# High Sensitivity InGaAs Avalanche Photodiode Preamplifier Module


CMC Electronics' 264-339836 series use an InGaAs APD with a low ionization ratio of 0.2, featuring a built-in preamplifier tuned for remarkably high sensitivity in the most demanding sensing applications, thereby enabling optimum signal-to-noise performance.

The APD is coupled to a GaAs FET input trans-impedance amplifier in a 12-lead TO-8 package. The internal temperature can be monitored via an embedded thermal sensor located close to the APD. The module is designed with a 10 Ω output impedance and can be AC- or DC-coupled.

Customizations such as bandwidth selection, NEP screening, responsivity optimization and packaging are available to fit your system design needs.

## Features

- 200 µm InGaAs APD
- 1 MHz Preamplifier Module
- Spectral Response: 1050 - 1600 nm
- Low k-factor InGaAs APD
- Low Noise Equivalent Power (NEP)
- Fast Overload Recovery Circuitry
- High Sensitivity
- Hermetically Sealed TO-8 Package
- ITAR-free
- ROHS compliant
- Optional: Fiber Receptacle

## Applications

- Fluorescence
- Instrumentation
- Remote Sensing

## Table 1. Electro-Optical Characteristics for 200 µm Active Area (-VAR)

**Unless otherwise specified: $T_A$ = 25°C, V+ = 5 V, V- = -5 V, $R_L$ = 100 Ω, λ = 1570 nm ± 10 nm (Externally AC coupled through 4.7 µF)**

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Operating Voltage, $V_{OP}$ (Note 1) | 40 | 54 | 85 | V |
| Temperature coefficient of $V_{OP}$ | | 0.07 | | V/˚C |
| Responsivity | | 100 | | MV/W |
| Noise equivalent power (Note 2) | | | | |
| 1570 nm [ $T_{case}$=25 °C ] | | 30 | | fW/√Hz |
| 1570 nm [ $T_{case}$=85 °C ] | | 90 | | fW/√Hz |
| Output impedance | | 10 | | Ω |
| Bandwidth | 0.7 | 1 | | MHz |
| Rise time (10-90 %) | | 350 | | ns |
| Fall time (90-10 %) | | 350 | | ns |
| Linear output voltage swing (Pulse) | 1.5 | 2.5 | 4.0 | V |
| Output offset voltage | -0.75 | -0.45 | 0 | V |
| Thermal sensor (1N914 diode) (Note 3) | | | | |
| $I_f$ of 5 mA at 25°C | | 645 | | mV |
| Sensor sensitivity | | -1.9 | | mV/°C |
| Overload recovery for optical power input signal: 1 mW, 20 ns pulse width: | | | | |
| $V_{out}$ → 200 ns after pulse start | | | 125 | mV |
| $V_{out}$ → 1 µs after pulse start | | | 20 | mV |
| Hybrid Supply current V_POS (pin 10) | 25 | | 35 | mA |
| V_NEG (pin 11) | -20 | | -10 | mA |

**Notes:**
1. Each APD receiver will have its individual $V_{OP}$ (provided on its production tests report).
2. NEP values for 85°C are by design and are for reference only. No test values provided on individual test reports. Integration of the noise calculation is based on minimum bandwidth.
3. Alternate thermal sensors (IC sensors or thermistance) are available upon request.
4. Not tested on all units.

## Table 2. Absolute-Maximum Ratings, Limiting Values

| Parameter | Min. | Max. | Units |
|---|---|---|---|
| APD breakdown, Maximum voltage [ HV_POS (pin 4) ] (Note 1) | | 90 | V |
| Recommended overcurrent limit | | 100 | µA |
| Input Voltage Positive Supply [ V_POS (+5 V) (pin 12) ] | +4.8 | +6.0 | V |
| Input Voltage Negative Supply [ V_NEG (-5 V) (pin 3) ] | -4.8 | -6.0 | V |
| Maximum Optical Power, CW | | 10 | µW |
| Peak value, 20 ns pulses < 100 Hz | | 100 | kW/cm² |
| Temperature sensor fixed input current between Sensor $V_{in}$ → TSensor ANODE (pin 8) Sensor output → TSensor CATHODE (pin 9) | 1 | 10 | mA |
| Operating Temperature | -40 | 85 | °C |
| Storage Temperature | -55 | 125 | °C |
| Soldering Temperature (5 s, leads only) | | 250 | °C |

