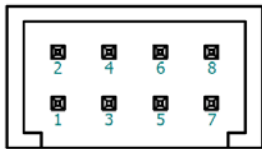
Related product

- PCI-3TE-12-1 \times 1-TO8-wZnSeAR-36

Mechanical layout, mm



Power supply and TEC control socket AMPMODU 2x4 (male)



Function	Symbol	Pin number
Power supply input (-)	-V _{sup}	1
Thermistor output	TH2	2
Data pin	DATA	3
TEC supply input (-)	TEC-	4
Ground	GND	5
Thermistor output	TH1	6
Power supply input (+)	+V _{sup}	7
TEC supply input (+)	TEC+	8

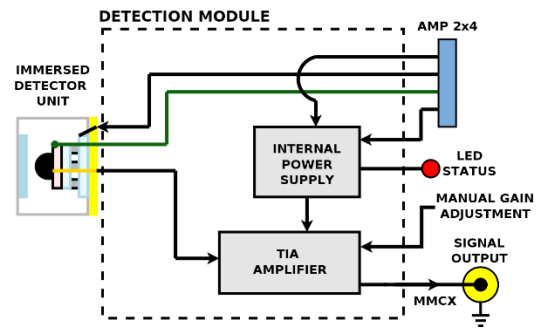
Included accessories

- MMCX-BNC, AMP2x4-DB9 cables

Dedicated accessories

- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB,
- KK2-POWER cables
- MHS-2 heatsink

Schematic diagram



2 INFRARED DETECTORS AND DETECTION MODULES - CONFIGURABLE LINE

VIGO offers various types of infrared detectors based on Mercury Cadmium Telluride, Indium Arsenide, and Indium Arsenide Antimonide featuring different parameters.

Main features

- Optimized at any wavelength from 2 – 14 μm spectral range
- With or without immersion technology
- Uncooled or thermoelectrically cooled
- Different sizes of active/optical area
- Different packages
- Different infrared windows
- Different acceptance angle
- Wide range of dedicated preamplifiers and accessories

How to choose an infrared detector?

For making a detector selection, the following points should be taken into consideration:

- wavelength or wavelength range,
- detectivity,
- speed of response.

VIGO detectors are optimized for various wavelengths. Depending on the required parameters a proper detector type should be selected.

Detector series	Spectral response range, μm																Features
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
HgCdTe (MCT) photoconductive detectors																	<ul style="list-style-type: none"> Broad 1 – 16 μm spectral range Active area from 25x25 μm^2 to 4x4 mm^2 High detectivity Low speed Long lifetime and MTBF Stability and reliability 1/f noise Uncooled and TE cooled Immersion microlens technology available
HgCdTe (MCT) photovoltaic detectors																	<ul style="list-style-type: none"> Near BLIP detection in 3 – 6 μm range < 10x gap to BLIP for $\lambda > 7 \mu\text{m}$ No bias required No 1/f noise Bandwidth: <ul style="list-style-type: none"> - tens of MHz (without reverse bias) - $\geq 1\text{GHz}$ (with reverse bias) LWIR devices limited to small areas Uncooled and TE cooled Immersion microlens technology available
HgCdTe (MCT) photovoltaic multiple junction detectors																	<ul style="list-style-type: none"> Wide 2 – 12 μm spectral range Large active areas up to 4x4 mm^2 No bias required No 1/f noise Short time constant $\leq 1.5 \text{ ns}$ Operation from DC to high frequency Sensitive to IR radiation polarisation Uncooled and TE cooled Immersion microlens technology available
HgCdTe (MCT) photoelectromagnetic detectors																	<ul style="list-style-type: none"> Wide 2 – 12 μm spectral range Room temperature operation No bias required No 1/f noise Large active area up to 2x2 mm^2 Short time constant $\leq 1.2 \text{ ns}$ Sensitive to IR radiation polarisation Immersion microlens technology available
InAs and InAsSb photovoltaic detectors																	<ul style="list-style-type: none"> Spectral range 2 – 5.5 μm Temperature stable up to 300°C Mechanically durable Complying with the RoHS Directive No bias required No 1/f noise Sensitive to IR radiation polarisation Uncooled and TE cooled Immersion microlens technology available

Detector code

Different information such as detector type, optical immersion, number of stages thermoelectric cooler, the wavelength a detector is optimized for, size of active/optical area, package type, window type, and acceptance angle combine to create VIGO System’s detector code.

Detector type	Immersion	-	Cooling	-	Optimal wavelength	-	Active/optical area	-	Package	-	Window	-	Acceptance angle
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Please see particular detector series datasheets to get available options for each detector type.

How to choose a preamplifier?

The infrared detection module integrates infrared photodetector and preamplifier in a common package. The integration makes detectors less vulnerable to:

- over-bias,
- electrostatic discharges,
- electromagnetic interferences,
- other environmental exposures.

Additional advantages of integration are improved high-frequency performance, output signal standardization, miniaturization, and cost reduction.

The broad line of transimpedance preamplifiers is specially designed for integration with VIGO IR detectors.

	Photo	Preamplifier type	Detector type	Low cut-on frequency f_{tr} , Hz	High cut-off frequency f_{tr} , Hz	Transimpedance K_v , V/A	Heatsink / fan	TEC controller	Mounting hole
all-in-one		AIP	TE cooled PC/ PC TE cooled PV/PVI TE cooled PVA/PVIA TE cooled PVM/PVMI	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 200k (fixed)	on board	on board	M4
programmable		PIP	TE cooled PC/ PC TE cooled PV/PVI TE cooled PVA/PVIA TE cooled PVM/PVMI	DC/10 (digitally adjustable)	150k/1.5M/20M 1.5M/15M/200M (digitally adjustable)	2.5k – 150k 0.5k – 30k (digitally adjustable)	on board	PTCC-01 obligatory	M4
standard		MIP	TE cooled PC/ PC TE cooled PV/PVI TE cooled PVA/PVIA TE cooled PVM/PVMI	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 200k (fixed)	on board	PTCC-01 necessary	M4
fast		FIP	TE cooled PV/PVI	1k, 10k	1G	up to 8.5k (fixed)	on board	PTCC-01 necessary	M4
small		SIP- TO8	TE cooled PC/ PC TE cooled PV/PVI TE cooled PVA/PVIA TE cooled PVM/PVMI	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 100k (tunable)	external heatsink necessary	PTCC-01 necessary	none
small		SIP- TO39	uncooled PC/ PC uncooled PV/PVI uncooled PVA/PVIA uncooled PVM/PVMI	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 100k (tunable)	not necessary	not necessary	none

To obtain the most optimal parameters of the integrated module each preamplifier is individually matched to the selected detector. The parameters of the integrated set will be known after the final evaluation (matching, adjustment, and final tests).

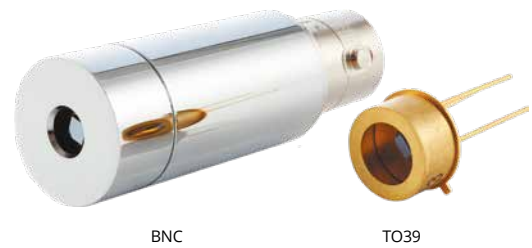
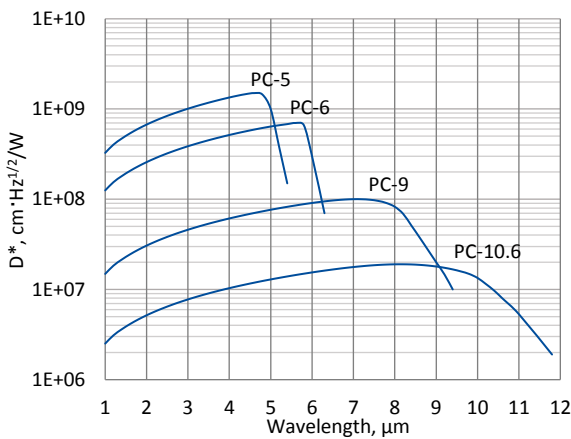
If you need any assistance in selecting VIGO product appropriate for your application, please contact **VIGO Technical Support Team:** techsupport@vigo.com.pl

2.1 PC series

2.1.1 1.0 – 12.0 μm HgCdTe ambient temperature photoconductive detectors

PC series features uncooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

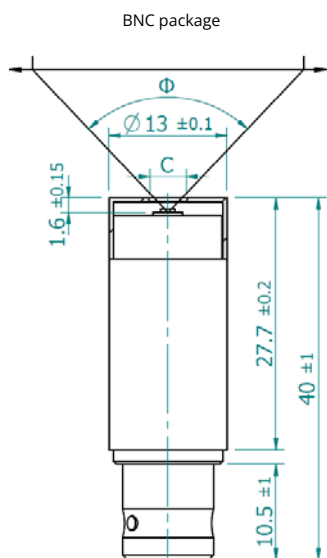
Parameter	Detector type							
	PC-5		PC-6		PC-9		PC-10.6	
Active element material	epitaxial HgCdTe heterostructure							
Optimal wavelength λ_{opt} , μm	5.0		6.0		9.0		10.6	
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.5×10 ⁹		≥7.0×10 ⁸		≥1.0×10 ⁸		≥1.9×10 ⁷	
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁹		≥3.0×10 ⁸		≥2.0×10 ⁷		≥9.0×10 ⁶	
Current responsivity-active area length product $R_i(\lambda_{opt}) \cdot L$, A·mm/W	≥0.07		≥0.02		≥0.003		≥0.001	
Time constant τ , ns	≤5000		≤500		≤10		≤3	
1/f noise corner frequency f_c , Hz			≤10k				≤20k	
Bias voltage-active area length ratio V_b/L , V/mm	≤4.5		≤4.0		≤3.6		≤3.0	
Resistance R , Ω	≤1200		≤600		≤300		≤120	
Active area A , mm×mm	0.05×0.05, 0.1×0.1, 0.25×0.25, 0.5×0.5, 1×1 ^{*)} , 2×2, 3×3							
Package	TO39	BNC	TO39	BNC	TO39	BNC	TO39	BNC
Acceptance angle Φ	~90°	~102 ^{o**)} , ~124 ^{o***)}	~90°	~102 ^{o**)} , ~124 ^{o***)}	~90°	~102 ^{o**)} , ~124 ^{o***)}	~90°	~102 ^{o**)} , ~124 ^{o***)}
Window	none							

^{*)} Not available for PC-9.

^{**)} Aperture C = Ø4 mm.

^{***)} Aperture C = Ø6 mm.

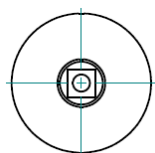
Mechanical layout, mm



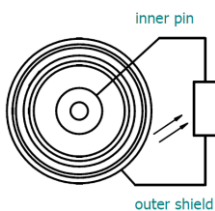
Parameter	Value	
Active area, mm×mm	0.05×0.05 - 2×2	3×3 - 4×4
C, mm	Ø4	Ø6
Acceptance angle Φ	~102°	~124°

C - aperture

Top view



Bottom view

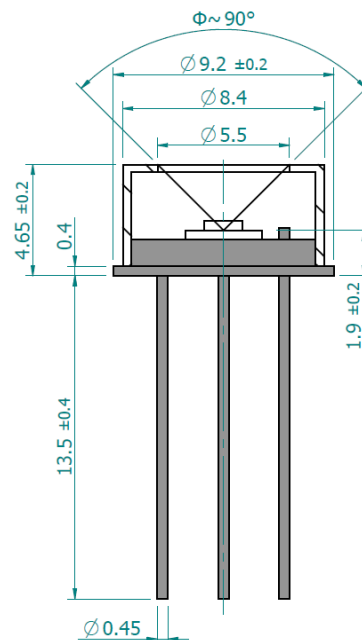


Dedicated preamplifier



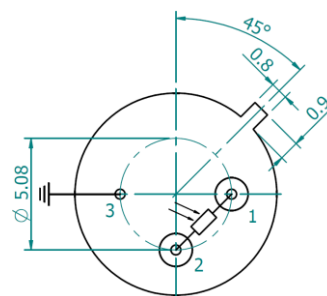
small SIP-TO39

TO39 package



Φ - acceptance angle

Bottom view



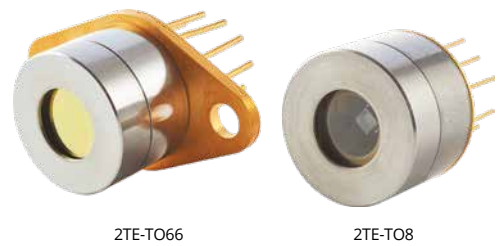
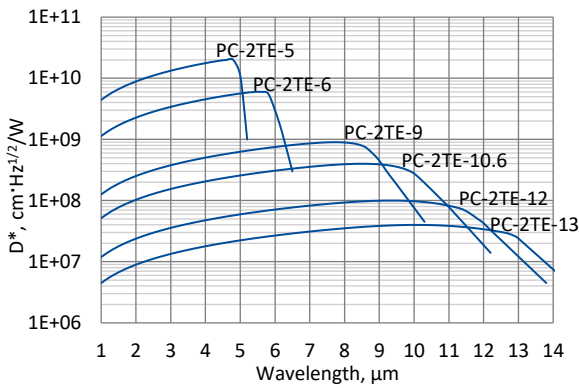
Function	Pin number
Detector	1, 2
Chassis ground	3

2.2 PC-2TE series

2.2.1 1.0 – 14.0 μm HgCdTe two-stage thermoelectrically cooled photoconductive detectors

PC-2TE series features two-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

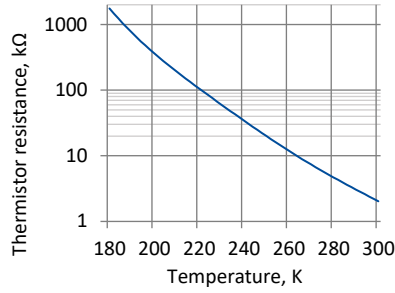
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type					
	PC-2TE-5	PC-2TE-6	PC-2TE-9	PC-2TE-10.6	PC-2TE-12	PC-2TE-13
Active element material	epitaxial HgCdTe heterostructure					
Optimal wavelength λ_{opt} , μm	5.0	6.0	9.0	10.6	12.0	13.0
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥2.0×10 ¹⁰	≥6.0×10 ⁹	≥9.0×10 ⁸	≥4.0×10 ⁸	≥1.0×10 ⁸	≥4.0×10 ⁷
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.0×10 ¹⁰	≥3.0×10 ⁹	≥4.5×10 ⁸	≥1.4×10 ⁸	≥4.5×10 ⁷	≥2.3×10 ⁷
Current responsivity-active area length product $R_i(\lambda_{opt})L$, A·mm/W	≥0.5	≥0.18	≥0.025	≥0.01	≥0.005	≥0.002
Time constant τ , ns	≤20000	≤4000	≤40	≤10	≤3	≤2
1/f noise corner frequency f_c , Hz	≤10k			≤20k		
Bias voltage-active area length ratio V_b/L , V/mm	≤2.0	≤3.2	≤2.0	≤2.25	≤1.5	≤1.8
Resistance R , Ω	≤1200	≤800	≤400	≤300	≤200	≤150
Active element temperature T_{dev} , K	~230					
Active area A , mm×mm	0.05×0.05, 0.1×0.1, 0.25×0.25, 0.5×0.5, 1×1, 2×2					
Package	TO8, TO66					
Acceptance angle Φ	~70°					
Window	wAl ₂ O ₃			wZnSeAR		

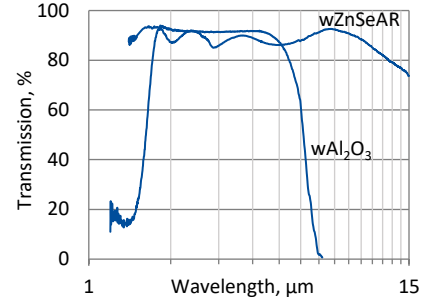
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

Thermistor characteristics

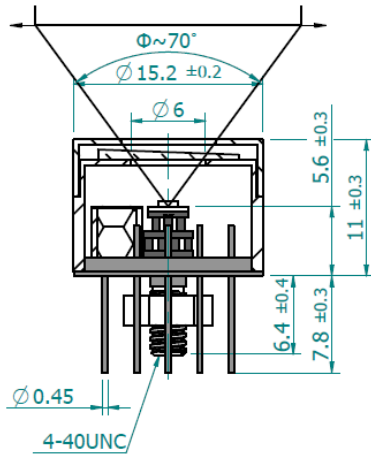


Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



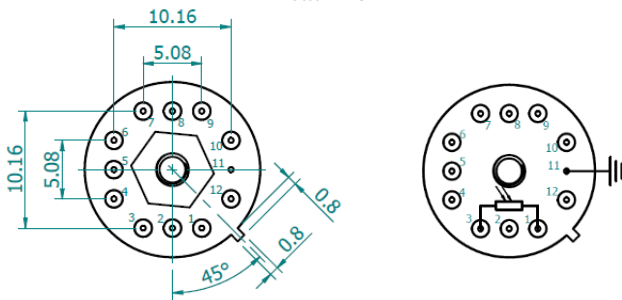
Mechanical layout, mm

TO8 package

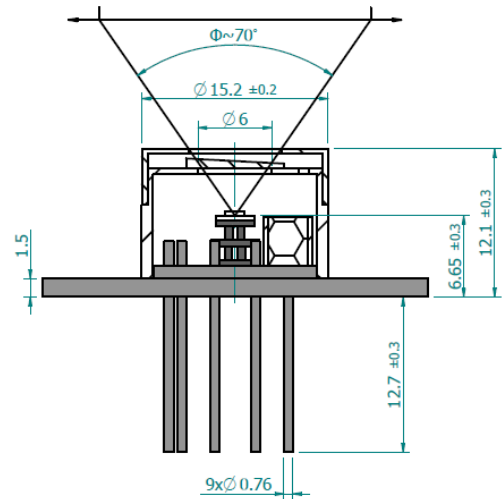


Φ - acceptance angle

Bottom view

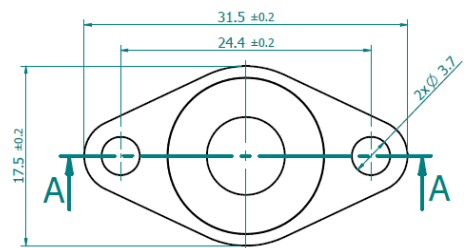


TO66 package

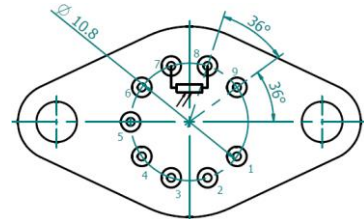


Φ - acceptance angle

Top view



Bottom view



TO8 package

Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

TO66 package

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



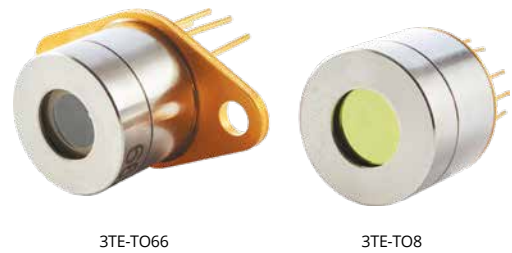
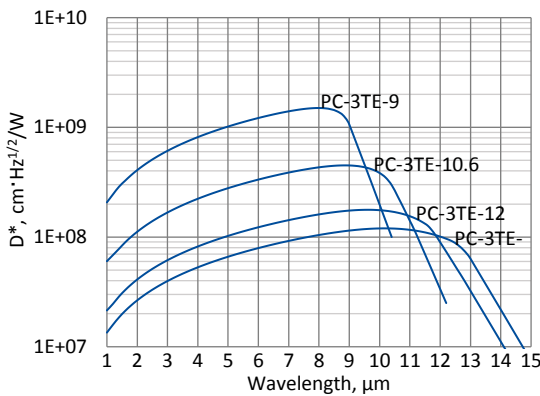
small SIP-TO8

2.3 PC-3TE series

2.3.1 1.0 – 15.0 μm HgCdTe three-stage thermoelectrically cooled photoconductive detectors

PC-3TE series features three-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

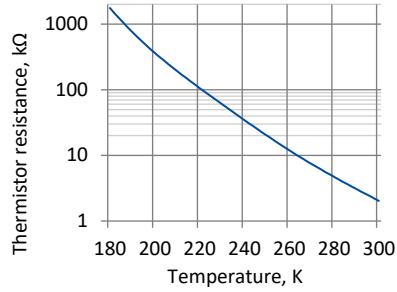
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type			
	PC-3TE-9	PC-3TE-10.6	PC-3TE-12	PC-3TE-13
Active element material	epitaxial HgCdTe heterostructure			
Optimal wavelength λ_{opt} , μm	9.0	10.6	12.0	13.0
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.5×10 ⁹	≥4.5×10 ⁸	≥1.8×10 ⁸	≥1.2×10 ⁸
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁹	≥2.5×10 ⁸	≥9.0×10 ⁷	≥6.0×10 ⁷
Current responsivity-active area length product $R_i(\lambda_{opt})L$, A·mm/W	≥0.075	≥0.02	≥0.01	≥0.007
Time constant τ , ns	≤60	≤20	≤5	≤4
1/f noise corner frequency f_c , Hz	≤10k	≤20k		
Bias voltage-active area length ratio V_b/L , V/mm	≤2.0	≤1.5		
Resistance R , Ω	≤400	≤300		
Active element temperature T_{dev} , K	~210			
Active area A , mm×mm	0.05×0.05, 0.1×0.1, 0.25×0.25, 0.5×0.5, 1×1, 2×2			
Package	TO8, TO66			
Acceptance angle Φ	~70°			
Window	wZnSeAR			

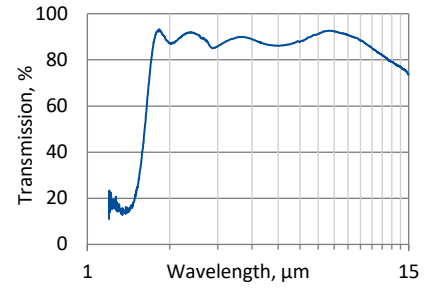
Three-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~210
V_{max} V	3.6
I_{max} A	0.45
Q_{max} W	0.27

Thermistor characteristics

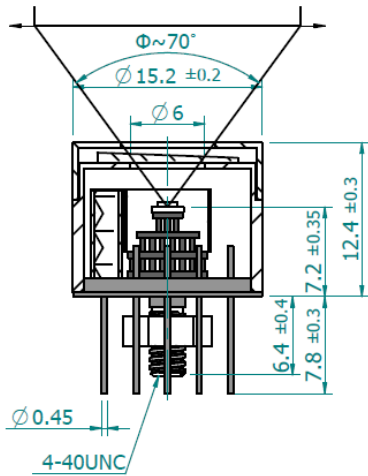


Spectral transmission of wZnSeAR window (typical example)



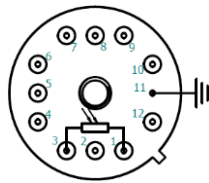
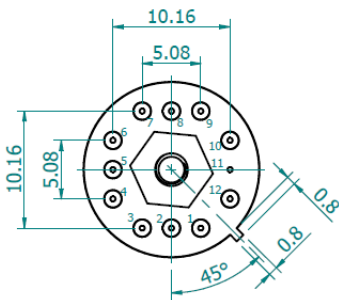
Mechanical layout, mm

TO8 package

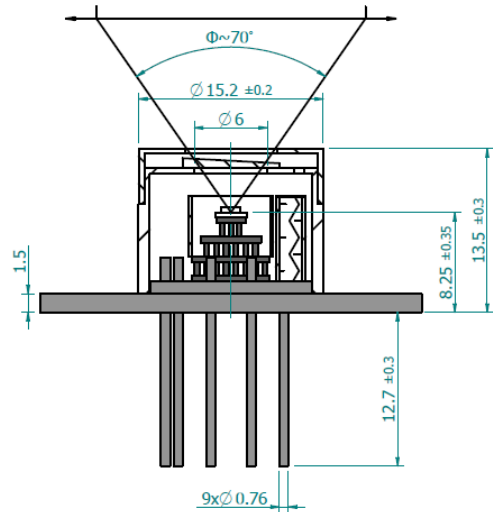


Φ - acceptance angle

Bottom view

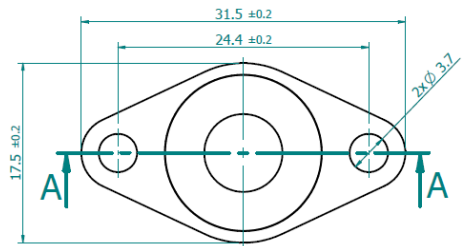


TO66 package

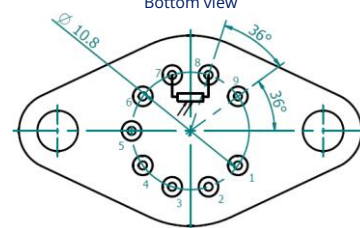


Φ - acceptance angle

Top view



Bottom view



TO8 package

Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

TO66 package

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



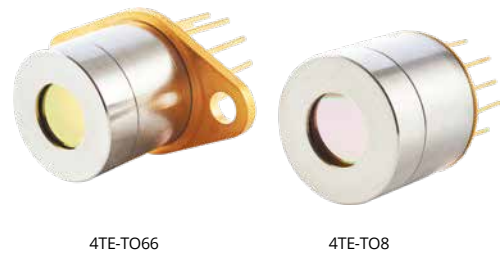
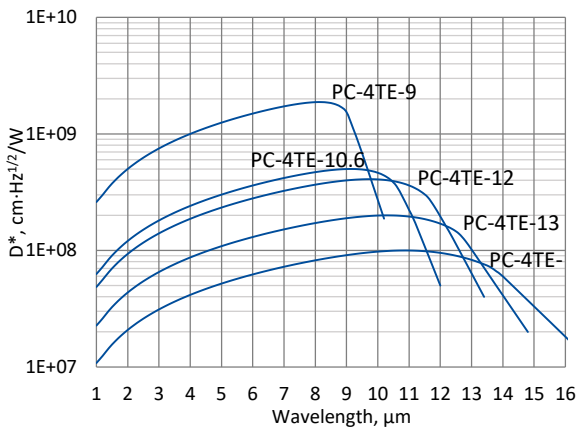
small SIP-TO8

2.4 PC-4TE series

2.4.1 1.0 – 16.0 μm HgCdTe four-stage thermoelectrically cooled photoconductive detectors

PC-4TE series features four-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

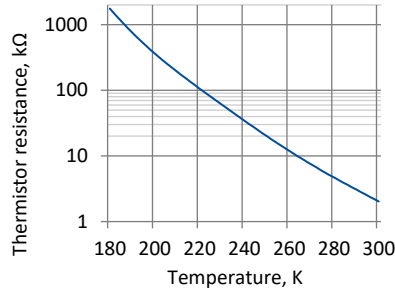
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type				
	PC-4TE-9	PC-4TE-10.6	PC-4TE-12	PC-4TE-13	PC-4TE-14
Active element material	epitaxial HgCdTe heterostructure				
Optimal wavelength λ_{opt} , μm	9.0	10.6	12.0	13.0	14.0
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.9 \times 10^9$	$\geq 5.0 \times 10^8$	$\geq 4.0 \times 10^8$	$\geq 2.0 \times 10^8$	$\geq 1.0 \times 10^8$
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.5 \times 10^9$	$\geq 3.5 \times 10^8$	$\geq 2.0 \times 10^8$	$\geq 1.0 \times 10^8$	$\geq 6.0 \times 10^7$
Current responsivity-active area length product $R_i(\lambda_{opt})L$, A·mm/W	≥ 0.1	≥ 0.03	≥ 0.015	≥ 0.01	≥ 0.007
Time constant τ , ns	≤ 80	≤ 30	≤ 7	≤ 6	≤ 5
1/f noise corner frequency f_c , Hz	$\leq 10\text{k}$	$\leq 20\text{k}$			
Bias voltage-active area length ratio V_b/L , V/mm	≤ 3.8		≤ 3.0		≤ 2.25
Resistance R , Ω	≤ 500		≤ 400		≤ 300
Active element temperature T_{det} , K	-195				
Active area A , mm×mm	0.05×0.05, 0.1×0.1, 0.25×0.25, 0.5×0.5, 1×1, 2×2				
Package	TO8, TO66				
Acceptance angle Φ	-70°				
Window	wZnSeAR				

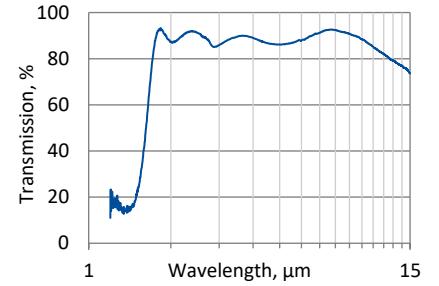
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~195
V_{max} V	8.3
I_{max} A	0.4
Q_{max} W	0.28

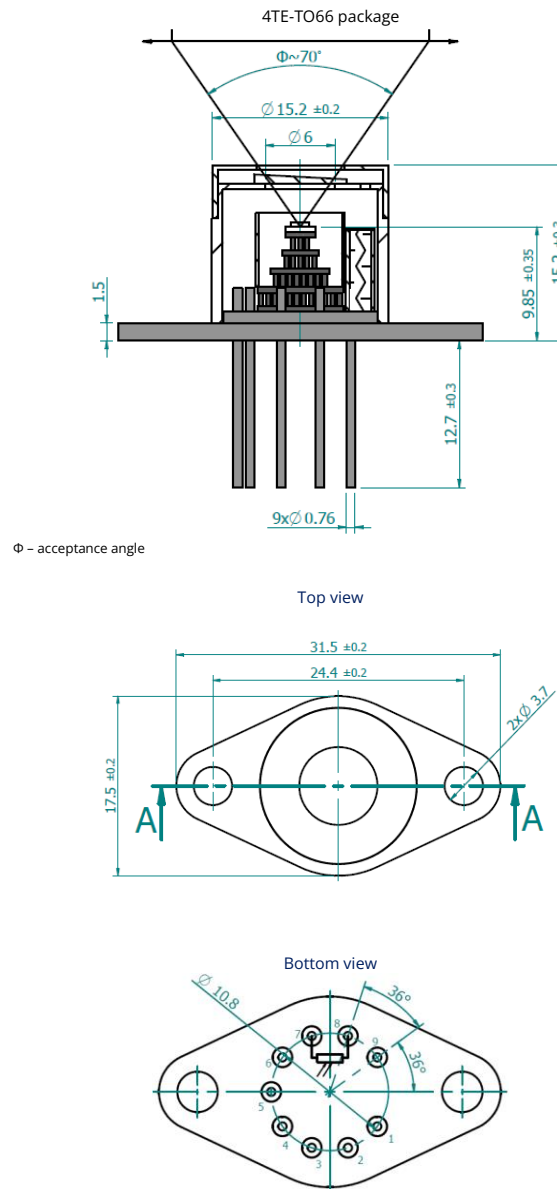
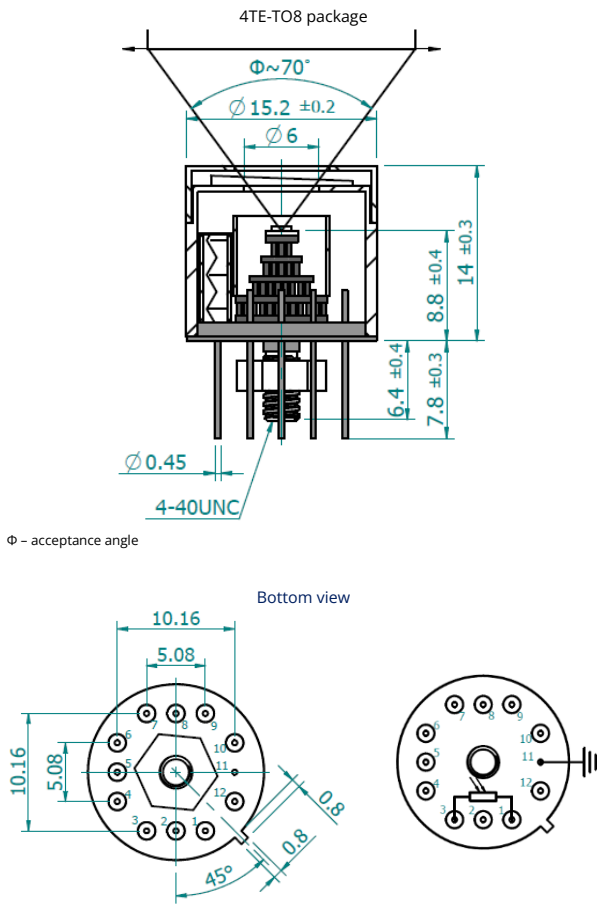
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)



Mechanical layout, mm



4TE-TO8 package

Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

4TE-TO66 package

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



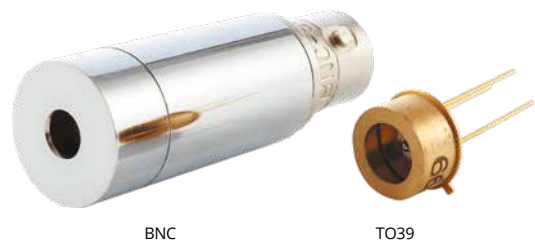
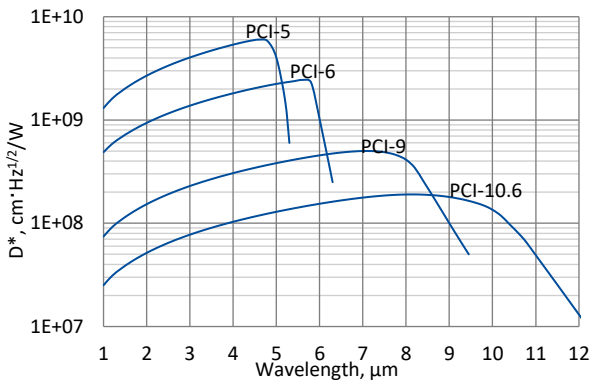
small SIP-TO8

2.5 PCI series

2.5.1 1.0 – 12.0 μm HgCdTe ambient temperature, optically immersed photoconductive detectors

PCI series features uncooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength is limited by GaAs transmittance (~0.9 μm). The devices should operate in optimum bias voltage and current read-out mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength.

