AM03100-02

PRELIMINARY DATASHEET

Infrared detection module with an integrated differential amplifier

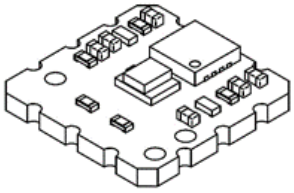

FIGURE 1. The AM03100-02 detection module

FEATURES

- Spectral range: 1.7 to 5.9 µm
- Active area: 1 mm × 1 mm
- Bandwidth: DC up to 3.0 MHz
- Single, low-voltage power supply: 3.0 V
- Differential output
- Small dimensions: 10 mm × 10 mm
- III-V material
- Low weight: 0.3 g

APPLICATIONS

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

GENERAL DESCRIPTION

The AM03100-02 is a cost-effective infrared detection module designed for high-volume applications. The detection structure is optimized for wavelengths up to 5 µm. The built-in differential amplifier provides high immunity to electromagnetic interference. 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. Small dimensions and solderable PCB provide easy mechanical integration with the target device.

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CONNECTIVITY

AM03100-02 has a form of PCB with 12 solderable pads on the sides of the PCB. The description of pins and pins ordering are shown in TABLE 2, FIGURE 2 and FIGURE 3.

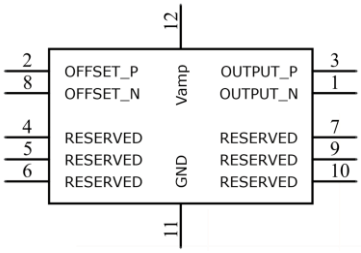

FIGURE 2. Pinout of the module connector

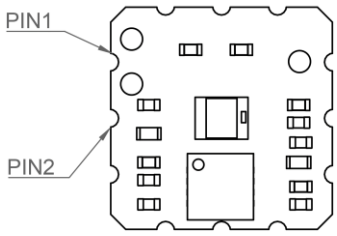

FIGURE 3. Pins ordering on the module connector

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
Amplifier supply, V_{amp}	+5.5 V
OFFSET_N and OFFSET_P voltage	-0.1 V to 3.1 V
OUTPUT_P and OUTPUT_N current	70 mA
Ambient operating temperature	-40°C to 65°C, non-condensing
Storage temperature	-50°C to 85°C

TABLE 2. Pin functions

Pin number	Symbol	Function
11	GND	Signal and amplifier supply ground
3	OUTPUT_P	Positive signal output
1	OUTPUT_N	Negative signal output
4, 5, 6, 7, 9, 10	RESERVED	Leave floating
12	V_{amp}	Amplifier supply input, 3.0V to 5.0V[1]
2	OFFSET_P	DC offset calibration for positive signal output. Leave floating if no output offset is required. For more information see the chapter SIGNAL OUTPUTS
8	OFFSET_N	DC offset calibration for negative signal output. Leave floating if no output offset is required. For more information see the chapter SIGNAL OUTPUTS

[1] The detection module is specified for 3.0 V. For higher supply voltages some DC parameters will change, but the module will still operate properly.

SPECIFICATION

+3.0 V supply, T_{amb} = 20°C, R_{load} = 1 MΩ to ground, unless otherwise noted.

TABLE 3. Module specification

Parameter	Test conditions, remarks	Value			Unit
		Min.	Typ.	Max.	
SPECTRAL CHARACTERISTICS					
Cut-on wavelength	At 10% of peak responsivity		1.7		µm
Peak wavelength, λ_{peak}			4.0		µm
Cut-off wavelength	At 10% of peak responsivity		5.9		µm
Responsivity	At λ_{peak}		360		V/W
Detectivity	At λ_{peak}, f = 1 kHz		5.0×10^{8}		cm·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 7		5.5		mW
	5% deviation, see FIGURE 7		5.2		
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 impedance, R_{OUT}	OUTPUT_P and OUTPUT_N, single-ended		0		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 coupling		0		Hz
High cut-off frequency, f_{hi}			3.0		MHz
POWER SUPPLY					
Supply current on V_{amp} and GND pins	R_{load} = 50 Ω		50		mA
OTHER					
OFFSET_N and OFFSET_P input resistance, R_{OFFSET}			3.3		kΩ
OFFSET_N and OFFSET_P input capacitance			100		nF

TYPICAL PERFORMANCE CHARACTERISTICS

+3.0 V supply, T_{amb} = 20°C, R_{load} = 1 MΩ to ground, unless otherwise noted.

