BostonElectronics

# VS2 Detector Set

Sensitive, affordable detection set, MWIR (3 to 6 um) with 1x1mm active area detector with immersion lens for enhanced performance. Integral AIP preamplifer, DC to 1MHz bandwidth.

- PVI-2TE-6-1x1
- AIP-DC-1M-S

Boston Electronics | VIGO SYSTEM

# PVI-2TE

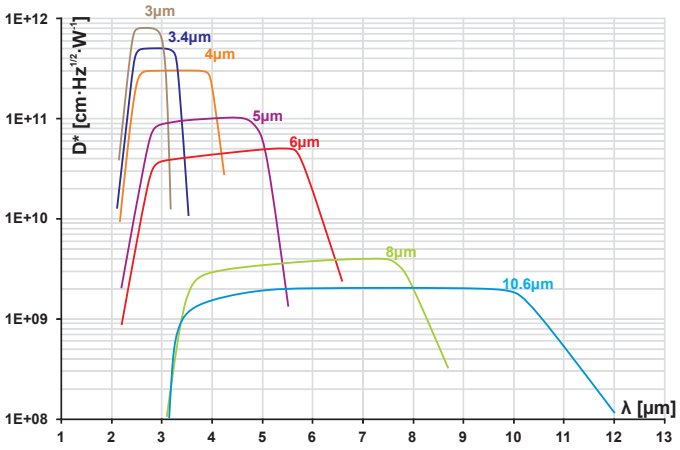
## 2-12 μm IR PHOTOVOLTAIC DETECTORS THERMOELECTRICALLY COOLED OPTICALLY IMMERSED

The **PVI-2TE-$\lambda_{opt}$** photodetectors series ($\lambda_{opt}$ – optimal wavelength in micrometers) feature IR photovoltaic detector on two-stage thermoelectrical cooler, optically immersed to high refractive index GaAs hyperhemispherical (standard) or hemispherical or any intermediate lens (as option) for different acceptance angle and saturation level.

## Detector code description

PVI - 2TE - 6 - 1x1 - TO8 - wAl203 - 35

- PVI: VIGO detector type (I - optical immersion)
- 2TE: Cooling
- 6: Optimal wavelength
- 1x1: Optical area
- TO8: Detector package
- wAl203: Window
- 35: FOV




*Example of D* vs Wavelength λ for PC Series HgCdTe Detectors. Spectral Characteristics of individual detectors may vary from those shown on the chart.*

## Features:

- High performance in the 2 to 12 μm spectral range
- Fast response
- No flicker noise
- Convenient to use
- Wide dynamic range
- Compact, rugged and reliable
- Low cost
- Prompt delivery
- Custom design upon request

**IR Detector Specification @20°C**

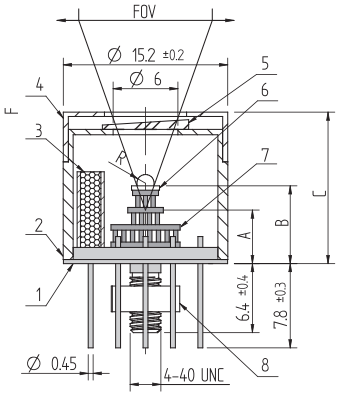
| Detector type | Cooling, operating temperature $T[K]$ | Optimal wavelength $\lambda_{opt}[\mu m]$ | Detectivity** $D^*\left[\frac{cm\cdot\sqrt{Hz}}{W}\right]$ @$\lambda_{peak}$ | Detectivity** $D^*\left[\frac{cm\cdot\sqrt{Hz}}{W}\right]$ @$\lambda_{opt}$ | Current responsivity length product @$\lambda_{opt}$ $R_i\cdot L\left[\frac{A\cdot mm}{W}\right]$ | Time constant $\tau[ns]$ | Resistance optical area product $R\cdot A\left[\Omega\cdot cm^2\right]$ | Acceptance angle $\varnothing[°]$, $\frac{1}{2NA}$ | Optical area*** $[mm\times mm]$ | Package | Window**** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PVI | two-stage TE-cooled (2TE), ~230 | 3 | ≥8.0×10$^{11}$ | ≥5.5×10$^{11}$ | ≥0.5 | ≤280 | ≥15000 | ~36, 1.62 | 0.5×0.5<br>1×1 | TO8, TO66 | wedged $Al_2O_3$ |
| | | 3.4 | ≥6.0×10$^{11}$ | ≥3.0×10$^{11}$ | ≥0.8 | ≤200 | ≥300 | | | | |
| | | 4 | ≥3.0×10$^{11}$ | ≥2.0×10$^{11}$ | ≥1.0 | ≤100 | ≥200 | | | | |
| | | 5 | ≥1.0×10$^{11}$ | ≥6.0×10$^{10}$ | ≥1.3 | ≤80 | ≥10 | | | | |
| | | 6 | ≥5.0×10$^{10}$ | ≥2.0×10$^{10}$ | ≥1.5 | ≤50 | ≥2 | | | | wedged ZnSe<br>AR coated |
| | | 8 | ≥4.0×10$^{9}$ | ≥2.0×10$^{9}$ | ≥0.8 | ≤30 | ≥0.02 | | 0.3×0.3<br>0.5×0.5 | | |
| | | | | | | ≤45 | | | 1×1 | | |
| | | 10.6 | ≥2.0×10$^{9}$ | ≥1.0×10$^{9}$ | ≥0.4 | ≤10 | ≥0.01 | | 0.3×0.3<br>0.5×0.5 | | |

