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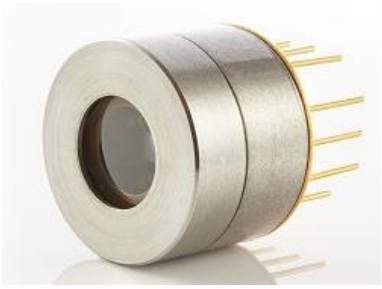
AM03120-01/02 detection module user's guide

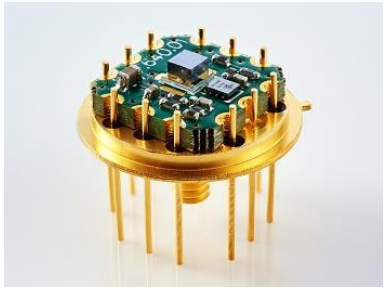
Introduction

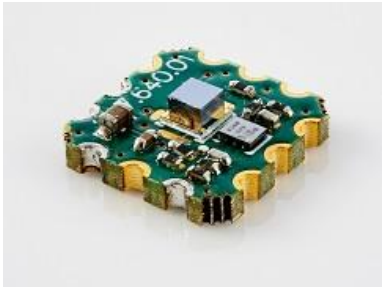
This document describes the main features and usage instructions for the AM03120-01/02 modules.
For specific parameters and as-delivered test results on a specific module, please refer to the corresponding Final Test Report, which is supplied along with each device.
This product represents detection modules category of VIGO System with the following highlights:

- **New material**: detectors based on InAsSb semiconductor material means no more Mercury or Cadmium, resulting in a RoHS compliant device.
- **Compact**: the integrated amplifier fits inside a TO8 package.
- **Versatile**: the module can be delivered as sealed TO8 package, non-sealed mounted on a TO8 header, or as a PCB module ready for implementation on a larger circuit board or in a custom housing.

Available options:


AM03120


AM03110


AM03100

Precaution for use

Unpacking

The module is packed in a protective plastic case lined with closed-cell foam. Additionally, the module has a protective sticker covering the window which must be removed before use. The sticker has a pull-tab to assist removal.

Beam power limitations

Damage thresholds, specified as integrated power of incoming radiation:

- For devices 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 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 equation:

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

The AM03120-01/02 modules will typically saturate at 10 mW irradiated power (around 2.5 V output signal).

Soldering

The TO8 header pins can be soldered manually. Use a tip temperature of 330°C or below, with contact time limited to 10 seconds.

Powering up

- Supply absolute maximum (V– to V+): 12 V.
- Nominal power supply: –3 V, +3 V.

Protection against electrostatic discharges (ESD)

- The module has reverse biased ESD protection diodes on all inputs. There is an additional clamp between the positive and negative supplies that further protects the device during ESD strikes.
- "Hot-plugging" of the device into a powered socket should be avoided since this can trigger the clamp resulting in larger currents flowing between the supply pins.

Connecting the output

- The module has an output impedance of 50 Ω, but can be connected to both high-Z and 50 Ω equipment.
- Maximum output current: 50 mA.
- The nominal output voltage range is from 0 to 2.5 V (±3 V supply, 50 Ω load).
- The output has thermal short-circuit protection.
- If the output is forced beyond either supply rail, protection diodes will become forward-biased, resulting in high currents and a high probability of damage to the amplifier.

Heat dissipation

The detector and active devices on the component side of the PCB will dissipate heat through thermal vias in the PCB and into the TO8 header base, as well as through copper planes and tracks connected to the TO8 header pins. The total thermal dissipation is on the order of 100 mW, and no special heatsinking efforts are necessary in normal operation.

Operating environment

The normal operating conditions are given by:

- Humidity 10 – 80%.
- Temperature 0 – 40ºC ambient.

Uncooled detection module's parameters exhibit a temperature-dependence as specified in the table below:

Parameter	Temperature	
	0°C	40°C
Cut-off wavelength $\lambda_{cut\text{-}off}$	c.a. –0.14 µm	c.a. +0.18 µm
Detectivity D* (λ_{peak})	c.a. +100%	c.a –50%
Voltage responsivity R_v (λ_{peak})	c.a. +18%	c.a. –24%

Storage

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

- Store in dark place, 10% to 90% humidity and –20ºC to 50ºC temperature.
- Avoid exposing to the direct sunlight and strong UV/VIS light as this may result in degradation the module performance.

Glossary of terms used in the Datasheet and the Final Test Report

Active element material InAsSb
Indium Arsenide Antimonide is variable band gap alloy used for fabrication of photodetectors with tunable spectral response.

Active area A, mm×mm
The physical area of a photosensitive element, the active region that converts incoming optical radiation into electric output signal.

Cut-on wavelength $\lambda_{cut\text{-}on}$ (10%), µm
The shorter wavelength at which a detector responsivity reaches 10% of the peak value.

Peak wavelength λ_{peak}, µm
The wavelength of detector maximum responsivity.

Cut-off wavelength $\lambda_{cut\text{-}off}$ (10%), µm
The longer wavelength at which a detector responsivity reaches 10% of the peak value.

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 optical area and a 1 Hz bandwidth. Stated values is given for a peak wavelength.

Voltage responsivity R_v, V/W
The output voltage divided by optical power incident on the detector. Stated value is given for a peak wavelength.

Low cut-off frequency f_{lo}, Hz
The minimum frequency at which a 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 module gain reaches -3dB of the peak value. f_{hi} of the preamplifier may differ from f_{hi} of the module.

Noise measurement frequency f_0, Hz
Frequency at which output voltage noise density is measured selectively.

Transimpedance K_i, V/A
Current to voltage conversion ratio:

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

Current signal I_{in}, A
Current signal from photodetector when exposed to incident radiant power.

Output noise voltage density v_n, nV/Hz$^{1/2}$
Noise voltage density measured at preamplifier output.

Output impedance R_{out}, Ω
Impedance that appears in series with the output from an ideal amplifier.

Load resistance R_L, Ω
Resistance of the module's load.

Output voltage V_{out}, V
Output signal of the module.

Output voltage offset V_{off}, mV
Constant DC component of the output voltage.

Noise equivalent power NEP, nW/Hz$^{1/2}$
The incident power on the detector generating a signal output equal to the noise output. Stated another way, the NEP is the signal level that produces a signal-to-noise ratio (SNR) of 1. Stated value is given for a peak wavelength.

Power supply input +V_{sup} and –V_{sup}, V
Supply voltage required for correct module operation.

Power supply current I_{sup}, mA
Supply current consumption during correct detection module operation.

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

Ambient operating temperature T_a, °C
Ambient temperature during test measurements.

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

Service and contact
If you need any assitance with using our products, please contact VIGO Technical Suport Team techsupport@vigo.com.pl or our Distributors.