Spectral response ($T_a = 20^\circ\text{C}$)

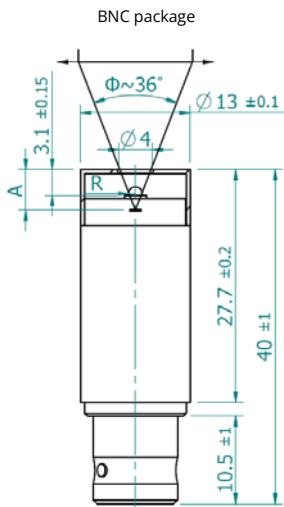


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

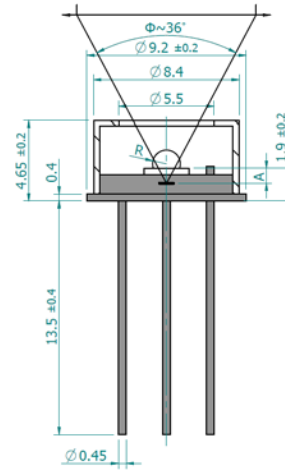
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type			
	PCI-5	PCI-6	PCI-9	PCI-10.6
Active element material	epitaxial HgCdTe heterostructure			
Optimal wavelength λ_{opt} , μm	5.0	6.0	9.0	10.6
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, $\text{cm}^2\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 6.0 \times 10^9$	$\geq 2.5 \times 10^9$	$\geq 5.0 \times 10^8$	$\geq 1.0 \times 10^8$
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, $\text{cm}^2\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 4.0 \times 10^9$	$\geq 1.0 \times 10^9$	$\geq 1.0 \times 10^8$	$\geq 8.0 \times 10^7$
Current responsivity-optical area length product $R_i(\lambda_{opt}) \cdot L_{ov}$, A·mm/W	≥ 0.5	≥ 0.2	≥ 0.02	≥ 0.008
Time constant τ , ns	≤ 5000	≤ 500	≤ 10	≤ 3
1/f noise corner frequency f_c , Hz		$\leq 10\text{k}$		$\leq 20\text{k}$
Bias voltage-optical area length ratio V_b/L_{ov} , V/mm	≤ 0.45	≤ 0.4	≤ 0.36	≤ 0.3
Resistance R, Ω	≤ 1200	≤ 600	≤ 300	≤ 120
Optical area A_{ov} , mm×mm	0.5×0.5, 1×1, 2×2			
Package	TO39, BNC			
Acceptance angle Φ	~36°			
Window	none			

Mechanical layout, mm



T039 package

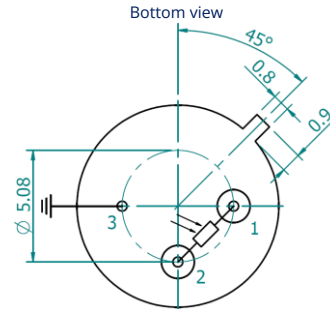
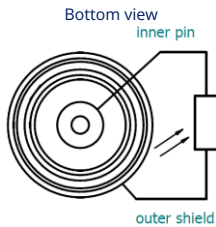
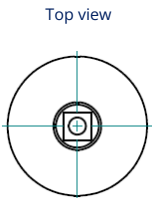


Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	4.6±0.3	5.5±0.3	6.85±0.30

Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	1.5±0.2	2.4±0.2	3.75±0.20

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the top of BNC package to the focal plane

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane



Dedicated preamplifier



small SIP-TO39

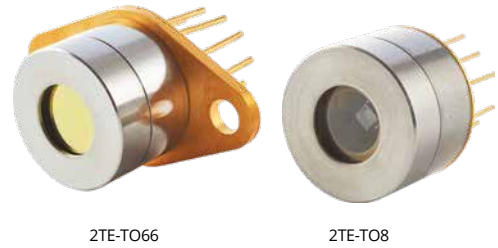
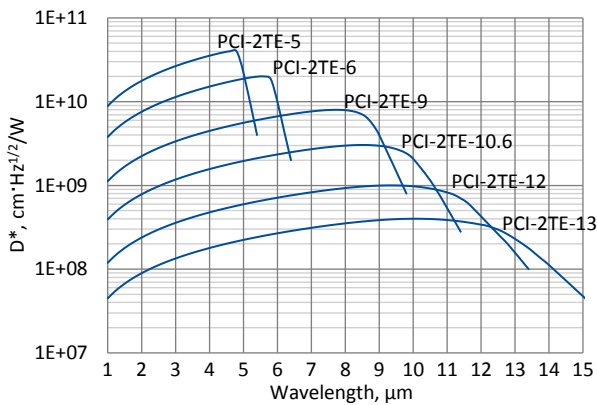
Function	Pin number
Detector	1, 2
Chassis ground	3

2.6 PCI-2TE series

2.6.1 1.0 – 15.0 μm HgCdTe two-stage thermoelectrically cooled, optically immersed photoconductive detectors

PCI-2TE series features two-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength is limited by GaAs transmittance (~0.9 μm). The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response (T_a = 20°C)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

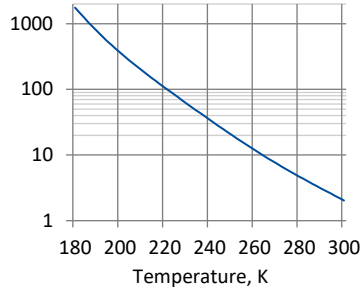
Specification (T_a = 20°C)

Parameter	Detector type					
	PCI-2TE-5	PCI-2TE-6	PCI-2TE-9	PCI-2TE-10.6	PCI-2TE-12	PCI-2TE-13
Active element material	epitaxial HgCdTe heterostructure					
Optimal wavelength λ _{opt} , μm	5.0	6.0	9.0	10.6	12.0	13.0
Detectivity D*(λ _{peak} , 20kHz), cm·Hz ^{1/2} /W	≥4.0×10 ¹⁰	≥2.0×10 ¹⁰	≥8.0×10 ⁹	≥2.8×10 ⁹	≥1.0×10 ⁹	≥4.0×10 ⁸
Detectivity D*(λ _{opt} , 20kHz), cm·Hz ^{1/2} /W	≥2.0×10 ¹⁰	≥1.0×10 ¹⁰	≥4.0×10 ⁹	≥1.0×10 ⁹	≥4.5×10 ⁸	≥2.3×10 ⁸
Current responsivity-optical area length product R _i (λ _{opt})·L _{cr} , A·mm/W	≥3.0	≥1.5	≥0.225	≥0.1	≥0.05	≥0.03
Time constant τ, ns	≤20000	≤4000	≤40	≤10	≤3	≤2
1/f noise corner frequency f _c , Hz	≤10k			≤20k		
Bias voltage-optical area length ratio V _b /L _{cr} , V/mm	≤0.2	≤0.32	≤0.2	≤0.225	≤0.15	≤0.18
Resistance R, Ω	≤1200	≤800	≤400	≤300	≤200	≤150
Active element temperature T _{det} , K	~230					
Optical area A _{cr} , mm×mm	0.5×0.5, 1×1, 2×2					
Package	TO8, TO66					
Acceptance angle Φ	~36°					
Window	wAl ₂ O ₃	wZnSeAR				

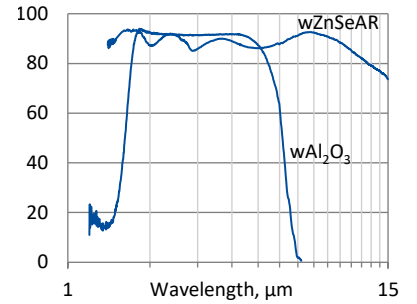
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

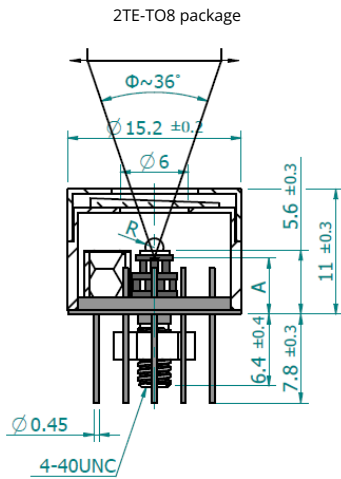
Thermistor characteristics



Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)

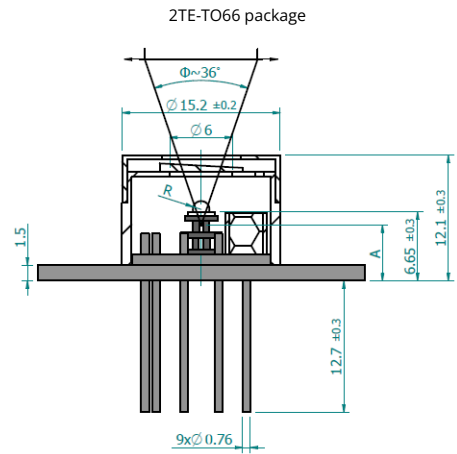


Mechanical layout, mm



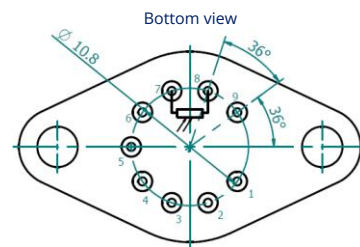
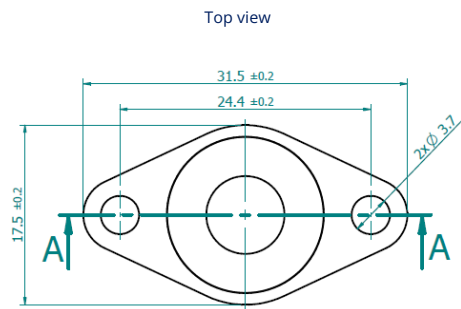
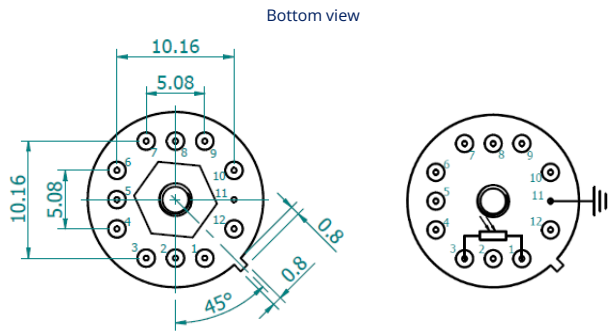
Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_o , mm×mm	5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	1±0.3	3.2±0.3	85±0.30

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 2TE-T08 header to the focal plane



Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_o , mm×mm	0.5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	5.15±0.30	3.2±0.3	1.85±0.30

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 2TE-T066 header to the focal plane



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



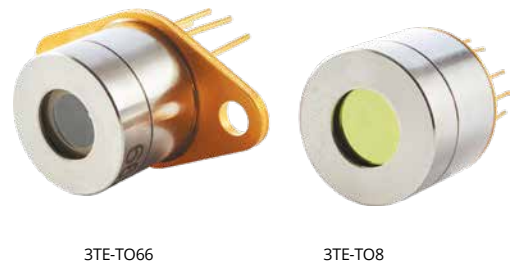
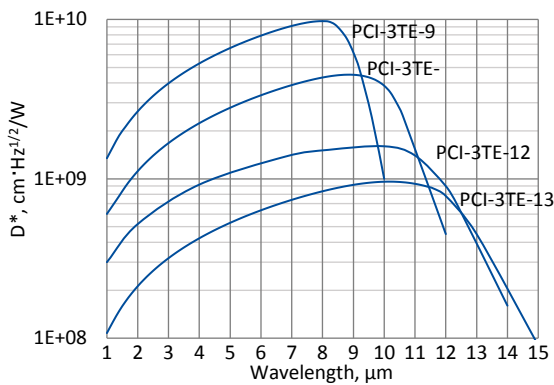
small SIP-T08

2.7 PCI-3TE series

2.7.1 1.0 – 15.0 μm HgCdTe three-stage thermoelectrically cooled, optically immersed photoconductive detectors

PCI-3TE series features three-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength is limited by GaAs transmittance (~0.9 μm). The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

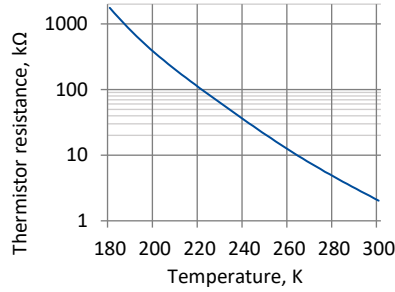
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type			
	PCI-3TE-9	PCI-3TE-10.6	PCI-3TE-12	PCI-3TE-13
Active element material	epitaxial HgCdTe heterostructure			
Optimal wavelength λ_{opt} , μm	9.0	10.6	12.0	13.0
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.0 \times 10^{10}$	$\geq 4.5 \times 10^9$	$\geq 1.6 \times 10^9$	$\geq 9.0 \times 10^8$
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 6.2 \times 10^9$	$\geq 2.5 \times 10^9$	$\geq 9.0 \times 10^8$	$\geq 4.5 \times 10^8$
Current responsivity-optical area length product $R_i(\lambda_{opt}) \cdot L_{ov}$, A·mm/W	≥ 0.7	≥ 0.17	≥ 0.07	≥ 0.03
Time constant τ , ns	≤ 60	≤ 20	≤ 5	≤ 4
1/f noise corner frequency f_c , Hz	$\leq 10\text{k}$		$\leq 20\text{k}$	
Bias voltage-optical area length ratio V_b/L_{ov} , V/mm	≤ 0.2		≤ 0.15	
Resistance R , Ω	≤ 400		≤ 300	
Active element temperature T_{det} , K	~210			
Optical area A_{ov} , mm×mm	0.5×0.5, 1×1, 2×2			
Package	TO8, TO66			
Acceptance angle Φ	~36°			
Window	wZnSeAR			

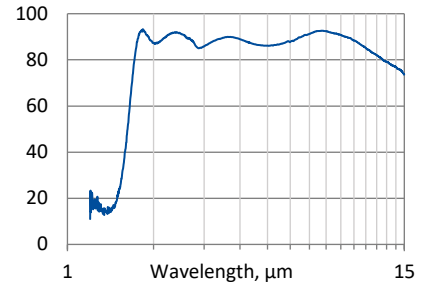
Three-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~210
V_{max} V	3.6
I_{max} A	0.45
Q_{max} W	0.27

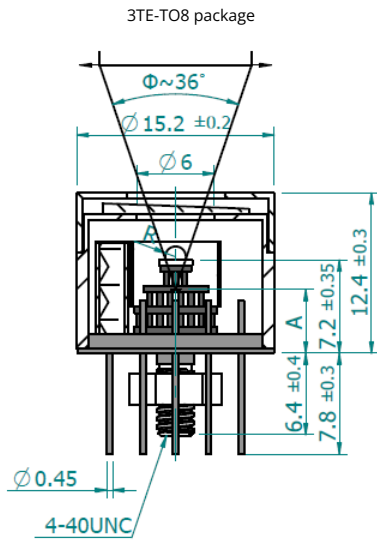
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)

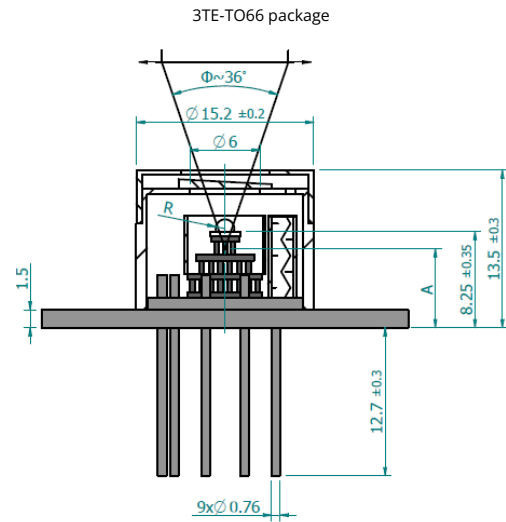


Mechanical layout, mm



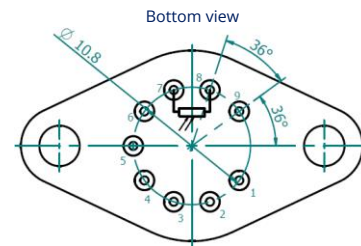
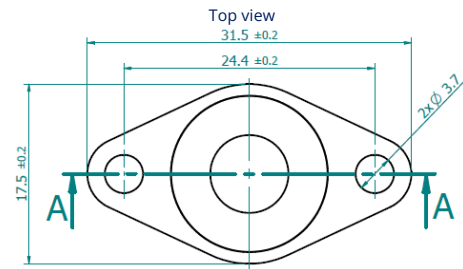
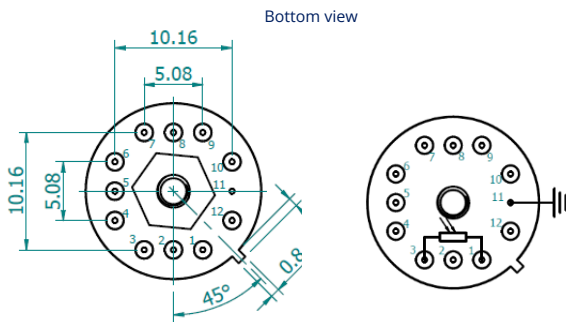
Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R , mm	0.5	0.8	1.25
A , mm	5.7±0.35	4.8±0.35	3.45±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE- TO8 header to the focal plane



Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R , mm	0.5	0.8	1.25
A , mm	6.75±0.35	5.85±0.35	4.50±0.35

Φ - acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE-TO66 header to the focal plane



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



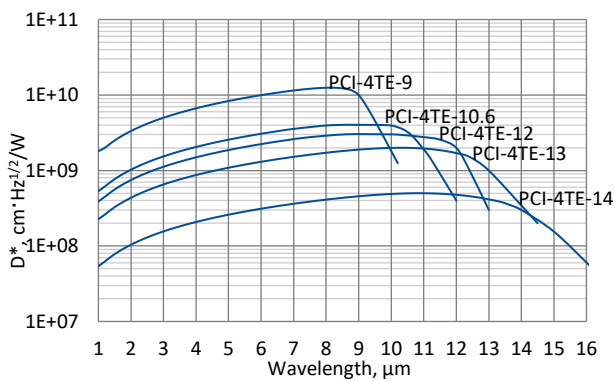
small SIP-T08

2.8 PCI-4TE series

2.8.1 1.0 – 16.0 μm HgCdTe four-stage thermoelectrically cooled, optically immersed photoconductive detectors

PCI-4TE series features four-stage thermoelectrically cooled IR photoconductive detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength is limited by GaAs transmittance (~0.9 μm). The devices should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The 1/f noise corner frequency increases with the cut-off wavelength. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

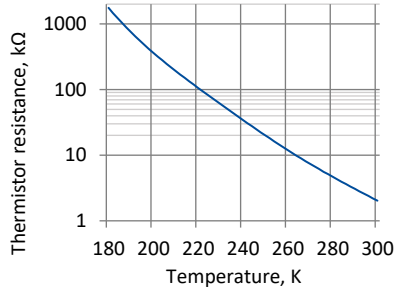
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type				
	PCI-4TE-9	PCI-4TE-10.6	PCI-4TE-12	PCI-4TE-13	PCI-4TE-14
Active element material	epitaxial HgCdTe heterostructure				
Optimal wavelength λ_{opt} , μm	9.0	10.6	12.0	13.0	14.0
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.25 \times 10^{10}$	$\geq 4.0 \times 10^9$	$\geq 3.0 \times 10^9$	$\geq 2.0 \times 10^9$	$\geq 5.0 \times 10^8$
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.0 \times 10^{10}$	$\geq 3.0 \times 10^9$	$\geq 2.0 \times 10^9$	$\geq 1.0 \times 10^9$	$\geq 3.0 \times 10^8$
Current responsivity-optical area length product $R_i(\lambda_{opt})\cdot L_{ov}$, A·mm/W	≥ 0.9	≥ 0.2	≥ 0.09	≥ 0.05	≥ 0.03
Time constant τ , ns	≤ 80	≤ 30	≤ 7	≤ 6	≤ 5
1/f noise corner frequency f_c , Hz	$\leq 10\text{k}$	$\leq 20\text{k}$			
Bias voltage-optical area length ratio V_b/L_{ov} , V/mm	≤ 0.3	≤ 0.24		≤ 0.18	
Resistance R , Ω	≤ 500	≤ 400		≤ 300	
Active element temperature T_{det} , K	-195				
Optical area A_{ov} , mm×mm	0.05×0.05, 0.1×0.1, 0.25×0.25, 0.5×0.5, 1×1, 2×2				
Package	TO8, TO66				
Acceptance angle Φ	~36°				
Window	wZnSeAR				

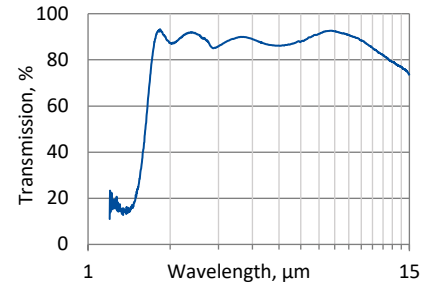
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~195
V_{max} , V	8.3
I_{max} , A	0.4
Q_{max} , W	0.28

Thermistor characteristics

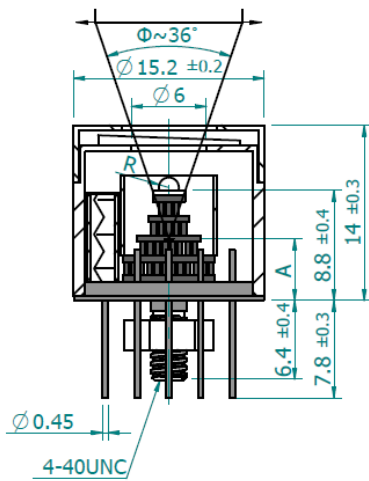


Spectral transmission of wZnSeAR window (typical example)



Mechanical layout, mm

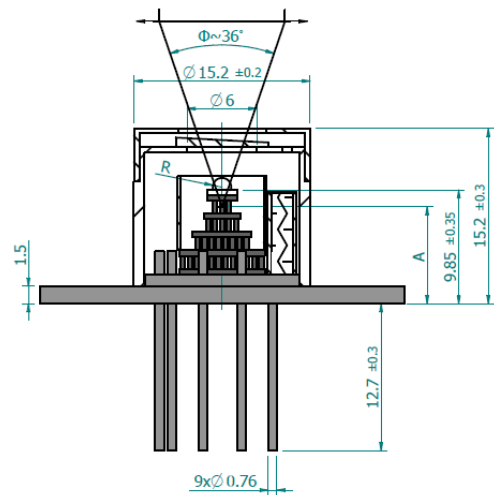
4TE-TO8 package



Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	7.3±0.4	6.4±0.4	5.0±0.4

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of 4TE-TO8 header to the focal plane

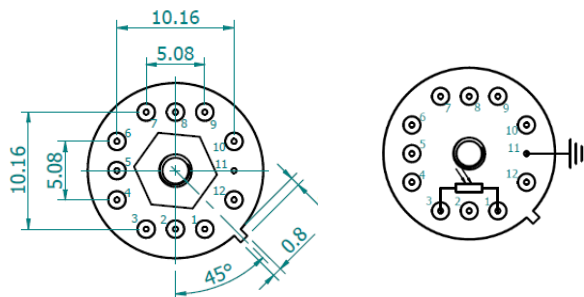
4TE-TO66 package



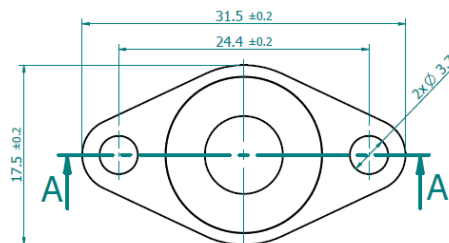
Parameter	Value		
Immersion microlens shape	hyperhemisphere		
Optical area A_{opt} , mm×mm	0.5×0.5	1×1	2×2
R, mm	0.5	0.8	1.25
A, mm	8.35±0.40	7.45±0.40	6.1±0.4

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of 4TE-TO66 header to the focal plane

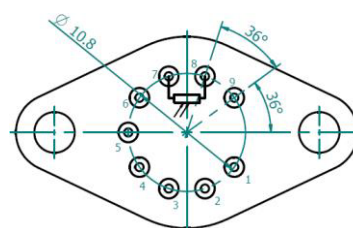
Bottom view



Top view



Bottom view



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



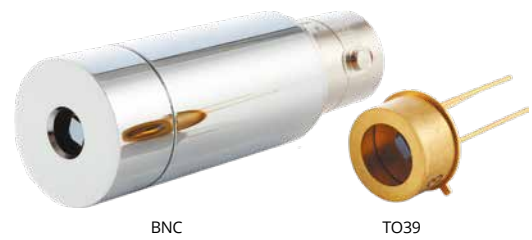
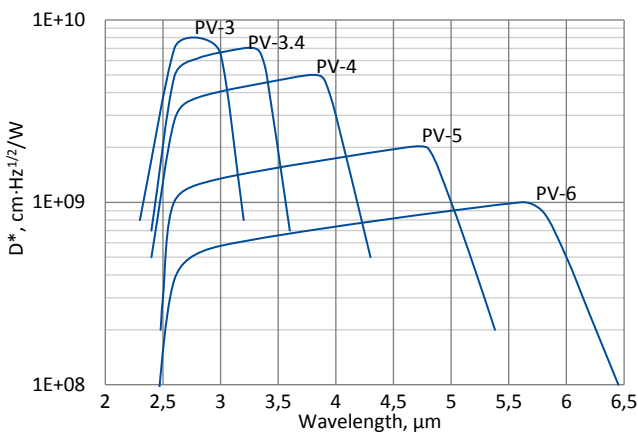
small SIP-TO8

2.9 PV series

2.9.1 2.5 – 6.5 μm HgCdTe ambient temperature photovoltaic detectors

PV series features uncooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

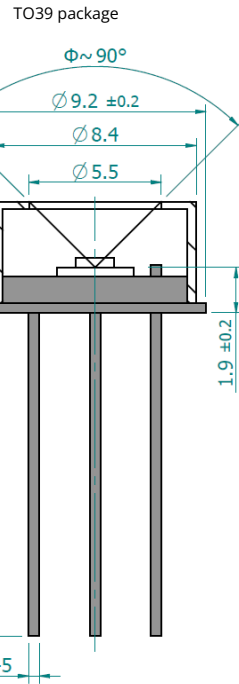
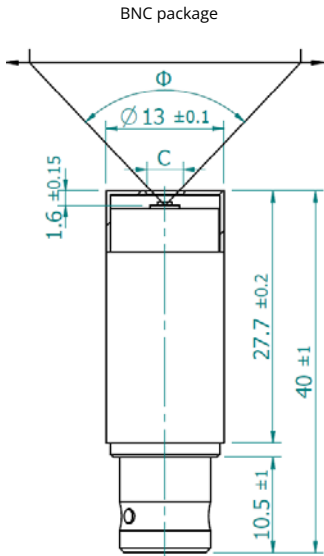


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type									
	PV-3		PV-3.4		PV-4		PV-5		PV-6	
Active element material	epitaxial HgCdTe heterostructure									
Optimum wavelength λ_{opt} , μm	3.0		3.4		4.0		5.0		6.0	
Detectivity $D^*(\lambda_{peak})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 8.0 \times 10^9$		$\geq 7.0 \times 10^9$		$\geq 5.0 \times 10^9$		$\geq 2.0 \times 10^9$		$\geq 1.0 \times 10^9$	
Detectivity $D^*(\lambda_{opt})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 6.5 \times 10^9$		$\geq 5.0 \times 10^9$		$\geq 3.0 \times 10^9$		$\geq 1.0 \times 10^9$		$\geq 5.0 \times 10^8$	
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5		≥ 0.8		≥ 1.0		≥ 1.0		≥ 1.0	
Time constant τ , ns	≤ 350		≤ 260		≤ 150		≤ 120		≤ 80	
Resistance R , Ω	≥ 10000		≥ 5000		≥ 1000		≥ 100		≥ 20	
Active area A , $\text{mm}\times\text{mm}$	0.1×0.1									
Package	TO39	BNC	TO39	BNC	TO39	BNC	TO39	BNC	TO39	BNC
Acceptance angle Φ	$\sim 90^\circ$	$\sim 102^\circ$	$\sim 90^\circ$	$\sim 102^\circ$	$\sim 90^\circ$	$\sim 102^\circ$	$\sim 90^\circ$	$\sim 102^\circ$	$\sim 90^\circ$	$\sim 102^\circ$
Window	none									

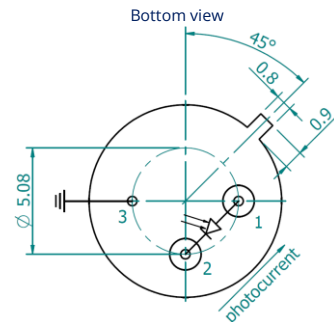
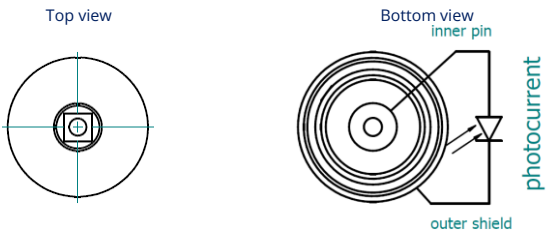
Mechanical layout, mm



Φ - acceptance angle

Parameter	Value
Active area, mm×mm	0.1×0.1
C, mm	Ø4
Acceptance angle Φ	Φ ~102°

C - aperture



Function	Pin number
Detector	1, 2
Reverse bias (optional)	1(-), 2(+)
Chassis ground	3

