VIGO
PHOTONICS

PRODUCTS

2024

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INTRODUCTION

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
	0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0	
InGaAs photovoltaic detectors	SWIR: PVA	• Spectral range 0.9 – 1.7 μm • Temperature stable up to 300°C • Complying with the RoHS Directive • Uncooled • Large active areas available
InAs and InAsSb photovoltaic detectors	MWIR: PVA/PVIA/PVMA LWIR: PVIA	• Spectral range 2.0 – 13.6 μm • Temperature stable up to 300°C • Mechanically durable • Complying with the RoHS Directive • No bias required • No 1/f noise • Uncooled and TE-cooled • Immersion microlens technology available
HgCdTe photoconductive detectors	MWIR: PC/PCI LWIR: PC/PCI	• Broad 1.0 – 16.0 μm spectral range • High detectivity • Long lifetime and MTBF • Stability and reliability • 1/f noise • Uncooled and TE-cooled • Immersion microlens technology available

HgCdTe
photovoltaic detectors
	MWIR: PV/PVI
	LWIR: PV/PVI
		• Near BLIP detection in 3.0 – 6.0 μm range
		• No bias required
		• No 1/f noise
		• Bandwidth:
		  ◦ tens of MHz (without reverse bias)
		  ◦ ≥ 1GHz (with reverse bias)
		• Uncooled and TE-cooled
		• Immersion microlens technology available

HgCdTe photovoltaic multi-junction detectors	LWIR: PVM/PVMI	• Wide 2.0 – 12.0 μm spectral range • Large active areas available • No bias required • No 1/f noise • Short time constant ≤1.5 ns • Operation from DC to high frequency • Uncooled and TE-cooled • Immersion microlens technology available
HgCdTe photoelectromagnetic detectors	LWIR: PEM	• Wide 2.0 – 12.0 μm spectral range • No bias required • No 1/f noise • Short time constant ≤1.5 ns • Operation from DC to high frequency

Detector code description

Different information such as detector type, optical immersion, number of stages thermoelectric cooler, the specific wavelength, size of active (or optical) area, package type, window type and acceptance angle combine a detector code.

Detector type	Immersion	–	Cooling	–	Specific wavelength	–	Active/optical area	–	Package	–	Window	–	Acceptance angle

How to choose an amplifier?

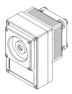
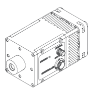
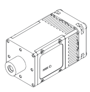
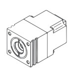
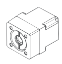
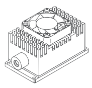
The infrared detection module integrates infrared photodetector and amplifier in a common package.

The integration makes detectors less vulnerable to:

- overbias,
- electrostatic discharges,
- electromagnetic interferences,
- other environmental exposures.

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

VIGO OFFERS A BROAD LINE OF TRANSIMPEDANCE AMPLIFIERS.

Main feature	Photo	Amplifier type	Low cut-on frequency f_{lo}, Hz	High cut-off frequency f_{hi}, Hz	Transimpedance K_i, V/A	Heatsink / fan	TEC controller	Mounting hole	Page
all-in-one		AIP	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 200k (fixed)	on board	on board	M4	126
programmable		PIP	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	129
standard		MIP	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 200k (fixed)	on board	PTCC-01 necessary	M4	132
small		SIP-TO8	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 100k (tunable)	external heatsink necessary	PTCC-01 necessary	none	135
small		SIP-TO39	DC, 10, 100, 1k, 10k	100k, 1M, 10M, 100M, 250M	up to 100k (tunable)	not necessary	not necessary	none	138
fast		FIP	1k, 10k	1G	up to 8.5k (fixed)	on board	PTCC-01 necessary	M4	141

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

Selected Line products

VIGO Selected Line products are the most popular infrared detectors and detection modules. These devices are suitable for both laboratory research as well as testing, prototyping, and R&D stages, and in a variety of MWIR and LWIR industrial applications.

FEATURES

- Detection modules dedicated to specific applications
- High performance and reliability
- Very good repeatability in mass production
- Cost-effective solutions
- Fast delivery

INFRARED DETECTORS

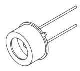
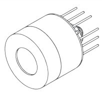
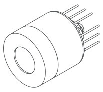
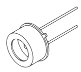
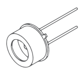
Photo	Detector symbol	Page
	PVI-4-1×1-TO39-NW-36	30
	PVI-2TE-6-1×1-TO8-wZnSeAR-36	45
	PCI-3TE-12-1×1-TO8-wZnSeAR-36	78

Photo	Detector symbol	Page
	PVI-5-1×1-TO39-NW-36	35
	PVM-10.6-1×1-TO39-NW-90	63

INFRARED DETECTION MODULES

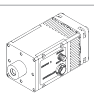
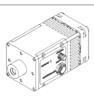
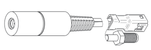
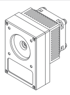
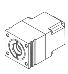
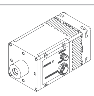
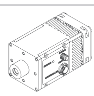
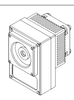
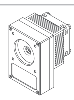
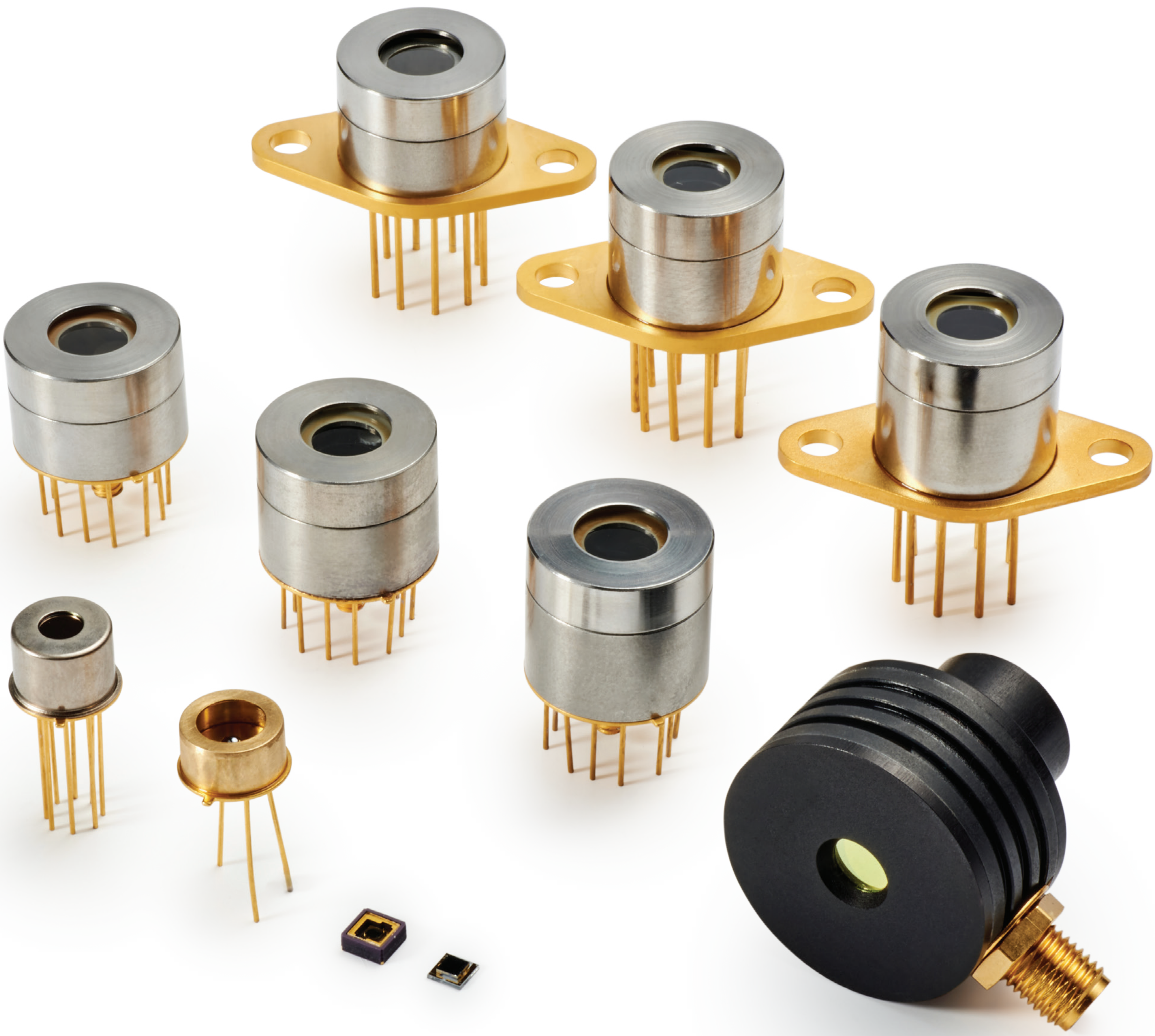
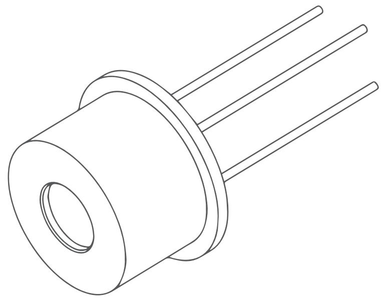
Photo	Detection module symbol	Page
	LabM-I-4	98
	LabM-I-6-01	104
	microM-10.6	110
	UHSM-10.6	116
	SM-I-12	122

Photo	Detection module symbol	Page
	LabM-I-5	101
	LabM-I-10.6	107
	UM-I-10.6	113
	UHSM-I-10.6	119

IR DETECTORS



PVA-1.7-d1-TO39-wAl_2O_3-45



InGaAs room-temperature photovoltaic infrared detector

FEATURES

- Cut-off wavelength: 1.7 µm
- RoHS-compliant III-V material
- High ambient operating and storage temperature
- Long-term stability and reliability
- Front-side illuminated
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4
- Telecommunication
- LIDAR
- Laser range finder, laser warning system
- Lasers and diodes life tests
- Food analysis
- Pharmaceutical analysis

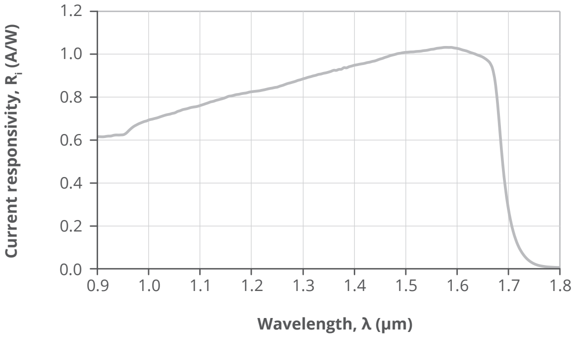
DETECTOR CONFIGURATION

Detector symbol	Cooling	Temperature sensor	Active area diameter, d_A, mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window p. 193
PVA-1.7-d1-TO39-wAl_2O_3-45	no	n/a	1	no	TO39 (3 pins)	~45	wAl_2O_3 (3 deg. wedged sapphire)

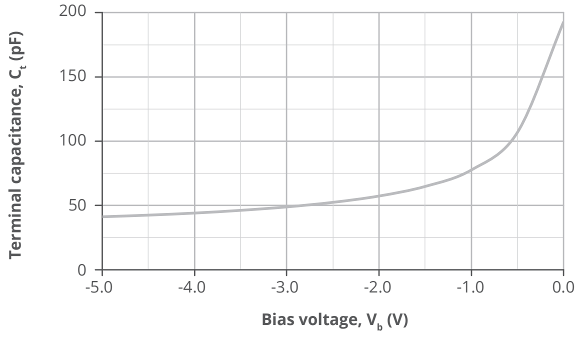
SPECIFICATION (T_{amb} = 293 K, V_b = -5 V)

Detector symbol	Peak wavelength	Cut-off wavelength (10%)		Detectivity		Current responsivity		Dark current	Dark current density		Terminal capacitance			3db bandwidth	Dynamic resistance	Bias voltage
	λ_{peak}	$\lambda_{cut-off}$		D*(λ=1.55µm, 20kHz)		R_i(λ=1.55µm)		I_{dark}	J_{dark}		C_t				R	V_b
	µm	µm		cm·Hz$^{1/2}$/W		A/W		nA	A/cm^2		pF			MHz	MΩ	V
	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max	Min.	Typ.	Max.	Typ.	Min.	Typ.
PVA-1.7-d1-TO39-wAl_2O_3-45	1.59±0.03	1.69	1.71	2.0×10^{11}	6.0×10^{11}	1.00	1.02	100	4.0×10^{-6}	1.0×10^{-5}	27	30	33	250	3	-5

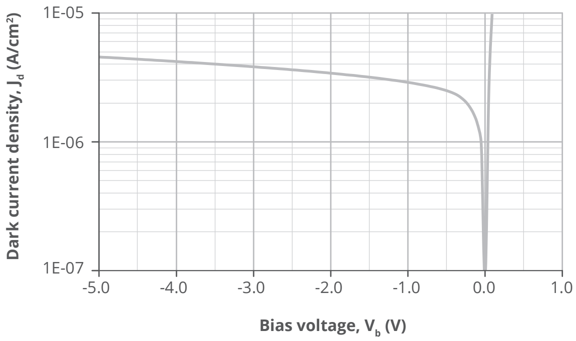
SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)



C_t-V_b CHARACTERISTICS (Typ., T_{amb} = 293 K)



J_{dark}-V_b CHARACTERISTICS (Typ., T_{amb} = 293 K)



MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (with window) – Technical drawing (p. 199)

RECOMMENDED AMPLIFIER

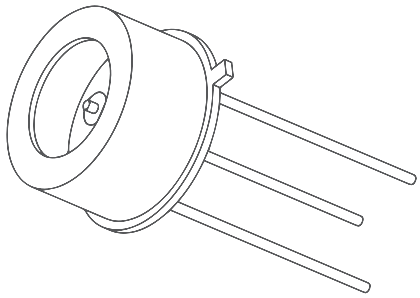
- SIP-TO39 series (p. 138)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Detector parameters depend on T_{amb}	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 85	°C
Soldering temperature	Within 5 s or less	≤260	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum bias voltage, $V_{b\ max}$		-10	V

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVA-3-1×1-TO39-NW-90



InAs room temperature photovoltaic infrared detector

FEATURES

- Spectral range: 2.3 to 3.5 µm
- RoHS-compliant III-V material
- High ambient operating and storage temperature
- Back-side illuminated
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: H_2O, HF, CH_4, C_2H_2, C_2H_4, C_2H_6, NH_3
- Combustion process control
- Green energy
- Medical laser control

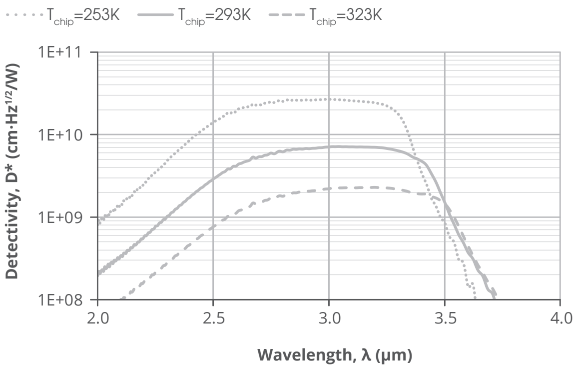
DETECTOR CONFIGURATION

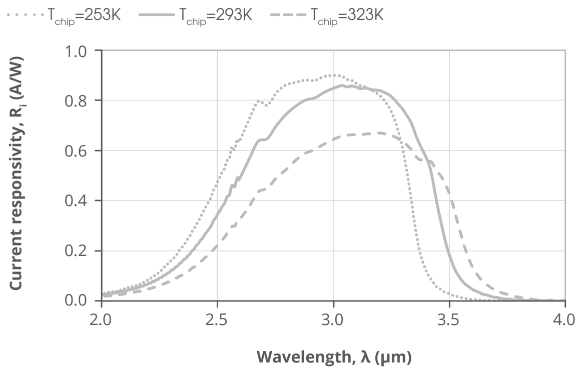
Detector symbol	Cooling	Temperature sensor	Active area A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window
PVA-3-1×1-TO39-NW-90	no	n/a	1×1	no	TO39 (3 pins)	~90	no

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

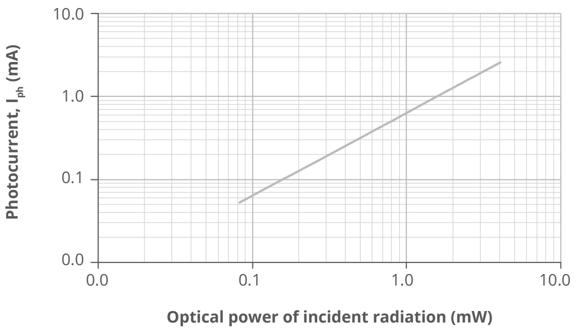
Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant		Dynamic resistance	
	λ_{cut-on}	λ_{peak}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$		$R_i(\lambda_{peak})$		τ		R_d	
	µm	µm	µm	$cm \cdot Hz^{1/2}/W$		A/W		ns		Ω	
	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Min.	Typ.
PVA-3-1×1-TO39-NW-90	2.3	3.1	3.5	5.0×10^9	7.0×10^9	0.7	0.9	35	40	55	75

SPECTRAL RESPONSE (Typ.)





LINEARITY (Typ., T_{amb} = 293 K, λ = 3.06 µm)



MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)

RECOMMENDED AMPLIFIER

- SIP-TO39 series (p. 138)

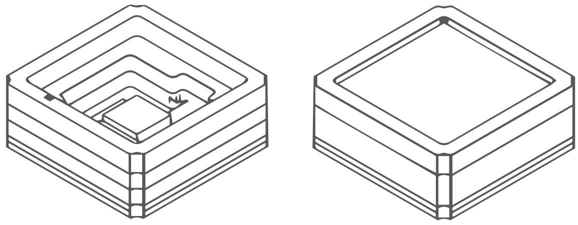
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Detector parameters depend on T_{amb}	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$		-1	V

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVA-3-d1.2-SMD series

InAs room temperature photovoltaic infrared detectors



FEATURES

- Spectral range: 1.3 to 3.6 µm (without filter)
- Front-side illuminated
- III-V material compliant with the RoHS Directive
- High ambient operating and storage temperature
- Compact, surface mount type ceramic package (size 4×4 mm^2)
- Compatible with lead-free solder reflow
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: H_2O, HF, CH_4, C_2H_2, C_2H_4, C_2H_6, NH_3
- Combustion process control
- Green energy
- Medical laser control

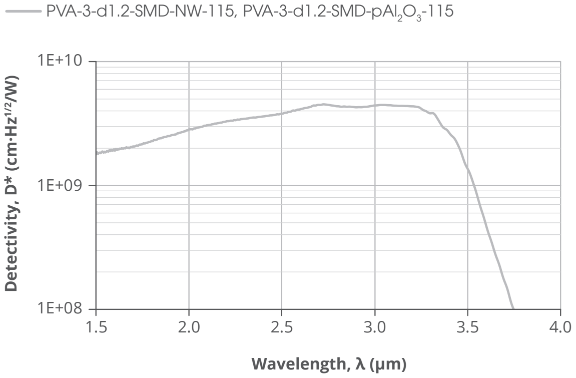
SERIES DESCRIPTION

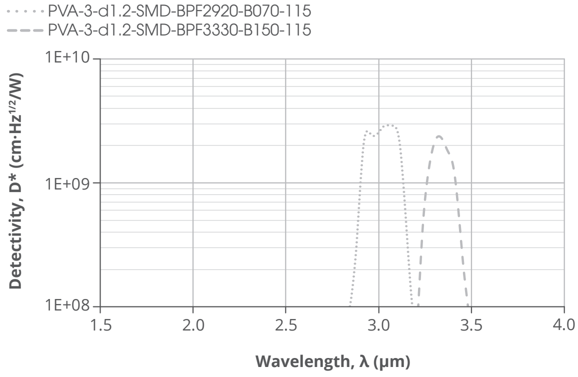
Detector symbol	Cooling	Temperature sensor	Active area diameter, d_A, mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVA-3-d1.2-SMD-NW-115	no	n/a	1.2	no	SMD	≥115 deg.	no
PVA-3-d1.2-SMD-pAl_2O_3-115							pAl_2O_3 (planar sapphire)
PVA-3-d1.2-SMD-BPF2920-B070-115							planar with filter (λ_{cwl} = 2920 nm, bandwidth = 70 nm)
PVA-3-d1.2-SMD-BPF3330-B150-115							planar with filter (λ_{cwl} = 3330 nm, bandwidth = 150 nm)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

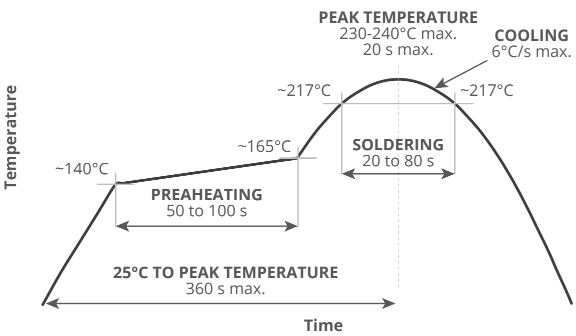
Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant		Dynamic resistance	
	$\lambda_{cut\text{-}on}$	λ_{peak}	$\lambda_{cut\text{-}off}$	$D^*(\lambda_{peak}$, 20 kHz)		$R_i(\lambda_{peak})$		τ		R_d	
	µm	µm	µm	cm·Hz$^{1/2}$/W		A/W		ns		Ω	
	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Min.	Typ.
PVA-3-d1.2-SMD-NW-115	1.30	2.90	3.60	3.0×10^9	5.0×10^9	0.45	0.55	35	45	55	75
PVA-3-d1.2-SMD-pAl_2O_3-115											
PVA-3-d1.2-SMD-BPF2920-B070-115	-	2.92	-	2.5×10^9	3.5×10^9	0.40	0.48				
PVA-3-d1.2-SMD-BPF3330-B150-115	-	3.33	-	1.6×10^9	2.4×10^9	0.28	0.36				

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





RECOMMENDED REFLOW SOLDERING CONDITIONS



Desoldering and re-soldering the component may cause degradation of the detector.

MECHANICAL LAYOUT AND SIGNAL OUTPUT

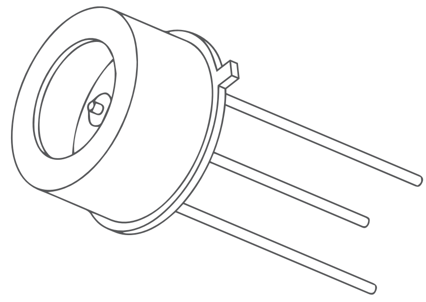
- SMD package (without window) – Technical drawing (p. 195)
- SMD package (with window) – Technical drawing (p. 196)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Detector parameters depend on T_{amb}	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 70	°C
Soldering temperature	See "Recommended reflow soldering conditions"	-	-
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm²
	Single pulses <1 μs duration	1	MW/cm²
Maximum bias voltage, $V_{b\ max}$		-1	V

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device

PVIA-5-1×1-TO39-NW-36



InAsSb room temperature optically immersed photovoltaic infrared detector

FEATURES

- Spectral range: 2.6 to 5.3 µm
- RoHS-compliant III-V material
- High ambient operating and storage temperature
- Unique optical immersion technology applied
- Back-side illuminated
- No minimum order quantity required

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

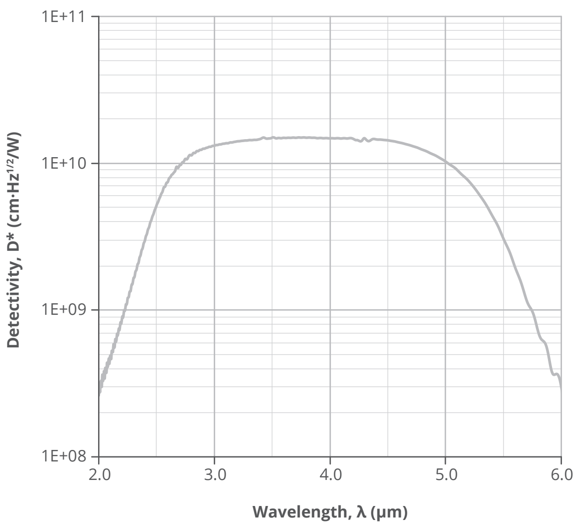
DETECTOR CONFIGURATION

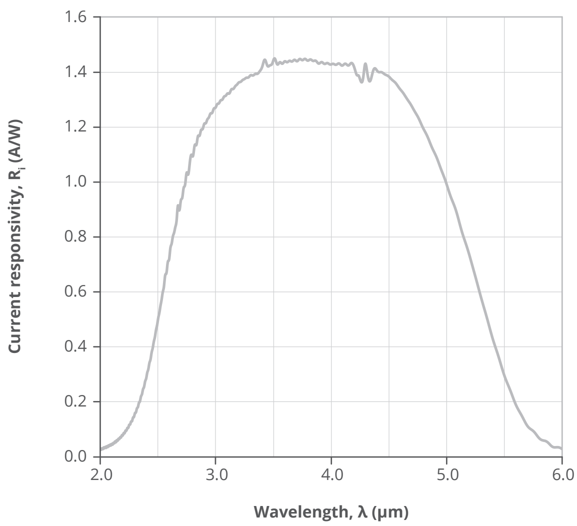
Detector symbol	Cooling	Temperature sensor	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window
PVIA-5-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$		$R_i(\lambda_{peak})$		τ	R_d	
	µm	µm	µm	$cm \cdot Hz^{1/2}/W$		A/W		ns	Ω	
	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVIA-5-1×1-TO39-NW-36	2.3	4.0±0.5	5.6	5.0×10^{9}	1.7×10^{10}	1.2	1.4	30	80	150

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)

RECOMMENDED AMPLIFIER

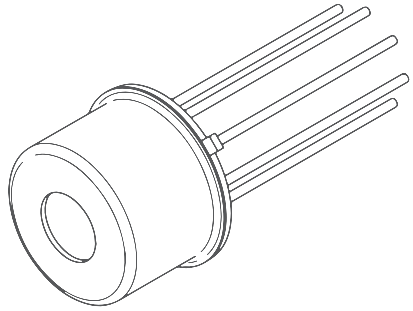
- SIP-TO39 series (p. 138)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Detector parameters depend on T_{amb}	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm²
	Single pulses <1 μs duration	10	kW/cm²
Maximum bias voltage, $V_{b\,max}$		-1	V

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVMA-1TE-5-1×1-TO39-pSiAR-70



InAsSb one-stage thermoelectrically cooled photovoltaic multi-junction infrared detector

FEATURES

- Spectral range: 1.7 to 5.5 µm
- RoHS-compliant III-V material
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCT

- **AMS3140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

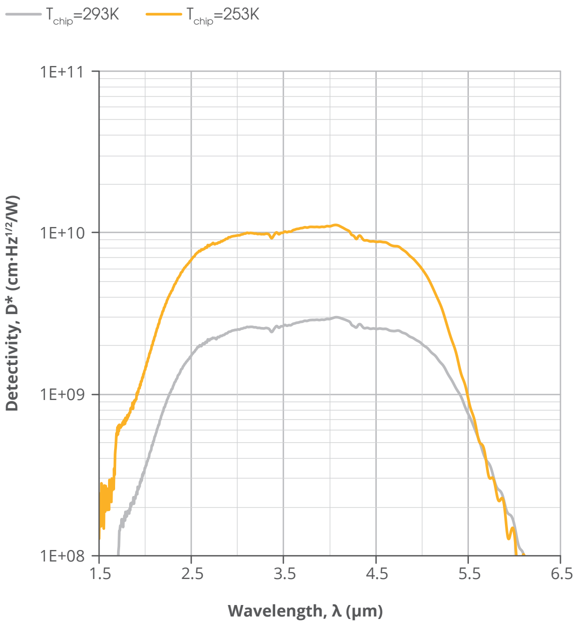
DETECTOR CONFIGURATION

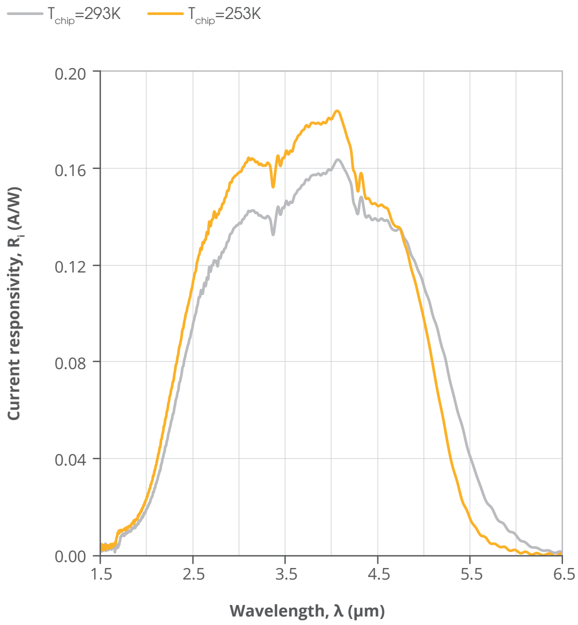
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVMA-1TE-5-1×1-TO39-pSiAR-70	1TE (T_{chip}≅253K)	thermistor	1×1	no	TO39 (8 pins)	~70	pSiAR (planar silicon, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Active element temperature	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant		Dynamic resistance	
	T_{chip}	λ_{cut-on}	λ_{peak}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$		$R_i(\lambda_{peak})$		τ		R_d	
	K	µm	µm	µm	cm·Hz$^{1/2}$/W		A/W		ns		Ω	
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Min.	Typ.
PVMA-1TE-5-1×1-TO39-pSiAR-70	253	2.0	4.0±0.5	5.5	3.0×10^{9}	1.0×10^{10}	0.08	0.18	20	80	1 000	4 000
	293			5.9	1.0×10^{9}	3.0×10^{9}	0.06	0.16	30	160	150	450

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

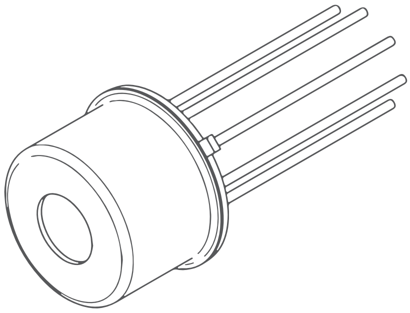
- 1TE-TO39 (8 pins) package – Technical drawing (p. 200)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\ max}$		-2	V
Maximum TEC voltage, $V_{TEC\ max}$	1TE	0.4	V
Maximum TEC current, $I_{TEC\ max}$	1TE	1.67	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVMA-1TE-6-1×1-TO39-pSiAR-70



InAsSb one-stage thermoelectrically cooled photovoltaic multi-junction infrared detector

FEATURES

- Spectral range: 2.2 to 6.6 µm
- RoHS-compliant III-V material
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCT

- **AMS6140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x, SO_x, HNO_3
- Exhaust gas denitrification
- Combustion process control
- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Heat-seeking, thermal signature detection
- Non-destructive material testing
- Biochemical analysis
- Laser calibration

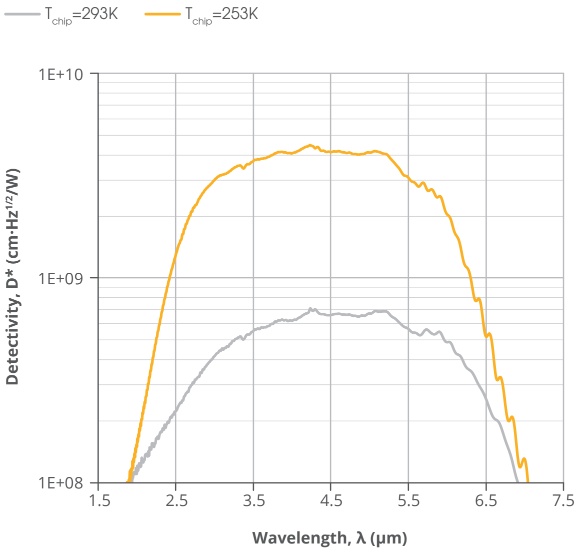
DETECTOR CONFIGURATION

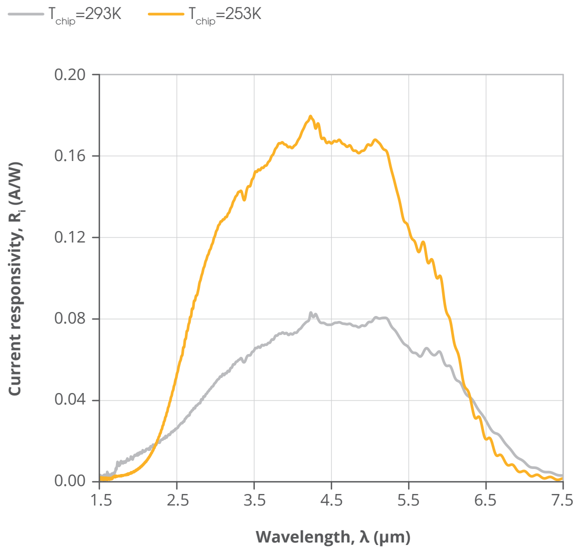
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVMA-1TE-6-1×1-TO39-pSiAR-70	1TE (T_{chip}≅253K)	thermistor	1×1	no	TO39 (8 pins)	~70	pSiAR (planar silicon, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Active element temperature	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant		Dynamic resistance	
	T_{chip}	λ_{cut-on}	λ_{peak}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$		$R_i(\lambda_{peak})$		τ		R_d	
	K	µm	µm	µm	$cm\cdot Hz^{1/2}/W$		A/W		ns		Ω	
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Min.	Typ.
PVMA-1TE-6-1×1-TO39-pSiAR-70	253	2.0	4.4±0.5	6.6	1.4×10^9	4.3×10^9	0.08	0.18	40	200	300	800
	293			7.1	2.3×10^8	6.9×10^8	0.03	0.08			50	100

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 1TE-TO39 (8 pins) package – Technical drawing (p. 200)

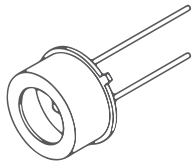
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 70	°C
Storage temperature, T_{stg}		-20 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\ max}$		-2	V
Maximum TEC voltage, $V_{TEC\ max}$	1TE	0.4	V
Maximum TEC current, $I_{TEC\ max}$	1TE	1.67	A

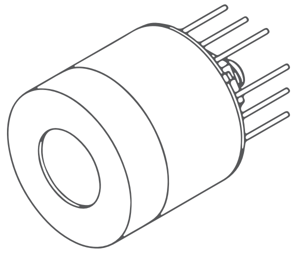
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVIA-10.6 SERIES

InAs/InAsSb superlattice room temperature and thermoelectrically cooled optically immersed photovoltaic infrared detectors



TO39



4TE-TO8

FEATURES

- Spectral range: 2.0 to 13.6 µm
- RoHS-compliant III-V material
- Unique optical immersion technology applied
- Back-side illuminated
- Long term stability
- Fast response
- No minimum order quantity required

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: C_2H_6
- Toxic gas detection
- Gas leak detection

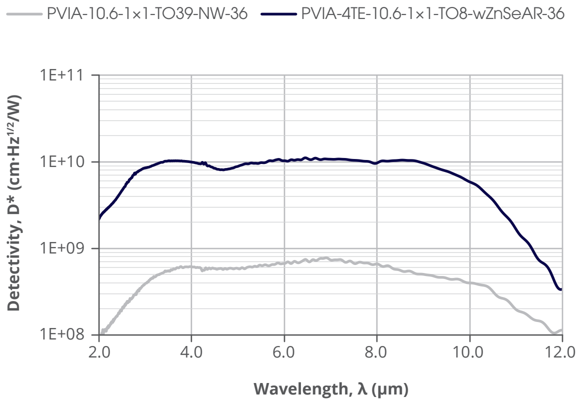
DETECTOR CONFIGURATION

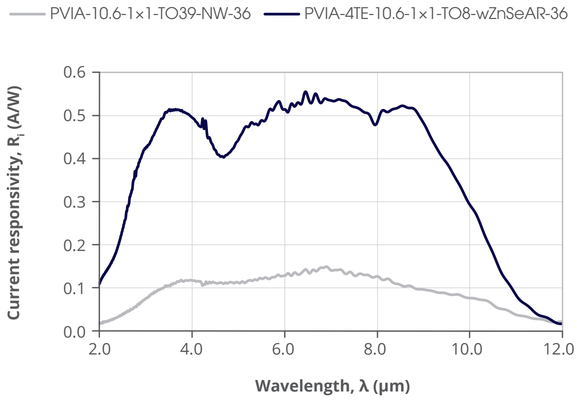
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVIA-10.6-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no
PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36	4TE (T_{chip}≅200K	thermistor			TO8		wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

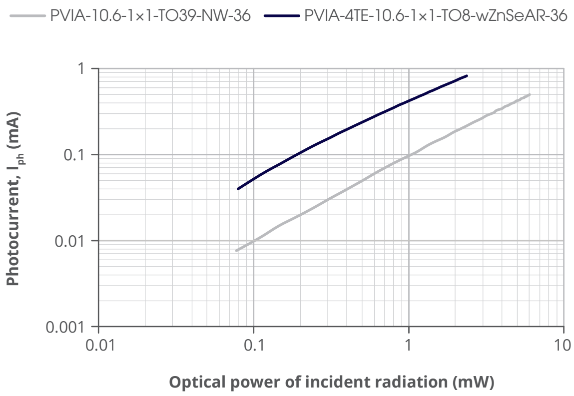
Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant		Dynamic resistance	
	$\lambda_{cut\text{-}on}$	λ_{peak}	$\lambda_{cut\text{-}off}$	$D^*(\lambda_{peak}$, 20kHz)		$R_i(\lambda_{peak})$		τ		R_d	
	µm	µm	µm	cm·Hz$^{1/2}$/W		A/W		ns		Ω	
	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Min.	Typ.
PVIA-10.6-1×1-TO39-NW-36	1.8	7.1	12.0	5.0×10^{8}	7.7×10^{8}	0.09	0.14	1.65	5	30	51
PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36	1.8	6.7	11.3	8.0×10^{9}	1.0×10^{10}	0.45	0.55	3	5	350	500

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





LINEARITY
(Typ., T_{amb} = 293 K, λ = 4.55 µm)



MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window)
  – Technical drawing (p. 198)
- 4TE-TO8 package
  – Technical drawing (p. 210)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVIA-10.6-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135)

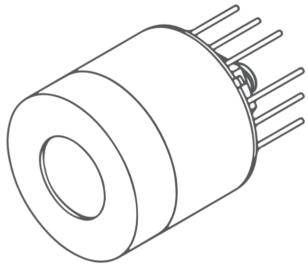
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-40 to 70	°C
Storage temperature, T_{stg}		-40 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\,max}$		-1.5	V
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVIA-4TE-13-1×1-TO8-wZnSeAR-36

InAs/InAsSb superlattice four-stage thermoelectrically cooled optically immersed photovoltaic infrared detector



FEATURES

- Spectral range: 2.0 to 13.6 µm
- RoHS-compliant III-V material
- Unique optical immersion technology applied
- Back-side illuminated
- Long term stability
- Fast response
- No minimum order quantity required

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: C_2H_6
- Toxic gas detection
- Gas leak detection

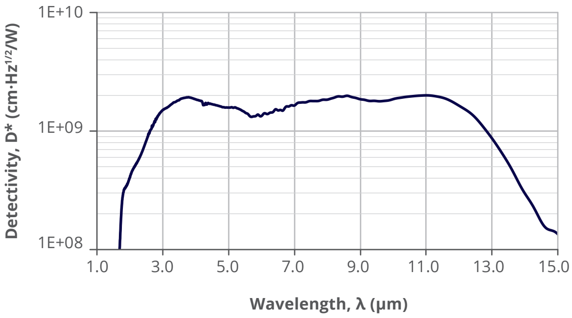
DETECTOR CONFIGURATION

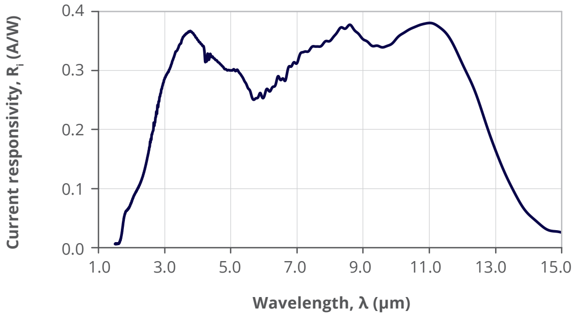
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVIA-4TE-13-1×1-TO8-wZnSeAR-36	4TE (T_{chip}≅200K)	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity		Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$		$R_i(\lambda_{peak})$		τ	R_d	
	µm	µm	µm	$cm \cdot Hz^{1/2}/W$		A/W		ns	Ω	
	Max.	Typ.	Min.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVIA-4TE-13-1×1-TO8-wZnSeAR-36	2.0	10.5	13.6	$2.0×10^9$	$3.0×10^9$	0.25	0.38	3	90	120

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





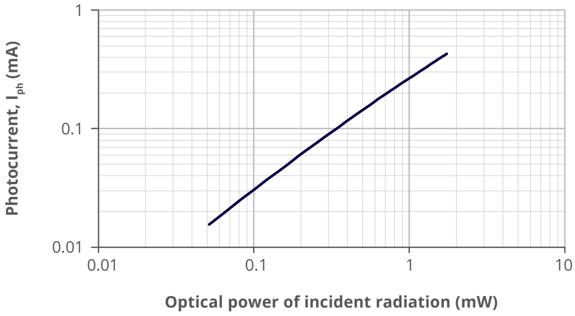
MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package – Technical drawing (p. 210)

RECOMMENDED AMPLIFIERS

- AIP series (p. 126)
- PIP series (p. 129)
- MIP series (p. 132)
- SIP-TO8 series (p. 135)

LINEARITY (Typ., T_{amb} = 293 K, λ = 4.55 µm)



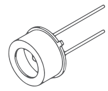
ABSOLUTE MAXIMUM RATINGS

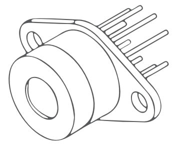
Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-40 to 70	°C
Storage temperature, T_{stg}		-40 to 85	°C
Soldering temperature	Within 5 s or less	≤370	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\,max}$		-1.5	V
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

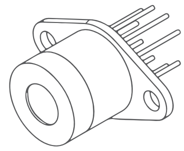
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

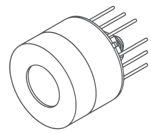
PVI-3 SERIES

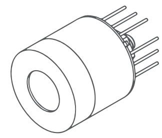
HgCdTe room temperature and thermoelectrically cooled photovoltaic optically immersed infrared detectors


TO39


2TE-TO66


4TE-TO66


2TE-TO8


4TE-TO8

FEATURES

- Spectral range: 2.2 to 3.35 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: H_2O, HF, CH_4, C_2H_2, C_2H_4, C_2H_6, NH_3
- Combustion process control
- Green energy
- Medical laser control

RELATED PRODUCTS

- **PVA-3-1×1-TO39-NW-90** RoHS-compliant detector (p. 12)
- **PVA-3-d1.2-SMD** RoHS-compliant detector series (p. 14)

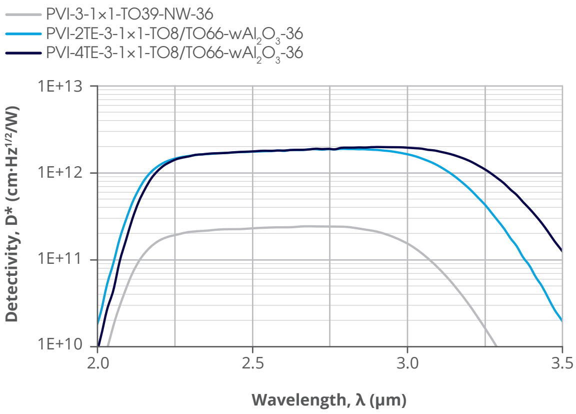
SERIES DESCRIPTION

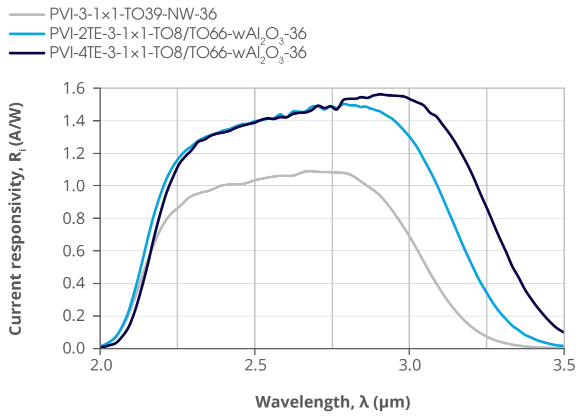
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-3-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no
PVI-2TE-3-1×1-TO8-wAl$_2$O$_3$-36	2TE T_{chip}≅230K	thermistor			TO8		wAl$_2$O$_3$ (3 deg. wedged sapphire)
PVI-2TE-3-1×1-TO66-wAl$_2$O$_3$-36					TO66		
PVI-4TE-3-1×1-TO8-wAl$_2$O$_3$-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-3-1×1-TO66-wAl$_2$O$_3$-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVI-3-1×1-TO39-NW-36	2.2	2.7±0.2	3.0	3.15	2.0×10^{11}	8.0×10^{10}	1.5×10^{11}	1.4	0.5	0.8	350	10 000	50 000
PVI-2TE-3-1×1-TO8-wAl$_2$O$_3$-36		2.8±0.2		3.25	1.5×10^{12}	5.5×10^{11}	1.0×10^{12}				280	1 500 000	5 000 000
PVI-2TE-3-1×1-TO66-wAl$_2$O$_3$-36													
PVI-4TE-3-1×1-TO8-wAl$_2$O$_3$-36				3.35	2.0×10^{12}	8.0×10^{11}	1.2×10^{12}					3 000 000	6 000 000
PVI-4TE-3-1×1-TO66-wAl$_2$O$_3$-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without the window)
  – Technical drawing (p. 198)
- 2TE-TO8 package
  – Technical drawing (p. 204)
- 2TE-TO66 package
  – Technical drawing (p. 206)
- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-3-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVI-2TE-3-1×1-TO8-wAl$_2$O$_3$-36	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135), FIP series*) (p. 141)
PVI-4TE-3-1×1-TO8-wAl$_2$O$_3$-36	

*) Only for biased detectors

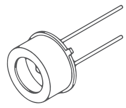
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	4TE	0.4	

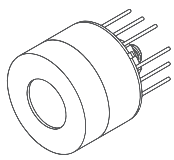
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PV-4 SERIES

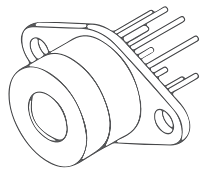
HgCdTe room temperature and thermoelectrically cooled photovoltaic infrared detectors



TO39



2TE-TO8



2TE-TO66

FEATURES

- Spectral range: 2.3 to 4.4 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCT

- **LabM-I-4** detection module (p. 98)

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO_2
- Breath analysis: C_2H_6, CH_2O, NH_3
- Explosion prevention
- Exhaust gas denitrification
- Emission control (exhaust fumes, greenhouse gases)
- Contactless temperature measurements (metal industry)

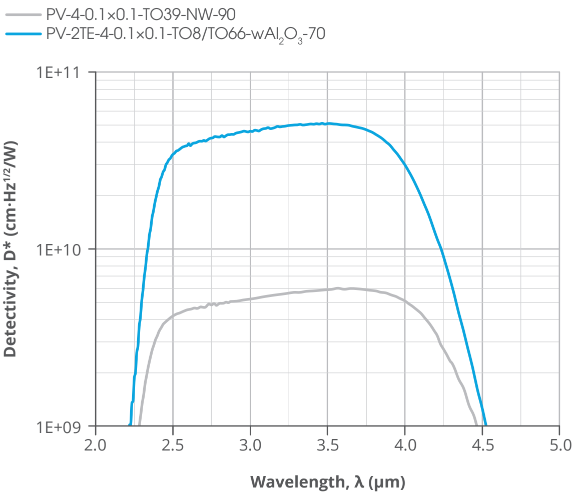
SERIES DESCRIPTION

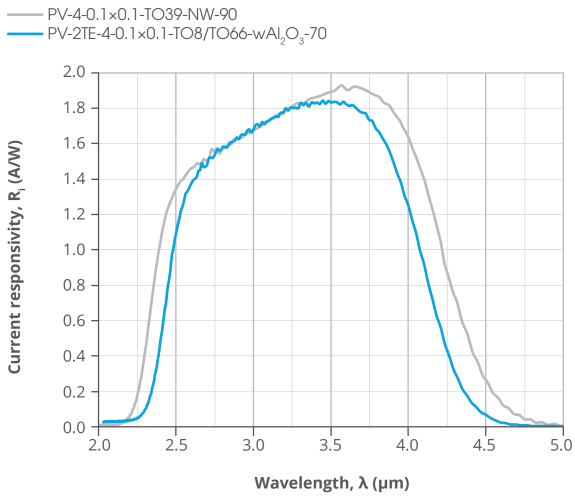
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PV-4-0.1×0.1-TO39-NW-90	no	n/a	0.1×0.1	no	TO39 (3 pins)	~90	no
PV-2TE-4-0.1×0.1-TO8-wAl_2O_3-70	2TE T_{chip}≅230K	thermistor			TO8	~70	wAl_2O_3 (3 deg. wedged sapphire)
PV-2TE-4-0.1×0.1-TO66-wAl_2O_3-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	
	$\lambda_{cut\text{-}on}$	λ_{peak}	λ_{spec}	$\lambda_{cut\text{-}off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PV-4-0.1×0.1-TO39-NW-90				4.3	6.0×10^9	3.0×10^9	4.0×10^9				150	800	2 000
PV-2TE-4-0.1×0.1-TO8-wAl_2O_3-70	2.3	3.5±0.1	4.0	4.4	5.0×10^{10}	2.0×10^{10}	3.0×10^{10}	1.95	1.0	1.3	100	30 000	100 000
PV-2TE-4-0.1×0.1-TO66-wAl_2O_3-70													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window)
  – Technical drawing (p. 197)
- 2TE-TO8 package
  – Technical drawing (p. 203)
- 2TE-TO66 package
  – Technical drawing (p. 205)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PV-4-0.1×0.1-TO39-NW-90	SIP-TO39 series (p. 138)
PV-2TE-4-0.1×0.1-TO8-wAl_2O_3-70	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135), FIP series*) (p. 141)

*) Only for biased detectors

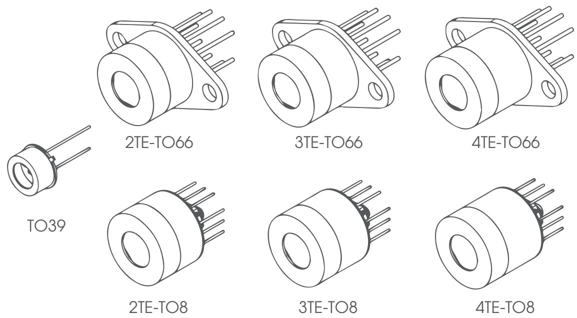
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\ max}$		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVI-4 SERIES

HgCdTe room temperature and thermoelectrically cooled photovoltaic optically immersed infrared detectors



FEATURES

- Spectral range: 2.3 to 4.4 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required
- Detector **PVI-4-1×1-TO39-NW-36** is a **Selected Line product**

RELATED PRODUCTS

- **LabM-I-4** detection module (p. 98)

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO_2
- Breath analysis: C_2H_6, CH_2O, NH_3
- Explosion prevention
- Exhaust gas denitrification
- Emission control (exhaust fumes, greenhouse gases)
- Contactless temperature measurements (metal industry)

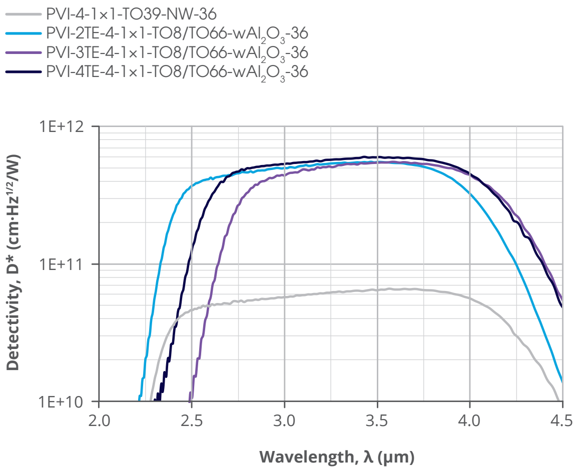
SERIES DESCRIPTION

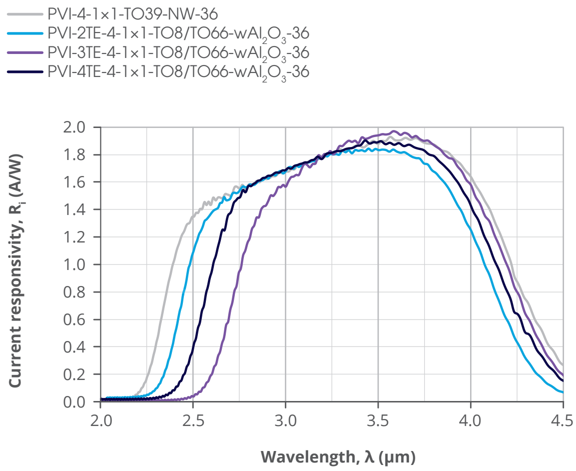
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-4-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no
PVI-2TE-4-1×1-TO8-wAl$_2$O$_3$-36	2TE T_{chip}≅230K	thermistor			TO8		wAl$_2$O$_3$ (3 deg. wedged sapphire)
PVI-2TE-4-1×1-TO66-wAl$_2$O$_3$-36					TO66		
PVI-3TE-4-1×1-TO8-wAl$_2$O$_3$-36	3TE T_{chip}≅210K				TO8		
PVI-3TE-4-1×1-TO66-wAl$_2$O$_3$-36					TO66		
PVI-4TE-4-1×1-TO8-wAl$_2$O$_3$-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-4-1×1-TO66-wAl$_2$O$_3$-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

<table>
<tr><th rowspan="4">Detector symbol</th><th>Cut-on wavelength (10%)</th><th>Peak wavelength</th><th>Specific wavelength</th><th>Cut-off wavelength (10%)</th><th colspan="3">Detectivity</th><th colspan="3">Current responsivity</th><th>Time constant</th><th colspan="2">Dynamic resistance</th></tr>
<tr><th>λ_{cut-on}</th><th>λ_{peak}</th><th>λ_{spec}</th><th>$\lambda_{cut-off}$</th><th>D*(λ_{peak}, 20kHz)</th><th colspan="2">D*(λ_{spec}, 20kHz)</th><th>R_i(λ_{peak})</th><th colspan="2">R_i(λ_{spec})</th><th>τ</th><th colspan="2">R_d</th></tr>
<tr><th>µm</th><th>µm</th><th>µm</th><th>µm</th><th>cm·Hz$^{1/2}$/W</th><th colspan="2">cm·Hz$^{1/2}$/W</th><th>A/W</th><th colspan="2">A/W</th><th>ns</th><th colspan="2">Ω</th></tr>
<tr><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th></tr>
<tr><td>PVI-4-1×1-TO39-NW-36</td><td rowspan="7">2.3</td><td rowspan="3">3.5±0.1</td><td rowspan="7">4.0</td><td rowspan="7">4.4</td><td>6.0×10^{10}</td><td>3.0×10^{10}</td><td>4.0×10^{10}</td><td>1.95</td><td rowspan="7">1.0</td><td rowspan="7">1.3</td><td>150</td><td>800</td><td>2 000</td></tr>
<tr><td>PVI-2TE-4-1×1-TO8-wAl_2O_3-36</td><td rowspan="2">5.0×10^{11}</td><td rowspan="2">2.0×10^{11}</td><td rowspan="2">3.0×10^{11}</td><td rowspan="6">1.8</td><td rowspan="6">100</td><td rowspan="2">30 000</td><td rowspan="2">100 000</td></tr>
<tr><td>PVI-2TE-4-1×1-TO66-wAl_2O_3-36</td></tr>
<tr><td>PVI-3TE-4-1×1-TO8-wAl_2O_3-36</td><td rowspan="2">3.6±0.1</td><td rowspan="2">5.5×10^{11}</td><td rowspan="4">3.0×10^{11}</td><td rowspan="2">3.5×10^{11}</td><td rowspan="2">60 000</td><td rowspan="2">150 000</td></tr>
<tr><td>PVI-3TE-4-1×1-TO66-wAl_2O_3-36</td></tr>
<tr><td>PVI-4TE-4-1×1-TO8-wAl_2O_3-36</td><td rowspan="2">3.6±0.15</td><td rowspan="2">6.0×10^{11}</td><td rowspan="2">4.0×10^{11}</td><td rowspan="2">200 000</td><td rowspan="2">800 000</td></tr>
<tr><td>PVI-4TE-4-1×1-TO66-wAl_2O_3-36</td></tr>
</table>

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)
- 2TE-TO8 package – Technical drawing (p. 204)
- 2TE-TO66 package – Technical drawing (p. 206)
- 3TE-TO8 package – Technical drawing (p. 207)
- 3TE-TO66 package – Technical drawing (p. 208)
- 4TE-TO8 package – Technical drawing (p. 210)
- 4TE-TO66 package – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-4-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVI-2TE-4-1×1-TO8-wAl$_2$O$_3$-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)
PVI-3TE-4-1×1-TO8-wAl$_2$O$_3$-36	
PVI-4TE-4-1×1-TO8-wAl$_2$O$_3$-36	

*) Only for biased detectors

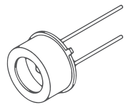
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, V_{bmax}		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	3TE	3.6	
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	3TE	0.45	
	4TE	0.4	

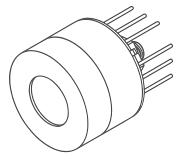
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PV-5 SERIES

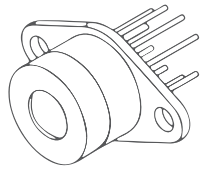
HgCdTe room temperature and thermoelectrically cooled photovoltaic infrared detectors



TO39



2TE-TO8



2TE-TO66

FEATURES

- Spectral range: 2.0 to 5.6 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-5** detection module (p. 101)
- **PVIA-5-1×1-TO39-NW-36** RoHS-compliant detector (p. 16)
- **PVMA-1TE-5-1×1-TO39-pSiAR-70** RoHS-compliant detector (p. 18)
- **AMS3140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

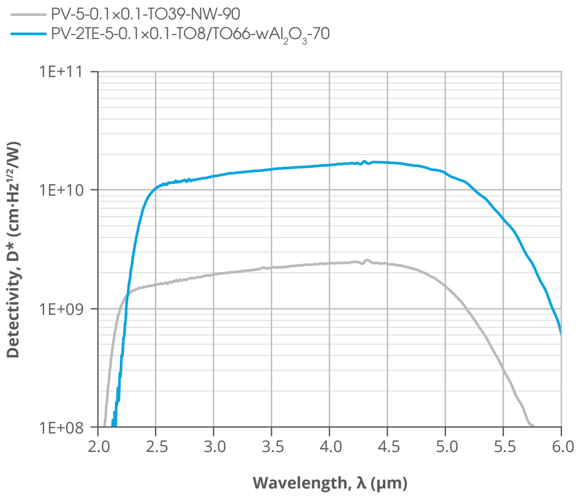
SERIES DESCRIPTION

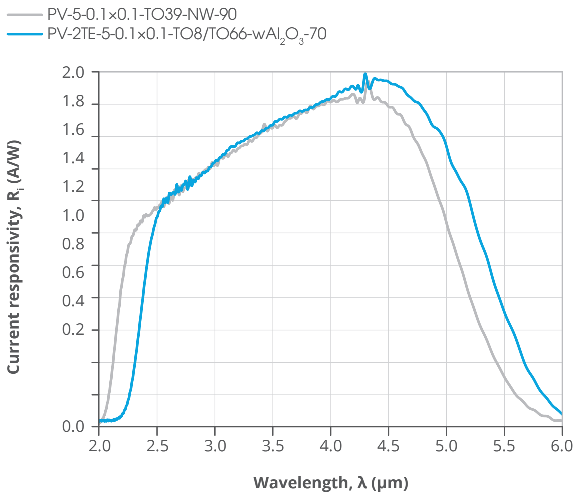
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PV-5-0.1×0.1-TO39-NW-90	no	n/a	0.1×0.1	no	TO39 (3 pins)	~90	no
PV-2TE-5-0.1×0.1-TO8-wAl$_2$O$_3$-70	2TE T_{chip}≅230K	thermistor			2TE-TO8	~70	wAl$_2$O$_3$ (3 deg. wedged sapphire)
PV-2TE-5-0.1×0.1-TO66-wAl$_2$O$_3$-70					2TE-TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PV-5-0.1×0.1-TO39-NW-90	2.0	4.4±0.2	5.0	5.4	2.5×10^9	1.0×10^9	1.5×10^9	2.0	1.0	1.2	120	100	250
PV-2TE-5-0.1×0.1-TO8-wAl$_2$O$_3$-36	2.3			5.6	1.7×10^{10}	9.0×10^9	1.2×10^{10}	2.1	1.2	1.5	80	2 000	5 000
PV-2TE-5-0.1×0.1-TO66-wAl$_2$O$_3$-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 197)
- 2TE-TO8 package – Technical drawing (p. 203)
- 2TE-TO66 package – Technical drawing (p. 205)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PV-5-0.1×0.1-TO39-NW-90	SIP-TO39 series (p. 138)
PV-2TE-5-0.1×0.1-TO8-wAl$_2$O$_3$-70	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135), FIP series*) (p. 141)

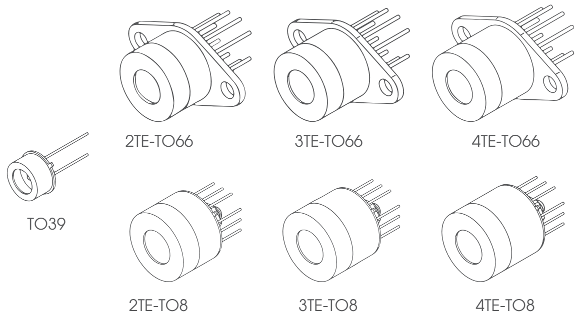
*) Only for biased detectors

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm^2
	Single pulses <1 μs duration	1	MW/cm^2
Maximum bias voltage, $V_{b\,max}$		-800	mV
Maximum TEC voltage, $V_{TEC\,max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\,max}$	2TE	1.2	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVI-5 SERIES



HgCdTe room temperature and thermoelectrically cooled photovoltaic optically immersed infrared detectors

FEATURES

- Spectral range: 2.7 to 5.6 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required
- Detector **PVI-5-1×1-TO39-NW-36** is a **Selected Line product**

RELATED PRODUCTS

- **LabM-I-5** detection module (p. 101)
- **PVIA-5-1×1-TO39-NW-36** RoHS-compliant detector (p. 16)
- **PVMA-1TE-5-1×1-TO39-pSiAR-70** RoHS- compliant detector (p. 18)
- **AMS3140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

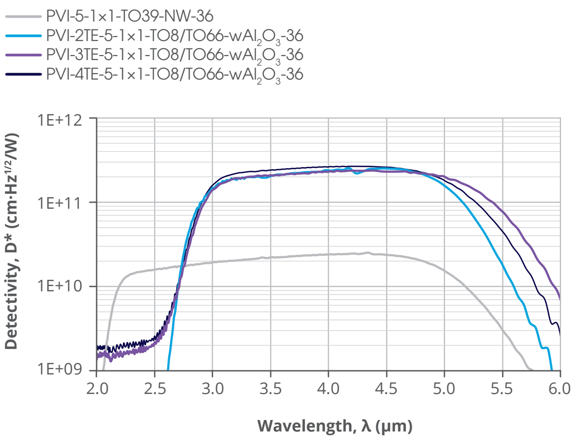
SERIES DESCRIPTION

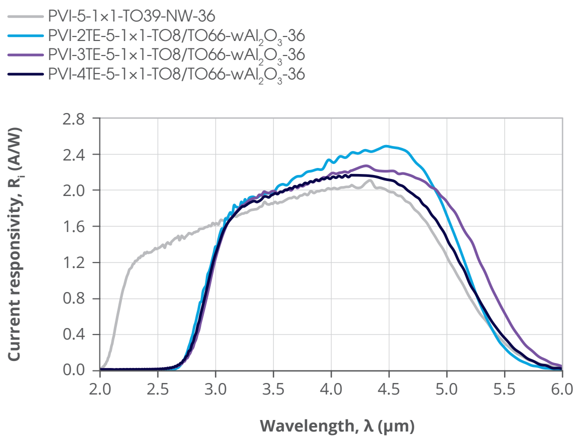
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-5-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no
PVI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36	2TE T_{chip}≅230K	thermistor			TO8		wAl$_2$O$_3$ (3 deg. wedged sapphire)
PVI-2TE-5-1×1-TO66-wAl$_2$O$_3$-36					TO66		
PVI-3TE-5-1×1-TO8-wAl$_2$O$_3$-36	3TE T_{chip}≅210K				TO8		
PVI-3TE-5-1×1-TO66-wAl$_2$O$_3$-36					TO66		
PVI-4TE-5-1×1-TO8-wAl$_2$O$_3$-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-5-1×1-TO66-wAl$_2$O$_3$-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