*) *Other optimal wavelengths available upon request.*
**) *Data sheet states minimum guaranteed D* values for each detector model. Higher performance detectors can be provided upon request.*
***) *Other optical areas available upon request.*
****) *Other windows available upon request.*
[1]) *Optical area available only for uncooled detectors*

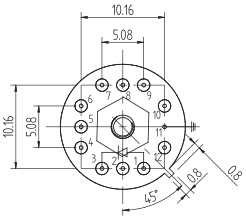
# DETECTOR PACKAGES

The packages of cooled detectors (TO8, TO66) are filled with dry, heavy noble gases for low thermal conductivity (Kr/Xe mixtures). Water vapor condensation is prevented by careful sealing and water absorbers applied inside the package. The packages are hermetically sealed with IR windows.

## TO8 detector package




A – distance from the bottom, of the TO8 package to the focal plane



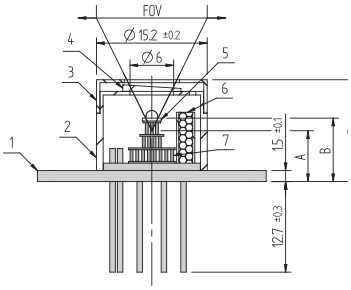

Bottom view

| Pin number | Function |
|---|---|
| 1, 3 | signal |
| 7, 9 | thermistor |
| 2(+), 8(-) | TE cooler supply |
| 11 | chassis ground |
| 4, 5, 6, 10, 12, | not used |

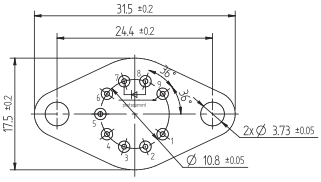
### Dimensions [mm]

| Two-stage thermoelectric cooler (2TE) | | | | | |
|---|---|---|---|---|---|
| Lens shape | Hyperhemisphere | | | Hemisphere | Flat |
| Optical area [mm x mm] | 0.5×0.5 | 1×1 | 2×2 | 0.5×0.5 - 2×2 | 0.01×0.01 - 4×4 |
| R [mm] | 0.5 | 0.8 | 1.25 | 0.5 - 1.25 | infinity |
| A [mm] | 4.1±0.3 | 3.2±0.3 | 1.85±0.30 | 5.6±0.3 | 5.6±0.3 |
| B [mm] | 5.6±0.3 | 5.6±0.3 | 5.6±0.3 | 5.6±0 .3 | 5.6±0.3 |
| C [mm] | 11.0±0.3 | 1.10±0.3 | 11.0±0.3 | 11.0±0.3 | 11.0±0.3 |
| FOV [°] | ~36 | ~36 | ~36 | ~70 | ~70 |

## TO66 detector package




A – distance from the bottom of the TO66 package to the focal plane




Bottom view

| Pin number | Function |
|---|---|
| 7, 8 | signal |
| 5, 6 | thermistor |
| 1(+), 9(-) | TE cooler supply |
| 11 | chassis ground |
| 2, 3, 4 | not used |