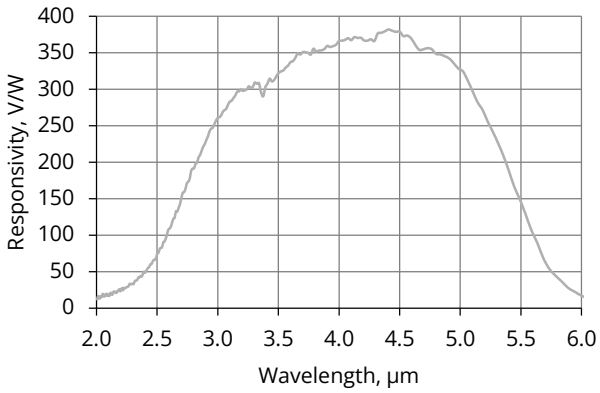

FIGURE 4. Spectral characteristic

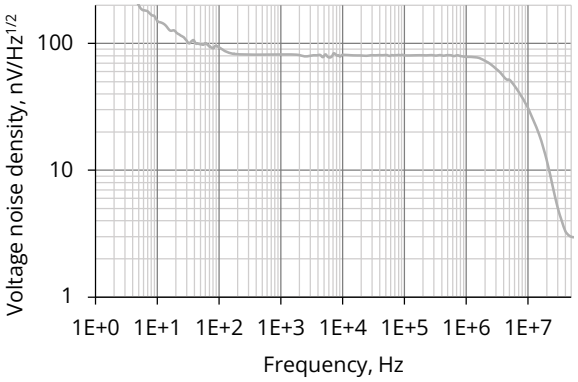

FIGURE 5. Differential output noise density

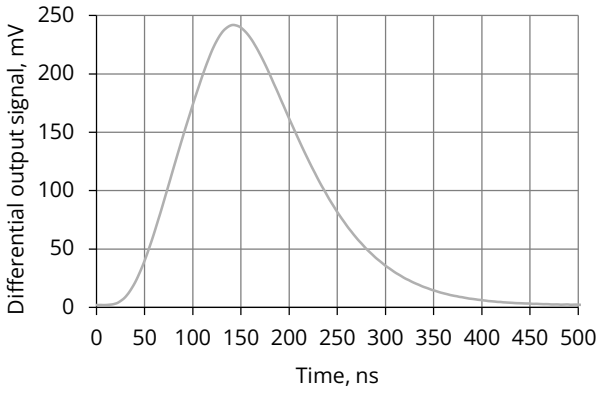

FIGURE 6. Pulse response

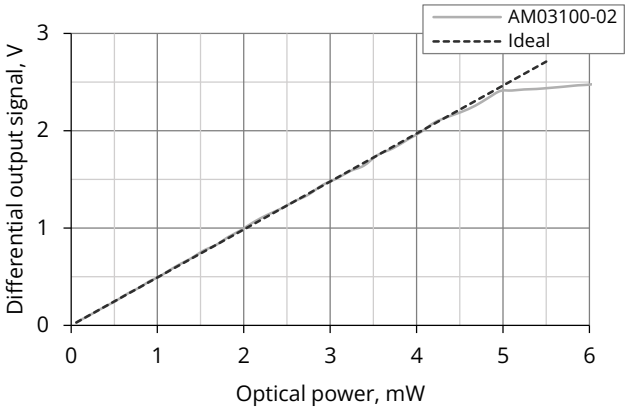

FIGURE 7. Output signal vs input power

POWER SUPPLY

The module can be powered from a single voltage source.
A 1 µF capacitor should be placed close to the supply input.

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 0 Ω. It is recommended to avoid low load impedances to reduce heat generated by the module which can impact the output signal.

The module is designed to keep the DC output offset to as low value as possible. However is 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 using OFFSET_P and OFFSET_N pins, as shown in FIGURE 8.

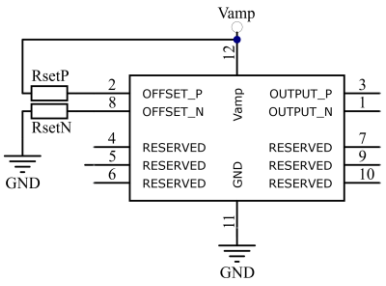

FIGURE 8. Adjusting differential offset of outputs using two resistors. R_{setP} and R_{setN} can be set to 0 Ω for maximum available offset

Connecting OFFSET_P to V_{amp} (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 with maximum 0.1% tolerance.

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

$$V_{DC\_OUTPUT\_P}=V_{CM}-\frac{(V_{amp}-V_{CM})}{R_{OFFSET}+R_{setP}}\cdot 1800\ \Omega \quad (1)$$

$$V_{DC\_OUTPUT\_N}=V_{CM}+\frac{V_{CM}}{R_{OFFSET}+R_{setN}}\cdot 1800\ \Omega \quad (2)$$

WARNINGS

The module is sensitive for electrostatic discharge. Special care should be taken to avoid charge flow through the module.

Do not touch the detection structure or any electronic components. This may lead to the damage of the module.