Dedicated preamplifier



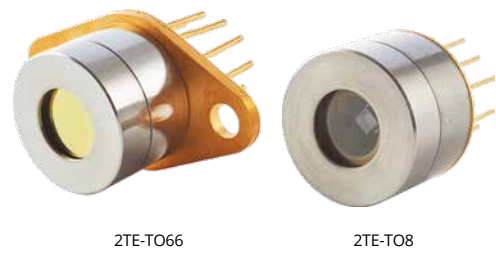
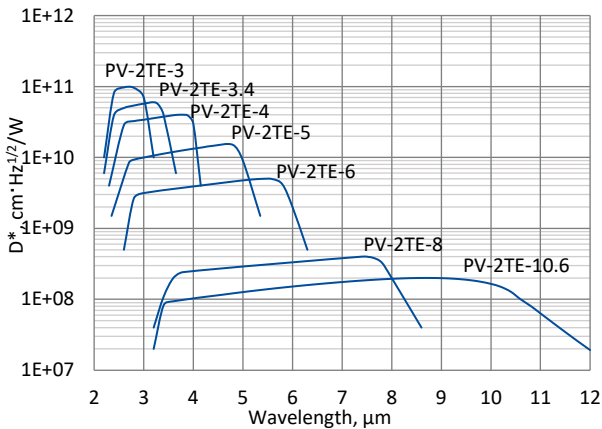
small SIP-TO39

2.10 PV-2TE series

2.10.1 2.0 – 12.0 μm HgCdTe two-stage thermoelectrically cooled photovoltaic detectors

PV-2TE series features two-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

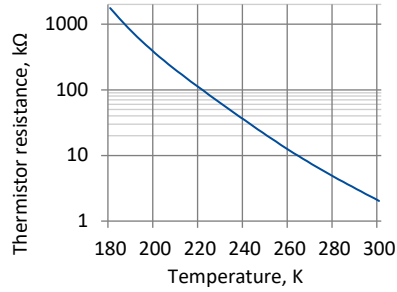
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{V}$)

Parameter	Detector type						
	PV-2TE-3	PV-2TE-3.4	PV-2TE-4	PV-2TE-5	PV-2TE-6	PV-2TE-8	PV-2TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimum wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	$\geq 1.0 \times 10^{11}$	$\geq 6.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 1.5 \times 10^{10}$	$\geq 5.0 \times 10^9$	$\geq 4.0 \times 10^8$	$\geq 2.0 \times 10^8$
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	$\geq 7.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 3.0 \times 10^{10}$	$\geq 9.0 \times 10^9$	$\geq 2.0 \times 10^9$	$\geq 2.0 \times 10^8$	$\geq 1.0 \times 10^8$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5	≥ 0.8	≥ 0.4
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 10
Resistance-active area product $R \cdot A$, Ω·cm ²	≥ 150	≥ 3	≥ 2	≥ 0.1	≥ 0.02	≥ 0.0002	≥ 0.0001
Active element temperature T_{det} , K	-230						
Active area A , mm×mm			0.1×0.1			0.05×0.05, 0.1×0.1	0.05×0.05
Package	TO8, TO66						
Acceptance angle Φ	~70°						
Window	wAl ₂ O ₃				wZnSeAR		

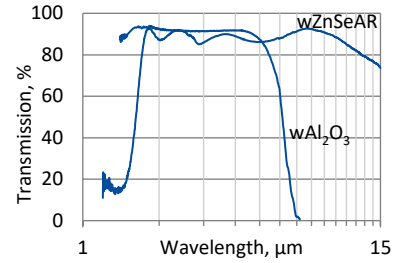
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} Kt	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

Thermistor characteristics

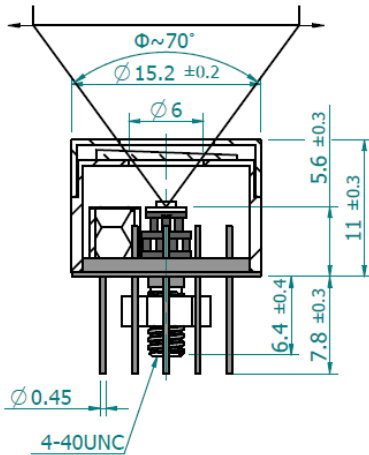


Spectral transmission of wAl_2O_3 and $wZnSeAR$ windows (typical example)



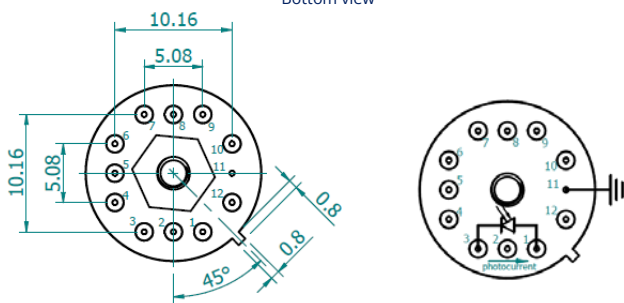
Mechanical layout, mm

2TE-T08 package

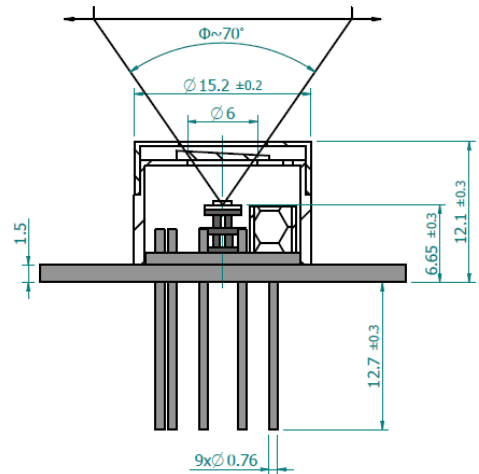


Φ - acceptance angle

Bottom view

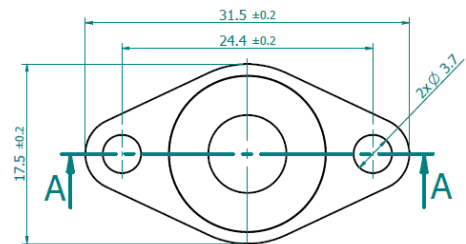


2TE-T066 package

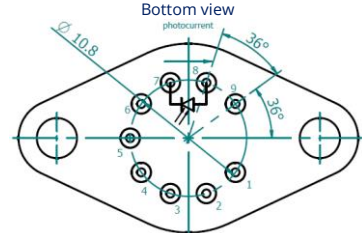


Φ - acceptance angle

Top view



Bottom view



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-TO8



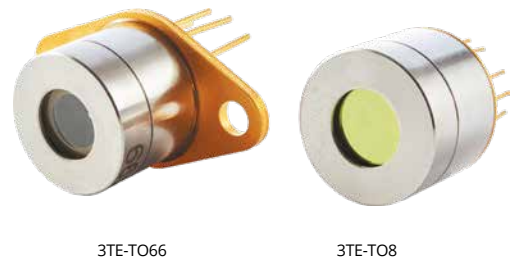
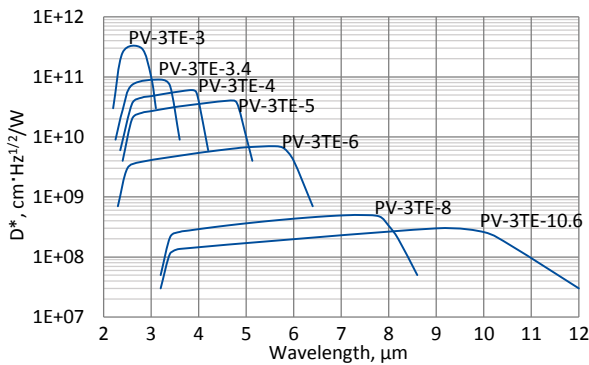
fast FIP

2.11 PV-3TE series

2.11.1 2.0 – 12.0 μm HgCdTe three-stage thermoelectrically cooled photovoltaic detectors

PV-3TE series features three-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

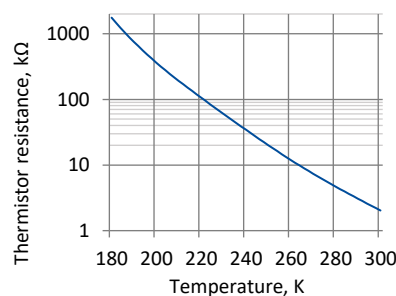
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{V}$)

Parameter	Detector type						
	PV-3TE-3	PV-3TE-3.4	PV-3TE-4	PV-3TE-5	PV-3TE-6	PV-3TE-8	PV-3TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimal wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 3.0 \times 10^{11}$	$\geq 9.0 \times 10^{10}$	$\geq 6.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 7.0 \times 10^9$	$\geq 5.0 \times 10^8$	$\geq 3.0 \times 10^8$
Detectivity $D^*(\lambda_{opt})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.0 \times 10^{11}$	$\geq 7.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 1.0 \times 10^{10}$	$\geq 4.0 \times 10^9$	$\geq 3.0 \times 10^8$	$\geq 1.5 \times 10^8$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5	≥ 1.0	≥ 0.7
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 10
Resistance-active area product $R \cdot A$, $\Omega \cdot \text{cm}^2$	≥ 240	≥ 15	≥ 6	≥ 0.3	≥ 0.025	≥ 0.0004	≥ 0.0002
Active element temperature T_{det} , K	-210						
Active area A , mm \times mm	0.1 \times 0.1					0.05 \times 0.05, 0.1 \times 0.1	
Package	TO8, TO66						
Acceptance angle Φ	$\sim 70^\circ$						
Window	wAl ₂ O ₃				wZnSeAR		

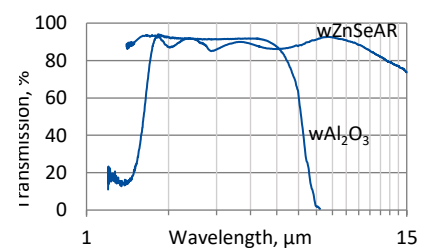
Three-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	-210
V_{max} , V	3.6
I_{max} , A	0.45
Q_{max} , W	0.27

Thermistor characteristics

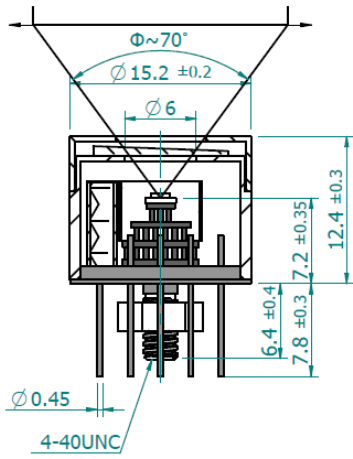


Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



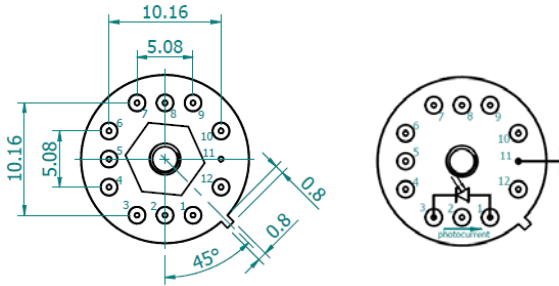
Mechanical layout, mm

3TE-TO8 package

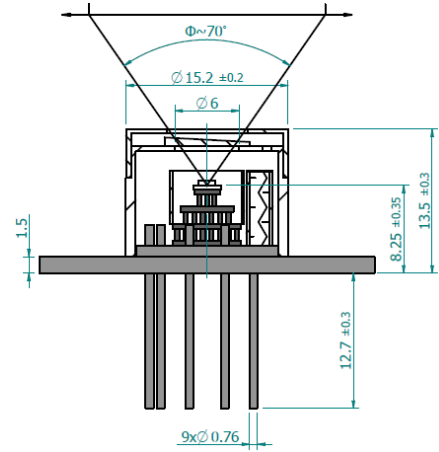


Φ - acceptance angle

Bottom view

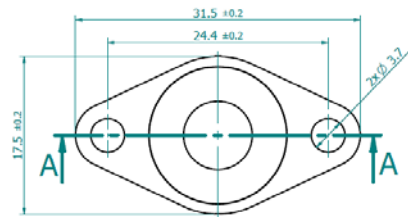


3TE-TO66 package

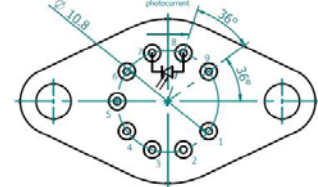


Φ - acceptance angle

Top view



Bottom view



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-TO8



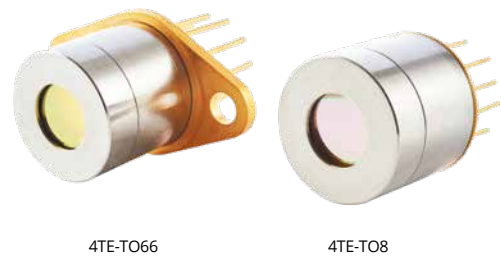
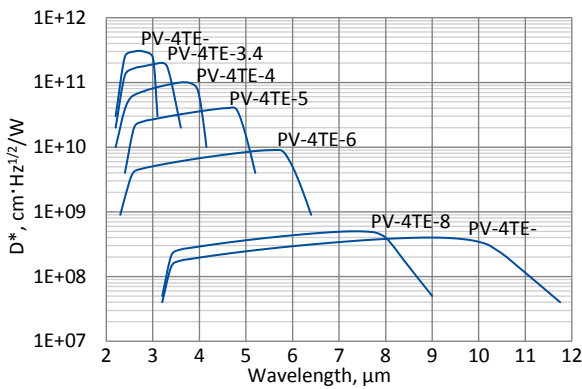
fast FIP

2.12 PV-4TE series

2.12.1 2.0 – 12.0 μm HgCdTe four-stage thermoelectrically cooled photovoltaic detectors

PV-4TE series features four-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The devices are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase response speed and dynamic range. It also results in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

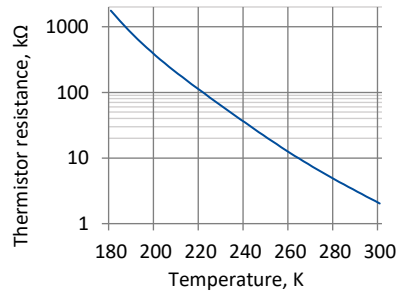
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ V}$)

Parameter	Detector type						
	PV-4TE-3	PV-4TE-3.4	PV-4TE-4	PV-4TE-5	PV-4TE-6	PV-4TE-8	PV-4TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimum wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm ² ·Hz ^{1/2} /W	$\geq 3.0 \times 10^{11}$	$\geq 2.0 \times 10^{11}$	$\geq 1.0 \times 10^{11}$	$\geq 4.0 \times 10^{10}$	$\geq 9.0 \times 10^9$	$\geq 5.0 \times 10^8$	$\geq 4.0 \times 10^8$
Detectivity $D^*(\lambda_{opt})$, cm ² ·Hz ^{1/2} /W	$\geq 1.5 \times 10^{11}$	$\geq 1.0 \times 10^{11}$	$\geq 6.0 \times 10^{10}$	$\geq 1.5 \times 10^{10}$	$\geq 5.0 \times 10^9$	$\geq 4.0 \times 10^8$	$\geq 2.0 \times 10^8$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5	≥ 1.5	≥ 0.5
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 25
Resistance-active area product R-A, Ω·cm ²	≥ 300	≥ 20	≥ 8	≥ 0.4	≥ 0.03	≥ 0.0006	≥ 0.0005
Active element temperature T_{det} , K	-195						
Active area A, mm×mm	0.1×0.1					0.05×0.05, 0.1×0.1	
Package	TO8, TO66						
Acceptance angle Φ	~70°						
Window	wAl ₂ O ₃				wZnSeAR		

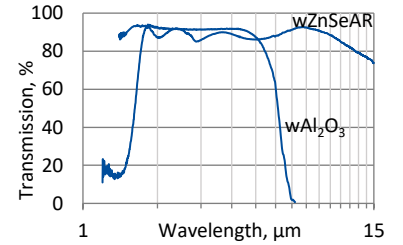
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} Kt	~195
V_{max} V	8.3
I_{max} A	0.4
Q_{max} W	0.28

Thermistor characteristics

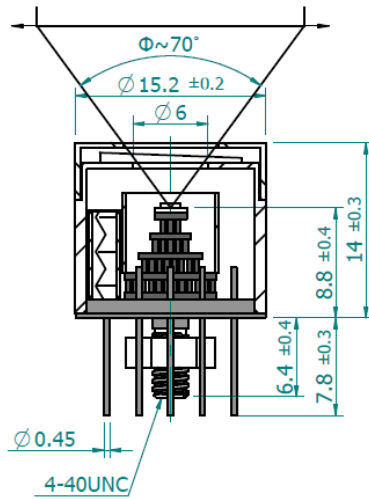


Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



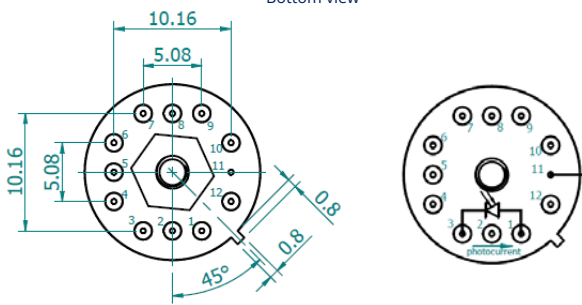
Mechanical layout, mm

4TE-TO8 package

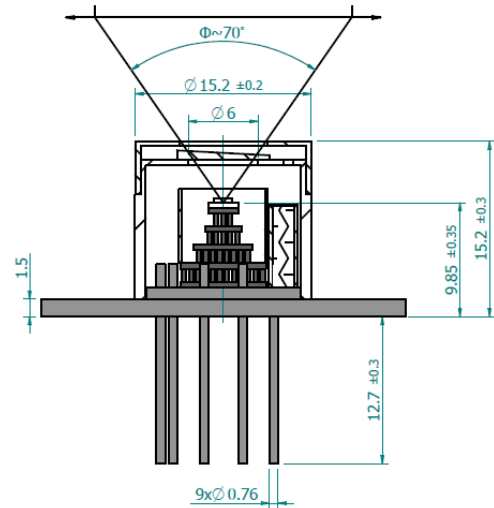


Φ - acceptance angle

Bottom view

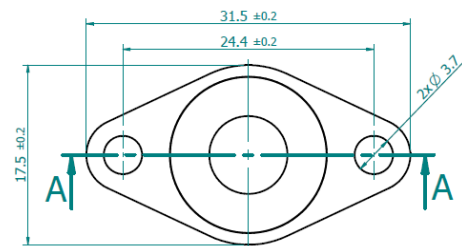


4TE-TO66 package

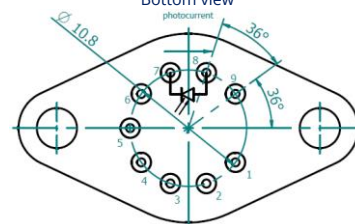


Φ - acceptance angle

Top view



Bottom view



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-TO8



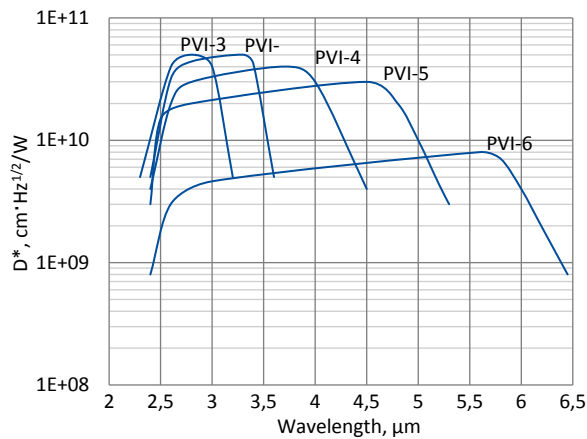
fast FIP

2.13 PVI series

2.13.1 2.5 – 6.5 μm HgCdTe ambient temperature, optically immersed photovoltaic detectors

PVI series features uncooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase speed of response and dynamic range. It results also in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

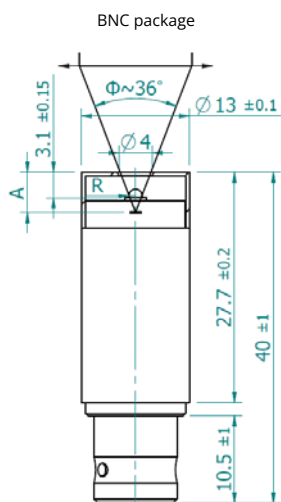


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type				
	PVI-3	PVI-3.4	PVI-4	PVI-5	PVI-6
Active element material	epitaxial HgCdTe heterostructure				
Optimal wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0
Detectivity $D^*(\lambda_{peak})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 5.0 \times 10^{10}$	$\geq 5.0 \times 10^{10}$	$\geq 3.0 \times 10^{10}$	$\geq 1.5 \times 10^{10}$	$\geq 8.0 \times 10^9$
Detectivity $D^*(\lambda_{opt})$, $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 5.0 \times 10^{10}$	$\geq 4.5 \times 10^{10}$	$\geq 2.0 \times 10^{10}$	$\geq 9.0 \times 10^9$	$\geq 4.0 \times 10^9$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0		
Time constant τ , ns	≤ 350	≤ 260	≤ 150	≤ 120	≤ 80
Resistance-optical area product $R \cdot A_{ov}$, $\Omega \cdot \text{cm}^2$	≥ 100	≥ 50	≥ 6	≥ 1	≥ 0.2
Optical area A_{ov} , mm \times mm	0.5 \times 0.5, 1 \times 1				
Package	TO39, BNC				
Acceptance angle Φ	$\sim 36^\circ$				
Window	none				

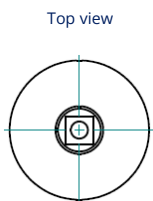
Mechanical layout, mm



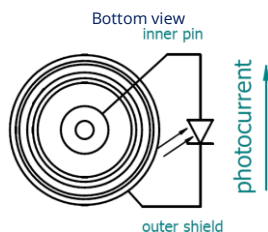
BNC package

Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	4.6±0.3	5.5±0.3

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the top of BNC package to the focal plane



Top view

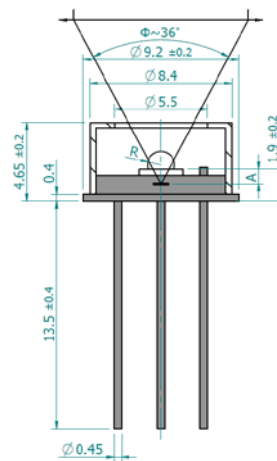


Bottom view

Dedicated preamplifier



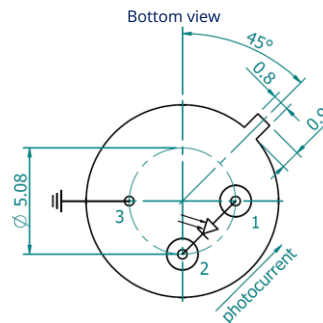
small SIP-T039



TO39 package

Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	1.5±0.2	2.4±0.2

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane



Bottom view

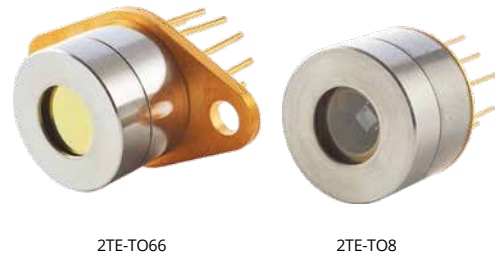
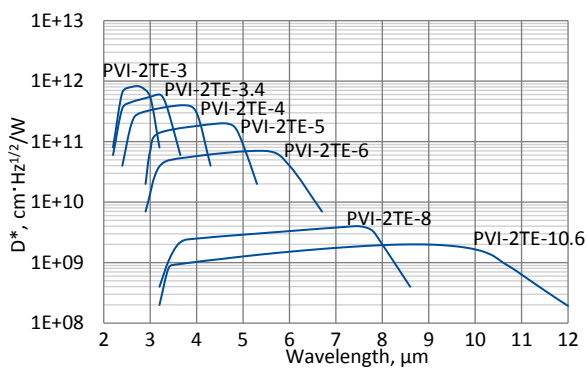
Function	Pin number
Detector	1, 2
Reverse bias (optional)	1(-), 2(+)
Chassis ground	3

2.14 PVI-2TE series

2.14.1 2 – 12 μm HgCdTe two-stage thermoelectrically cooled, optically immersed photovoltaic detectors

PVI-2TE series features two-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase speed of response and dynamic range. It results also in improved performance at high frequencies, but $1/f$ noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl_2O_3) or zinc selenide anti- reflection coated ($wZnSeAR$) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ C, V_b = 0 mV$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

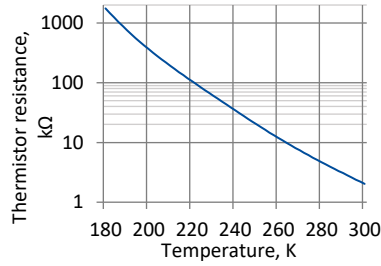
Specification ($T_a = 20^\circ C, V_b = 0 V$)

Parameter	Detector type						
	PVI-2TE-3	PVI-2TE-3.4	PVI-2TE-4	PVI-2TE-5	PVI-2TE-6	PVI-2TE-8	PVI-2TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimal wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, $cm \cdot Hz^{1/2}/W$	$\geq 8.0 \times 10^{11}$	$\geq 6.0 \times 10^{11}$	$\geq 4.0 \times 10^{11}$	$\geq 2.0 \times 10^{11}$	$\geq 7.0 \times 10^{10}$	$\geq 4.0 \times 10^9$	$\geq 2.0 \times 10^9$
Detectivity $D^*(\lambda_{opt})$, $cm \cdot Hz^{1/2}/W$	$\geq 5.5 \times 10^{11}$	$\geq 3.0 \times 10^{11}$	$\geq 3.0 \times 10^{11}$	$\geq 9.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 2.0 \times 10^9$	$\geq 1.0 \times 10^9$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.3	≥ 1.3	≥ 1.5	≥ 0.8	≥ 0.4
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 10
Resistance-optical area product $R \cdot A_{ov}$, $\Omega \cdot cm^2$	≥ 15000	≥ 300	≥ 200	≥ 10	≥ 2	≥ 0.02	≥ 0.01
Active element temperature T_{det} , K	~230						
Optical area A_{ov} , mm×mm	0.5×0.5, 1×1						0.5×0.5
Package	T08, T066						
Acceptance angle Φ	~36°						
Window	wAl_2O_3				$wZnSeAR$		

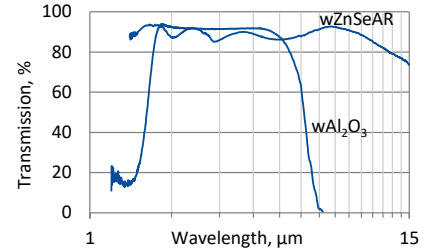
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~230
V_{max} , V	1.3
I_{max} , A	1.2
Q_{max} , W	0.36

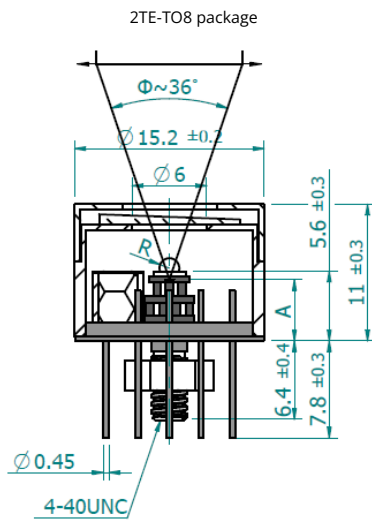
Thermistor characteristics



Spectral transmission of wAl_2O_3 and $wZnSeAR$ windows (typical example)

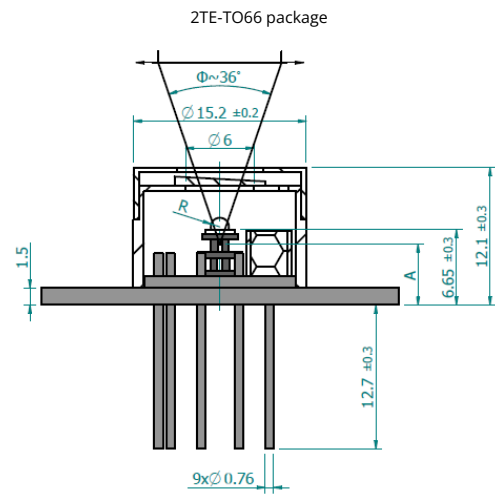


Mechanical layout, mm



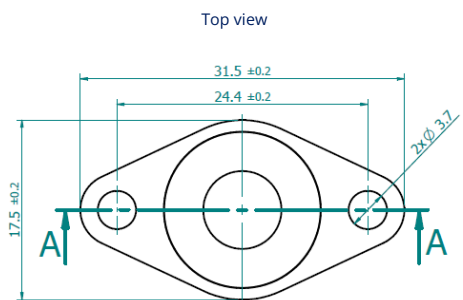
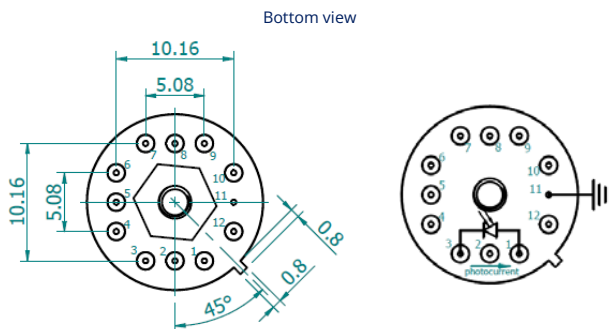
Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	4.1±0.3	3.2±0.3

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 2TE-T08 header to the focal plane



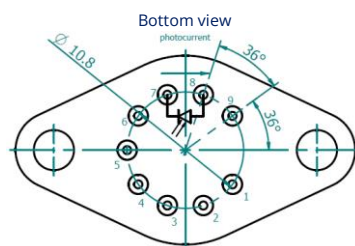
Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	5.15±0.3	0.2±0.3

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 2TE-T066 header to the focal plane



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4



Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-TO8



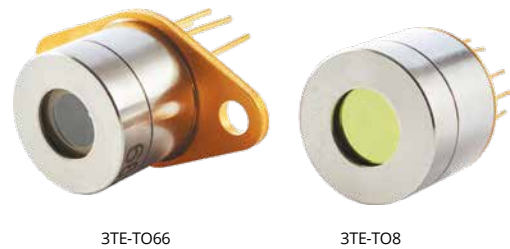
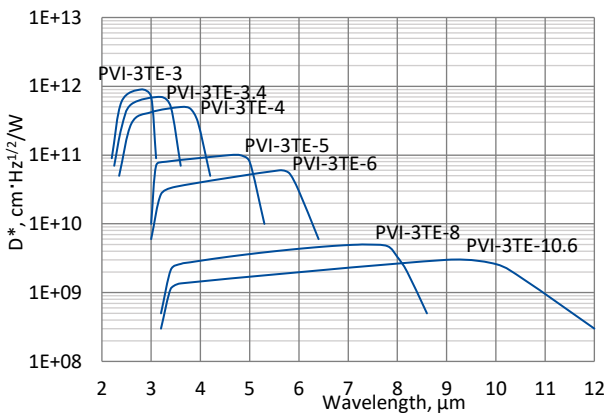
fast FIP

2.15 PVI-3TE series

2.15.1 2 – 12 μm HgCdTe three-stage thermoelectrically cooled, optically immersed photovoltaic detectors

PVI-3TE series features three-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase speed of response and dynamic range. It results also in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl_2O_3) or zinc selenide anti-reflection coated ($wZnSeAR$) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ C, V_b = 0 mV$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

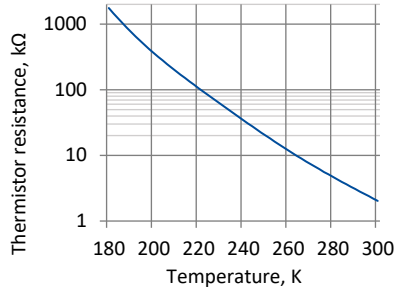
Specification ($T_a = 20^\circ C, V_b = 0 mV$)