<table>
<tr><th rowspan="4">Detector symbol</th><th>Cut-on wavelength (10%)</th><th>Peak wavelength</th><th>Specific wavelength</th><th>Cut-off wavelength (10%)</th><th colspan="3">Detectivity</th><th colspan="3">Current responsivity</th><th>Time constant</th><th colspan="2">Dynamic resistance</th></tr>
<tr><th>$\lambda_{cut\text{-}on}$</th><th>λ_{peak}</th><th>λ_{spec}</th><th>$\lambda_{cut\text{-}off}$</th><th>$D^*(\lambda_{peak}$, 20kHz)</th><th colspan="2">$D^*(\lambda_{spec}$, 20kHz)</th><th>$R_i(\lambda_{peak})$</th><th colspan="2">$R_i(\lambda_{spec})$</th><th>τ</th><th colspan="2">R_d</th></tr>
<tr><th>µm</th><th>µm</th><th>µm</th><th>µm</th><th>cm·Hz$^{1/2}$/W</th><th colspan="2">cm·Hz$^{1/2}$/W</th><th>A/W</th><th colspan="2">A/W</th><th>ns</th><th colspan="2">Ω</th></tr>
<tr><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th></tr>
<tr><td>PVI-5-1×1-TO39-NW-36</td><td>2.0</td><td rowspan="7">4.4±0.2</td><td rowspan="7">5.0</td><td>5.4</td><td>2.5×10^{10}</td><td>1.0×10^{10}</td><td>1.5×10^{10}</td><td>2.0</td><td>1.0</td><td>1.2</td><td>120</td><td>100</td><td>250</td></tr>
<tr><td>PVI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36</td><td rowspan="6">2.7</td><td rowspan="2">5.6</td><td rowspan="2">1.8×10^{11}</td><td rowspan="2">9.0×10^{10}</td><td rowspan="2">1.2×10^{11}</td><td rowspan="6">2.1</td><td rowspan="4">1.2</td><td rowspan="6">1.5</td><td rowspan="6">80</td><td rowspan="2">2 000</td><td rowspan="2">5 000</td></tr>
<tr><td>PVI-2TE-5-1×1-TO66-wAl$_2$O$_3$-36</td></tr>
<tr><td>PVI-3TE-5-1×1-TO8-wAl$_2$O$_3$-36</td><td rowspan="2">5.5</td><td rowspan="2">2.3×10^{11}</td><td rowspan="2">8.0×10^{10}</td><td rowspan="2">1.5×10^{11}</td><td rowspan="2">4 000</td><td rowspan="2">15 000</td></tr>
<tr><td>PVI-3TE-5-1×1-TO66-wAl$_2$O$_3$-36</td></tr>
<tr><td>PVI-4TE-5-1×1-TO8-wAl$_2$O$_3$-36</td><td rowspan="2">5.2</td><td rowspan="2">2.5×10^{11}</td><td rowspan="2">1.0×10^{11}</td><td rowspan="2">1.5×10^{11}</td><td rowspan="2">1.3</td><td rowspan="2">10 000</td><td rowspan="2">50 000</td></tr>
<tr><td>PVI-4TE-5-1×1-TO66-wAl$_2$O$_3$-36</td></tr>
</table>

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)
- 2TE-TO8 package – Technical drawing (p. 204)
- 2TE-TO66 package – Technical drawing (p. 206)
- 3TE-TO8 package – Technical drawing (p. 207)
- 3TE-TO66 package – Technical drawing (p. 208)
- 4TE-TO8 package – Technical drawing (p. 210)
- 4TE-TO66 package – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-5-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)
PVI-3TE-5-1×1-TO8-wAl$_2$O$_3$-36	
PVI-4TE-5-1×1-TO8-wAl$_2$O$_3$36	

*) Only for biased detectors

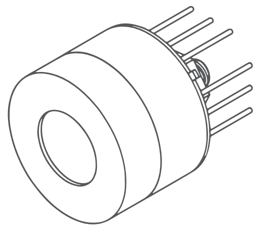
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	3TE	3.6	
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	3TE	0.45	
	4TE	0.4	

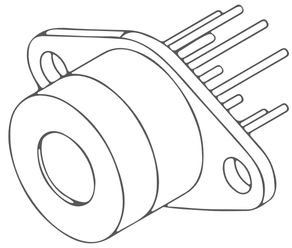
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PC-5 SERIES

HgCdTe thermoelectrically cooled photoconductive infrared detectors



2TE-TO8



2TE-TO66

FEATURES

- Spectral range: 2.0 to 5.6 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-5** detection module (p. 101)
- **PVIA-5-1×1-TO39-NW-36** RoHS-compliant detector (p. 105)
- **PVMA-1TE-5-1×1-TO39-pSiAR-70** RoHS-compliant detector (p. 16)
- **AMS3140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

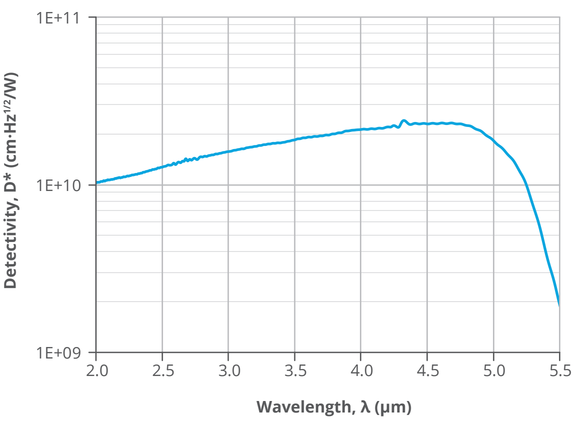
SERIES DESCRIPTION

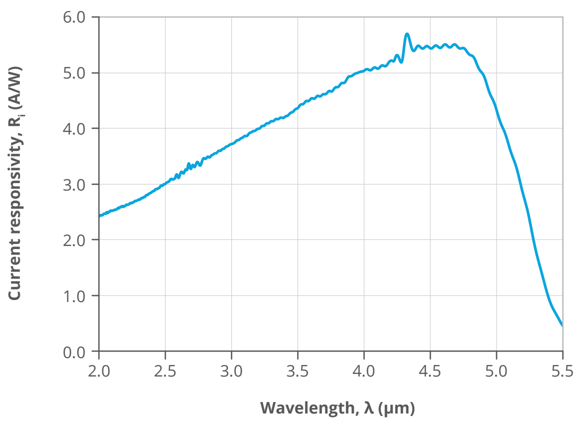
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PC-2TE-5-1×1-TO8-wAl_2O_3-70	2TE T_{chip}≅230K	thermistor	1×1	no	TO8	~70	wAl_2O_3 (3 deg. wedged sapphire)
PC-2TE-5-1×1-TO66-wAl_2O_3-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 2.0 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut\text{-}off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		µs	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PC-2TE-5-1×1-TO8-wAl_2O_3-70	4.5±0.3	5.0	5.5	2.0×10^{10}	1.0×10^{10}	1.2×10^{10}	4.0	0.5	3.0	20	750	2.0	10
PC-2TE-5-1×1-TO66-wAl_2O_3-70													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package
  – Technical drawing (p. 203)
- 2TE-TO66 package
  – Technical drawing (p. 205)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PC-2TE-5-1×1-TO8-wAl_2O_3-70	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135)

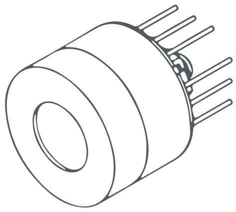
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm²
	Single pulses <1 μs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$		2.0	V
Maximum TEC voltage, $V_{TEC\,max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\,max}$	2TE	1.2	A

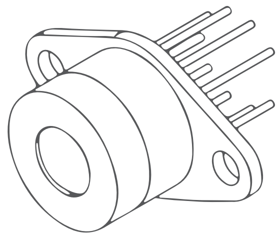
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-5 SERIES

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors



2TE-TO8



2TE-TO66

FEATURES

- Spectral range: 2.0 to 5.6 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-5** detection module (p. 101)
- **PVIA-5-1×1-TO39-NW-36** RoHS-compliant detector (p. 16)
- **PVMA-1TE-5-1×1-TO39-pSiAR-70** RoHS-compliant detector (p. 18)
- **AMS3140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing

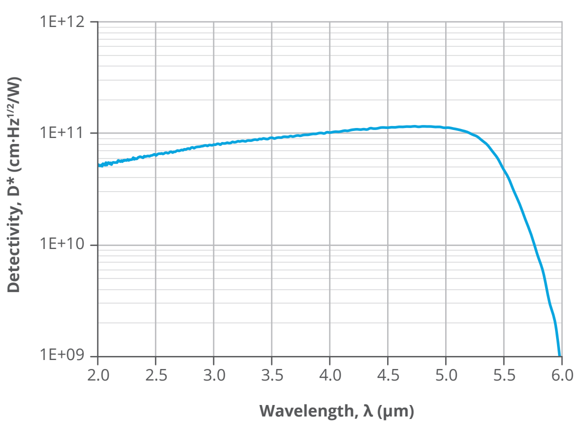
SERIES DESCRIPTION

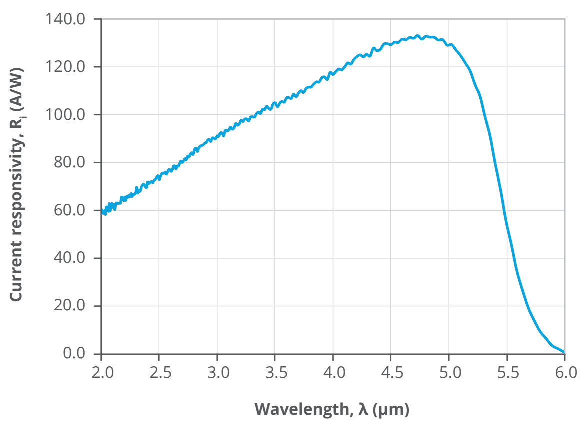
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36	2TE T_{chip}≅230K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wAl$_2$O$_3$ (3 deg. wedged sapphire)
PCI-2TE-5-1×1-TO66-wAl$_2$O$_3$-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.5 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut\text{-}off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		µs	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PCI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36	4.6±0.3	5.0	5.5	4.0×10^{10}	2.0×10^{10}	6.0×10^{10}	90	30	60	20	750	0.5	10
PCI-2TE-5-1×1-TO66-wAl$_2$O$_3$-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package
  – Technical drawing (p. 204)
- 2TE-TO66 package
  – Technical drawing (p. 206)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PCI-2TE-5-1×1-TO8-wAl$_2$O$_3$-36	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135)

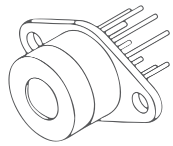
ABSOLUTE MAXIMUM RATINGS

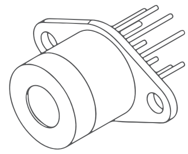
Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\ max}$		1.5	V
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A

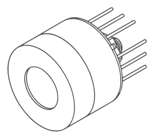
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

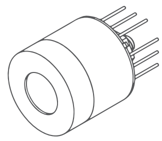
PV-6 SERIES

HgCdTe thermoelectrically cooled photovoltaic infrared detectors


2TE-TO66


4TE-TO66


2TE-TO8


4TE-TO8

FEATURES

- Spectral range: 2.6 to 6.8 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-6-01** detection module (p. 104)
- **PVMA-1TE-6-1×1-TO39-pSiAR-70** RoHS-compliant detector (p. 20)
- **AMS6140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x, SO_x, HNO_3
- Exhaust gas denitrification
- Combustion process control
- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Heat-seeking, thermal signature detection
- Non-destructive material testing
- Biochemical analysis
- Laser calibration

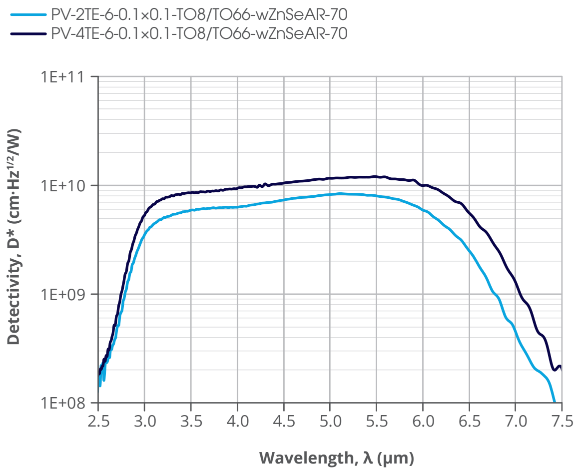
SERIES DESCRIPTION

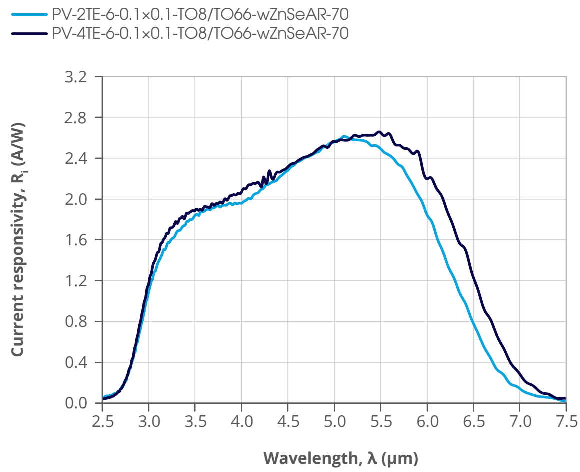
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PV-2TE-6-0.1×0.1-TO8-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	0.1×0.1	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PV-2TE-6-0.1×0.1-TO66-wZnSeAR-70					TO66		
PV-4TE-6-0.1×0.1-TO8-wZnSeAR-70	4TE T_{chip}≅198K				TO8		
PV-4TE-6-0.1×0.1-TO66-wZnSeAR-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PV-2TE-6-0.1×0.1-TO8-wZnSeAR-70	2.6	5.2±0.2	6.0	6.8	8.0×10^9	3.0×10^9	6.0×10^9	2.5	1.3	1.8	50	300	1 000
PV-2TE-6-0.1×0.1-TO66-wZnSeAR-70	2.6	5.2±0.2	6.0	6.8	8.0×10^9	3.0×10^9	6.0×10^9	2.5	1.3	1.8	50	300	1 000
PV-4TE-6-0.1×0.1-TO8-wZnSeAR-70	2.6	5.4±0.2	6.0	6.8	1.2×10^{10}	4.0×10^9	9.0×10^9	2.5	1.3	1.8	50	600	1 500
PV-4TE-6-0.1×0.1-TO66-wZnSeAR-70	2.6	5.4±0.2	6.0	6.8	1.2×10^{10}	4.0×10^9	9.0×10^9	2.5	1.3	1.8	50	600	1 500

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package
  – Technical drawing (p. 203)
- 2TE-TO66 package
  – Technical drawing (p. 205)
- 4TE-TO8 package
  – Technical drawing (p. 209)
- 4TE-TO66 package
  – Technical drawing (p. 211)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PV-2TE-6-0.1×0.1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)
PV-4TE-6-0.1×0.1-TO8-wZnSeAR-70	

*) Only for biased detectors

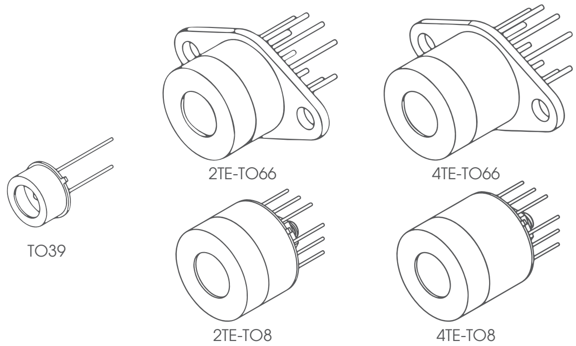
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm^2
	Single pulses <1 μs duration	1	MW/cm^2
Maximum bias voltage, $V_{b\,max}$		-800	mV
Maximum TEC voltage, $V_{TEC\,max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\,max}$	2TE	1.2	A
	4TE	0.4	

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVI-6 SERIES

HgCdTe room temperature and thermoelectrically cooled photovoltaic optically immersed infrared detectors



FEATURES

- Spectral range: 2.5 to 7.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required
- Detector **PVI-2TE-6-1×1-TO8-wZnSeAR-36** is a **Selected Line product**

RELATED PRODUCTS

- **LabM-I-6-01** detection module (p. 104)
- **PVMA-1TE-6-1×1-TO39-pSiAR-70** RoHS-compliant detector (p. 20)
- **AMS6140-01** RoHS-compliant detection module (p. 86)

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x, SO_x, HNO_3
- Exhaust gas denitrification
- Combustion process control
- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Heat-seeking, thermal signature detection
- Non-destructive material testing
- Biochemical analysis
- Laser calibration

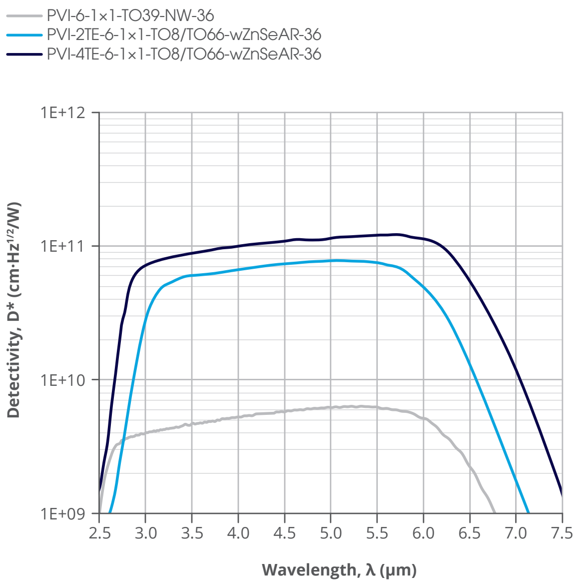
SERIES DESCRIPTION

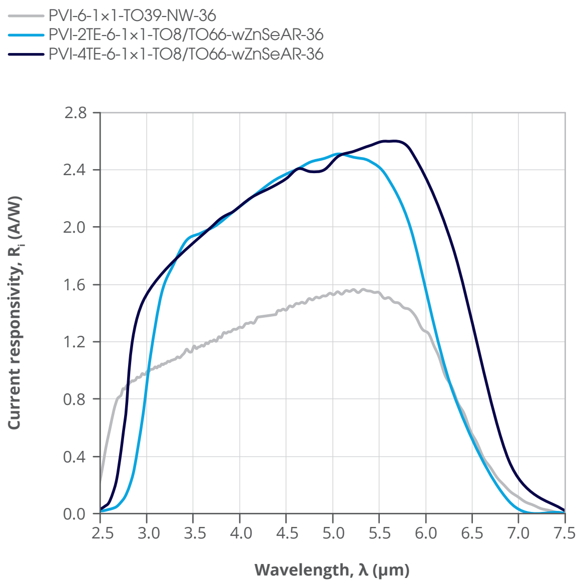
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-6-1×1-TO39-NW-36	no	n/a			TO39 (3 pins)		no
PVI-2TE-6-1×1-TO8-wZnSeAR-36	2TE T_{chip}≅230K				TO8		
PVI-2TE-6-1×1-TO66-wZnSeAR-36		thermistor	1×1	hyperhemi-sphere	TO66	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVI-4TE-6-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-6-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

<table>
<tr><th rowspan="4">Detector symbol</th><th>Cut-on wavelength (10%)</th><th>Peak wavelength</th><th>Specific wavelength</th><th>Cut-off wavelength (10%)</th><th colspan="3">Detectivity</th><th colspan="3">Current responsivity</th><th>Time constant</th><th colspan="2">Dynamic resistance</th></tr>
<tr><th>λ_{cut-on}</th><th>λ_{peak}</th><th>λ_{spec}</th><th>$\lambda_{cut-off}$</th><th>$D^*(\lambda_{peak}$, 20kHz)</th><th colspan="2">$D^*(\lambda_{spec}$, 20kHz)</th><th>$R_i(\lambda_{peak})$</th><th colspan="2">$R_i(\lambda_{spec})$</th><th>τ</th><th colspan="2">R_d</th></tr>
<tr><th>µm</th><th>µm</th><th>µm</th><th>µm</th><th>cm·Hz$^{1/2}$/W</th><th colspan="2">cm·Hz$^{1/2}$/W</th><th>A/W</th><th colspan="2">A/W</th><th>ns</th><th colspan="2">Ω</th></tr>
<tr><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th></tr>
<tr><td>PVI-6-1×1-TO39-NW-36</td><td>2.5</td><td>5.1±0.2</td><td rowspan="5">6.0</td><td>6.5</td><td>8.0×10^{9}</td><td>3.5×10^{9}</td><td>1.5×10^{10}</td><td>2.0</td><td>0.6</td><td>1.2</td><td>80</td><td>20</td><td>40</td></tr>
<tr><td>PVI-2TE-6-1×1-TO8-wZnSeAR-36</td><td rowspan="4">2.6</td><td rowspan="2">5.2±0.2</td><td rowspan="4">7.0</td><td rowspan="2">8.0×10^{10}</td><td rowspan="4">4.0×10^{10}</td><td rowspan="2">6.0×10^{10}</td><td rowspan="4">2.5</td><td rowspan="4">1.3</td><td rowspan="4">1.8</td><td rowspan="4">50</td><td rowspan="2">300</td><td rowspan="2">1 000</td></tr>
<tr><td>PVI-2TE-6-1×1-TO66-wZnSeAR-36</td></tr>
<tr><td>PVI-4TE-6-1×1-TO8-wZnSeAR-36</td><td rowspan="2">5.4±0.2</td><td rowspan="2">1.2×10^{11}</td><td rowspan="2">9.0×10^{10}</td><td rowspan="2">600</td><td rowspan="2">1 500</td></tr>
<tr><td>PVI-4TE-6-1×1-TO66-wZnSeAR-36</td></tr>
</table>

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)
- 2TE-TO8 package – Technical drawing (p. 204)
- 2TE-TO66 package – Technical drawing (p. 206)
- 4TE-TO8 package – Technical drawing (p. 210)
- 4TE-TO66 package – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-6-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVI-2TE-6-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)
PVI-4TE-6-1×1-TO8-wZnSeAR-36	

*) Only for biased detectors

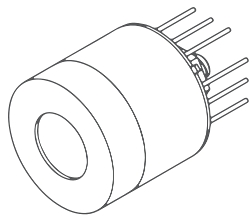
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	4TE	0.4	

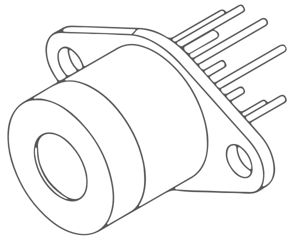
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PV-8 SERIES

HgCdTe thermoelectrically cooled photovoltaic infrared detectors



4TE-TO8



4TE-TO66

FEATURES

- Spectral range: 3.0 to 10.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, H_2S, NO_2, SO_x
- FTIR spectroscopy

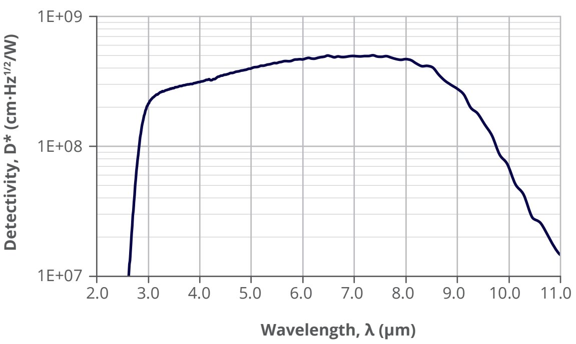
SERIES DESCRIPTION

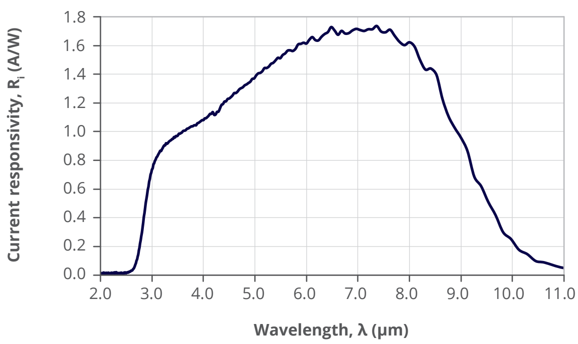
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PV-4TE-8-0.1×0.1-TO8-wZnSeAR-70	4TE T_{chip}≅198K	thermistor	0.1×0.1	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PV-4TE-8-0.1×0.1-TO66-wZnSeAR-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PV-4TE-8-0.1×0.1-TO8-wZnSeAR-70	3.0	6.5±1.0	8.0	10.0	5.0×10^8	4.0×10^8	1.9	1.5	1.7	45	50	100
PV-4TE-8-0.1×0.1-TO66-wZnSeAR-70												

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 209)
- 4TE-TO66 package
  – Technical drawing (p. 211)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PV-4TE-8-0.1×0.1-TO8-wZnSeAR-70	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135), FIP series*) (p. 141)

*) Only for biased detectors

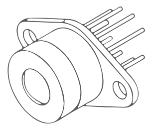
ABSOLUTE MAXIMUM RATINGS

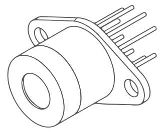
Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

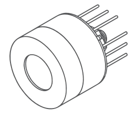
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

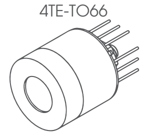
PVI-8 SERIES

HgCdTe thermoelectrically cooled photovoltaic optically immersed infrared detectors


2TE-TO66


4TE-TO66


2TE-TO8


4TE-TO8

FEATURES

- Spectral range: 3.0 to 10.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, H_2S, NO_2, SO_x
- FTIR spectroscopy

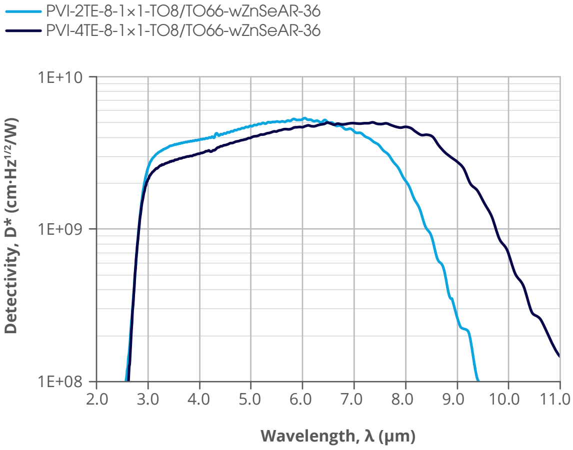
SERIES DESCRIPTION

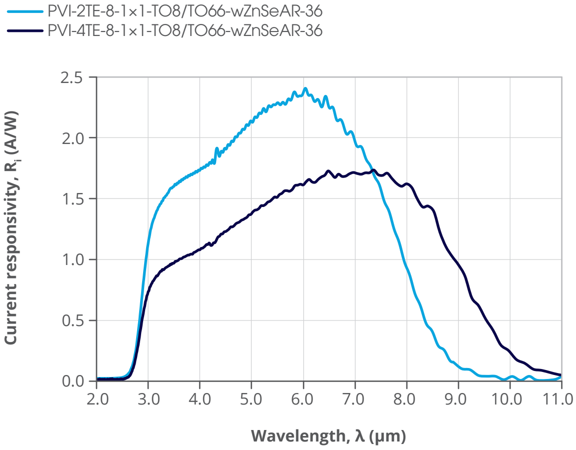
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-2TE-8-1×1-TO8-wZnSeAR-36	2TE T_{chip}≅230K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVI-2TE-8-1×1-TO66-wZnSeAR-36					TO66		
PVI-4TE-8-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-8-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$	$D^*(\lambda_{spec}, 20kHz)$	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVI-2TE-8-1×1-TO8-wZnSeAR-36	3.0	6.0±1.0	8.0	8.9	4.0×10^9	2.0×10^9	1.6	0.8	1.0	45	30	40
PVI-2TE-8-1×1-TO66-wZnSeAR-36												
PVI-4TE-8-1×1-TO8-wZnSeAR-36		6.5±1.0		10.0	5.0×10^9	4.0×10^9	3.0	1.5	1.7		50	100
PVI-4TE-8-1×1-TO66-wZnSeAR-36												

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package – Technical drawing (p. 204)
- 2TE-TO66 package – Technical drawing (p. 206)
- 4TE-TO8 package – Technical drawing (p. 210)
- 4TE-TO66 package – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-2TE-8-1×1-TO8-wZnSeAR-36	AIP series (p. 126), PIP series (p. 129), MIP series (p. 132), SIP-TO8 series (p. 135), FIP series*) (p. 141)
PVI-4TE-8-1×1-TO8-wZnSeAR-36	

*) Only for biased detectors

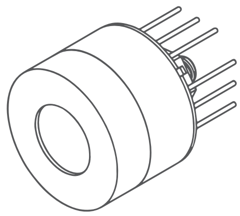
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\ max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	4TE	0.4	

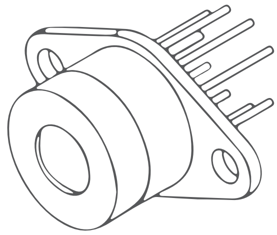
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVM-8 SERIES

HgCdTe thermoelectrically cooled photovoltaic multi-junction infrared detectors



2TE-TO8



2TE-TO66

FEATURES

- Spectral range: 2.0 to 10.0 µm
- Large active areas
- Back-side illuminated
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, H_2S, NO_2, SO_x
- FTIR spectroscopy

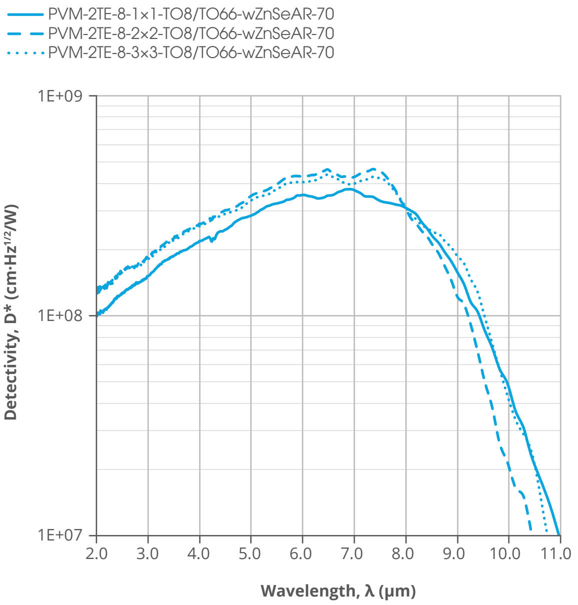
SERIES DESCRIPTION

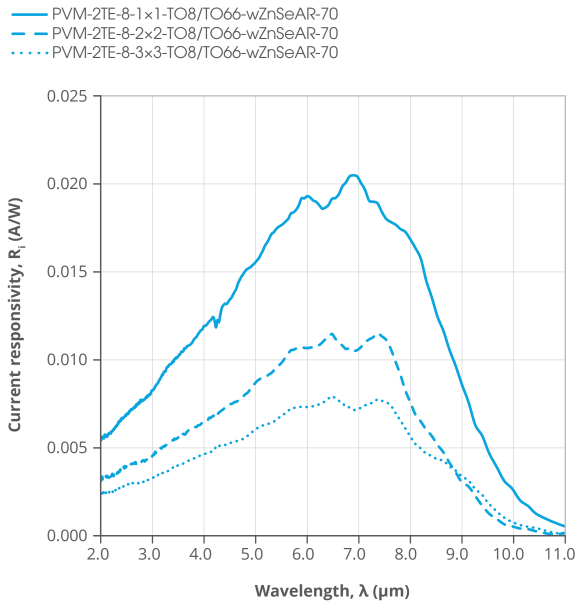
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVM-2TE-8-1×1-TO8-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	1×1	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-8-1×1-TO66-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	1×1	no	TO66	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-8-2×2-TO8-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	2×2	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-8-2×2-TO66-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	2×2	no	TO66	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-8-3×3-TO8-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	3×3	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-8-3×3-TO66-wZnSeAR-70	2TE T_{chip}≅230K	thermistor	3×3	no	TO66	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVM-2TE-8-1×1-TO8-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.02	0.015	0.017	4	120	400
PVM-2TE-8-1×1-TO66-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.02	0.015	0.017	4	120	400
PVM-2TE-8-2×2-TO8-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.01	0.0075	0.008	4	120	400
PVM-2TE-8-2×2-TO66-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.01	0.0075	0.008	4	120	400
PVM-2TE-8-3×3-TO8-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.007	0.005	0.006	4	120	400
PVM-2TE-8-3×3-TO66-wZnSeAR-70	2.0	7.0±1.0	8.0	10.0	4.0×10^8	3.0×10^8	0.007	0.005	0.006	4	120	400

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package
  – Technical drawing (p. 203)
- 2TE-TO66 package
  – Technical drawing (p. 205)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVM-2TE-8-1×1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)
PVM-2TE-8-2×2-TO8-wZnSeAR-70	
PVM-2TE-8-3×3-TO8-wZnSeAR-70	

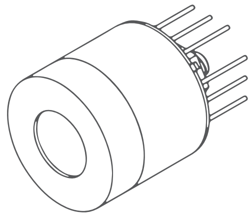
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm^2
	Single pulses <1 μs duration	1	MW/cm^2
Maximum bias voltage, $V_{b\ max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A

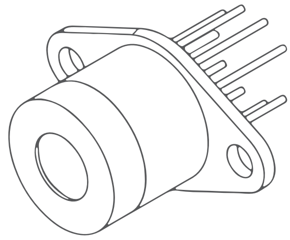
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVMI-8 SERIES

HgCdTe thermoelectrically cooled photovoltaic multi-junction optically immersed infrared detectors



4TE-TO8



4TE-TO66

FEATURES

- Spectral range: 2.0 to 9.8 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, H_2S, NO_2, SO_x
- FTIR spectroscopy

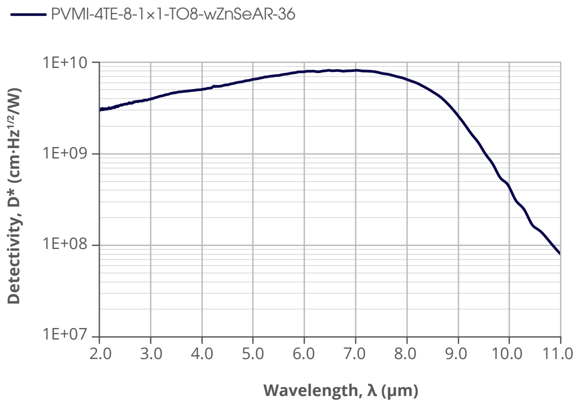
SERIES DESCRIPTION

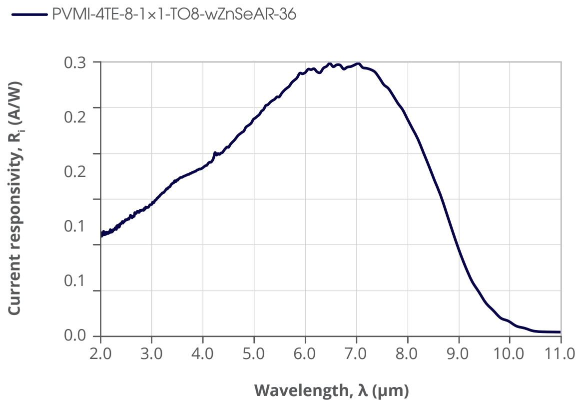
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVMI-4TE-8-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅197K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVMI-4TE-8-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVMI-4TE-8-1×1-TO8-wZnSeAR-36	2.0	7.0±1.0	8.0	9.8	8.0×10^9	6.0×10^9	0.4	0.2	0.25	4	500	800
PVMI-4TE-8-1×1-TO66-wZnSeAR-36												

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVMI-4TE-8-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

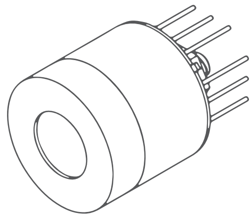
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\ max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\ max}$	4TE	0.4	A

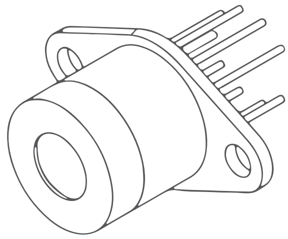
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PC-9 SERIES

HgCdTe thermoelectrically cooled photoconductive infrared detectors



4TE-TO8



4TE-TO66

FEATURES

- Spectral range: over 10.3 µm
- Front-side illuminated
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3
- FTIR spectroscopy

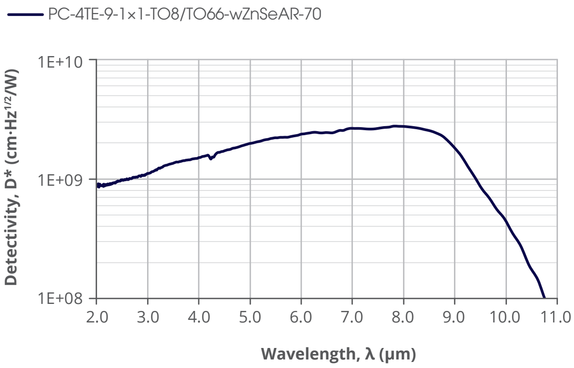
SERIES DESCRIPTION

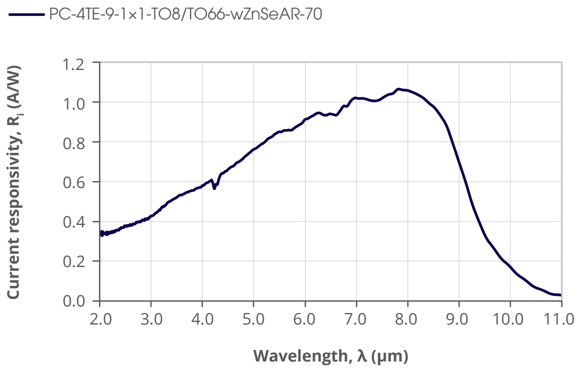
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PC-4TE-9-1×1-TO8-wZnSeAR-70	4TE T_{chip}≅200K	thermistor	1×1	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PC-4TE-9-1×1-TO66-wZnSeAR-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.3 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PC-4TE-9-1×1-TO8-wZnSeAR-70	7.6±0.5	9.0	10.3	1.9×10^9	1.5×10^9	1.7×10^9	0.6	0.1	0.3	80	250	0.3	20
PC-4TE-9-1×1-TO66-wZnSeAR-70													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 209)
- 4TE-TO66 package
  – Technical drawing (p. 211)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PC-4TE-9-1×1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

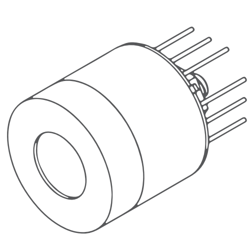
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	100	W/cm²
	Single pulses <1 μs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$		2.0	V
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

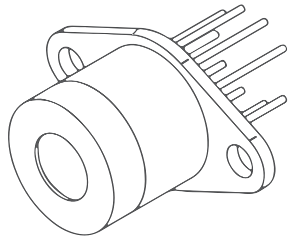
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-9 SERIES

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors



4TE-TO8



4TE-TO66

FEATURES

- Spectral range: over 10.4 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3
- FTIR spectroscopy

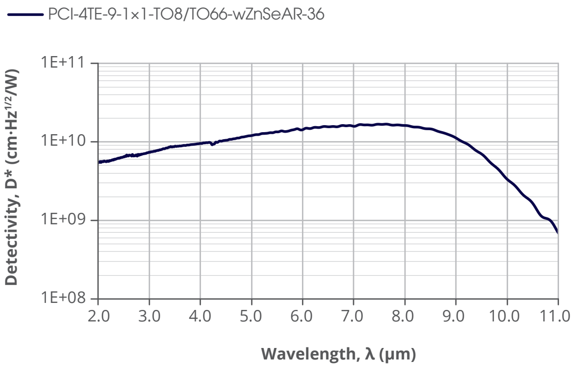
SERIES DESCRIPTION

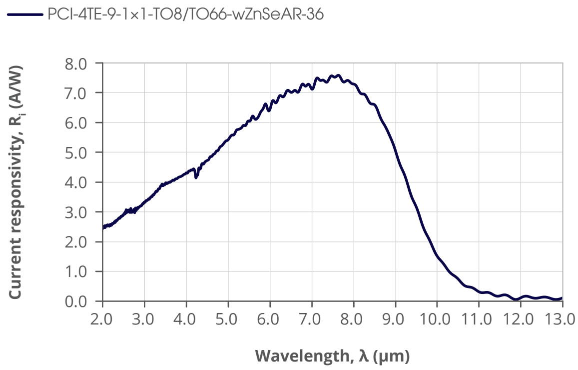
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-4TE-9-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅200K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PCI-4TE-9-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.3 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut\text{-}off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ..	Max.	Typ.	Typ.
PCI-4TE-9-1×1-TO8-wZnSeAR-36	7.6±0.5	9.0	10.4	1.25×10^{10}	1.0×10^{10}	1.1×10^{10}	4.0	0.9	3.0	80	200	0.3	20
PCI-4TE-9-1×1-TO66-wZnSeAR-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

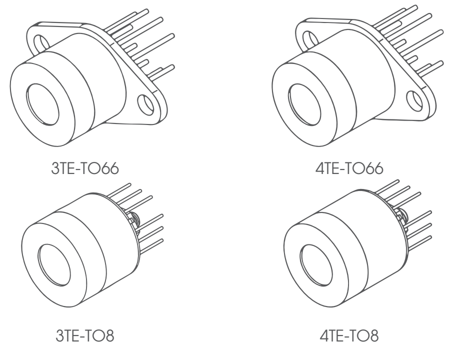
Detector symbol	Amplifier type
PCI-4TE-9-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		1.5	V
Maximum TEC voltage, $V_{TEC\ max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\ max}$	4TE	0.4	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVI-10.6 SERIES



HgCdTe thermoelectrically cooled photovoltaic optically immersed infrared detectors

FEATURES

- Spectral range: 3.0 to 12.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36** RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36** RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

SERIES DESCRIPTION

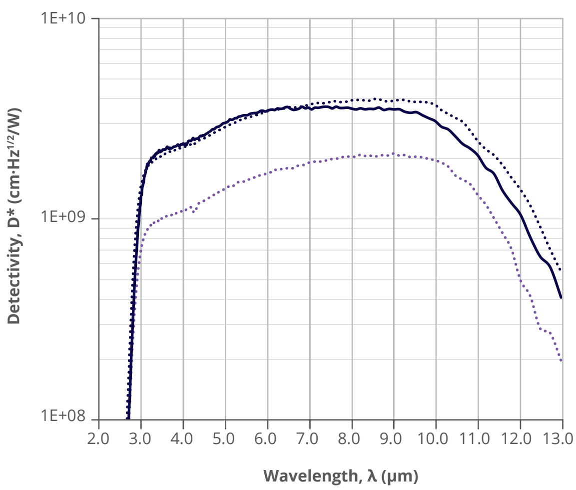
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVI-3TE-10.6-0.5×0.5-TO8-wZnSeAR-36	3TE T_{chip}≅210K	thermistor	0.5×0.5	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVI-3TE-10.6-0.5×0.5-TO66-wZnSeAR-36					TO66		
PVI-4TE-10.6-0.5×0.5-TO8-wZnSeAR-36	4TE T_{chip}≅198K				TO8		
PVI-4TE-10.6-0.5×0.5-TO66-wZnSeAR-36					TO66		
PVI-4TE-10.6-1×1-TO8-wZnSeAR-36			1×1		TO8		
PVI-4TE-10.6-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

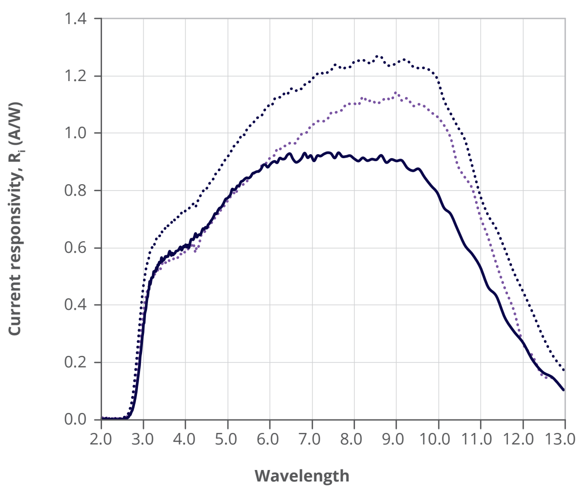
<table>
<tr><th rowspan="4">Detector symbol</th><th>Cut-on wavelength (10%)</th><th>Peak wavelength</th><th>Specific wavelength</th><th>Cut-off wavelength (10%)</th><th colspan="2">Detectivity</th><th colspan="3">Current responsivity</th><th>Time constant</th><th colspan="2">Dynamic resistance</th></tr>
<tr><td>λ_{cut-on}</td><td>λ_{peak}</td><td>λ_{spec}</td><td>$\lambda_{cut-off}$</td><td>D*(λ_{peak}, 20kHz)</td><td>D*(λ_{spec}, 20kHz)</td><td>$R_i(\lambda_{peak})$</td><td colspan="2">$R_i(\lambda_{spec})$</td><td>τ</td><td colspan="2">R_d</td></tr>
<tr><td>µm</td><td>µm</td><td>µm</td><td>µm</td><td>cm·Hz$^{1/2}$/W</td><td>cm·Hz$^{1/2}$/W</td><td>A/W</td><td colspan="2">A/W</td><td>ns</td><td colspan="2">Ω</td></tr>
<tr><td>Typ.</td><td>Typ.</td><td>Typ.</td><td>Typ.</td><td>Typ.</td><td>Min.</td><td>Typ.</td><td>Min.</td><td>Typ.</td><td>Typ.</td><td>Min.</td><td>Typ.</td></tr>
<tr><td>PVI-3TE-10.6-0.5×0.5-TO8-wZnSeAR-36</td><td rowspan="6">3.0</td><td rowspan="6">8.0±1.0</td><td rowspan="6">10.6</td><td rowspan="6">12.0</td><td rowspan="2">2.0×10^9</td><td rowspan="2">1.5×10^9</td><td rowspan="2">0.9</td><td rowspan="2">0.7</td><td rowspan="2">0.9</td><td rowspan="2">10</td><td rowspan="4">20</td><td rowspan="4">50</td></tr>
<tr><td>PVI-3TE-10.6-0.5×0.5-TO66-wZnSeAR-36</td></tr>
<tr><td>PVI-4TE-10.6-0.5×0.5-TO8-wZnSeAR-36</td><td rowspan="4">4.0×10^9</td><td rowspan="4">2.0×10^9</td><td rowspan="4">1.0</td><td rowspan="4">0.5</td><td rowspan="2">1.0</td><td rowspan="4">25</td></tr>
<tr><td>PVI-4TE-10.6-0.5×0.5-TO66-wZnSeAR-36</td></tr>
<tr><td>PVI-4TE-10.6-1×1-TO8-wZnSeAR-36</td><td rowspan="2">0.7</td><td rowspan="2">5</td><td rowspan="2">20</td></tr>
<tr><td>PVI-4TE-10.6-1×1-TO66-wZnSeAR-36</td></tr>
</table>

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)

PVI-3TE-10.6-0.5×0.5-TO8/TO66-wZnSeAR-36
PVI-4TE-10.6-0.5×0.5-TO8/TO66-wZnSeAR-36
PVI-4TE-10.6-1×1-TO8/TO66-wZnSeAR-36



PVI-3TE-10.6-0.5×0.5-TO8/TO66-wZnSeAR-36
PVI-4TE-10.6-0.5×0.5-TO8/TO66-wZnSeAR-36
PVI-4TE-10.6-1×1-TO8/TO66-wZnSeAR-36



MECHANICAL LAYOUT AND PINOUT

- 3TE-TO8 package
  – Technical drawing (p. 207)
- 3TE-TO66 package
  – Technical drawing (p. 208)
- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVI-3TE-10.6-0.5×0.5-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)
PVI-4TE-10.6-0.5×0.5-TO8-wZnSeAR-36	
PVI-4TE-10.6-1×1-TO8-wZnSeAR-36	

*) Only for biased detectors

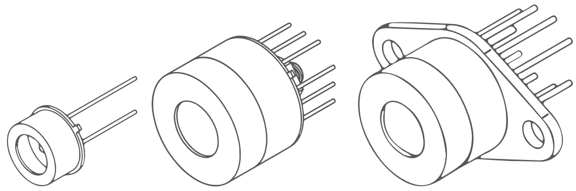
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm^2
	Single pulses <1 μs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		-800	mV
Maximum TEC voltage, $V_{TEC\ max}$	3TE	3.6	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	3TE	0.45	A
	4TE	0.4	

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVM-10.6 SERIES

HgCdTe room temperature and thermoelectrically cooled photovoltaic multi-junction infrared detectors



TO39 2TE-TO8 2TE-TO66

FEATURES

- Spectral range: 2.0 to 13.0 µm
- Back-side illuminated
- No minimum order quantity required
- Detector **PVM-10.6-1×1-TO39-NW-90** is a **Selected Line product**

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36** RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36** RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

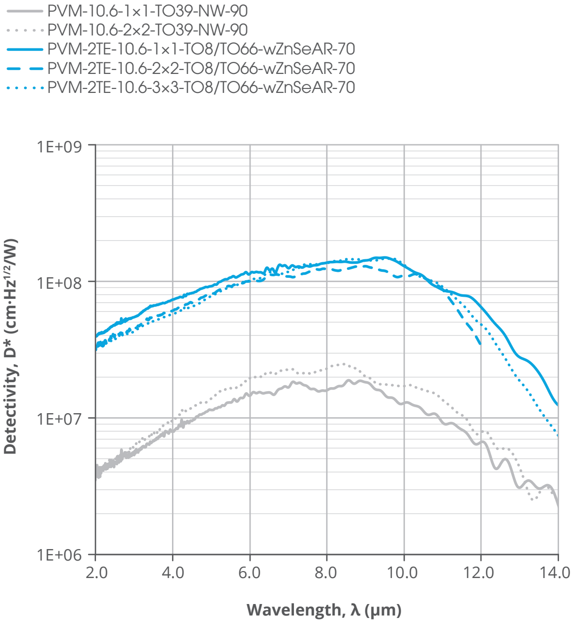
SERIES DESCRIPTION

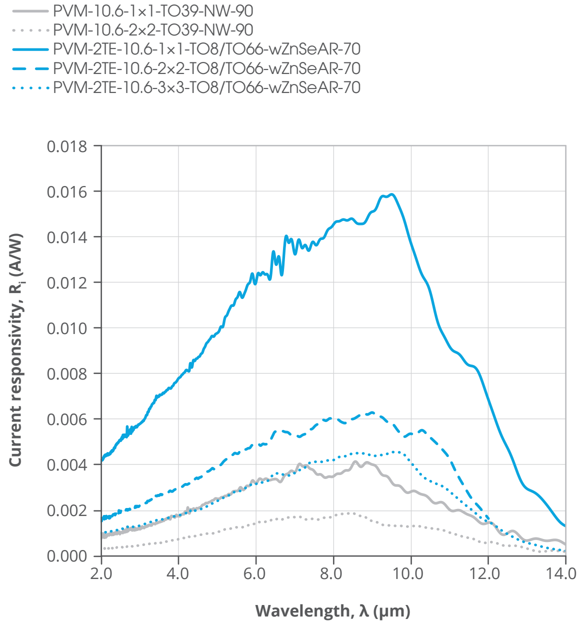
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVM-10.6-1×1-TO39-NW-90	no	n/a	1×1	no	TO39 (3 pins)	~90	no
PVM-10.6-2×2-TO39-NW-90			2×2				
PVM-2TE-10.6-1×1-TO8-wZnSeAR-70	2TE $T_{chip} \cong 230K$	thermistor	1×1		TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVM-2TE-10.6-1×1-TO66-wZnSeAR-70					TO66		
PVM-2TE-10.6-2×2-TO8-wZnSeAR-70			2×2		TO8		
PVM-2TE-10.6-2×2-TO66-wZnSeAR-70					TO66		
PVM-2TE-10.6-3×3-TO8-wZnSeAR-70			3×3		TO8		
PVM-2TE-10.6-3×3-TO66-wZnSeAR-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVM-10.6-1×1-TO39-NW-90	2.0	8.5±1.0	10.6	12.0	2.0×10^7	1.0×10^7	0.004	0.002	0.0025	1.5	30	50
PVM-10.6-2×2-TO39-NW-90							0.002	0.001	0.0015			
PVM-2TE-10.6-1×1-TO8-wZnSeAR-70		9.0±1.0		13.0	1.5×10^8	1.0×10^8	0.015	0.01	0.012	4	90	120
PVM-2TE-10.6-1×1-TO66-wZnSeAR-70												
PVM-2TE-10.6-2×2-TO8-wZnSeAR-70							0.007	0.005	0.006			
PVM-2TE-10.6-2×2-TO66-wZnSeAR-70												
PVM-2TE-10.6-3×3-TO8-wZnSeAR-70							0.0045	0.03	0.04			
PVM-2TE-10.6-3×3-TO66-wZnSeAR-70												

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window)
  – Technical drawing (p. 197)
- 2TE-TO8 package
  – Technical drawing (p. 203)
- 2TE-TO66 package
  – Technical drawing (p. 205)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVM-10.6-1×1-TO39-NW-90	SIP-TO39 series (p. 138)
PVM-10.6-2×2-TO39-NW-90	
PVM-2TE-10.6-1×1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)
PVM-2TE-10.6-2×2-TO8-wZnSeAR-70	
PVM-2TE-10.6-3×3-TO8-wZnSeAR-70	

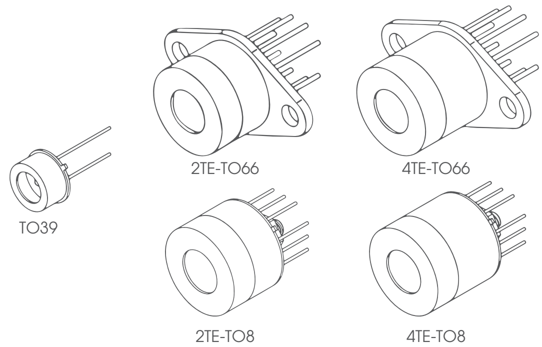
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm^2
	Single pulses <1 µs duration	1	MW/cm^2
Maximum bias voltage, $V_{b\ max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVMI-10.6 SERIES

HgCdTe room temperature and thermoelectrically cooled photovoltaic multi-junction optically immersed infrared detectors



FEATURES

- Spectral range: 2.0 to 13.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36** RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36** RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

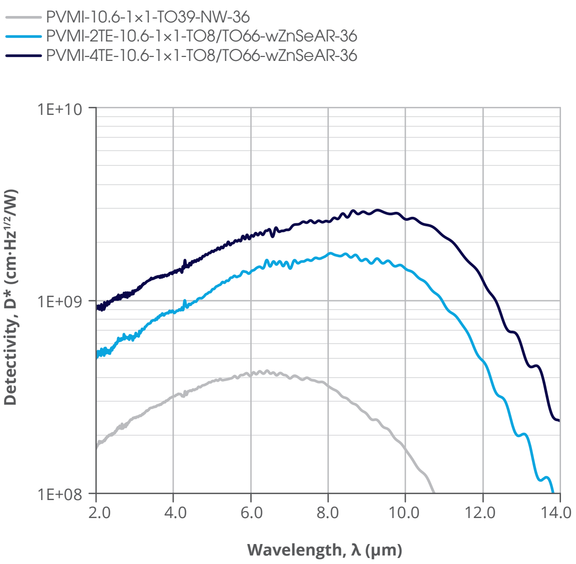
SERIES DESCRIPTION

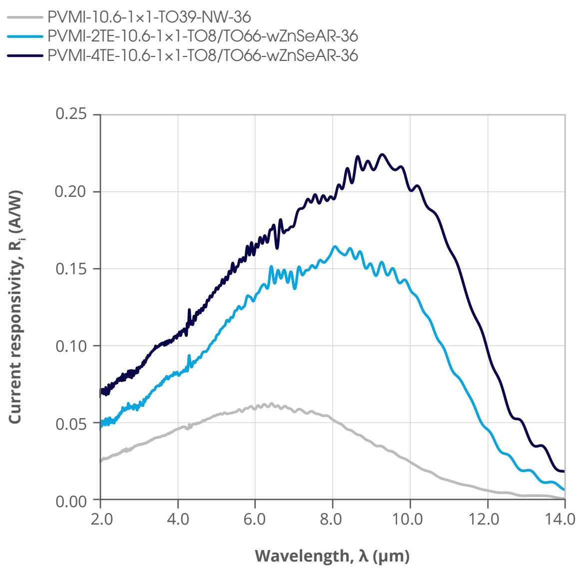
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PVMI-10.6-1×1-TO39-NW-36	no	n/a	1×1	hyperhemi-sphere	TO39 (3 pins)	~36	no
PVMI-2TE-10.6-1×1-TO8-wZnSeAR-36	2TE T_{chip}≅230K	thermistor			TO8		wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PVMI-2TE-10.6-1×1-TO66-wZnSeAR-36					TO66		
PVMI-4TE-10.6-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅197K				TO8		
PVMI-4TE-10.6-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

<table>
<tr><th rowspan="4">Detector symbol</th><th>Cut-on wavelength (10%)</th><th>Peak wavelength</th><th>Specific wavelength</th><th>Cut-off wavelength (10%)</th><th colspan="2">Detectivity</th><th colspan="3">Current responsivity</th><th>Time constant</th><th colspan="2">Dynamic resistance</th></tr>
<tr><th>$\lambda_{cut\text{-}on}$</th><th>λ_{peak}</th><th>λ_{spec}</th><th>$\lambda_{cut\text{-}off}$</th><th>D*(λ_{peak}, 20kHz)</th><th>D*(λ_{spec}, 20kHz)</th><th>$R_i(\lambda_{peak})$</th><th colspan="2">$R_i(\lambda_{spec})$</th><th>τ</th><th colspan="2">R_d</th></tr>
<tr><th>μm</th><th>μm</th><th>μm</th><th>μm</th><th>cm·Hz$^{1/2}$/W</th><th>cm·Hz$^{1/2}$/W</th><th>A/W</th><th colspan="2">A/W</th><th>ns</th><th colspan="2">Ω</th></tr>
<tr><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th><th>Typ.</th><th>Min.</th><th>Typ.</th></tr>
<tr><td>PVMI-10.6-1×1-TO39-NW-36</td><td rowspan="5">2.0</td><td>8.5±1.0</td><td rowspan="5">10.6</td><td>12.0</td><td>2.0×10^8</td><td>1.0×10^8</td><td>0.02</td><td>0.01</td><td>0.015</td><td>1.5</td><td>20</td><td>50</td></tr>
<tr><td>PVMI-2TE-10.6-1×1-TO8-wZnSeAR-36</td><td rowspan="2">8.0±1.0</td><td rowspan="2">13.0</td><td rowspan="2">2.0×10^9</td><td rowspan="2">1.0×10^9</td><td rowspan="2">0.2</td><td rowspan="2">0.1</td><td rowspan="2">0.12</td><td rowspan="4">3</td><td rowspan="2">90</td><td rowspan="2">120</td></tr>
<tr><td>PVMI-2TE-10.6-1×1-TO66-wZnSeAR-36</td></tr>
<tr><td>PVMI-4TE-10.6-1×1-TO8-wZnSeAR-36</td><td rowspan="2">9.0±1.0</td><td rowspan="2">12.0</td><td rowspan="2">3.0×10^9</td><td rowspan="2">2.5×10^9</td><td rowspan="2">0.36</td><td rowspan="2">0.18</td><td rowspan="2">0.2</td><td rowspan="2">120</td><td rowspan="2">250</td></tr>
<tr><td>PVMI-4TE-10.6-1×1-TO66-wZnSeAR-36</td></tr>
</table>

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO39 (3 pins) package (without window) – Technical drawing (p. 198)
- 2TE-TO8 package – Technical drawing (p. 204)
- 2TE-TO66 package – Technical drawing (p. 206)
- 4TE-TO8 package – Technical drawing (p. 210)
- 4TE-TO66 package – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PVMI-10.6-1×1-TO39-NW-36	SIP-TO39 series (p. 138)
PVMI-2TE-10.6-1×1-TO8-wZnSeAR-36 PVMI-4TE-10.6-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135) FIP series*) (p. 141)

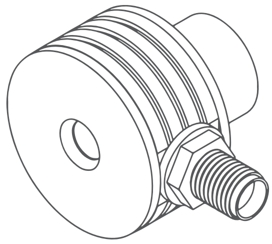
*) Only for biased detectors

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm^2
	Single pulses <1 μs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$	No bias voltage needed	-	-
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	4TE	0.4	

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PEM-10.6-1×1-PEM-SMA-wZnSeAR-48



HgCdTe room temperature photoelectromagnetic infrared detector

FEATURES

- Spectral range: 2.0 to 12.0 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36**
  RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36**
  RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

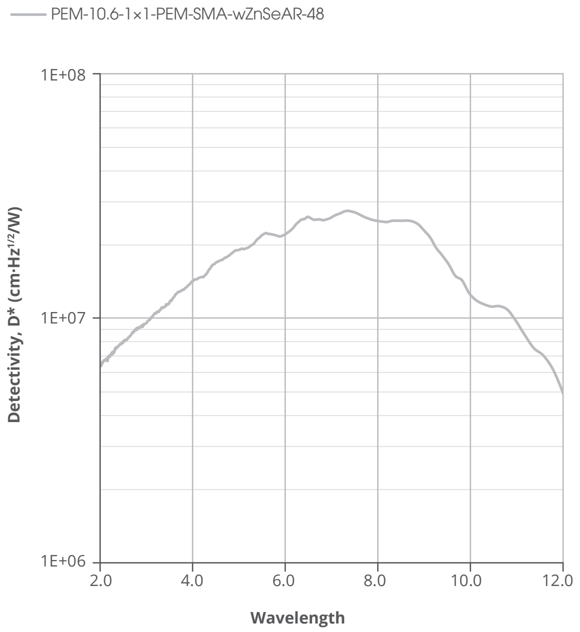
DETECTOR CONFIGURATION

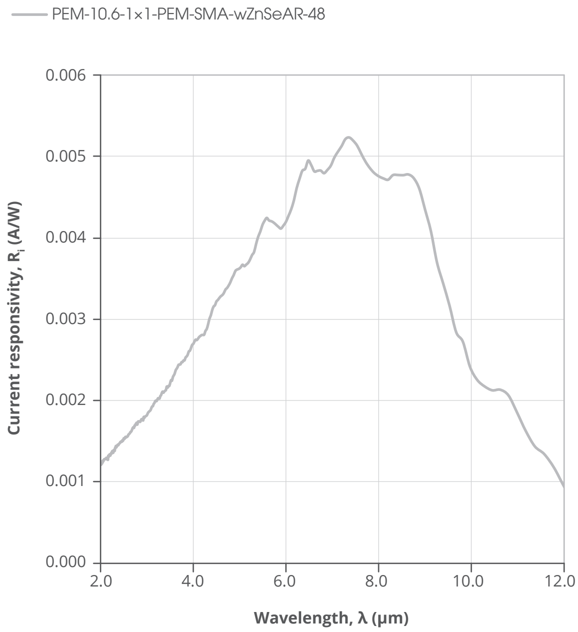
Detector symbol	Cooling	Temperature sensor	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PEM-10.6-1×1-PEM-SMA-wZnSeAR-48	no	n/a	1×1	no	PEM-SMA	~48	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$	$D^*(\lambda_{spec}, 20kHz)$	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	$cm \cdot Hz^{1/2}/W$	$cm \cdot Hz^{1/2}/W$	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PEM-10.6-1×1-PEM-SMA-wZnSeAR-48	2.0	8.5±1.0	10.6	12.0	2.0×10^7	1.0×10^7	0.004	0.002	0.0025	1.2	40	50

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

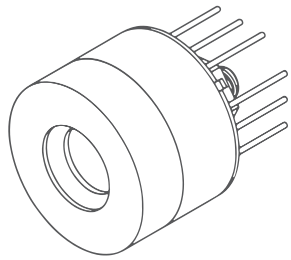
- PEM-SMA package – Technical drawing (p. 202)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm^2
	Single pulses <1 µs duration	1	MW/cm^2
Maximum bias voltage, $V_{b\,max}$	No bias voltage needed	-	-

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PVMQ-10.6-1×1-TO8-NW-70



HgCdTe room temperature photovoltaic multi-junction quadrant infrared detector

FEATURES

- Spectral range: 2.0 to 12.0 µm
- Back-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36**
  RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36**
  RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

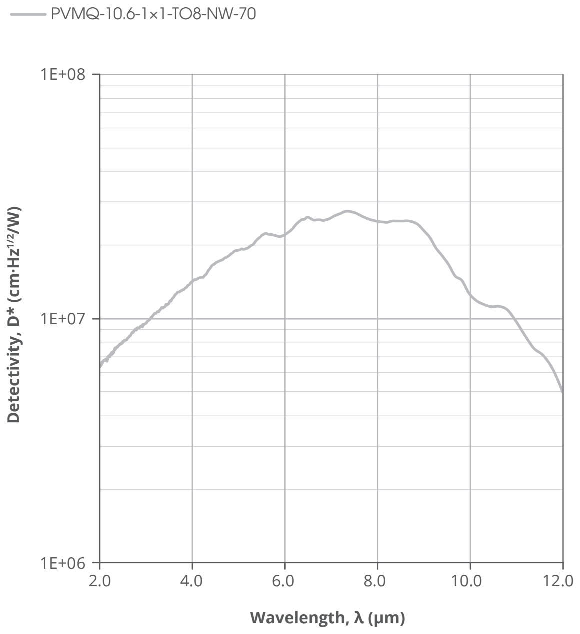
DETECTOR CONFIGURATION

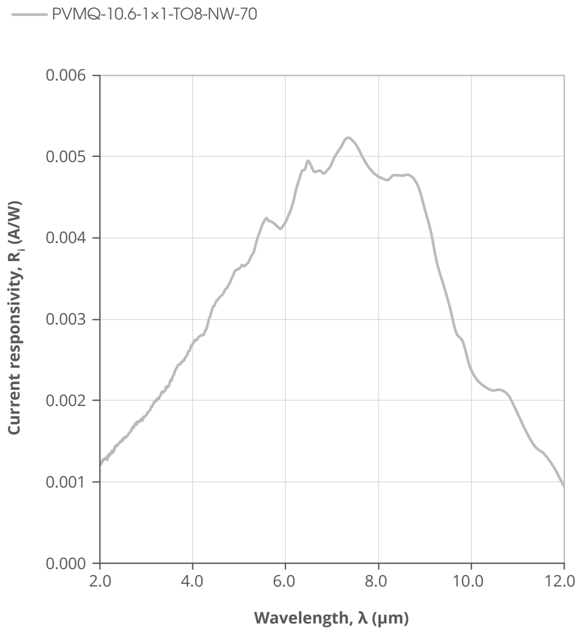
Detector symbol	Cooling	Temperature sensor	Active area of single element, A, mm×mm	Number of elements	Active area pitch, mm	Optical immersion	Package	Acceptance angle, Φ, deg	Window
PVMQ-10.6-1×1-TO8-NW-70	no	n/a	1×1	4 (2 rows, 2 lines)	1.15 (horizontally) 1.20 (vertically)	no	TO8	~70	no

SPECIFICATION (T_{amb} = 293 K, V_b = 0 V)

Detector symbol	Cut-on wavelength (10%)	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity		Current responsivity			Time constant	Dynamic resistance	
	λ_{cut-on}	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)	$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R_d	
	µm	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W	A/W	A/W		ns	Ω	
	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Min.	Typ.
PVMQ-10.6-1×1-TO8-NW-70	2.0	8.5±1.0	10.6	12.0	2.0×10^7	1.0×10^7	0.004	0.002	0.0025	1.5	30	50