### Dimensions [mm]

| Two-stage thermoelectric cooler (2TE) | | | | | |
|---|---|---|---|---|---|
| Lens shape | Hyperhemisphere | | | Hemisphere | Flat |
| Optical area [mm x mm] | 0.5×0.5 | 1×1 | 2×2 | 0.5×0.5 - 2×2 | 0.01×0.01 - 4×4 |
| R [mm] | 0.5 | 0.8 | 1.25 | 0.5 - 1.6 | infinity |
| A [mm] | 5.1±0.3 | 4.2±0.3 | 12.9±0.3 | 6.6±0.3 | 6.6±0.3 |
| B [mm] | 6.6±0.3 | 6.6±0.3 | 6.6±0.3 | 6.6±0.3 | 6.6±0.3 |
| C [mm] | 12.1±0.3 | 12.1±0.3 | 12.1±0.3 | 12.1±0.3 | 12.1±0.3 |
| FOV [°] | ~36 | ~36 | ~36 | ~70 | ~70 |

| Preamplifier type | Main feature | Detector package | Detector type | Detector cooling | Radiator, cooling, TEC controlling | Input noise voltage density | Input noise current density | Low cut-off frequency |
|---|---|---|---|---|---|---|---|---|
| | | | | | | $e_n \left[\frac{nV}{\sqrt{Hz}}\right]$ | $i_n \left[\frac{pA}{\sqrt{Hz}}\right]$ | $f_{lo}[Hz]$ |
| VIP | standalone | BNC | PV, PVI, PVM, PVMI | uncooled | not needed | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |
| µIP | micro-size | TO39 | PC, PCI, PV, PVI, PVM, PVMI | uncooled | not needed | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |
| QIP | four-channel | TO8 | PCQ, PVQ, PVMQ | uncooled | on board radiator and TEC controller, fan | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |
| SIP | ultra-small, OEM | TO39 TO8 | PC, PCI, PV, PVI, PVM, PVMI | uncooled 2TE, 3TE, 4TE | external heatsink needed | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |
| FIP | very fast | TO8 | PC, PCI, PV, PVI, PVM, PVMI | 2TE, 3TE, 4TE | on board radiator, fan | 1.1 | 5.0 | 1k, 10k |
| MIP | standard | TO8 | PC, PCI, PV, PVI, PVM, PVMI | 2TE, 3TE, 4TE | on board radiator, fan | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |
| PIP | programmable | TO8 | PC, PCI, PV, PVI, PVM, PVMI | 2TE, 3TE, 4TE | on board radiator, fan | 0.95 | 4.5 7.0 | DC/10 |
| AIP | on board TEC controller | TO8 | PC, PCI, PV, PVI, PVM, PVMI | 2TE, 3TE, 4TE | on board radiator and TEC controller, fan | 0.97 – 8.0[1)] | 0.02 – 3.5[1)] | DC, 10, 100, 1k, 10k |

1) *noise measurement frequency* $f_0 = 10kHz$
2) *first stage transimpedance* $= 1k\Omega$
3) *first stage transimpedance* $= 5k\Omega$
4) *transimpedance range* $\frac{K_{imax}}{K_{imin}}$ up to 5 (dependent on $f_{hi}$)
5) $f_{hi} \leq 1MHz$, *load resistance* $R_L = 1M\Omega t$
6) $f_{hi} > 1MHz$, *load resistance* $R_L = 50M\Omega$

| High cut-off frequency | Transimpedance | Output impedance | Output voltage swing | Output voltage offset | Power supply voltage | Power supply current | Supply connector | Signal output |
|---|---|---|---|---|---|---|---|---|
| $f_{hi}[Hz]$ | $K_i\left[\frac{V}{A}\right]$ | $R_{out}[\Omega]$ | $V_{out}[V]$ | $V_{off}[mV]$ | $V_{sup}[V]$ | $I_{sup}[mA]$ | | |
| 100k, 300k, 1M, 5M, 10M, 20M | fixed up to $1.0\times10^5$ | 50 | ±10[5] ±2[6] | max ±20[9] | ±15[12] ±9[13] | max ±25 | DB9 | BNC |
| 100k, 300k, 1M, 5M, 10M, 100M, 200M | fixed up to $1.0\times10^5$ | 50 | ±2[5] ±1[6] | max ±20[9] | ±9 | max ±50 | MOLEX1×3 | MMCX |
| 100k, 300k, 1M, 5M, 10M, 100M | fixed up to $2.0\times10^5$ | 50 | ±2[5] ±1[6] | max ±20[9] | +5 | max ±50 | DC 2.1/5.5 | **4×MCX** |
| 100k, 300k, 1M, 5M, 10M, 100M, 250M | tunable[4] up to $1.0\times10^5$ | 50 | ±10[5] ±1[6] | max ±20[9] | ±15[12] ±9[13] | max ±50 | AMP2×4 | MMCX |
| **1G** | fixed up to $8.5\times10^3$ | 50 | ±1 | - | +12/-5 | +100 -50 | LEMO | SMA ( **DC monitor as an option**) |
| 100k, 300k, 1M, 5M, 10M, 100M, 250M | fixed up to $2.0\times10^5$ | 50 | ±10[5] ±2[7] ±1[8] | max ±20[9] | ±15[12] ±9[13] | max ±50 | LEMO | SMA |
| 150k/1.5M/20M 1.5M/15M/200M | digitally adjustable 500 – 30k[2] 2.5k – 150k[3] | 50 | ±1 | max ±20[9] (DC) max ±10 (AC) | ±9 | typ ±80 max ±100 | LEMO | SMA |
| 100k, 300k, 1M, 5M, 10M, 100M, 250M | fixed up to $2.0\times10^5$ | 50 | ±2[5] ±1[6] | max ±20[9] | +5[10] +12[11] | max ±50 | DC 2.1/5.5 | 2×SMA ( **DC monitor as an option**) |