Parameter	Detector type						
	PVI-3TE-3	PVI-3TE-3.4	PVI-3TE-4	PVI-3TE-5	PVI-3TE-6	PVI-3TE-8	PVI-3TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimum wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, $cm \cdot Hz^{1/2} / W$	$\geq 9.0 \times 10^{11}$	$\geq 7.0 \times 10^{11}$	$\geq 5.0 \times 10^{11}$	$\geq 1.0 \times 10^{11}$	$\geq 6.0 \times 10^{10}$	$\geq 5.0 \times 10^9$	$\geq 3.0 \times 10^9$
Detectivity $D^*(\lambda_{opt})$, $cm \cdot Hz^{1/2} / W$	$\geq 7.0 \times 10^{11}$	$\geq 5.0 \times 10^{11}$	$\geq 3.0 \times 10^{11}$	$\geq 8.0 \times 10^{10}$	$\geq 3.0 \times 10^{10}$	$\geq 3.0 \times 10^9$	$\geq 1.5 \times 10^9$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5	≥ 1.0	≥ 0.7
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 10
Resistance-optical area product $R \cdot A_{ov}$, $\Omega \cdot cm^2$	≥ 24000	≥ 1500	≥ 600	≥ 30	≥ 2.5	≥ 0.04	≥ 0.02
Active element temperature T_{det} , K	-210						
Optical area A_{ov} , mm×mm	0.5×0.5, 1×1						0.5×0.5
Package	T08, T066						
Acceptance angle Φ	~36°						
Window	wAl_2O_3				$wZnSeAR$		

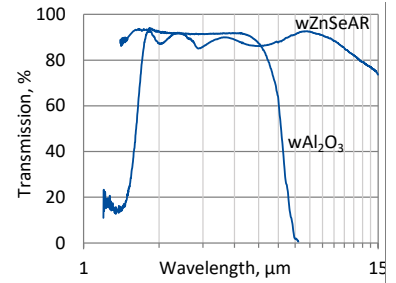
Three-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~210
V_{max} , V	3.6
I_{max} , A	0.45
Q_{max} , W	0.27

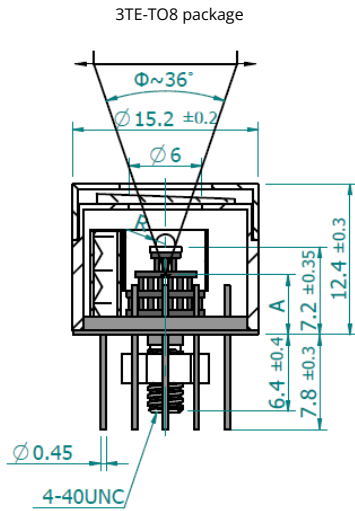
Thermistor characteristics



Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)

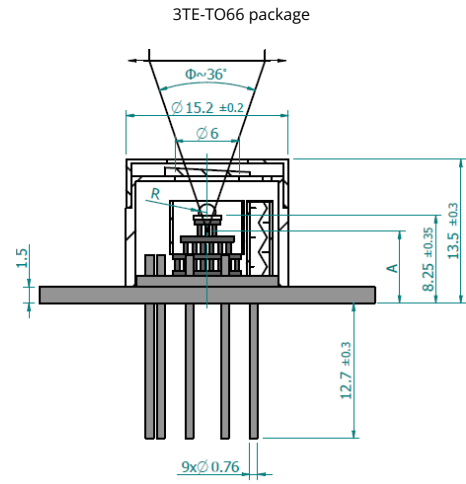


Mechanical layout, mm



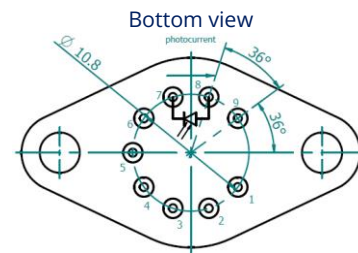
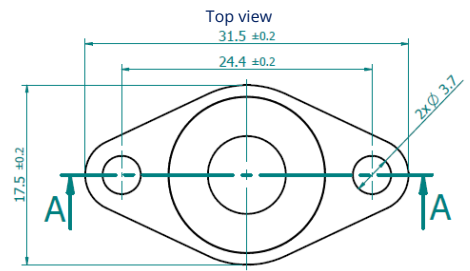
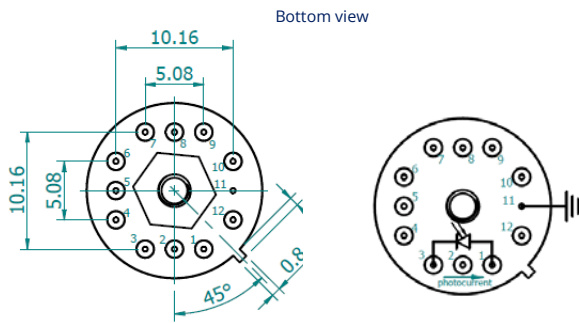
Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	5.7±0.35	4.8±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE-T08 header to the focal plane



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ov} , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	6.75±0.35	5.85±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE-T066 header to the focal plane



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-TO8



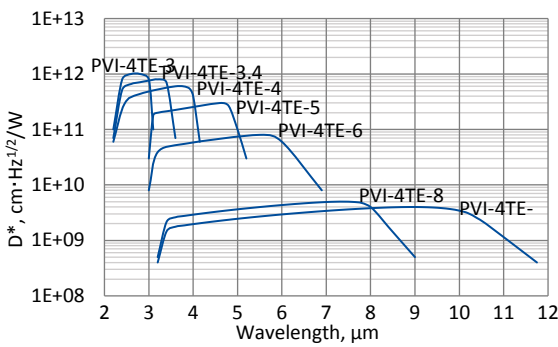
fast FIP

2.16 PVI-4TE series

2.16.1 2 – 12 μm HgCdTe four-stage thermoelectrically cooled, optically immersed photovoltaic detectors

PVI-4TE series features four-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase speed of response and dynamic range. It results also in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

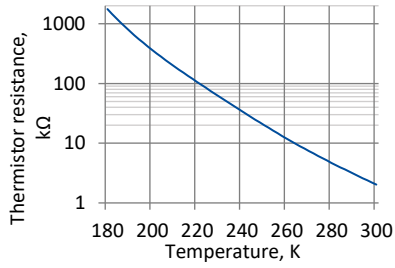
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{V}$)

Parameter	Detector type						
	PVI-4TE-3	PVI-4TE-3.4	PVI-4TE-4	PVI-4TE-5	PVI-4TE-6	PVI-4TE-8	PVI-4TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimum wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	$\geq 1.0 \times 10^{12}$	$\geq 8.0 \times 10^{11}$	$\geq 6.0 \times 10^{11}$	$\geq 3.0 \times 10^{11}$	$\geq 8.0 \times 10^{10}$	$\geq 5.0 \times 10^9$	$\geq 4.0 \times 10^9$
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	$\geq 8.0 \times 10^{11}$	$\geq 7.0 \times 10^{11}$	$\geq 4.0 \times 10^{11}$	$\geq 1.0 \times 10^{11}$	$\geq 6.0 \times 10^{10}$	$\geq 4.0 \times 10^9$	$\geq 2.0 \times 10^9$
Current responsivity $R_i(\lambda_{opt})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5		≥ 0.5
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 25
Resistance-optical area product $R \cdot A_{ov}$, Ω·cm ²	≥ 30000	≥ 2000	≥ 800	≥ 40	≥ 3	≥ 0.06	≥ 0.05
Active element temperature T_{det} , K	-195						
Optical area A_{ov} , mm×mm	0.5×0.5, 1×1						
Package	TO8, TO66						
Acceptance angle Φ	~36°						
Window	wAl ₂ O ₃				wZnSeAR		

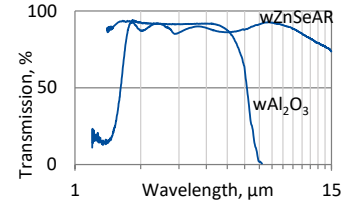
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~195
V_{max} , V	8.3
I_{max} , A	0.4
Q_{max} , W	0.28

Thermistor characteristics

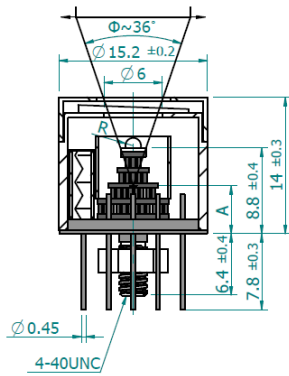


Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



Mechanical layout, mm

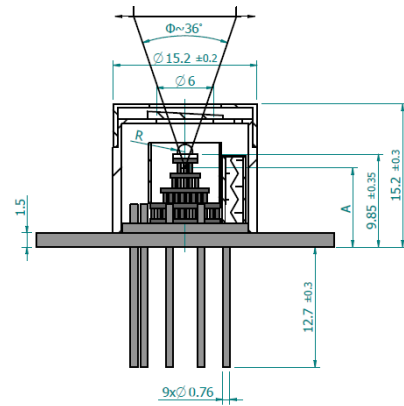
4TE-TO8 package



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_o , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	7.3±0.4	6.4±0.4

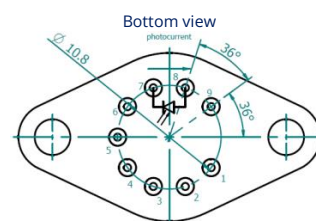
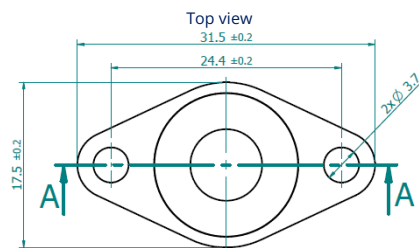
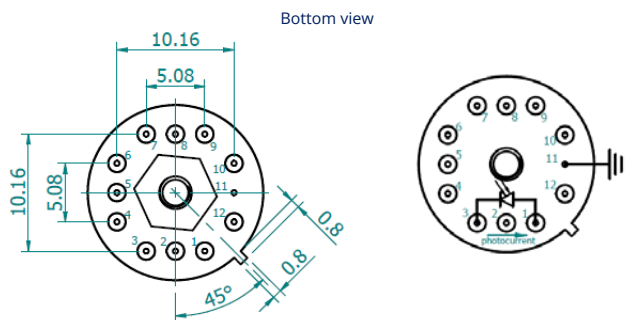
Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 4TE-TO8 header to the focal plane

4TE-TO66 package



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_o , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	8.35±0.40	7.45±0.40

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 4TE-TO66 header to the focal plane



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



small SIP-T08



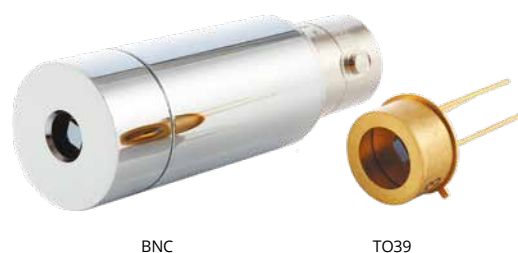
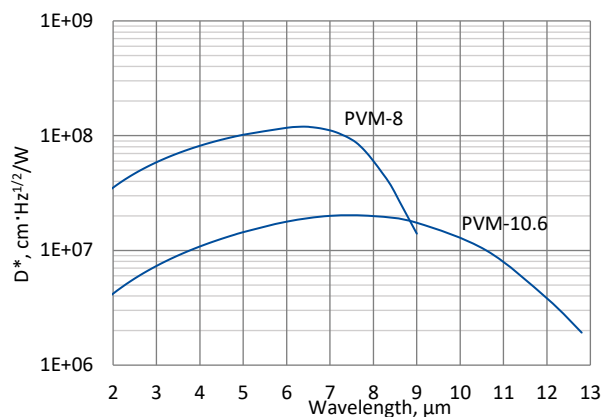
fast FIP

2.17 PVM series

2.17.1 2.0 – 13.0 μm HgCdTe ambient temperature photovoltaic multiple junction detectors

PVM series features uncooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large active area detectors operating within 2 to 13 μm spectral range.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

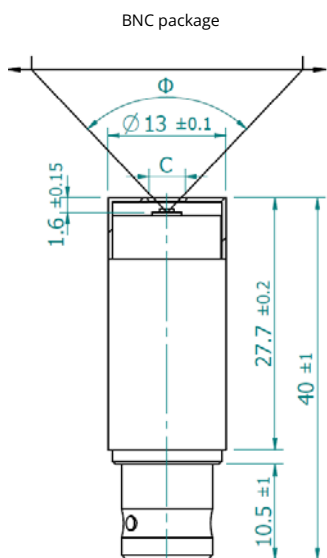
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type			
	PVM-8		PVM-10.6	
Active element material	epitaxial HgCdTe heterostructure			
Optimum wavelength λ_{opt} , μm	8.0		10.6	
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥1.2×10 ⁸		≥2.0×10 ⁷	
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥6.0×10 ⁷		≥1.0×10 ⁷	
Current responsivity-active area length product $R_i(\lambda_{opt})L$, A·mm/W	≥0.008		≥0.002	
Time constant τ , ns	≤4		≤1.5	
Resistance R , Ω	50 to 300		20 to 150	
Active area A , mm×mm	1×1, 2×2, 3×3, 4×4			
Package	TO39	BNC	TO39	BNC
Acceptance angle Φ	~90°	~102° ^{*)} , ~124° ^{**)}	~90°	~102° ^{*)} , ~124° ^{**)}
Window	none			

^{*)} Aperture C = Ø4 mm.

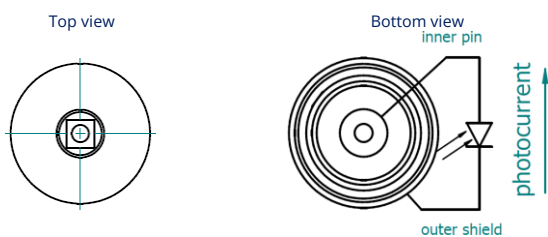
^{**)} Aperture C = Ø6 mm

Mechanical layout, mm



Parameter	Value	
Active area, mm×mm	1×1, 2×2	3×3, 4×4
C, mm	Ø4	Ø6
Acceptance angle Φ	~102°	~124°

C - aperture

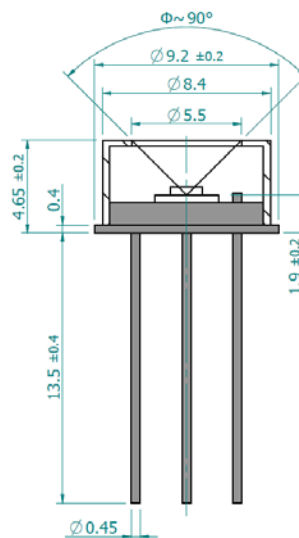


Dedicated preamplifier



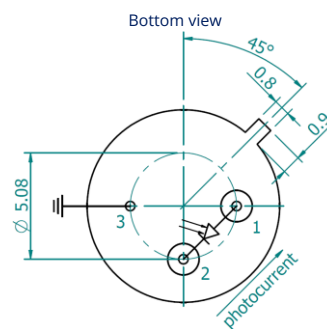
small SIP-T039

T039 package



Φ - acceptance angle

Function	Pin number
Detector	1, 2
Chassis ground	3

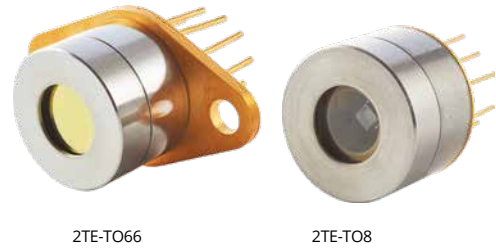
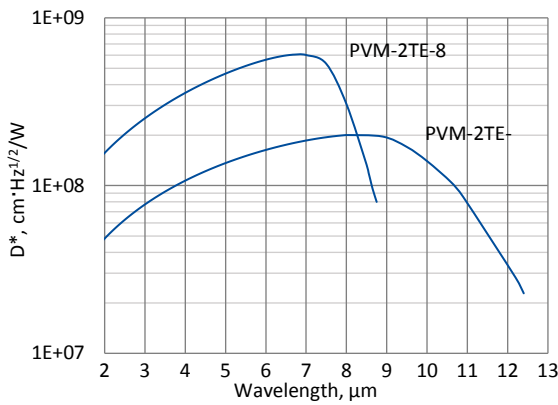


2.18 PVM-2TE series

2.18.1 2.0 – 12.0 μm HgCdTe two-stage thermoelectrically cooled photovoltaic multiple junction detectors

PVM-2TE series features two-stage thermoelectrically cooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large active area detectors operating within 2 to 12 μm spectral range. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

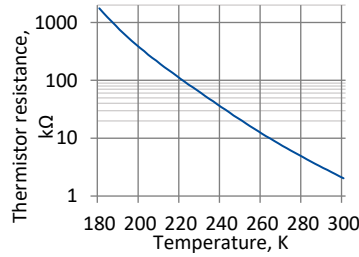
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type	
	PVM-2TE-8	PVM-2TE-10.6
Active element material	epitaxial HgCdTe heterostructure	
Optimal wavelength λ_{opt} , μm	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm ² ·Hz ^{1/2} /W	≥6.0×10 ⁸	≥2.0×10 ⁸
Detectivity $D^*(\lambda_{opt})$, cm ² ·Hz ^{1/2} /W	≥3.0×10 ⁸	≥1.0×10 ⁸
Current responsivity-active area length product $R_i(\lambda_{opt}) \cdot L$, A·mm/W	≥0.015	≥0.01
Time constant τ , ns	≤4	≤4
Resistance R, Ω	150 to 1200	90 to 350
Active element temperature T_{det} , K	~230	
Active area A, mm×mm	1×1, 2×2	
Package	TO8, TO66	
Acceptance angle Φ	~70°	
Window	wZnSeAR	

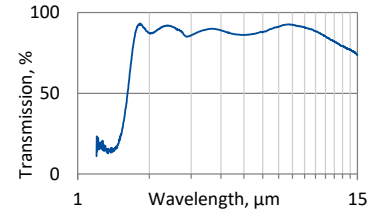
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

Thermistor characteristics

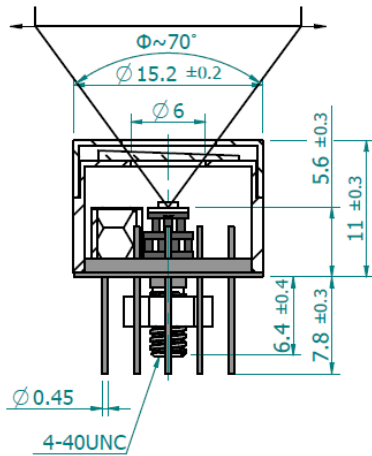


Spectral transmission of wZnSeAR window (typical example)



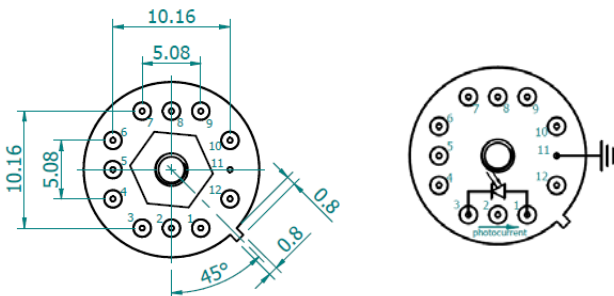
Mechanical layout, mm

2TE-TO8 package

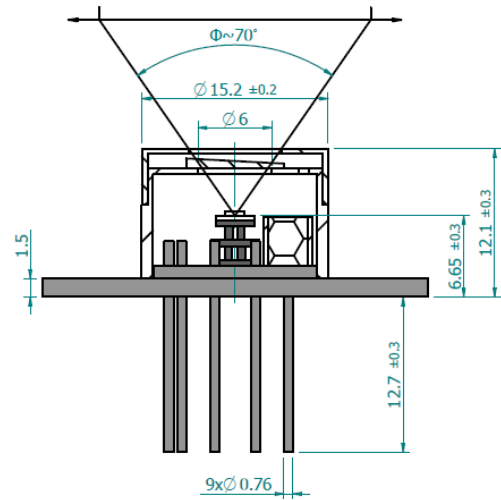


Φ - acceptance angle

Bottom view

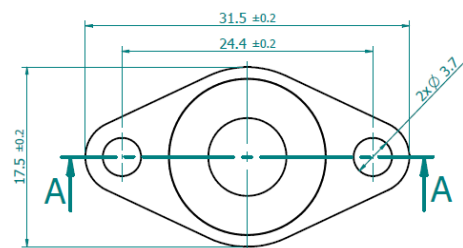


2TE-TO66 package

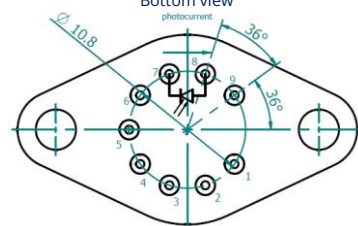


Φ - acceptance angle

Top view



Bottom view



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



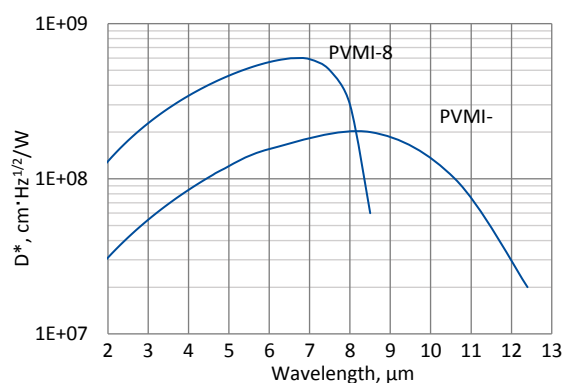
small SIP-T08

2.19 PVMI series

2.19.1 2.0 – 12.0 μm HgCdTe ambient temperature, optically immersed photovoltaic multiple junction detectors

PVMI series features uncooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large optical area detectors operating within 2 to 12 μm spectral range.

Spectral response ($T_a = 20^\circ\text{C}$)

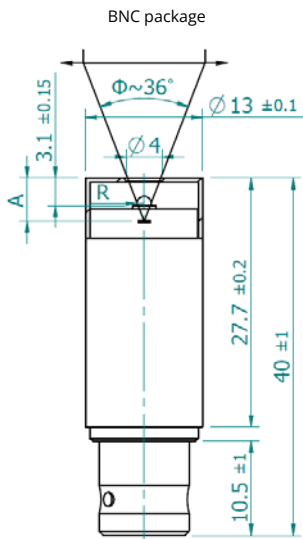


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

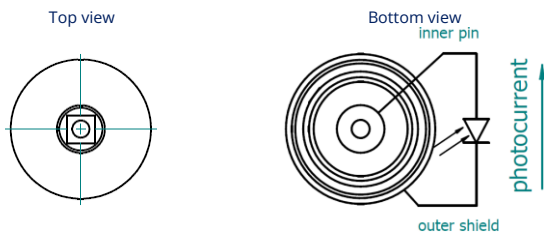
Parameter	Detector type	
	PVMI-8	PVMI-10.6
Active element material	epitaxial HgCdTe heterostructure	
Optimum wavelength λ_{opt} , μm	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥6.0×10 ⁸	≥2.0×10 ⁸
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥3.0×10 ⁸	≥1.0×10 ⁸
Current responsivity-optical area length product $R_i(\lambda_{opt}) \cdot L_{opt}$, A·mm/W	≥0.04	≥0.01
Time constant τ , ns	≤4	≤1.5
Resistance R, Ω	50 to 300	20 to 150
Optical area A_{opt} , mm×mm	1×1	1×1, 2×2
Package	TO39, BNC	
Acceptance angle Φ	~36°	
Window	none	

Mechanical layout, mm



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ν} , mm×mm	1×1	2×2
R, mm	0.8	1.25
A, mm	5.5±0.3	6.85±0.30

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the top of BNC package to the focal plane

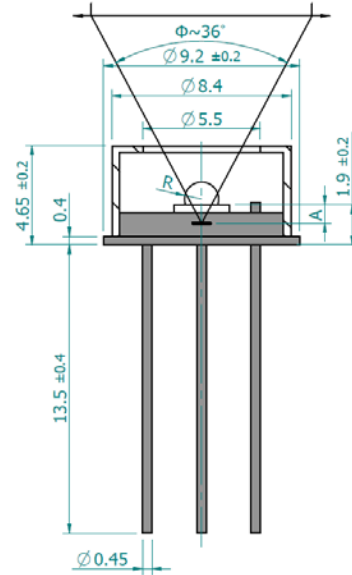


Dedicated preamplifier



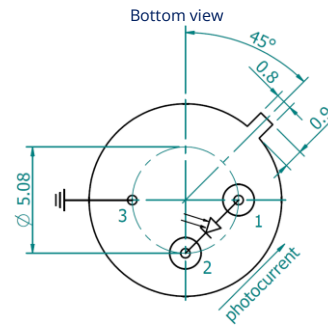
small SIP-T039

T039 package



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_{ν} , mm×mm	1×1	2×2
R, mm	0.8	1.25
A, mm	2.4±0.2	3.75±0.2

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane



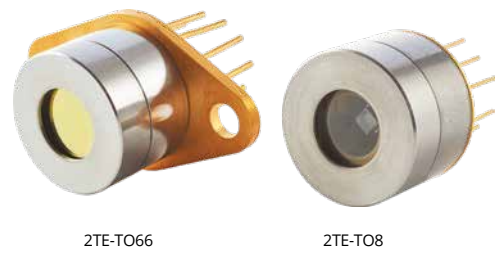
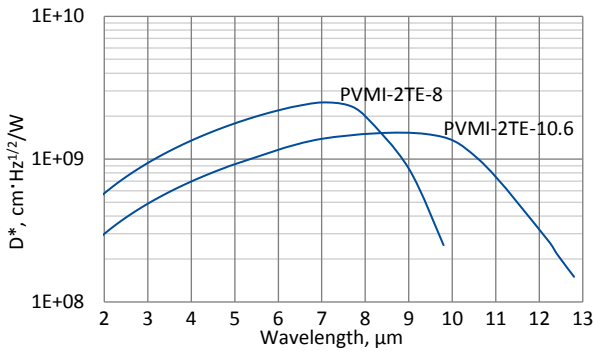
Function	Pin number
Detector	1, 2
Chassis ground	3

2.20 PVMI-2TE series

2.20.1 2.0 – 13.0 μm HgCdTe two-stage thermoelectrically cooled, optically immersed photovoltaic multiple junction detectors

PVMI-2TE series features two-stage thermoelectrically cooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the device. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large optical area detectors operated within 2.0 to 13.0 μm spectral range. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

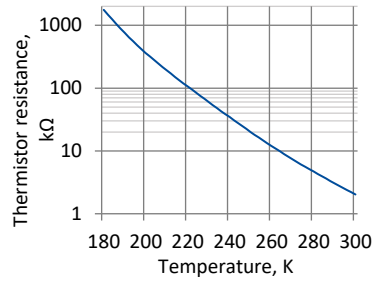
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type	
	PVMI-2TE-8	PVMI-2TE-10.6
Active element material	epitaxial HgCdTe heterostructure	
Optimal wavelength λ_{opt} , μm	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥2.5×10 ⁹	≥1.5×10 ⁹
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥2.0×10 ⁹	≥1.0×10 ⁹
Current responsivity $R_i(\lambda_{opt})$, A/W	≥0.1	
Time constant τ , ns	≤4	≤3
Resistance R, Ω	150 to 1000	90 to 350
Active element temperature T_{det} , K	~230	
Optical area A_{ov} , mm×mm	1×1	
Package	TO8, TO66	
Acceptance angle Φ	~36°	
Window	wZnSeAR	

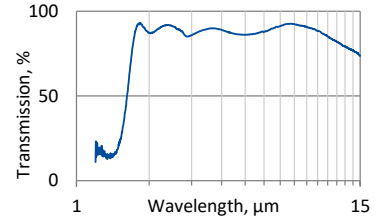
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~230
V_{max} , V	1.3
I_{max} , A	1.2
Q_{max} , W	0.36

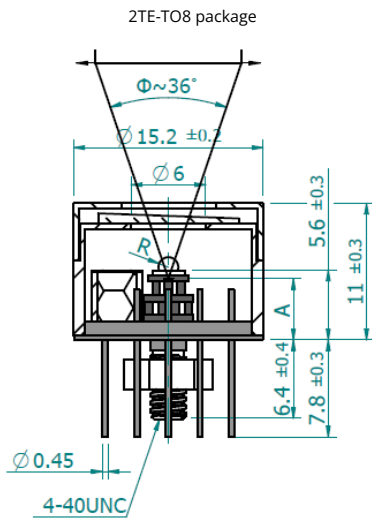
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)

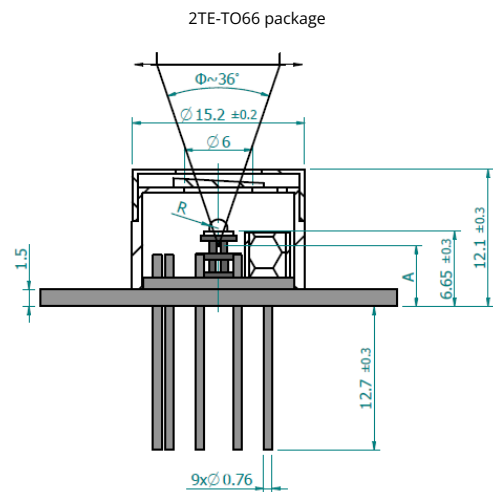


Mechanical layout, mm



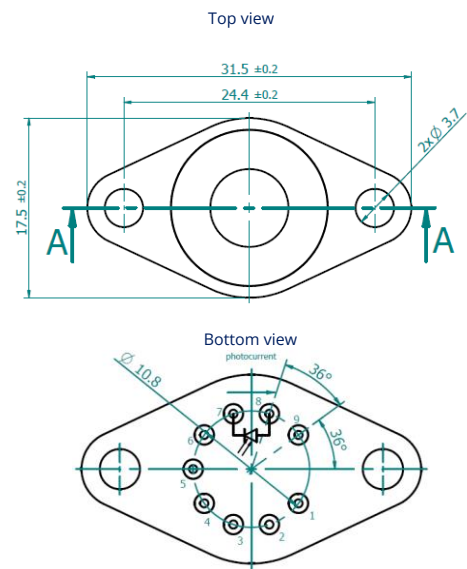
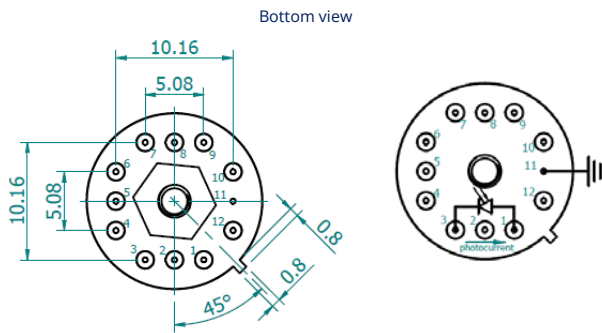
Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ov} , mm×mm	1×1
R, mm	0.8
A, mm	3.2±0.3

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of 2TE-TO8 header to the focal plane



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ov} , mm×mm	1×1
R, mm	0.8
A, mm	3.2±0.3

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of 2TE-TO66 header to the focal plane



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



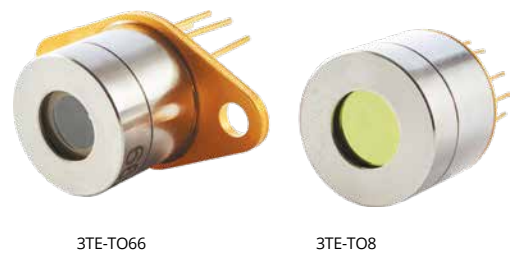
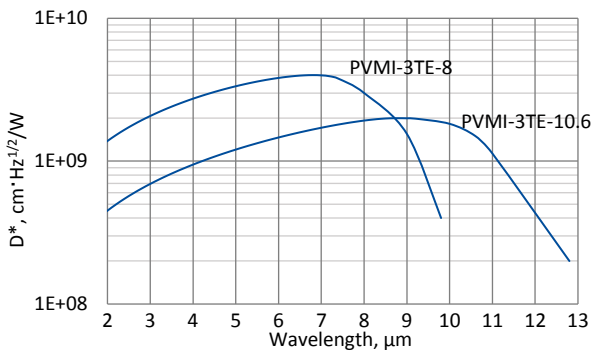
small SIP-T08