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- TO8 (quadrant) package (without window) – Technical drawing (p. 201)

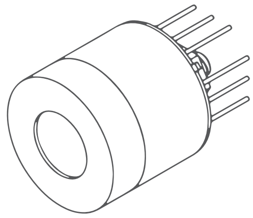
ABSOLUTE MAXIMUM RATINGS

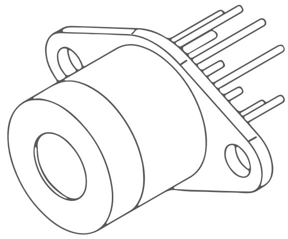
Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$	No bias voltage needed	-	-

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PC-10.6 SERIES

HgCdTe thermoelectrically cooled photoconductive infrared detectors


4TE-TO8


4TE-TO66

FEATURES

- Spectral range: over 10.3 µm
- Front-side illuminated
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36**
  RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36**
  RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

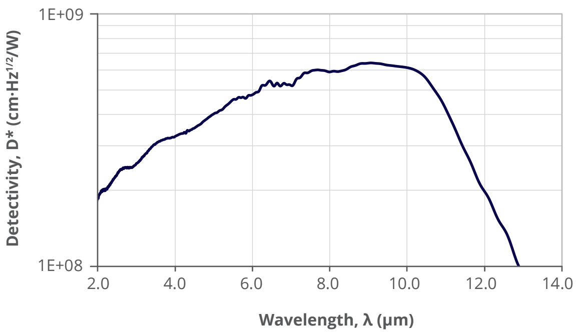
SERIES DESCRIPTION

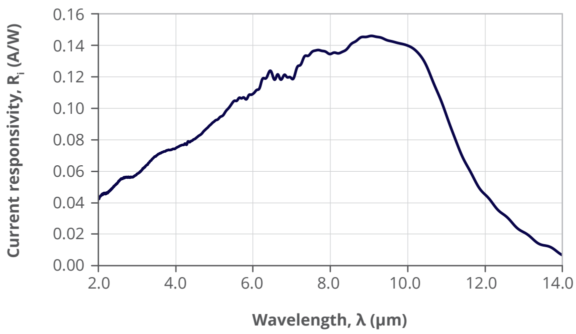
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Active area, A, mm×mm	Optical immersion	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PC-4TE-10.6-1×1-TO8-wZnSeAR-70	4TE T_{chip}≅200K	thermistor	1×1	no	TO8	~70	wZnSeAR (3 deg. zinc selenide, anti-reflection coating
PC-4TE-10.6-1×1-TO66-wZnSeAR-70					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.4 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current reponsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PC-4TE-10.6-1×1-TO8-wZnSeAR-70	8.5±0.6	10.6	13	6.5×10^8	3.5×10^8	4.0×10^8	0.06	0.03	0.06	30	250	0.4	20
PC-4TE-10.6-1×1-TO66-wZnSeAR-70													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 209)
- 4TE-TO66 package
  – Technical drawing (p. 211)

RECOMMENDED AMPLIFIERS

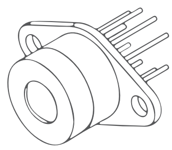
Detector symbol	Amplifier type
PC-4TE-10.6-1×1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

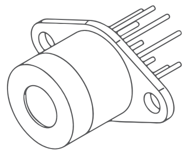
ABSOLUTE MAXIMUM RATINGS

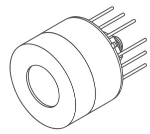
Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	MW/cm²
Maximum bias voltage, $V_{b\,max}$		2.0	V
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

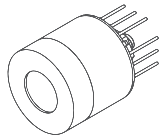
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-10.6 SERIES


2TE-TO66


4TE-TO66


2TE-TO8


4TE-TO8

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors

FEATURES

- Spectral range: up to 12.8 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

RELATED PRODUCTS

- **LabM-I-10.6** detection module (p. 107)
- **UM-I-10.6** detection module (p. 113)
- **microM-10.6** detection module (p. 110)
- **PVIA-10.6-1×1-TO39-NW-36** RoHS-compliant detector (p. 22)
- **PVIA-4TE-10.6-1×1-TO8-wZnSeAR-36** RoHS-compliant detector (p. 22)

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing

SERIES DESCRIPTION

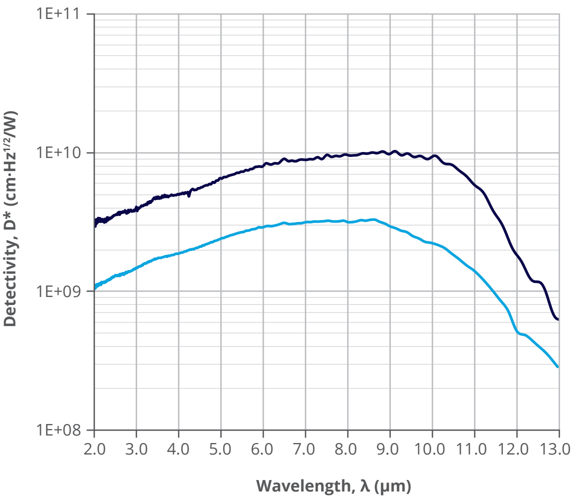
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-2TE-10.6-1×1-TO8-wZnSeAR-36	2TE T_{chip}≅230K	thermistor	1×1	hyperhemisphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PCI-2TE-10.6-1×1-TO66-wZnSeAR-36					TO66		
PCI-4TE-10.6-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅200K				TO8		
PCI-4TE-10.6-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K)

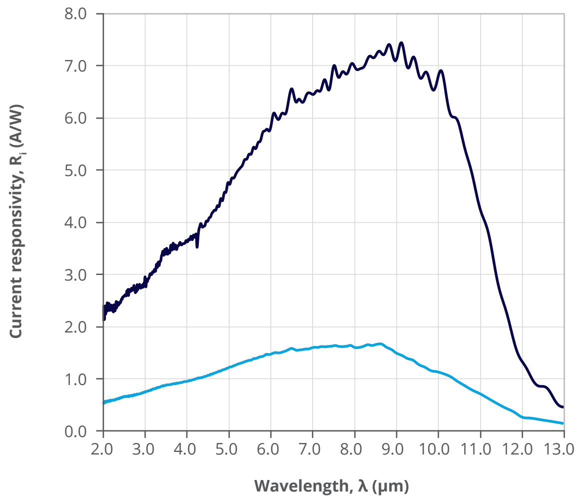
Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut\text{-}off}$	$D^*(\lambda_{peak}$, 20kHz)	$D^*(\lambda_{spec}$, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PCI-2TE-10.6-1×1-TO8-wZnSeAR-36 PCI-2TE-10.6-1×1-TO66-wZnSeAR-36	8.2±0.8	10.6	12.8	2.2×10^9	1.0×10^9	1.5×10^9	0.6	0.1	0.3	10	200	0.3	20
PCI-4TE-10.6-1×1-TO8-wZnSeAR-36 PCI-4TE-10.6-1×1-TO66-wZnSeAR-36	9.5±0.6	10.6	12.5	4.1×10^9	3.0×10^9	3.0×10^9	0.7	0.2	0.4	30		0.24	

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)

PCI-2TE-10.6-1×1-TO8/TO66-wZnSeAR-36
PCI-4TE-10.6-1×1-TO8/TO66-wZnSeAR-36



PCI-2TE-10.6-1×1-TO8/TO66-wZnSeAR-36
PCI-4TE-10.6-1×1-TO8/TO66-wZnSeAR-36



MECHANICAL LAYOUT AND PINOUT

- 2TE-TO8 package
  – Technical drawing (p. 204)
- 2TE-TO66 package
  – Technical drawing (p. 206)
- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PCI-2TE-10.6-1×1-TO8-wZnSeAR-70	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)
PCI-4TE-10.6-1×1-TO8-wZnSeAR-70	

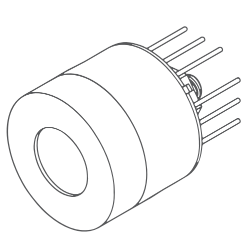
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm^2
	Single pulses <1 μs duration	10	kW/cm^2
Maximum bias voltage, $V_{b\ max}$		1.5	V
Maximum TEC voltage, $V_{TEC\ max}$	2TE	1.3	V
	4TE	8.3	
Maximum TEC current, $I_{TEC\ max}$	2TE	1.2	A
	4TE	0.4	

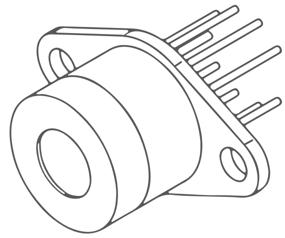
Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-12 SERIES

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors



3TE-TO8



3TE-TO66

FEATURES

- Spectral range: over 14.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required
- Detector **PCI-3TE-12-1×1-TO8-wZnSeAR-36** is a **Selected Line product**

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: C_2H_6, NH_3
- Laser measurements: power monitoring and control, beam profiling and positioning, calibration

RELATED PRODUCT

- **SM-I-12** detection module (p. 122)

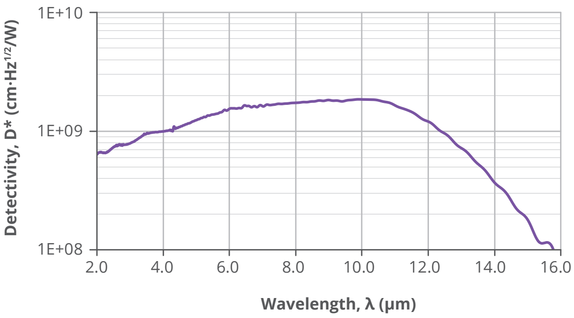
SERIES DESCRIPTION

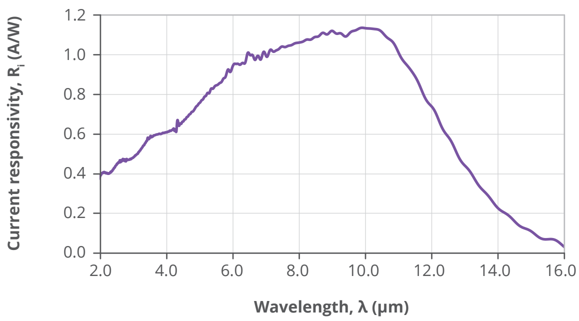
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-3TE-12-1×1-TO8-wZnSeAR-36	3TE T_{chip}≅210K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PCI-3TE-12-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.9 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PCI-3TE-12-1×1-TO8-wZnSeAR-36	10.0±0.5	12.0	14.0	1.6×10^9	9.0×10^8	1.2×10^9	1.0	0.07	0.7	5	200	0.9	20
PCI-3TE-12-1×1-TO66-wZnSeAR-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 3TE-TO8 package
  – Technical drawing (p. 207)
- 3TE-TO66 package
  – Technical drawing (p. 208)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PCI-3TE-12-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

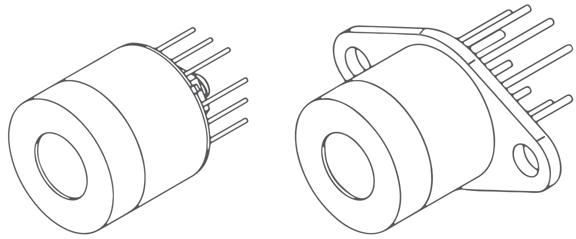
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\,max}$		1.5	V
Maximum TEC voltage, $V_{TEC\,max}$	3TE	3.6	V
Maximum TEC current, $I_{TEC\,max}$	3TE	0.45	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-13 SERIES

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors



4TE-TO8 4TE-TO66

FEATURES

- Spectral range: over 14.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: C_2H_6
- Toxic gas detection
- Gas leak detection

RELATED PRODUCT

- **PVIA-4TE-13-1×1-TO8-wZnSeAR-36**
  RoHS-compliant detector (p. 24)

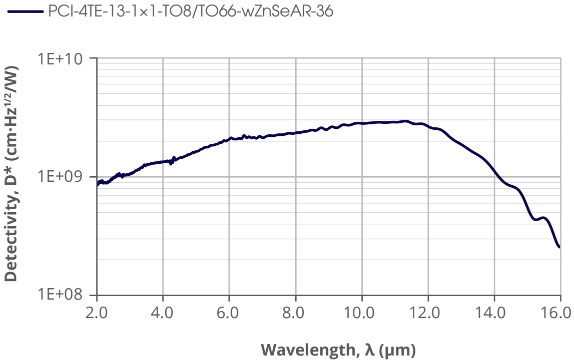
SERIES DESCRIPTION

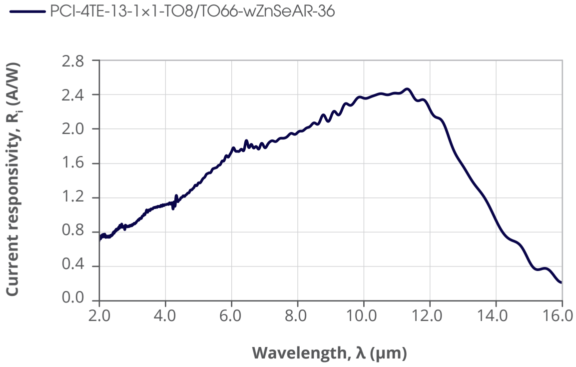
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-4TE-13-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅200K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PCI-4TE-13-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.8 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Dynamic resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	D*(λ_{peak}, 20kHz)	D*(λ_{spec}, 20kHz)		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	cm·Hz$^{1/2}$/W	cm·Hz$^{1/2}$/W		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PCI-4TE-13-1×1-TO8-wZnSeAR-36	10.4±0.6	13.0	14.0	2.4×10^9	1.0×10^9	1.8×10^9	0.5	0.05	0.4	6	300	0.8	20
PCI-4TE-13-1×1-TO66-wZnSeAR-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PCI-4TE-13-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

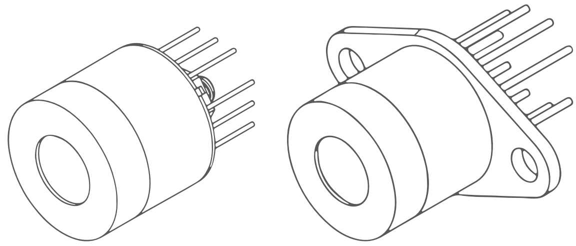
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm²
	Single pulses <1 μs duration	10	kW/cm²
Maximum bias voltage, $V_{b\ max}$		1.5	V
Maximum TEC voltage, $V_{TEC\ max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\ max}$	4TE	0.4	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PCI-14 SERIES

HgCdTe thermoelectrically cooled optically immersed photoconductive infrared detectors



4TE-TO8 4TE-TO66

FEATURES

- Spectral range: over 14.0 µm
- Back-side illuminated
- Unique immersion lens technology applied
- No minimum order quantity required

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: CH_3Cl, C_2H_2
- Toxic gas detection

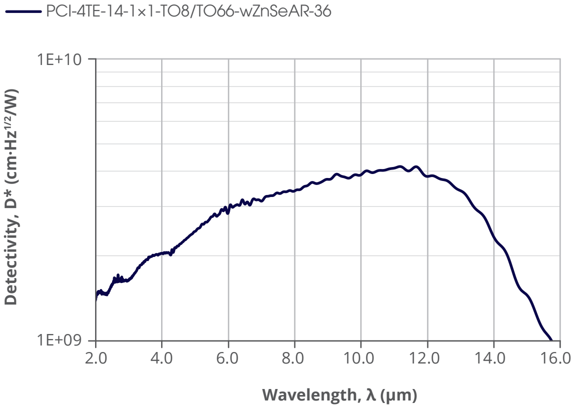
SERIES DESCRIPTION

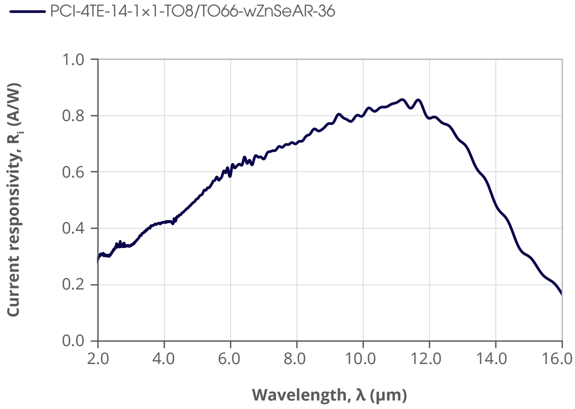
Detector symbol	Cooling (p. 191)	Temperature sensor (p. 192)	Optical area, A_o, mm×mm	Optical immersion (p. 188)	Package	Acceptance angle, Φ, deg.	Window (p. 193)
PCI-4TE-14-1×1-TO8-wZnSeAR-36	4TE T_{chip}≅200K	thermistor	1×1	hyperhemi-sphere	TO8	~36	wZnSeAR (3 deg. zinc selenide, anti-reflection coating)
PCI-4TE-14-1×1-TO66-wZnSeAR-36					TO66		

SPECIFICATION (T_{amb} = 293 K, V_b = 0.5 V)

Detector symbol	Peak wavelength	Specific wavelength	Cut-off wavelength (10%)	Detectivity			Current responsivity			Time constant	Resistance	Bias voltage	1/f corner frequency
	λ_{peak}	λ_{spec}	$\lambda_{cut-off}$	$D^*(\lambda_{peak}, 20kHz)$	$D^*(\lambda_{spec}, 20kHz)$		$R_i(\lambda_{peak})$	$R_i(\lambda_{spec})$		τ	R	V_b	f_c
	µm	µm	µm	$cm \cdot Hz^{1/2}/W$	$cm \cdot Hz^{1/2}/W$		A/W	A/W		ns	Ω	V	kHz
	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Typ.
PCI-4TE-14-1×1-TO8-wZnSeAR-36	11.2±0.6	14.0	15.0	5.0×10^8	3.0×10^8	4.0×10^8	0.25	0.03	0.10	5	250	0.5	20
PCI-4TE-14-1×1-TO66-wZnSeAR-36													

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K)





MECHANICAL LAYOUT AND PINOUT

- 4TE-TO8 package
  – Technical drawing (p. 210)
- 4TE-TO66 package
  – Technical drawing (p. 212)

RECOMMENDED AMPLIFIERS

Detector symbol	Amplifier type
PCI-4TE-14-1×1-TO8-wZnSeAR-36	AIP series (p. 126) PIP series (p. 129) MIP series (p. 132) SIP-TO8 series (p. 135)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Operation at T_{amb} >30°C may increase the active element temperature and reduce the performance of the detector below specified parameters	-20 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Soldering temperature	Within 5 s or less	≤300	°C
Storage humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²
Maximum bias voltage, $V_{b\,max}$		1.5	V
Maximum TEC voltage, $V_{TEC\,max}$	4TE	8.3	V
Maximum TEC current, $I_{TEC\,max}$	4TE	0.4	A

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

IR DETECTION MODULES

AMS3140-01, AMS6140-01

Temperature stabilized infrared detection module with an integrated amplifier and temperature controller

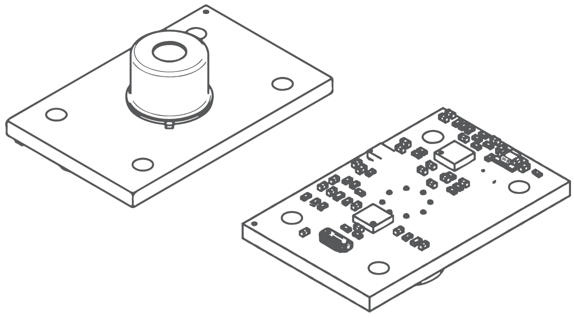


FIGURE 1. The AMS detection module

FEATURES

- Spectral range: 2.5 to 5.7 µm or 1.7 to 7 µm[1]
- Active area: 1 mm × 1 mm
- Built-in temperature controller
- Pin configurable chip temperature
- Low 1/f noise corner
- Bandwidth: DC up to 4 MHz
- Single, low-voltage power supply: 3.3 V
- Differential output
- Small board-to-board connector
- Small dimensions: 30 mm × 19 mm × 10 mm
- III-V material
- Low weight: 5 g
- Evaluation kit and additional accessories available (p. 156)

APPLICATIONS

- Gas detectors with MEMS, LED, or laser sources
- Temperature sensors
- Embedded systems
- Portable devices

GENERAL DESCRIPTION

The AMS3140-01/AMS6140-01 are cost-effective infrared detection modules designed for high-volume applications. They include PVMA-1TE-5-1×1-TO39-pSiAR-70/PVMA-1TE-6-1×1-TO39-pSiAR-70 detectors which are optimized for wavelengths up to 5 µm or up to 6 µm respectively. The built-in amplifier and temperature controller provide constant responsivity over a wide range of ambient temperatures. Wide frequency bandwidth and low 1/f noise corner frequency provide efficient measurements with generally available sources of radiation, including MEMS heaters and pulsed LEDs or lasers. With differential output, the modules offer easy connectivity over tiny and low-cost connectors with high immunity to electromagnetic interference. Small dimensions provide easy mechanical and thermal integration with the target device. Planar silicon window with anti-reflection coating facilitates applications with narrow-band IR sources.

[1] Responsivity is higher than 10% of peak value within this range for chip temperature 20°C

CONNECTIVITY

AMS3140-01/AMS6140-01 feature a tiny connector with 14 signal pins and 2 high current pins. The description of pins and pins ordering are shown in TABLE 1, FIGURE 2, and FIGURE 3.

The recommended mating connector is Amphenol 101R014FB110. Please refer to chapter MECHANICAL REQUIREMENTS for more information.

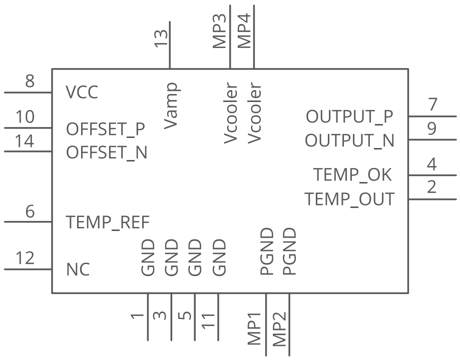


FIGURE 2. Pinout of the module connector

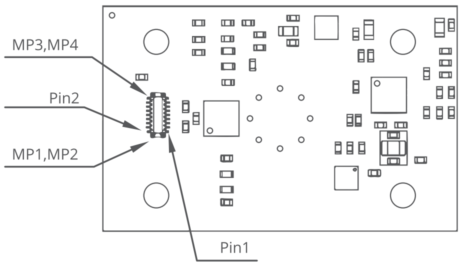


FIGURE 3. Pins ordering on the module connector

TABLE 1. Pin functions

Pin number	Symbol	Function
1, 3, 5, 11	GND	Signal and amplifier supply ground
7	OUTPUT_P	Positive signal output
9	OUTPUT_N	Negative signal output
12	NC	Not used. Leave floating
2	TEMP_OUT	Analog temperature output. For more information see the chapter THERMAL DESIGN
4	TEMP_OK	Comparator output signal. Set to high when the temperature of the chip is close to the desired value. For more information see the chapter THERMAL DESIGN
6	TEMP_REF	Temperature reference voltage. Can be used to change the temperature of the chip. For more information see the chapter THERMAL DESIGN
13	V_{amp}	Amplifier supply input
8	V_{cc}	Internal supply voltage output. Use only to set DC offset voltage using OFFSET_P and OFFSET_N. For more information see the chapter SIGNAL OUTPUTS. Do not use it for any other purpose
10	OFFSET_P	DC offset for positive signal output. Leave floating if no output offset is required. Connect directly to V_{cc} to introduce the maximum possible DC offset. The optional resistor can be used if a lower value of DC offset is required. For more information see the chapter SIGNAL OUTPUTS
14	OFFSET_N	DC offset for negative signal output. Leave floating if no output offset is required. Connect directly to GND to introduce the maximum possible DC offset. The optional resistor can be used if a lower value of DC offset is required
MP3, MP4	V_{cooler}	Supply voltage input for the temperature controller. Can be connected to V_{amp}. For more information see the chapter POWER SUPPLY
MP1, MP2	PGND	Ground path for temperature controller. Connect to GND

ABSOLUTE MAXIMUM RATINGS

Do not stress the device above the limits specified in this chapter since it may cause permanent damage to the device.

TABLE 2. Absolute maximum ratingss

Parameter	Rating
Amplifier supply, V_{amp}	5.5 V
Temperature controller supply, V_{cooler}	5.5 V
TEMP_REF voltage	-0.1 V to 3.1 V
OFFSET_N and OFFSET_P voltage	-0.1 V to 3.1 V
Ambient operating temperature (with ideal heatsink)	-40°C to 65°C, non-condensing
Storage temperature	-50°C to 85°C

SPECIFICATION (+3.3 V supply, T_{amb} = -20°C, R_{load} = 1 MΩ to ground, unless otherwise noted)

TABLE 3. Module specification for chip temperature T_{chip} = -20°C

Parameter	Test conditions/remarks		Value Min.	Value Typ.	Value Max.	Unit
SPECTRAL CHARACTERISTICS						
Cut-on wavelength	At 10% of peak responsivity	AMS3140-01		2.35		μm
		AMS6140-01		2.20		μm
Peak wavelength, λ_{peak}		AMS3140-01		4.30		μm
		AMS6140-01		4.20		μm
Cut-off wavelength	At 10% of peak responsivity	AMS3140-01		5.40		μm
		AMS6140-01		6.58		μm
Responsivity	At λ_{peak}	AMS3140-01		400		V/W
		AMS6140-01		220		V/W
Detectivity	At λ_{peak}, f = 1 kHz	AMS3140-01		2.0×10^9		$cm\cdot Hz^{1/2}/W$
		AMS6140-01		1.0×10^9		$cm\cdot Hz^{1/2}/W$
OPTICAL						
Active area width				1		mm
Active area length				1		mm
Acceptance angle, Φ			54	58	62	deg
Linearity range	10% deviation, see FIGURE 10			5.3		mW
	5% deviation, see FIGURE 10			2.8		mW
OUTPUT PERFORMANCE						
Output differential offset	No radiation, OFFSET_P and OFFSET_N floating		-5		20	mV
Output single-ended common mode voltage, V_{CM}	OFFSET_P and OFFSET_N floating			1.22		V
Output single-ended common mode voltage	OFFSET_P and OFFSET_N floating, R_{load} = 50 Ω			0.61		V
Output impedance, R_{out}	OUTPUT_P and OUTPUT_N, single-ended			50		Ω
Output voltage swing, negative	OUTPUT_P and OUTPUT_N, single-ended			0.2		V
Output voltage swing, positive	OUTPUT_P and OUTPUT_N, single-ended			2.2		
High cut-off frequency, f_{hi}	R_{load} = 50 Ω	AMS3140-01		4		MHz
		AMS6140-01		2.6		MHz
POWER SUPPLY						
Supply current on V_{amp} and GND pins	R_{load} = 50 Ω			50		mA
Supply current on V_{cooler} and PGND pins				550		mA
THERMAL						
Thermal resistance[1], θ_{T-S}	Hot side of built-in TEC to cooling surface of the module			10		K/W
Thermal power, P_{cool}	Dissipated through heatsink			1.2		W
Maximum temperature difference[2], ΔT_{max}	Provided by built-in TEC cooler			60		°C
Area of cooling surface, S_C	Board surface which can be used to transfer heat to the heatsink			450		mm^2
OTHER						
TEMP_REF voltage	When left floating			1.54		V
TEMP_REF input resistance				17		kΩ
OFFSET_N and OFFSET_P input resistance, R_{OFFSET}				3.3		kΩ
OFFSET_N and OFFSET_P input capacitance				100		nF
V_{CC}				3.0		V
TEMP_OK current	Sourcing/sinking				0.1	mA
TEMP_OK high voltage			2.7			V
TEMP_OK low voltage					0.3	V

[1] See chapter THERMAL DESIGN for more details

SPECIFICATION (+3.3 V supply, T_{amb} = 20°C, R_{load} = 1 MΩ to ground, unless otherwise noted)

TABLE 4. Module specification for chip temperature T_{chip} = 20°C

Parameter	Test conditions/remarks		Value Min.	Value Typ.	Value Max.	Unit
SPECTRAL CHARACTERISTICS						
Cut-on wavelength	At 10% of peak responsivity	AMS3140-01		2.4		μm
		AMS6140-01		1.7		μm
Peak wavelength, λ_{peak}		AMS3140-01		4.4		μm
		AMS6140-01		4.2		μm
Cut-off wavelength	At 10% of peak responsivity	AMS3140-01		5.7		μm
		AMS6140-01		7.0		μm
Responsivity	At λ_{peak}	AMS3140-01		360		V/W
		AMS6140-01		160		V/W
Detectivity	At λ_{peak}, f = 1 kHz	AMS3140-01		5.0×10^{8}		$cm\cdot Hz^{1/2}/W$
		AMS6140-01		4.2×10^{8}		$cm\cdot Hz^{1/2}/W$
OPTICAL						
Active area width				1		mm
Active area length				1		mm
Acceptance angle, Φ			54	58	62	deg
Linearity range	10% deviation, see FIGURE 10			5.5		mW
	5% deviation, see FIGURE 10			5.2		mW
OUTPUT PERFORMANCE						
Output differential offset	No radiation, OFFSET_P and OFFSET_N floating		-5		5	mV
Output single-ended common mode voltage, V_{CM}	OFFSET_P and OFFSET_N floating			1.22		V
Output single-ended common mode voltage	OFFSET_P and OFFSET_N floating, R_{load} = 50 Ω			0.61		V
Output impedance, R_{out}	OUTPUT_P and OUTPUT_N, single-ended			50		Ω
Output voltage swing, negative	OUTPUT_P and OUTPUT_N, single-ended			0.2		V
Output voltage swing, positive	OUTPUT_P and OUTPUT_N, single-ended			2.2		
Low cut-off frequency, f_{lo}				DC		
High cut-off frequency, f_{hi}	R_{load} = 50 Ω	AMS3140-01		3.0		MHz
		AMS6140-01		2.3		MHz
POWER SUPPLY						
Supply current on V_{amp} and GND pins	R_{load} = 50 Ω			50		mA
Supply current on V_{cooler} and PGND pins				20		mA
THERMAL						
Thermal resistance[1], θ_{T-S}	Hot side of built-in TEC to cooling surface of the module			10		K/W
Thermal power, P_{cool}	Dissipated through heatsink			0.1		W
Maximum temperature difference[3], ΔT_{max}	Provided by built-in TEC cooler			60		°C
Area of cooling surface, S_c	Board surface which can be used to transfer heat to the heatsink			450		mm^2
OTHER						
TEMP_REF voltage	When left floating			1.54		V
TEMP_REF input resistance				17		kΩ
OFFSET_N and OFFSET_P input resistance, R_{OFFSET}				3.3		kΩ
OFFSET_N and OFFSET_P input capacitance				100		nF
V_{CC}				3.0		V
TEMP_OK current	Sourcing/sinking				0.1	mA
TEMP_OK high voltage			2.7			V
TEMP_OK low voltage					0.3	V

[1] See chapter THERMAL DESIGN for more details

TYPICAL PERFORMANCE CHARACTERISTICS
(+3.3 V supply, T_{amb} = 20°C, R_{load} = 1 MΩ to ground, unless otherwise noted)

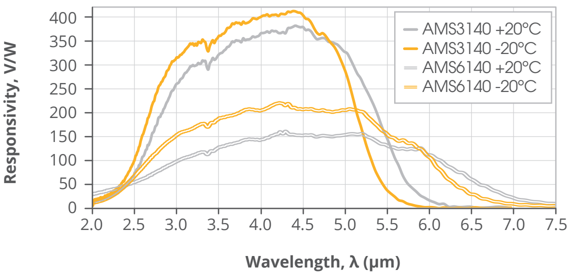


FIGURE 4. Spectral characteristics for different temperatures of detection chip

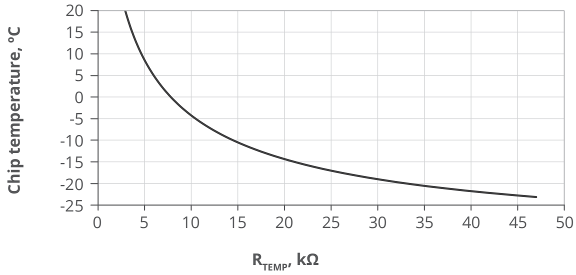


FIGURE 5. Detection chip temperature vs resistance connected to TEMP_REF pin (see FIGURE 12)

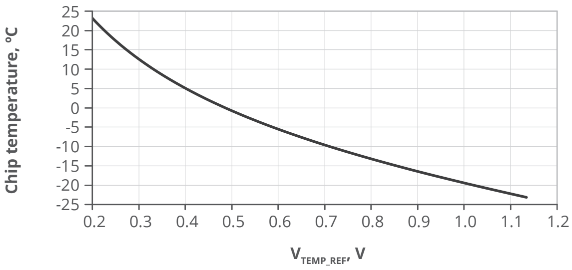


FIGURE 6. Detection chip temperature vs voltages on TEMP_REF and TEMP_OUT pins (see FIGURE 13)

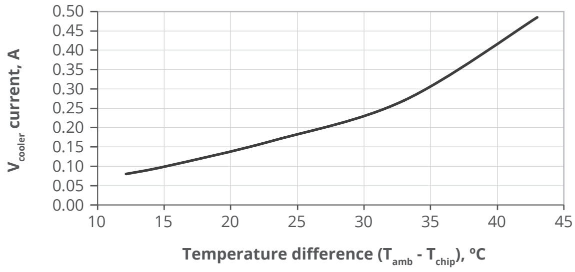


FIGURE 7. Supply current vs temperature difference between detection chip and ambient. The thermal resistance of the attached heatsink: 2.5 K/W

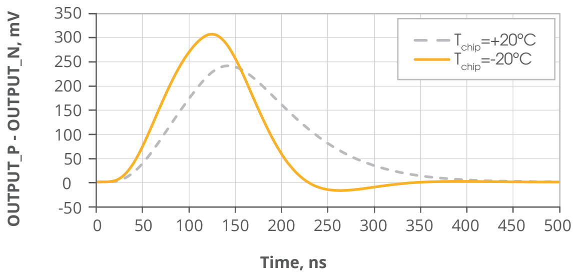


FIGURE 8. Pulse response for different temperatures of detection chip, R_{load} = 50 Ω

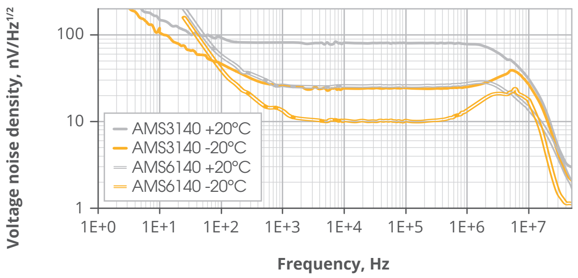


FIGURE 9. Differential output noise density for different temperatures of detection chip

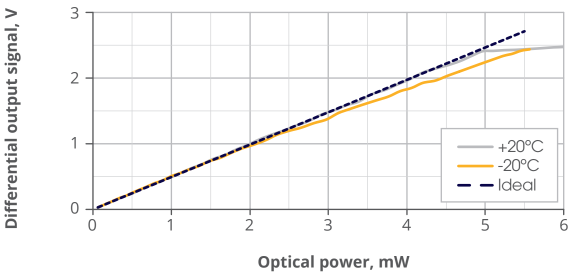


FIGURE 10. Output signal vs input power

POWER SUPPLY

The module can be powered from a single voltage source, but special care is required to avoid interference between the amplifier circuit and the temperature controller circuit.

There are two supply paths present on the socket: V_{amp}/GND and V_{cooler}/PGND. V_{amp}/GND are used to supply the amplifier circuit. A 1 µF capacitor should be placed close to the module connector. V_{cooler}/PGND pins are used to supply the built-in thermoelectric cooler (TEC) and require an additional 1 µF decoupling capacitor. The simplified supply pattern is presented in FIGURE 11.

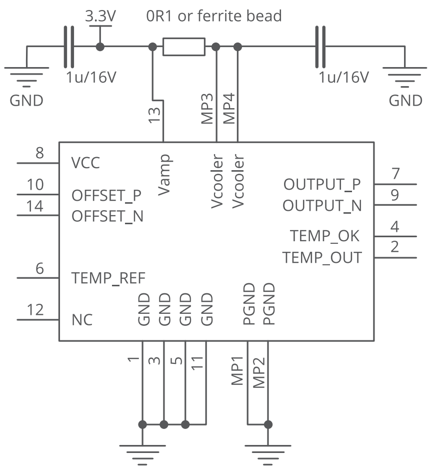


FIGURE 11. Recommended power supply decoupling

In some applications, a built-in temperature controller can influence the output signal. The following methods can be used to reduce interference between the temperature controller and output signal:

1. Separate power supplies with EMI ferrite.
2. Add a common mode filter on the V_{cooler}/PGND to separate it from V_{amp}/GND.
3. Add a common mode filter on the differential signal output.
4. Add a small resistor (0.1 Ω) to the V_{cooler} supply.

The choice of proper solution depends on the nature of the interference and has to be considered individually for each design.

TEMPERATURE CONTROL

The module has a built-in thermoelectric cooler and provides easy pin-configurable temperature adjustment with a single resistor, external voltage source, or DAC output.

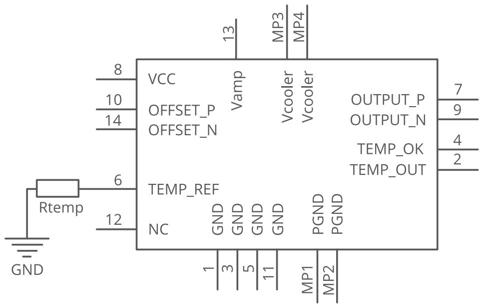


FIGURE 12. Adjusting chip temperature with a single resistor

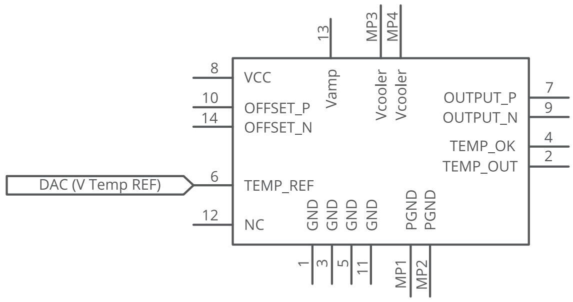


FIGURE 13. Adjusting chip temperature with an external digital-to-analog converter

The module provides constant responsivity only when the chip temperature is stable. After powering on the module the built-in temperature controller starts the cooling process. Before the controller reaches its stable point, parameters of the module (i.e. voltage responsivity) should be considered unknown. There are a couple of approaches to deal with this issue:

1. Time-based. In most applications, the chip will reach the desired temperature in less than 5 seconds. Therefore V_{amp} and V_{cooler} should be enabled 5 seconds before the first measurement.
2. Comparator + time-based. TEMP_OK is a simple comparator output that will be asserted high when chip temperature is close to or lower than desired. Make sure that TEMP_OK is kept high for at least 1 second before the first measurement.

3. ADC-based. TEMP_OUT provides voltage related to the current temperature of the chip. In steady-state TEMP_OUT and TEMP_REF should be equal. As before, make sure that TEMP_OUT and TEMP_REF are close enough for at least 1 second.

The only 3rd method is a fully-featured solution that can detect unpredicted situations when the system is operating (i.e. decreasing performance of thermal interface material). However, it requires additional ADC which has some impact on the price of the final device. Therefore, pricewise, 1st and 2nd methods can be considered as simplified solutions.

There is also a fully analog solution for 3rd method, which is presented in FIGURE 14. U1B buffers voltage from the TEMP_REF pin. R1-R2-R3-R4 shifts the potential a little up (R1-R2) and down (R3-R4) to define the borders of the window. U1C asserts output if the TEMP_REF pin is too high, and U1D asserts output if the TEMP_OUT pin voltage is too low, compared to shifted potentials.

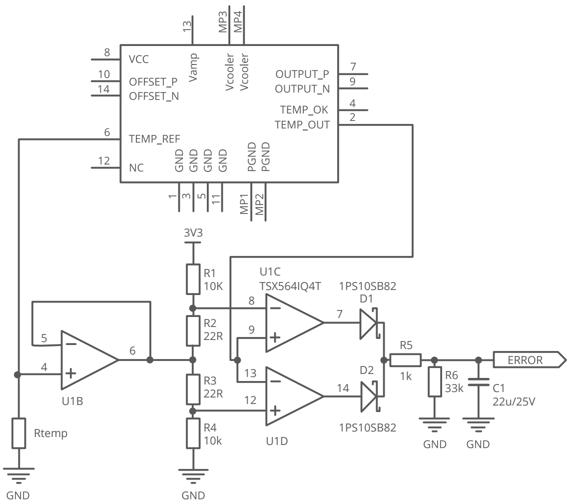


FIGURE 14. Example of analogue window detector to monitor the temperature of the detection chip

THERMAL DESIGN

There are two sources of heat that need to be separately considered. First is the TE cooler mounted inside of the detector. It is strongly coupled to the surrounding cooling surface on top of the PCB and requires an external heat sink. The example is presented in FIGURE 16.

FIGURE 15. Cross-section of example application with attached heatsink

The heatsink is not provided with the module. Its size and required performance depend on the application and target price of the final device.

The second source of heat is the electronic components on the bottom of the PCB. For applications with high cooling power, it is recommended to leave the bottom side of the module uncovered. An example of such a solution is presented in FIGURE 21.

The simplified thermal model for application presented in FIGURE 15 is presented in FIGURE 17.

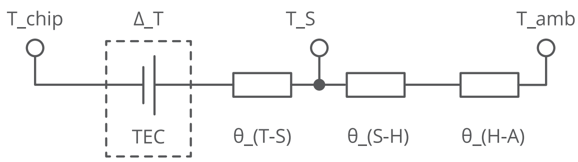


FIGURE 16. Simplified thermal model for a typical application consisting of AMS module T(EC + $\theta_{T\text{-}S}$), thermal interface material ($\theta_{S\text{-}H}$), and heatsink ($\theta_{H\text{-}A}$). T_{chip} is the temperature of the detection chip, T_s is the temperature of the cooling surface, T_{amb} is the ambient temperature

The lowest possible chip temperature can be calculated as:

$$T_{chip} = T_{amb} + P_{cool} \cdot (\theta_{H\text{-}A} + \theta_{S\text{-}H} + \theta_{T\text{-}S}) - \triangle T_{max} \quad (1)$$

where:

- T_{chip} is the temperature of the detection chip
- T_{amb} is ambient temperature,
- P_{cool} is thermal power dissipated through the cooling surface,
- $\theta_{H\text{-}A}$ is the thermal resistance between the heatsink and air,
- $\theta_{S\text{-}H}$ is the thermal resistance between the cooling surface and heatsink,
- $\theta_{T\text{-}S}$ is the thermal resistance between the hot side of the built-in TEC cooler and the cooling surface of the module,
- $\triangle T_{max}$ is the maximum temperature difference that can be generated by the built-in TEC cooler.

$\theta_{S\text{-}H}$ depends mainly on the used thermal interface material or grease and can be calculated using the following formula:

$$\theta_{S\text{-}H} = \frac{t}{\lambda \cdot S_c} \cdot K_f \quad (2)$$

where:

- t is the thickness of the thermal interface material,
- λ is the thermal conductivity of the thermal interface material,
- S_c is the area of the cooling surface,
- K_f is a correction factor due to non-uniform heat transfer through the cooling surface, typically equal to 2.0

Example 1

The module will be mounted on a passive heatsink.

- Range of ambient temperatures: T_{amb} = 0°C to 30°C
- Chosen temperature of detection chip: T_{chip} = -5°C
- Thermal conductivity of grease: 1 W/m · K
- Grease thickness: 0.1mm
- Unknown: required thermal resistance of heatsink ($\theta_{H\text{-}A}$)

Using equations (1) and (2) thermal resistance of heatsink can be expressed as:

$$\theta_{H\text{-}A} = \frac{T_{chip} + \Delta T_{max} - T_{amb}}{P_{cool}} - \theta_{S\text{-}H} - \theta_{T\text{-}S} \quad (3)$$

In this example thermal grease $\theta_{S\text{-}H}$ can be calculated as follows:

$$\theta_{S\text{-}H} = \frac{1 \cdot 10^{-4}\,\mathrm{m}}{1\,\frac{\mathrm{W}}{\mathrm{m \cdot K}}\,450 \cdot 10^{-6}\,\mathrm{m}^2} \cdot 2 = 0.44\,\frac{\mathrm{K}}{\mathrm{W}} \quad (4)$$

Worst case scenario is the highest possible ambient temperature, which in this example is 30°C, what yields:

$$\theta_{H\text{-}A} = \frac{5°\mathrm{C} + 60°\mathrm{C} - 30°\mathrm{C}}{1.2\,\mathrm{W}} - 0.44\,\frac{\mathrm{K}}{\mathrm{W}} - 10\,\frac{\mathrm{K}}{\mathrm{W}} = 10.39\,\frac{\mathrm{K}}{\mathrm{W}} \quad (5)$$

Heatsink with thermal resistance not worse than 10.39 K/W will be sufficient to provide thermal stability of the AMS3140-01/AMS6140-01 module.

Example 2

The module will be mounted on an active cooled metal rail with constant temperature and very good cooling capacity.

- Temperature of cooling rail: 10°C
- Thermal conductivity of grease: 1 W/m · K
- Grease thickness: 0.1 mm
- Unknown: best available temperature of detection chip

Grease parameters are identical to the previous example, therefore thermal resistance of the interface between the module and the cooling rail is already calculated in (4) . $\theta_{H\text{-}A}$ equals zero since the cooling rail has infinite performance. Using equations (1) and (2) the best available temperature of the detection chip can be calculated as:

$$T_{chip} = 10°\mathrm{C} + 1.2\,\mathrm{W} \cdot (0 + 0.44\,\frac{\mathrm{K}}{\mathrm{W}} + 10\,\frac{\mathrm{K}}{\mathrm{W}}) - 60°\mathrm{C} \approx 37°\mathrm{C} \quad (6)$$

Conclusion

The range of ambient temperatures where detection chip temperature is kept on a constant value depends strongly on heatsink parameters. The design of the final device requires a trade-off between price, size, and performance. However, it is also possible to keep a small and cheap heatsink and extend the range of ambient temperatures introducing multiple ranges of ambient temperatures and changing the voltage of the TEMP_REF (see FIGURE 6) pin according to current conditions. The final device needs to be calibrated separately for each range of ambient temperatures. An example of this approach is presented in TABLE 5. The values should be considered as an example only since they depend on the heatsink parameters.

TABLE 5. Example ranges of ambient temperatures

Ambient temperature, °C	Chip temperature set by TEMP_REF pin, °C
30...50	25
15...35	10
0...20	-5

In this example, three ranges of ambient temperatures and three corresponding desired chip temperatures are presented. The voltage on the TEMP_REF pin should be adjusted according to ambient temperature with small hysteresis to avoid unwanted oscillations on the edges of the ranges. The relation between TEMP_REF voltage and chip temperature is presented in FIGURE 6.

SIGNAL OUTPUTS

Output signals paths or wires have to be as short as possible and placed close to each other to minimize loop area formed by them and therefore reduce EMI interference.

The impedance of both outputs is fixed to 50 Ω. If fast pulsed source of radiation is used and the shape of the rising or falling slope is important, both outputs should be terminated with 50 Ω to GND. In this case please use precise resistors with a tolerance not worse than 0.1% to keep the signal path symmetrical. The termination pattern is presented in FIGURE 17.

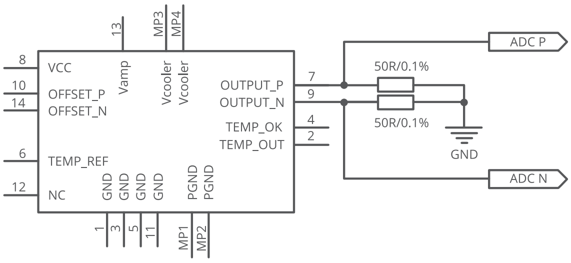


FIGURE 17. Outputs termination for high-speed signals

However, in most typical applications signal termination is not necessary. Provided slowly changing radiation sources are used and/or signal paths are short, outputs may be left unterminated. Connecting outputs to high impedance has one additional benefit: bigger dynamic range of output voltages, since common-mode voltage is bigger for unterminated outputs.

The module is designed to keep the DC output offset to as low value as possible. However in some applications (i.e. direct connection to differential ADC) it may be beneficial to introduce some known value to the DC component. This can be done by connecting the OFFSET_P pin to V_{CC} and OFFSET_N pin to GND.

This approach can be used to match the full scale of differential ADC. If lower offset is required additional resistors may be used, according to FIGURE 18.

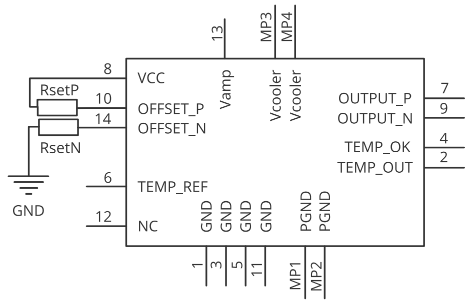


FIGURE 18. Adjusting differential offset of outputs using two resistors. R_{setP} and R_{setN} can be set to 0 Ω for maximum available offset

Connecting OFFSET_P to V_{CC} (using a resistor or short-circuit) will lower the DC component on OUTPUT_P while connecting OFFSET_N to GND will rise the DC component on OUTPUT_N. If R_{setP} and R_{setN} R_{se} represent non-zero values, please use thin-film resistors to avoid additional flicker noise.

For high impedance loads the impact of R_{setP} and R_{setN} on the outputs can be calculated using the following formulas:

$$V_{DC\_OUTPUT\_P} = V_{CM} - \frac{(V_{CC}-V_{CM})}{R_{OFFSET} + R_{setP}} \cdot 1800\ \Omega \quad (7)$$

$$V_{DC\_OUTPUT\_N} = V_{CM} + \frac{V_{CM}}{R_{OFFSET} + R_{setP}} \cdot 1800\ \Omega \quad (8)$$

For matched impedance loads the values calculated with the formula should be divided by 2.

In most applications, an additional voltage amplifier will be necessary. FIGURE 19 shows one of the possible solutions.

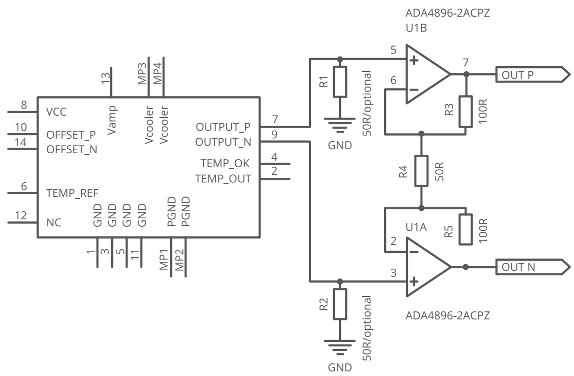


FIGURE 19. Example differential voltage amplifier with gain=5 and DC coupling. R1/R2 are not required for slowly changing signals

This topology of the amplifier is a "simplified instrumentation amplifier". It "copies" common-mode voltage from input to output and amplifies only the differential component. Changing the common-mode voltage to another value is possible using a fully differential amplifier such as LTC6404-1 or LTC6409. Regardless of the chosen solution, please use precise resistors with a tolerance not worse than 0.1% to keep the signal path symmetrical. R_1 and R_2 provide impedance match and can be omitted for slowly changing signals and/or short connection paths.

In most applications, DC component does not provide any information and can be neglected. In such situations, AC coupling is strongly recommended, since the DC component depends on the temperature of the chip as well as the temperature of the surrounding environment. An example of AC coupling is presented in FIGURE 20.

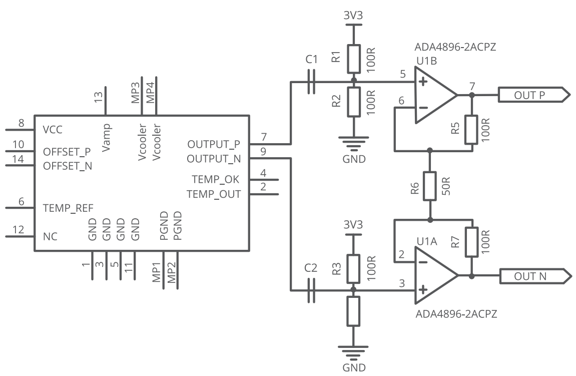


FIGURE 20. Example differential voltage amplifier with gain = 5 and AC coupling

Choose the values of R1, R2, R3, and R4 to set the desired common mode voltage on OUT_N-OUT_P pair. Use low tolerances to keep differential DC component at low values.

Assuming symmetry of "positive" and "negative" paths (i.e. C1=C2, R1=R2, R2=R4), low cut-off frequency is equal to:

$$f_{low3dB} = \frac{1}{2\pi \left(R_{out} + \frac{R_1 \cdot R_2}{R_1 + R_2}\right) C_1} \quad (9)$$

For example:

if $C_1 = C_2 = 10\ \mu F$ and $R_1 = R_2 = R_3 = R_4 = 100\ \Omega$ then low cut-off frequency is equal to 159.15 Hz.

In most applications setting low cut-off frequency to value 10 to 100 times lower than the lowest signal frequency is sufficient. This should not be a problem even for slow signals since impedance matching is not required in this case and therefore R_1, R_2, R_3 and R_4 can have high values.

MECHANICAL REQUIREMENTS

The module has to be mounted on a heatsink. Operations without a heatsink are possible, however not recommended. All four holes have to be used to minimalize mechanical stress and provide a proper thermal connection between the module and the heatsink. If required, thermal grease or any thermal interface material can be used to improve heat transfer. For more information please see the chapter THERMAL DESIGN.

To minimalize the risk of unexpected disconnection of the plug it needs to be fixed to the module using at least two mounting holes. Two connection types are recommended:

- Semi-flexible PCB. Receptacle Amphenol 101R014FB110 has to be placed on the rigid part and the flexible part can be used to connect signals and power supplies to another PCB (FIGURE 22).
- Direct board to board connection. All components on the module are not higher than 1mm, which enables direct stacking of PCBs using the **Amphenol 101R014FB110** receptacle.

In both cases, the distance between the module and the external PCB needs to be precisely fixed to 1mm to avoid stress on the connector. One of the possible solutions are SMT spacers: **Würth Elektronik 9774010943.**

MECHANICAL LAYOUT

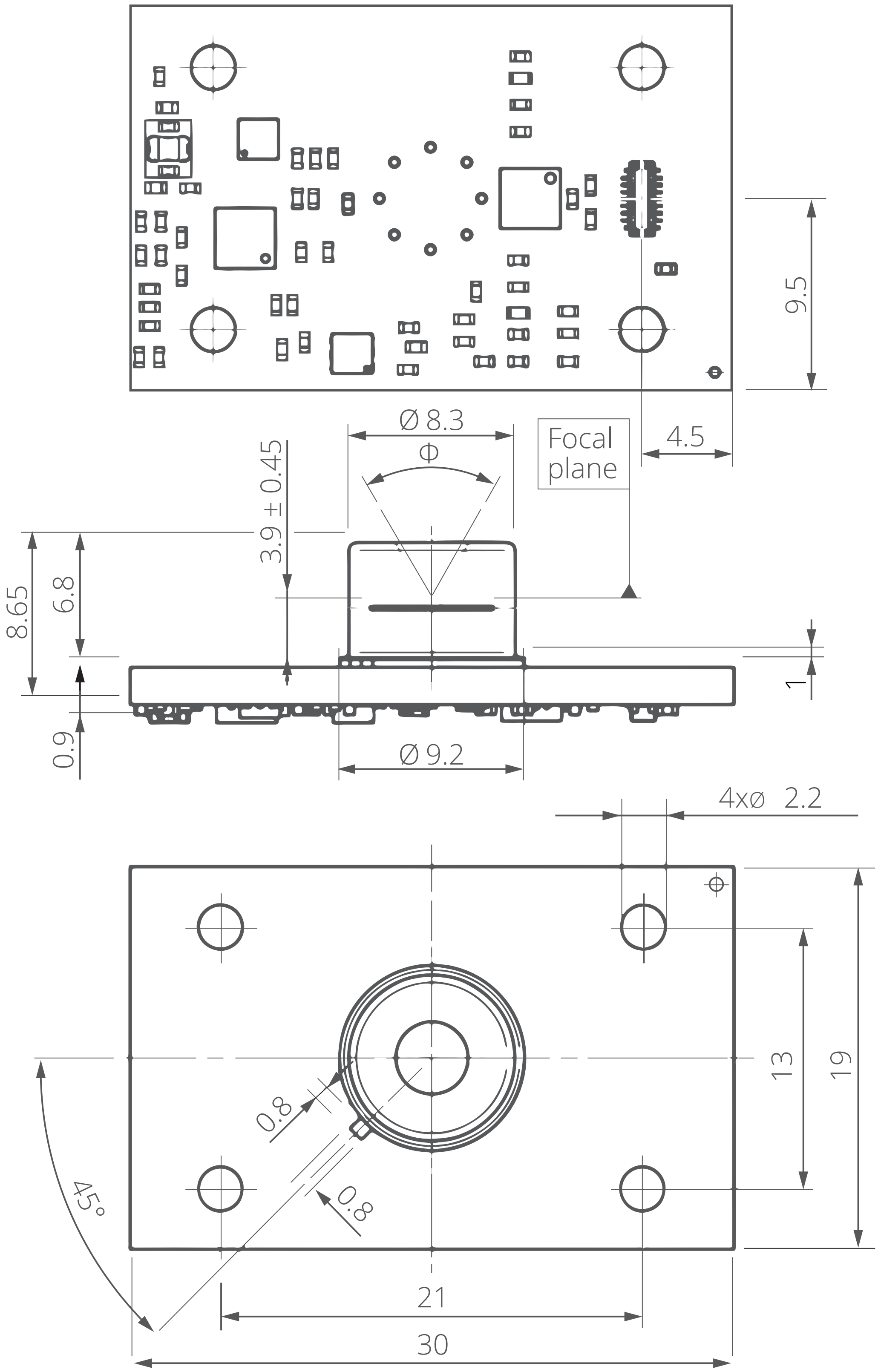


FIGURE 21. Dimensions of AMS3140-01/AMS6140-01 (given in mm)

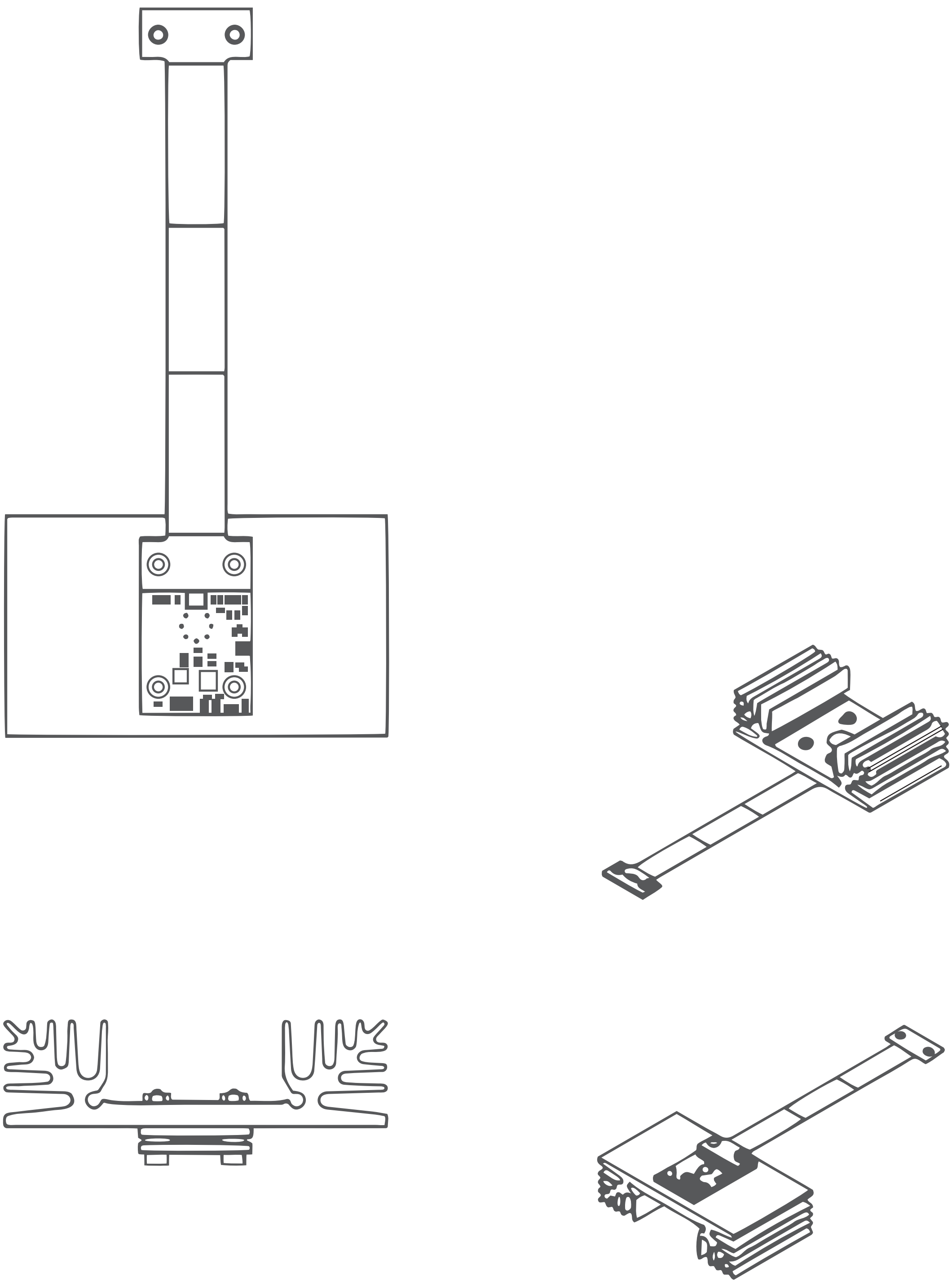
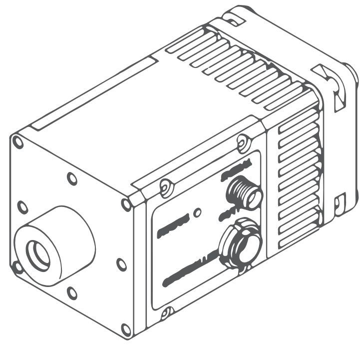


FIGURE 22. Example application of AMS3140-01/AMS6140-01 with flexible PCB

LabM-I-4



Programmable IR detection module based on HgCdTe TE cooled optically immersed photovoltaic detector

FEATURES

- Spectral range: 2.3 to 4.4 µm
- Frequency bandwidth: DC to 7.5 MHz (typ.)
- High performance and reliability
- DC offset compensation
- Built-in fan
- M4 mounting hole
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO_2
- Breath analysis: C_2H_6, CH_2O, NH_3
- Explosion prevention
- Exhaust gas denitrification
- Emission control (exhaust fumes, greenhouse gases)
- Contactless temperature measurements (metal industry)
- Research and prototyping

PROGRAMMABLE PARAMETERS

- Gain: in the 40 dB range
- Bandwidth: 0.15 MHz/1.5 MHz/7.5 MHz (typ.)
- Coupling: AC/DC
- Detector's temperature
- Output voltage offset

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

DEDICATED ACCESSORIES

- PTCC-01 series TEC controller: obligatory (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

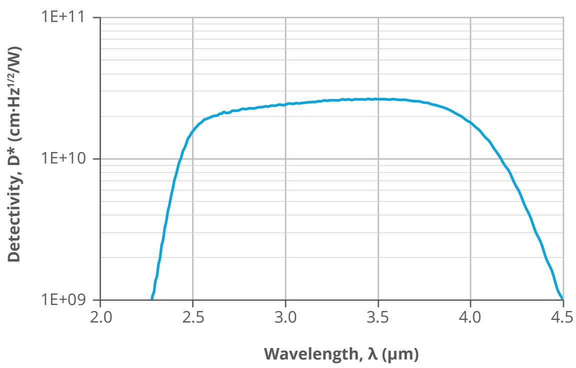
DETECTION MODULE CONFIGURATION

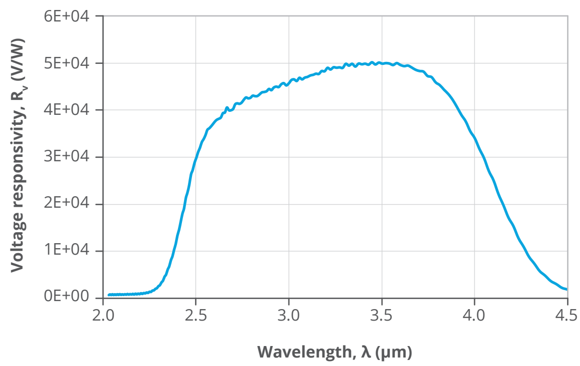
Detection module symbol	LabM-I-4
Detector symbol	PVI-2TE-4-1×1-TO8-wAl_2O_3-36 (p. 30)
Detector type	photovoltaic
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_o	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	2TE
Acceptance angle, Φ	~36 deg.
Window	wAl_2O_3 (3 deg. wedged sapphire)
Preamplifier symbol	PIP (p. 129)
Preamplifier type	transimpedance, programmable
Signal output socket	SMA
Power supply, TE cooler, thermistor and fan socket	LEMO ECG.0B.309.CLN

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted; default module settings)