**Note:** 1. Absolute maximum over the product Temperature Operating Range (-40°C to +85°C).

**Figure 1. CMC 264-339836 Series block diagram**

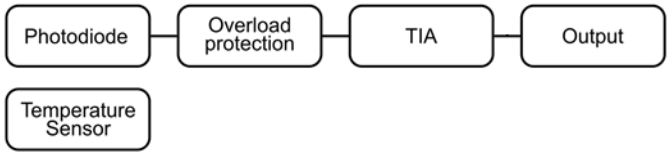
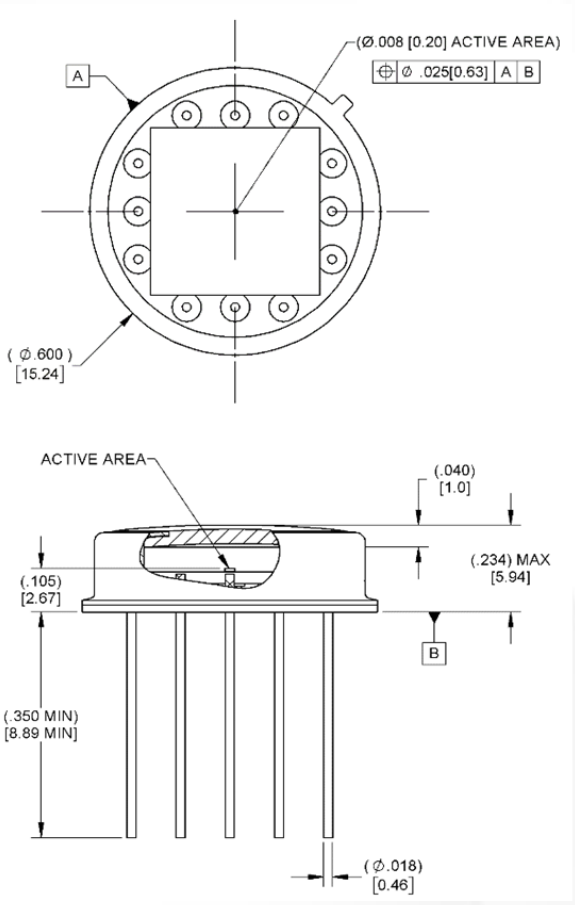
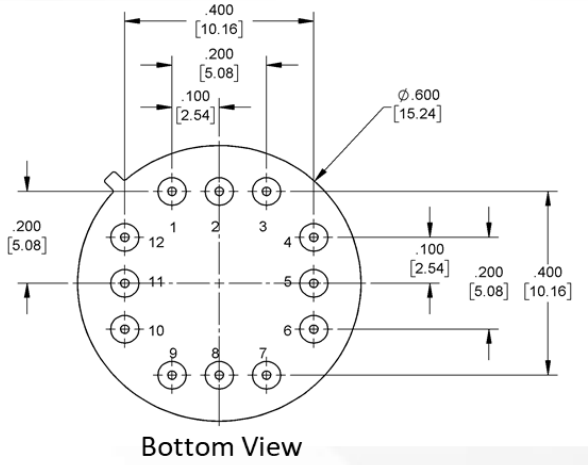



**Figure 2. Package Dimension and Pinout**

**Unless otherwise specified, dimensions are in inches (mm) and are for reference only.**




Bottom View

| | | | |
|---|---|---|---|
| 1 | OUTPUT | 7 | GND |
| 2 | NC | 8 | TSensor ANODE |
| 3 | V_NEG (-5V) | 9 | Tsensor CATHODE |
| 4 | HV_POSITIVE | 10 | GND |
| 5 | NC | 11 | NC |
| 6 | GND | 12 | V_POS (+5V) |

## VAR Options

| | |
|---|---|
| -VAR | InGaAs APD 200 µm, 1 MHz TIA |

**For more information, visit www.cmcelectronics.ca/optoelectronics**
**Or email us at opto@cmcelectronics.ca**

For information purposes only. To accommodate product improvements, specifications are subject to change without notice.


CMC-MEG-OPTO836-VAR | Datasheet REV 04.2025