7) $1MHz < f_{hi} \leq 20MHz$, *load resistance* $R_L = 1M\Omega$
8) $20MHz < f_{hi} \leq 250MHz$, *load resistance* $R_L = 50M\Omega$
9) *Measured with equivalent resistor at the input instead of the detector. It's to avoid the environmental thermal radiation's impast*
10) *with uncooled,* 2TE *and* 3TE *detectors*
11) *with* 4TE *detectors*
12) $f_{hi} \leq 1MHz$
13) $f_{hi} > 1MHz$

# AIP preamplifier

AIP is the new generation of transimpedance, AC or DC coupled preamplifier, integrated with thermoelectric cooler controller. It is designed to operate with either biased and non-biased detectors. Internal apply/roltape inverter allows to use single power supply what makes AIP very convenient in use and decreases power consumption.

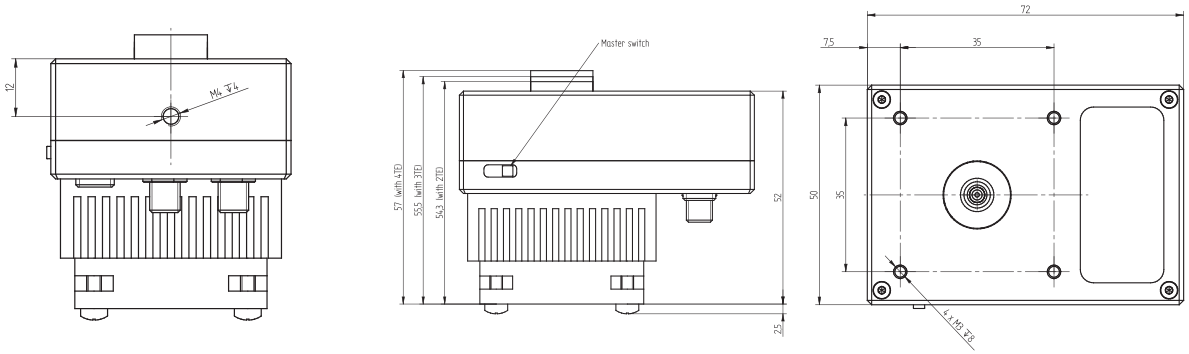
## Code description

**AIP - 10k - 250M - S**

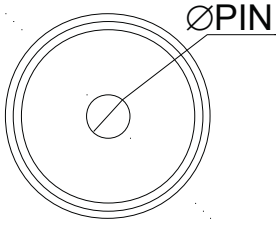
- **AIP** – VIGO preamplifier type AIP
- **10k** – Low cut-off frequency $f_{lo}$ [Hz]:
  - DC
  - 10
  - 100
  - 1k
  - 10k
- **250M** – High cut-off frequency $f_{hi}$ [Hz]:
  - 100k
  - 300k
  - 1M
  - 5M
  - 10M
  - 100M
  - 250M
- **S** – Version:
  - S - standard - with package

*see the preamplifier specification table for additional information*

## Dimensions [mm]




## Power supply connector - DC Jack connector




| Type | Voltage [V] | Pin diamater |
|---|---|---|
| DC Jack – 2.5 | 9 -12 | Ø 2.5 |
| DC Jack – 2.1 | 5 | Ø 2.1 |