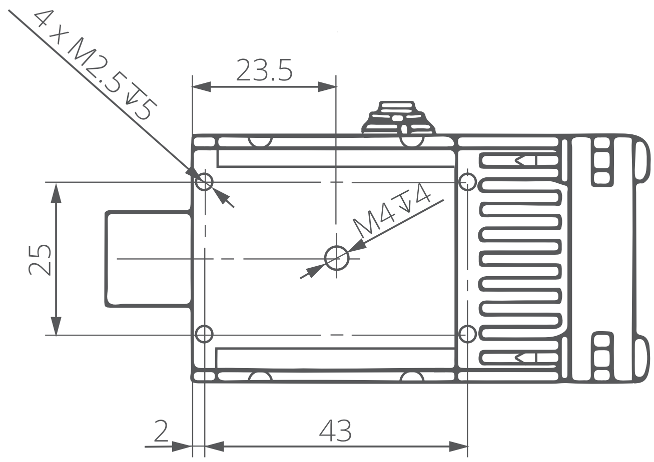
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	230	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of the peak responsivity	-	2.3	-	µm
Peak wavelength, λ_{peak}		3.4	3.5	3.6	µm
Specific wavelength, λ_{spec}		-	4.0	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of the peak responsivity	-	4.4	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 1 MHz	-	2.7×10^{10}	-	cm·Hz$^{1/2}$/W
	At $\lambda = \lambda_{spec}$, f = 1 MHz	1.2×10^{10}	1.8×10^{10}	-	cm·Hz$^{1/2}$/W
Output noise voltage density, v_n	At f = 1 MHz	-	-	300	nV/Hz$^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	5.0×10^4	-	V/W
	At $\lambda = \lambda_{spec}$	2.3×10^4	3.4×10^4	-	V/W
Low cut-off frequency, f_{lo-DC}	DC coupling selected	-	0	-	Hz
Low cut-off frequency, f_{lo-AC}	AC coupling selected	-	10	-	Hz
High cut-off frequency, f_{hi-H}	High bandwidth selected	5	7.5	-	MHz
High cut-off frequency, f_{hi-M}	Mid bandwidth selected	-	1.5	-	MHz
High cut-off frequency, f_{hi-L}	Low bandwidth selected	-	0.15	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+9	-	V
Power supply voltage (negative), $-V_{sup}$		-	-9	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+100	mA
Power supply current consumption (negative), $-I_{sup}$		-	-	-100	mA
Fan power consumption, P_{fan}		-	-	900	mW
TEC voltage, V_{TEC}		-	-	1.3	V
TEC current, I_{TEC}		-	-	1.2	A
Weight		-	180	-	g

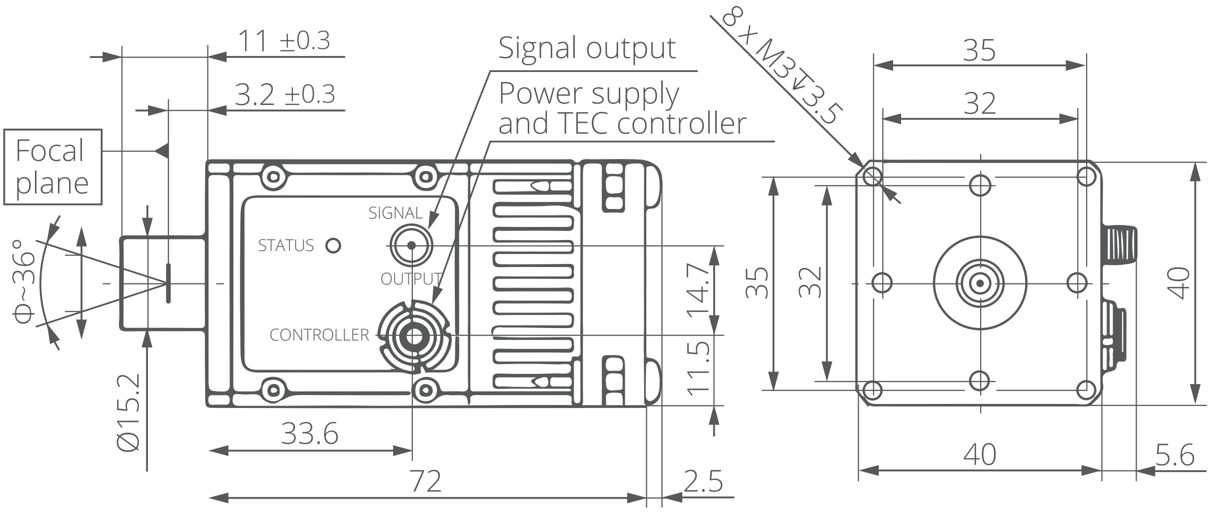
SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 230 K)



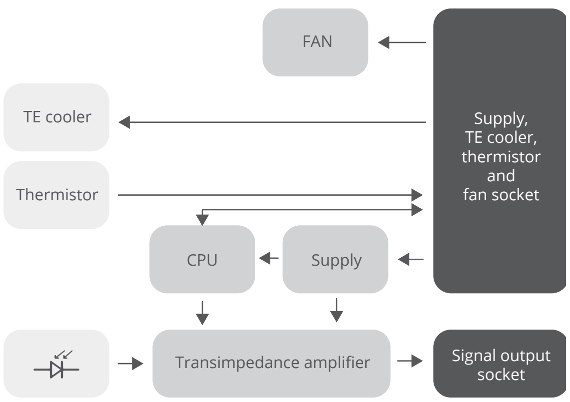


MECHANICAL LAYOUT (Unit: mm)





SCHEMATIC DIAGRAM

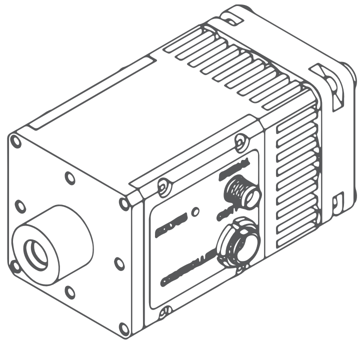


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device

LabM-I-5



Programmable IR detection module based on HgCdTe TE cooled optically immersed photovoltaic detector

FEATURES

- Spectral range: 2.7 to 5.6 µm
- Frequency bandwidth: DC to 18 MHz (typ.)
- High performance and reliability
- DC offset compensation
- Built-in fan
- M4 mounting hole
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Flame and explosion detection
- Threat warning systems
- Heat-seeking, thermal signature detection
- Dentistry
- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x
- Breath analysis: C_2H_6, CH_2O, NH_3, NO, OCS
- Gas leak detection
- Combustion process control
- Non-destructive material testing
- Research and prototyping

PROGRAMMABLE PARAMETERS

- Gain: in the 40 dB range
- Bandwidth: 0.15 MHz/1.5 MHz/18 MHz (typ.)
- Coupling: AC/DC
- Detector's temperature
- Output voltage offset

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

DEDICATED ACCESSORIES

- PTCC-01 TEC controller series: obligatory (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

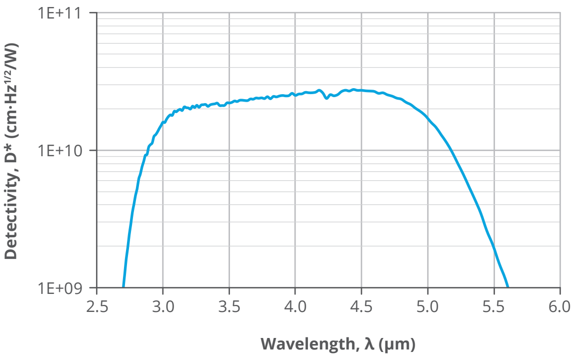
DETECTION MODULE CONFIGURATION

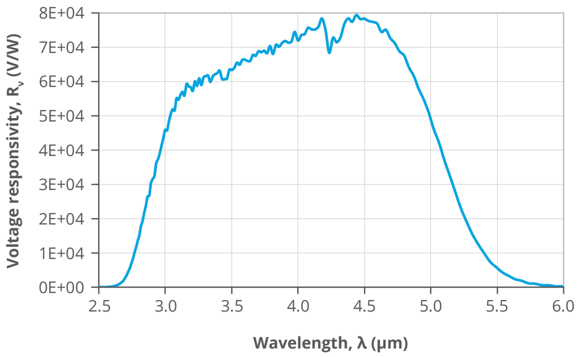
Detection module symbol	LabM-I-5
Detector symbol	PVI-2TE-5-1×1-TO8-wAl_2O_3-36 (p. 35)
Detector type	photovoltaic
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	2TE
Acceptance angle, Φ	~36 deg.
Window	wAl_2O_3 (3 deg. wedged sapphire)
Preamplifier symbol	PIP (p. 129)
Preamplifier type	transimpedance, programmable
Signal output socket	SMA
Power supply, TE cooler, thermistor and fan socket	LEMO ECG.0B.309.CLN

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted; default module settings)

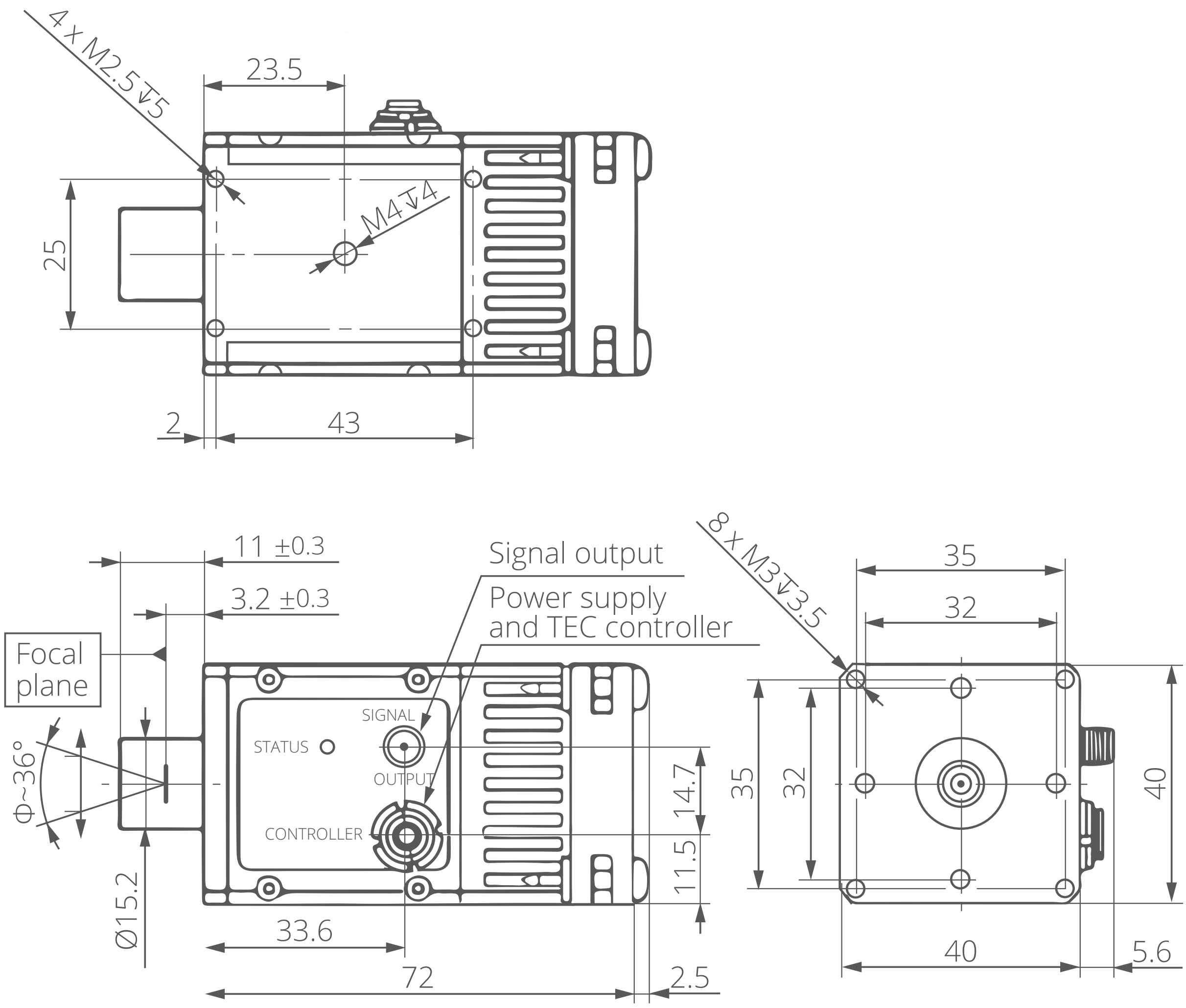
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	230	-	K
Cut-on wavelength, $\lambda_{cut\text{-}on}$ (10%)	At 10% of the peak responsivity	-	2.7	-	µm
Peak wavelength, λ_{peak}		4.2	4.4	4.6	µm
Specific wavelength, λ_{spec}		-	5.0	-	µm
Cut-off wavelength, $\lambda_{cut\text{-}off}$ (10%)	At 10% of the peak responsivity	-	5.6	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 1 MHz	-	2.8×10^{10}	-	$cm\cdot Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, f = 1 MHz	1.0×10^{10}	1.6×10^{10}	-	$cm\cdot Hz^{1/2}/W$
Output noise voltage density, v_n	At f = 1 MHz	-	-	500	$nV/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	7.9×10^4	-	V/W
	At $\lambda = \lambda_{spec}$	3.0×10^4	4.6×10^4	-	V/W
Low cut-off frequency, $f_{lo\text{-}DC}$	DC coupling selected	-	0	-	Hz
Low cut-off frequency, $f_{lo\text{-}AC}$	AC coupling selected	-	10	-	Hz
High cut-off frequency, $f_{hi\text{-}H}$	High bandwidth selected	12	18	-	MHz
High cut-off frequency, $f_{hi\text{-}M}$	Mid bandwidth selected	-	1.5	-	MHz
High cut-off frequency, $f_{hi\text{-}L}$	Low bandwidth selected	-	0.15	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+9	-	V
Power supply voltage (negative), $-V_{sup}$		-	-9	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+100	mA
Power supply current consumption (negative), $-I_{sup}$		-	-	-100	mA
Fan power consumption, P_{fan}		-	-	900	mW
TEC voltage, V_{TEC}		-	-	1.3	V
TEC current, I_{TEC}		-	-	1.2	A
Weight		-	180	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 230 K)

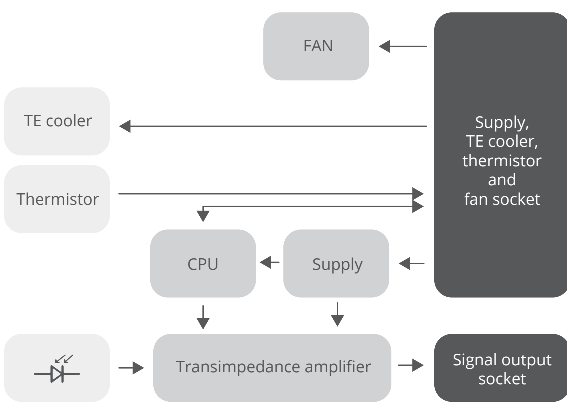




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM

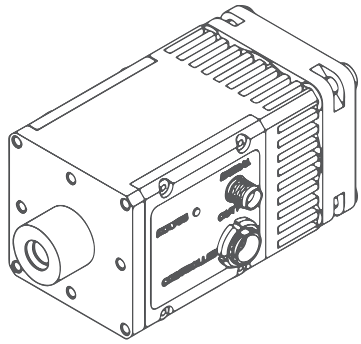


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

LabM-I-6-01



Programmable IR detection module based on HgCdTe TE cooled optically immersed photovoltaic detector

FEATURES

- Spectral range: 2.6 to 7.0 µm
- Frequency bandwidth: DC to 4 MHz (typ.)
- High performance and reliability
- DC offset compensation
- Built-in fan
- M4 mounting hole
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: CH_4, C_2H_2, CH_2O, HCl, NH_3, SO_2, C_2H_6, CO, CO_2, NO_x, SO_x, HNO_3
- Exhaust gas denitrification
- Combustion process control
- Contactless temperature measurement: railway transport, industrial and laboratory processes monitoring
- Heat-seeking, thermal signature detection
- Non-destructive material testing
- Biochemical analysis
- Laser calibration
- Research and prototyping

PROGRAMMABLE PARAMETERS

- Gain: in the 40 dB range
- Bandwidth:
  0.15 MHz/1.5 MHz/4 MHz (typ.)
- Coupling: AC/DC
- Detector's temperature
- Output voltage offset

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

DEDICATED ACCESSORIES

- PTCC-01 series TEC controller: obligatory (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

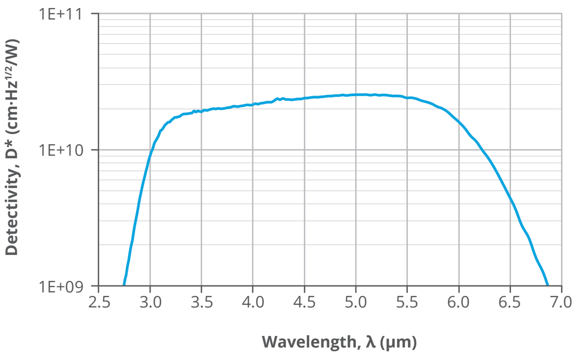
DETECTION MODULE CONFIGURATION

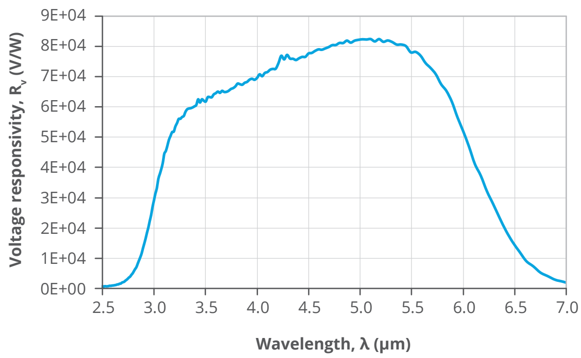
Detection module symbol	**LabM-I-6-01**
Detector symbol	PVI-2TE-6-1×1-TO8-wZnSeAR-36 (p. 45)
Detector type	photovoltaic
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	2TE
Acceptance angle, Φ	~36 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier symbol	PIP (p. 129)
Preamplifier type	transimpedance, programmable
Signal output socket	SMA
Power supply, TE cooler, thermistor and fan socket	LEMO ECG.0B.309.CLN

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted; default module settings)

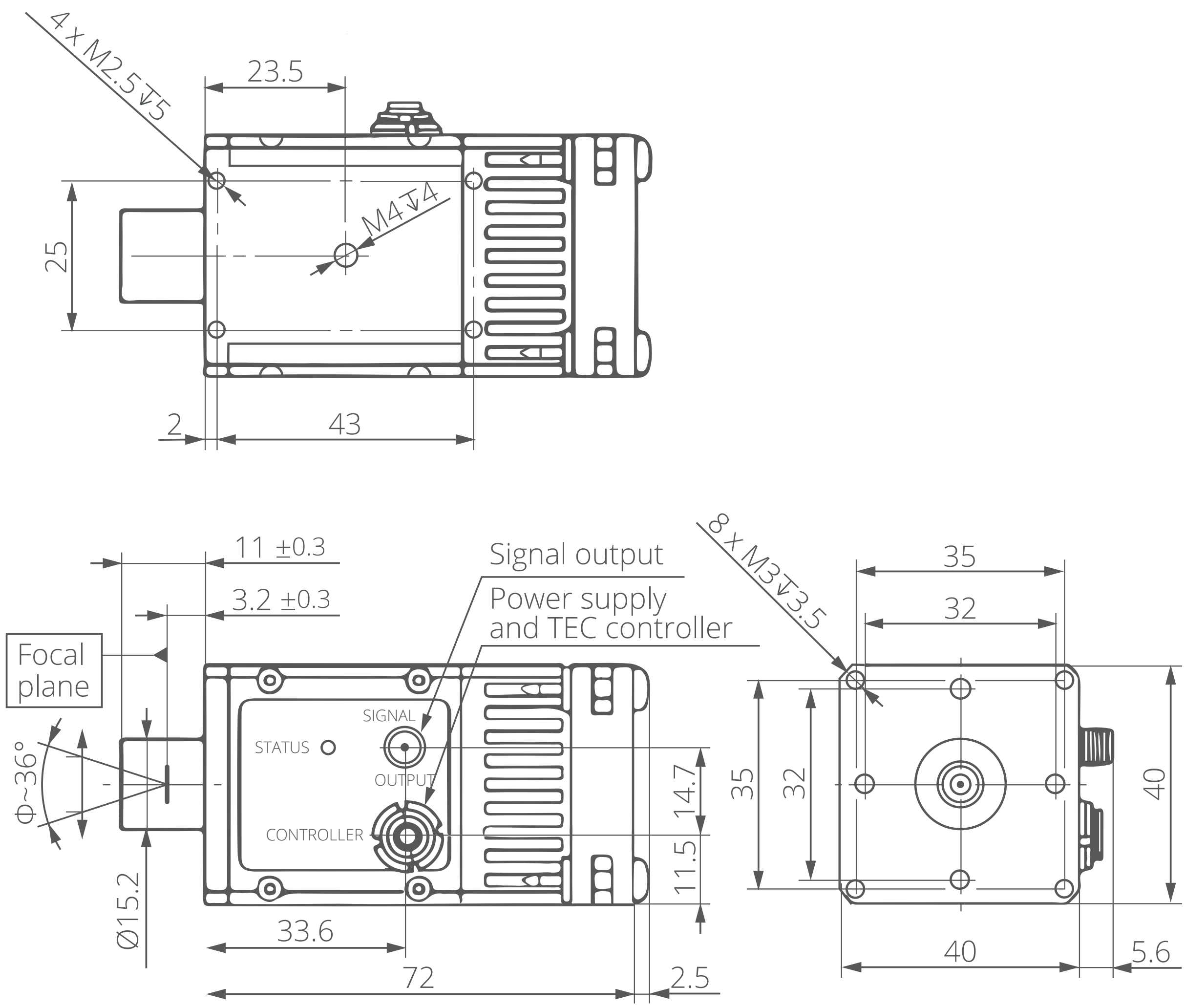
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	230	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of the peak responsivity	-	2.6	-	µm
Peak wavelength, λ_{peak}		5.0	5.2	5.4	µm
Specific wavelength, λ_{spec}		-	6.0	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of the peak responsivity	-	7.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 1 MHz	-	2.5×10^{10}	-	$cm·Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, f = 1 MHz	7.0×10^{9}	1.6×10^{10}	-	$cm·Hz^{1/2}/W$
Output noise voltage density, v_n	At f = 1 MHz	-	-	500	$nV/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	8.2×10^{4}	-	V/W
	At $\lambda = \lambda_{spec}$	3.5×10^{4}	5.2×10^{4}	-	V/W
Low cut-off frequency, f_{lo-DC}	DC coupling selected	-	0	-	Hz
Low cut-off frequency, f_{lo-AC}	AC coupling selected	-	10	-	Hz
High cut-off frequency, f_{hi-H}	High bandwidth selected	2.5	4	-	MHz
High cut-off frequency, f_{hi-M}	Mid bandwidth selected	-	1.5	-	MHz
High cut-off frequency, f_{hi-L}	Low bandwidth selected	-	0.15	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+9	-	V
Power supply voltage (negative), $-V_{sup}$		-	-9	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+100	mA
Power supply current consumption (negative), $-I_{sup}$		-	-	-100	mA
Fan power consumption, P_{fan}		-	-	900	mW
TEC voltage, V_{TEC}		-	-	1.3	V
TEC current, I_{TEC}		-	-	1.2	A
Weight		-	180	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 230 K)

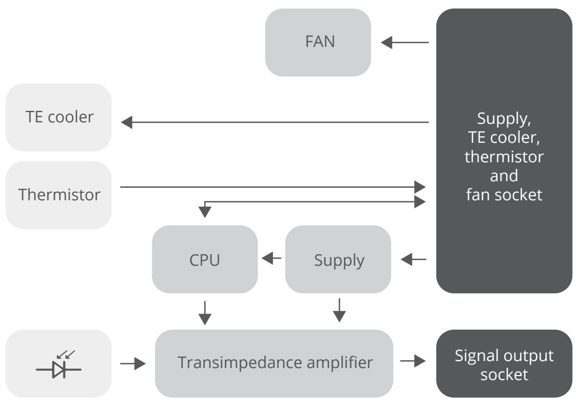




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM

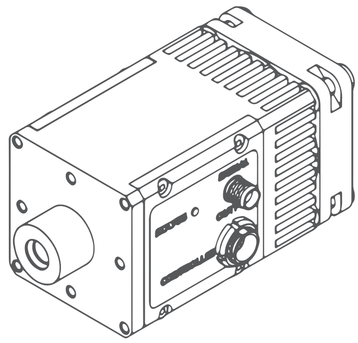


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 85	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

LabM-I-10.6



Programmable IR detection module based on HgCdTe TE cooled optically immersed photovoltaic multi-junction detector

FEATURES

- Spectral range: 2.0 to 12.0 µm
- Frequency bandwidth: DC to 120 MHz (typ.)
- High performance and reliability
- DC offset compensation
- Built-in fan
- M4 mounting hole
- Compatible with optical accessories
- Versatility and flexibility
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry
- Glucose sensing
- Research and prototyping

PROGRAMMABLE PARAMETERS

- Gain: in the 40 dB range
- Bandwidth: 1.5 MHz/15 MHz/120 MHz (typ.)
- Coupling: AC/DC
- Detector's temperature
- Output voltage offset

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

DEDICATED ACCESSORIES

- PTCC-01 series TEC controller: obligatory (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

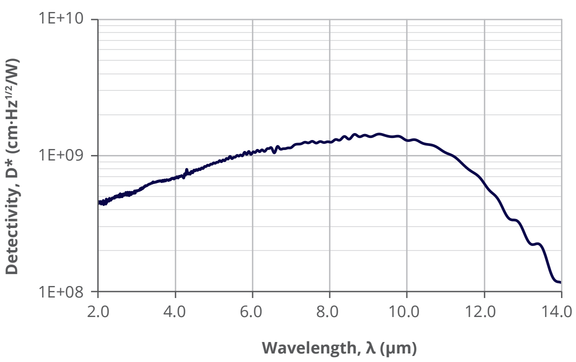
DETECTION MODULE CONFIGURATION

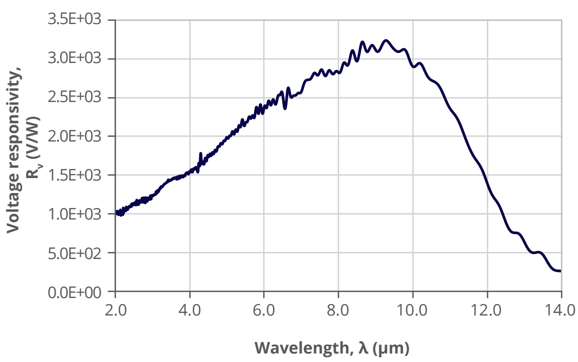
Detection module symbol	LabM-I-10.6
Detector symbol	PVMI-4TE-10.6-1×1-TO8-wZnSeAR-36 (p. 66)
Detector type	photovoltaic, multi-junction
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	4TE
Acceptance angle, Φ	~36 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier symbol	PIP (p. 129)
Preamplifier type	transimpedance, programmable
Signal output socket	SMA
Power supply, TE cooler, thermistor and fan socket	LEMO ECG.0B.309.CLN

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted; default module settings)

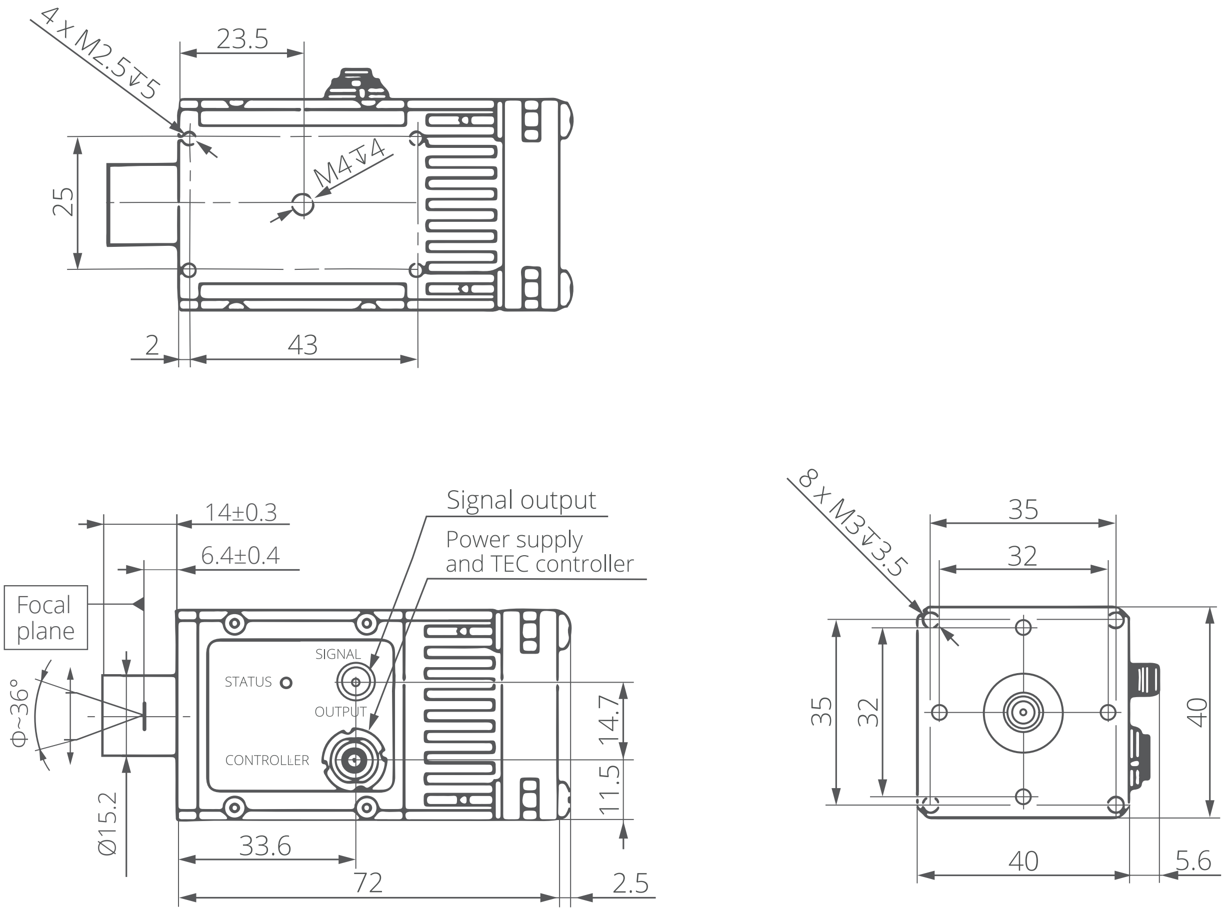
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	200	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of peak responsivity	-	2.0	-	µm
Peak wavelength, λ_{peak}		8.0	9.0	10.0	µm
Specific wavelength, λ_{spec}		-	10.6	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of peak responsivity	-	12.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 10 MHz	-	1.4×10^9	-	cm·Hz$^{1/2}$/W
	At $\lambda = \lambda_{spec}$, f = 10 MHz	6.0×10^8	1.2×10^9	-	cm·Hz$^{1/2}$/W
Output noise voltage density, v_n	At f = 10 MHz	-	-	400	nV/Hz$^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	3.2×10^3	-	V/W
	At $\lambda = \lambda_{spec}$	1.8×10^3	2.7×10^3	-	V/W
Low cut-off frequency, f_{lo-DC}	DC coupling selected	-	0	-	Hz
Low cut-off frequency, f_{lo-AC}	AC coupling selected	-	10	-	Hz
High cut-off frequency, f_{hi-H}	High bandwidth selected	80	120	-	MHz
High cut-off frequency, f_{hi-M}	Mid bandwidth selected	-	15	-	MHz
High cut-off frequency, f_{hi-L}	Low bandwidth selected	-	1.5	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+9	-	V
Power supply voltage (negative), $-V_{sup}$		-	-9	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+100	mA
Power supply current consumption (negative), $-I_{sup}$		-	-	-100	mA
Fan power consumption, P_{fan}		-	-	900	mW
TEC voltage, V_{TEC}		-	-	8.3	V
TEC current, I_{TEC}		-	-	0.4	A
Weight		-	180	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 200 K)

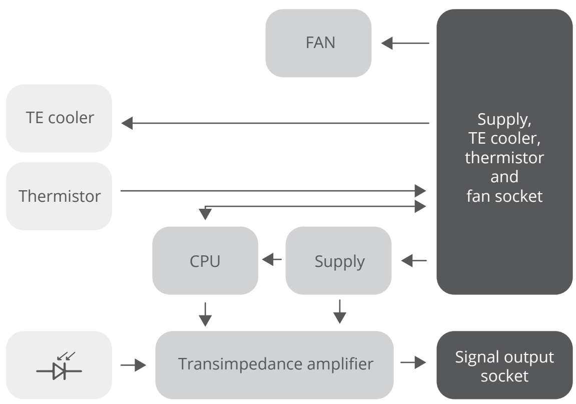




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM



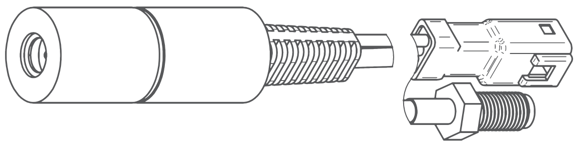
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm²
	Single pulses <1 µs duration	10	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

microM-10.6

Micro-size IR detection module based on HgCdTe room temperature multi-junction detector



FEATURES

- Spectral range: 2.0 to 12.0 µm
- Frequency bandwidth: DC to 10 MHz
- Very small size
- Convenient to use
- Versatile
- Cost-effective OEM version available
- Quantity discounted price
- Fast deliver

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC signal output cable
- 1 pc of JWPF-DB9 power supply cable

DEDICATED ACCESSORIES

- PPS-03-09 amplifier power supply (p. 149)
- MH-1 module holder (p. 154)
- DRB-2 base mounting system (p. 152)

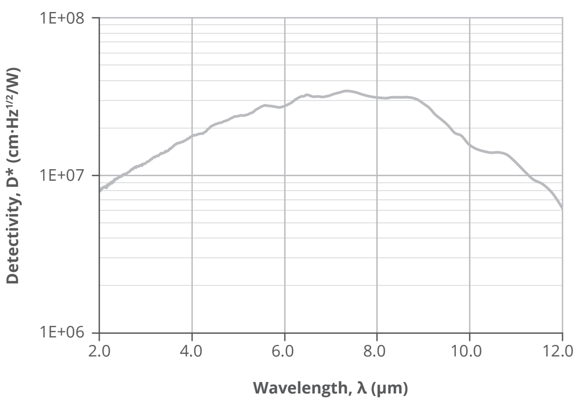
DETECTION MODULE CONFIGURATION

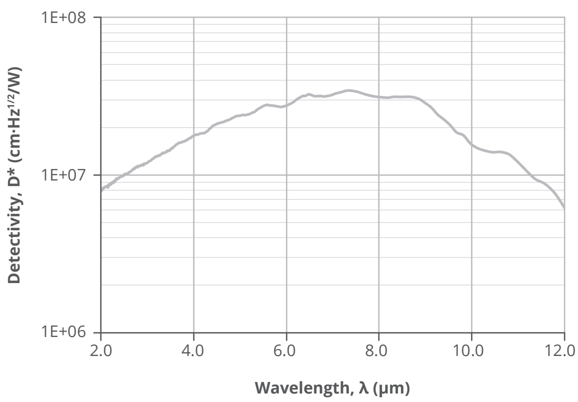
Detection module symbol	microM-10.6
Detector symbol	PVM-10.6-1×1-TO39-NW-90 (p. 63)
Detector type	photovoltaic, multi-junction
Active element material	epitaxial HgCdTe heterostructure
Active area, A	1 mm × 1 mm
Immersion	no
Cooling	no
Acceptance angle, Φ	~85 deg.
Window	no
Preamplifier type	transimpedance
Signal output plug	SMA
Power supply plug	JWPF (part No. 03T-JWPF-VSLE-S)

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted)

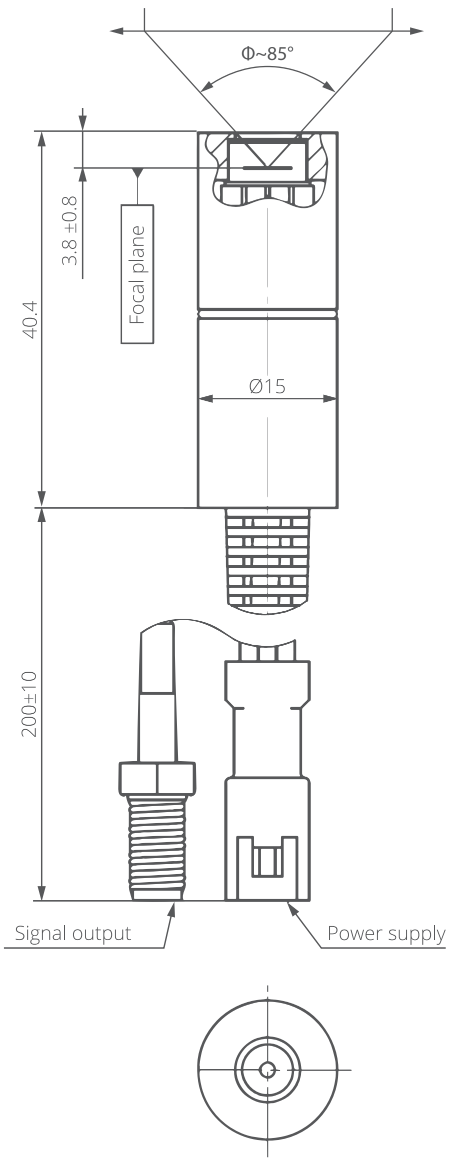
Parameter	Test conditions/remarks	Value Min.	Value Typ.	Value Max.	Unit
Active element temperature, T_{chip}	$T_{chip} = T_{amb}$	-	293	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of peak responsivity	-	2.0	-	µm
Peak wavelength, λ_{peak}		7.5	8.5	9.5	µm
Specific wavelength, λ_{spec}		-	10.6	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of peak responsivity	-	12.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 100 kHz	-	3.4×10^{7}	-	cm·Hz$^{1/2}$/W
	At $\lambda = \lambda_{spec}$, f = 100 kHz	4.0×10^{6}	1.4×10^{7}	-	cm·Hz$^{1/2}$/W
Output noise voltage density, v_n	At f = 100 kHz	-	-	1	µV/Hz$^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	2.1×10^{2}	-	V/W
	At $\lambda = \lambda_{spec}$	3.0×10^{1}	8.5×10^{1}	-	V/W
Low cut-off frequency, f_{lo}	DC coupling	-	0	-	Hz
High cut-off frequency, f_{hi}		10	-	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+9	-	V
Power supply voltage (negative), $-V_{sup}$		-	-9	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+50	mA
Power supply current consumption (negative), $-I_{sup}$		-	-	-30	mA
Weight		-	40	-	g

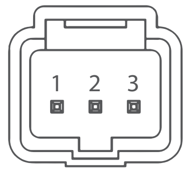
SPECTRAL RESPONSE (Typ., T_{amb} = T_{chip} = 293 K)





MECHANICAL LAYOUT AND PINOUT (Unit: mm)

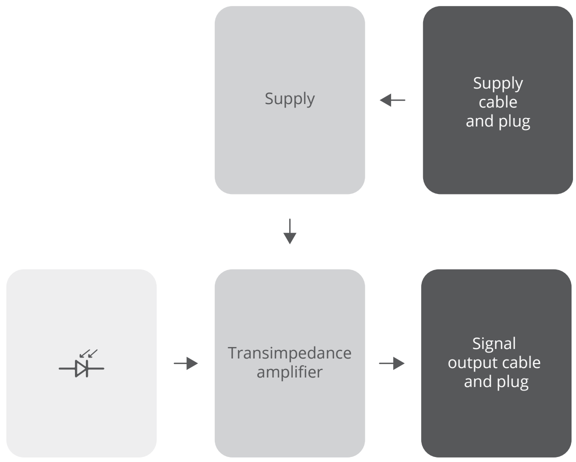




Power supply plug 03T-JWPF-VSLE-S

Pin number	Symbol	Function
1	–Vsup	Power supply input (–)
2	GND	Ground
3	+Vsup	Power supply input (+)

SCHEMATIC DIAGRAM

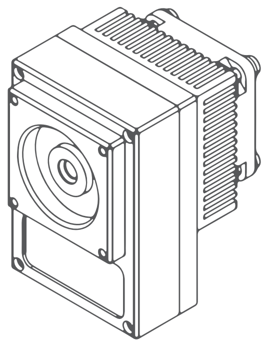


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}	Detection module parameters depend on T_{amb}	10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

UM-I-10.6



All-in-one IR detection module based on HgCdTe TE cooled optically immersed photovoltaic multi-junction detector

FEATURES

- Spectral range: 2.0 to 13.0 µm
- Frequency bandwidth: DC to 100 MHz
- Integrated TEC controller and fan
- M4 mounting hole
- DC monitor
- Optimized for effective heat dissipation
- Compatible with optical accessories
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- Gas detection, monitoring and analysis: SO_2, NH_3, SF_6
- CBRN threats detection
- CO_2 laser measurements: power monitoring and control, beam profiling and positioning, calibration
- Free-space optical communication
- FTIR spectroscopy
- Medical bacteria identification
- Dentistry

INCLUDED ACCESSORIES

- 2 pcs of SMA-BNC cable
- 1 pc of AC adaptor

DEDICATED ACCESSORIES

- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

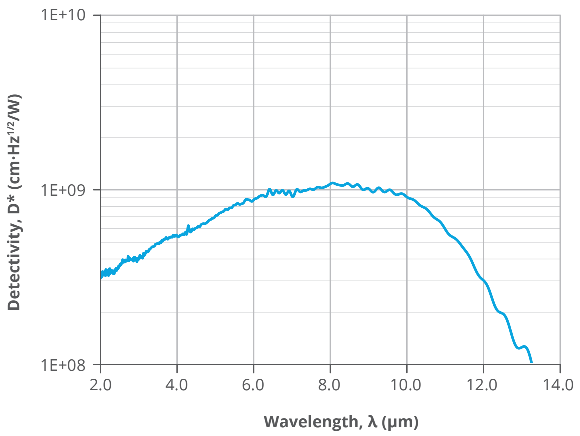
DETECTION MODULE CONFIGURATION

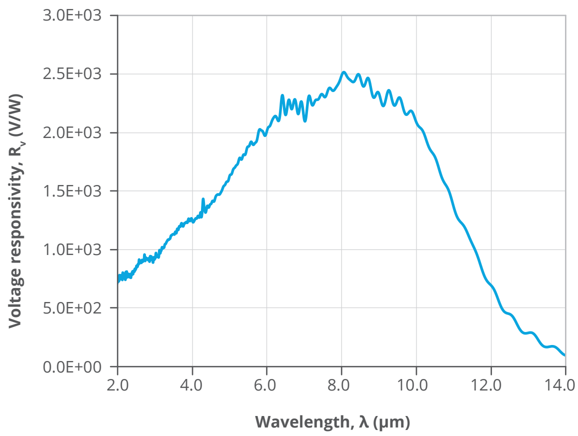
Detection module symbol	UM-I-10.6
Detector symbol	PVMI-2TE-10.6-1×1-TO8-wZnSeAR-36 (p. 66)
Detector type	photovoltaic, multi-junction
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	2TE
Acceptance angle, Φ	~36 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier symbol	AIP (p. 126)
Preamplifier type	transimpedance
Signal output socket	SMA
DC monitor output socket	SMA
Power supply socket	DC 2.5/5.5

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted)

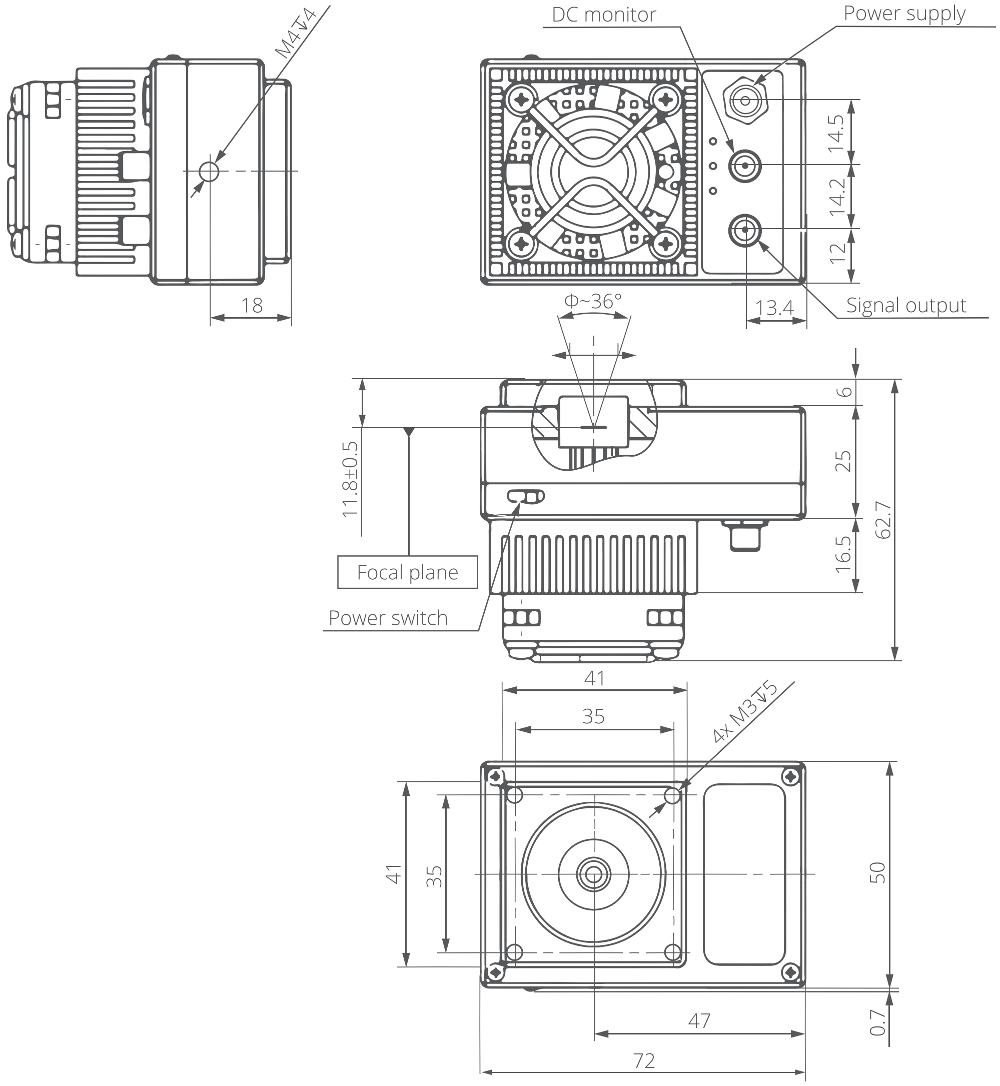
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	230	-	K
Cut-on wavelength, $\lambda_{cut\text{-}on}$ (10%)	At 10% of peak responsivity	-	-	2.0	µm
Peak wavelength, λ_{peak}		7.0	8.0	9.0	µm
Specific wavelength, λ_{spec}		-	10.6	-	µm
Cut-off wavelength, $\lambda_{cut\text{-}off}$ (10%)	At 10% of peak responsivity	-	13.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, averaged over 1 MHz to f_{hi}	-	1.1×10^9	-	$cm\cdot Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, averaged over 1 MHz to f_{hi}	3.5×10^8	7.4×10^8	-	$cm\cdot Hz^{1/2}/W$
Output noise voltage density, v_n	Averaged over 1 MHz to f_{hi}	-	-	350	$nV/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	2.5×10^3	-	V/W
	At $\lambda = \lambda_{spec}$	6.5×10^2	1.7×10^3	-	V/W
Low cut-off frequency, f_{lo}	DC coupling	-	0	-	Hz
High cut-off frequency, f_{hi}		100	-	-	MHz
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$, DC monitor	2.2×10^2	-	-	V/W
	At $\lambda = \lambda_{spec}$, DC monitor	1.5×10^2	-	-	V/W
Low cut-off frequency, f_{lo}	DC monitor	-	0	-	Hz
High cut-off frequency, f_{hi}	DC monitor	-	150	-	kHz
Output voltage swing, V_{out}		-	-	±0.7	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage, V_{sup}		-	5	-	V
Power supply current consumption, I_{sup}		-	-	1.2	A
Weight		-	235	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 230 K)

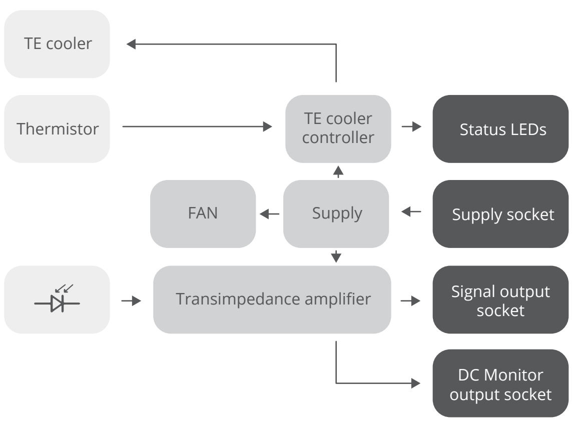




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM

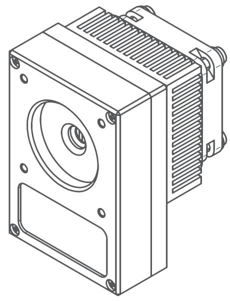


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 μs duration	2.5	W/cm²
	Single pulses <1 μs duration	10	kW/cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

UHSM-10.6



Ultra-high-speed IR detection module based on HgCdTe TE cooled photovoltaic detector

FEATURES

- Spectral range: 2.0 to 13.0 µm
- Frequency bandwidth: 300 Hz to 1.25 GHz (typ.)
- High performance and reliability
- DC monitor
- Single power supply
- Integrated TEC controller and fan
- M4 mounting hole
- Compatible with optical accessories
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

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

INCLUDED ACCESSORIES

- 2 pcs of SMA-BNC cable
- 1 pc of AC adaptor

DEDICATED ACCESSORIES

- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

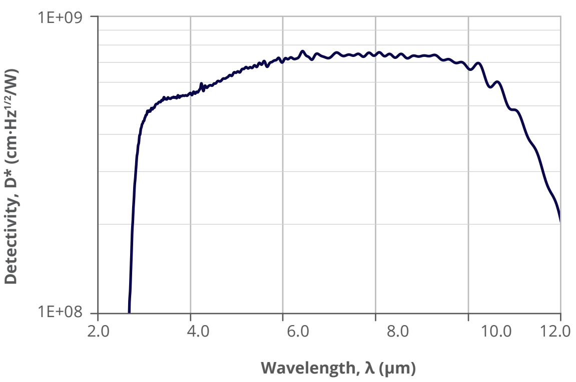
DETECTION MODULE CONFIGURATION

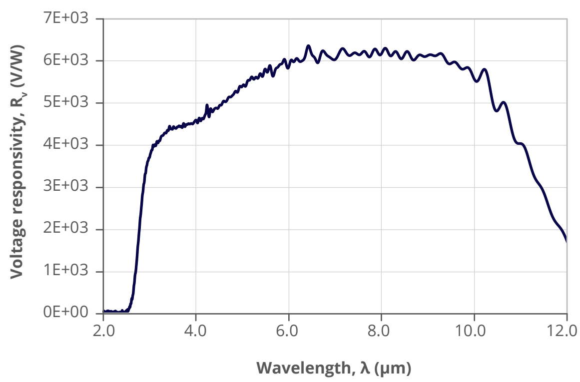
Detection module symbol	UHSM-10.6
Detector type	photovoltaic
Active element material	epitaxial HgCdTe heterostructure
Active area, A	0.05 mm × 0.05 mm
Immersion	no
Cooling	4TE
Acceptance angle, Φ	~80 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier type	transimpedance
Signal output socket	SMA
DC monitor output socket	SMA
Power supply socket	DC 2.1/5.5

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted)

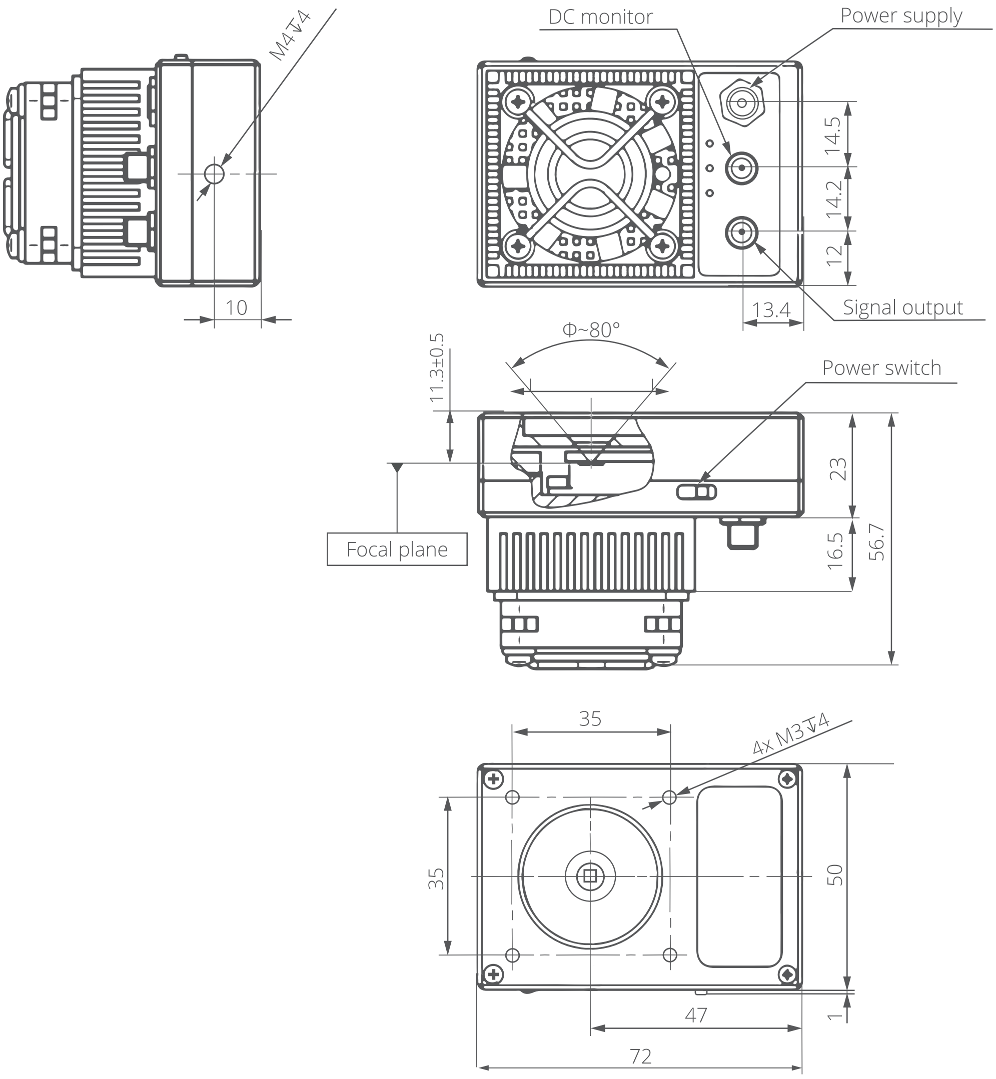
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	215	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of peak responsivity	-	3.0	-	µm
Peak wavelength, λ_{peak}		7.0	8.0	9.0	µm
Specific wavelength, λ_{spec}		-	10.6	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of peak responsivity	-	12.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 100 MHz	-	7.6×10^{8}	-	$cm\cdot Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, f = 100 MHz	3.0×10^{8}	6.0×10^{8}	-	$cm\cdot Hz^{1/2}/W$
Output noise voltage density, v_n	At f = 100 MHz	-	-	70	$nV/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	6.4×10^{3}	-	V/W
	At $\lambda = \lambda_{spec}$	2.5×10^{3}	5.0×10^{3}	-	V/W
Low cut-off frequency, f_{lo}		-	300	-	Hz
High cut-off frequency, f_{hi}		0.9	1.25	-	GHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
1/f corner frequency,f_c		-	-	10	MHz
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$, DC monitor	1.3×10^{3}	-	-	V/W
	At $\lambda = \lambda_{spec}$, DC monitor	1.0×10^{3}	-	-	V/W
Low cut-off frequency, f_{lo}	DC monitor	-	0	-	Hz
High cut-off frequency, f_{hi}	DC monitor	-	260	-	Hz
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage, V_{sup}		-	9	-	V
Power supply current consumption, I_{sup}		-	-	1.2	A
Weight		-	235	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 215 K)

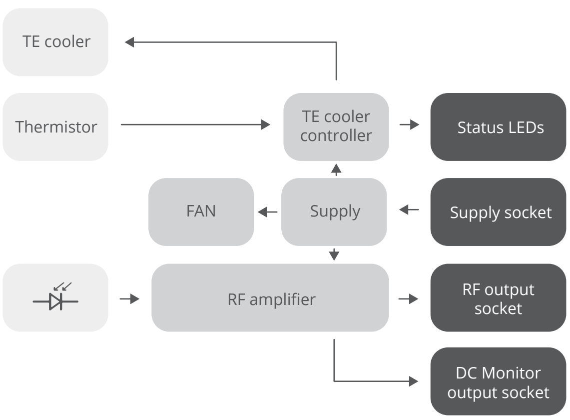




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM

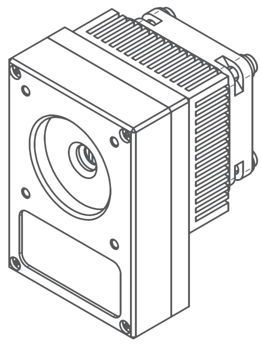


ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	100	W/cm²
	Single pulses <1 µs duration	1	cm²

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

UHSM-I-10.6



Ultra-high-speed IR detection module based on HgCdTe TE cooled optically immersed photovoltaic detector

FEATURES

- Spectral range: 3.0 to 12.0 µm
- Frequency bandwidth: 300 Hz to 900 MHz (typ.)
- High performance and reliability
- DC monitor
- Single power supply
- Integrated TEC controller and fan
- M4 mounting hole
- Compatible with optical accessories
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

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

INCLUDED ACCESSORIES

- 2 pcs of SMA-BNC cable
- 1 pc of AC adaptor

DEDICATED ACCESSORIES

- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

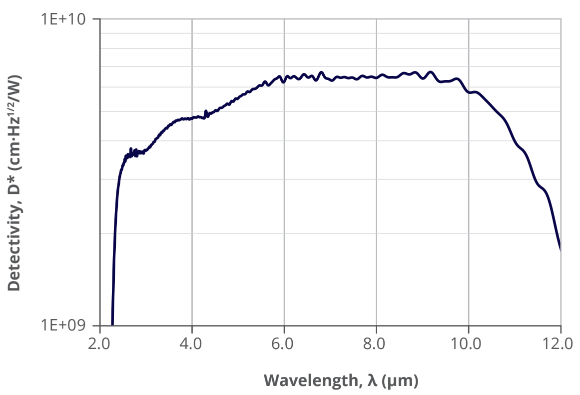
DETECTION MODULE CONFIGURATION

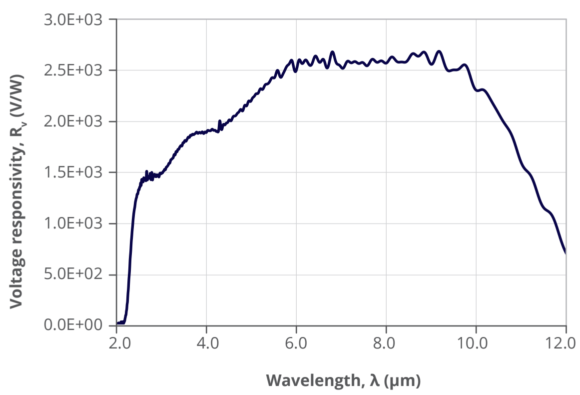
Detection module symbol	UHSM-I-10.6
Detector type	photovoltaic
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	4TE
Acceptance angle, Φ	~36 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier type	transimpedance
Signal output socket	SMA
DC monitor output socket	SMA
Power supply socket	DC 2.1/5.5

SPECIFICATION (T_{amb} = 293 K, R_{load} = 50 Ω, unless otherwise noted)

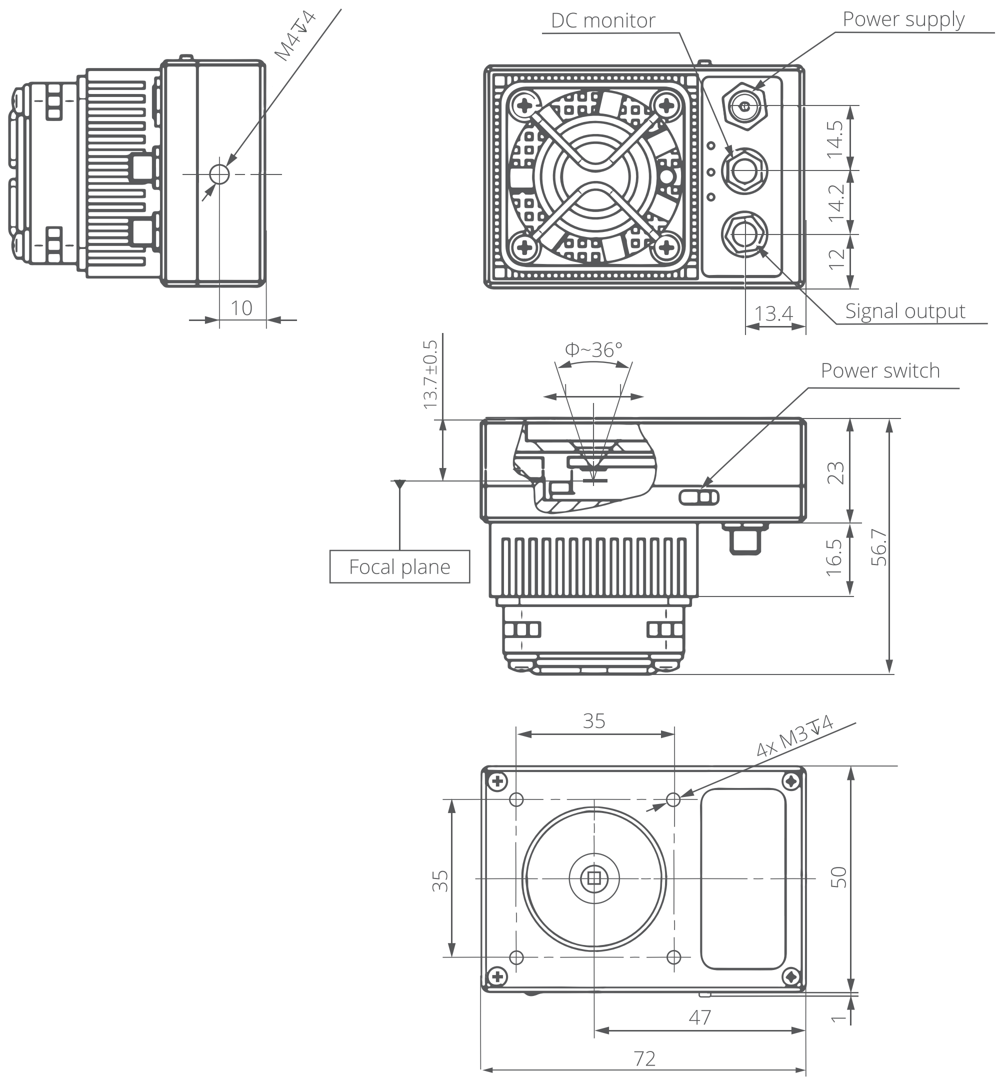
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	215	-	K
Cut-on wavelength, λ_{cut-on} (10%)	At 10% of peak responsivity	-	3.0	-	µm
Peak wavelength, λ_{peak}		7.0	8.0	9.0	µm
Specific wavelength, λ_{spec}		-	10.6	-	µm
Cut-off wavelength, $\lambda_{cut-off}$ (10%)	At 10% of peak responsivity	-	12.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 100 MHz	-	6.7×10^{9}	-	$cm\cdot Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, f = 100 MHz	2.0×10^{9}	5.0×10^{9}	-	$cm\cdot Hz^{1/2}/W$
Output noise voltage density, v_n	At f = 100 MHz	-	-	70	$nV/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$	-	2.7×10^{3}	-	V/W
	At $\lambda = \lambda_{spec}$	7.0×10^{2}	2.0×10^{3}	-	V/W
Low cut-off frequency, f_{lo}		-	300	-	Hz
High cut-off frequency, f_{hi}		0.7	0.9	-	GHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±1	V
1/f corner frequency, f_c		-	-	10	MHz
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$, DC monitor	3.8×10^{3}	-	-	V/W
	At $\lambda = \lambda_{spec}$, DC monitor	2.7×10^{2}	-	-	V/W
Low cut-off frequency, f_{lo}	DC monitor	-	0	-	Hz
High cut-off frequency, f_{hi}	DC monitor	-	260	-	Hz
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage, V_{sup}		-	9	-	V
Power supply current consumption, I_{sup}		-	-	1.2	A
Weight Value		-	235	-	g

SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 215 K)

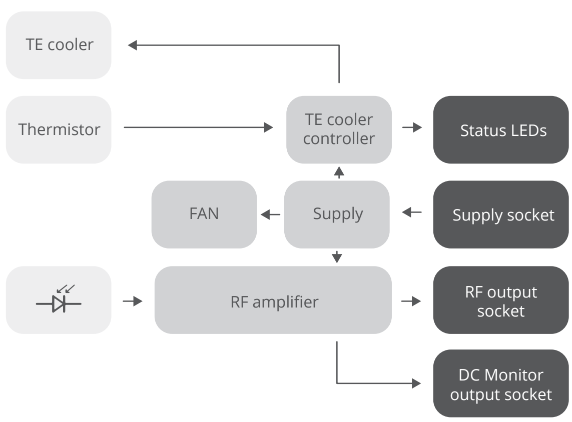




MECHANICAL LAYOUT (Unit: mm)



SCHEMATIC DIAGRAM



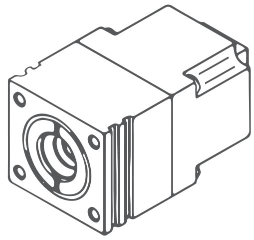
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

SM-I-12

Small-size IR detection module based on HgCdTe TE cooled optically immersed photoconductive detector



FEATURES

- Spectral range: up to 14.0 µm
- Frequency bandwidth: 10 Hz to 1 MHz
- Adjustable gain
- Small size
- Compatible with optical accessories
- External heatsink required
- External TEC controller required
- Quantity discounted price
- Fast delivery
- No minimum order quantity required

APPLICATIONS

- FTIR spectroscopy
- Gas detection, monitoring and analysis: C_2H_6, NH_3
- Laser measurements: power monitoring and control, beam profiling and positioning, calibration