2.21 PVMI-3TE series

2.21.1 2.0 – 13.0 μm HgCdTe three-stage thermoelectrically cooled, optically immersed photovoltaic multiple junction detectors

PVMI-3TE series features three-stage thermoelectrically cooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large optical area detectors operating within 2.0 to 13.0 μm spectral range. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

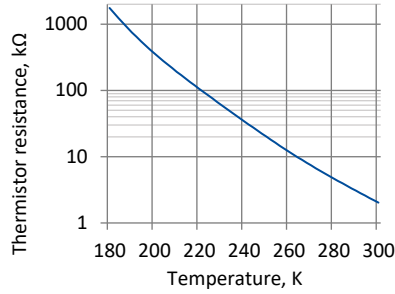
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type	
	PVMI-3TE-8	PVMI-3TE-10.6
Active element material	epitaxial HgCdTe heterostructure	
Optimal wavelength λ_{opt} , μm	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥4.0×10 ⁹	≥2.0×10 ⁹
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥3.0×10 ⁹	≥1.5×10 ⁹
Current responsivity $R_i(\lambda_{opt})$, A/W	≥0.15	≥0.10
Time constant τ , ns	≤4	≤3
Resistance R, Ω	200 to 1500	100 to 400
Active element temperature T_{det} , K	~210	
Optical area A_{ov} , mm×mm	1×1	
Package	TO8, TO66	
Acceptance angle Φ	~36°	
Window	wZnSeAR	

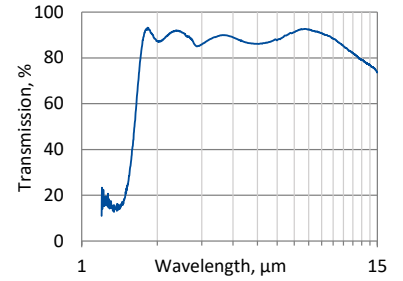
Three-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~210
V_{max} V	3.6
I_{max} A	0.45
Q_{max} W	0.27

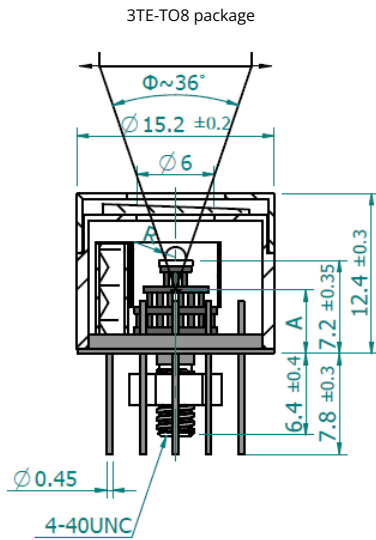
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)

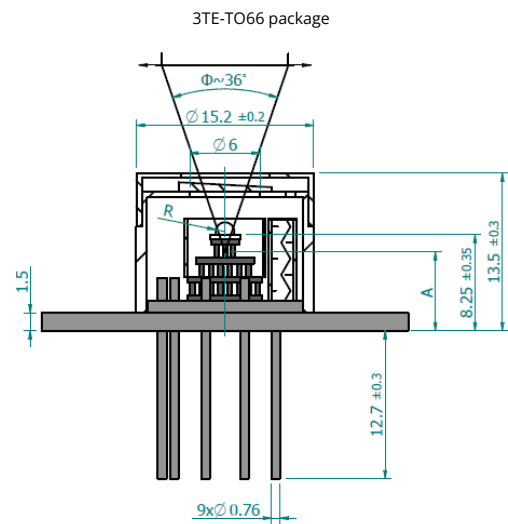


Mechanical layout, mm



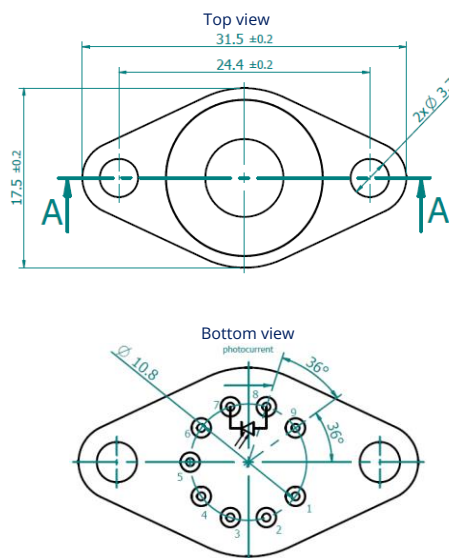
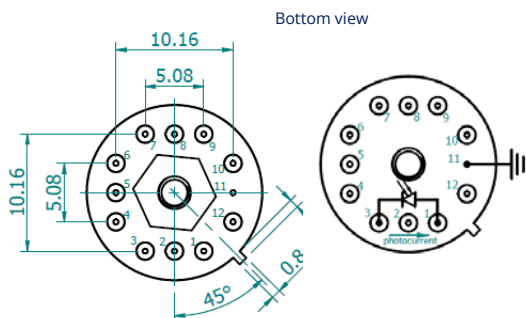
Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{opt} , mm×mm	1×1
R, mm	0.8
A, mm	4.8±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE-T08 header to the focal plane



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{opt} , mm×mm	1×1
R, mm	0.8
A, mm	5.85±0.35

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 3TE-T066 header to the focal plane



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



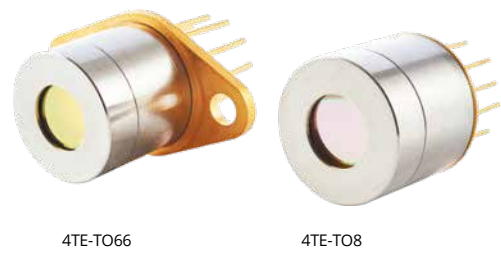
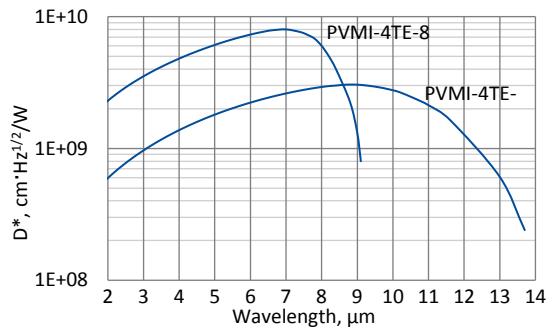
small SIP-TO8

2.22 PVMI-4TE series

2.22.1 2.0 – 13.0 μm HgCdTe four-stage thermoelectrically cooled, optically immersed photovoltaic multiple junction detectors

PVMI-4TE series features four-stage thermoelectrically cooled IR photovoltaic multiple junction detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . They are especially useful as large optical area detectors operating within 2.0 to 13.0 μm spectral range. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

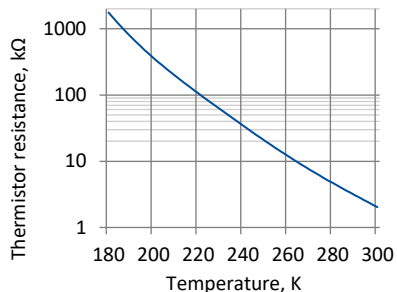
Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type	
	PVMI-4TE-8	PVMI-4TE-10.6
Active element material	epitaxial HgCdTe heterostructure	
Optimal wavelength λ_{opt} , μm	8.0	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥8.0×10 ⁹	≥3.0×10 ⁹
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥6.0×10 ⁹	≥2.5×10 ⁹
Current responsivity $R_i(\lambda_{opt})$, A/W	≥0.20	≥0.18
Time constant τ , ns	≤4	≤3
Resistance R, Ω	500 to 2500	120 to 500
Active element temperature T_{det} , K	~195	
Optical area A_o , mm×mm	1×1	
Package	TO8, TO66	
Acceptance angle Φ	~36°	
Window	wZnSeAR	

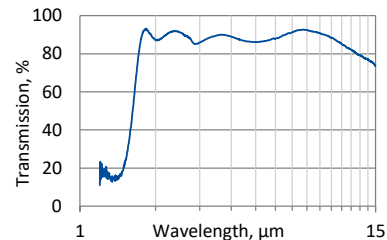
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~195
V_{max} V	8.3
I_{max} A	0.4
Q_{max} W	0.28

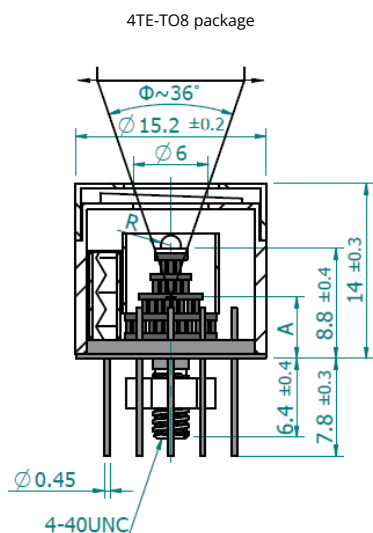
Thermistor characteristics



Spectral transmission of wZnSeAR window (typical example)

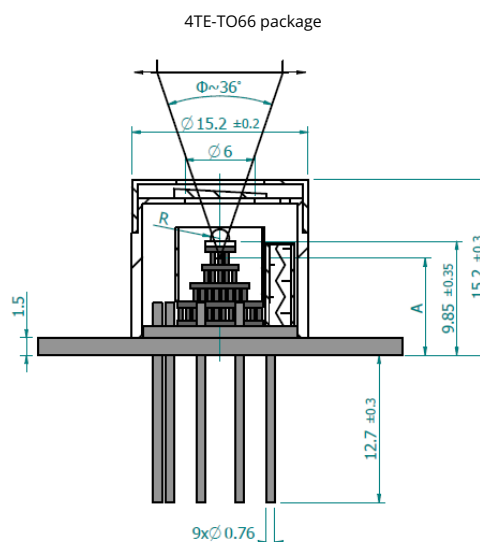


Mechanical layout, mm



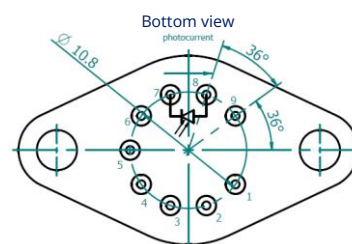
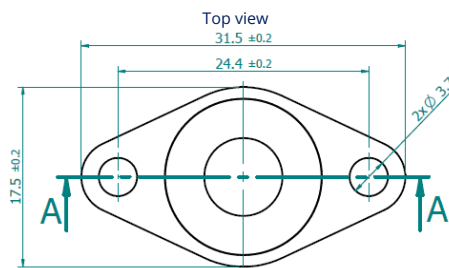
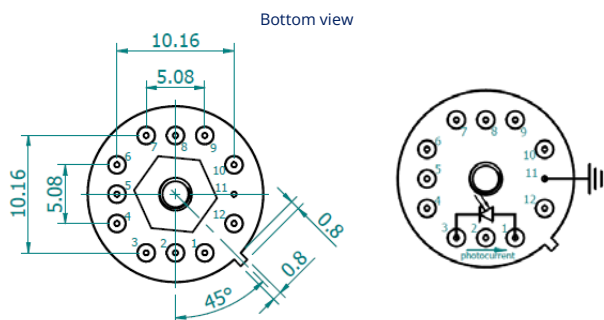
Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ov} , mm×mm	1×1
R, mm	0.8
A, mm	6.4±0.4

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 4TE-T08 header to the focal plane



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ov} , mm×mm	1×1
R, mm	0.8
A, mm	7.45±0.40

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of 4TE-T066 header to the focal plane



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Function	Pin number
Detector	7, 8
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



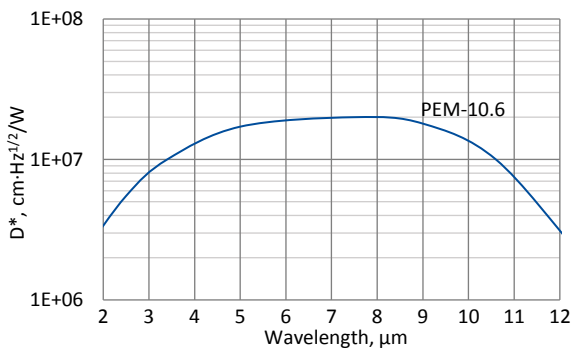
small SIP-T08

2.23 PEM series

2.23.1 2.0 – 12.0 μm HgCdTe ambient temperature photoelectromagnetic detectors

PEM series features uncooled HgCdTe photovoltaic IR detectors based on photoelectromagnetic effect in the semiconductor – spatial separation of optically generated electrons and holes in the magnetic field. The devices are designed for the maximum performance at 10.6 μm and especially useful as a large active area detectors to detect CW and low frequency modulated radiation. These devices are mounted in specialized packages with incorporated magnetic circuit inside. 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects and protects against pollution.

Spectral response ($T_a = 20^\circ\text{C}$)

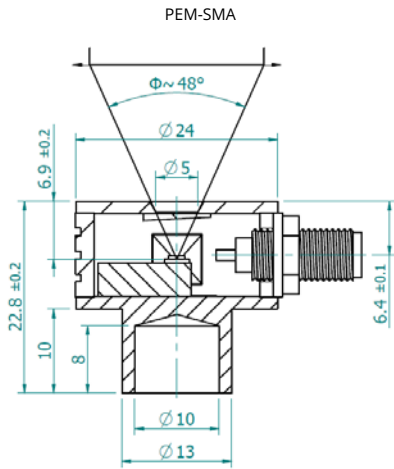


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

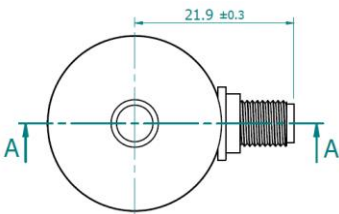
Parameter	Detector type	
	PEM-10.6	
Active element material	epitaxial HgCdTe heterostructure	
Optimum wavelength λ_{opt} , μm	10.6	
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥2.0×10 ⁷	
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁷	
Current responsivity-active area length product $R_i(\lambda_{opt}) \cdot L$, A·mm/W	≥0.002	
Time constant τ , ns	≤1.2	
Resistance R, Ω	≥40	
Active area A, mm×mm	1×1, 2×2	
Package	PEM-SMA	PEM-TO8
Acceptance angle Φ	~48°	~52°
Window	wZnSeAR	

Mechanical layout, mm

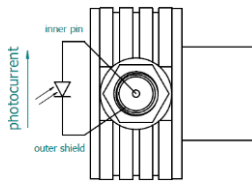


Φ - acceptance angle

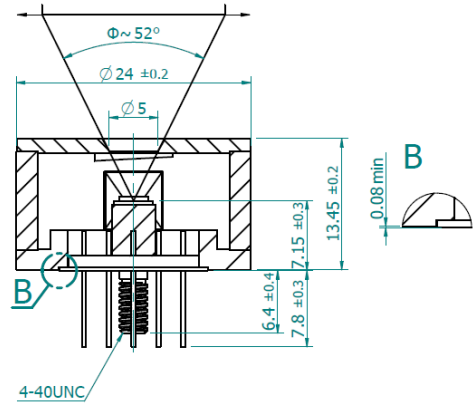
Top view



Side view

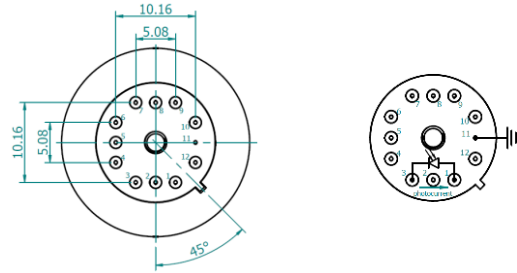


PEM-TO8



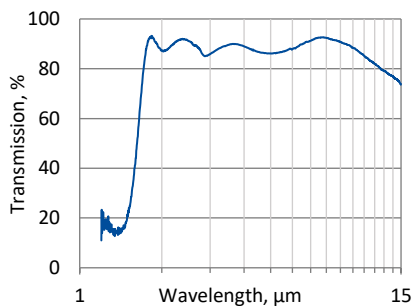
Φ - acceptance angle

Bottom view



Function	Pin number
Detector	1, 3
Chassis ground	11
Not used	2, 4, 5, 6, 7, 8, 9, 10, 12

Spectral transmission of wZnSeAR window (typical example)



Dedicated preamplifier



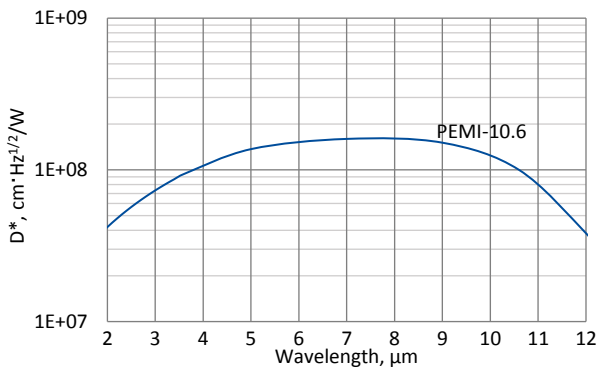
standard MIP

2.24 PEMI series

2.24.1 2.0 – 12.0 μm HgCdTe ambient temperature, optically immersed photoelectromagnetic detectors

PEMI series features uncooled HgCdTe photovoltaic optically immersed IR detectors based on photoelectromagnetic effect in the semiconductor – spatial separation of optically generated electrons and holes in the magnetic field. The devices are designed for the maximum performance at 10.6 μm and especially useful as large optical area detectors to detect CW and low frequency modulated radiation. These devices are mounted in specialized packages with incorporated magnetic circuit inside. 3° wedged zinc selenide anti-reflection coating (wZnSeAR) window prevents unwanted interference effects and protects against pollution.

Spectral response ($T_a = 20^\circ\text{C}$)

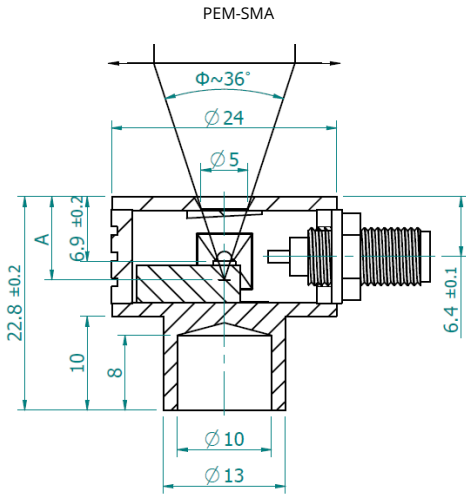


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

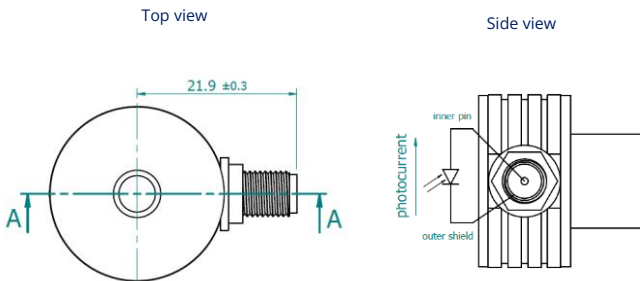
Parameter	Detector type
	PEMI-10.6
Active element material	epitaxial HgCdTe heterostructure
Optimum wavelength λ_{opt} , μm	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥1.6×10 ⁸
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁸
Current responsivity-optical area length product $R_i(\lambda_{opt}) \cdot L$, A·mm/W	≥0.01
Time constant τ , ns	≤1.2
Resistance R , Ω	40 to 100
Optical area A_o , mm×mm	1×1, 2×2
Package	PEM-SMA, PEM-TO8
Acceptance angle Φ	~36°
Window	wZnSeAR

Mechanical layout, mm

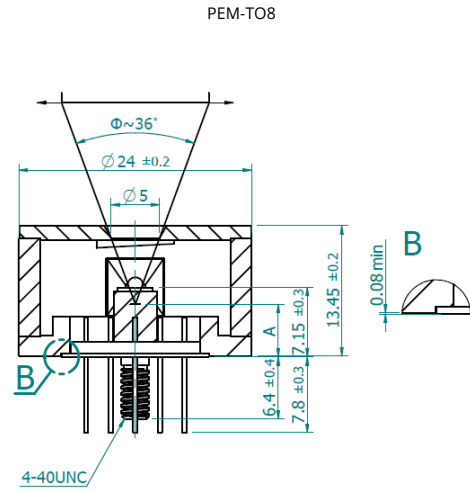
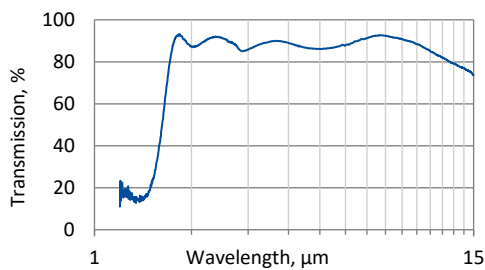


Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_o , mm×mm	1×1	2×2
R, mm	0.8	1.25
A, mm	9.3±0.4	10.65±0.40

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the top of PEM-SMA lid to the focal plane

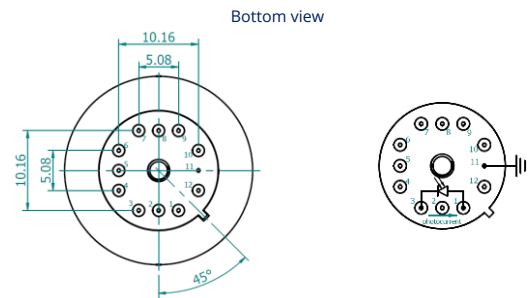


Spectral transmission of wZnSeAR window (typical example)



Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_o , mm×mm	1×1	2×2
R, mm	0.8	1.25
A, mm	4.75±0.30	3.4±0.4

Φ - acceptance angle, R - hyperhemisphere microlens radius, A - distance from the bottom of PEM-TO8 header to the focal plane



Function	Pin number
Detector	1, 3
Chassis ground	11
Not used	2, 4, 5, 6, 7, 8, 9, 10, 12

Dedicated preamplifier



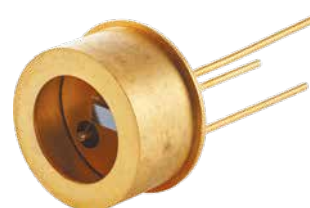
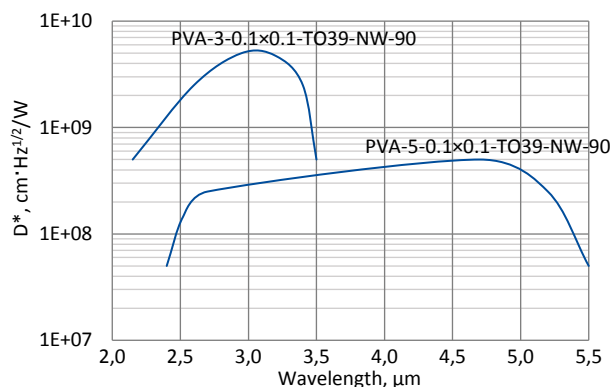
standard MIP

2.25 PVA series

2.25.1 2.0 – 5.5 μm InAs and InAsSb ambient temperature photovoltaic detectors

PVA series features uncooled IR photovoltaic detectors based on InAs_{1-x}Sb_x alloys. They do not contain mercury or cadmium and are complying with the RoHS Directive.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

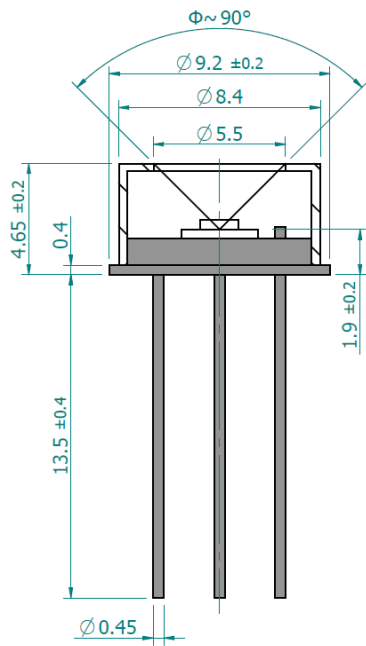


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

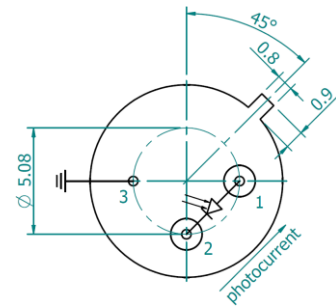
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type	
	PVA-3-0.1x0.1-TO39-NW-90	PVA-5-0.1x0.1-TO39-NW-90
Active element material	epitaxial InAs heterostructure	epitaxial InAsSb heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm	≤2.4	≤2.6
Peak wavelength λ_{peak} , μm	2.9±0.3	4.5±0.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm	≥3.3	≥5.3
Detectivity D^* (λ_{peak}), cm ² ·Hz ^{1/2} /W	≥5.0×10 ⁹	≥5.0×10 ⁸
Current responsivity R_i (λ_{peak}), A/W	≥1.1	≥1.2
Time constant τ , ns	≤20	≤60
Resistance R, Ω	≥2k	≥70
Active area A, mm×mm	0.1×0.1	
Package	TO39	
Acceptance angle Φ	~90°	
Window	none	

Mechanical layout, mm



Bottom view



Function	Pin number
Detector	1, 2
Chassis ground	3

Dedicated preamplifier



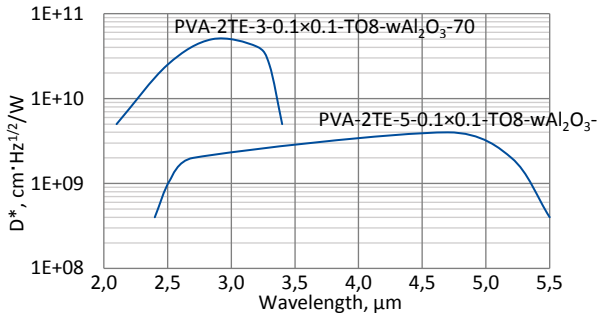
small SIP-T039

2.26 PVA-2TE series

2.26.1 2.0 – 5.5 μm InAs and InAsSb two-stage thermoelectrically cooled photovoltaic detectors

PVA-2TE series features two-stage thermoelectrically cooled IR photovoltaic detectors based on InAs_{1-x}Sb_x alloys. They do not contain mercury or cadmium and are complying with the RoHS Directive. 3° wedged sapphire (wAl₂O₃) window prevents unwanted interference effects.

Spectral response (T_a = 20°C, V_b = 0 mV)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

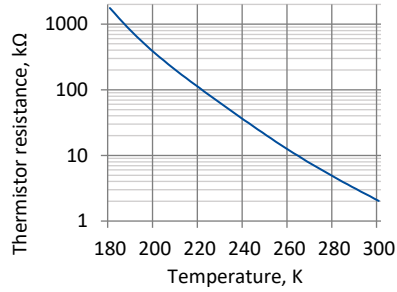
Specification (T_a = 20°C, V_b = 0 mV)

Parameter	Detector type	
	PVA-2TE-3-0.1x0.1-TO8-wAl ₂ O ₃ -70	PVA-2TE-5-0.1x0.1-TO8-wAl ₂ O ₃ -70
Active element material	epitaxial InAs heterostructure	epitaxial InAsSb heterostructure
Cut-on wavelength λ _{cut-on} (10%), μm	≤2.4	≤2.6
Peak wavelength λ _{peak} , μm	2.9±0.3	4.5±0.6
Cut-off wavelength λ _{cut-off} (10%), μm	≥3.2	≥5.3
Detectivity D* (λ _{peak}), cm·Hz ^{1/2} /W	≥5.0×10 ¹⁰	≥4.0×10 ⁹
Current responsivity R _i (λ _{peak}), A/W	≥1.1	≥1.2
Time constant τ, ns	≤15	≤20
Resistance R, Ω	≥200k	≥1.0k
Active element temperature T _{det} , K	~230	
Active area A, mm×mm	0.1×0.1	
Package	TO8	
Acceptance angle Φ	~70°	
Window	wAl ₂ O ₃	

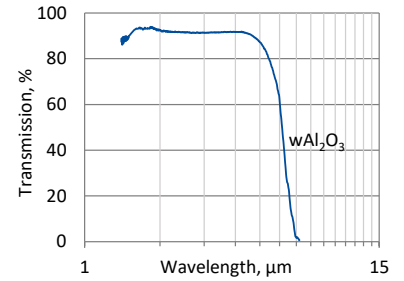
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

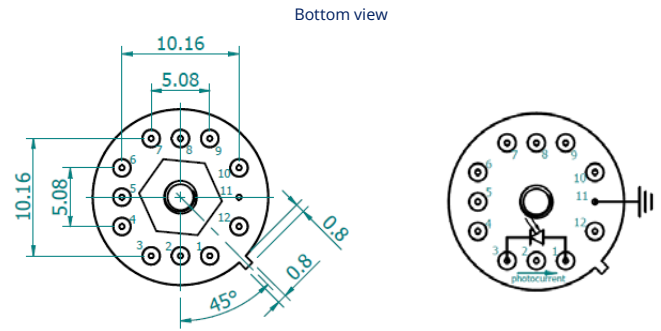
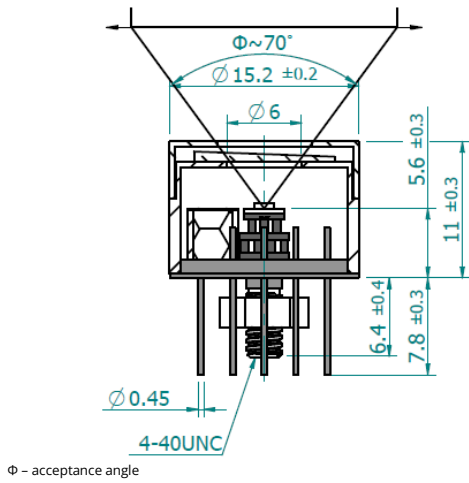
Thermistor characteristics



Spectral transmission of wAl_2O_3 window (typical example)



Mechanical layout, mm



Function	Pin number
Detector	1, 3
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



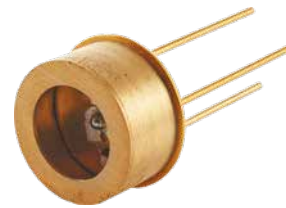
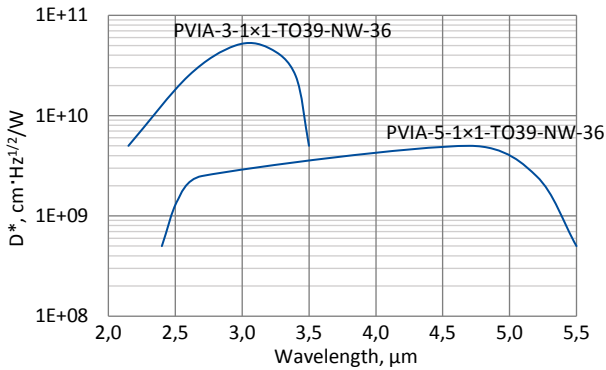
small SIP-TO8

2.27 PVIA series

2.27.1 2.0 – 5.5 μm InAs and InAsSb ambient temperature, optically immersed photovoltaic detectors

PVIA series features uncooled IR photovoltaic detectors based on InAs_{1-x}Sb_x alloys, optically immersed in order to improve performance of the devices. They do not contain mercury or cadmium and are complying with the RoHS Directive.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

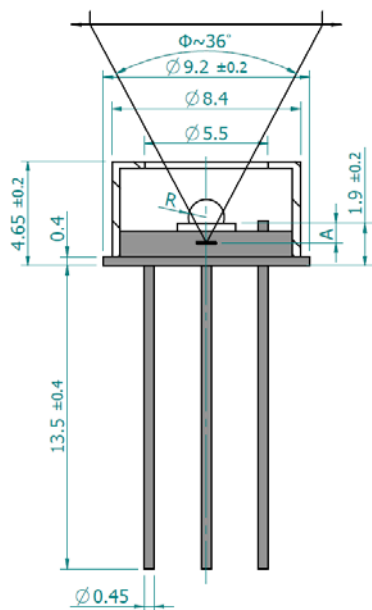


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)

Parameter	Detector type	
	PVIA-3-1×1-TO39-NW-36	PVIA-5-1×1-TO39-NW-36
Active element material	epitaxial InAs heterostructure	epitaxial InAsSb heterostructure
Cut-on wavelength $\lambda_{\text{cut-on}}$ (10 %), μm	≤ 2.4	≤ 2.6
Peak wavelength λ_{peak} , μm	2.9 ± 0.3	4.5 ± 0.6
Cut-off wavelength $\lambda_{\text{cut-off}}$ (10 %), μm	≥ 3.3	≥ 5.3
Detectivity D^* (λ_{peak}), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 5.0 \times 10^{10}$	$\geq 5.0 \times 10^9$
Current responsivity R_i (λ_{peak}), A/W	≥ 1.1	≥ 1.2
Time constant τ , ns	≤ 20	≤ 15
Resistance R , Ω	$\geq 2\text{k}$	≥ 70
Optical area A_o , $\text{mm}\times\text{mm}$	1×1	
Package	TO39	
Acceptance angle Φ	~36°	
Window	none	

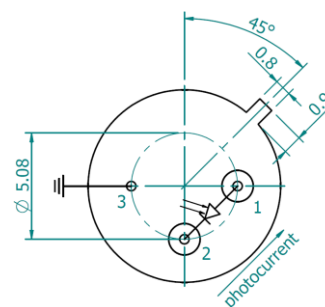
Mechanical layout, mm



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_o , mm×mm	1×1
R, mm	0.8
A, mm	2.4±0.2

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of hyperhemisphere microlens to the focal plane

Bottom view



Function	Pin number
Detector	1, 2
Chassis ground	3

Dedicated preamplifier



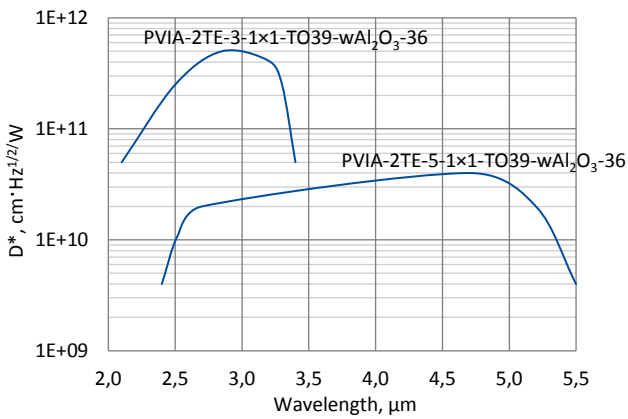
small SIP-TO39

2.28 PVIA-2TE series

2.28.1 2.0 – 5.5 μm InAs and InAsSb two-stage thermoelectrically cooled, optically immersed photovoltaic detectors

PVIA-2TE series features two-stage thermoelectrically cooled IR photovoltaic detectors based on InAs_{1-x}Sb_x alloys, optically immersed in order to improve performance of the devices. They do not contain mercury or cadmium and are complying with the RoHS Directive. 3° wedged sapphire (wAl₂O₃) window prevents unwanted interference effects.