The module should be soldered manually. Reflow solder is not allowed and can cause irreversible damage

MECHANICAL LAYOUT

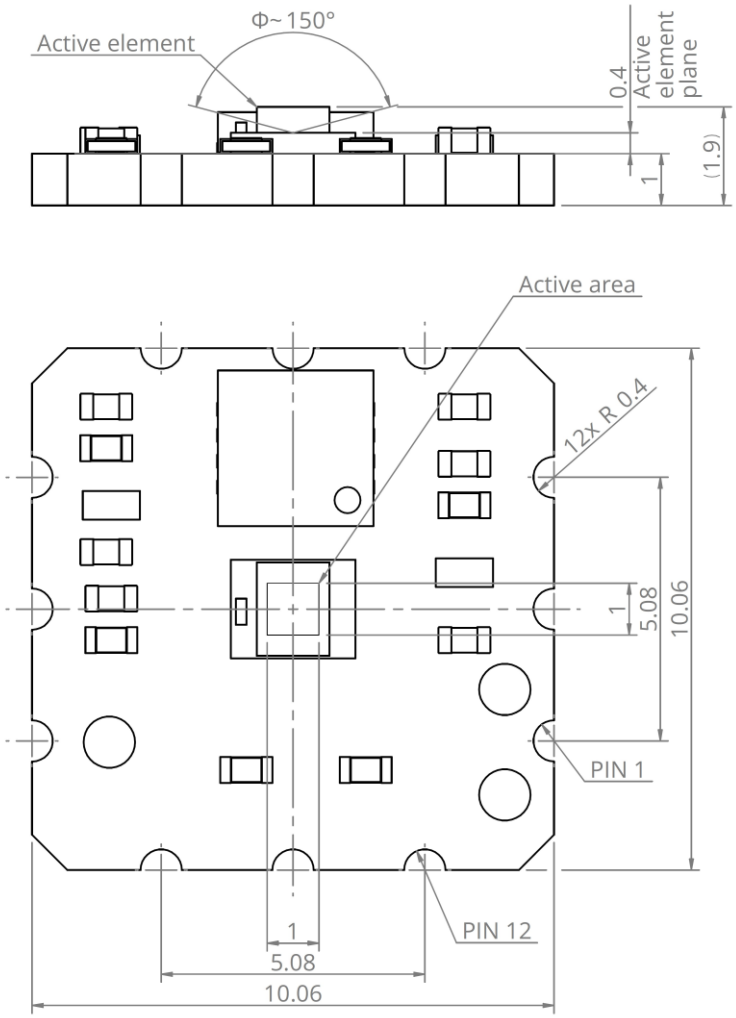

FIGURE 9. Dimensions of the AM03100-02 detectin module (given in mm)

The AM03100-02 detection modules will be delivered in a panel containing up to 20 individual PCBs (FIGURE 10). Separate the PCBs from the panel before use.

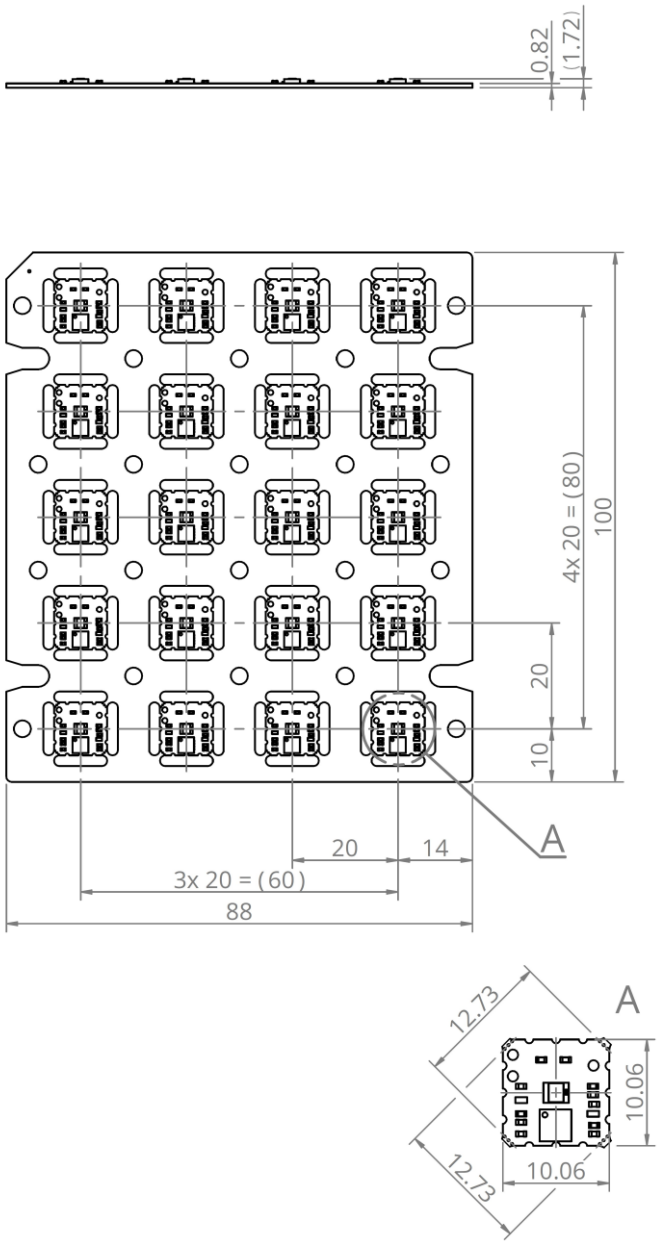

FIGURE 10. Dimensions of the AM03100-02 detection module 5x4 panel (given in mm)