INCLUDED ACCESSORIES

- 1 pc of MMCX-SMA cable
- 1 pc of AMP2×4-DB9 cable

DEDICATED ACCESSORIES

- PTCC-01 series TEC controller (p. 145)
- Smart Manager software: freeware
- MHS-2 heatsink (p. 153)

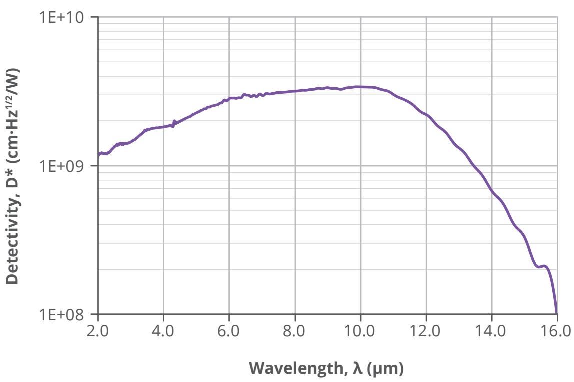
DETECTION MODULE CONFIGURATION

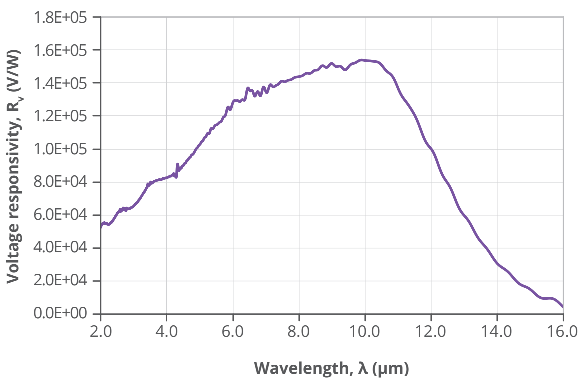
Detection module symbol	SM-I-12
Detector symbol	PCI-3TE-12-1×1-TO8-wZnSeAR-36 (p. 78)
Detector type	photoconductive
Active element material	epitaxial HgCdTe heterostructure
Optical area, A_O	1 mm × 1 mm
Immersion	hyperhemisphere
Cooling	3TE
Acceptance angle, Φ	~36 deg.
Window	wZnSeAR (3 deg. wedged zinc selenide, anti-reflection coating)
Preamplifier symbol	SIP-TO8 (p. 135)
Preamplifier type	transimpedance
Signal output socket	MMCX
Power supply, TE cooler and thermistor socket	AMP2×4 (part No. 280389-2)

SPECIFICATION (T_{amb} = 293 K, R_{load} = 1 MΩ, unless otherwise noted)

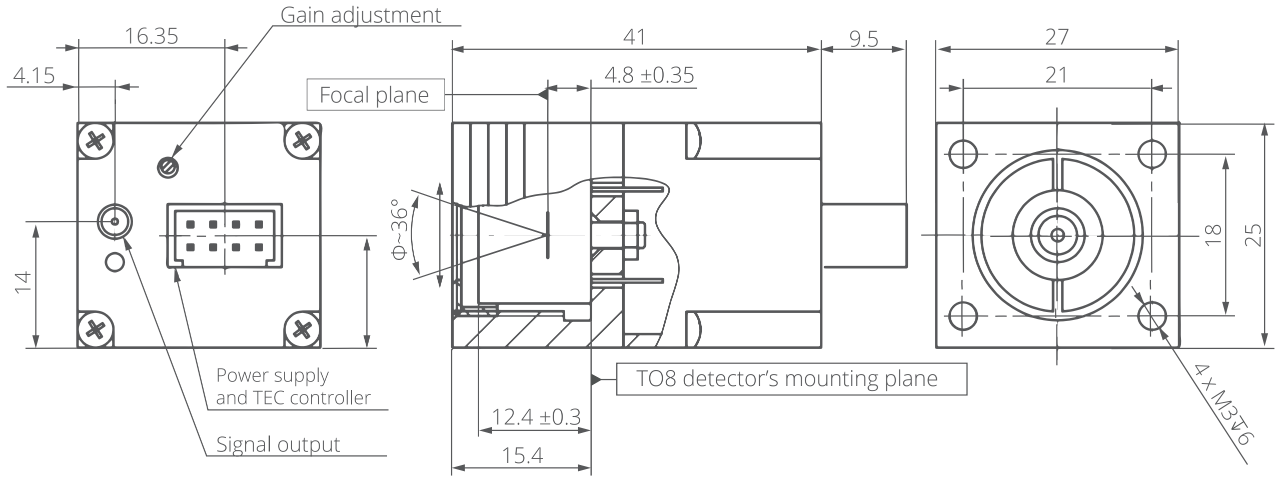
Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Active element temperature, T_{chip}		-	210	-	K
Peak wavelength, λ_{peak}		9.5	10.0	10.5	µm
Specific wavelength, λ_{spec}		-	12.0	-	µm
Cut-off wavelength, $\lambda_{cut\text{-}off}$ (10%)	At 10% of peak responsivity	-	14.0	-	µm
Detectivity, D*	At $\lambda = \lambda_{peak}$, f = 100 kHz	-	3.4×10^{9}	-	$cm\cdot Hz^{1/2}/W$
	At $\lambda = \lambda_{spec}$, f = 100 kHz	1.2×10^{9}	2.2×10^{9}	-	$cm\cdot Hz^{1/2}/W$
Output noise voltage density, v_n	At f = 100 kHz	-	-	8	$\mu V/Hz^{1/2}$
Voltage responsivity, R_v	At $\lambda = \lambda_{peak}$, K_i = 100 kV/A	-	1.5×10^{5}	-	V/W
	At $\lambda = \lambda_{spec}$, K_i = 100 kV/A	5.0×10^{4}	1.0×10^{5}	-	V/W
	At $\lambda = \lambda_{peak}$, K_i = 55 kV/A	-	8.3×10^{4}	-	V/W
	At $\lambda = \lambda_{spec}$, K_i = 55 kV/A	2.75×10^{4}	5.5×10^{4}	-	V/W
Low cut-off frequency, f_{lo}	AC coupling	-	10	-	Hz
High cut-off frequency, f_{hi}		1	-	-	MHz
Output impedance, R_{out}		-	50	-	Ω
Output voltage swing, V_{out}		-	-	±10	V
Output voltage offset, V_{off}		-	-	±20	mV
Power supply voltage (positive), $+V_{sup}$		-	+15	-	V
Power supply voltage (negative), $-V_{sup}$		-	-15	-	V
Power supply current consumption (positive), $+I_{sup}$		-	-	+50	mA
Power supply current consumption (negative), $+I_{sup}$		-	-	-50	mA
TEC voltage, V_{TEC}		-	-	3.6	V
TEC current, I_{TEC}		-	-	0.45	A
Weight		-	52	-	g

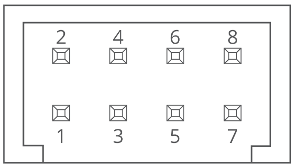
SPECTRAL RESPONSE (Typ., T_{amb} = 293 K, T_{chip} = 210 K, K_i = 100 kV/A)





MECHANICAL LAYOUT (Unit: mm)

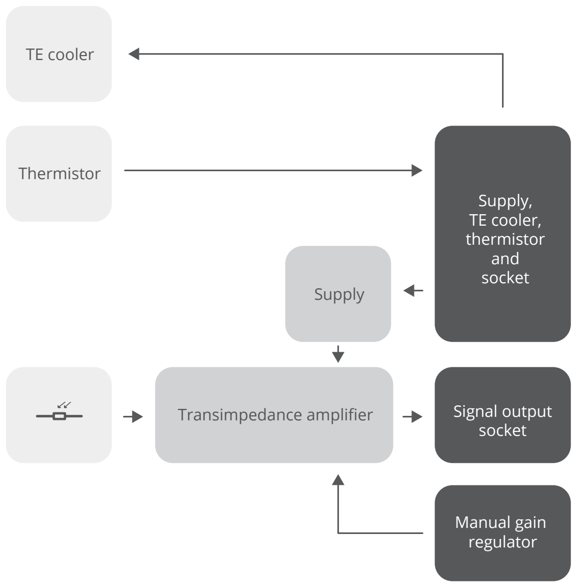




Power supply TEC and thermistor socket AMP2x4
(part No. 280389-2)

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

SCHEMATIC DIAGRAM



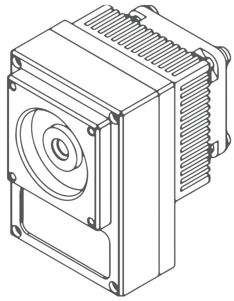
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%
Maximum incident optical power density	Continuous wave (CW) or single pulses >1 µs duration	2.5	W/cm^2
	Single pulses <1 µs duration	10	kW/cm^2

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

ACCESSORIES

AIP SERIES



“All-in-one” transimpedance amplifiers

FEATURES

- Compatible with VIGO TE-cooled IR detectors in the TO8 package
- Integrated TEC controller and fan
- M4 mounting hole
- Frequency bandwidth: up to 250 MHz
- Single power supply
- DC monitor
- Designed for effective heat dissipation
- Compatible with optical accessories
- Cost-effective OEM version available

INCLUDED ACCESSORIES

- 2 pcs of SMA-BNC cable
- 1 pc of AC adaptor

DEDICATED ACCESSORIES

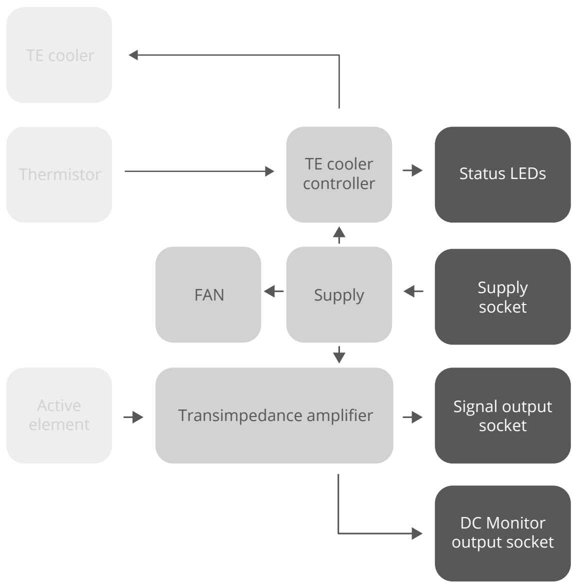
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

CODE DESCRIPTION

Type		f_{lo}, Hz		f_{hi}, Hz		Version
		DC		100k		
		10		1M		
AIP	-	100	-	10M	-	S[*] (with the package)
		1k		100M		
		10k		250M		

[*] OEM version available upon request

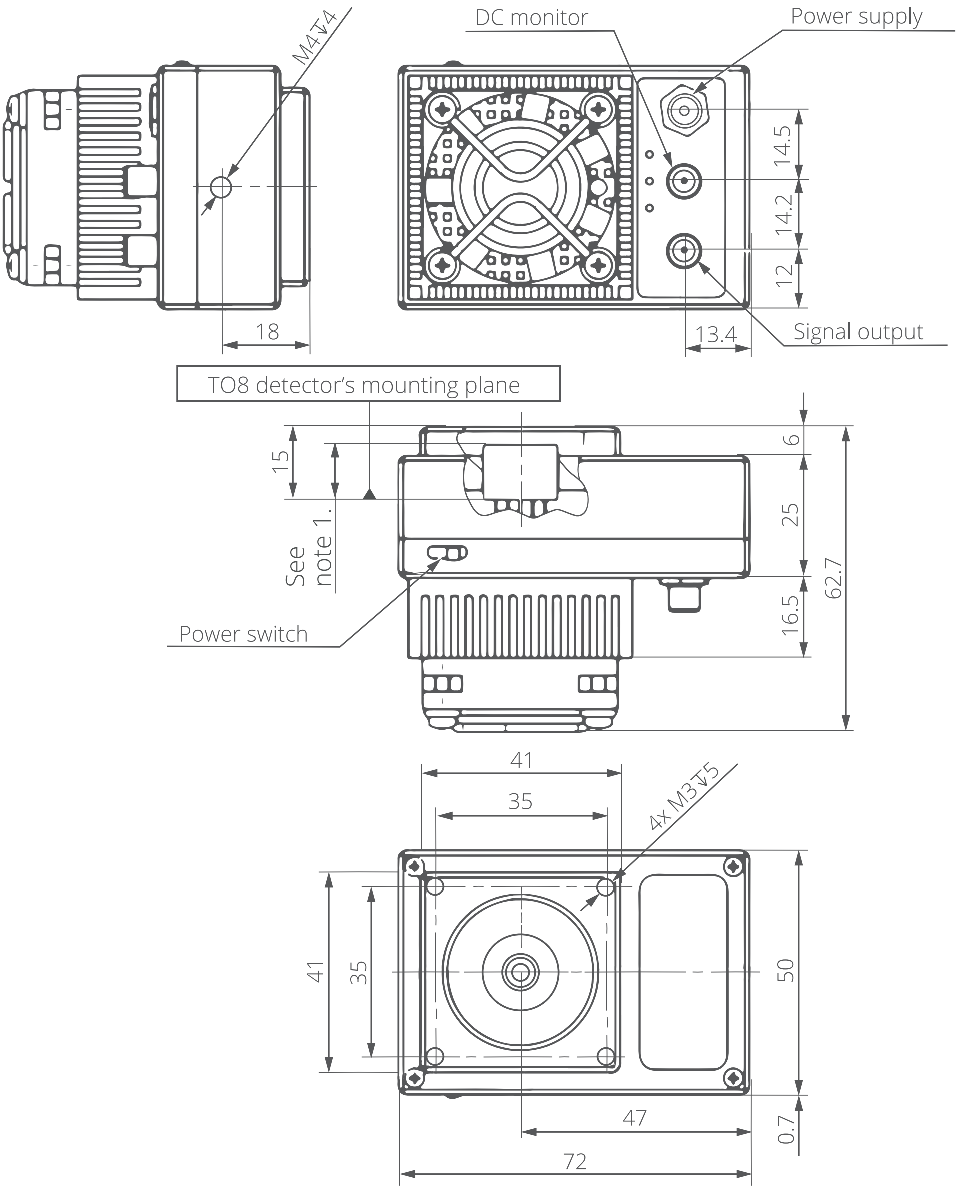
SCHEMATIC DIAGRAM



SPECIFICATION (T_{amb} = 293 K)

Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}		DC, 10, 100, 1k, 10k	Hz
High cut-off frequency, f_{hi}		100k, 1M, 10M, 100M, 250M	Hz
Transimpedance, K_i	Fixed	up to 200	kV/A
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	$f_{hi} \leq$ 1 MHz, R_{load} = 1 MΩ	±1.8	V
	f_{hi} > 1 MHz, R_{load} = 50 Ω	±0.7	V
Output voltage offset, V_{off}		max. ±20	mV
Power supply voltage, V_{sup}	With 2TE and 3TE cooled detectors	5	V
	With 4TE cooled detectors	12	
Power supply current, I_{sup}	With 2TE cooled detectors	max. 1.2	A
	With 3TE cooled detectors	max. 0.5	
	With 4TE cooled detectors	max. 0.45	
Weight		235	g

MECHANICAL LAYOUT (Unit: mm)



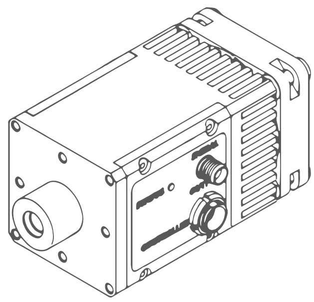
Notes:
1. TO8 detector dimensions in the TO8 package technical drawings (p. 203, 204, 207, 209, 210)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PIP SERIES



Programmable transimpedance amplifiers

FEATURES

- Compatible with VIGO TE-cooled IR detectors in the TO8 package
- Frequency bandwidth:
  - up to 20 MHz (PIP-UC-LS)
  - up to 200 MHz (PIP-UC-HS)
- AC or DC coupled
- Compatible with optical accessories
- M4 mounting hole
- Designed for effective heat dissipation
- Integrated fan
- VIGO PTCC-01 TEC controller obligatory
- Versatility and flexibility

PROGRAMMABLE PARAMETERS

- Gain: in the 40 dB range
- Bandwidth:
  - 150 kHz/1.5 MHz/20 MHz (PIP-UC-LS)
  - 1.5 MHz/15 MHz/200 MHz (PIP-UC-HS)
- Coupling: AC/DC
- Detector parameters: temperature, reverse bias
- Output voltage offset

CODE DESCRIPTION

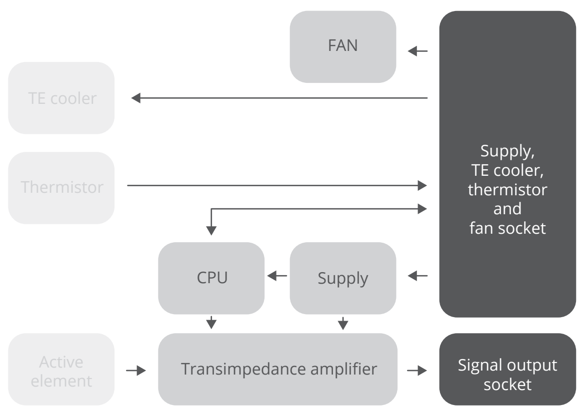
Type		f_{lo}, Hz		f_{hi}, Hz
PIP	-	UC*) (DC/10Hz)	-	LS*) (150kHz/1.5MHz/20MHz) HS*) (1.5MHz/15MHz/200MHz)

*) User configurable by software

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cale

SCHEMATIC DIAGRAM



DEDICATED ACCESSORIES

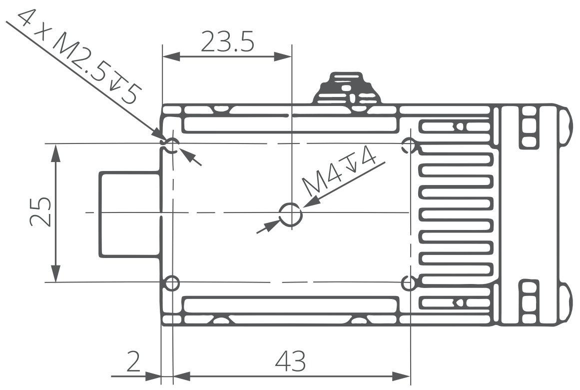
- PTCC-01 series TEC controller: obligatory (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

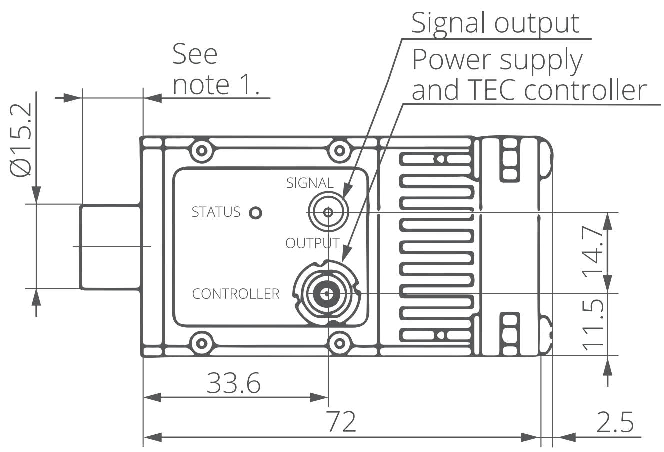
SPECIFICATION (T_{amb} = 293 K)

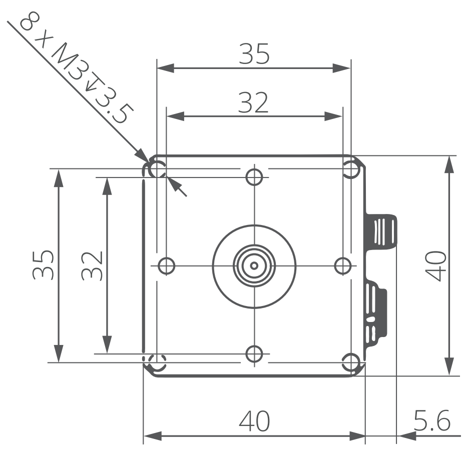
Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}	DC coupling selected	0	Hz
	AC coupling selected	10	Hz
High cut-off frequency, f_{hi-H}	High bandwidth selected	20*)/200**)	MHz
High cut-off frequency, f_{hi-M}	Mid bandwidth selected	1.5*)/15**)	MHz
High cut-off frequency, f_{hi-L}	Low bandwidth selected	0.15*)/1.5**)	MHz
Transimpedance, K_i	Digitally adjustable in 40 dB range	up to 150	kV/A
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	R_{load} = 50 Ω	±1	V
Output voltage offset, V_{off}	Default setup	max. ±20	mV
Power supply voltage, V_{sup}		±9	V
Power supply current, I_{sup}		max. ±100	mA
TEC voltage, V_{TEC}	2TE	max. 1.3	V
	3TE	max. 3.6	
	4TE	max. 8.3	
TEC current, I_{TEC}	2TE	max. 1.2	A
	3TE	max. 0.45	
	4TE	max. 0.4	
Fan power consumption, P_{fan}		max. 900	mW
Weight		180	g

*) PIP-UC-LS
**) PIP-UC-HS

MECHANICAL LAYOUT (Unit: mm)







Notes:
1. TO8 detector dimensions in the TO8 package technical drawings (p. 203, 204, 207, 209, 210)

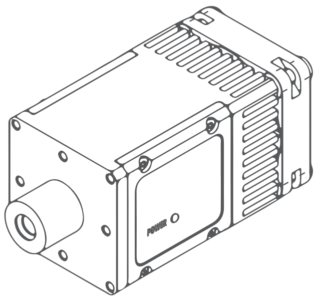
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

MIP SERIES

Medium-size transimpedance amplifiers



FEATURES

- Compatible with VIGO TE-cooled IR detectors in the TO8 package
- Frequency bandwidth: up to 250 MHz
- AC or DC coupled
- Compatible with optical accessories
- M4 mounting hole
- Designed for effective heat dissipation
- Integrated fan
- External TEC controller required

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

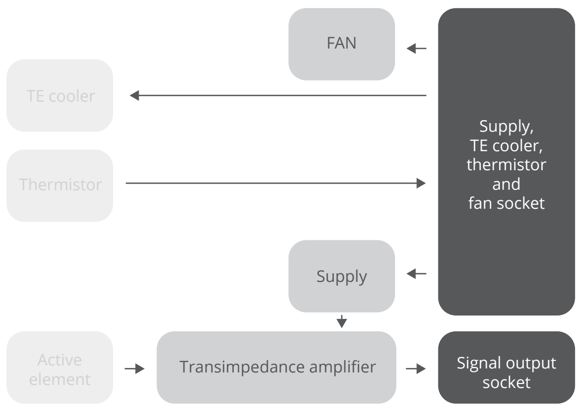
DEDICATED ACCESSORIES

- PTCC-01 series TEC controller (p. 145)
- Smart Manager software: freeware
- OTA optical threaded adapter (p. 155)
- DRB-2 base mounting system (p. 152)

CODE DESCRIPTION

Type		f_{lo}, Hz		f_{hi}, Hz
MIP	-	DC	-	100k
		10		1M
		100		10M
		1k		100M
		10k		250M

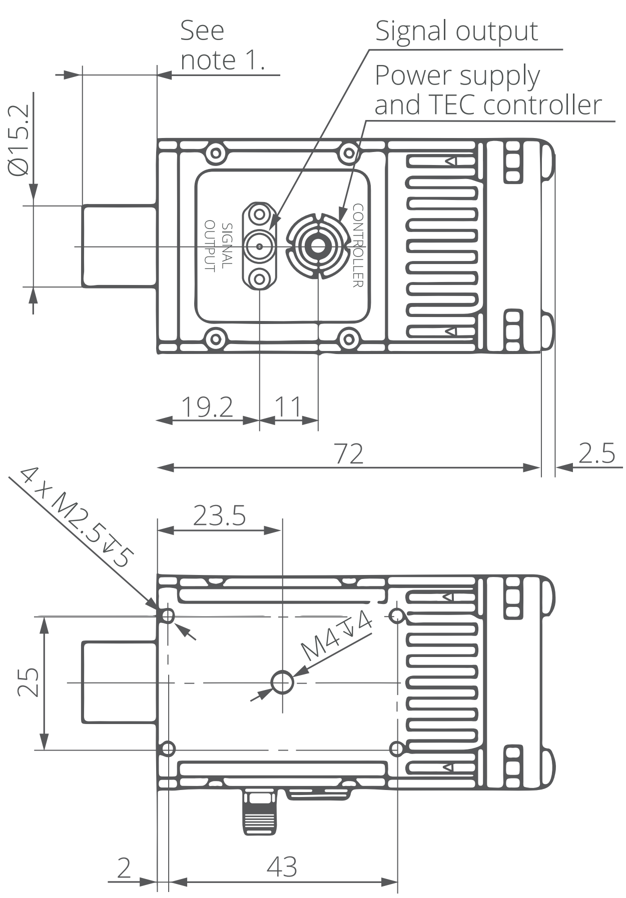
SCHEMATIC DIAGRAM

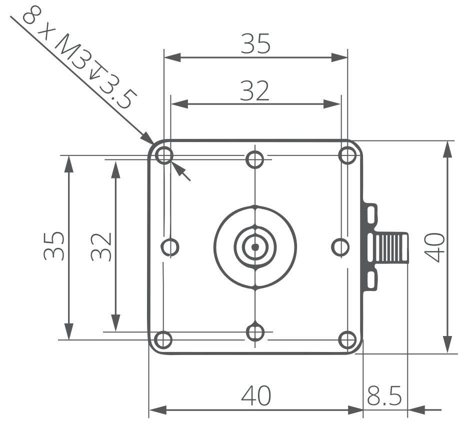


SPECIFICATION (T_{amb} = 293 K)

Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}		DC, 10, 100, 1k, 10k	Hz
High cut-off frequency, f_{hi}		100k, 1M, 10M, 100M, 250M	Hz
Transimpedance, K_i	Fixed	up to 200	kV/A
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	f_{hi} ≤ 1 MHz, R_{load} = 1 MΩ	±10	V
	f_{hi} > 1 MHz, R_{load} = 50 Ω	±1	V
Output voltage offset, V_{off}		max. ±20	mV
Power supply voltage, V_{sup}	f_{hi} ≤ 1 MHz, R_{load} = 1 MΩ	±15	V
	f_{hi} > 1 MHz, R_{load} = 50 Ω	±9	V
Power supply current, I_{sup}		max. ±50	mA
TEC voltage, V_{TEC}	2TE	max. 1.3	V
	3TE	max. 3.6	
	4TE	max. 8.3	
TEC current, I_{TEC}	2TE	max. 1.2	A
	3TE	max. 0.45	
	4TE	max. 0.4	
Fan supply voltage, V_{fan}		5	V
Fan power consumption, P_{fan}		max. 900	mW
Weight		180	g

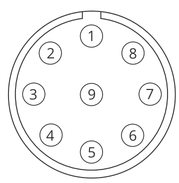
MECHANICAL LAYOUT (Unit: mm)





Notes:
1. TO8 detector dimensions in the TO8 package technical drawings (p. 203, 204, 207, 209, 210)

POWER SUPPLY, TE COOLER, THERMISTOR AND FAN SOCKET PINOUT



LEMO ECG.0B.309.CLN

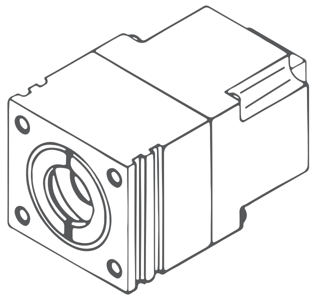
Pin No.	Symbol	Function
1	FAN+	Fan supply input (+)
2	TH2	Thermistor output (2)
3	TEC-	TEC supply input (-)
4	-Vsup	Power supply input (-)
5	GND	Ground
6	+Vsup	Power supply input (+)
7	TEC+	TEC supply input (+)
8	TH1	Thermistor output (1)
9	DATA	Data

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

SIP-TO8 SERIES



Small-size transimpedance amplifiers

FEATURES

- Compatible with VIGO TE-cooled IR detectors in the TO8 package
- Frequency bandwidth: up to 250 MHz
- Adjustable gain (optional, for modules with a frequency bandwidth of up to 100MHz)
- AC or DC coupled
- Small size
- Compatible with optical accessories
- External heatsink required
- External TEC controller required

INCLUDED ACCESSORIES

- 1 pc of MMCX-BNC cable
- 1 pc of AMP2×4-DB9 cable

DEDICATED ACCESSORIES

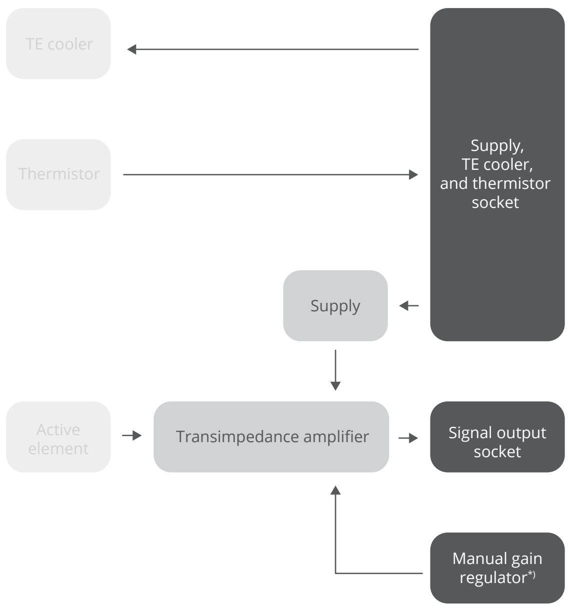
- PTCC-01 series TEC controller (p. 145)
- Smart Manager software: freeware
- MHS-2 heatsink (p. 153)

CODE DESCRIPTION

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

*) Only for SIP amplifiers with $f_{hi} \leq 100$ MHz

SCHEMATIC DIAGRAM

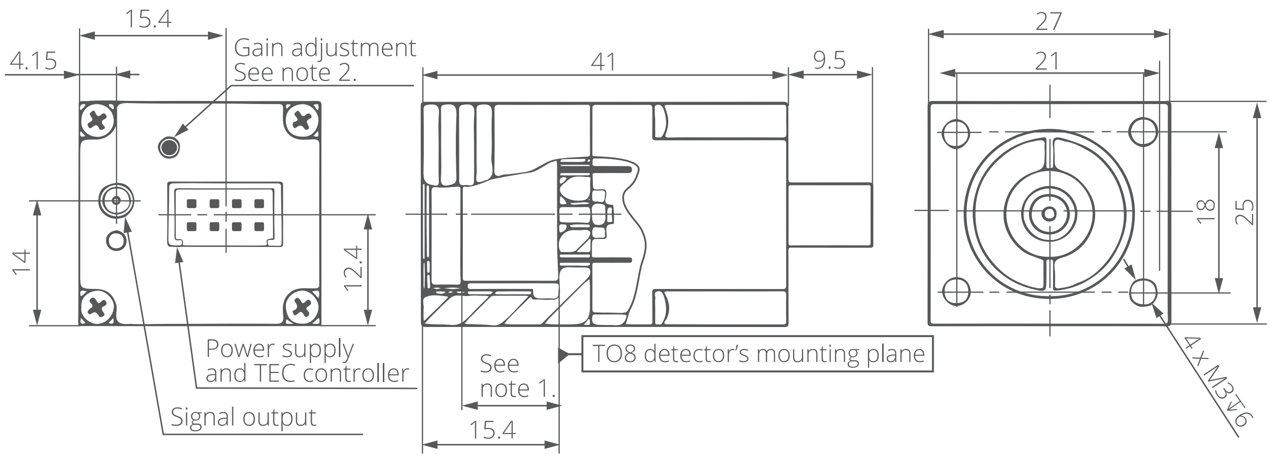


*) Only for SIP amplifiers with $f_{hi} \leq 100$ MHz

SPECIFICATION (T_{amb} = 293 K)

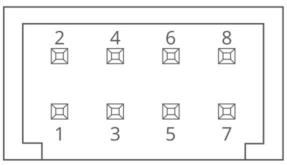
Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}		DC, 10, 100, 1k, 10k	Hz
High cut-off frequency, f_{hi}		100k, 1M, 10M, 100M, 250M	Hz
Transimpedance, K_i	Tunable, only the SIP-xx-xx-TO8-G version	up to 100	kV/A
Transimpedance range, $K_{i\,max}/K_{i\,min}$	Depending on the f_{hi}, only the SIP-xx-xx-TO8-G version	up to 5	-
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	$f_{hi} \le 1$ MHz, R_{load} = 1 MΩ	±10	V
	$f_{hi} > 1$ MHz, R_{load} = 50 Ω	±1	
Output voltage offset, V_{off}		max. ±20	mV
Power supply voltage, V_{sup}	$f_{hi} \le 1$ MHz, R_{load} = 1 MΩ	±15	V
	$f_{hi} > 1$ MHz, R_{load} = 50 Ω	±9	
Power supply current, I_{sup}		max. ±50	mA
TEC voltage, V_{TEC}	2TE	max. 1.3	V
	3TE	max. 3.6	
	4TE	max. 8.3	
TEC current, I_{TEC}	2TE	max. 1.2	A
	3TE	max. 0.45	
	4TE	max. 0.4	
Weight		52	g

MECHANICAL LAYOUT (Unit: mm)



Notes:
1. TO8 detector dimensions in the TO8 package technical drawings (p. 203, 204, 207, 209, 210)
2. Only for the SIP-xx-xx-TO8-G version.

POWER SUPPLY, TE COOLER, THERMISTOR AND FAN SOCKET PINOUT



AMP2×4 (PART NO. 280389-2)

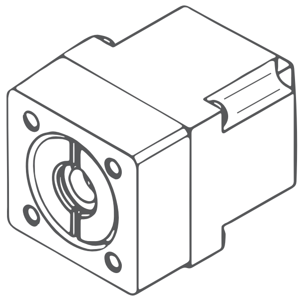
Pin No.	Symbol	Function
1	-Vsup	Power supply input (-)
2	TH2	Thermistor output (2)
3	DATA	Data
4	TEC-	TEC supply input (-)
5	GND	Ground
6	TH1	Thermistor output (1)
7	+Vsup	Power supply input (+)
8	TEC+	TEC supply input (+)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

SIP-TO39 SERIES



Small-size transimpedance amplifiers

FEATURES

- Compatible with VIGO uncooled IR detectors in the TO39 (3 pins) package
- Frequency bandwidth: up to 250 MHz
- Adjustable gain (optional, modules with a frequency bandwidth of up to 100MHz)
- AC or DC coupled
- Small size
- Compatible with optical accessories

INCLUDED ACCESSORIES

- 1 pc of MMCX-BNC cable
- 1 pc of AMP2×4-DB9 cable

DEDICATED ACCESSORIES

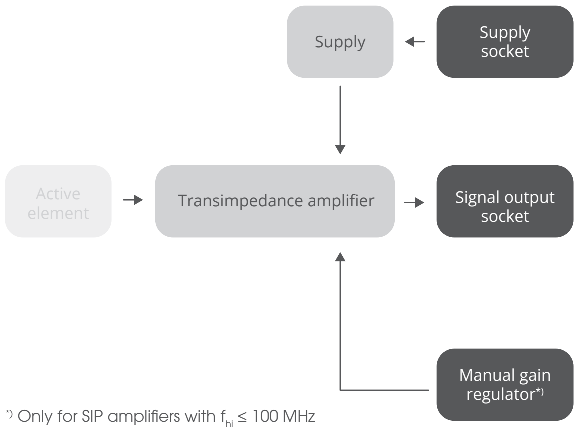
- PPS-03 amplifier power supply series (p. 149)

CODE DESCRIPTION

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

*) Only for SIP amplifiers with $f_{hi} \leq 100$ MHz

SCHEMATIC DIAGRAM

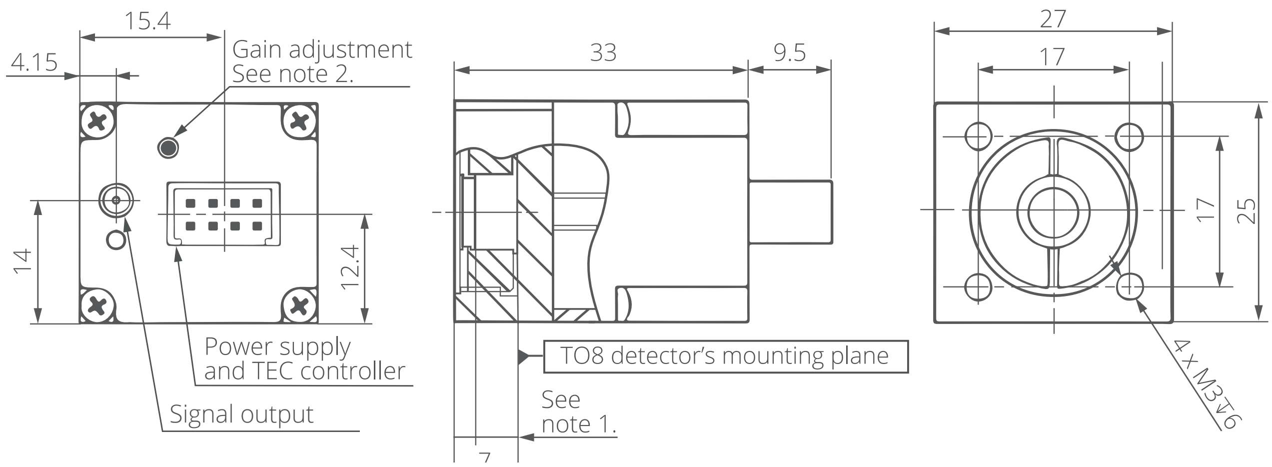


*) Only for SIP amplifiers with $f_{hi} \leq 100$ MHz

SPECIFICATION (T_{amb} = 293 K)

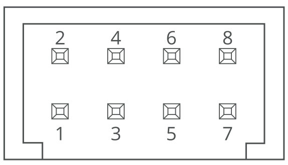
Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}		DC, 10, 100, 1k, 10k	Hz
High cut-off frequency, f_{hi}		100k, 1M, 10M, 100M, 250M	Hz
Transimpedance, K_i	Tunable, only the SIP-xx-xx-TO39-G version	up to 100	kV/A
Transimpedance range, $K_{i\,max}/K_{i\,min}$	Depending on the f_{hi}, only the SIP-xx-xx-TO39-G version	up to 5	-
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	f_{hi} ≤ 1 MHz, R_{load} = 1 MΩ	±10	V
	f_{hi} > 1 MHz, R_{load} = 50 Ω	±1	
Output voltage offset, V_{off}		max. ±20	mV
Power supply voltage, V_{sup}	f_{hi} ≤ 1 MHz, R_{load} = 1 MΩ	±15	V
	f_{hi} > 1 MHz, R_{load} = 50 Ω	±9	
Power supply current, I_{sup}		max. ±50	mA
Weight		52	g

MECHANICAL LAYOUT (Unit: mm)



Notes:
1. TO39 detector dimensions in the TO39 package technical drawings (p. 197, 198, 199)
2. Only for the SIP-xx-xx-TO39-G version.

POWER SUPPLY SOCKET PINOUT



AMP2×4 (PART NO. 280389-2)

Pin No.	Symbol	Function
1	-Vsup	Power supply input (-)
2	NC	Not connected
3	GND	Ground
4	NC	Not connected
5	GND	Ground
6	NC	Not connected
7	+Vsup	Power supply input (+)
8	NC	Not connected

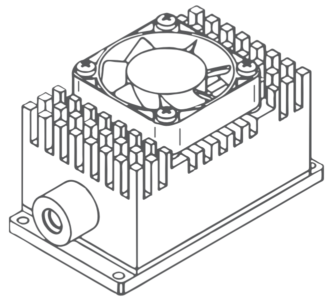
ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

FIP series

Fast transimpedance amplifiers



FEATURES

- Compatible with VIGO TE-cooled biased photovoltaic IR detectors in the TO8 package
- Frequency bandwidth: up to 1 GHz
- AC coupled (DC monitor as an option)
- M4 mounting hole
- Designed for effective heat dissipation
- Integrated fan
- External TEC controller required

INCLUDED ACCESSORIES

- 1 pc of SMA-BNC cable
- 1 pc of LEMO-DB9 cable

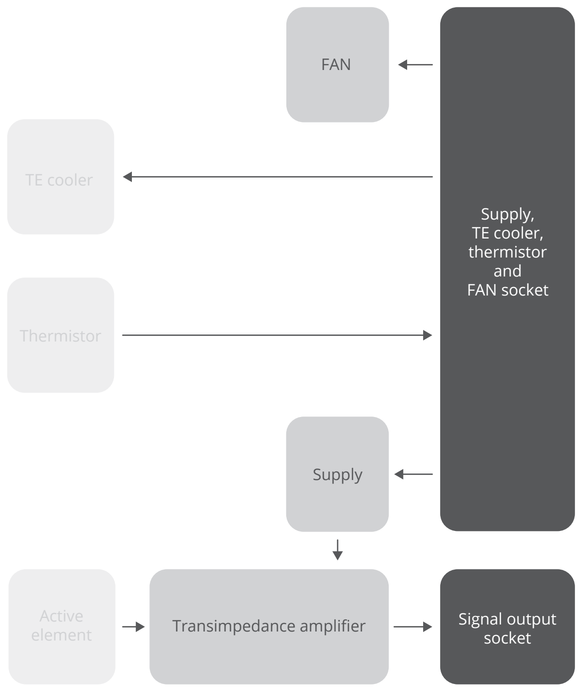
DEDICATED ACCESSORIES

- PTCC-01 series TEC controller (p. 145)
- Smart Manager software: freeware
- DRB-2 base mounting system (p. 152)

CODE DESCRIPTION

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

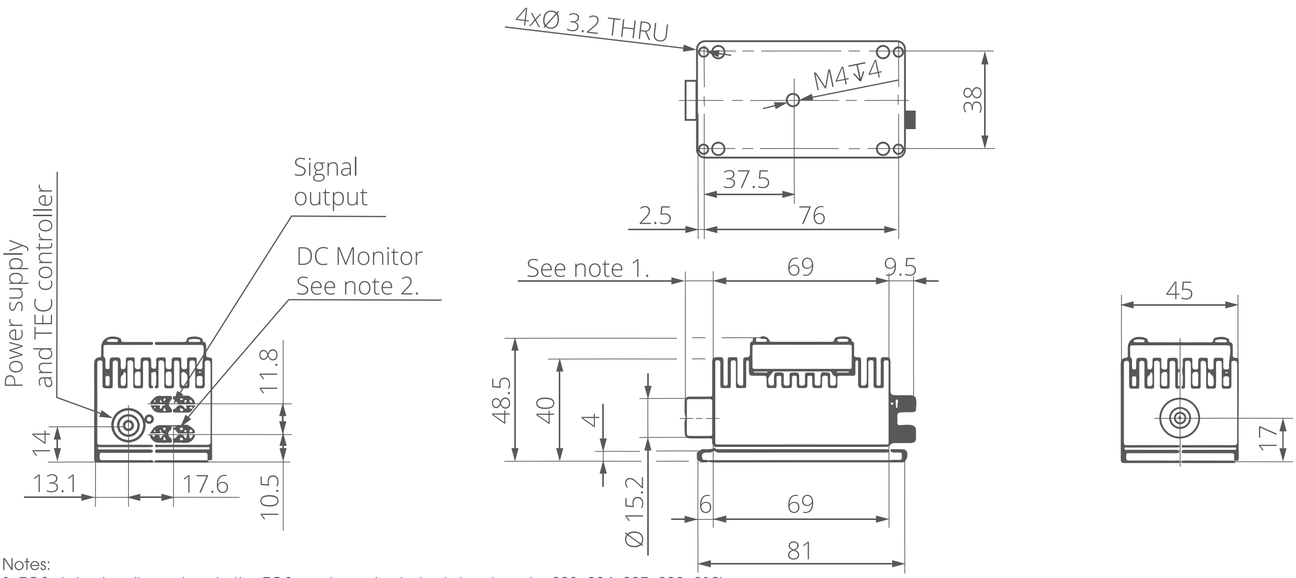
SCHEMATIC DIAGRAM



SPECIFICATION (T_{amb} = 293 K)

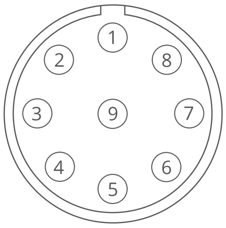
Parameter	Conditions/remarks	Value	Unit
Low cut-off frequency, f_{lo}		1k, 10k	Hz
High cut-off frequency, f_{hi}		1G	Hz
Transimpedance, K_i	Fixed	up to 8.5	kV/A
Output impedance, R_{out}		50	Ω
Output voltage swing, V_{out}	R_{load} = 50 Ω	±1	V
Power supply voltage, V_{sup}		+12/-5	V
Power supply current, I_{sup}		max. ±50	mA
Weight		210	g

MECHANICAL LAYOUT (Unit: mm)



Notes:
1. TO8 detector dimensions in the TO8 package technical drawings (p. 203, 204, 207, 209, 210)
2. Only for FIP-xx-xx-D version.

POWER SUPPLY, TE COOLER, THERMISTOR AND FAN SOCKET PINOUT



LEMO ECG.0B.309.CLN

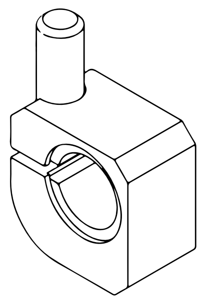
Pin No.	Symbol	Function
1	FAN+	Fan supply input (+)
2	TH2	Thermistor output (2)
3	TEC-	TEC supply input (-)
4	-Vsup	Power supply input (-)
5	GND	Ground
6	+Vsup	Power supply input (+)
7	TEC+	TEC supply input (+)
8	TH1	Thermistor output (1)
9	DATA	Data

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/remarks	Value	Unit
Ambient operating temperature, T_{amb}		10 to 30	°C
Storage temperature, T_{stg}		-20 to 50	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

DH-2

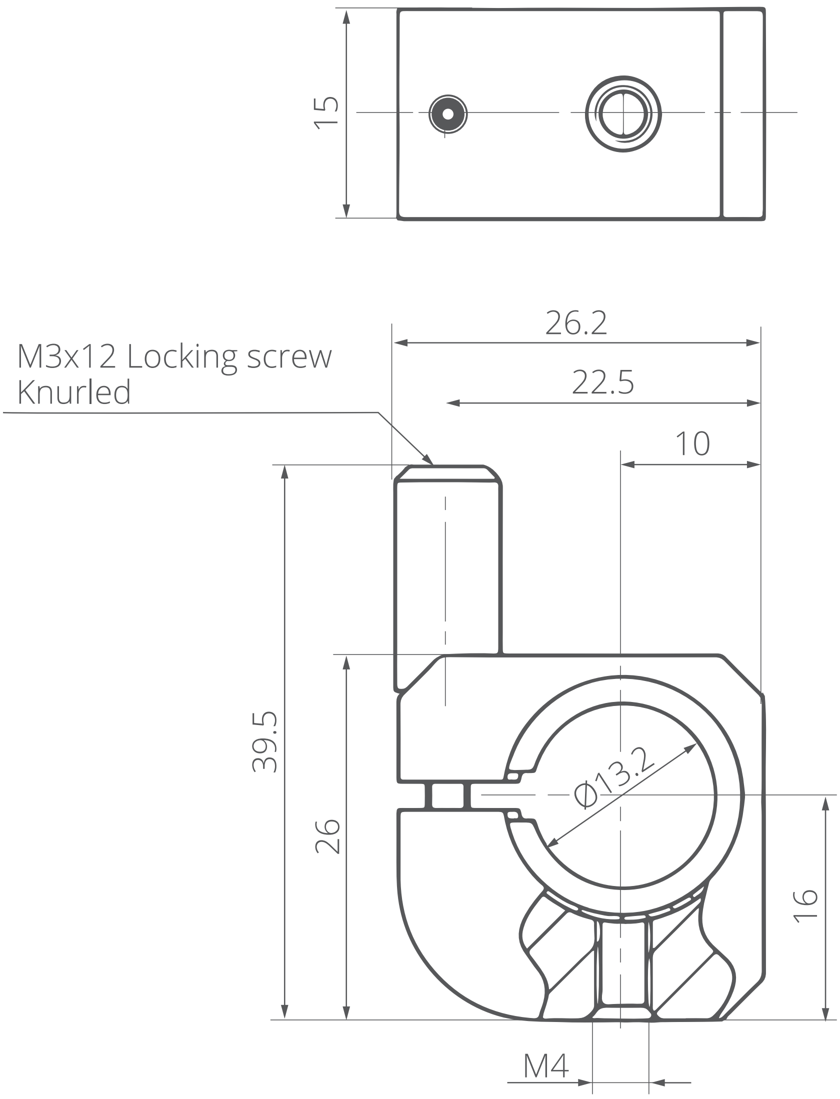


Detector holder

FEATURES

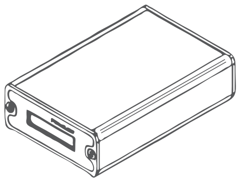
- Dedicated for assembly of VIGO detectors in the PEM-SMA package: **PEM-10.6-1×1-PEM-SMA-wZnSeAR-48** (p. 69)
- Compatible with the **DRB-2** mounting system (p. 152)

MECHANICAL LAYOUT (Unit: mm)

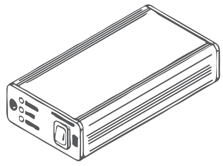


PTCC-01 SERIES

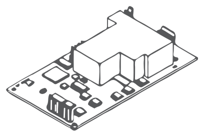
Programmable, smart thermoelectric cooler controllers



PTCC-01-ADV



PTCC-01-BAS



PTCC-01-OEM

OPTIONS

PTCC-01-ADV

- TEC controller and preamplifier power supply encapsulated in a small-size package.
- Configurable by built-in function keys or PC software available on the VIGO website.
- Status LCD indicator.
- IR module socket: D-sub 9 pins
- Power supply socket: DC 2.1/5.5

PTCC-01-BAS

- TEC controller and preamplifier power supply encapsulated in a small-size package.
- Configurable by PC software available on the VIGO website.
- Status LED indicator.
- IR module socket: D-sub 9 pins
- Power supply socket: DC 2.1/5.5

PTCC-01-OEM

- TEC controller and preamplifier power supply without package.
- Configurable by PC software available on the VIGO website.
- Status LED indicator and status/data connector.
- IR module socket: DUBOX 2×5
- Power supply socket: KK2

VIGO IR DETECTION MODULES THAT CAN OPERATE WITH PTCC-01 SERIES

SELECTED LINE

- **LabM-I-4** detection module (p. 98)
- **LabM-I-5** detection module (p. 101)
- **LabM-I-6-01** detection module (p. 104)
- **LabM-I-10.6** detection module (p. 107)
- **SM-I-12** detection module (p. 122)

- IR detection modules containing TE-cooled detectors in the TO8 package and preamplifiers:
  - **PIP** series (p. 129)
  - **MIP** series (p. 132)
  - **SIP-TO8** series (p. 135)
  - **FIP** series (p. 141)

INCLUDED ACCESSORIES

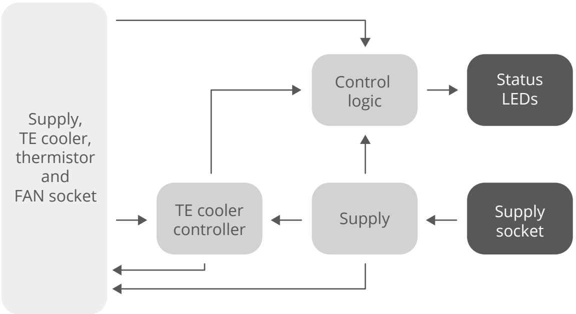
PTCC-01-ADV, PTCC-01-BAS

- Smart Manager software (freeware)
- 1 pc of USB: TypeA-MicroB cable
- 1 pc of AC adaptor

PTCC-01-OEM

- Smart Manager software (freeware)
- 1 pc of USB: TypeA-MicroB cable
- 1 pc of KK2-POWER cable

SCHEMATIC DIAGRAM

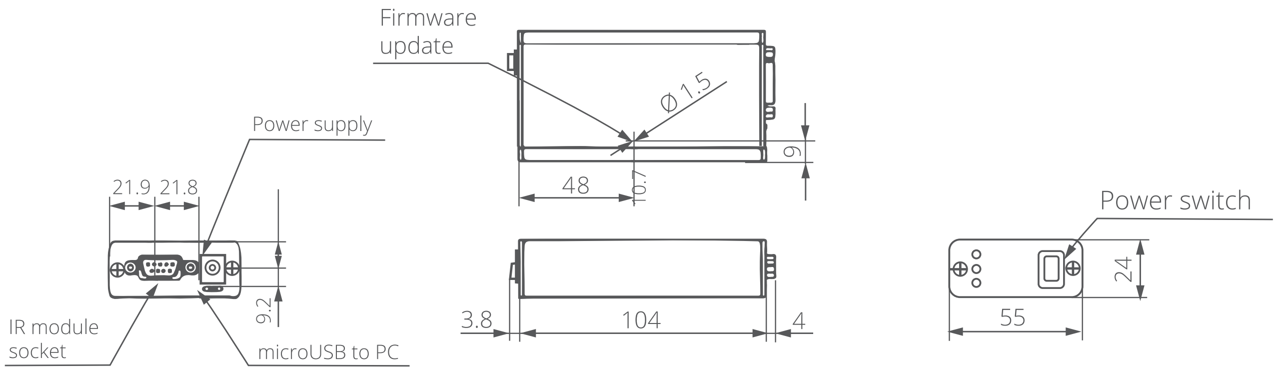


SPECIFICATION (T_{amb} = 293 K)

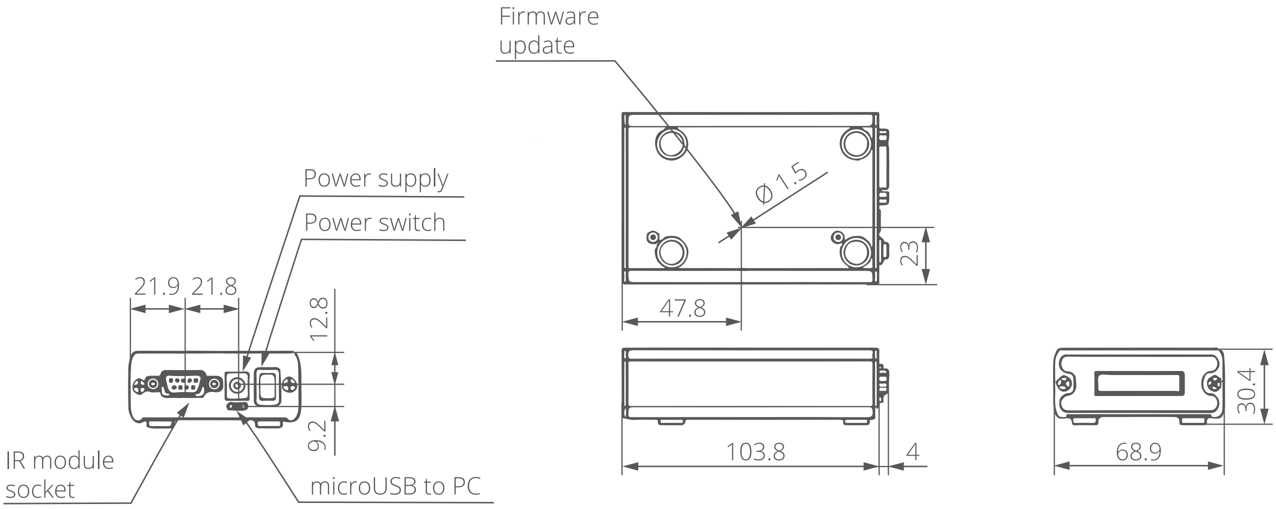
Parameter	Conditions/ remarks	Value			Unit
		Min.	Typ.	Max.	
Temperature stability		-	±0.01	-	K
Temperature readout stability		-	-	1.0	mK
Detector temperature settling time, s	2TE	-	25	-	s
	3TE	-	45	-	
	4TE	-	60	-	
Maximum TEC output current	2TE	-	1.2	-	A
	3TE	-	0.45	-	
	4TE	-	0.4	-	
IR module positive power supply output voltage range		+3.0	-	+14.5	V
IR module negative power supply output voltage range		-14.5	-	-3.0	V
IR module power supply output current		-	-	±200	mA
TEC controller input power supply voltage range		9.0	-	16.0	V_{DC}
TEC controller power supply current consumption	I_{TEC} = 0.45 A, U_{TEC} = 7.5 V	-	500	-	mA
Maximum total resistance of the wires supplying TEC element	Resitances higher than specified may limit minimum temperatures that the controller can stabilize	-	1.0	-	Ω
Weight	PTCC-01-ADV	-	190	-	g
	PTCC-01-BAS	-	150	-	
	PTCC-01-OEM	-	50	-	

MECHANICAL LAYOUT (Unit: mm)

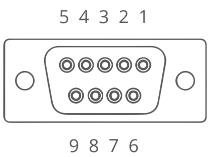
PTCC-01-BAS



PTCC-01-ADV



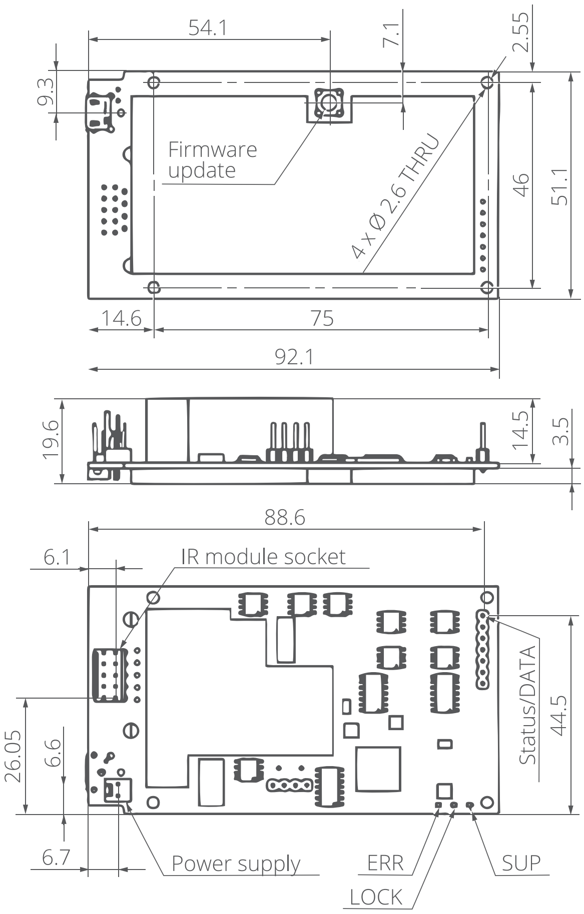
IR MODULE SOCKET PINOUT



D-SUB 9 PIN

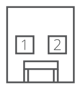
Pin No.	Symbol	Function
1	TEC+	TEC supply output (+)
2	TEC-	TEC supply output (-)
3	GND	IR module power supply ground
4	TH1	Thermistor input (1)
5	TH2	Thermistor input (2)
6	-Vsup	IR module power supply output (-)
7	+5V	FAN and programmable preamp internal logic auxiliary supply
8	DATA	Bidirectional data port
9	+Vsup	IR module power supply output (+)
Metal cover	GND-SH	Shield

MECHANICAL LAYOUT (Unit: mm)



PTCC-01-OEM

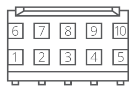
POWER SUPPLY SOCKET PINOUT



KK2

Pin No.	Symbol	Function
1	PTCCsup+	TEC controller supply input (+)
2	PTCCsup-	TEC controller supply input (-)

IR MODULE SOCKET PINOUT



DUBOX2x5

Pin No.	Symbol	Function
1	TEC+	TEC supply output (+)
2	TEC-	TEC supply output (-)
3	GND	IR module power supply ground
4	TH1	Thermistor input (1)
5	TH2	Thermistor input (2)
6	-Vsup	IR module power supply output (-)
7	+5V	FAN and programmable preamp internal logic auxiliary supply
8	DATA	Bidirectional data port
9	+Vsup	IR module power supply output (+)
10	GND-SH	Shield

STATUS/DATA SOCKET PINOUT

PIN-HEADER 1x7

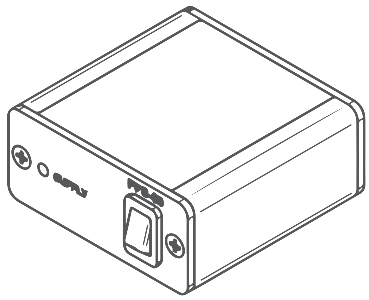
Pin No.	Symbol	Function
1	ERR-LED	Error indicator
2	LOCK-LED	Temperature control loop lock indicator
3	SUP-LED	Module power supply on indicator
4	3.3 V	Auxiliary supply
5	TXD	Transmitted data (RS-232)
6	GND	Common (signal) ground (RS-232)
7	RXD	Received data (RS-232)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		5 to 45	°C
Storage temperature, T_{stg}		-20 to 70	°C
Humidity	No dew condensation	10 to 90	%

Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

PPS-03 SERIES



Preamplifier power supplies

VIGO IR DETECTION MODULES THAT CAN OPERATE WITH PPS-03 SERIES

SELECTED LINE

- **microM-10.6** detection module
- IR detection modules containing uncooled detectors in the TO39 package and amplifiers **SIP-TO39** series

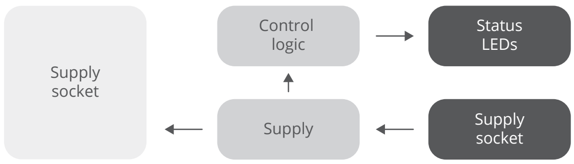
INCLUDED ACCESSORIES

- 1 pc of AC adaptor

CODE DESCRIPTION

Type		Output voltage, V_{DC}
PPS-03	-	09 15

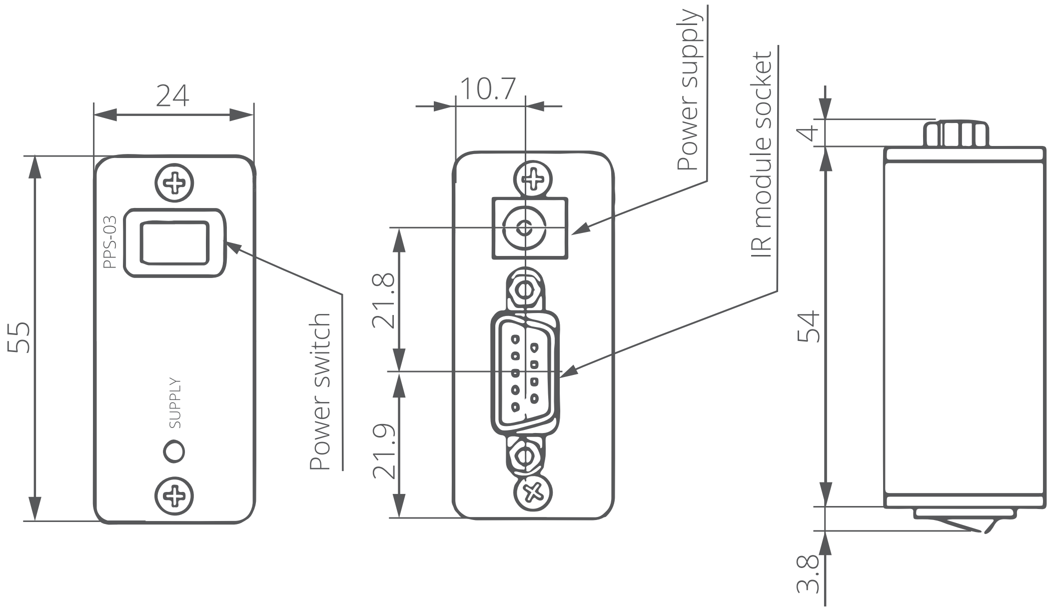
SCHEMATIC DIAGRAM



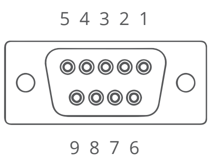
SPECIFICATION (T_{amb} = 293 K)

Parameter	Test conditions/remarks	Value			Unit
		Min.	Typ.	Max.	
Input power supply voltage range		9.0	-	16.0	V_{DC}
IR module power supply output voltage	PPS-03-09	-	±9	-	V_{DC}
	PPS-03-15	-	±15	-	
IR module power supply output current		-	-	±100	mA
Weight		-	90	-	g

MECHANICAL LAYOUT (Unit: mm)



IR MODULE SOCKET PINOUT



D-SUB 9 PIN

Pin No.	Symbol	Function
1	NC	Not connected
2	NC	Not connected
3	GND	IR module power supply ground
4	NC	Not connected
5	NC	Not connected
6	-Vsup	IR module power supply output (-)
7	NC	Not connected
8	NC	Not connected
9	+Vsup	IR module power supply output (+)

ABSOLUTE MAXIMUM RATINGS

Parameter	Test conditions/ remarks	Value	Unit
Ambient operating temperature, T_{amb}		5 to 45	°C
Storage temperature, T_{stg}		-20 to 70	°C
Humidity	No dew condensation	10 to 90	%

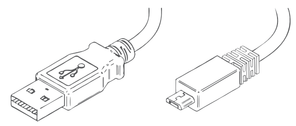
Stresses beyond those listed under Absolute maximum ratings may cause permanent damage to the device. Constant or repeated exposure to absolute maximum rating conditions may affect the quality and reliability of the device.

