



PRELIMINARY

Cooled Negative Feedback Avalanche Diodes (NFAD) –Fiber Pigtailed PNA-308

1. Product Features

- Single photon sensitivity
- SWIR (1000 – 1700nm) response
- High gain and low noise
- Fast response with precise timing

RMY’s PNA-308 NFAD (transferred technology from previous Princeton Lightwave Inc.) is a new type of photon-counting device in a standard three-stage cooled 6 pin TO-8 package, consisting of InGaAs/InP avalanche diode chip with monolithically integrated negative feedback. This integration approach of negative feedback resistor provides stable high-performance single photon response in Geiger mode operation, Leveraging the best-in- class performance of RMY’s single photon avalanche diode (SPAD) technology. RMY’s NFAD has excellent photon-counting capability in the shortwave infrared (SWIR) band, with high internal gain (10^5 to 10^6) and low dark count rate. The detector also has fast response coupled with excellent time resolution. The pigtail is SMF-28 single mode fiber.

2. Applications

- Laser Radar (LADAR) and Ranging
- Optical communications
- Fluorescence measurements
- Environmental analysis
- Biomedical devices

3. Typical Performance Specifications

Operating conditions: device temperature $T = 240$ K; reverse-biased

Parameter Description	Symbol	PNA-308	Units
Detection area dimensions		Ø22	µm
Spectral response range		1020 - 1650	nm
Photon detection efficiency	PDE	Min 10	%
Operating voltage (10% PDE)	V_{op}	70 - 85	V
Dark count rate [1]	DCR	Max 30	kHz
Terminal capacitance	C_t	0.4 typical	pF
Timing jitter [2]	TJ	300 typical	ps
Temperature coefficient of V_{op}	γ	0.1 typical	V/K
Output pulse amplitude [3]	V_{out}	0.5 typical	mV

[1] At PDE = 10%

[2] Single photon level, FWHM

[3] 50Ω termination, depends on PDE

4. Absolute Maximum Ratings

Parameter	Conditions	Max	Units
Forward Current	Continuous Bias	+1	mA
Forward Voltage	Continuous Bias	+1	V
Optical Power	Continuous Wave (CW)	1	mW
Reverse Current	Continuous Bias	-1	mA
Reverse Voltage	Continuous Bias	-(V _b +5)	V
Reverse Voltage	Pulsed (gated operation)	-(V _b +10)	V

Operation beyond maximum ratings may cause permanent device damage.

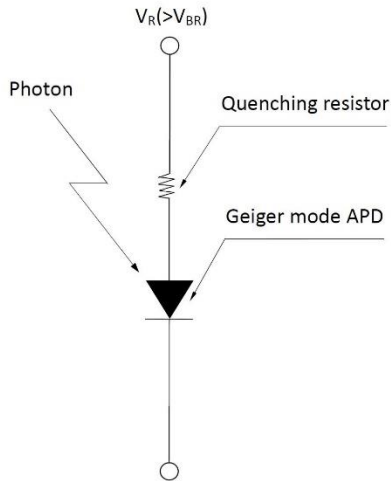
5. TEC Specifications

Parameter	Conditions	Max	Units
TEC Current		1.5	A
TEC Voltage		1.9	V
TEC deltaT	Device case at 298K	77	°C