Spectral response (T_a = 20°C, V_b = 0 mV)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

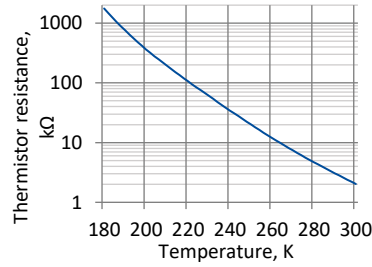
Specification (T_a = 20°C, V_b = 0 mV)

Parameter	Detector type	
	PVIA-2TE-3-1x1-TO8-wAl ₂ O ₃ -36	PVIA-2TE-5-1x1-TO8-wAl ₂ O ₃ -36
Active element material	epitaxial InAs heterostructure	epitaxial InAsSb heterostructure
Cut-on wavelength λ _{cut-on} (10 %), μm	≤2.4	≤2.6
Peak wavelength λ _{peak} , μm	2.9±0.3	4.5±0.6
Cut-off wavelength λ _{cut-off} (10 %), μm	≥3.2	≥5.3
Detectivity D* (λ _{peak}), cm·Hz ^{1/2} /W	≥5.0×10 ¹¹	≥4.0×10 ¹⁰
Current responsivity R _i (λ _{peak}), A/W	≥1.1	≥1.2
Time constant τ, ns	≤15	≤5
Resistance R, Ω	≥200k	≥1.0k
Active element temperature T _{det} , K	~230	
Optical area A _{ov} , mm×mm	1×1	
Package	TO8	
Acceptance angle Φ	~36°	
Window	wAl ₂ O ₃	

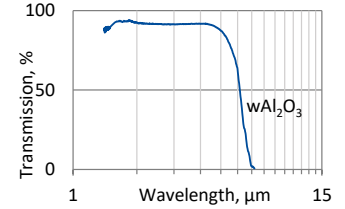
Two-stage thermoelectric cooler parameters

Parameter	Value
T_{det} K	~230
V_{max} V	1.3
I_{max} A	1.2
Q_{max} W	0.36

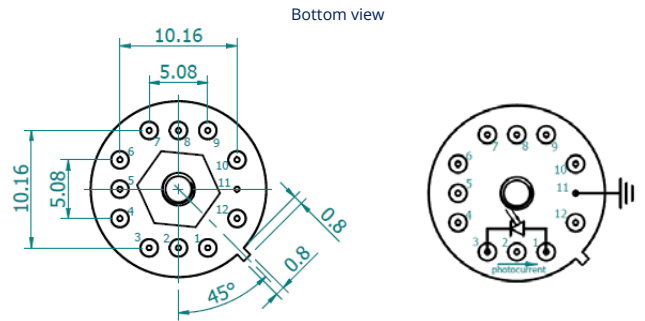
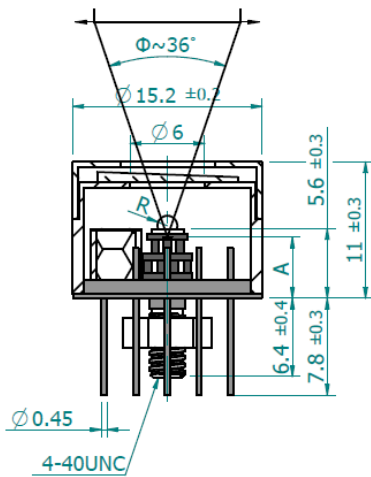
Thermistor characteristics



Spectral transmission of wAl_2O_3 window (typical example)



Mechanical layout, mm



Parameter	Value
Immersion microlens shape	hyperhemisphere
Optical area A_{ϕ} , mm×mm	1×1
R, mm	0.8
A, mm	3.2±0.3

Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

Φ – acceptance angle, R – hyperhemisphere microlens radius, A – distance from the bottom of the 2TE-TO8 header to the focal plane

Dedicated preamplifier



„all-in-one“ AIP



programmable PIP



standard MIP



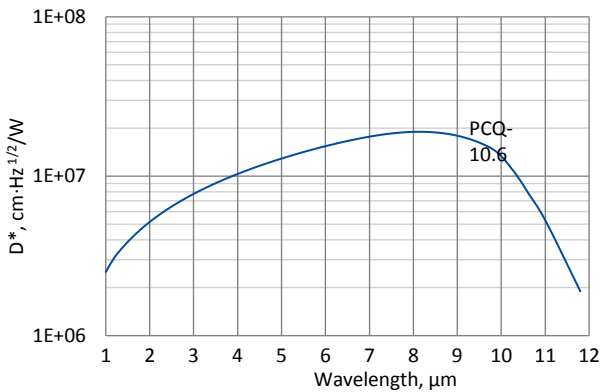
small SIP-TO8

2.29 PCQ

2.29.1 1.0 – 12.0 μm HgCdTe ambient temperature photoconductive quadrant detector

PCQ is uncooled IR photoconductive quadrant detector based on sophisticated HgCdTe heterostructures for the best performance and stability. Quadrant detector consists of four separate active elements arranged in a quadrant geometry. The device is optimized for the maximum performance at 10.6 μm. The detector should operate in optimum bias voltage and current readout mode. Performance at low frequencies is reduced due to 1/f noise. The main application of PCQ detectors is laser beam profiling and positioning.

Spectral response ($T_a = 20^\circ\text{C}$)

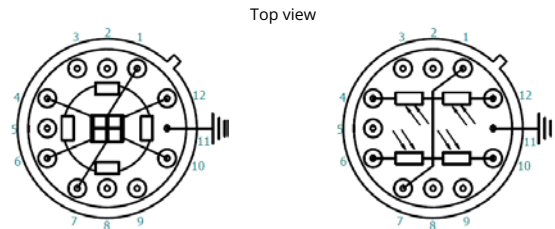
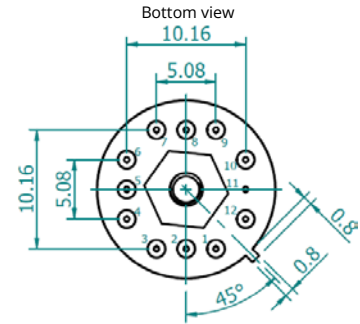
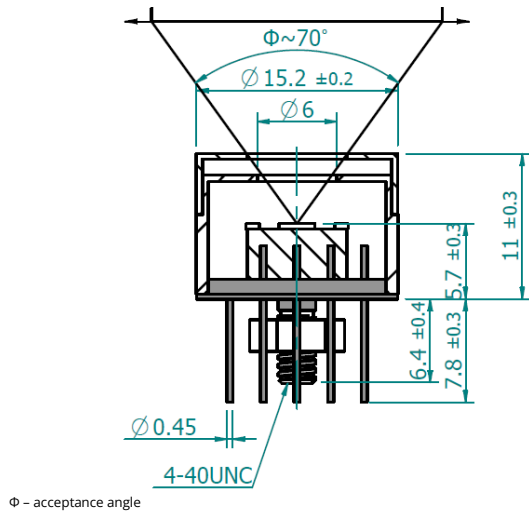


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type
	PCQ-10.6
Active elements material	epitaxial HgCdTe heterostructure
Optimum wavelength λ_{opt} , μm	10.6
Detectivity $D^*(\lambda_{peak}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥1.9×10 ⁷
Detectivity $D^*(\lambda_{opt}, 20\text{kHz})$, cm·Hz ^{1/2} /W	≥9.0×10 ⁶
Current responsivity $R_i(\lambda_{opt})$, A/W	≥0.001
Time constant τ , ns	≤5
1/f noise corner frequency f_c , Hz	≤20k
Bias voltage-active area length ratio V_b/L , V/mm	≤6.0
Resistance R , Ω	≤240
Active area of single element A , mm×mm	1×1
Distance between elements, μm	50
Package	TO8
Acceptance angle Φ	~70°
Window	none

Mechanical layout, mm



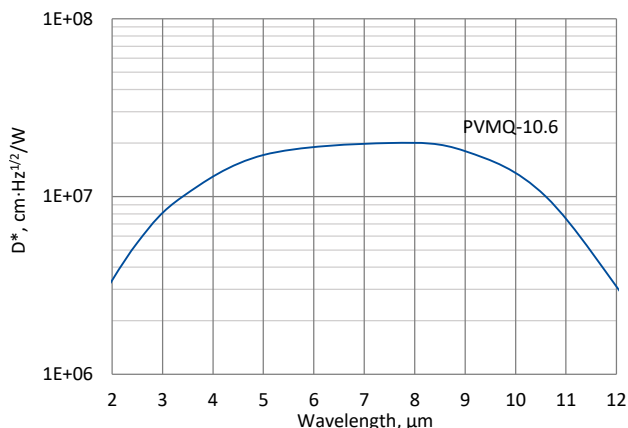
Function	Pin number
Detector 1	12
Detector 2	10
Detector 3	6
Detector 4	4
Common	1, 7
Chassis ground	11
Not used	2, 3, 5, 8, 9

2.30 PVMQ

2.30.1 2.0 – 12.0 μm HgCdTe ambient temperature photovoltaic multiple junction quadrant detector

PVMQ is uncooled IR photovoltaic multiple junction quadrant detector based on sophisticated HgCdTe heterostructures for the best performance and stability. Quadrant detector consists of four separate active elements arranged in a quadrant geometry. The device is optimized for the maximum performance at 10.6 μm. The main application of PVMQ detector is laser beam profiling and positioning.

Spectral response ($T_a = 20^\circ\text{C}$)

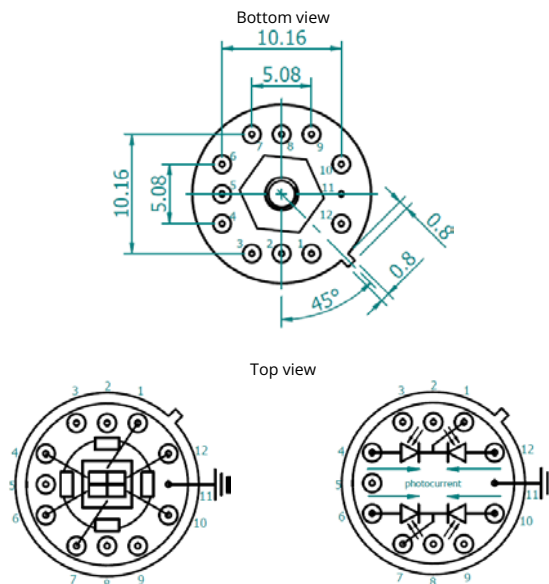
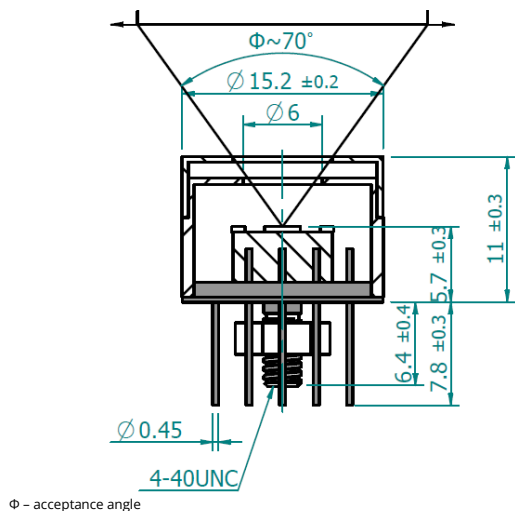


Exemplary spectral detectivity, the spectral response of delivered devices may differ.

Specification ($T_a = 20^\circ\text{C}$)

Parameter	Detector type
	PVMQ-10.6
Active elements material	epitaxial HgCdTe heterostructure
Optimu, wavelength λ_{opt} , μm	10.6
Detectivity $D^*(\lambda_{peak})$, cm·Hz ^{1/2} /W	≥2.0×10 ⁷
Detectivity $D^*(\lambda_{opt})$, cm·Hz ^{1/2} /W	≥1.0×10 ⁷
Current responsivity $R_i(\lambda_{opt})$, A/W	≥0.002
Time constant τ , ns	≤1.5
Resistance R, Ω	30 to 150
Active area of single element A, mm×mm	1×1
Distance between elements, μm	200
Package	TO8
Acceptance angle Φ	~70°
Window	none

Mechanical layout, mm



Function	Pin number
Detector 1	12
Detector 2	10
Detector 3	6
Detector 4	4
Common	1, 7
Chassis ground	11
Not used	2, 3, 5, 8, 9

2.31 AIP series

AIP is a new generation of transimpedance, AC or DC coupled preamplifiers. It is designed to operate with either biased or non-biased VIGO detectors. AIP is an „all-in-one“ device – a preamplifier is integrated with a fan and a thermoelectric cooler controller in a compact housing. It is a very convenient and user-friendly device, thus can be easily used in a variety of applications.

Features

- Integrated TEC controller and fan
- Frequency bandwidth up to 250 MHz
- Single power supply
- DC monitor
- Optimised for effective heat dissipation
- Compatible with optical accessories
- Cost-effective OEM version available
- Universal and flexible



Specification (T_a = 20°C)

Parameter	Typical value	Conditions, remarks
Low cut-off frequency f _{lo} , Hz	DC, 10, 100, 1k, 10k	
High cut-off frequency f _{hi} , Hz	100k, 1M, 10M, 100M, 250M	
Transimpedance K _v , V/A	up to 200k	fixed
Output impedance R _{out} , Ω	50	
Output voltage swing V _{out} , V	±1.8 ±0.7	f _{hi} ≤ 1 MHz, R _{load} = 1 MΩ f _{hi} > 1 MHz, R _{load} = 50 Ω
Output voltage offset V _{off} , mV	max ±20 ^{*)}	
Power supply voltage V _{sup} , V	+5 +12	with 2TE and 3TE cooled detectors with 4TE cooled detectors
Power supply current I _{sup} , mA	max ±50	
Ambient operating temperature T _a , °C	10 to 30	
Signal output socket	SMA	RF output
DC output socket	SMA	DC monitor
Supply socket	DC 2.1/5.5 DC 2.5/5.5	V _{sup} = +12 V V _{sup} = +5 V
Mounting hole	M4	
Fan	yes	

^{*)} Measured with an equivalent resistor at the input instead of the detector, it is to avoid the environmental thermal radiation impact.

Types of VIGO detectors that can be integrated with AIP preamplifier

- Photoconductive: PC-2TE, PC-3TE, PC-4TE
- Photoconductive optically immersed: PCI-2TE, PCI-3TE, PCI-4TE
- Photovoltaic: PV-2TE, PVA-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed: PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE
- Photovoltaic multiple junction: PVM-2TE
- Photovoltaic multiple junction optically immersed: PVMI-2TE, PVMI-3TE, PVMI-4TE

Code description

Type	f _{lo} , Hz	f _{hi} , Hz	Version
AIP	DC	100	S ¹⁾ (with the package)
	10	1M	
	100	10M	
	1k	100M	
	10k	250M	

¹⁾ OEM version available upon request.

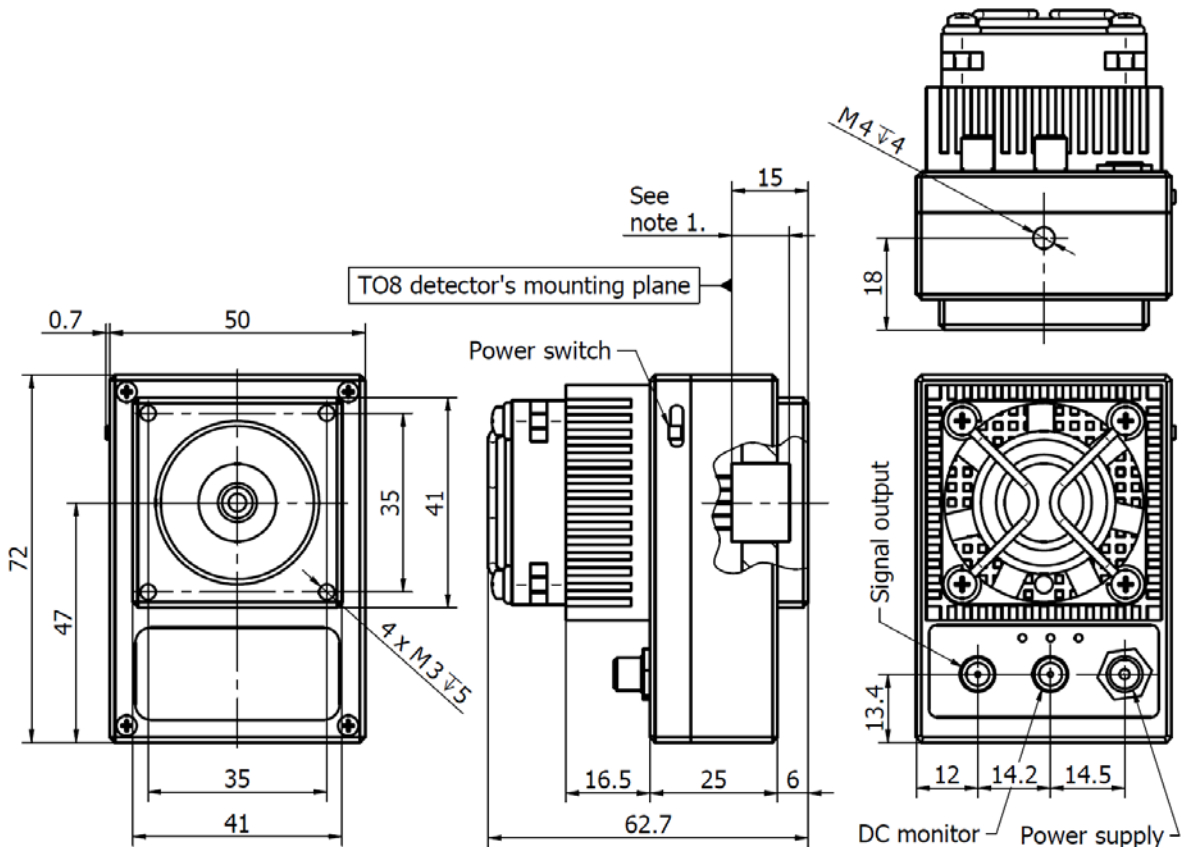
Included accessories

- 2xSMA-BNC cables + AC adaptor

Dedicated accessories

- OTA optical threaded adapter
- DRB-2 base mounting system

Mechanical layout, mm



Notes:
1. TO8 detector dimensions in the "TO8 technical drawing".

2.32 PIP series

PIP is a series of programmable “smart” preamplifiers. Due to the modern internal configuration, it offers extreme flexibility combined with superior signal parameters and high reliability. Built-in voltage monitor allows to check and optimize the working conditions (supply voltages, detector bias voltage, first and last stage output voltage offset, etc.).

There is also possible to change the gain, coupling (AC/DC), optimize the first stage transimpedance, and manually or automatically suppress the voltage offset.

Optimized parameters are stored into the internal EEPROM memory and automatically loaded after the power is on. Reset to default settings is available at any time. For detection module safety detector bias adjusting is blocked by default. Users can request to enable this option while ordering.

For proper operation, PTCC-01 TEC controller is required.

Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth:
 - 150 kHz/1.5 MHz/20 MHz
 - 1.5 MHz/15 MHz/200 MHz
- Coupling AC/DC
- Detector’s parameters (temperature, reverse bias etc.)



Specification (T_a = 20°C)

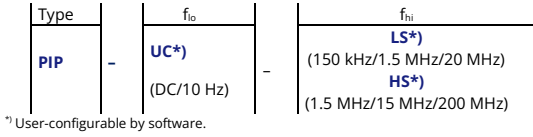
Parameter	Typical value	Conditions, remarks
Low cut-off frequency f_{lo} , Hz	DC/10	user-configurable by software
High cut-off frequency f_{hi} , Hz	150k/1.5M/20M 1.5M/15M/200M	user-configurable by software
Transimpedance K_v , V/A	2.5k – 150k 0.5k – 30k	digitally adjustable first stage transimpedance = 1 kΩ first stage transimpedance = 5 kΩ
Output impedance R_{out} , Ω	50	
Output voltage swing V_{out} , V	±1	$R_{Load} = 50 \Omega$
Output voltage offset V_{off} , mV	max ±20 ^{*)}	
Ambient operating temperature T_a , °C	10 to 30	
Signal output socket	SMA	
Power supply and TEC control socket	LEMO (female)	ECG.0B.309.CLN
Mounting hole	M4	
Fan	yes	

^{*)} Measured with equivalent resistor at the input instead of the detector, it is to avoid the environmental thermal radiation impact.

Types of VIGO detectors that can be integrated with PIP preamplifier

- Photoconductive: PC-2TE, PC-3TE, PC-4TE
- Photoconductive optically immersed: PCI-2TE, PCI-3TE, PCI-4TE
- Photovoltaic: PV-2TE, PVA-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed: PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE
- Photovoltaic multiple junction: PVM-2TE
- Photovoltaic multiple junction optically immersed: PVMI-2TE, PVMI-3TE, PVMI-4TE

Code description



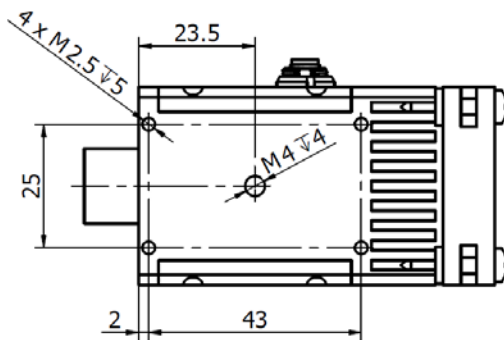
Included accessories

- SMA-BNC, LEMO-DB9 cables

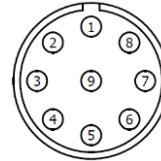
Dedicated accessories

- PTCC-01-BAS TEC controller + USB:
TypeA-MicroB cable+ AC adaptor
- PTCC-01-ADV TEC controller + USB:
TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB,
- KK2-POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

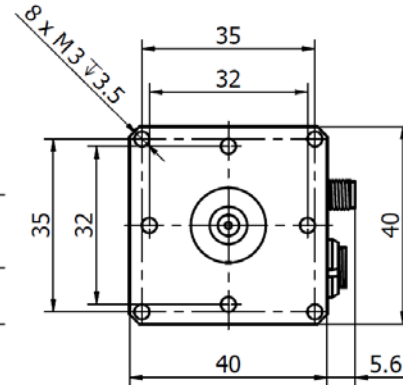
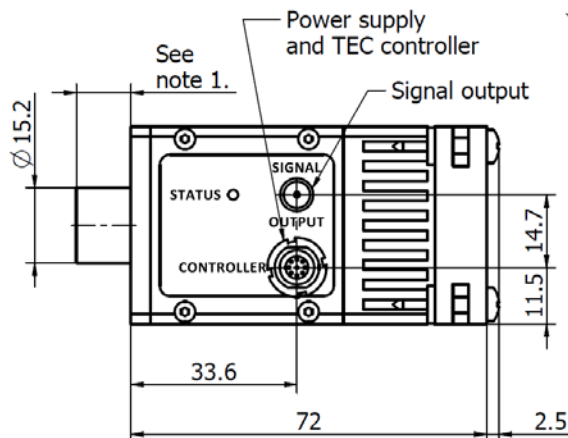
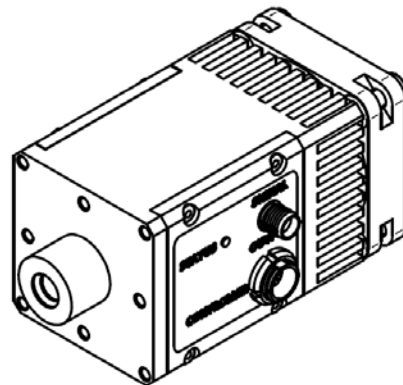
Mechanical layout, mm



**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9



Notes:
1. TO8 detector dimensions in the "TO8 technical drawing".

2.33 MIP series

MIP is a series of medium-size transimpedance, DC or AC coupled preamplifiers, intended to operate with either biased or non-biased VIGO detectors. MIP is equipped with a fan and does not require any additional external heatsink. It is one of the most user-friendly preamplifiers which surely facilitate work.

Features

- Frequency bandwidth up to 250 MHz
- Integrated fan
- Compatible with optical accessories



Specification (T_a = 20°C)

Parameter	Typical value	Conditions, remarks
Low cut-off frequency f _{lo} , Hz	DC, 10, 100, 1k, 10k	
High cut-off frequency f _{hi} , Hz	100k, 1M, 10M, 100M, 250M	
Transimpedance K _v , V/A	up to 200k	fixed
Output impedance R _{out} , Ω	50	
Output voltage swing V _{out} , V	±10 ±2 ±1	f _{hi} ≤ 1 MHz, R _{Load} = 1 MΩ 1 MHz < f _{hi} ≤ 10 MHz, R _{Load} = 1 MΩ 10 MHz < f _{hi} ≤ 250 MHz, R _{Load} = 50 Ω
Output voltage offset V _{off} , mV	max ±20 ^{*)}	
Power supply voltage V _{sup} , V	±15 ±9	f _{hi} ≤ 1 MHz f _{hi} > 1 MHz
Power supply current I _{sup} , mA	max ±50	
Ambient operating temperature T _a , °C	10 to 30	
Signal output socket	SMA	
Power supply and TEC control socket	LEMO (female)	ECG.0B.309.CLN
Mounting hole	M4	
Fan	yes	

^{*)} Measured with an equivalent resistor at the input instead of the detector, it is to avoid the environmental thermal radiation impact.

Types of VIGO detectors that can be integrated with MIP preamplifier

- Photoconductive: PC-2TE, PC-3TE, PC-4TE
- Photoconductive optically immersed: PCI-2TE, PCI-3TE, PCI-4TE
- Photovoltaic: PV-2TE, PVA-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed: PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE
- Photovoltaic multiple junction: PVM-2TE
- Photovoltaic multiple junction optically immersed: PVMI-2TE, PVMI-3TE, PVMI-4TE

Code description

Type	f _{lo} , Hz	f _{hi} , Hz
MIP	DC	100k
	10	1M
	100	10M
	1k	100M
	10k	250M

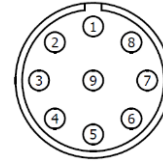
Included accessories

- SMA-BNC, LEMO-DB9 cables

Dedicated accessories

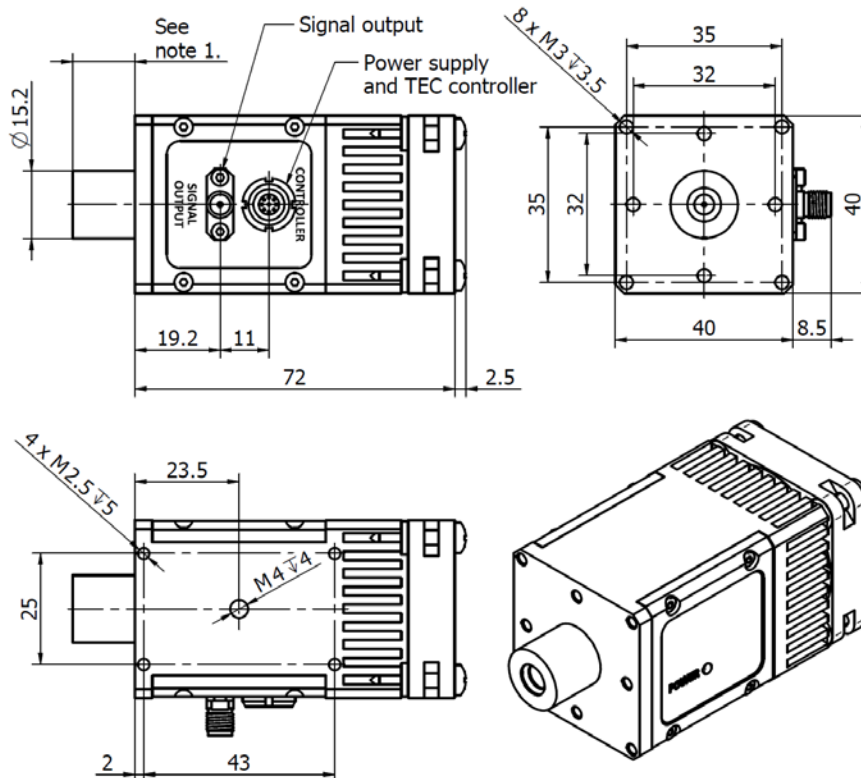
- PTCC-01-BAS TEC controller + USB:
TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB:
TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB:
TypeA-MicroB
- KK2-POWER cables
- OTA optical threaded adapter
- DRB-2 base mounting system

**Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN**



Function	Symbol	Pin number
Fan (+)	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Data pin	DATA	9

Mechanical layout, mm



Notes:
1. TO8 detector dimensions in the "TO8 technical drawing".

2.34 FIP series

FIP is a series of high speed, transimpedance, AC coupled preamplifiers, intended to operate with biased TE cooled VIGO detectors. Fast preamplifier enables precise I-V conversion, detector biasing up to 800 mV and simultaneously maintains compact size and keeps current noise low. FIP is equipped with a fan and does not require additional heat dissipation. It is suitable for applications requiring wide frequency bandwidth. Additional DC output is available as an option.