AC adaptor and cables

AC ADAPTOR

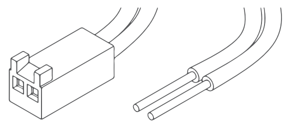
- GEM18I05-P1J/GE24I07-P1J/GE18I09-P1J/SYS1541-2412
- Set of sockets (EU, UK, US)

CABLE FOR PC CONNECTION

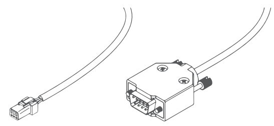


Cable type
USB: TypeA-MicroB
(1.8 m)

POWER SUPPLY CABLES

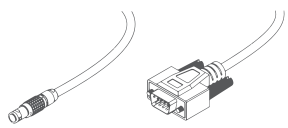


Cable type
KK2-POWER
(0.5 m)

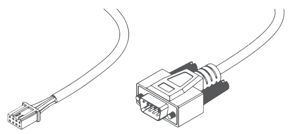


Cable type
JWPF-DB9
(1.8 m)

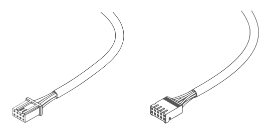
POWER SUPPLY, TE COOLER, THERMISTOR AND FAN CABLE



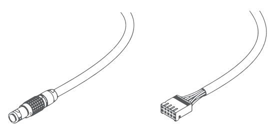
Cable type
LEMO-DB9
(1.8 m)



Cable type
AMP2x4-DB9
(1.8 m)

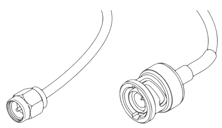


Cable type
AMP2×4-DUBOX2×5
(1.8 m)

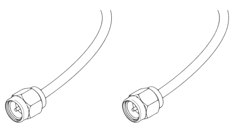


Cable type
LEMO-DUBOX2×5
(1.8 m)

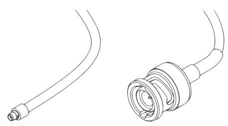
SIGNAL OUTPUT CABLES



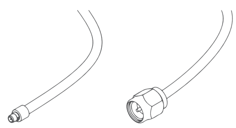
Cable type
SMA-BNC
(1.0 m)



Cable type
SMA-SMA
(1.0 m)



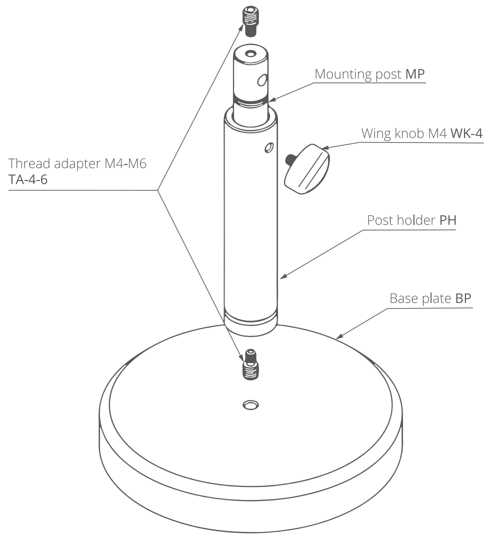
Cable type
MMCX-BNC
(1.0 m)



Cable type
MMCX-SMA
(1.0 m)

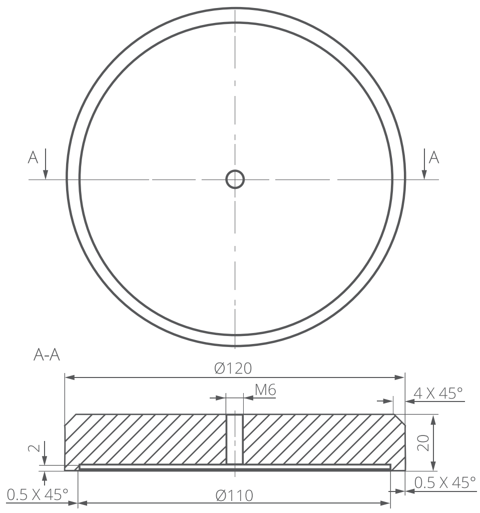
DRB-2

Base mounting system



FEATURES

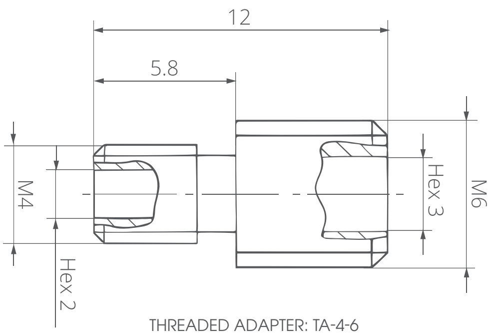
- Dedicated to VIGO detection modules with M4 mounting hole
- Adjustable height
- Compatible with M6 optical breadboards



BASE PLATE: BP

DRB-2 PARTS

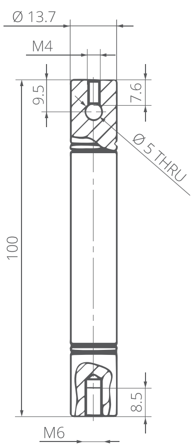
- Base plate: BP
  - Made of black, lacquered steel
  - Provides stable mechanical conditions for the mounting system
  - Weight: ~1756 g
- Mounting post: MP
  - Made of stainless steel
  - Equipped with two threaded adapters TA-4-6
  - Weight: ~115 g
- Post holder: PH
  - Made of black anodized aluminium
  - Equipped with wing knob WK-4
  - Weight: ~60 g



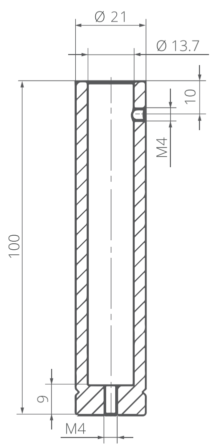
THREADED ADAPTER: TA-4-6

COMPATIBLE ACCESSORIES

- **MH-1** module holder (p. 154)
- **DH-2** detector holder (p. 144)

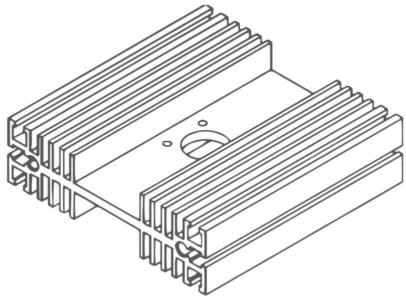


MOUNTING POST: MP



POST HOLDER: PH

MHS-2

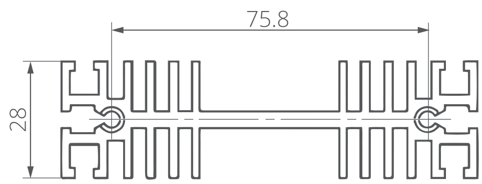


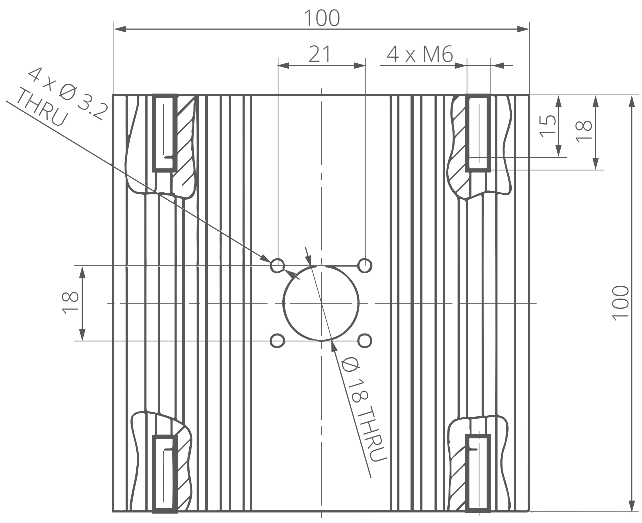
Heatsink

FEATURES

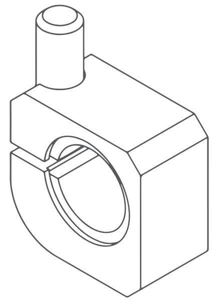
- Dedicated to VIGO **SM-I-12** detection module (p. 122)
- Dedicated to other VIGO detection modules with TE-cooled detectors in the TO8 package including **SIP-TO8** preamplifier series
- Made of black anodized aluminum
- Thermal resistance: ~1.5 K/W

MECHANICAL LAYOUT (Unit: mm)





MH-1

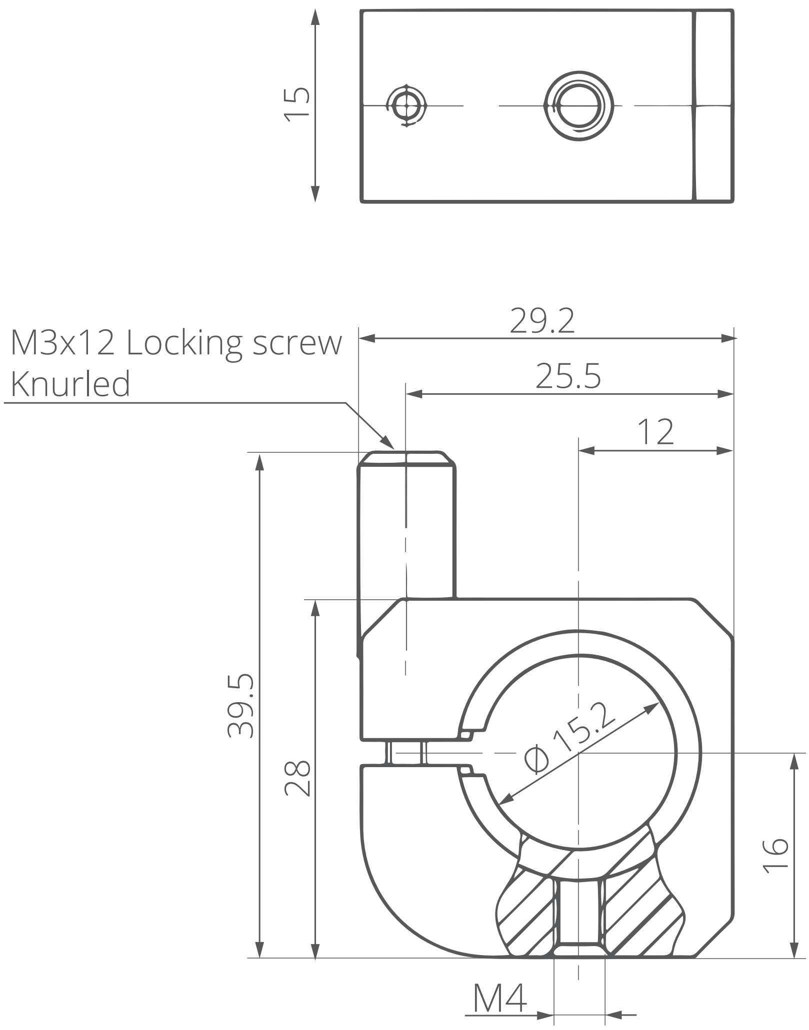


Module holder

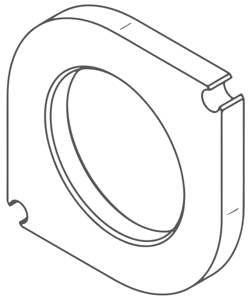
FEATURES

- Dedicated for assembly of VIGO detection module: **microM-10.6** (p. 110)
- Compatible with the **DRB-2** mounting system (p. 152)

MECHANICAL LAYOUT (Unit: mm)



OTA

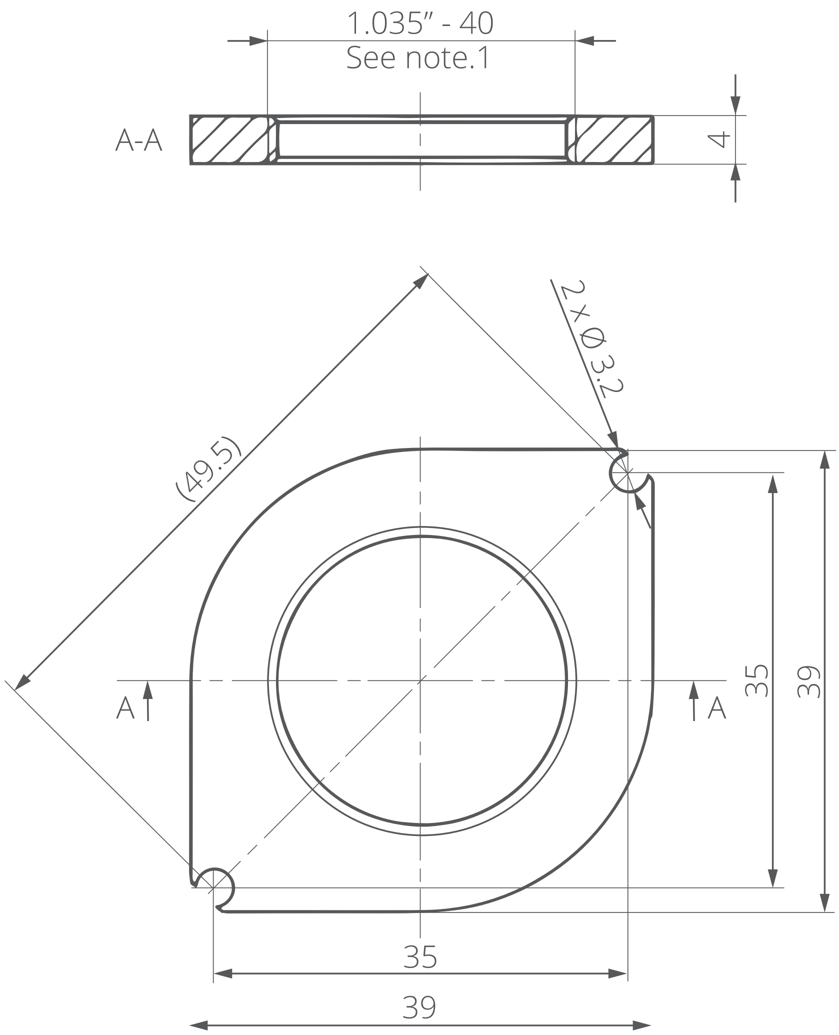


Optical threaded adapter

FEATURES

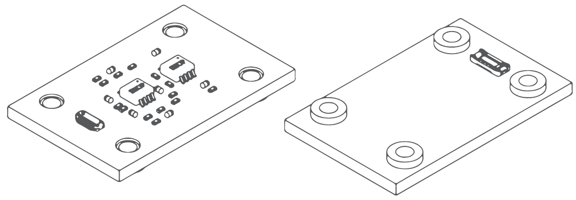
- Made of black anodized aluminum
- Allows to build complex systems containing VIGO detection modules and optical components
- Compatible with all types of Thorlabs SM1 threaded lens tubes

MECHANICAL LAYOUT (Unit: mm)



AMS-x10-AMP/AMS-x10-ACAMP

External amplifiers for the AMS detection module series



FEATURES

- Compatible with the AMS3140-01 and AMS6140-01 (p. 86)
- Bandwidth: DC to 10 MHz (AMS-x10-AMP) or 0.1 Hz to 10 MHz (AMS-x10-ACAMP)
- Differential gain: x10
- Common mode gain: x1
- Rapid prototyping and proof-of-concept development
- Designed for easy integration with the AMS detection module series

GENERAL DESCRIPTION

The AMS-x10-AMP/AMS-x10-ACAMP are external amplifiers for the AMS module series. They are designed to be an easy tool for rapid prototyping and proof-of-concept work when the default responsivity of the module is too low.

The amplifiers can be used as a "transparent" extension board that provides only amplification of differential output signal. The functionality of the other signals remains unchanged.

Common mode voltage of OUT_P and OUT_N signals is passed to the outputs without amplification. The differential signal is amplified 10 times. For AMS-x10-ACAMP low cut-off frequency is 0.1 Hz. The output impedance of OUT_P and OUT_N pins is set to 50 Ω as shown in FIGURE 1 and FIGURE 2. More detailed schematics are presented in FIGURE 4 and FIGURE 5.

For the AMS-x10-AMP signals OFFSET_P and OFFSET_N are crossed to keep their original functions: OFFSET_P changes the DC value of OUTP_AMP_P while OFFSET_N changes the DC value of OUT_AMP_N.

For the AMS-x10-ACAMP OFFSET_P/N do not impact the differential value of OUT_AMP_P/N since the amplifier is AC coupled. It is recommended not to use OFFSET_P/N for AMS-x10-ACAMP.

ELECTRICAL DIAGRAMS

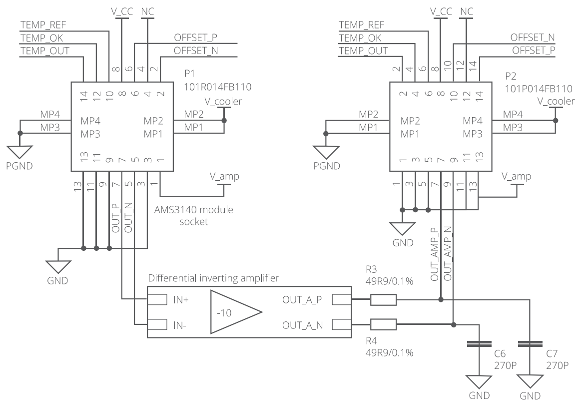


FIGURE 1. General schematic diagram of the AMS-x10-AMP.

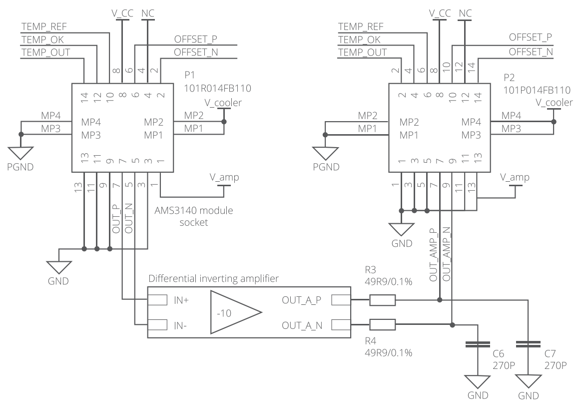


FIGURE 2. General schematic diagram of the AMS-x10-ACAMP. OFFSET_P and OFFSET_N are not crossed and should not be used.

CONNECTIVITY

There are two sockets placed on the board (see FIGURE 3). P1 is the interface to the AMS module. P2 acts as an output socket with a pinout exactly the same as on the AMS module.
The part number of P2 is the same as on the AMS module. Please check the datasheet of the AMS module series for more details about pin functions.

MECHANICAL REQUIREMENTS

There are four spacers mounted on the PCB to keep the proper distance between the AMS module and AMS x10-AMP/AMS x10-ACAMP. Warning! The P1 socket is very sensitive to mechanical stress.
The AMS x10-AMP/AMS x10-ACAMP has to be fixed to the AMS detection module with screws and nuts. Caution is required when assembling the adapter with the module.

TABLE 1. P2 socket pin functions

Pin number	Symbol	Function
1, 3, 5, 11	GND	Signal and amplifier supply ground
7	OUT__AMP_P	Amplified positive signal output
9	OUT_AMP_N	Amplified negative signal output
12	NC	Not used. Leave floating
2	TEMP_OUT	Analog temperature output
4	TEMP_OK	Comparator output signal
6	TEMP_REF	Temperature reference voltage
13	V_{amp}	Amplifier supply input
8	V_{cc}	Internal supply voltage output
10	OFFSET_P	DC offset for positive signal output
14	OFFSET_N	DC offset for negative signal output
MP3, MP4	V_{cooler}	Supply voltage input for the temperature controller
MP1, MP2	PGND	Ground path for temperature controller. Connect to GND

For more information please check the datasheet of the AMS module series (p. 86)

MECHANICAL LAYOUT

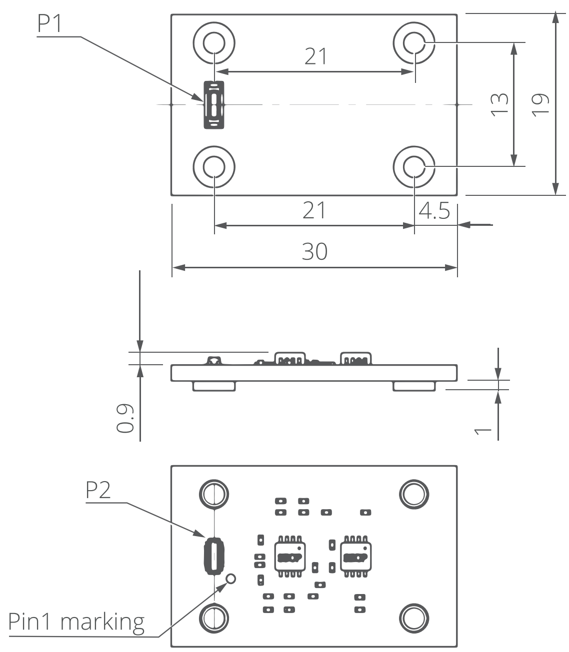


FIGURE 3. Dimensions of the AMS-x10-AMP and AMS-x10-ACAMP (given in mm)

DETAILED SCHEMATICS

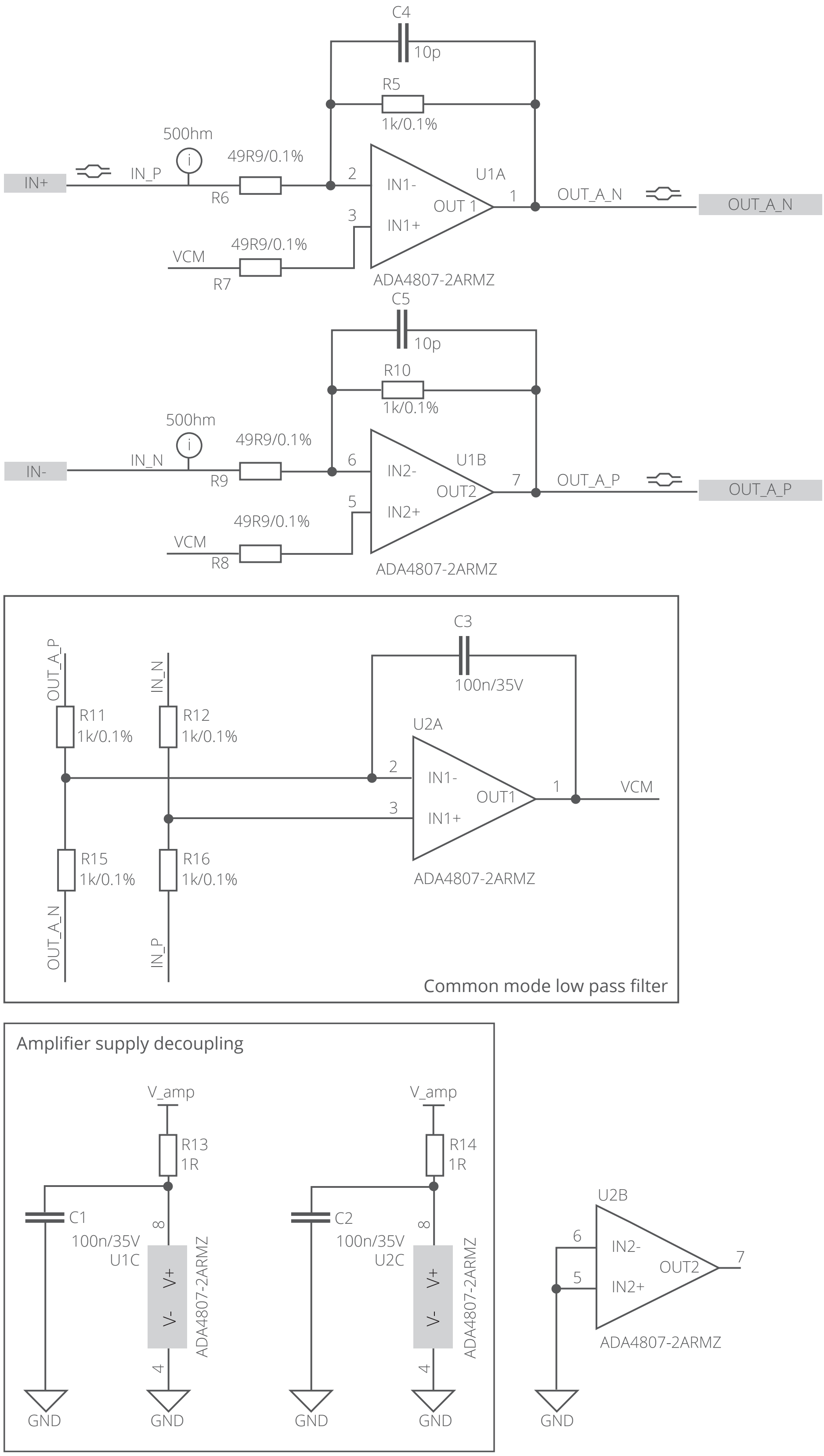


FIGURE 4. Schematic of the differential amplifier of the AMS x10-AMP

DETAILED SCHEMATICS

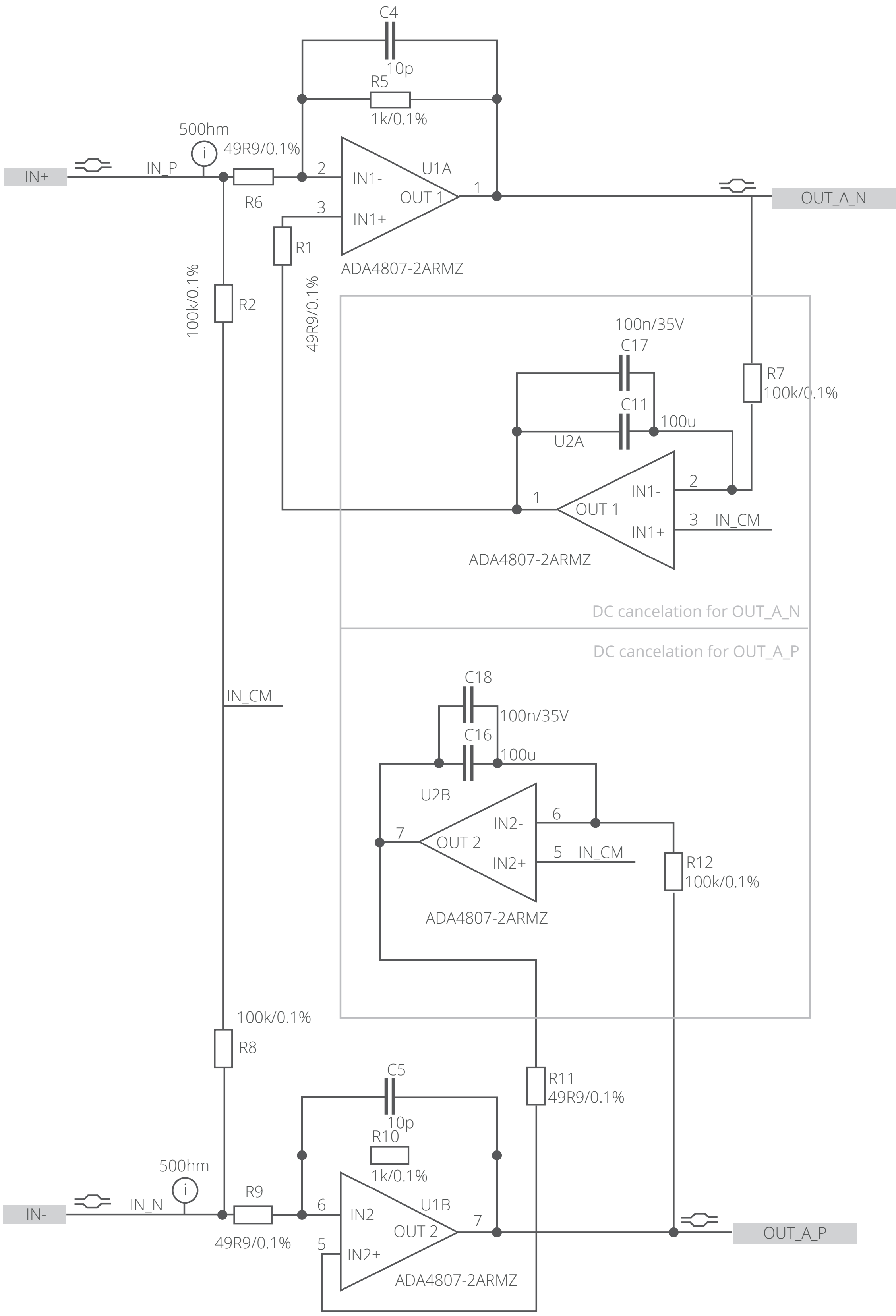
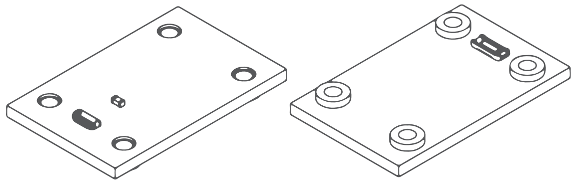


FIGURE 5. Schematic of the differential amplifier of the AMS x10-ACAMP

AMS-100k-LPF

Low pass filter for the AMS detection module series



FEATURES

- Compatible with the AMS3140-01 and AMS6140-01 (p. 86)
- Bandwidth: 100 kHz
- Rapid prototyping and proof-of-concept development
- Designed for easy integration with the AMS detection module series

GENERAL DESCRIPTION

The AMS-100k-LPF is an external low-pass filter for the AMS module series. It is designed to be an easy tool for rapid prototyping and proof-of-concept work when the default responsivity of the module is too low.
The AMS-100k-LPF can be used as a "transparent" extension board that provides only filtering of the differential output signal. The functionality of the other signals remains unchanged.
Besides connectors and mechanical spacer, the AMS-100k-LPF contains only one capacitor as shown in FIGURE 1.

CONNECTIVITY

There are two sockets placed on the board (see FIGURE 2). P1 is the interface to the AMS module. P2 acts as an output socket with a pinout exactly the same as on the AMS module.
The part number of P2 is the same as on the AMS module. Please check the datasheet of the AMS module series module for more details about pin functions.

TABLE 1. P2 socket pin functions

Pin number	Symbol	Function
1, 3, 5, 11	GND	Signal and amplifier supply ground
7	OUT__AMP_P	Amplified positive signal output
9	OUT_AMP_N	Amplified negative signal output
12	NC	Not used. Leave floating
2	TEMP_OUT	Analog temperature output
4	TEMP_OK	Comparator output signal
6	TEMP_REF	Temperature reference voltage
13	V_{amp}	Amplifier supply input
8	V_{cc}	Internal supply voltage output
10	OFFSET_P	DC offset for positive signal output
14	OFFSET_N	DC offset for negative signal output
MP3, MP4	V_{cooler}	Supply voltage input for the temperature controller
MP1, MP2	PGND	Ground path for temperature controller. Connect to GND

For more information please check the datasheet of the AMS3140-01 module (p. 86).

ELECTRICAL DIAGRAMS

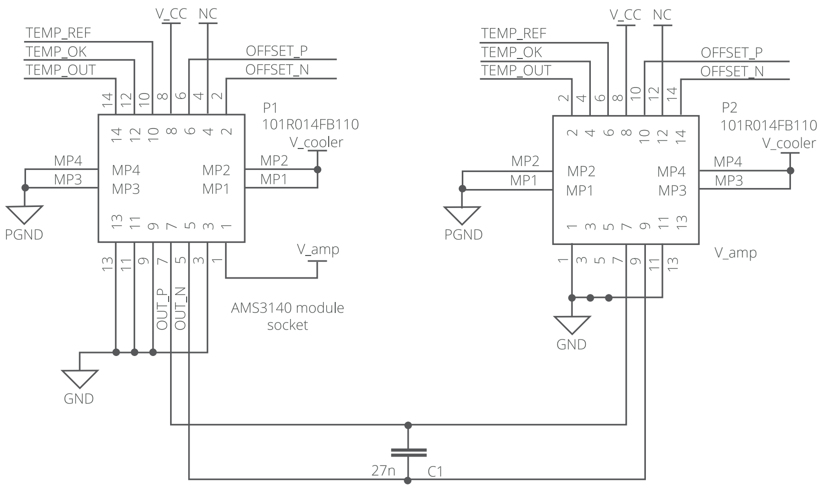


FIGURE 1. Schematic diagram of the AMS-100k-LPF

MECHANICAL REQUIREMENTS

There are four spacers mounted on the PCB to keep the proper distance between the AMS module and AMS-100k-LPF. Warning! The P1 socket is very sensitive to mechanical stress.
The AMS-100k-LPF has to be fixed to the AMS detection module with screws and nuts. Caution is required when assembling the adapter with the module.

MECHANICAL LAYOUT

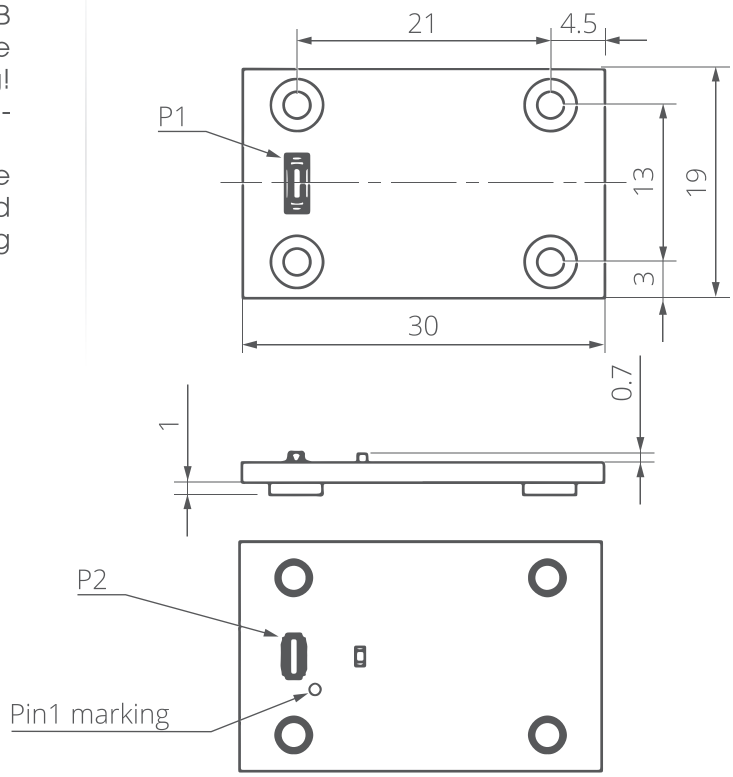
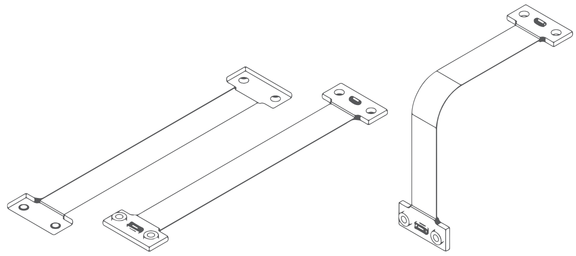


FIGURE 2. Dimensions of the AMS-100k-LPF (given in mm)

AMS-90-FLEX



Flexible stack extender for the AMS modules and accessories

FEATURES

- Compatible with the AMS modules series (p. 86) and accessories
- Flexible connection between the module and other PCBs
- 5 mm minimal bending radius

APPLICATIONS

- Embedded systems
- Rapid prototyping

GENERAL DESCRIPTION

The AMS-90-FLEX is a 90 mm semi-flex board for the AMS modules and accessories. It is designed to be an easy tool for rapid prototyping, proof-of-concept work, and final devices.

CONNECTIVITY

Two connectors are available. They are interconnected in a way that allows transparent work without modification of any signals. The AMS-90-FLEX board can be used between any two analog boards of the AMS family. A generic electrical diagram is presented in FIGURE 1.

ELECTRICAL DIAGRAM

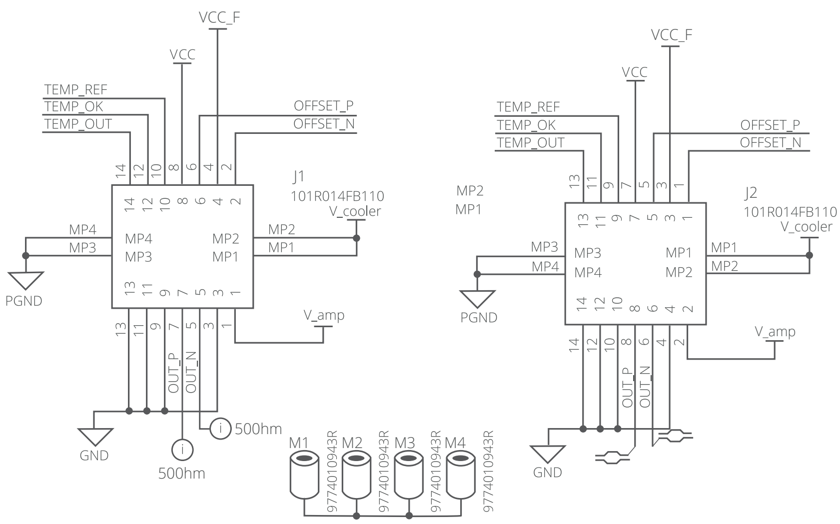


FIGURE 1. Schematic diagram of the AMS-90-FLEX

MECHANICAL REQUIREMENTS

The connectors are very sensitive to mechanical stress. The boards have to be fixed to each other with screws and nuts.

EXAMPLE APPLICATION

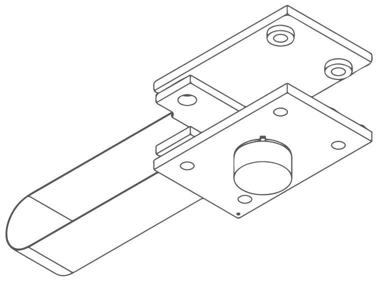


Figure 2 Example application of the AMS-90-FLEX between the AMS3140 module and the AMS-x10-AMP or AMS-x10-ACAMP external amplifier

MECHANICAL LAYOUT

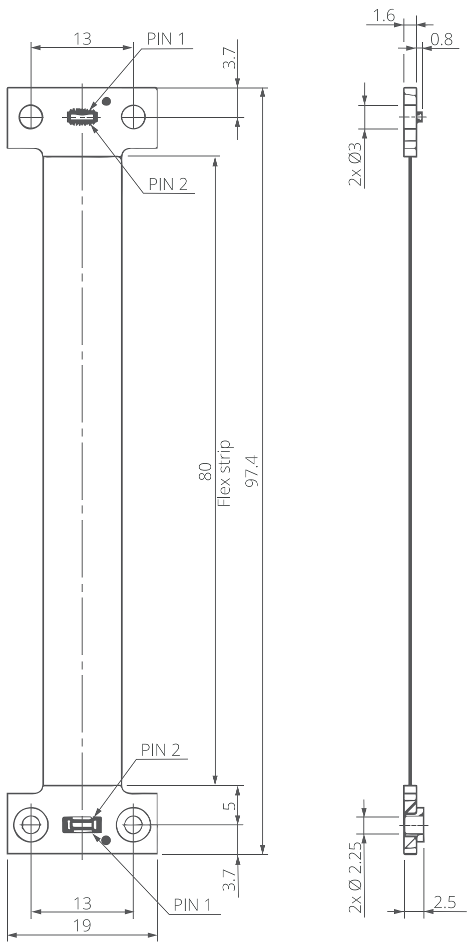
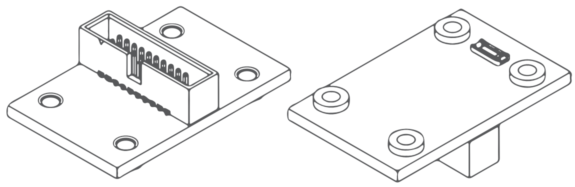


FIGURE 3. Dimensions of the AMS-90-FLEX (given in mm)

AMS-1.27-EA

Electrical adapter for the AMS detection module series



FEATURES

- Compatible with the AMS3140-01 and AMS6140-01 (p. 86)
- Standard 1.27 mm socket
- Rapid prototyping and proof-of-concept development
- Designed for easy integration with the AMS detection module series

GENERAL DESCRIPTION

The AMS-1.27-EA is an accessory for the AMS module series. It is designed to be an easy tool for rapid prototyping and proof-of-concept work if the full Evaluation Kit is not suitable.

CONNECTIVITY

There are two sockets placed on the board. P1 (see FIGURE 2) is the interface to the AMS module. P2 (see FIGURE 2) can be used to connect an external cable. The part number of P2 is 20021521-00020C4LF from Amphenol with a 1.27 mm pitch. An example mating plug is Amphenol 20021444-00020T4LF.
A description of pin functions for the P2 socket is presented in TABLE 1. The AMS-1.27-EA is a passive PCB board and does not change the function of any signal.

ELECTRICAL DIAGRAM

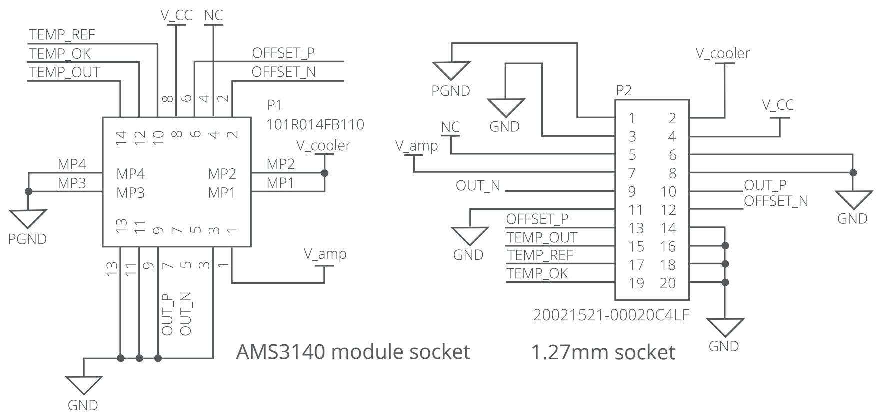


FIGURE 1. Schematic diagram of the AMS-1.27-EA

TABLE 1. P2 socket pin functions

Pin number	Symbol	Function
3, 6, 8, 14, 16, 18, 20	GND	Signal and amplifier supply ground
10	OUTPUT_P	Positive signal output
9	OUTPUT_N	Negative signal output
5	NC	Not used. Leave floating
15	TEMP_OUT	Analog temperature output
19	TEMP_OK	Temperature comparator output signal
17	TEMP_REF	Temperature reference voltage. It can be used to change the temperature of the chip
7	V_{amp}	Amplifier supply input
4	V_{CC}	Internal supply voltage output
13	OFFSET_P	DC offset for positive signal output. Leave floating if no output offset is required
12	OFFSET_N	DC offset for negative signal output. Leave floating if no output offset is required
2	V_{cooler}	Supply voltage input for the temperature controller
1	PGND	Ground path for temperature controller. Connect to GND with a separate wire for optimal performance

For more information please check the datasheet of the AMS module series (p. 86).

MECHANICAL LAYOUT

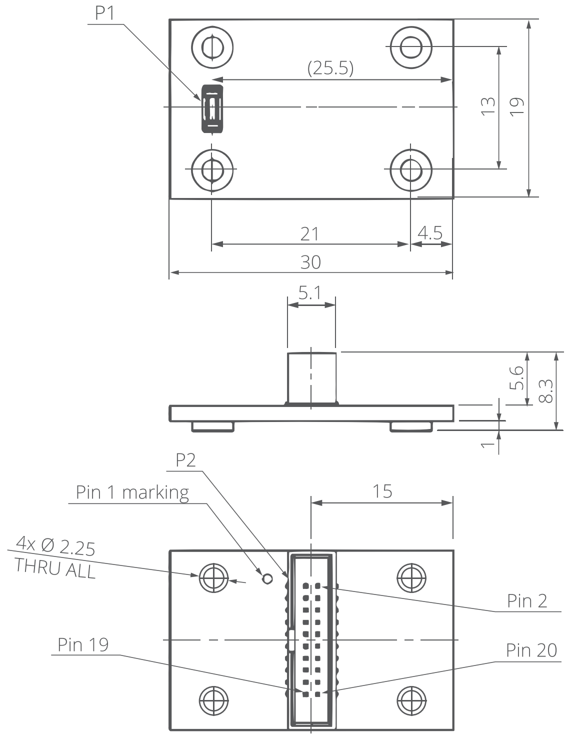


FIGURE 2. Dimensions of the AMS-1.27-EA (given in mm)

MECHANICAL REQUIREMENTS

There are four spacers mounted on the PCB to keep the proper distance between the AMS module and the AMS 1.27 EA adapter. Warning! The P1 socket is very sensitive to mechanical stress. The AMS-1.27-EA has to be fixed to the AMS detection module with screws and nuts. Caution is required when assembling the adapter with the module. An example assembly of the AMS detection module with the AMS-1.27-EA adapter and the heatsink is presented in FIGURE 3.

TABLE 1. P2 socket pin functions

Part number	Part name	Quantity
1	M2×10 screw (not included)	4
2	Heatsink (not included)	1
3	AMS detection module (available to order)	1
4	AMS-1.27-EA adapter	1
5	M2 nut (not included)	4

EXAMPLE ASSEMBLY

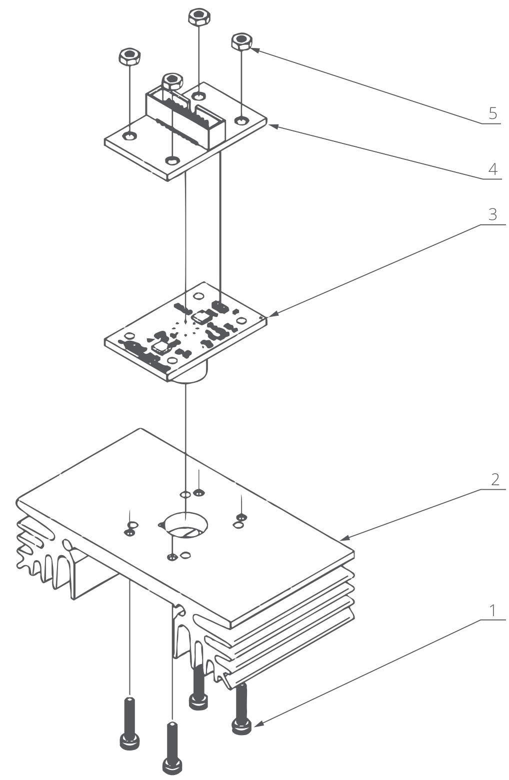
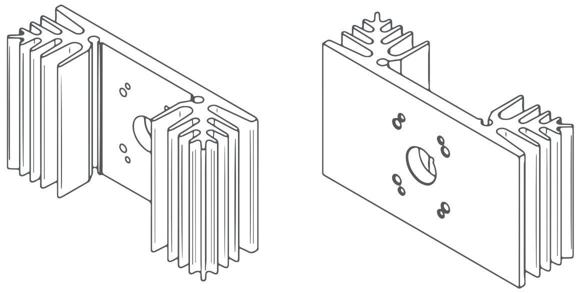


FIGURE 3. Example assembly of the AMS detection module with the AMS-1.27-EA adapter and the heatsink

AMS-HS



Example heatsink for the AMS detection module series

FEATURES

- Compatible with the AMS3140-01 and AMS6140-01 (p. 86)
- Thermal resistance: 6 K/W
- Rapid prototyping and proof-of-concept development
- Designed for easy integration with the AMS detection module series

GENERAL DESCRIPTION

The AMS-HS is an example heatsink for the AMS detection module series. It is designed to be an easy tool for rapid prototyping and proof-of-concept work when a full evaluation kit is not suitable.
The AMS-HS features threaded mounting holes for the AMS module as well as additional holes compatible with Thorlabs 16 mm cage system for easy integration with external optics.

MECHANICAL LAYOUT

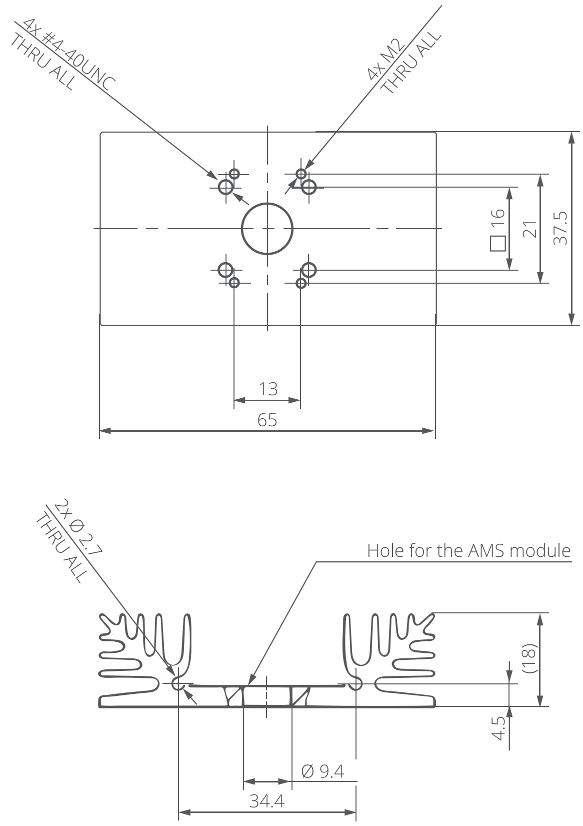
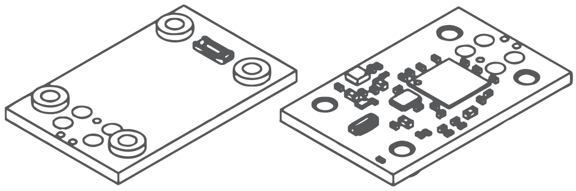


FIGURE 1. Dimensions of the AMS-HS (given in mm)

AMS-DIG-PROC

Signal processing add-on for the AMS detection module series



FEATURES

- Onboard acquisition and processing
- Fully configurable processing pipeline
- 16bit sampling, 32bit processing
- 7 Msamples/s
- Programmable oversampling
- Multiple processing algorithms
- Trigger output and input
- UART communication interface
- Optional adapter to the 1.27 mm standard header
- Optional USB adapter (AMS-DIG-USB – p. 178)
- Compatible with the AMS3140-01, AMS6140-01 (p. 86) and their accessories
- Rapid prototyping and proof-of-concept development
- Designed for easy integration with the AMS detection module series and the AMS accessories
- Python and C libraries including source code

APPLICATIONS

- Portable devices
- Temperature and gas sensors
- Embedded systems
- Rapid prototyping

GENERAL DESCRIPTION

The AMS-DIG-PROC is a digital accessory for the AMS detection module series. It is designed to be an easy tool for rapid prototyping and proof-of-concept work. It provides standard electrical interfaces and well-documented software protocol to fit all infrared measurement applications. The AMS-DIG-PROC offers not only analog signal acquisition. It can be used to process data directly on board. Built-in algorithms allow rapid implementation of typical measurement scenarios, including pulsed laser or chopper-based methods. The output socket of the AMS-DIG-PROC offers serial communication as well as trigger input and output. The functions of the pins are shown in TABLE 1. For optimal noise performance, external amplifiers from AMS accessories are strongly recommended.

CONNECTIVITY AND ELECTRICAL DIAGRAM

There are two sockets placed on the board (see FIGURE 1 and FIGURE 4). P1 is the interface to the AMS module. P2 is the output socket with pinout described in TABLE 1. P2 is rotated 90 degrees relative to P1 to avoid accidental connection of non-compatible analog accessories from the AMS family. All unused pins of P2 should be left floating. The recommended mating part for P2 is Amphenol 101R014FB110.

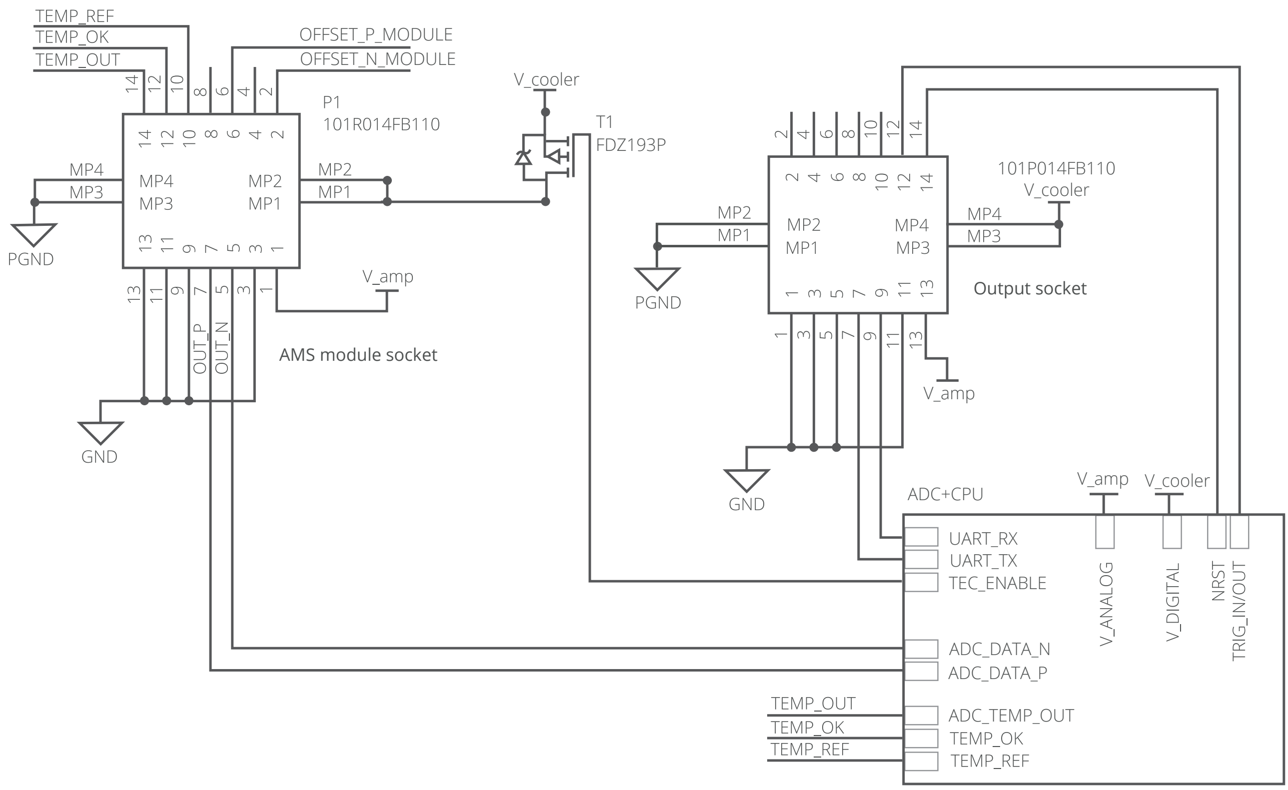


FIGURE 1. Schematic diagram of the AMS-DIG-PRO. All unused pins of P2 should be left floating.

TABLE 1. P2 socket pin functions

Pin number	Symbol	Function
1, 3, 5, 11	GND	Signal ground
2, 4, 6, 8, 10		Reserved. Leave floating
7	UART_TX	UART output of the AMS-DIG-PROC
9	UART_RX	UART input of the AMS-DIG_PROC
12	TRIG_IN/OUT	Trigger input or output
13	V_{amp}	Analog supply input
14	NRST	Reset input. Active low
MP1, MP2	PGND	Power ground. Connect to signal ground.
MP3, MP4	V_{cooler}	Power supply for the cooler of the AMS module and digital logic of AMS-DIG-PROC

The digital part of the ADC+CPU block is supplied from the V_{cooler} which is also passed to the AMS module using a T1 transistor allowing programmable enabling/disabling of the cooler circuit built into the AMS module. The V_{amp} is used to supply analog circuits and is also passed to the AMS module to supply its amplifiers.

ABSOLUTE MAXIMUM RATINGS

Do not stress the device above the limits specified in this chapter since it may cause permanent damage to the device.

TABLE 2. Absolute maximum ratings

Parameter	Rating
Amplifier supply, V_{amp}, V_{cooler}	3.5 V
TRIG_IN voltage	0 V to 5.0 V
NRST voltage	0 V to (V_{cooler} + 0.2) V
UART_RX/TX voltage	0 V to 3.5 V
Ambient operating temperature, T_{amb}	-40°C to 65°C, non-condensing
Storage temperature, T_{stg}	-50°C to 85°C

SPECIFICATION (+3.3 V supply, T_{amb} = 20°C, unless otherwise noted)

TABLE 3. AMS-DIG-PROC specification

Parameter	Test conditions/ remarks	Value			Unit
		Min.	Typ.	Max.	
ANALOG					
V_{amp} current, I_{amp}	Without additional boards		5		mA
	Without additional boards		120		mA
DIGITAL					
Sampling rate, f_s			7		MHz
ADC Resolution			16		bits
Processing resolution			32		bits
Trigger out low level, V_{OL}				0.4	V
Trigger out high level, V_{OH}		2.9			V
Trigger in low level, V_{IL}				1.22	V
Trigger in high level, V_{IH}		2.31			V
Default UART bitrate			1		Mbit/s

PROCESSING PIPELINE

Built-in processing pipeline provides onboard configurable 32-bit algorithms. The processing logic is presented in FIGURE 2, while its architecture is presented in FIGURE 3.

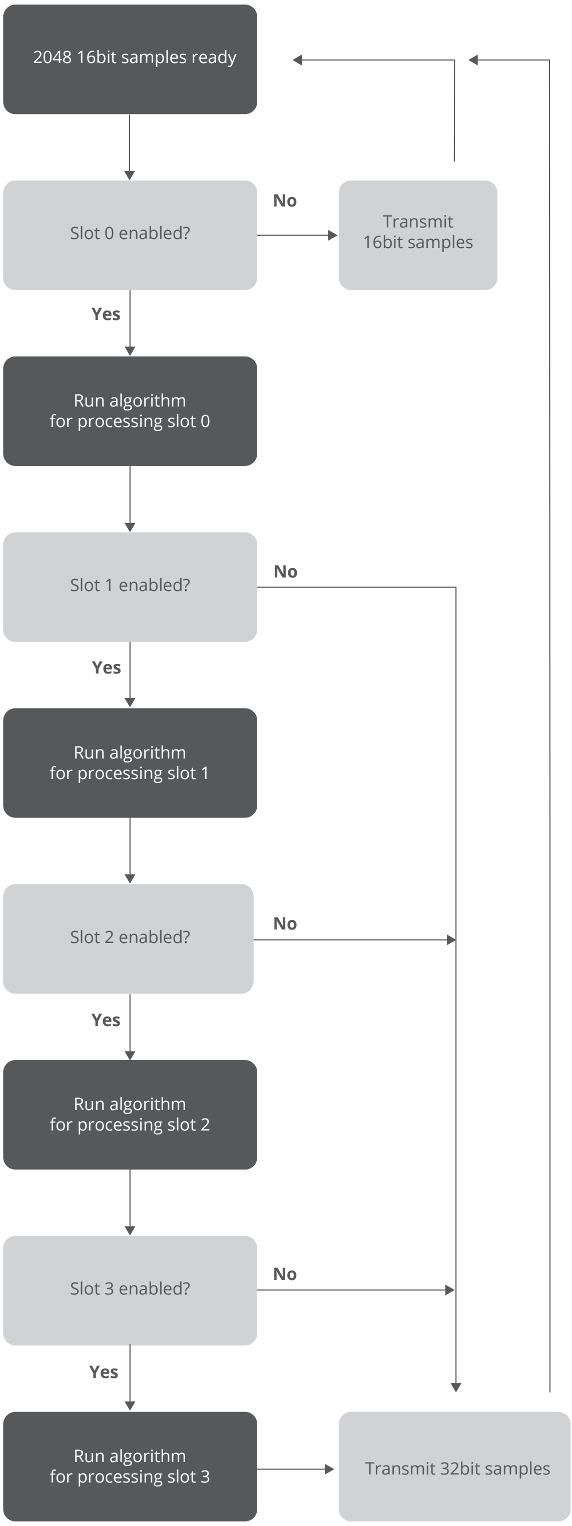


FIGURE 2. Processing pipeline logic

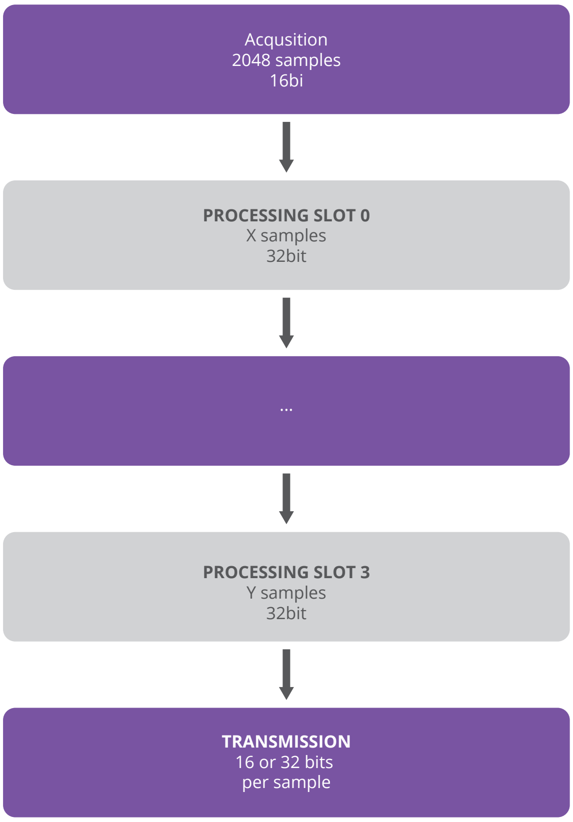


FIGURE 3. Processing pipeline architecture

After acquisition with built-in ADC, data are passed to the first processing slot. Buffer size between acquisition and processing is fixed and contains 2048 16-bit samples. There are 4 processing slots available. Each of them is fully configurable. For all available processing algorithms please refer to chapter COMMUNICATION. Processing can be also disabled to provide the fastest possible data rate. However, in this setup data loss will occur due to the limited bandwidth of communication interfaces. Therefore it is highly recommended to use as many processing capabilities as possible to avoid high data rates transmissions. First disabled (not configured) processing slot will pass data directly to the transmission block. Therefore it is required to configure slots starting from slot 0 and use always adjacent slots without any gap between them. Output buffer size from the processing slot depends on its configuration. Some processing algorithms produce up to 2048 samples, while others generate just 1 sample. For more information please refer to chapter COMMUNICATION.

COMMUNICATION

INTRODUCTION

The communication interface for the AMS-DIG-PROC board is 3.3V UART, 8 bits, no parity, 1 stop bit. Default speed is 1 Mbit/s.

Please keep in mind that there are Python and C API available and their use is strongly recommended. They come with a lot of examples for typical use cases of AMS-DIG-PROC.

PACKETS AND FRAMING

In critical applications, consistency of transmitted data is crucial to guarantee the necessary safety level.

Therefore AMS-DIG-PROC uses Consistent Overhead Byte Stuffing packet framing and CRC32/POSIX checksum on the data-link layer for any communication interface. The format of the packet and message is presented in TABLE 4.

TABLE 4. Packet and message format

COBS packet	Content		Length in bytes
SOP (Start of Packet)	(0×00 to 0xFF, see COBS)		1
Message, COBS encoded	Header	CRC	4
		MessageID	1
	Payload		(Variable)
EOP (End of Packet)	0×00		1

Generally there are no acknowledgments. The module does not sent any direct response to most messages, except MESSAGE_CONFIG_READ, MESSAGE_MODE_READ and MESSAGE_PROCESSING_READ.

STATUS

Status contains all important information about the current state of the AMS-DIG-PROC. It will be sent periodically once per second regarding any configuration option.

TABLE 5. Output message: status

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	120	MESSAGE_STATUS
ResetFlag	1	1 – Reset occurred. 0 – Reset not occurred.	Can be cleared with a MESSAGE_CLEAR_RESET_FLAG message.
ConfigurationUnsaved	1	1 – Configuration changed since last saving. 0 – Configuration unchanged since last saving.	Will be set to 1 after changing any configuration parameter. Will be set to 0 after configuration save or after reboot.
SamplingState	1	0 –Sampling stopped. 1 – Sampling in progress. 2 – Waiting for the trigger.	
ProcessingState	1	0 – Processing idle or disabled. 1 – Processing in progress.	
DataOverflowCounter	4	0 after reboot.	Type: uint32_t. Will be incremented after overflow.
MessagesReceivedCounter	4	0 after reboot.	Type: uint32_t. Will be incremented after receiving each correct message.
DetectorTemperature	4		Type: uint32_t. Units: mK.
TemperatureOK	1	0 – Temperature not reached or not stable. 1 – Temperature is stable and close to expected.	

CLEARING RESET FLAG

Clearing the reset flag in the STATUS message allows the detection of unexpected reboot of the AMS-DIG-PROC.

TABLE 6. Input message: clear reset flag

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	125	MESSAGE_CLEAR_RESET_FLAG

REBOOT

This message forces AMS-DIG-PROC to reboot. The ResetFlag in the STATUS message will be set to 1. Configuration will be read from nonvolatile memory and work mode STOP will be enabled.

TABLE 7. Input message: reboot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	124	MESSAGE_REBOOT

CONFIGURATION

Configuration is a special subset of messages for which transmitted parameters can be saved to nonvolatile memory. Default values for each parameter are bolded.

Communication interfaces

TABLE 8. Input/output message: communication channel and parameters

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	50	MESSAGE_CONFIGURE_COMMUNICATION
UartBaud	4	9600 57600 115200 1000000	Type: uint32_t. Unit: bps.

Sampling and processing resolution

TABLE 9. Input/output message: sampling parameters

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	51	MESSAGE_CONFIGURE_SAMPLING
PhysicalSampleRate	4	700000 to 7000000	Type: uint32_t. Unit: samples per second. Leave default 7000000 in most scenarios.
PhysicalResolution	1	2 - 16 bit	Fixed to 16bits. Leave default.
ProcessingResolution	1	4 - 32 bit	Fixed to 32bits. Leave default.

Temperature of the detector

TABLE 10. Input/output message: temperature of the detector

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	52	MESSAGE_CONFIGURE_DETECTOR_TEMPERATURE
Temperature	2	200-400 or 0 Default: 273	Type: uint16_t. Units: K. Set to zero to disable the temperature controller.

User space

User space is a space which can be freely modified by the host. It can be used for any kind of data, i.e. calibration parameters, UID storage, etc.

TABLE 11. Input/output message: setting user space content

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	53	MESSAGE_CONFIGURE_USER_SPACE
Data	256	-	

Saving configuration

The AMS-DIG-PROC will perform a reboot

after saving the configuration. To be sure that a valid configuration has been stored in nonvolatile memory it is recommended to read configuration after reboot.

TABLE 12. Input message: saving configuration into nonvolatile memory

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	55	MESSAGE_CONFIG_SAVE

Reading configuration

Once the configuration has been set and/or saved, it is recommended to read its content to verify if all parameters were set to desired values. The response for this message will have the same format as presented before.

TABLE 13. Input message: reading configuration

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	56	MESSAGE_CON-FIG_READ
ConfigID	1	MESSAGE_CONFIGU-RE_COMMUNICATION	Defines which configuration will be read.
		MESSAGE_CONFIGU-RE_SAMPLING	
		MESSAGE_CONFIGU-RE_DETECTOR_TEM-PERATURE	
		MESSAGE_CONFIGU-RE_USER_SPACE	

Work modes

The AMS-DIG-PROC can work in different modes of operation, called work modes. Their purpose is to implement typical use cases for infrared measurements, like working with choppers or pulsed laser sources. Unlike configuration, work mode has to be configured after each reset of the AMS-DIG-PROC board. By default the AMS-DIG-PROC board enter STOP mode after each boot.