Thermistor = 2.20KΩ at 298K, 291.75KΩ at 223K

Steinhart-Hart Thermistor Constants: A=1.629E-03; B=2.242E-04; C=4.316E-09

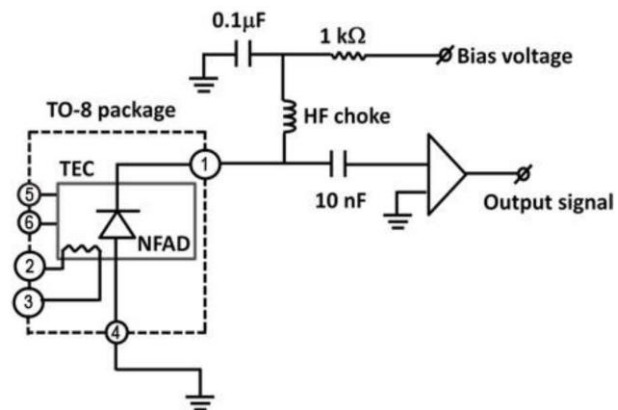
6. Principle Of Operation



V_R : Reverse voltage

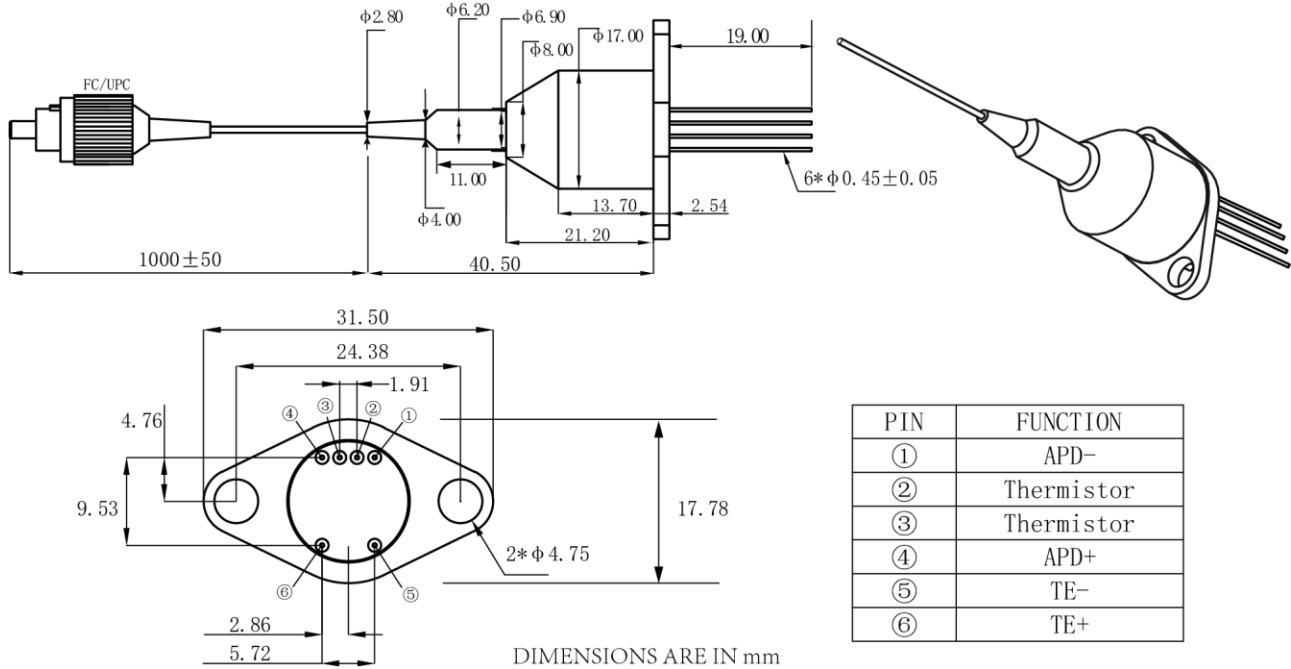
V_{BR} : Breakdown voltage

Typical Application Circuit: PNA-308



7. Mechanical Specifications: PNA-308

The PNA-308 is packaged in a standard 6 pin TO-8 header with a three stage thermo-electric cooler capable of cooling the APD from package temperature of 25°C to -50°C (223K). A single mode fiber (9/125μm) pigtail with an FC/UPC connector is coupled to the APD. Fiber length: 1.0±0.05m



8. Product Handling

Avalanche photodiodes are sensitive to electrostatic discharge (ESD) and should be handled with appropriate caution, including the use of ESD protective equipment such as grounding straps and anti-static mats.

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