Features

- Wide frequency bandwidth up to 1 GHz
- Integrated fan
- DC monitor as an option



Specification (T_a = 20°C)

Parameter	Typical value	Conditions, remarks
Low cut-off frequency f _{lo} , Hz	1k, 10k	
High cut-off frequency f _{hi} , Hz	1G	
Transimpedance K _v , V/A	up to 8.5k	fixed
Output impedance R _{out} , Ω	50	
Output voltage swing V _{out} , V	±1	R _{Load} = 50 Ω
Power supply voltage V _{sup} , V	+12 / -5	
Power supply current I _{sup} , mA	+100 -50	
Ambient operating temperature T _{op} , °C	10 to 30	
Signal output socket	SMA	RF output
DC output socket	SMA	DC monitor (option)
Power supply and TEC control socket	LEMO (female)	ECG.0B.309.CLN
Mounting hole	M4	
Fan	yes	

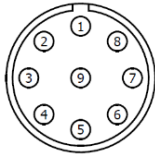
Types of VIGO detectors that can be integrated with FIP preamplifier

- Photovoltaic: PV-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed: PVI-2TE, PVI-3TE, PVI-4TE

Code description

Type	f _{lo} , Hz	f _{hi} , Hz	Version
FIP	1k 10k	1G	D (with DC monitor) ND (without DC monitor)

Power supply and TEC control socket LEMO (female)
ECG.0B.309.CLN



Function	Symbol	Pin number
Fan (+)	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	-V _{sup}	4
Ground	GND	5
Power supply input (+)	+V _{sup}	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Data pin	DATA	9

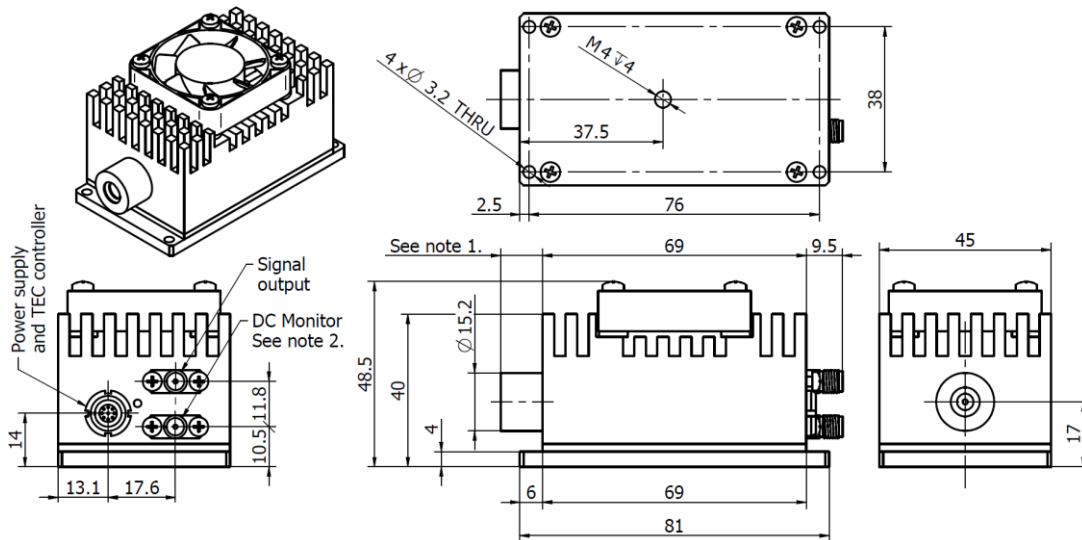
Included accessories

- SMA-BNC^{*)}, LEMO-DB9 cables
- ^{*)} Additional SMA-BNC cable for FIP-xx-xx-D version.

Dedicated accessories

- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB KK2-POWER cables
- DRB-2 base mounting system

Mechanical layout, mm



Notes:
 1. TO8 detector dimensions in the "TO8 technical drawing".
 2. Only for FIP-xx-xx-D version.

2.35 SIP series

SIP is a series of ultra-small transimpedance, AC or DC coupled preamplifiers. It is designed to operate with either biased or non-biased detectors. It is compatible with uncooled detectors in TO39 package (SIP-TO39) or thermoelectrically cooled detectors in TO8 package (SIP-TO8). SIP is dedicated for OEM applications and requires an external heatsink (MHS-2). There is a possibility to adjust the gain (devices with a frequency bandwidth up to 100 MHz).

Features

- Very small size
- Frequency bandwidth up to 250 MHz
- Adjustable gain as an option



Specification (T_a = 20°C)

Parameter	Typical value	Conditions, remarks
Low cut-off frequency f _{lo} , Hz	DC, 10, 100, 1k, 10k	
High cut-off frequency f _{hi} , Hz	100k, 1M, 10M, 100M, 250M	
Transimpedance K _v , V/A	up to 100k	tunable
Transimpedance range K _{v,max} /K _{v,min}	up to 5	dependent on f _{hi}
Output impedance R _{out} , Ω	50	
Output voltage swing V _{out} , V	±10 ±2 ±1	f _{hi} ≤ 1 MHz, R _{Load} = 1 MΩ 1 MHz < f _{hi} ≤ 10 MHz, R _{Load} = 1 MΩ 10 MHz < f _{hi} ≤ 250 MHz, R _{Load} = 50 Ω
Output voltage offset V _{off} , mV	max ±20 ^{*)}	
Power supply voltage V _{sup} , V	±15 ±9	f _{hi} ≤ 1 MHz f _{hi} > 1 MHz
Power supply current I _{sup} , mA	max ±50	no detector biasing
Ambient operating temperature T _{op} , °C	10 to 30	
Signal output socket	MMCX	
Power supply and TEC control socket	AMP2×4 (male)	AMPMODU 2×4
Mounting hole	none	
Fan	no	external heatsink necessary

^{*)} Measured with an equivalent resistor at the input instead of the detector, it is to avoid the environmental thermal radiation impact.

Types of VIGO detectors that can be integrated with SIP- TO8 preamplifier

- Photoconductive: PC-2TE, PC-3TE, PC-4TE
- Photoconductive optically immersed: PCI-2TE, PCI-3TE, PCI-4TE
- Photovoltaic: PV-2TE, PVA-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed: PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE
- Photovoltaic multiple junction: PVM-2TE
- Photovoltaic multiple junction optically immersed: PVMI-2TE, PVMI-3TE, PVMI-4TE

Types of VIGO detectors that can be integrated with SIP-TO39 preamplifier

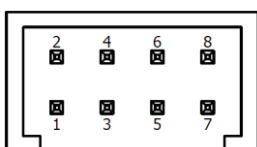
- Photoconductive: PC
- Photoconductive optically immersed: PCI
- Photovoltaic: PV, PVA
- Photovoltaic optically immersed: PVI, PVIA
- Photovoltaic multiple junction: PVM
- Photovoltaic multiple junction optically immersed: PVMI

Code description

Type	f_{i0} , Hz	f_{hi} , Hz	Detector package	Gain adjustment
SIP	DC	100k	TO8	G ^{*)} (with gain adjustment)
	10	1M		
	100	10M	TO39	NG (without gain adjustment)
	1k	100M		
	10k	250M		

^{*)} Only for SIP preamplifier with $f_{hi} \leq 100$ MHz.

Power supply and TEC control socket AMPMODU 2x4 (male)



Function	Symbol	Pin number
Power supply input (-)	$-V_{sup}$	1
Thermistor output/Not connected	TH2/N.C.	2 ^{*)}
Data pin/Ground	DATA/GND	3 ^{**)}
TEC supply input (-)/ Not connected	TEC-/N.C.	4 ^{*)}
Ground	GND	5
Thermistor output/Not connected	TH1/N.C.	6 ^{*)}
Power supply input (+)	$+V_{sup}$	7
TEC supply input (+)/ Not connected	TEC+/N.C.	8 ^{*)}

^{*)} N.C. – only for SIP-TO39 version.

^{**)} GND – only for SIP-TO39 version.

Included accessories

- MMCX-BNC, AMP2x4-DB9 cables

Dedicated accessories for SIP-TO8

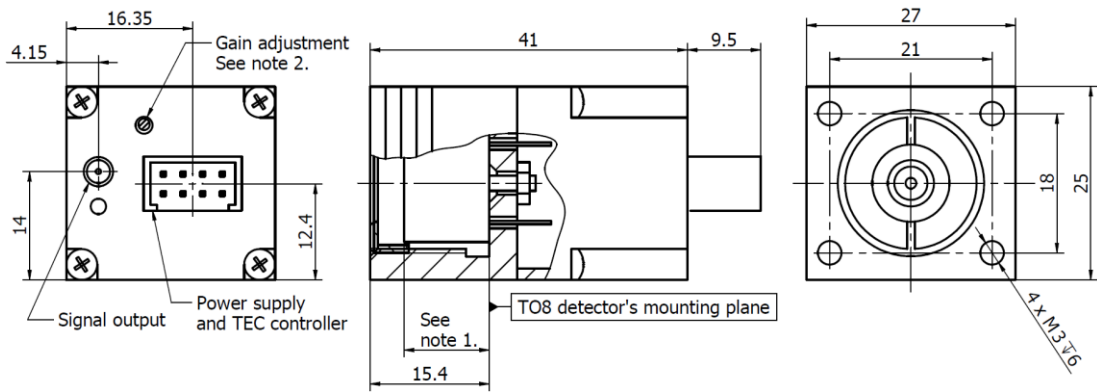
- PTCC-01-BAS TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-ADV TEC controller + USB: TypeA-MicroB cable + AC adaptor
- PTCC-01-OEM TEC controller + USB: TypeA-MicroB,
- KK2-POWER cables
- MHS-2 heatsink

Dedicated accessories for SIP-TO39

- PPS-03 preamplifier power supply + AC adaptor

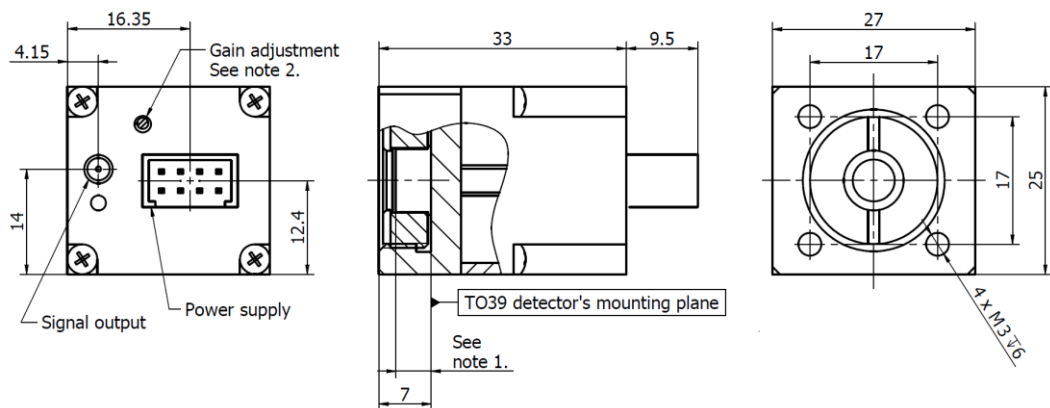
Mechanical layout, mm

SIP-TO8



- Notes:
 1. TO8 detector dimensions in the "TO8 technical drawing".
 2. Only for SIP-xx-xx-TO8-G version.

SIP-TO39



- Notes:
 1. TO8 detector dimensions in the "TO39 technical drawing".
 2. Only for SIP-xx-xx-TO39-G version.

3 ACCESSORIES

- PTCC-01 series thermoelectric cooler controllers
- PPS-03 series preamplifier power supplies
- AC adaptor and cables
- DRB-2 base mounting system
- MHS-2 heatsink
- DH-2 detector holder
- MH-1 module holder
- OTA optical threaded adapter

3.1 PTCC-01 series

PTCC-01 is a series of programmable, precision low-noise thermoelectric cooler controllers. They are designed to operate with VIGO IR detection modules: LabM-I-4, LabM-I-5, LabM-I-6-01, LabM-I-10.6, SM-I-12 and devices containing TE cooled detectors and preamplifiers: PIP, MIP, FIP, SIP-TO8.



AVAILABLE OPTIONS

PTCC-01-ADV (advanced)

- TEC controller and preamplifier power supply encapsulated in a small size package.
- Configurable by built-in function keys or PC software available on VIGO website.
- Status LCD indicator.

PTCC-01-BAS (basic)

- TEC controller and preamplifier power supply encapsulated in a small size package.
- Configurable by PC software available on VIGO website.
- Status LED indicator.

PTCC-01-OEM (oem)

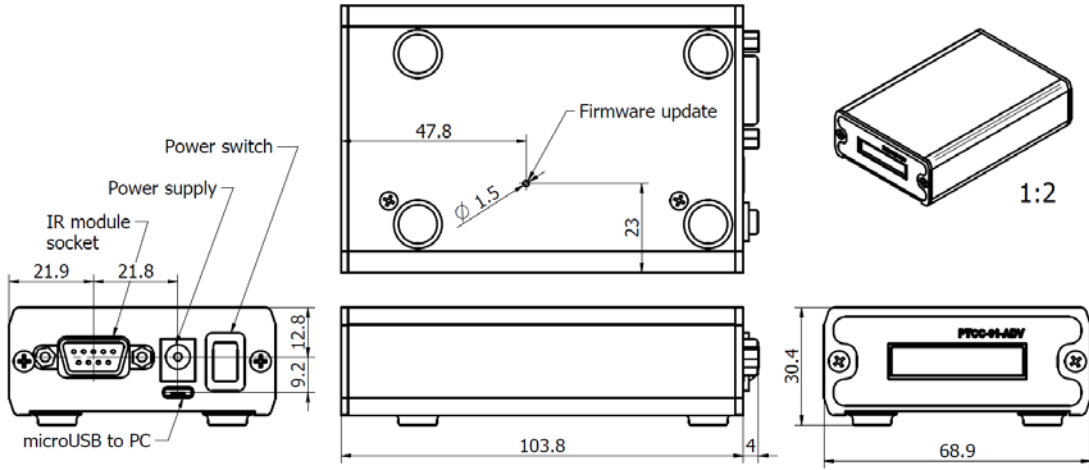
- TEC controller and preamplifier power supply without the package.
- Configurable by PC software available on VIGO website.
- Status LED indicator and status/data connector.

Specification (T_a = 20°C)

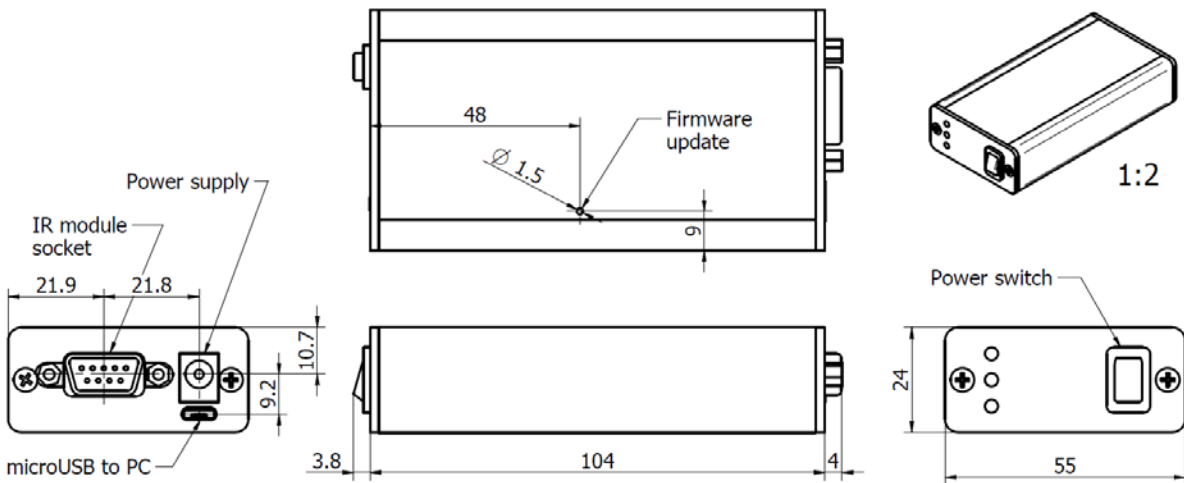
Parameter	Typical value	Conditions, remarks
Temperature stability, K	±0.01	
Temperature readout stability, mK	max 1.0	
Detector temperature settling time, s	25 45 60	2TE 3TE 4TE
Maximum TEC output current, A	1.20 0.45 0.40	2TE 3TE 4TE
Output voltage range, V	min 3.0 max 14.5	
Power supply voltage V _{sup} , V _{DC}	min 9.0 max 16.0	
Power supply current I _{sup} , mA	500	I _{TEC} = 0.45 A, U _{TEC} = 7.5 V
Series resistance of the connecting cable, Ω	1	total resistance of the wires supplying TEC element
Ambient operating temperature, °C	5 to 45	
Storage temperature, °C	-20 to 70	
IR module socket	DB9 (female) DUBOX2×5 (male)	D-sub 9 pin (PTCC-01-ADV, PTCC-01-BAS) PTCC-01-OEM
Power supply socket	DC 2.1/5.5 KK2	PTCC-01-ADV, PTCC-01-BAS PTCC-01-OEM
Weight, g	51±5 155±5 190±5	PTCC-01-OEM PTCC-01-BAS PTCC-01-ADV

Mechanical layout, mm

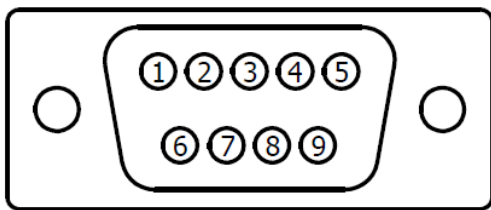
PTCC-01-ADV



PTCC-01-BAS



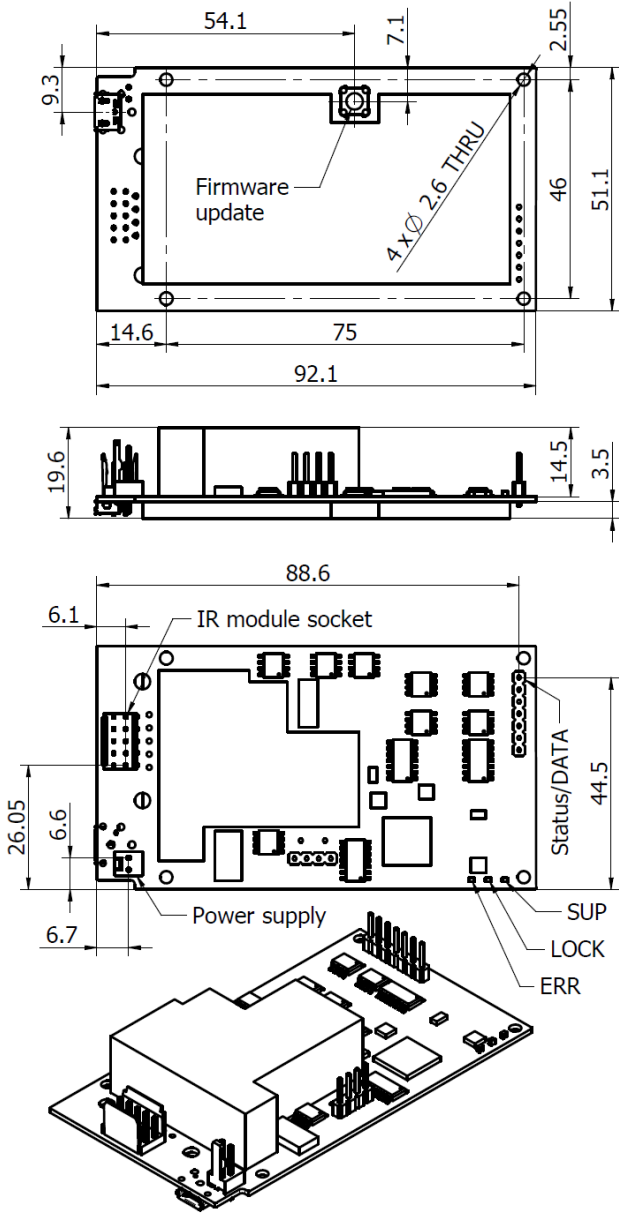
IR module socket D-sub 9 pin (male)



Function	Symbol	Pin number
TEC supply output (+)	TEC+	1
TEC supply output (-)	TEC-	2
Ground	GND	3
Thermistor input (1)	TH1	4
Thermistor input (2)	TH2	5
Power supply output (-)	-V _{sup}	6
FAN and programmable preamp internal logic auxiliary supply	+5V	7
Bidirectional data port	DATA	8
Power supply output (+)	+V _{sup}	9
Shield	GND-SH	metal cover

Mechanical layout, mm

PTCC-01-OEM



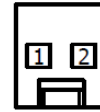
Included accessories for PTCC-01-ADV and PTCC-01-BAS

- USB: TypeA-MicroB cable + AC adaptor
- Smart Manager software

Included accessories for PTCC-01-OEM

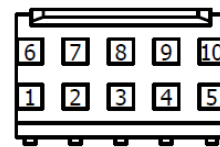
- USB: TypeA-MicroB, KK2-POWER cables
- Smart Manager software

Power supply socket KK2 (male)



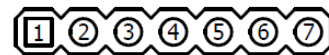
Function	Symbol	Pin number
TEC controller supply input (+)	TECC+	1
TEC controller ground	TEC GND	2

IR module socket DUBOX2x5 (male)



Function	Symbol	Pin number
TEC supply output (+)	TEC+	1
TEC supply output (-)	TEC-	2
Ground	GND	3
Thermistor input (1)	TH1	4
Thermistor input (2)	TH2	5
Power supply output (-)	-V _{sup}	6
FAN and programmable preamp internal logic auxiliary supply	+5V	7
Bidirectional data port	DATA	8
Power supply output (+)	+V _{sup}	9
Shield	GND-SH	10

Status/DATA socket Pin-header 1x7



Function	Symbol	Pin number
Error indicator	ERR - LED	1
Temperature control loop lock indicator	LOCK - LED	2
Module power supply on indicator	SUP - LED	3
Auxiliary supply	3.3 V	4
Transmitted data (RS-232)	TXD	5
Common (signal) ground (RS-232)	GND	6
Received data (RS-232)	RXD	7

3.2 PPS-03 series

PPS-03 is a small-size, easy to use and universal preamplifier power supply, designed to operate with VIGO detection module microM-10.6 and other devices containing uncooled detectors in TO39 packages and preamplifiers SIP-TO39.



Specification (T_a = 20°C)

Parameter	Value	Conditions, remarks
Power supply voltage V _{sup} , V _{DC}	min 9.0 max 16.0	
Output voltage, V _{DC}	±15 ±9	PPS-03-15 PPS-03-09
Output current, mA	±100	
IR module socket	DB9 (female)	D-sub 9 pin
Power supply socket	DC 2.1/5.5	
Weight, g	100±5	

Code description

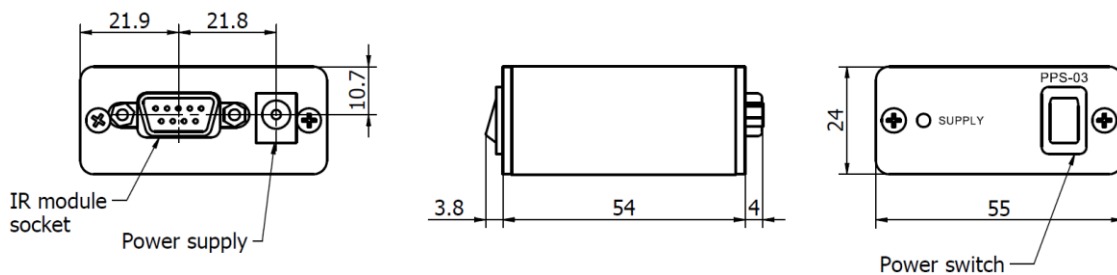
Code description

Type	Output voltage, V _{DC}
• PPS-03	• 09 • 15

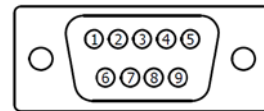
Included accessories

- AC adaptor

Mechanical layout, mm



IR module socket D-sub 9 pin (male)



Function	Symbol	Pin number
Not connected	N.C.	1
Not connected	N.C.	2
Ground	GND	3
Not connected	N.C.	4
Not connected	N.C.	5
Power supply output (-)	-V _{sup}	6
Not connected	N.C.	7
Not connected	N.C.	8
Power supply output (+)	+V _{sup}	9

3.3 AC adaptor and cables

AC adaptor



GE18 05-P1J
 GE18 09-P1J
 GE18 12-P1J
 Sockets: EU, UK, AU ,US

Cable for PC connection



USB: TypeA-MicroB

Signal output cables



SMA-SMA



SMA-BNC



BNC-BNC



MMCX-SMA



MMCX-BNC

Power supply and TEC control cables



LEMO-DB9



AMP2x4-DB9



AMP2x4-DUBOX2x5



LEMO-DUBOX2x5

Power supply cables



KK2-POWER



JWPF-DB9

3.4 DRB-2 base mounting system

DRB-2 is a stable base mounting system dedicated to VIGO detection modules with M4 mounting hole and VIGO uncooled detectors in BNC and PEM-SMA packages. DRB-2 has adjustable height and is compatible with M6 optical breadboards.

DRB-2 consists of:

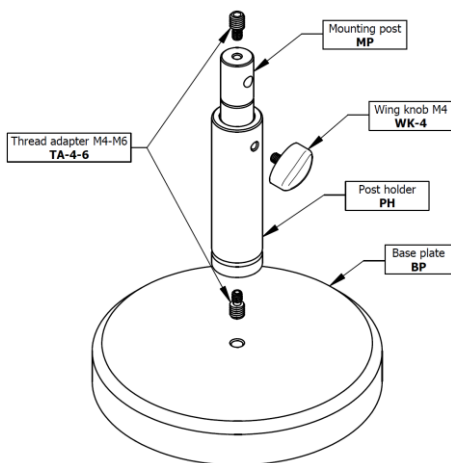
- base plate BP
- mounting post MP
- post holder PH

DRB-2 is a stable base mounting system dedicated to VIGO detection modules with M4 mounting hole and VIGO uncooled detectors in BNC and PEM-SMA packages. DRB-2 has adjustable height and is compatible with M6 optical breadboards.

BP is a base plate made of black, lacquered steel. It provides mechanical stable conditions for the mounting system. Weight: 1756 g.

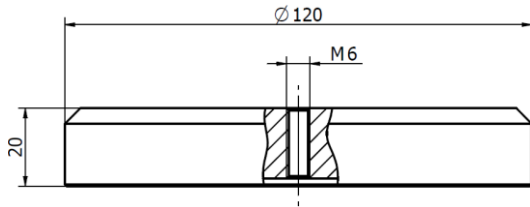
MP is a mounting post made of stainless steel. It is equipped with two thread adapters TA-4-6. Weight: 115 g.

PH is a post holder made of black anodized aluminum. It is equipped with a wing knob WK-4. Weight: 60 g.

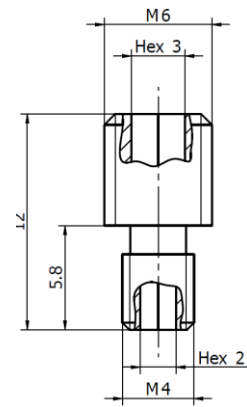


Mechanical layout, mm

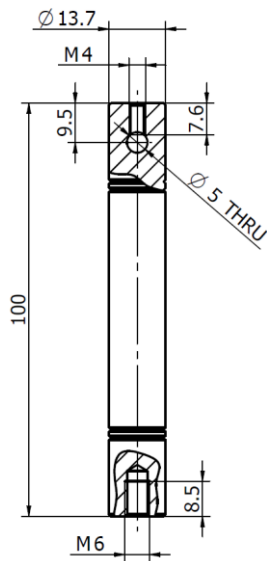
Base plate BP



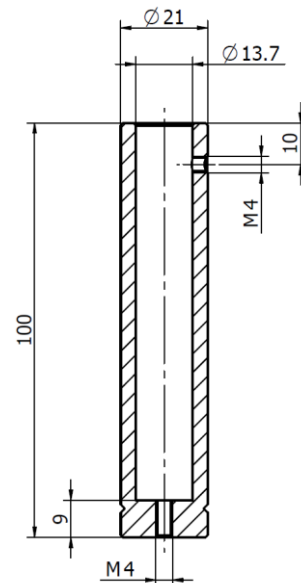
Thread adapter M4-M6



Mounting post MP



Post holder PH



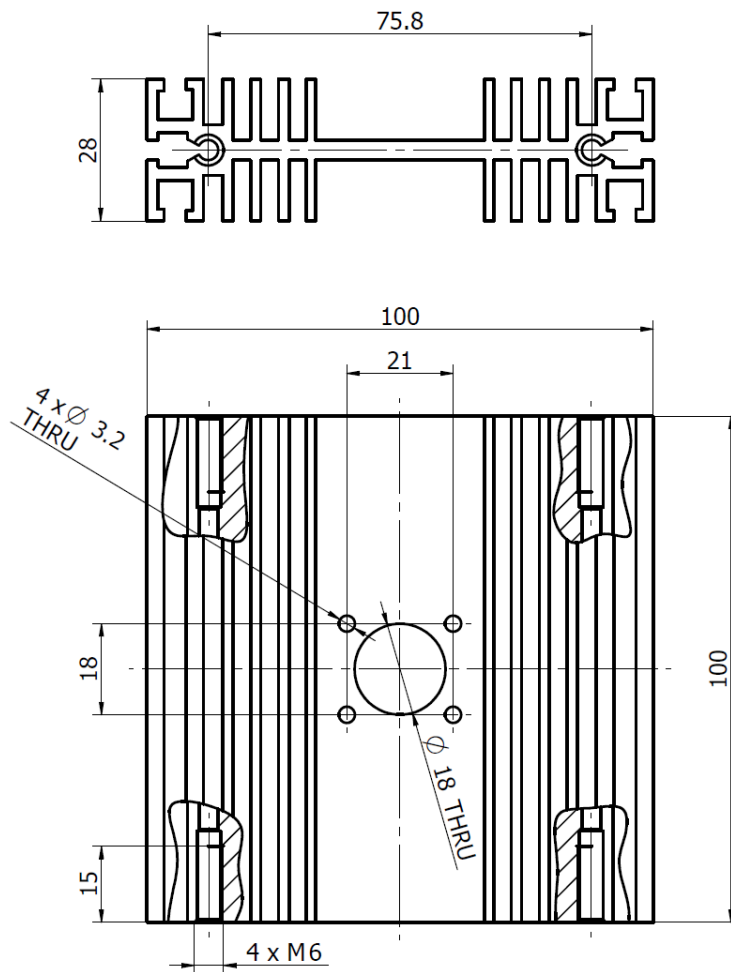
3.5 MHS-2 DH-2 MH-1 OTA

MHS-2 heatsink

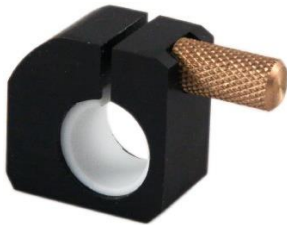
MHS-2 is an external heatsink made of black anodized aluminum, dedicated for OEM VIGO detection modules integrated with TE cooled detectors and preamplifier SIP-TO8. It provides suitable dissipation of heat generated by the Peltier cooler. Its thermal resistance is ~1.5 K/W.