Work mode: Stop

In this work mode data acquisition and processing are stopped. This is default mode for AMS-DIG-PROC board after booting.

TABLE 14. Entering STOP work mode

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	3	MESSAGE_MODE_ STOP

Work mode: Free running

This is simplest work mode with continuous data acquisition. No synchronization with external signals is available in this mode.

TABLE 15. Input/output message: FREERUNNING work mode

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	5	MESSAGE_MODE_FREE_RUNNING
Number of samples	4	0×00: Infinity Other: number of samples	Number of samples. Has to be multiple of 2048. When set to non-zero value, sampling process will stop and module will enter STOP mode. Keep in mind that this is not necessary the length of data reported in MESSAGE_OUTPUT_DATA message. If Number of samples does not fit into the output buffer (8192 bytes) then data will be splited into multiple messages with output data. The processing pipeline can also reduce the number of samples what also impacts the length of MESSAGE_OUTPUT_ DATA message.

Work mode: Trigger input

This mode is very similar to typical operation of an oscilloscope. The AMS-DIG-PROC waits for rising edge on TRIG_IN/OUT signal. Optional delay after trigger event can be configured. After the delay AMS-DIG-PROC starts sampling data. Sampling process is stopped after acquiring the requested number of samples and the module waits for the next trigger event.

TABLE 16. Input/output message: TRIGGER INPUT work mode

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	6	MESSAGE_MODE_TRIGGER_INPUT
Number of samples	4	>= 2048	Type: uint32_t. Total number of samples to be acquired for a single trigger event. Has to be a multiple of 2048.
Delay	4	0 to 1e7	Type: uint32_t. Unit: microseconds. Set to zero to disable the delay between trigger event and start of ADC sampling.
Edge	1	1 - rising edge	Only rising edge is currently implemented.

Work mode: Trigger output

This mode allows external sources of radiation (like pulsed lasers) to be triggered from the module. In comparison to trigger input, this work mode provides lowest possible jitter and therefore is recommended with fast pulsed sources. Optional delay can be set to introduce time offset between generated trigger event and start of sampling.

TABLE 17. Input/output message: TRIGGER OUTPUT work mode

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	7	MESSAGE_MODE_TRIGGER_OUTPUT
Number of samples	4	>= 1	Type: uint32_t. Total number of samples to be acquired for a single trigger event. Has to be a multiple of 2048.
Delay	4	0 to 1e7	Type: uint32_t. Unit: microseconds. Time between start of ADC sampling and trigger event. Set to zero to start ADC together with generated trigger event.
Period	4	0 to 1e7	Type: uint32_t. Unit: microseconds. Actual period can be higher than set due to configuration of processing.
Edge	1	1 - rising edge	Only rising edge is currently implemented.

Work mode: Simulation

This mode is useful for testing purposes. Instead of sampled data simulated values will be sent to processing pipeline periodically. Addition of random can be activated to verify if processing was properly configured.

TABLE 18. Input/output message: SIMULATION work mode

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	8	MESSAGE_MODE_SIMULATION
SamplesCount	4	2048	Type: uint32_t. Total number of samples that will be sent to processing pipeline. Currently fixed to 2048 samples.
SampleSize	1	2 : 16 bit	SampleSize is fixed to 16bit.
NoiseRMS	4	0 – 65535	Type: float32. Gaussian white noise with this RMS value will be added to samples. Set to zero to disable addition of noise.
Period	4	>0	Type: uint32_t. Unit: ms. Time interval between sending simulated samples to processing pipeline.
Samples	N		Type: uint16_t[N]. Samples will be used instead of ADC samples. Single buffer. N*2 should match SamplesCount value.

Reading current work mode settings

Once work mode has been set it is recommended to read its settings to verify if all parameters were set correctly. The response for this message will be one of described above messages: MESSAGE_MODE_STOP, MESSAGE_MODE_FREE_RUNNING, MESSAGE_MODE_TRIGGER_INPUT, MESSAGE_MODE_TRIGGER_OUTPUT, MESSAGE_MODE_SIMULATION.

TABLE 19. Input message: reading work mode settings

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	100	MESSAGE_MODE_READ

PROCESSING ALGORITHMS

Processing algorithms can be configured

and assigned to each processing slot individually. Several algorithms are available, however not every combination of them makes sense. Therefore example configurations will be presented at the end of this chapter. Processing can be reconfigured only in STOP work mode.

No processing

This is the default "algorithm" assigned to each processing slot after power-up. All data are passed through processing slot without any modification. Output buffer length and sample size are equal to the input buffer length and sample size.

TABLE 20. Input/output message: No processing for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	9	MESSAGE_PROCESSING_NONE
SlotID	1	0 to 3	

Simple average

All samples from the input buffer are averaged and passed as single value to the output buffer. Output buffer length is equal to 1. Output sample size: 32bits.

TABLE 21. Input/output message: simple average for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	10	MESSAGE_PROCESSING_SIMPLE_AVERAGE
SlotID	1	0 to 3	

Sample-wise iir filter

Average is averaged using infinite impulse response filter according to the following formula:

$$X = X_{previous} * weight + X_{new} * (1 - weight)$$

Output buffer length: 1.
Output sample size: 32bits.

TABLE 22. Input/output message: sample-wise IIR filter for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	11	MESSAGE_PROCESSING_SAMPLE_IIR
SlotID	1	0 to 3	
Weight	4	0.0 to 1.0	Type: float32.

Buffer-wise iir filter

Every n-th sample of the input buffer is averaged with n-th sample from the previous result. This algorithm is especially useful in triggered work modes. This kind of processing reduces noise while keeping the original shape of the detected pulse. Output buffer length: length of the input buffer. Output sample size: 32bits.

TABLE 23. Input/output message: buffer-wise IIR filter for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	12	MESSAGE_PROCESSING_BUFFER_IIR
SlotID	1	0 to 3	
Weight	4	0.0 to 1.0	Type: float32.

Oversampling

Averages N consecutive samples in the input buffer. Reduces output data rate in a configurable way. Output buffer length: value of **OutputSamples** parameter. CAUTION: **Ratio * OutputSamples** has to be a multiple of input buffer length. Output buffer length: variable. Output sample size: 32bits.

TABLE 24. Input/output message: oversampling for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	13	MESSAGE_PROCESSING_OVER-SAMPLING
SlotID	1	0 to 3	
Ratio (N)	4	2 to 8388608	Type: uint32_t. **Ratio * OutputSamples** has to be multiple of input buffer length.
OutputSam-ples	4	1 to 2048	Type: uint32_t. **Ratio * OutputSamples** has to be multiple of input buffer length.

Peak-peak measurement

Extracts peak-peak value from the input buffer. Output buffer length: 1. Output sample size: input buffer sample size.

TABLE 25. Input/output message: peak-peak measurement for a processing slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	14	MESSAGE_PROCESSING_PEAK_PEAK
SlotID	1	0 to 3	

Buffer-wise decimation

Drops whole buffers. Passes only N-th buffer from input to output. Output buffer length: length of the input buffer or zero for dropped buffers. Output sample size: Input buffer sample size. This type of processing may be useful e.g. in case of buffer-wise filter. Usually not every buffer need to be transmitted since the content of each buffer changes slowly. Usually not all buffers may be sent due to limits of communication channels. Buffer-wise decimation allows proper handling of Counter field in output data message.

TABLE 26. Input/output message: buffer-wise decimation of data

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	15	MESSAGE_PROCESSING_BUF-FER_DECIMATION
SlotID	1	0 to 3	
Ratio (N)	4	>= 2	Type: uint32_t. For example: 4 means that every 4th buffer will be sent to the output.

Reading processing configuration

Once processing configuration has been set, it is recommended to read current configuration to verify if all parameters have correct values. The response will have the same format as request of specific processing configuration presented before.

TABLE 27. Input message: reading configuration for a slot

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	105	MESSAGE_PROCESSING_READ
SlotID	1	0 to 3	

OUTPUT DATA

Once properly configured (e.g. work mode is set to freerunning) the AMS-DIG-PROC will send periodically output data. Length of data is variable and depends on the current configuration of the processing pipeline. On the receiver side length can be extracted utilizing features of COBS encoding.

TABLE 28. Output message: output data sent by AMS-DIG-PROC

Field	Length in bytes	Values	Description or constant name
CRC	4	-	
MessageID	1	90	MESSAGE_OUTPUT_DATA

Field	Length in bytes	Values	Description or constant name
Counter	1		Will be incremented for each output data message. Can be used to check for data loss due to communication errors or processing overflow. In case of buffer decimation in processing pipeline it will be incremented by ratio of decimation.
SampleSize	1	1 – 8bit 2 – 16bit 4 – 32bit	Sample size depends on processing pipeline configuration.
Data	1 to 8192	0-255 or 0-65535 or 0- 4294967295	Type: uint8_t, uint16_t or uint32_t, depending on SampleSize. Each data sample has offset equal to half of the range. For example for 8bit SampleSize value 128 should be interpreted as zero. Higher values correspond to positive values while lower are negative. The length of Data will be between 1 and 2048, depending on the configuration of processing pipeline.

Conversion from raw samples to voltages for i-th sample can be done using the following generic formula:

voltage = (data8(i) * 2.0 / 255 - 1) * 3.3 // For 8-bit samples

voltage = (data16(i) * 2.0 / 65535 - 1) * 3.3 // For 16-bit samples

voltage = (data32(i) * 2.0 / 4294967295- 1) * 3.3 // For 16-bit samples

where data8, data16 and data32 are elements from Data casted to a proper type depending on SampleSize.

Examples

1. Continuous temperature measurement couple times a second

a. Workmode: freerunning
b. Processing slot 0: oversampling (Ratio=4096, OutputSamples=2048)
c. Processing slot 1: oversampling (Ratio=512, OutputSamples=1)

2. Pulsed laser source. Duration of single pulse: 1ms. Rise and fall time: 0.1 ms.

a. Workmode: trigger input or output
b. Processing slot 0: oversampling (Ratio=8, OutputSamples=2048)
c. Processing slot 1: buffer-wise iir filter (weight=0.95)

3. Black body with chopper. Frequency: 1 kHz. Peak-peak measurement
a. Workmode: trigger input
b. Processing slot 0: oversampling (Ratio=8, OutputSamples=2048)
c. Processing slot 1: peak-peak

For more examples please refer to API documentation.

MECHANICAL REQUIREMENTS

There are four spacers mounted on the PCB to keep the proper distance between the AMS module (or amplifier) and AMS DIG PROC.

Warning! The P1 and P2 sockets are very sensitive to mechanical stress. The AMS DIG-PROC has to be fixed to the AMS detection module with screws and nuts. Caution is required when assembling the AMS-DIG-PROC with the AMS module.

MECHANICAL LAYOUT

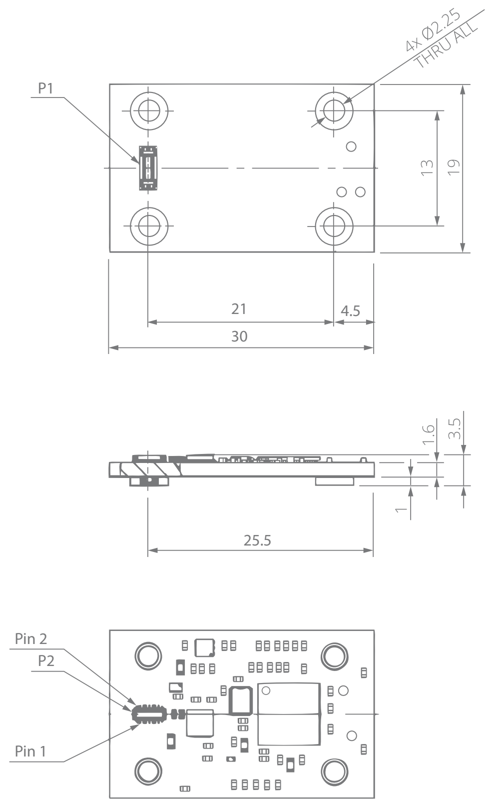
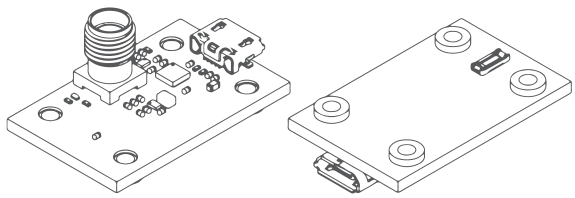


FIGURE 4. Dimensions of the AMS-DIG-PROC (given in mm)

AMS-DIG-USB



USB addon for the AMS-DIG-PROC board

FEATURES

- Compatible with the AMS-DIG-PROC board (p. 167)
- Communication over the standard USB interface
- Power supply for AMS-DIG-PROC and AMS series modules with accessories
- Up to 1 Mbit/s transfer rate
- Trigger output and input on the SMA socket
- Designed for easy integration with the AMS detection module series and AMS accessories
- Virtual COM port

APPLICATIONS

- Rapid prototyping
- PC-based measurements in the lab
- Temperature and gas sensors
- Embedded systems

GENERAL DESCRIPTION

The AMS-DIG-USB is a USB adapter for the AMS-DIG-PROC board. It is designed to be an easy tool for rapid prototyping and proof-of-concept work. It provides communication and power supply over a single USB connector. A virtual serial port (COM port) makes it easy to integrate with PC-based measurement software. From a communication point of view, AMS-DIG-USB is transparent. For details about communication protocol please refer to the AMS-DIG-PROC documentation. SMA connector can work as trigger input as well as output, which enables synchronization with external signals.

CONNECTIVITY

Just two connectors are available for the user: USB for communication and SMA for external trigger. A generic electrical diagram is presented in FIGURE 1. A detailed schematic is available on request. Please contact our tech support team for more details.

ELECTRICAL DIAGRAM

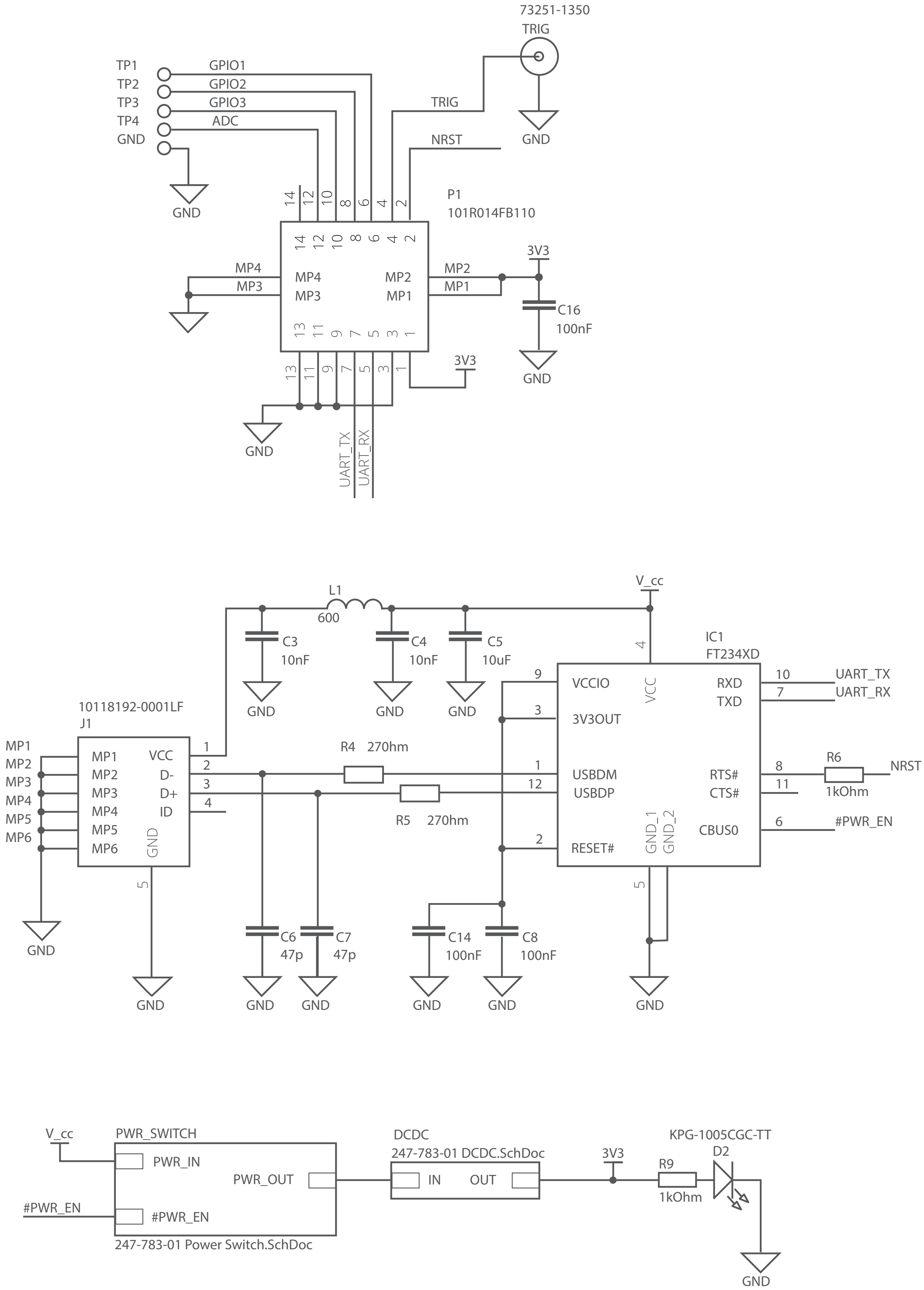


FIGURE 1. Schematic diagram of the AMS-DIG-USB

SPECIFICATION (+3.3 V supply, T_{amb} = 20°C, unless otherwise noted.)

TABLE 2. AMS-DIG-USB specification

Parameter	Test conditions/ remarks	Value			Unit
		Min.	Typ.	Max.	
ANALOG					
V_{cc} current	Without additional boards		10		mA
V_{cc} current	With AMS3140 module (maximum cooling performance) + AMS-EXT-AMP + AMS-DIG-PROC		500		mA
DIGITAL					
Maximum baudrate				1	Mbit/s

For optimal noise performance, external amplifiers from AMS accessories are strongly recommended.

MECHANICAL REQUIREMENTS

There are four spacers mounted on the PCB to keep the proper distance between the AMS-DIG-USB and underlying boards.

Warning! The P1 socket is very sensitive to mechanical stress. The AMS DIG-USB has to be fixed to the AMS-DIG-PROC board with screws and nuts. Caution is required when assembling the AMS-DIG-USB with the underlying boards.

ABSOLUTE MAXIMUM RATINGS

Do not stress the device above the limits specified in this chapter since it may cause permanent damage to the device.

TABLE 1. Absolute maximum ratings

Parameter	Rating
TRIG_IN voltage	0 V to 3.3 V
Ambient operating temperature, T_{amb}	-40°C to 65°C, non-condensing
Storage temperature, T_{stg}	-50°C to 85°C

MECHANICAL LAYOUT

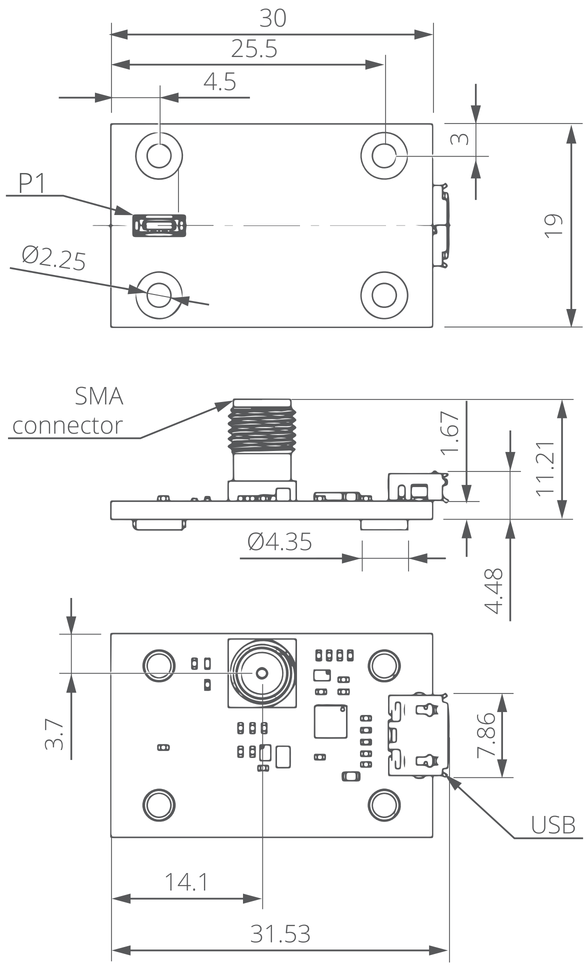


FIGURE 2. Dimensions of the AMS-DIG-USB (given in mm)

TECHNICAL INFORMATION

Glossary

INFRARED DETECTORS

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

PHOTOCONDUCTIVE DETECTORS: PC

Photoconductive detectors are based on the photoconductive effect. Infrared radiation generates charge carriers in the semiconductor's 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:

$$E=V_b/L$$

The optimum bias voltage is specified in the Final test report (supplied with each VIGO device) and depends on the detector size, active element 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, and differential resistance, improve high-frequency performance and increase the dynamic range.

Photovoltaic detectors are more vulnerable to electrostatic discharges than photoconductors.

PHOTOELECTROMAGNETIC DETECTORS: PEM

Photoelectromagnetic detectors are based on the photoelectromagnetic effect based on the 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 $Hg_{1-x}Cd_xTe$

Mercury Cadmium Telluride (MCT) is a variable band gap alloy, commonly used for the fabrication of photodetectors with tunable spectral response.

Mercury Cadmium Telluride (MCT) is a chemical compound of cadmium telluride (CdTe) and mercury telluride (HgTe) with a tunable bandgap from the shortwave infrared to the very long-wave infrared regions. The amount of cadmium (Cd) in the alloy can be chosen so as to tune the optical absorption of the material to the desired infrared wavelength.

ACTIVE ELEMENT MATERIAL $InAs_{1-x}Sb_x$

Indium Arsenide Antimonide is a variable band gap compound semiconductor material that belongs to the III-V group of semiconductors, which includes elements from columns III and V of the periodic table. InAsSb is a ternary alloy formed by combining indium (In), arsenic (As), and antimony (Sb). The specific composition can vary, and different ratios of these elements can be used to tailor the material's properties for specific applications.

ACTIVE ELEMENT MATERIAL InGaAs

Indium gallium arsenide is a ternary alloy (chemical compound) of indium arsenide (InAs) and gallium arsenide (GaAs). Indium and gallium are group III elements of the periodic table while arsenic is a group V element. Alloys made of these chemical groups are referred to as "III-V" compounds. InGaAs has properties intermediate between those of GaAs and InAs. InGaAs is a room-temperature semiconductor. The principal importance of GaInAs is it's application as high-speed, high-sensitivity photodetectors.

ACTIVE AREA, A, mm×mm

The physical area of a photosensitive element; it's the active region that converts incoming optical radiation into an electric output signal.

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

In photoconductors, L is the distance between the contacts.

OPTICAL AREA, A_O, mm×mm

The apparent optical area of the detector that is "seen". It is equal to the physical area of the detector's 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 (see chapter Optical immersion).

$$A_O = W_O(\text{optical width})\times L_O(\text{optical length})$$

CUT-ON WAVELENGTH, $\lambda_{cut\text{-}on}$ (10%), µm

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

PEAK WAVELENGTH λ_{peak}, µm

The wavelength of the detector's maximum responsivity.

SPECIFIC WAVELENGTH, λ_{spec}, µm

The wavelength for which the parameters (detectivity and responsivity) in the datasheets are given.

CUT-OFF WAVELENGTH, $\lambda_{cut\text{-}off}$ (10%), µm

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

NORMALIZED DETECTIVITY, D*, cm·Hz$^{1/2}$/W

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

NOISE EQUIVALENT POWER, NEP, nW/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}, A

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.

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

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 stronger radiation.

TIME CONSTANT, τ, ns

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

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

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

$$t_r = 2.2 \cdot \tau$$

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 the white noise (e.g. the Johnson or shot noise), the flicker noise dominates at $f<f_c$.

ACTIVE ELEMENT TEMPERATURE, T_{chip}, K

The detector active element temperature.

ACCEPTANCE ANGLE, Φ, deg.

The 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, the acceptance angle and Field of View (FOV) are identical.

INFRARED DETECTION MODULES

The detection module integrates a 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, it 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_0, Hz

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

TRANSIMPEDANCE, K_i, V/A

Current to voltage conversion ratio:

$$K_i=V_{out}/I_{in}$$

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

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

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_{amb}, °C

Ambient temperature during test measurements.

THERMOELECTRIC COOLERS AND THERMOELECTRIC COOLER CONTROLLERS

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

Time that is taken by the cooling system to reach the appropriate temperature of the detector active element.

MAXIMUM TEC OUTPUT CURRENT, $I_{TEC\ max}$, A

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}, V_{DC}

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 the resistance of the supply cable. It depends on the cable length.

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 reports and datasheets (delivered with every device). Be careful using ohmmeters for photovoltaic detectors! Standard ohmmeters may overbias and damage the detector. This is especially true for small physical area or SWIR photovoltaic detectors. A 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 may reduce the performance of the 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 safe and reliable operation of the detector:

- store in dark place, 10% to 90% humidity and -20°C to 50°C temperature,
- avoid exposure to 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.

HANDLING

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

CLEANING THE 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.

MECHANICAL INSTALLATION

The maximum tightening torque of the TO8 detector header fixing screw is 0.3 Nm.

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, below 5 s.

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/cm^2.The irradiance of a pulse shorter than 1 µs must not exceed 1 MW/cm^2.
- 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/cm^2. The irradiance of the pulse shorter than 1 µs must not exceed 10 kW/cm^2.
- 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:

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

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

Optical immersion technology

DESCRIPTION

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 a monolithic integration of detector active element with hyperhemispherical microlens (default). It makes the optical linear size of the detector's active area ~11 times larger compared to its physical size. This results in an improvement of the detectivity D* by one order of magnitude. Also, the detector's 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 ~36 deg. – the microlens naturally shields background radiation which is one of the factors of noise. 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 – see the chapter Precautions for use.

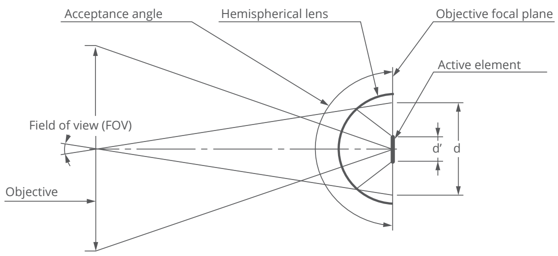
OPTICALLY IMMERSED DETECTOR PARAMETERS

Parameter	Microlens shape			
	Hemisphere		Hyperhemisphere	
	Theory	GaAs	Theory	GaAs
L	R	R	R·(n+1)	4.3·R
d/d′	n	3.3	n^2	10.9
$D^*_{imm}/D^*_{non\text{-}imm}$	n	3.3	n^2	10.9
Acceptance angle, Φ, deg.	~180	~180	2·arcsin(1/n)	~36

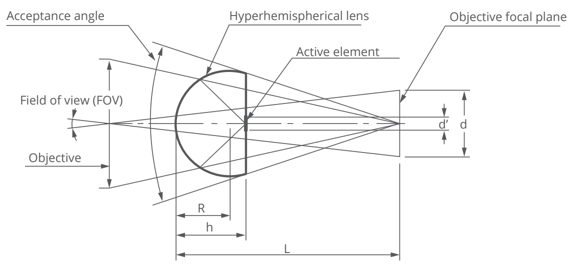
n = 3.3 refractive index of GaAs (the microlens material)
R – microlens radius
L – lens face to the objective focal plane distance
d – optical (apparent) detector size
d′ – physical detector size
h = R + R/n, microlens thickness

FUNCTION AND PROPERTIES OF THE IMMERSION MICROLENS

Hemispherical



Hyperhemispherical



Preamplifiers for infrared detectors

DESCRIPTION

Preamplifiers are used to amplify weak signals from low noise detectors and provide optimal conditions for detector operation. Preamplifiers protect detectors against overbias and make the detector/preamplifier system immune to electromagnetic interference.

VIGO offers a variety of transimpedance preamplifiers, AC and DC coupled, with narrow and wide bandwidths, dedicated for integration with detectors in common packages. The transimpedance preamplifiers are preferable in most applications due to inherent linearity and good frequency response.

TRANSIMPEDANCE PREAMPLIFIERS

The current readout of infrared detectors is typically achieved in transimpedance (TI) preamplifiers. An important advantage of the TI-amp is the ability to maintain the detector at a constant bias voltage, equal to the voltage applied to the non-inverting input of the op-amp.

A simple description of the detector/TI preamplifier system is presented in Figure 1.

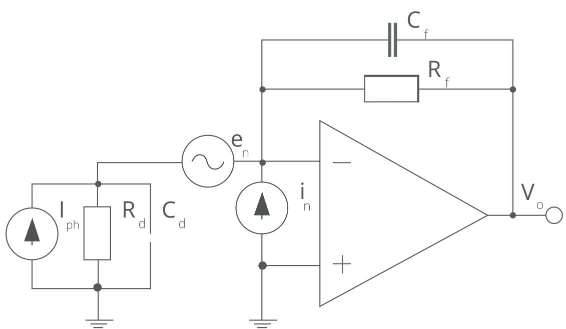


Figure 1. Transimpedance circuit for infrared detector

The detector is modeled by a photocurrent source I_{ph}, shunt resistance R_d and capacitance C_d. The photocurrent is proportional to the input optical power P and detector current responsivity R_i.

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

A transimpedance preamplifier is an operational amplifier with feedback resistance R_f. Feedback capacitance C_f is used to set system bandwidth and eliminate gain peaking at high frequencies.

The output voltage of the transimpedance preamplifier is:

$$V_0=Z_f\cdot I_{ph}$$

The transimpedance gain Z_f can be approximated by one-pole filter characteristics:

$$Z_f=R_f/(1+2\cdot\pi\cdot f)^2\cdot C_f^{\,2}\cdot R_f^{\,2})^{1/2}$$

with cut-off frequency:

$$f_\infty=1/(2\pi f\cdot C_f\cdot R_f)$$

It should be noted that the cut-off frequency is typically greater compared with the voltage preamplifier when bandwidth is limited by the detector $R_d\cdot C_d$ time constant. For frequencies less than the 3dB cut-off frequency f_∞, transimpedance is equal to the R_f. In consequence, the circuit converts linearly optical input power P into output voltage:

$$V_0=R_i\cdot R_f\cdot P$$

with resulting voltage responsivity $R_v=R_i\cdot R_f$ independent of frequency, detector resistance and capacitance.

Unfortunately, the above considerations are limited to the maximal frequencies dependent on detector capacitance and resistance, op-amp gain-bandwidth product and other factors.

NOISE

As follows from the transimpedance circuit (Figure 1) the preamplifier noise current can be approximated as:

$$i_{PA}^{\,2}=4KT/R_f+i_n^{\,2}+e_n^{\,2}/Z_d^{\,2}$$

Where i_n and e_n are the op amp open input noise current and short input noise voltage, respectively. Z_d is the detector impedance:

$$Z_d=R_d/(1+2\cdot\pi\cdot f)^2\cdot C_d^{\,2}\cdot R_d^{\,2})^{1/2}$$

At low frequencies, preamplifier noise (frequently called „floor noise level") is not dependent on frequency:

$$i_{PA}^2=4KT/R_f+i_n^2+e_n^2/R_d^2$$

At high frequencies the noise current increases due to decreasing detector impedance:

$$i_{PA}=2\pi f\cdot C_d\cdot e_n$$

Incorrect frequency compensation of transimpedance amplifier may cause a remarkable increase in the noise level near the top cut-off frequency, as shown in Figure 2.

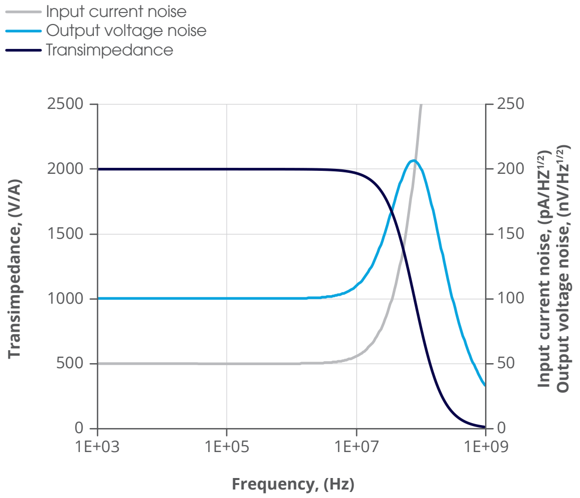


FIGURE 2. Output noise density and frequency response of the transimpedance amplifier

HOW PREAMPLIFIER AFFECT SYSTEM PERFORMANCE

The total input current noise of a detection module is:

$$i_n^2=i_{PA}^2+i_d^2$$

This results in degradation of the overall detectivity of the detector/preamplifier system by i_n/i_d factor.

The degradation may be significant for low impedance detectors having low resistance <50 Ω or, at high frequencies, having large capacitance.

The design of preamplifiers is dependent on required bandwidth, gain, detector resistance, capacitance and other factors. The crucial step is the selection of suitable op-amps or discrete transistors. Bipolar op-amps are characterized by large i_n (~2 pA/Hz$^{1/2}$) and low e_n (~1 nV/Hz$^{1/2}$), in contrast to FET-based preamplifiers where i_n (~1 fA/Hz$^{1/2}$) is low and e_n (~5 nV/Hz$^{1/2}$) is high. Therefore, the low e_n-bipolar op-amps suit well to low Z_d detectors (which means low resistance, high capacitance and high frequencies). FET-based op-amps are useful for high Z_d detectors operating at low frequencies.

Thermoelectric cooling, heat sinking

THERMOELECTRIC COOLING

Cooling of infrared detectors reduces noises, increases responsivity, and shifts the cut-off wavelength $\lambda_{cut\text{-}off}$:

- toward longer wavelengths – in HgCdTe detectors,
- toward shorter wavelengths – in InAs and 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.

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.

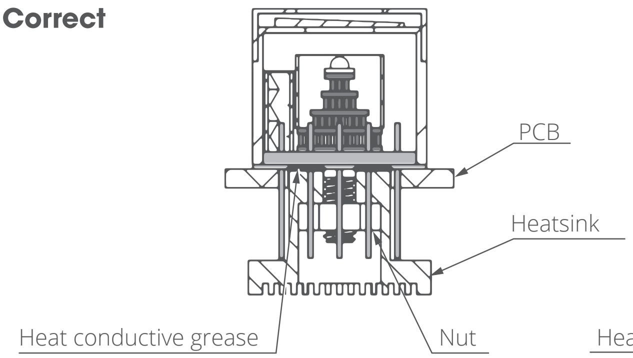
A heatsink thermal resistance of ~2 K/W is typically recommended for 1TE, 2TE and 3TE coolers. For a 4TE cooler, a heatsink thermal resistance of ~1 K/W is recommended.

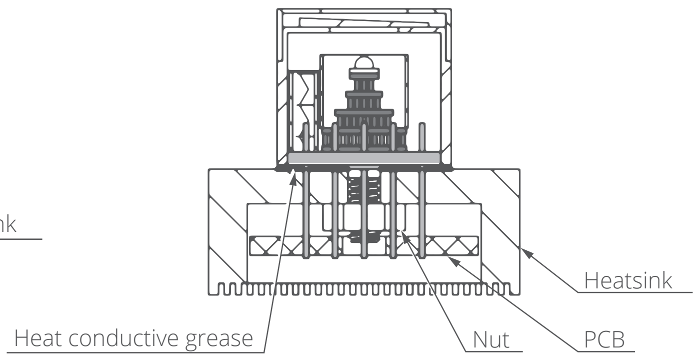
THERMOELECTRIC COOLERS PARAMETERS

Parameter	Stage of thermoelectric cooling				Unit
	1TE	2TE	3TE	4TE	
Active element temperature, T_{chip}	~253	~230	~210	~197	K
Maximum TEC voltage, $V_{TEC\ max}$	0.4	1.3	3.6	8.3	V
Maximum TEC current, $I_{TEC\ max}$	1.67	1.2	0.45	0.4	A

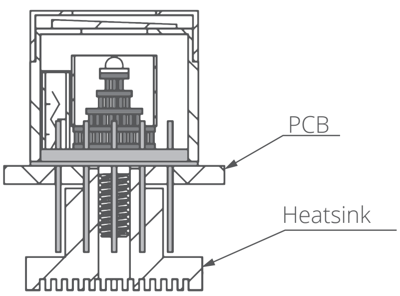
HEATSINK PLACEMENT

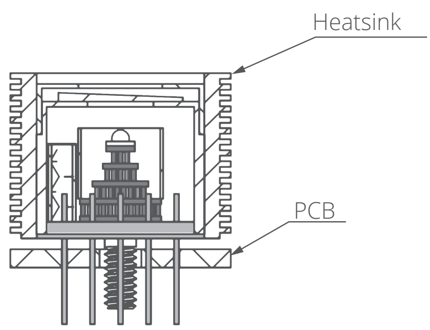
Correct





Incorrect

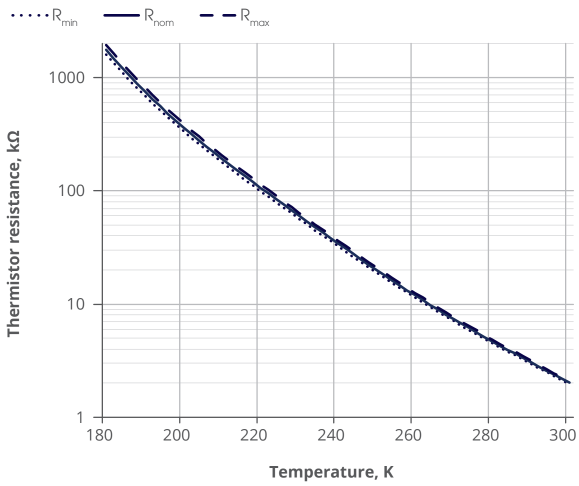




Temperature sensor characteristics

THERMISTOR

Thermoelectrically cooled detectors are equipped with a 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 thermistor. For the measurement of resistance, the power should not exceed 1 mW.



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

Infrared windows and filters

INFRARED WINDOWS

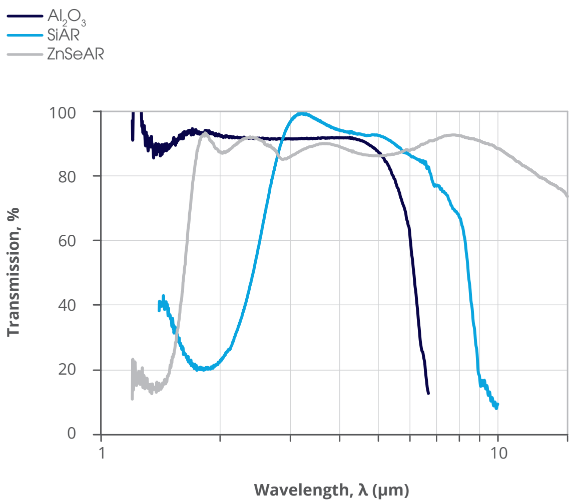
The following types of windows are a VIGO standard:

- 3 deg. wedged sapphire (wAl_2O_3)
- 3 deg. wedged zinc selenide anti-reflection coated (wZnSeAR)
- planar silicon anti-reflection coated (pSiAR)

3 deg. wedged window prevents unwanted interference effects (fringing).

Symbol	Material	Hardness, kg/mm²	Wedging	Anti-re-flection coating
wAl_2O_3	sapphire	1370	3°	no
wZnSeAR	zinc selenide	120	3°	yes
pSiAR	silicon	1150	no	yes

Spectral transmission of VIGO IR windows (typ.)



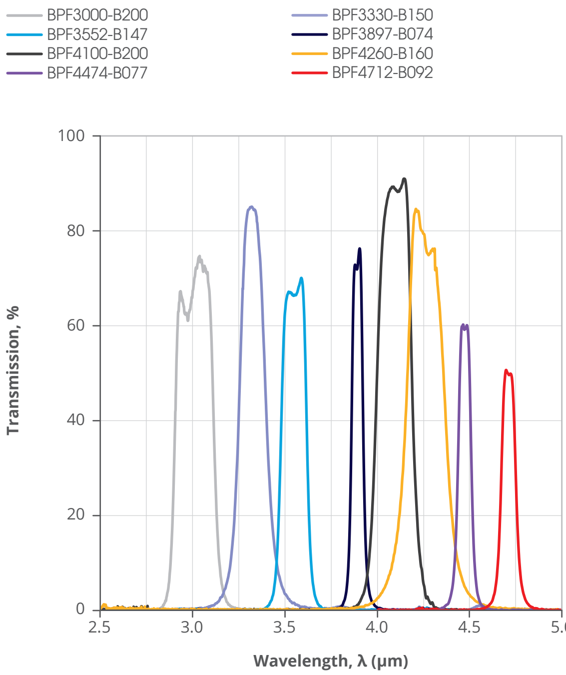
INFRARED FILTERS

Some VIGO detectors can be provided with infrared filters. Bandpass filters are used to transmit only a narrow band of wavelengths, blocking out unwanted infrared radiation. This helps detectors focus on a particular spectral region of interest.

The choice of filter depends on the goals and requirements of the particular infrared sensing application. The following types of filters can be provided upon request:

Symbol	Filter centre wavelength, λ_{cwl}, nm	Hardness, kg/mm²
BPF3000-B200	3000±50	200±30
BPF3330-B150	3330±50	150±30
BPF3552-B147	3552±50	147±30
BPF3897-B074	3897±60	74±20
BPF4100-B200	4100±50	200±30
BPF4260-B160	4260±50	160±30
BPF4474-B077	4474±50	77±20
BPF4712-B092	4712±50	92±20

Spectral transmission of VIGO IR filters (typ.)



Detector packages

PACKAGES FOR UNCOOLED DETECTORS

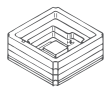
Photoconductive (PC) and photovoltaic (PV, PVM) uncooled detectors are provided in the TO39 (3 pins) package (with or without the window) and in SMD package (with or without wthe window).

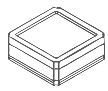
The photoelectromagnetic (PEM) detector is provided in the specialized PEM-SMA packages. Due to the magnetic circuit incorporated into the package, the window is mounted to protect the detector against external pollution.

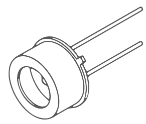
The quadrant (PVMQ) detector is provided in the TO8 package without the window.

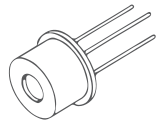
PACKAGES FOR TE COOLED DETECTORS

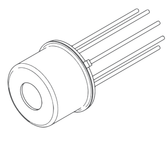
Thermoelectrically cooled detectors are mounted in metal packages: TO39 (8 pins), TO8 and TO66 sealed with the infrared windows. They are filled with dry, heavy, noble gases (Krypton and Xenon mixture) of low thermal conductivity. Water vapour condensation is prevented by a humidity absorber (container mounted inside the package) and careful polymer sealing. For low-temperature fluctuation, anti-convection shields are also mounted.

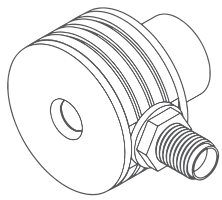

SMD (without window)

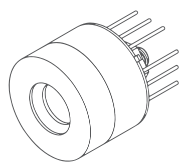

SMD (with window)

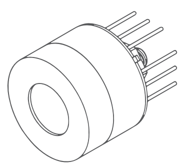

TO39 (3 pins, without window)

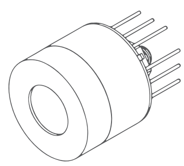

TO39 (3 pins, with window)

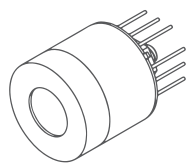

1TE-TO39 (8 pins)

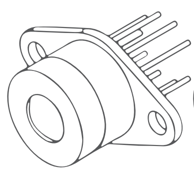

PEM-SMA

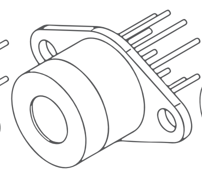

TO8 (quadrant)

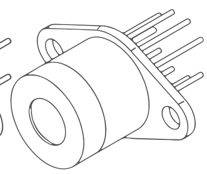

2TE-TO8

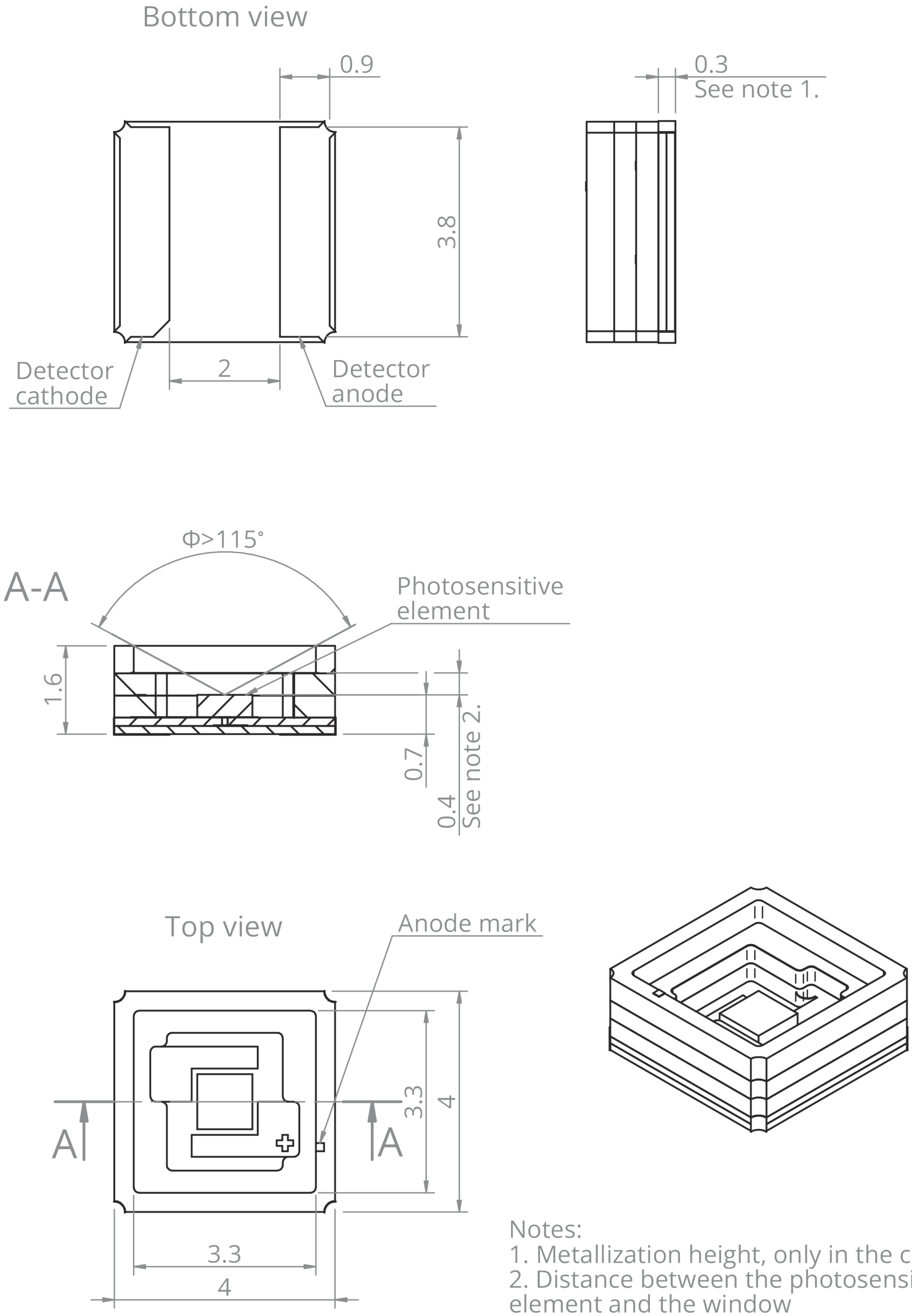

3TE-TO8


4TE-TO8


2TE-TO66


3TE-TO66

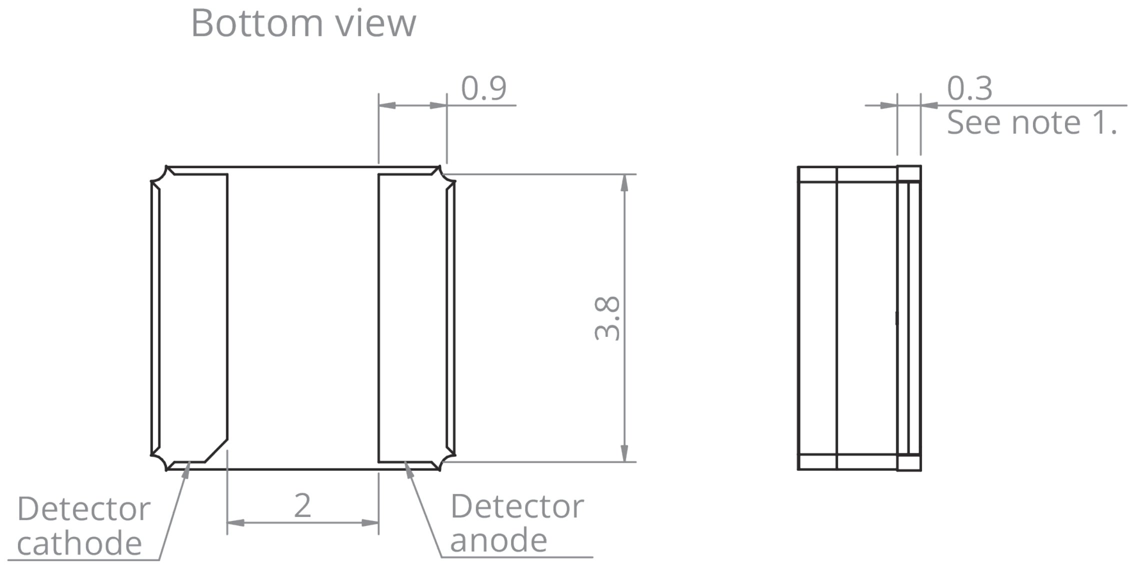

4TE-TO66

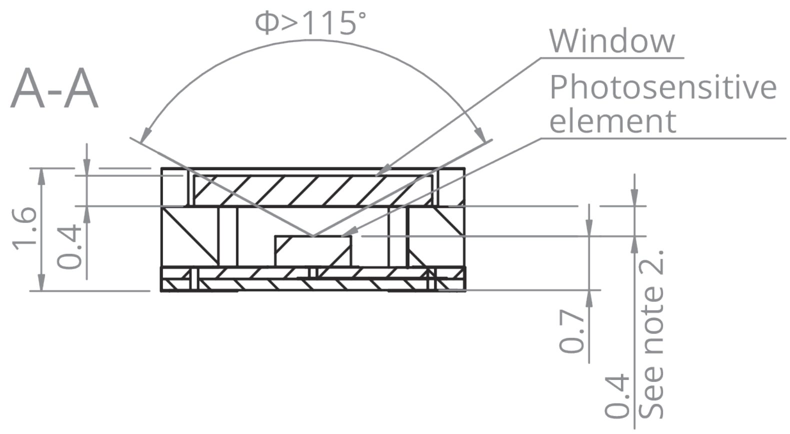


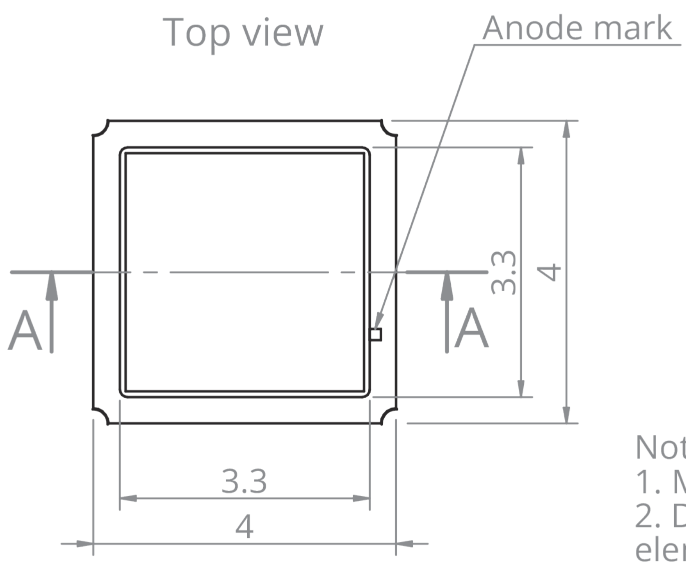
Notes:
1. Metallization height, only in the corners
2. Distance between the photosensitive element and the window

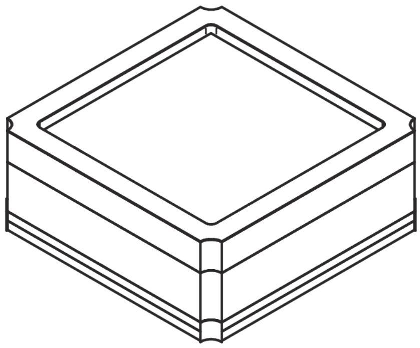
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 10:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

Drawing No.	Rev.	Title
ZTM-SMD-Z171.14	1	Detector SMD - no immersion v2









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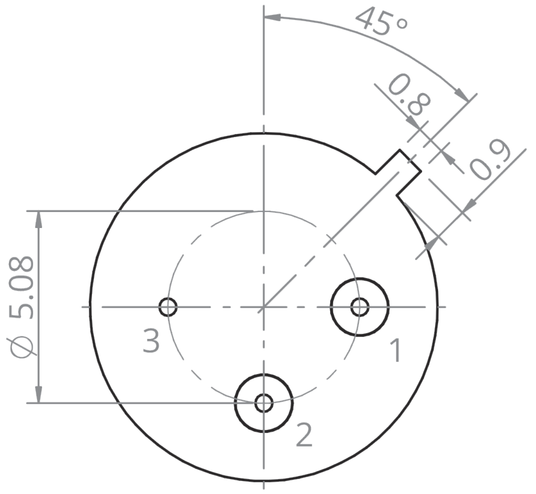
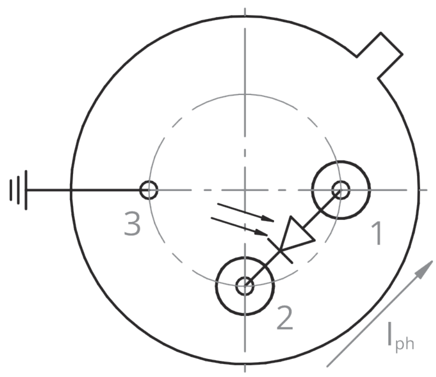
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 10:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

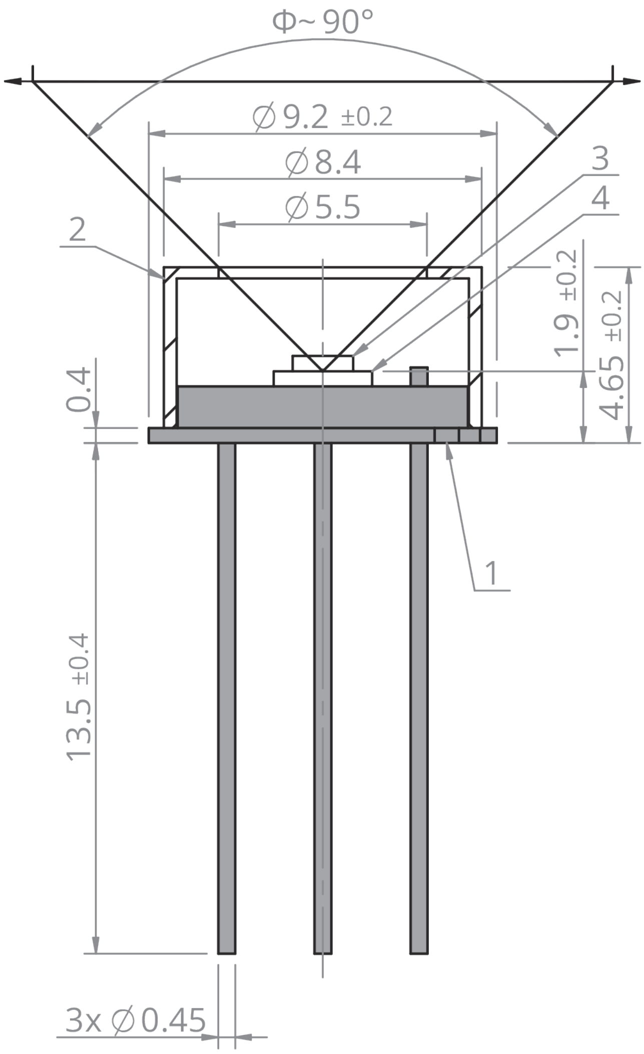
Drawing No.	Rev.	Title
ZTM-SMD-Z171.1	2	Detector SMD - no immersion

Bottom view

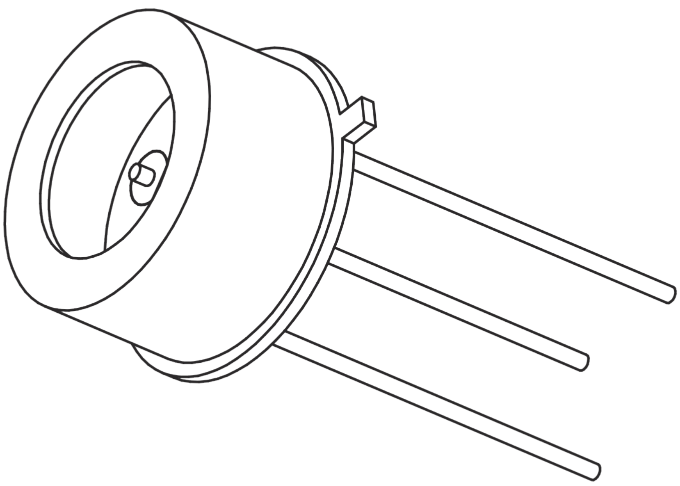


Bottom view
Photovoltaic





Pinout	
Pin No.	Connection
1	Detector anode
2	Detector cathode
3	Chassis ground

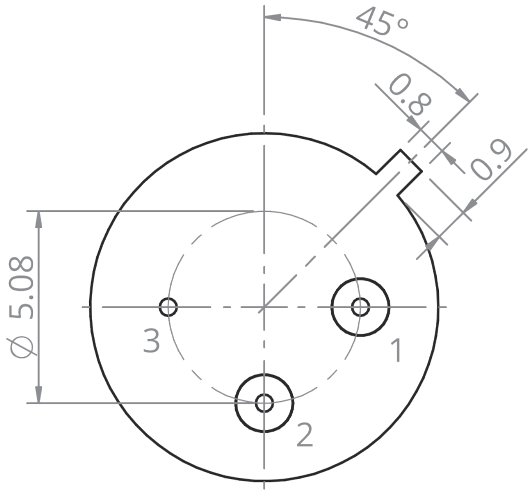


No.	Name	Material
4	Detector carrier	Sapphire/Silicon
3	Detector	HgCdTe/InAs/InAsSb/GaAs
2	Detector cap	Brass
1	TO39 header	Gold plated Kovar

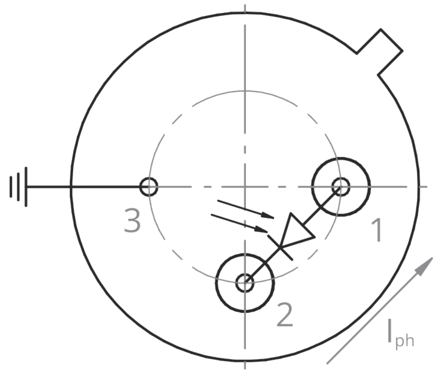
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

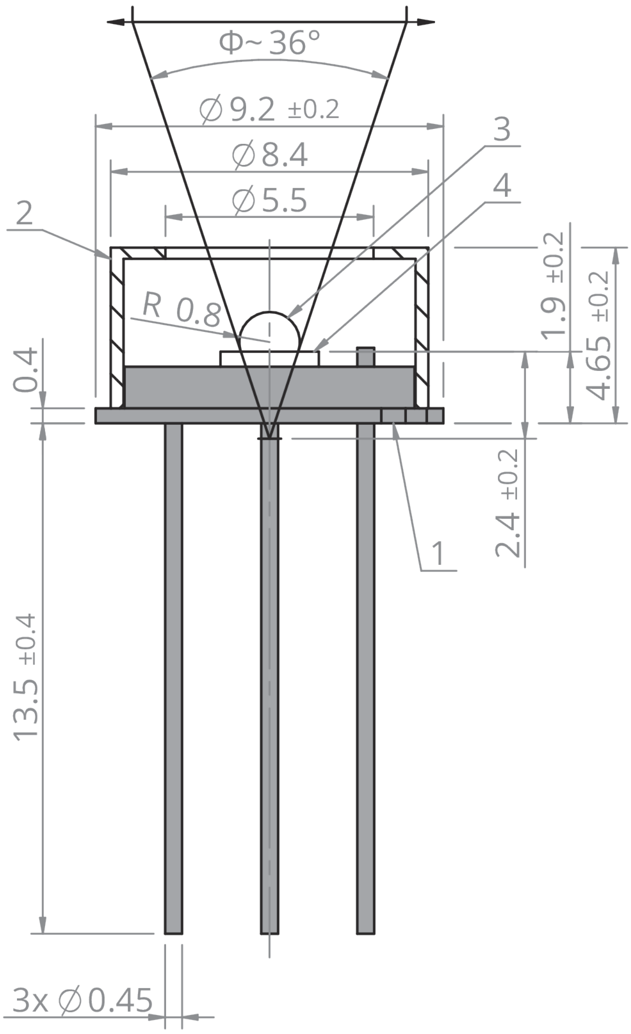
Drawing No.	Rev.	Title
ZTM-TO39-Z002	7	Detector TO39 - no immersion

Bottom view

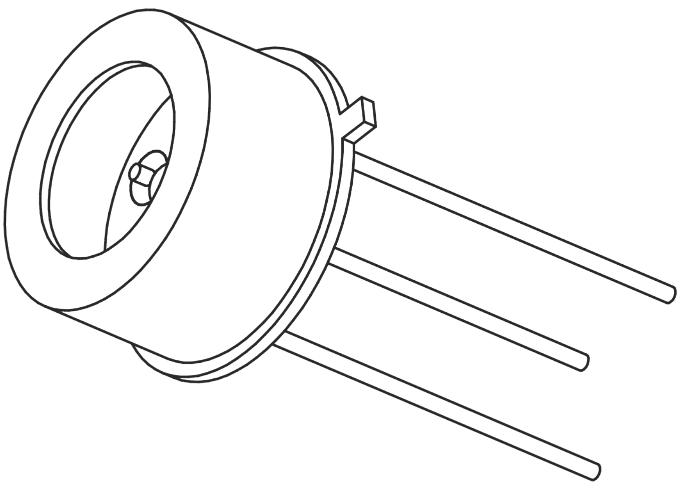


Bottom view
Photovoltaic





Pinout	
Pin No.	Connection
1	Detector anode
2	Detector cathode
3	Chassis ground

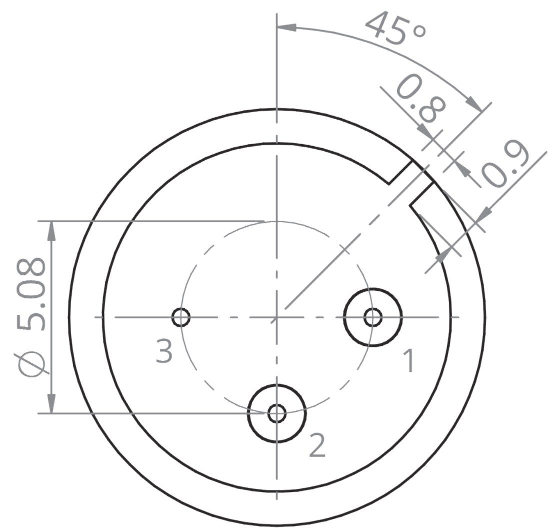


No.	Name	Material
4	Detector carrier	Sapphire/Silicon
3	Detector	HgCdTe/InAs/InAsSb/GaAs
2	Detector cap	Brass
1	TO39 header	Gold plated Kovar

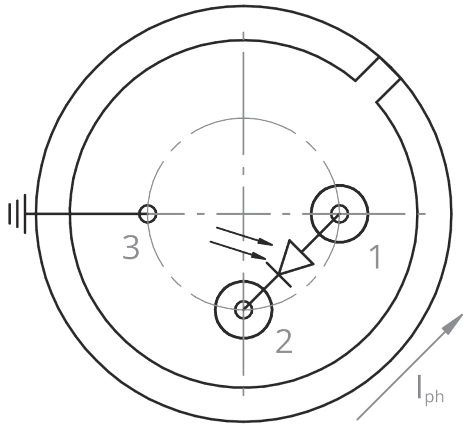
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

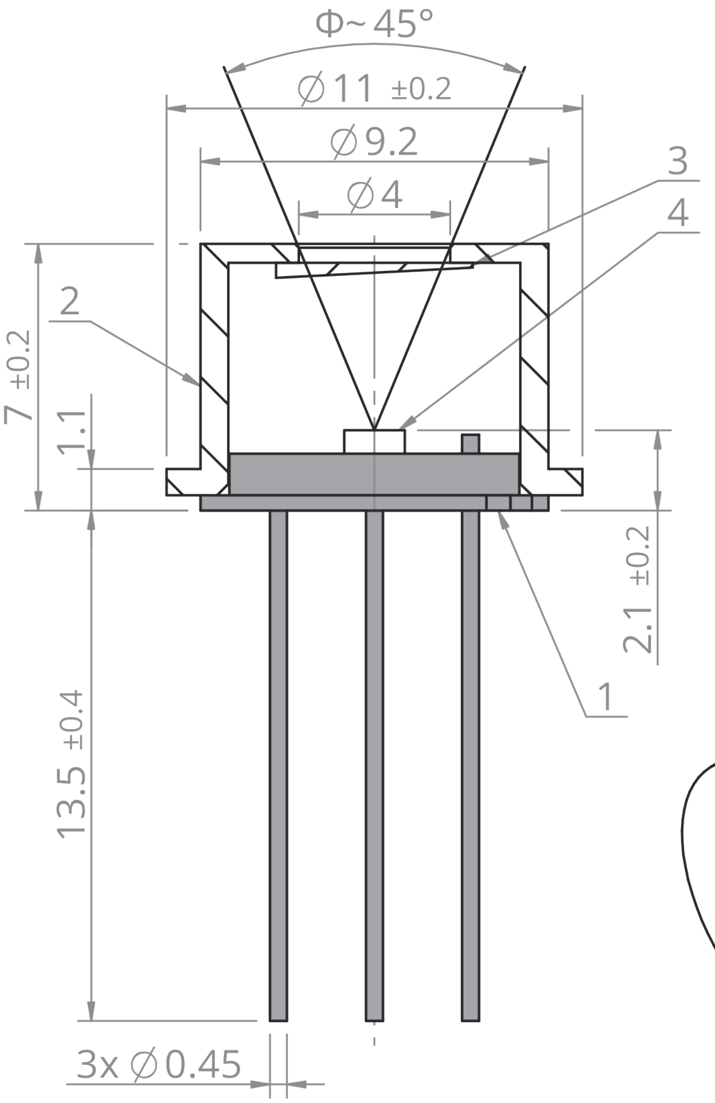
Drawing No.	Rev.	Title
ZTM-TO39-Z001	8	Detector TO39 - immersion

Bottom view

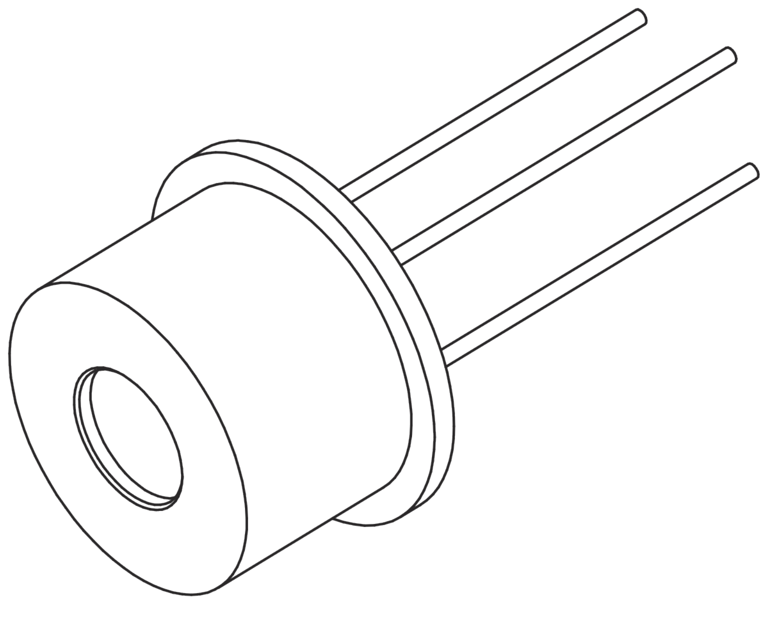


Bottom view
Photovoltaic





Pinout	
Pin No.	Connection
1	Detector anode
2	Detector cathode
3	Ground

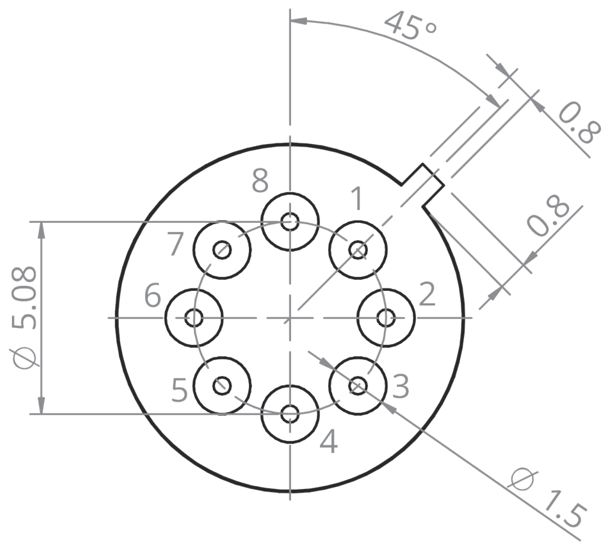


No.	Name	Material
4	Detector	InP/InGaAs
3	Window	Al2O3
2	Detector cap	Stainless Steel
1	TO39 header	Gold plated Kovar

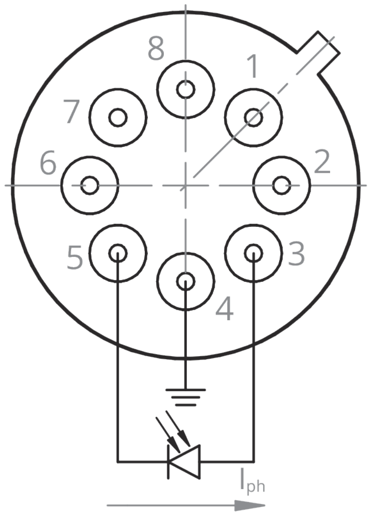
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale	Sheet	Size	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.
		5:1	1/1	A4	

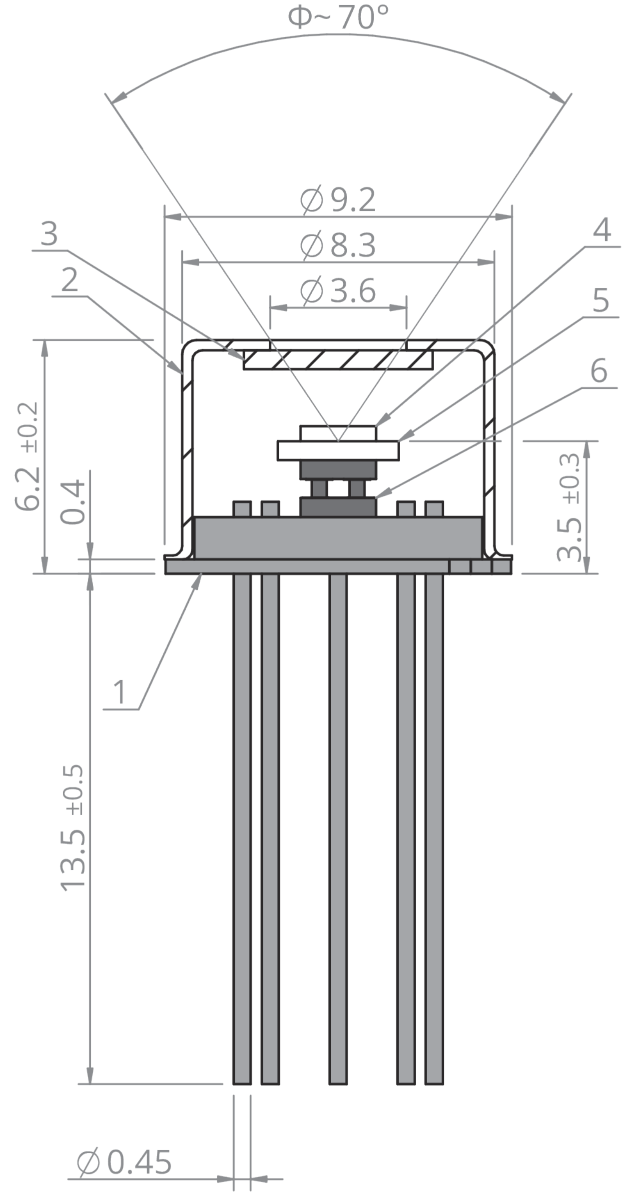
Drawing No.	Rev.	Title
ZTM-TO39-Z228.1	1	Detector TO39 v2 - no immersion

Bottom view

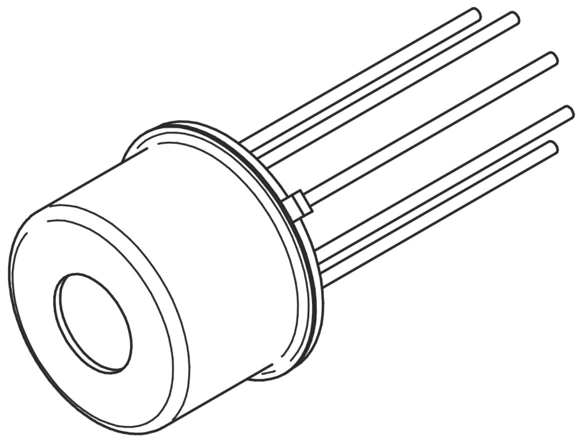


Bottom view
Photovoltaic





Pinout	
Pin No.	Connection
1	TE cooler (+)
2	Not used
3	Detector anode (+)
4	Ground
5	Detector cathode (-)
6	Thermistor Pin 1
7	TE cooler (-)
8	Thermistor Pin 2

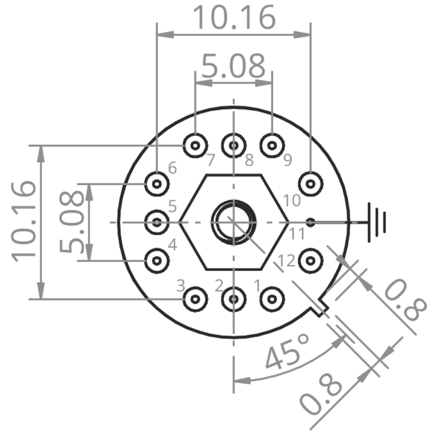


6	Thermoelectric cooler	
5	Detector carrier	Silicon
4	Detector	InAs/InAsSb/GaAs
3	Window	Si AR
2	Detector cap	Kovar
1	TO39 header	Gold plated Steel
No.	Name	Material

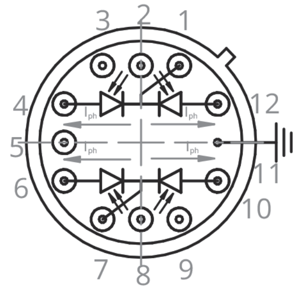
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	

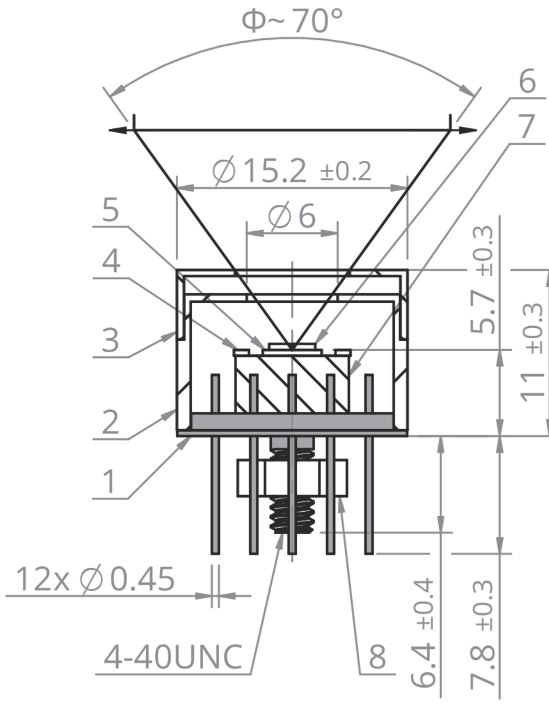
Drawing No.	Rev.	Title
ZTM-TO39_8-Z001	4	Detector TO39 8 pin - no immersion

Bottom view

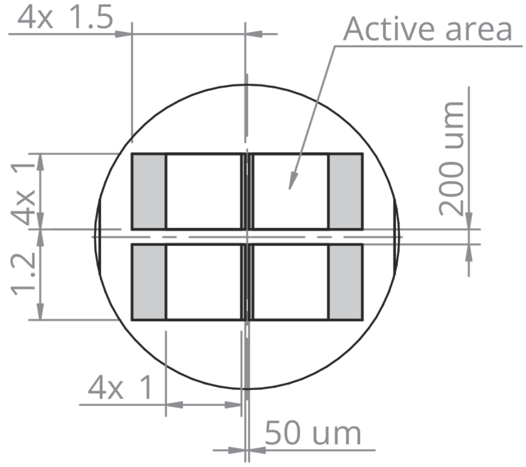


Top view
Photovoltaic

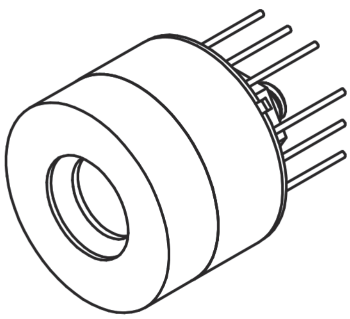




Top view
Photovoltaic

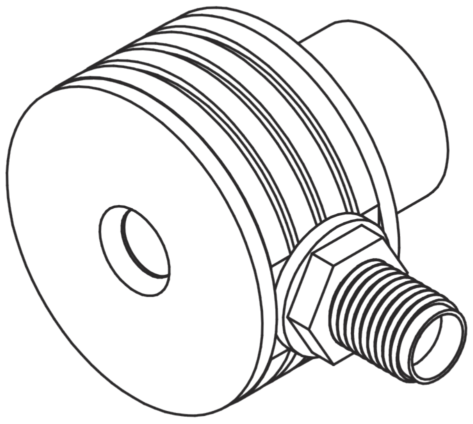


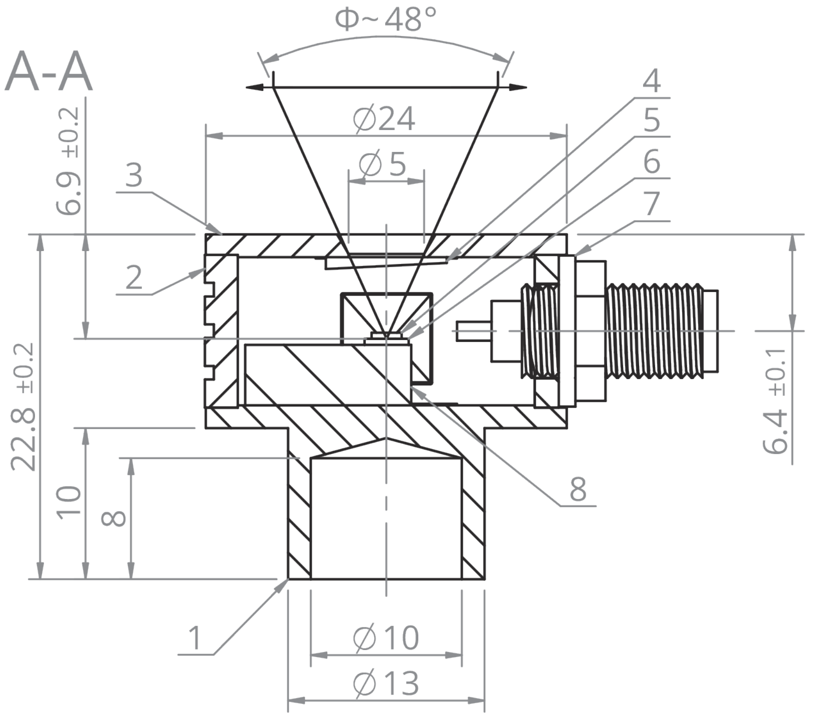
Pinout	
Pin No.	Connection
1	Detectors 1 and 4 cathode
2	Not used
3	Not used
4	Detector 4 anode
5	Not used
6	Detector 3 anode
7	Detectors 2 and 3 cathode
8	Not used
9	Not used
10	Detector 2 anode
11	Chassis ground
12	Detector 1 anode



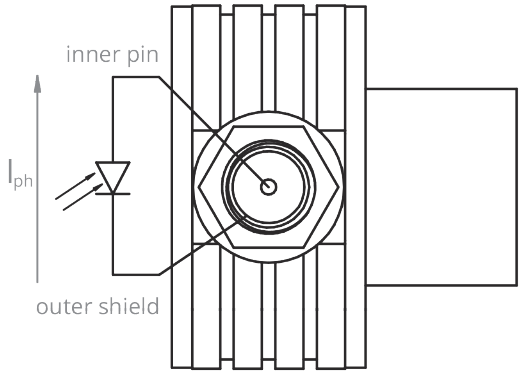
No.	Name	Material
8	4-40 UNC A2 nut	Stainless steel
7	Distance barrel	MO58
6	Detector	HgCdTe/GaAs
5	Detector carrier	Sapphire/Silicon
4	Pad	Sapphire
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.
Drawing No. ZTM-TO8Quad-Z001	Rev. 10	Title Detector TO8 - Quadrant Photovoltaic			

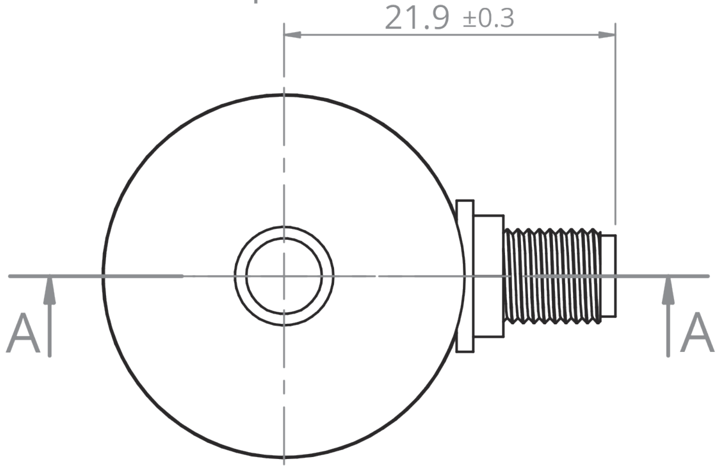




Side view
Photovoltaic



Top view



Output signal	
Inner pin	Detector anode
Outer shield	Detector cathode

8	Mounting pad	Brass
7	SMA connector	
6	Detector carrier	Silicon
5	Detector	HgCdTe/GaAs
4	Window	ZnSe AR
3	PEM lid	Black anodized aluminium
2	Detector case	Black anodized steel
1	PEM handle	Black anodized aluminium
No.	Name	Material

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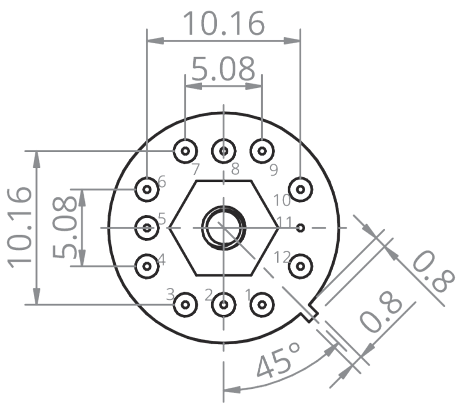
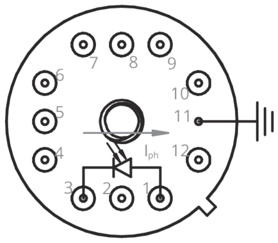
Drawing No.	Rev.	Title
ZTM-PEM-Z002	5	Detector PEM SMA - no immersion

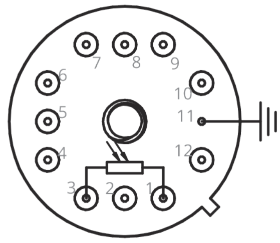
Bottom view

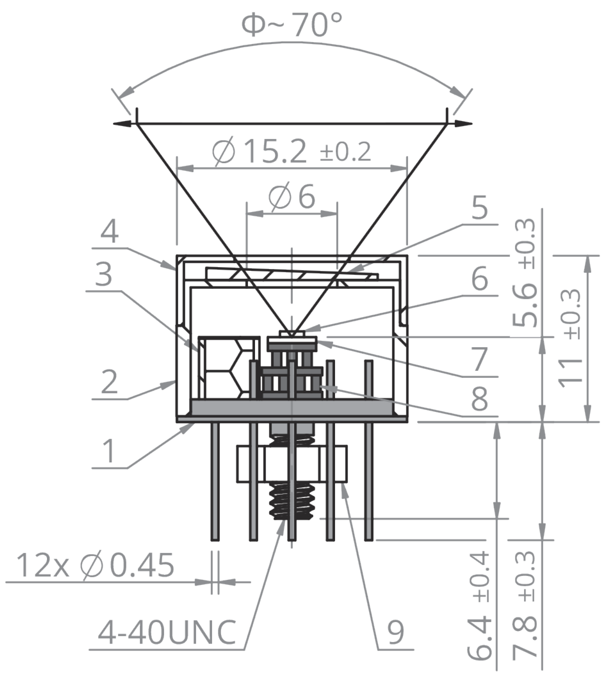


Bottom view
Photovoltaic

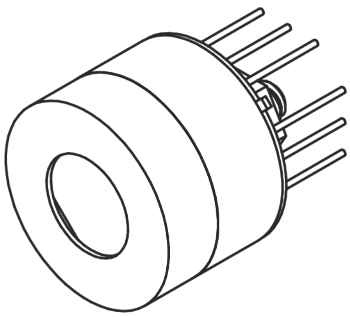


Bottom view
Photoconductive





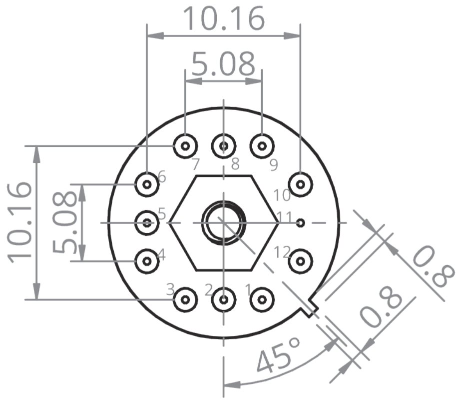
Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	Detector anode	Detector
2	TE cooler (+)	TE cooler (+)
3	Detector cathode	Detector
4	Not used	Not used
5	Not used	Not used
6	Not used	Not used
7	Thermistor	Thermistor
8	TE cooler (-)	TE cooler (-)
9	Thermistor	Thermistor
10	Not used	Not used
11	Chassis ground	Chassis ground
12	Not used	Not used



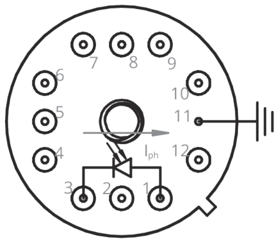
No.	Name	Material
9	4-40 UNC A2 nut	Stainless steel
8	Thermoelectric cooler	
7	Detector carrier	Sapphire/Silicon
6	Detector	HgCdTe/InAs/InAsSb/GaAs
5	Window	Al2O3/ZnSe AR
4	Detector cap	Stainless steel
3	Humidity absorber container	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.
	Drawing No. ZTM-TO8-Z021		Rev. 8	Title Detector TO8 2TE - no immersion	

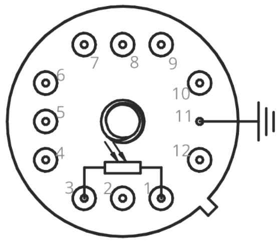
Bottom view

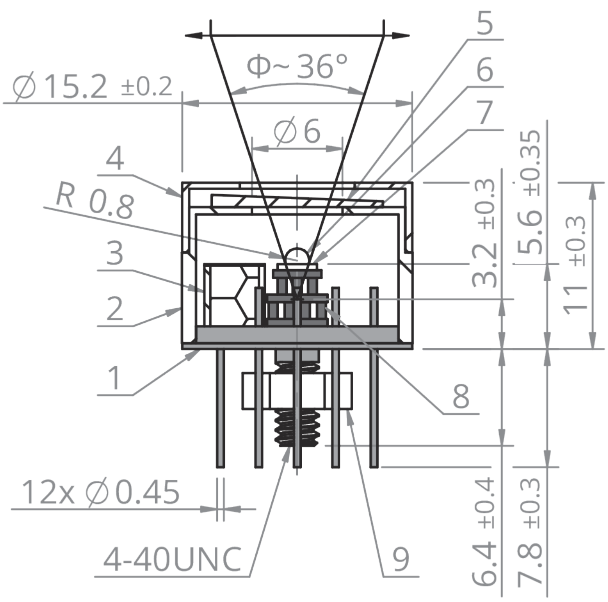


Bottom view
Photovoltaic



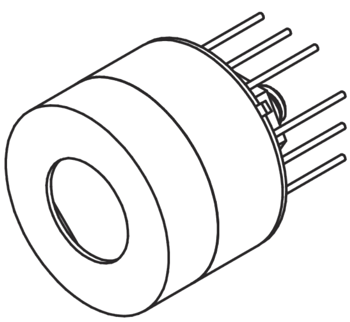
Bottom view
Photoconductive





Pin No.	Connection	
	Photovoltaic	Photoconductive
1	Detector anode	Detector
2	TE cooler (+)	TE cooler (+)
3	Detector cathode	Detector
4	Not used	Not used
5	Not used	Not used
6	Not used	Not used
7	Thermistor	Thermistor
8	TE cooler (-)	TE cooler (-)
9	Thermistor	Thermistor
10	Not used	Not used
11	Chassis ground	Chassis ground
12	Not used	Not used

Pinout



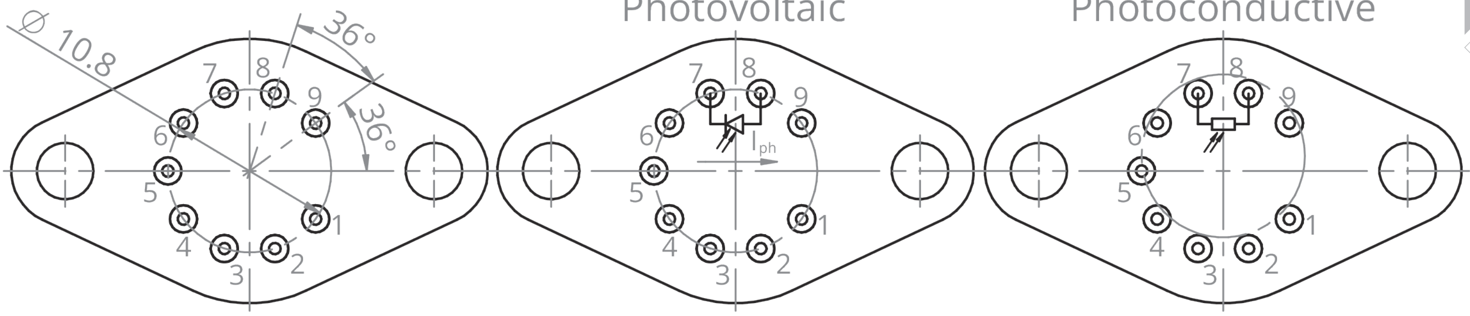
No.	Name	Material
9	4-40 UNC A2 nut	Stainless steel
8	Thermoelectric cooler	
7	Detector carrier	Sapphire/Silicon
6	Detector	HgCdTe/InAs/InAsSb/GaAs
5	Window	Al2O3/ZnSe AR
4	Detector cap	Stainless steel
3	Humidity absorber container	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.
	Drawing No. ZTM-TO8-Z020	Rev. 8	Title Detector TO8 2TE - immersion		

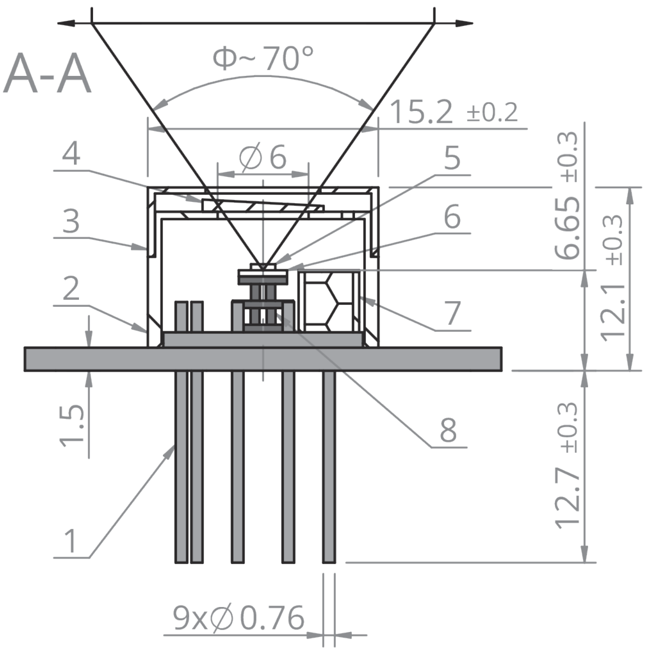
Bottom view

Bottom view Photovoltaic

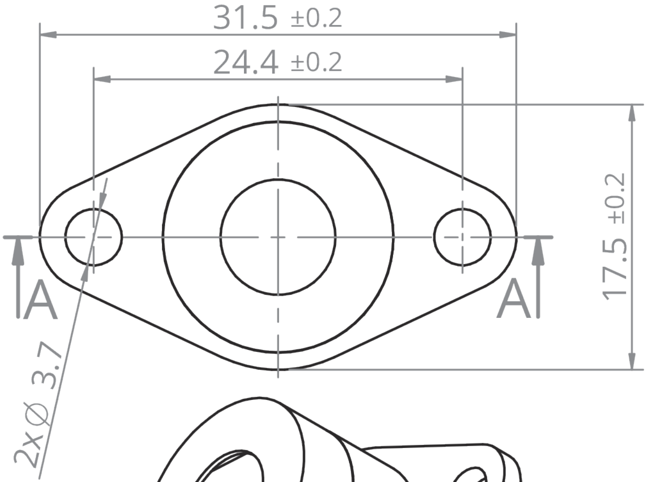
Bottom view Photoconductive

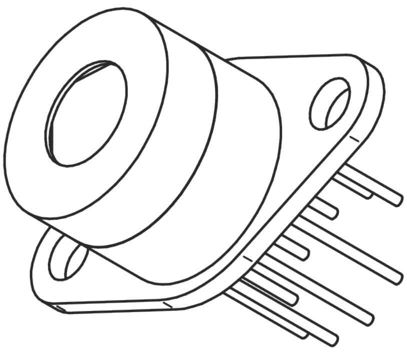


A-A



Top view



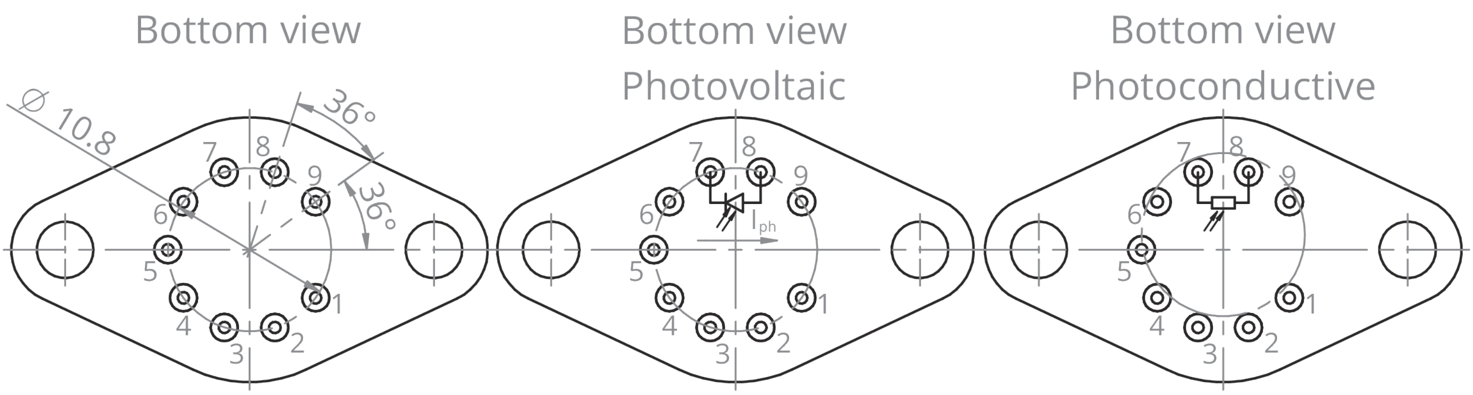


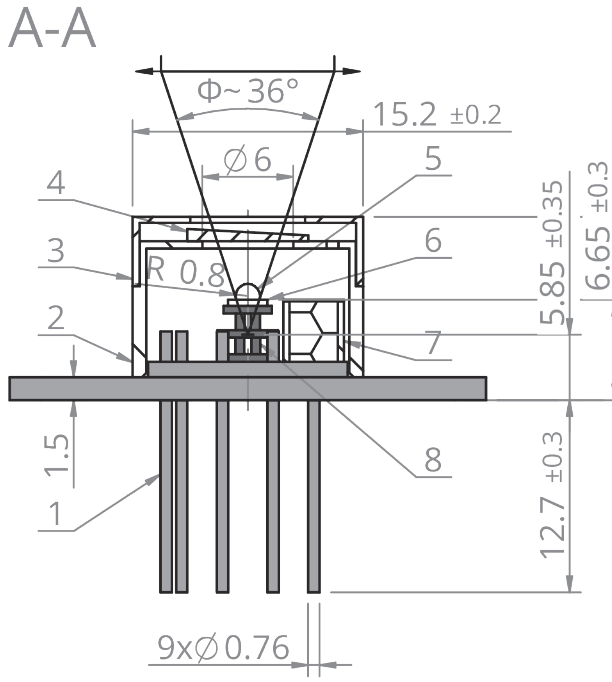
Pin No.	Pinout	
	Connection	
	Photovoltaic	Photoconductive
1	TE cooler (+)	TE cooler (+)
2	Not used	Not used
3	Not used	Not used
4	Not used	Not used
5	Thermistor	Thermistor
6	Thermistor	Thermistor
7	Detector cathode	Detector
8	Detector anode	Detector
9	TE cooler (-)	TE cooler (-)

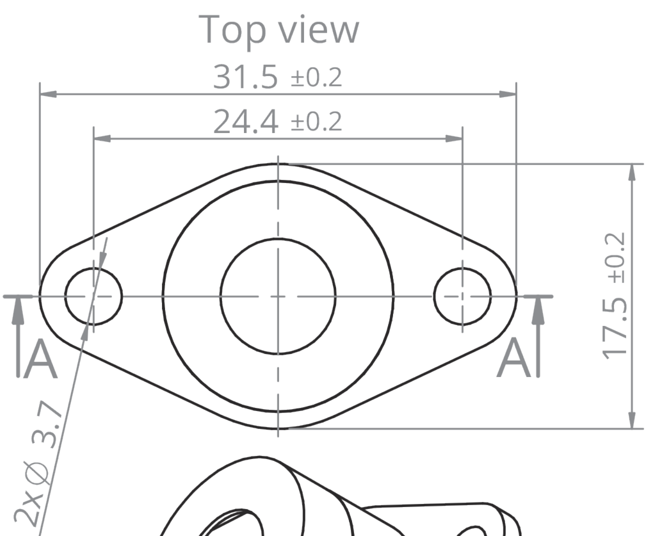
No.	Name	Material
8	Thermoeletric cooler	
7	Humidity absorber container	Stainless steel
6	Detector carrier	Sapphire/Silicon
5	Detector	HgCdTe/InAs/InAsSb/GaAs
4	Window	Al2O3/ZnSe AR
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO66 header	Gold plated Kovar

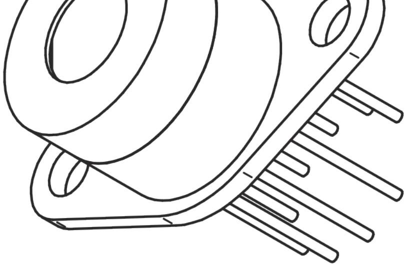
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	

Drawing No.	Rev.	Title
ZTM-TO66-Z041	7	Detector TO66 2TE - no immersion









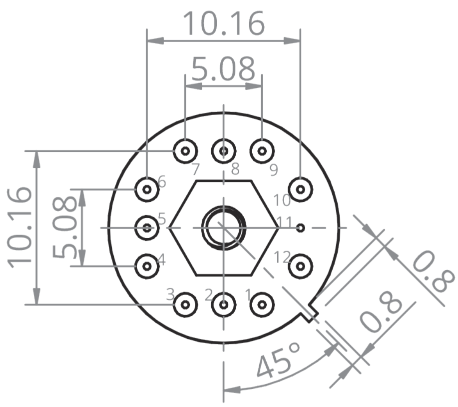
Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	TE cooler (+)	TE cooler (+)
2	Not used	Not used
3	Not used	Not used
4	Not used	Not used
5	Thermistor	Thermistor
6	Thermistor	Thermistor
7	Detector cathode	Detector
8	Detector anode	Detector
9	TE cooler (-)	TE cooler (-)

No.	Name	Material
8	Thermoeletric cooler	
7	Humidity absorber container	Stainless steel
6	Detector carrier	Sapphire/Silicon
5	Detector	HgCdTe/InAs/InAsSb/GaAs
4	Window	Al2O3/ZnSe AR
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO66 header	Gold plated Kovar

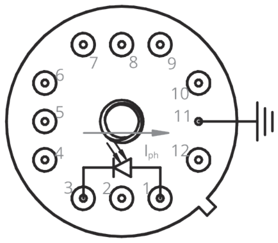
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale	Sheet	Size	
		5:1	1/1	A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

Drawing No.	Rev.	Title
ZTM-TO66-Z020	9	Detector TO66 2TE - immersion

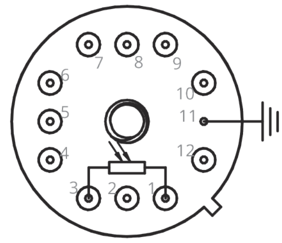
Bottom view

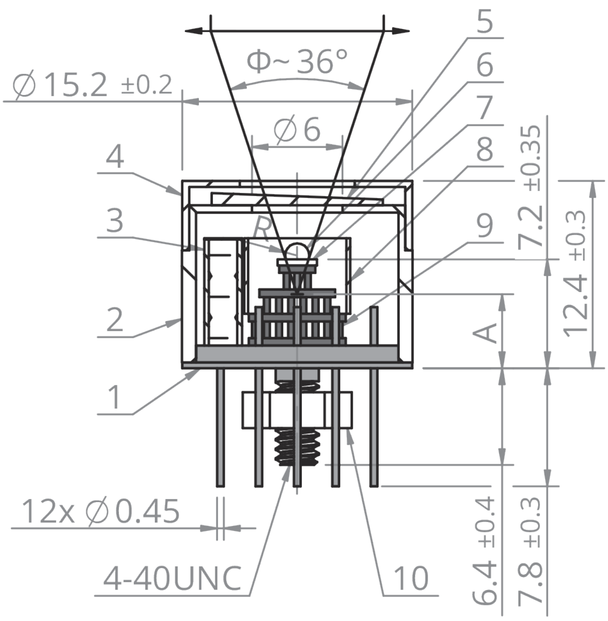


Bottom view
Photovoltaic



Bottom view
Photoconductive

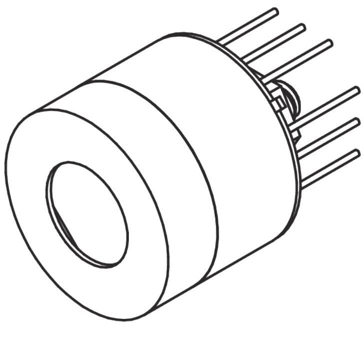




Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	Detector anode	Detector
2	TE cooler (+)	TE cooler (+)
3	Detector cathode	Detector
4	Not used	Not used
5	Not used	Not used
6	Not used	Not used
7	Thermistor	Thermistor
8	TE cooler (-)	TE cooler (-)
9	Thermistor	Thermistor
10	Not used	Not used
11	Chassis ground	Chassis ground
12	Not used	Not used

Immersion lens shape	Hyperhemisphere	
Detector optical area [mm²]	0.5x0.5	1x1
R [mm]	0.5	0.8
A [mm]	5.70±0.35	4.80±0.35

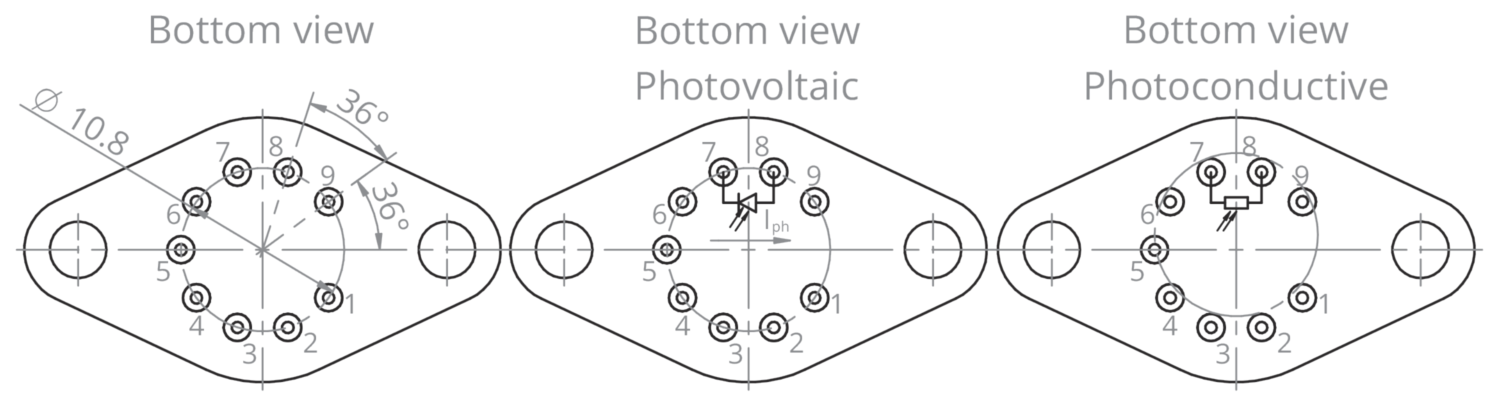
A - Distance from the bottom of the TO8 header to the focal plane

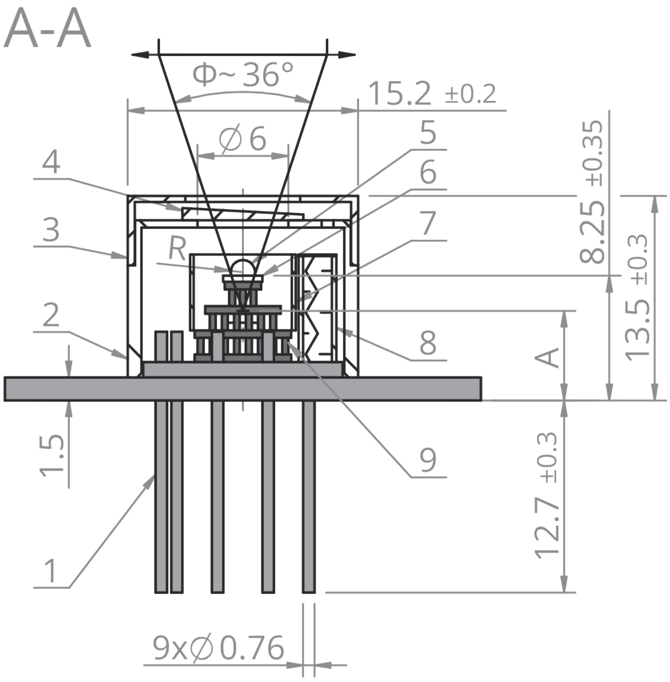


No.	Name	Material
10	4-40 UNC A2 nut	Stainless steel
9	Thermoelectric cooler	
8	Anticonvection shield	POM
7	Detector carrier	Sapphire/Silicon
6	Detector	HgCdTe/InAs/InAsSb/GaAs
5	Window	Al2O3/ZnSe AR
4	Detector cap	Stainless steel
3	Humidity absorber container	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

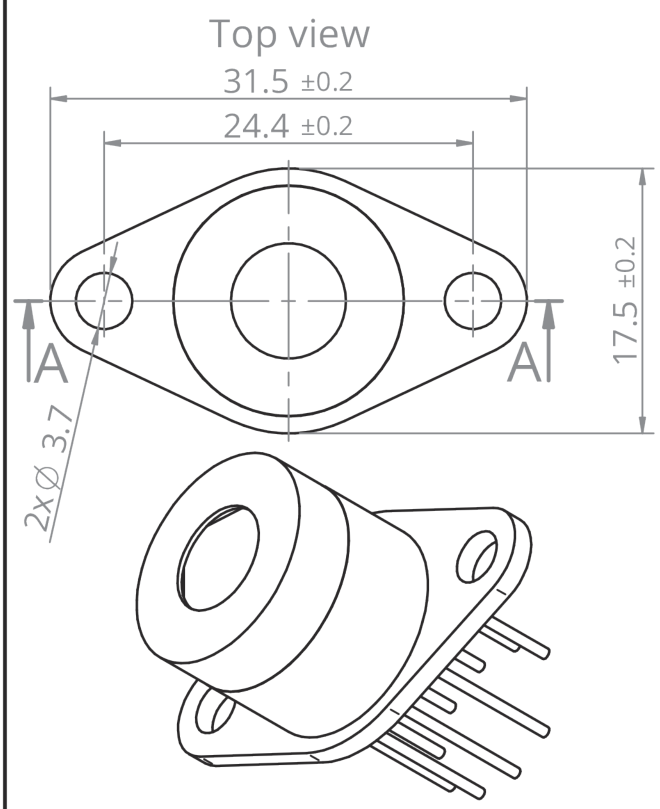
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 2:1	Sheet 1/1	Size A4

Drawing No.	Rev.	Title
ZTM-TO8-Z030	8	Detector TO8 3TE - immersion





Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	TE cooler (+)	TE cooler (+)
2	Not used	Not used
3	Not used	Not used
4	Not used	Not used
5	Thermistor	Thermistor
6	Thermistor	Thermistor
7	Detector cathode	Detector
8	Detector anode	Detector
9	TE cooler (-)	TE cooler (-)



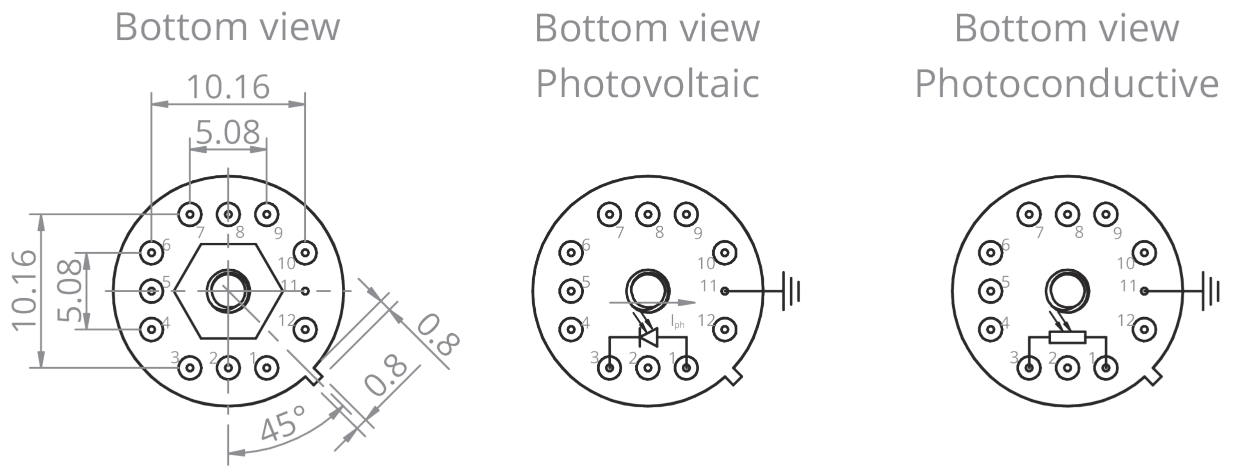
Immersion lens shape	Hyperhemisphere	
Detector optical area [mm^2]	0.5x0.5	1x1
R [mm]	0.5	0.8
A [mm]	6.75±0.35	5.85±0.35

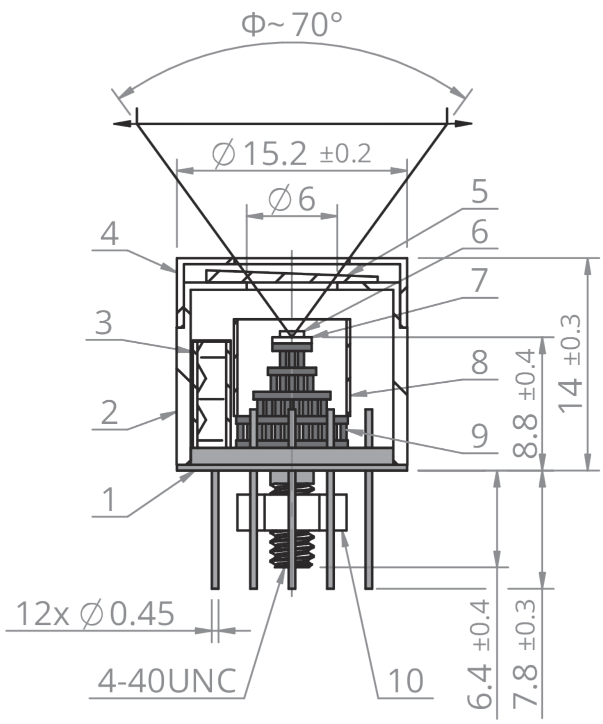
A - Distance from the bottom of the TO66 header to the focal plane

No.	Name	Material
9	Thermoeletric cooler	
8	Humidity absorber container	Stainless steel
7	Anticonvection shield	POM
6	Detector carrier	Sapphire/Silicon
5	Detector	HgCdTe/InAs/InAsSb/GaAs
4	Window	Al2O3/ZnSe AR
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO66 header	Gold plated Kovar

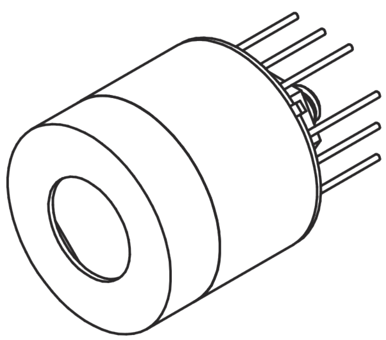
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4

Drawing No.	Rev.	Title
ZTM-TO66-Z030	8	Detector TO66 3TE - immersion





Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	Detector anode	Detector
2	TE cooler (+)	TE cooler (+)
3	Detector cathode	Detector
4	Not used	Not used
5	Not used	Not used
6	Not used	Not used
7	Thermistor	Thermistor
8	TE cooler (-)	TE cooler (-)
9	Thermistor	Thermistor
10	Not used	Not used
11	Chassis ground	Chassis ground
12	Not used	Not used

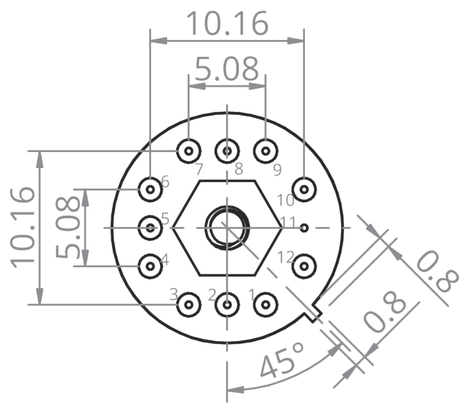


No.	Name	Material
10	4-40 UNC A2 nut	Stainless steel
9	Thermoelectric cooler	
8	Anticonvection shield	POM
7	Detector carrier	Sapphire/Silicon
6	Detector	HgCdTe/InAs/InAsSb/GaAs
5	Window	Al2O3/ZnSe AR
4	Detector cap	Stainless steel
3	Humidity absorber container	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

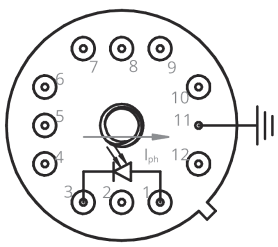
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale	Sheet	Size
		5:1	1/1	A4

Drawing No.	Rev.	Title
ZTM-TO8-Z041	8	Detector TO8 4TE - no immersion

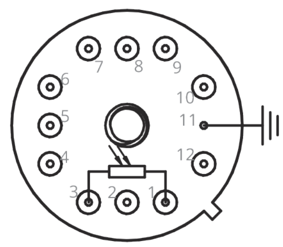
Bottom view

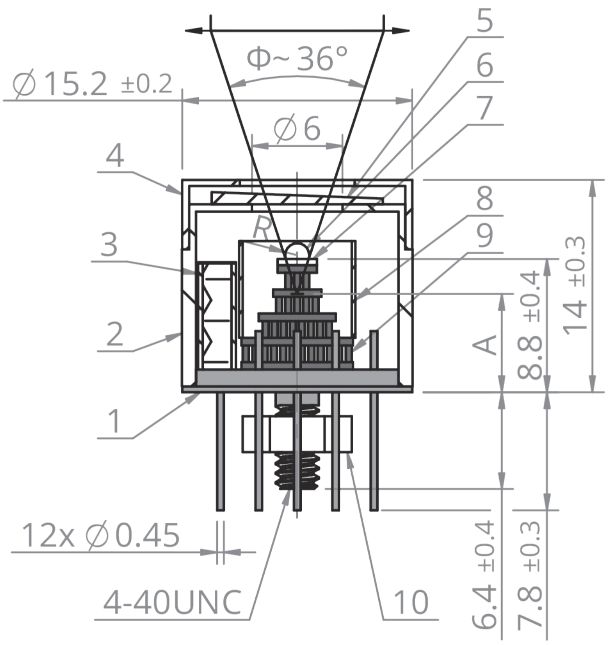


Bottom view
Photovoltaic



Bottom view
Photoconductive

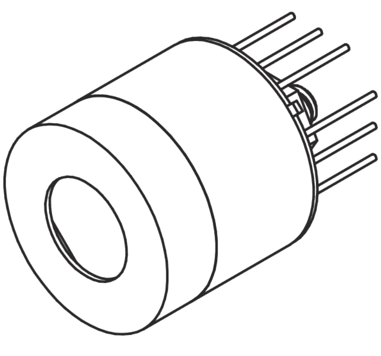




Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	Detector anode	Detector
2	TE cooler (+)	TE cooler (+)
3	Detector cathode	Detector
4	Not used	Not used
5	Not used	Not used
6	Not used	Not used
7	Thermistor	Thermistor
8	TE cooler (-)	TE cooler (-)
9	Thermistor	Thermistor
10	Not used	Not used
11	Chassis ground	Chassis ground
12	Not used	Not used

Immersion lens shape	Hyperhemisphere	
Detector optical area [mm²]	0.5x0.5	1x1
R [mm]	0.5	0.8
A [mm]	7.3±0.4	6.4±0.4

A - Distance from the bottom of the TO8 header to the focal plane

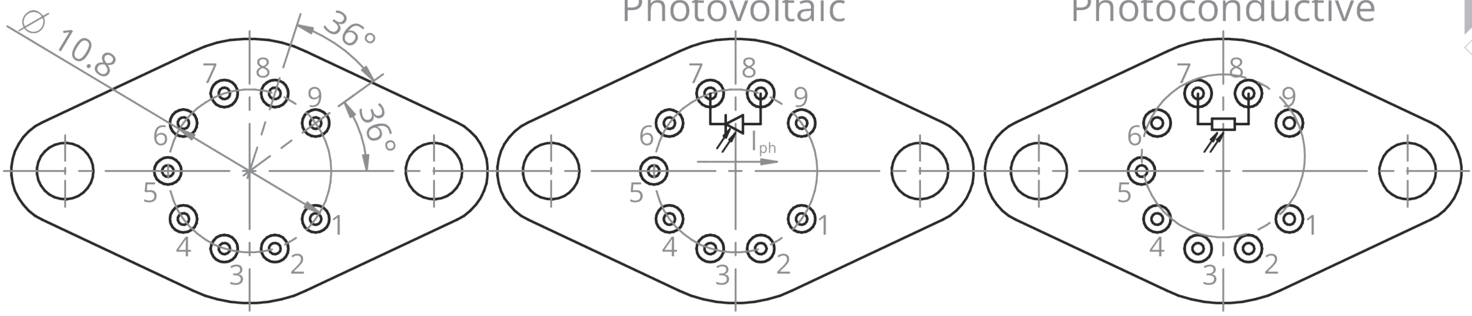


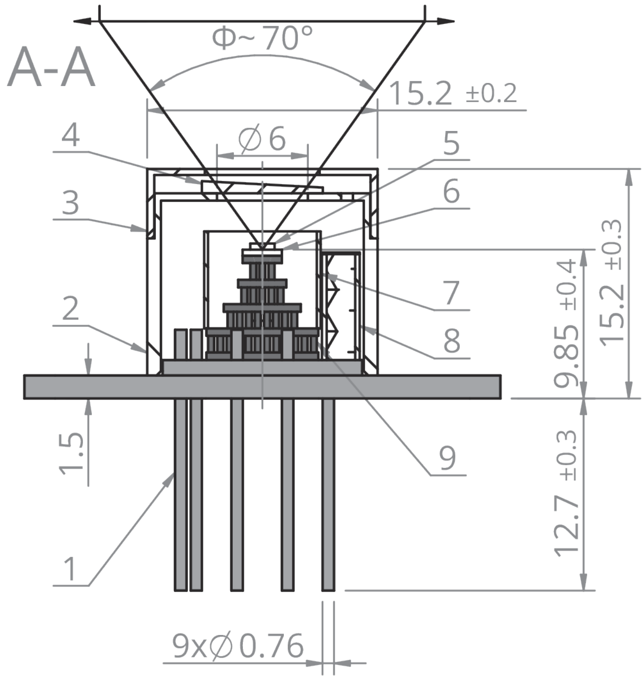
No.	Name	Material
10	4-40 UNC A2 nut	Stainless steel
9	Thermoelectric cooler	
8	Anticonvection shield	POM
7	Detector carrier	Sapphire/Silicon
6	Detector	HgCdTe/InAs/InAsSb/GaAs
5	Window	Al2O3/ZnSe AR
4	Detector cap	Stainless steel
3	Humidity absorber container	Stainless steel
2	Detector case	Stainless steel
1	TO8 header	Gold plated Kovar

FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale 5:1	Sheet 1/1	Size A4	This document is the property of VIGO Photonics S.A. and may not be disclosed to third parties, copied or used in whole or in part for any purpose without written permission from VIGO Photonics S.A.

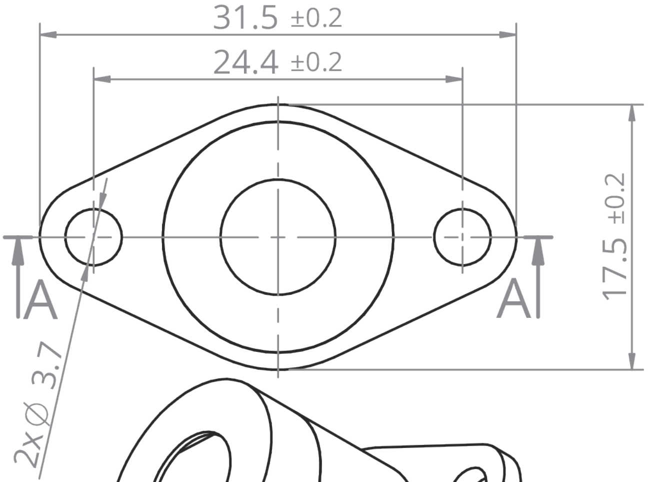
Drawing No.	Rev.	Title
ZTM-TO8-Z040	8	Detector TO8 4TE - immersion

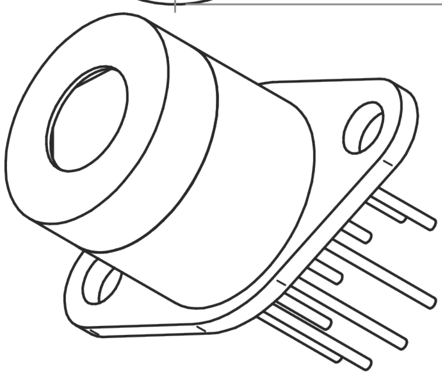
Bottom view | Bottom view Photovoltaic | Bottom view Photoconductive





Top view





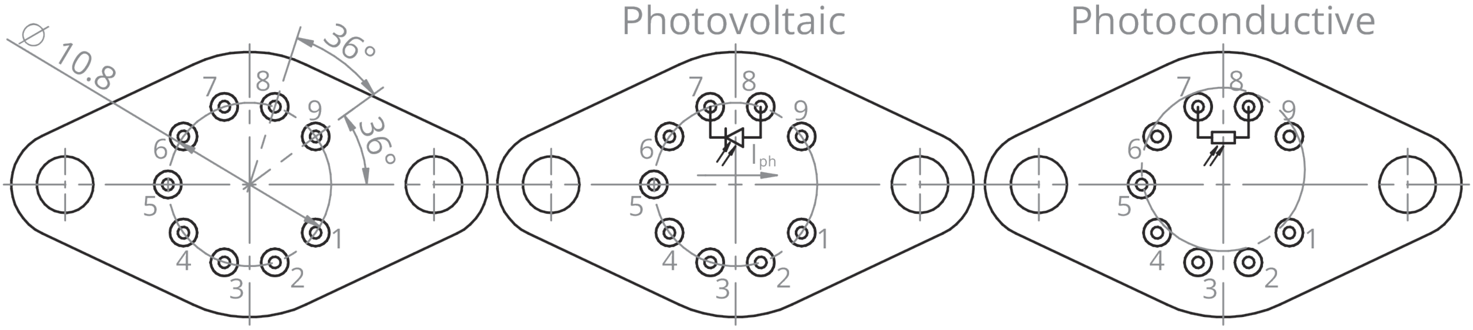
Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	TE cooler (+)	TE cooler (+)
2	Not used	Not used
3	Not used	Not used
4	Not used	Not used
5	Thermistor	Thermistor
6	Thermistor	Thermistor
7	Detector cathode	Detector
8	Detector anode	Detector
9	TE cooler (-)	TE cooler (-)

No.	Name	Material
9	Thermoeletric cooler	
8	Humidity absorber container	Stainless steel
7	Anticonvection shield	POM
6	Detector carrier	Sapphire/Silicon
5	Detector	HgCdTe/InAs/InAsSb/GaAs
4	Window	Al2O3/ZnSe AR
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO66 header	Gold plated Kovar

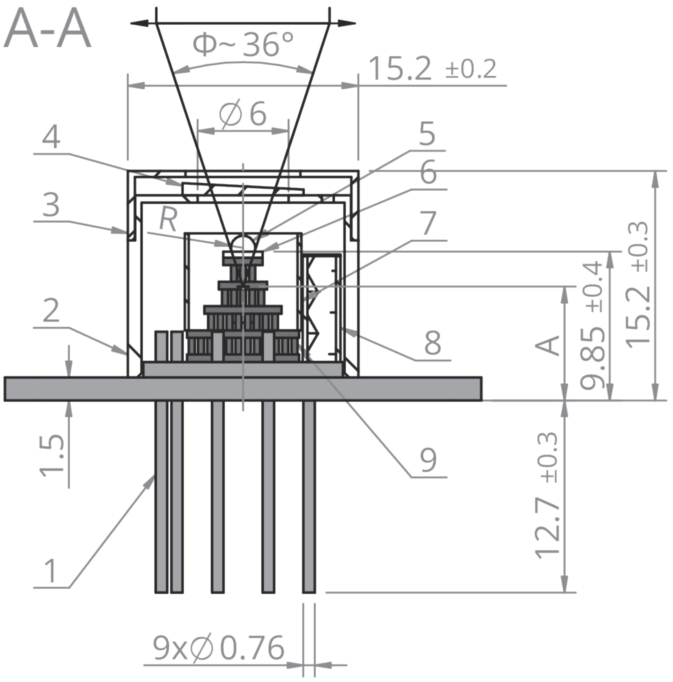
FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale	Sheet	Size
		5:1	1/1	A4

Drawing No.	Rev.	Title
ZTM-TO66-Z041	7	Detector TO66 4TE - no immersion

Bottom view | Bottom view Photovoltaic | Bottom view Photoconductive

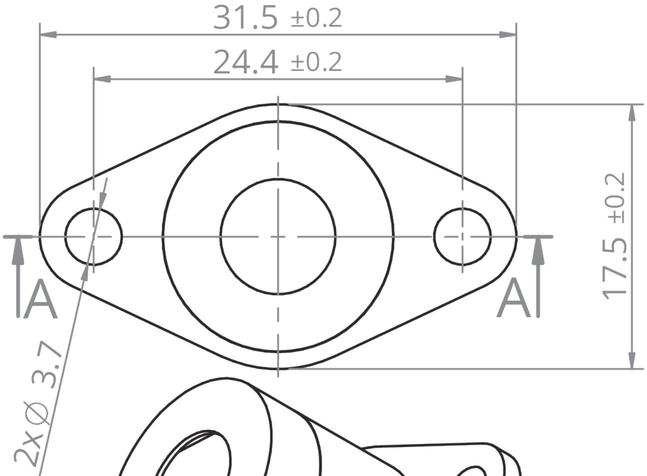


A-A



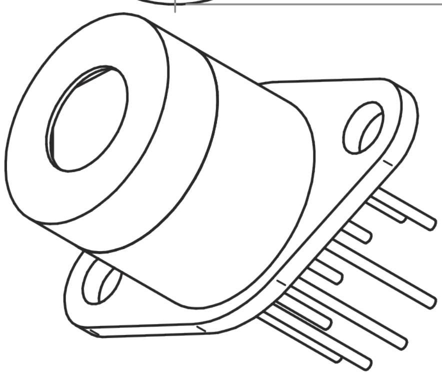
Pinout		
Pin No.	Connection	
	Photovoltaic	Photoconductive
1	TE cooler (+)	TE cooler (+)
2	Not used	Not used
3	Not used	Not used
4	Not used	Not used
5	Thermistor	Thermistor
6	Thermistor	Thermistor
7	Detector cathode	Detector
8	Detector anode	Detector
9	TE cooler (-)	TE cooler (-)

Top view



Immersion lens shape	Hyperhemisphere	
Detector optical area [mm²]	0.5x0.5	1x1
R [mm]	0.5	0.8
A [mm]	8.35±0.40	7.45±0.40

A - Distance from the bottom of the TO66 header to the focal plane



No.	Name	Material
9	Thermoeletric cooler	
8	Humidity absorber container	Stainless steel
7	Anticonvection shield	POM
6	Detector carrier	Sapphire/Silicon
5	Detector	HgCdTe/InAs/InAsSb/GaAs
4	Window	Al2O3/ZnSe AR
3	Detector cap	Stainless steel
2	Detector case	Stainless steel
1	TO66 header	Gold plated Kovar

FIRST ANGLE PROJECTION	UNIT: mm GENERAL TOLERANCE: ISO 2768-mK	Scale	Sheet	Size
		5:1	1/1	A4

Drawing No.	Rev.	Title
ZTM-TO66-Z040	7	Detector TO66 4TE - immersion

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