Mechanical layout, mm

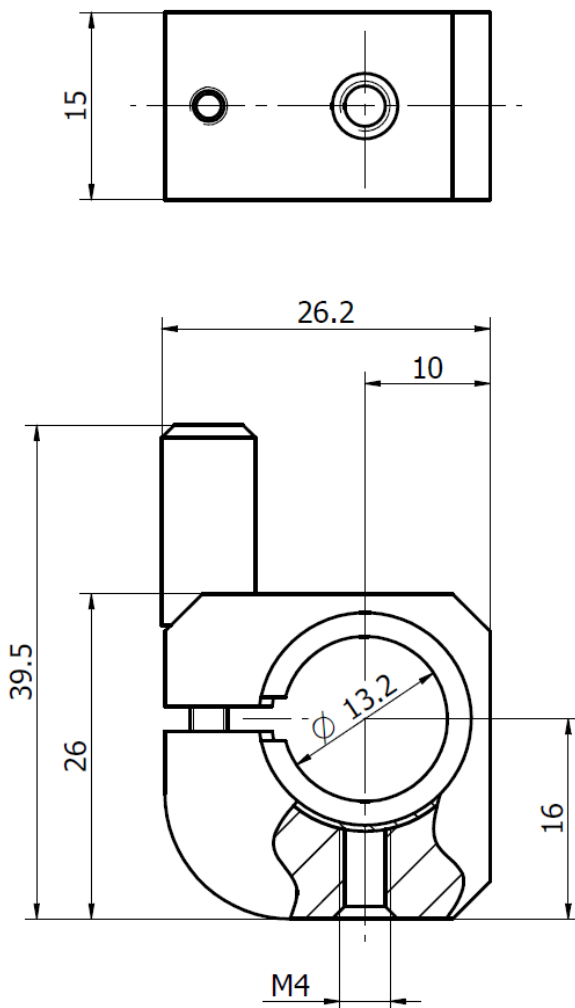


DH-2 detector holder



DH-2 is a detector holder with M4 mounting hole, dedicated for assembly VIGO uncooled detectors in BNC and PEM-SMA packages. It is compatible with DRB-2 mounting system.

Mechanical layout, mm

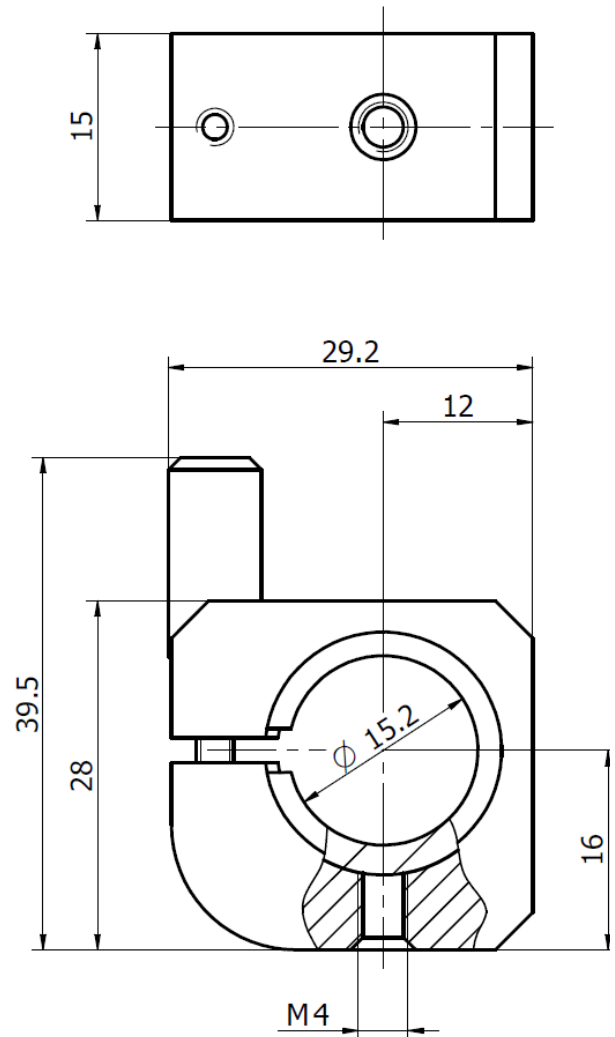


MH-1 module holder



MH-1 is a module holder with M4 mounting hole, dedicated for assembly VIGO microM-10.6 detection modules. It is compatible with DRB-2 mounting system.

Mechanical layout, mm



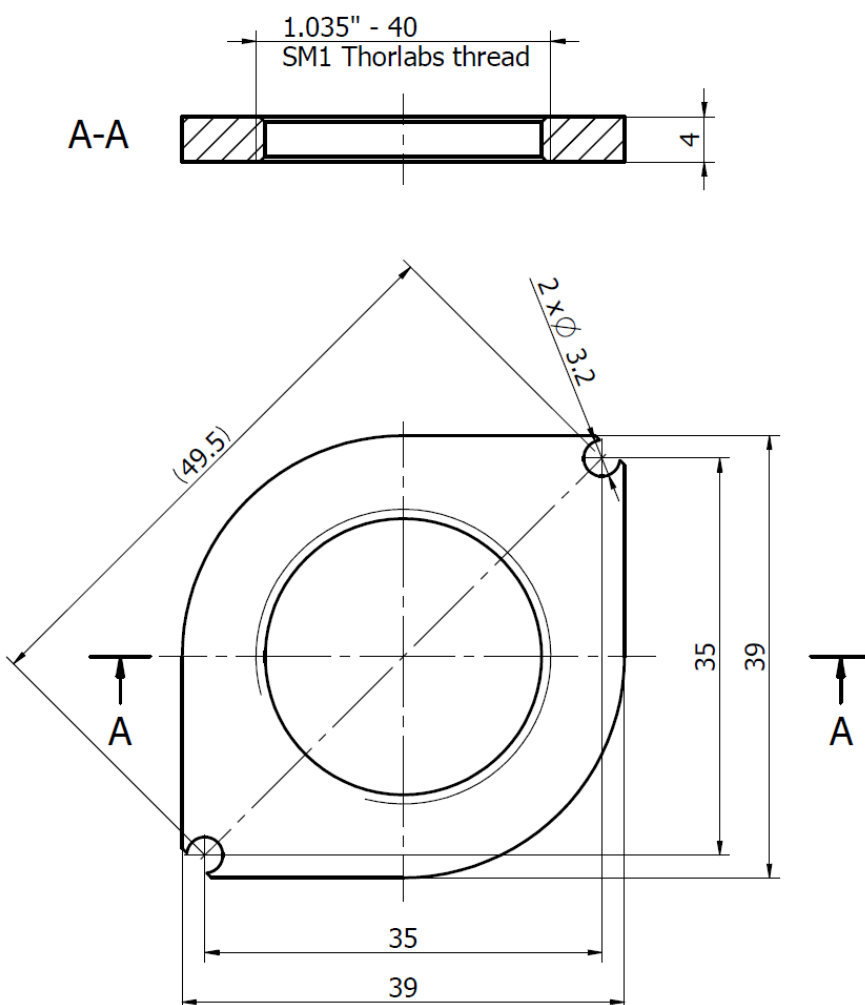
OTA optical threaded adapter

OTA is an optical threaded adapter made of black anodized aluminum. It is an accessory that allows building complex systems containing VIGO detection modules (AIP, MIP, PIP) and optical components.

OTA is compatible with all types of Thorlabs SM1 threaded lens tubes.



Mechanical layout, mm



4 GLOSSARY AND TECHNICAL INFORMATION

4.1 Glossary

Infrared detectors

Infrared photodetectors are semiconductor electro-optical devices that convert infrared radiation into an electrical signal.

Photoconductive detectors PC

Photoconductive detectors based on the photoconductive effect. Infrared radiation generates charge carriers in the semiconductor active region decreasing its resistance. The resistance change is sensed as a current change by applying a constant voltage bias. The devices are characterized by near-linear current-voltage characteristics. The electric field E in photoconductors is constant across the device. It equals the ratio of bias voltage V_b and distance between contacts L :

$$E = \frac{V_b}{L}$$

The optimum bias voltage is specified in the Final test report (supplied with each VIGO device) and depends on detector size, operating temperature, and spectral response.

Photovoltaic detectors PV, PVM

Photovoltaic detectors (photodiodes) are semiconductor structures with one (PV) or multiple (PVM), homo- or heterojunctions. Absorbed photons produce charge carriers that are collected at the contacts, resulting in external photocurrent. Photodiodes have complex current-voltage characteristics. The devices can operate either at flicker-free zero bias or with reverse voltage. A reverse bias voltage is frequently applied to increase responsivity, differential resistance, improve high-frequency performance and increase the dynamic range. Unfortunately, at the expense of flicker noise $1/f$ in most cases.

Photovoltaic detectors are more vulnerable to electrostatic discharges than photoconductors.

Photoelectromagnetic detectors PEM

Photovoltaic detectors are based on the photoelectromagnetic effect based on spatial separation of optically generated electrons and holes in the magnetic field. The devices do not require electrical bias and show no flicker noise $1/f$. The PEM devices are typically used as fast, uncooled detectors of long-wavelength radiation.

Active element material $Hg_{1-x}Cd_xTe$

$Hg_{1-x}Cd_xTe$ also known as Mercury Cadmium Telluride, MCT, HgCdTe, (Cd, Hg)Te, or MerCardTel. It is a variable bandgap alloy, commonly used for the fabrication of photodetectors with a tunable spectral response.

Active element material $InAs_{1-x}Sb_x$

$InAs_{1-x}Sb_x$ also known as Indium Arsenide Antimonide or InAsSb is another variable bandgap alloy used for the fabrication of photodetectors with a tunable spectral response.

Active area A, mm×mm

The physical area of a photosensitive element is the active region that converts incoming optical radiation into the electric output signal.

$$A = W \text{ (width)} \times L \text{ (length)}.$$

In photoconductors, L is a distance between contacts.

Optical area A_o , mm×mm

The apparent optical area of the detector is "seen". It is equal to the physical area of the detector active element unless an optical concentrator is used. The optical detector area can be significantly magnified in detectors supplied with optical concentrators, i.e. immersion microlenses (Chapter **Optical immersion technology**).

$$A_o = W_o \text{ (width)} \times L_o \text{ (length)}.$$

Cut-on wavelength $\lambda_{\text{cut-on}}$ (10%), μm

The shorter wavelength at which a detector responsivity reaches 10% of the peak value.

Peak wavelength λ_{peak} , μm

The wavelength of detector maximum responsivity.

Cut-off wavelength $\lambda_{\text{cut-off}}$ (10%), μm

The longer wavelength at which a detector responsivity reaches 10% of the peak value.

Normalized detectivity D^* , $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$

The signal-to-noise ratio (SNR) at a detector output normalized to 1 W radiant power, a 1 cm^2 detector optical area, and a 1 Hz noise bandwidth.

Noise equivalent power NEP, $\text{nW}/\text{Hz}^{1/2}$

The incident power on the detector generates a signal output equal to the 1 Hz bandwidth noise output. Stated another way, the NEP is the signal level that produces a signal-to-noise ratio (SNR) of 1.

Photocurrent I_{ph}

The photocurrent is the current generated by infrared radiation, which is not in thermal equilibrium with the detector. For small irradiation, the photocurrent is proportional to incident radiation power P.

$$I_{\text{ph}} = R_i \cdot P$$

R_i is the current responsivity.

Current responsivity R_i , A/W

Current responsivity is the ratio of photocurrent and power of radiation. The current responsivity is typically measured for monochromatic radiation (the spectral current responsivity) and blackbody radiation (the blackbody current responsivity). The responsivity typically remains constant for weak radiation and tends to decrease with more strong radiation.

Current responsivity-active area length product $R_i \cdot L$ and current responsivity-optical area length product $R_i \cdot L_o$, $\text{A}\cdot\text{mm}/\text{W}$

The current responsivity of unbiased PEM, PVM, and biased (with constant electric field E) PC detectors is proportional to the reciprocal active area length L (optical area length L_o). Therefore, the current responsivity $R_i \cdot L$ ($R_i \cdot L_o$) is used to compare devices of various formats.

Another normalized current responsivity, $R_i \cdot L/E$ ($R_i \cdot L_o/E$), is used to compare the responsivity of photoconductive detectors of various formats and operate with different electric fields.

Time constant τ , ns

Typically, detector time response can be described by the one-pole filter characteristics. The time constant is the time it takes the detector to reach $1/e \approx 37\%$ of the initial signal value. The time constant is related to the 3dB high cut-off frequency f_{hi} :

$$\tau = 1/(2\pi \cdot f_{hi})$$

The time constant for one pole filter is related to 10-90% rise time t_r :

$$t_r = 2.2 \cdot \tau$$

Bias voltage-active area length ratio V_b/L , V/mm

Normalized photoconductive bias voltage for nonimmersed detectors.

Bias voltage-optical area length ratio V_b/L_o , V/mm

Normalized photoconductive bias voltage for immersed detectors.

Flicker noise 1/f

It is a frequency-dependent noise. It occurs in any biased devices.

1/f noise corner frequency f_c , Hz

Frequency, at which the low-frequency noise equals to the white noise (e.g. the Johnson or shot noise), the flicker noise dominates at $f < f_c$.

Resistance-active area product $R \cdot A$, $\Omega \cdot \text{cm}^2$

Normalized detector resistance for nonimmersed photovoltaic detectors. It is used to compare photodiodes with different sizes of active areas, in which dynamic resistance decreases proportionally to the detector active area.

Resistance-optical area product $R \cdot A_o$, $\Omega \cdot \text{cm}^2$

Normalized detector resistance for immersed photovoltaic detectors. It is used to compare photodiodes with different sizes of optical areas, in which dynamic resistance decreases proportionally to the detector optical area.

Active element temperature T_{det} , K

The detector active element temperature.

Acceptance angle Φ , deg

Acceptance angle is the maximum cone angle at which incoming radiation can be captured by a detector. Radiation coming from a larger angle will not reach the detector. In systems without external objectives, acceptance angle and field of view (FOV) are identical.

Infrared detection modules

The detection module integrates detector, preamplifier, thermoelectric cooler, and other components (detector biasing circuit, heat dissipation system, optics, etc.) in a common package. The operation of detection modules can be described in a similar way as for detectors, by specifying their spectral and frequency characteristics of responsivity and detectivity.

Voltage responsivity R_v , V/W

The output voltage is divided by the optical power incident on the detector. For spectra measurements can be expressed as:

$$R_v(\lambda) = R_i(\lambda) \cdot K_i$$

Low cut-off frequency f_{lo} , Hz

The minimum frequency at which a detection module gain reaches -3dB of the peak value or 0 for DC coupling devices.

High cut-off frequency f_{hi} , Hz

The maximum frequency at which a detection module gain reaches -3dB of the peak value. f_{hi} of the preamplifier may differ from f_{hi} of the detection module.

Noise measurement frequency f_n , Hz

The frequency at which output voltage noise density is measured selectively.

Transimpedance K_i , V/A

Current to voltage conversion ratio:

$$K_i = \frac{V_{out}}{I_{in}}$$

Current signal I_{in} , A

Current signal from photodetector when exposed to incident radiant power.

Output noise voltage density v_n , nV/Hz^{1/2}

Noise voltage density measured at preamplifier output.

Output impedance R_{out} , Ω

Impedance that appears in series with the output from an ideal amplifier.

Load resistance R_{Load} , Ω

Resistance of the detection module's load.

Output voltage V_{out} , V

The output signal of the detection module.

Output voltage offset V_{off} , mV

Output DC voltage of the detection module without input signal.

Power supply input $+V_{sup}$ and $-V_{sup}$, V

The supply voltage required for correct detection module operation.

Power supply current I_{sup} , mA

Supply current consumption during correct detection module operation.

GND

Point of zero potential. It is a common power supply ground and signal ground.

Ambient operating temperature T_a , °C

Ambient temperature during test measurements.

THERMOELECTRIC COOLERS AND THERMOELECTRIC COOLER CONTROLLERS

Active element temperature T_{det} , K

The detector active element temperature.

Maximum thermoelectric cooler current I_{max} , A

Maximum current resulting in greatest ΔT_{max} .

Maximum thermoelectric cooler voltage V_{max} , V

Maximum voltage drop resulting in greatest ΔT_{max} .

Maximum heat pumping capacity Q_{max} , W

Q_{max} rated at $\Delta T = 0$. At other ΔT cooling capacity should be estimated as

$$Q = Q_{max} \cdot (1 - \Delta T / \Delta T_{max}).$$

Maximum temperature difference ΔT_{max} , K

ΔT_{max} rated at $Q = 0$. At other Q the temperature difference should be estimated as

$$\Delta T = \Delta T_{max} \cdot (1 - Q / Q_{max}).$$

Temperature stability, K

It indicates the possible error in the temperature on the thermoelectric cooler.

Temperature readout stability, mK

It indicates the possible error in a readout of the temperature of the thermoelectric cooler provided by the controller.

Detector temperature settling time, s

The time is taken by the cooling system to reach the appropriate temperature of the detector active element.

Maximum TEC output current, A

The maximum current that is provided by the controller to the thermoelectric cooler.

Output voltage range, V

Range of voltage on the output of the module.

Power supply voltage V_{sup} , VDC

The supply voltage required for correct thermoelectric cooler controller operation.

Power supply current I_{sup} , mA

Supply current required for correct thermoelectric cooler controller operation.

Series resistance of the connecting cable, Ω

Material parameter. It is resistance of the supply cable. It depends on the cable length.

4.2 Detector's packages and infrared windows

Photo	Package type	Cooling	Window	Detector type
	BNC	uncooled	no	PC, PCI, PV, PVI, PVM, PVMI
	TO39	uncooled	no	PC, PCI, PV, PVI, PVA, PVIA, PVM, PVMI
	PEM-SMA	uncooled	yes	PEM, PEMI
	PEM-TO8	uncooled	yes	PEM, PEMI
	TO8	uncooled	no	PCQ, PVMQ
	TO8	TE cooled	yes	PC-2TE, PC-3TE, PC-4TE PCI-2TE, PCI-3TE, PCI-4TE, PV-2TE, PVA-2TE, PV-3TE, PV-4TE PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE PVM-2TE PVMI-2TE, PVMI-3TE, PVMI-4TE
	TO66	TE cooled	yes	PC-2TE, PC-3TE, PC-4TE PCI-2TE, PCI-3TE, PCI-4TE PV-2TE, PVA-2TE, PV-3TE, PV-4TE PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE PVM-2TE PVMI-2TE, PVMI-3TE, PVMI-4TE

Uncooled detectors are typically provided in BNC or TO39 packages without the window.

The exception is the specialized PEM package. Due to the magnetic circuit incorporated into the package, a 3° wedged zinc selenide anti-reflection coated (wZnSeAR) window is supplied to protect against external pollution. There are two versions of packages dedicated to photoelectromagnetic detectors:

- PEM-SMA with SMA signal output connector which makes it convenient in use,
- PEM-TO8 on TO8 header which enables integration with VIGO preamplifier.

Encapsulation

Thermoelectrically cooled detectors are mounted in metal packages: TO8 and TO66 sealed with IR windows. The packages are filled with dry, heavy, noble gases (Krypton / Xenon mixture) of low thermal conductivity. Water vapor condensation is prevented by a humidity absorber container mounted inside the package and careful polymer sealing. For low-temperature fluctuation, anti-convection shields are also applied.

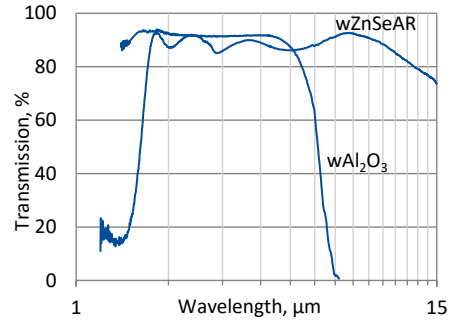
Infrared windows

We provide two types of windows as a standard:

- 3° wedged sapphire (wAl₂O₃)
- 3° wedged zinc selenide anti-reflection coated (wZnSeAR)
- 3° wedge prevents „fringing” – unwanted interference effects.

Material	Hardness, kg/mm ²	Wedging	Anti- reflection coating	Symbol
sapphire	1370	3°	no	wAl ₂ O ₃
zinc selenide	120	3°	yes	wZnSeAR

Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



4.3 Thermoelectric cooling, temperature control, heat sinking

Thermoelectric cooling

Some of the VIGO devices are provided with thermoelectric cooling. Cooling of infrared detectors reduces noises, increases responsivity, shifts the cut-off wavelength toward longer wavelengths (in HgCdTe detectors) and toward shorter wavelengths (in InAs / InAsSb detectors).

Two-, three- and four-stage thermoelectric coolers are available. The operation of TE coolers is based on the Peltier effect. Thermoelectric coolers are supplied with a DC power supply.

Temperature control

Thermoelectrically cooled detectors are equipped with the built-in thermistor to provide precise control and measurements of detector active element temperature.

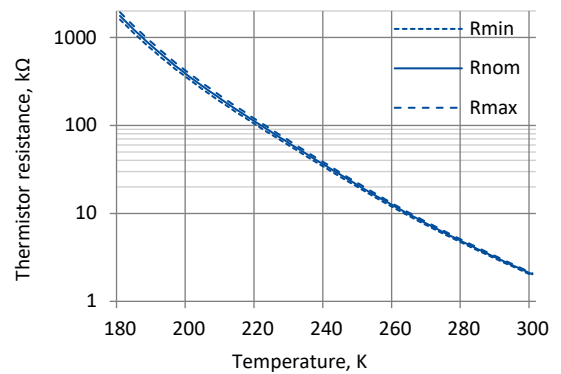
The electricity applied to between terminals of thermistors should be under the maximum power dissipation at 25°C (100 mW) not to destroy the thermosensor. For the measurement of resistance, the power should not exceed 1 mW.

Thermoelectric coolers parameters^{*)}

Parameter	Cooling		
	2TE	3TE	4TE
Active element temperature T_{det} , K	~230	~210	~195
Maximum TEC voltage V_{max} , V	1.3	3.6	8.3
Maximum TEC current I_{max} , A	1.20	0.45	0.40
Maximum heat pumping capacity Q_{max} , W	0.36	0.27	0.28

^{*)} Depend on the temperature of the hot side of the TE cooler. Typically specified for 300 K.

Thermistor characteristics



Resistance vs. temperature of thermistor

T,K	T,°C	R _{min} , kΩ	R _{nom} , kΩ	R _{max} , kΩ
180	-93	1594.97	1757.95	1935.84
182	-91	1336.02	1469.90	1615.75
184	-89	1124.16	1234.66	1354.81
186	-87	950.46	1042.11	1141.58
188	-85	807.57	883.99	966.78
190	-83	689.57	753.62	822.88
192	-81	591.68	645.64	703.89
194	-79	510.07	555.75	604.98
196	-77	441.68	480.54	522.34
198	-75	384.05	417.25	452.91
200	-73	335.23	363.71	394.26
202	-71	293.65	318.17	344.43
204	-69	258.05	279.23	301.88
206	-67	227.41	245.76	265.36
208	-65	200.91	216.85	233.85
210	-63	177.89	191.77	206.55
212	-61	157.81	169.92	182.79
214	-59	140.22	150.80	162.03
216	-57	124.76	134.02	143.83
218	-55	111.14	119.25	127.83
220	-53	99.10	106.21	113.72
222	-51	88.44	94.67	101.25
224	-49	78.98	84.44	90.21
226	-47	70.57	75.37	80.42
228	-45	63.09	67.30	71.73
230	-43	56.42	60.12	64.01
232	-41	50.49	53.74	57.15
234	-39	45.19	48.05	51.04
236	-37	40.47	42.98	45.61
238	-35	36.26	38.47	40.77

T,K	T,°C	R _{min} , kΩ	R _{nom} , kΩ	R _{max} , kΩ
240	-33	32.51	34.45	36.47
242	-31	29.16	30.87	32.64
244	-29	26.18	27.68	29.24
246	-27	23.51	24.84	26.21
248	-25	21.14	22.30	23.51
250	-23	19.02	20.05	21.11
252	-21	17.13	18.04	18.98
254	-19	15.45	16.25	17.07
256	-17	13.95	14.65	15.38
258	-15	12.61	13.23	13.87
260	-13	11.41	11.96	12.53
262	-11	10.34	10.83	11.33
264	-9	9.38	9.82	10.26
266	-7	8.52	8.91	9.31
268	-5	7.75	8.10	8.45
270	-3	7.07	7.37	7.69
272	-1	6.45	6.72	7.00
274	1	5.89	6.13	6.38
276	3	5.38	5.60	5.83
278	5	4.93	5.13	5.32
280	7	4.52	4.69	4.87
282	9	4.15	4.30	4.46
284	11	3.81	3.95	4.09
286	13	3.50	3.63	3.75
288	15	3.22	3.33	3.45
290	17	2.96	3.06	3.17
292	19	2.73	2.82	2.91
294	21	2.51	2.59	2.68
296	23	2.32	2.39	2.46
298	25	2.13	2.20	2.27

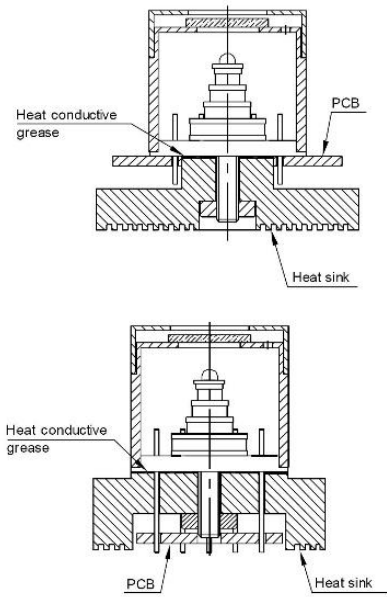
Heat sinking

Suitable heat sinking is necessary to dissipate heat generated by the Peltier cooler or excessive optical irradiation. Since heat is almost 100% dissipated at the base of the detector header, it must be firmly attached to the heat sink.

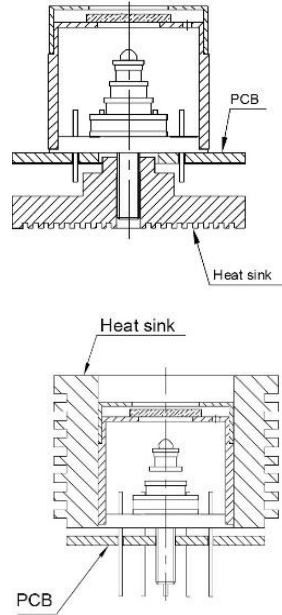
A thin layer of heat conductive epoxy or silicon (thermal) grease should be used to improve thermal contact between the detector header and the heat sink to maximize heat transfer. Heat sinking via the detector cylindrical cap or via the mounting screw is not sufficient.

A heatsink thermal resistance of ~2 K/W is typically recommended for most 2TE and 3TE coolers. For a 4TE cooler, heatsink thermal resistance ~1 K/W is recommended.

Correct heatsink placement



Incorrect heatsink placement



4.4 Optical immersion technology

In order to improve performance and get the best signal-to-noise ratio of the devices, optical immersion technology may be applied. It is successfully used in all types of VIGO detectors.

Optical immersion is monolithic integration of detector active elements with hyperhemispherical microlens (default). It makes the optical linear size of the detector active area 11 times larger compared to its physical size. This results in improvement of detectivity D^* by one order of magnitude. Also detector electric capacitance C_d is reduced by a factor of two orders of magnitude compared to the conventional detector of the same optical area. Acceptance angle Φ is reduced to $\sim 36^\circ$ – the microlens naturally shields background radiation which is one of the factors of noise. The hemispherical microlens is available as a custom option.

Optical power limitations for optically immersed detectors are more restrictive than for detectors without immersion microlens – for more information please see chapter **Precaution for use**.

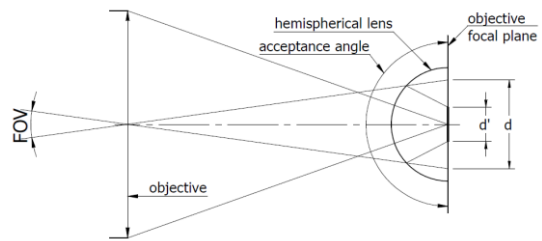
Optically immersed detectors parameters

Parameter	Microlens shape			
	Hemisphere ^{*)}		Hyperhemisphere	
	Theory	GaAs	Theory	GaAs
Distance L	R	R	$R \cdot (n+1)$	$4.3 \cdot R$
d / d'	n	3.3	n^2	10.9
$D^*_{imm} / D^*_{non-imm}$	n	3.3	n^2	10.9
Acceptance angle Φ	180°	180°	$2 \arcsin(1/n)$	$\sim 36^\circ$

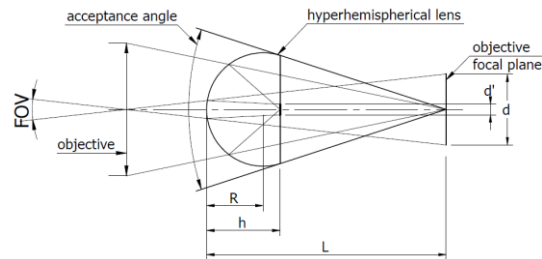
^{*)} Custom option

n – refractive index of microlens material (GaAs), $n = 3.3$,
 d – optical (apparent) detector size,
 d' – physical detector size,
 R – lens radius,
 L – lens face to objective focal plane distance,
 h – lens thickness, $h = R + R/n$

Function and properties of hemisphere microlens



Function and properties of hyperhemisphere microlens



4.5 Precautions for use

Operating temperature

A detector should be operated at its optimal temperature given in the Final test report (delivered with every device).

Maximum voltage

Do not operate the photovoltaic detector at higher bias voltages than suggested in the Final test report (delivered with every device).

Be careful using ohmmeters for photovoltaic detectors!

Standard ohmmeters may overbias and damage the detector. This is especially true for a small physical area or SWIR photovoltaic detectors. The bias of 10 mV can be used for resistance measurements of any type of detector. Ask for conditions of I-V plot measurements!

Usage

Devices can operate in the 10% to 80% humidity, in the -20°C to +30°C ambient temperature range. Operation at >30°C ambient may reduce performance for standard Peltier coolers. Ask for devices that can operate in the +30°C to +80°C ambient temperature range.

Storage

The following conditions should be fulfilled for the safe and reliable operation of the detector:

- store in a dark place, 10% to 90% humidity and -20°C to +50°C temperature,
- avoid exposure to the direct sunlight and strong UV/VIS light as this may result in degradation of the detector performance,
- avoid electrostatic discharges at leads therefore, the devices should be stored having leads shorted.

Beam power limitations

Damage thresholds, specified as integrated power of incoming radiation:

- For devices without immersion microlens irradiated with continuous wave (CW) or single pulses of more than 1 μs duration, irradiated power on the active area must not exceed 100 W/cm². The irradiance of a pulse shorter than 1 μs must not exceed 1 MW/cm².
- For optically immersed detectors irradiated with CW or single pulse longer than 1 μs irradiance on the apparent optical active area must not exceed 2.5 W/cm². The irradiance of the pulse shorter than 1 μs must not exceed 10 kW/cm².
- For repeated irradiation with pulses shorter than 1 μs, the equivalent CW irradiation, average power over the pulse-to-pulse period should be less than the CW damage threshold according to the equation:

$$\text{equivalent CW radiation power density} = \frac{\text{pulse peak power}}{\text{focus area}} \cdot \text{pulse duration} \cdot \text{repetition rate}$$

Saturation thresholds vary by detector type and can be provided upon request.

Handling

Particular attention should be paid to not scratching the surface of the window. A damaged window may entirely degrade the detector performance. Excessive mechanical stress applied to the package itself or to a device containing the package may result in permanent damage. Peltier element inside thermoelectrically cooled detectors is susceptible to mechanical shocks. Great care should be taken when handling cooled detectors.

Cleaning window

Keep the window clean. Use a soft cotton cloth damped with isopropyl alcohol and wipe off the surface gently if necessary.

Mechanical shocks

The Peltier elements may be damaged by excessive mechanical shock or vibration. Care is recommended during manipulations and normal use. Drop impacts against a hard surface are particularly dangerous.

Shaping leads

Avoid bending the leads at a distance less than 2 mm from the base of the package to prevent glass seal damage. When shaping the leads, a maximum of two right-angle bends and three twists at a distance minimum of 6 mm from the base of the package. Keep the leads of the detecting element shorted when shaping!

Soldering leads

IR detectors can be easily damaged by excessive heat. Special care should be taken when soldering the leads. Usage of heat sinks is highly recommended. Tweezers can be used for this purpose; when soldering, clamp a lead at a place between the soldering iron and the base of the package. To avoid the destructive influence of ESD and other accidental voltages (e.g. from a non-grounded soldering iron) rules for handling LSI integrated circuits should be applied to IR detectors too. Leads should be soldered at +370 °C or below within 5 s.



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