PRELIMINARY DATASHEET

Cooled Single Photon Counting Avalanche Photodiode – Fiber Pigtailed

PGA-308

1. Produce Description

The RMY Electronics SPAD is an InGaAs/InP avalanche photodetector (transferred technology from previous Princeton Lightwave Inc.) designed specifically for single photon counting applications. The device is intended for use at pulsed voltage biases above the breakdown voltage (in the so-called “Geiger mode”) so that a single photon incident on the detector will give rise to a macroscopic current pulse. Combined with appropriate pulse detection circuitry, this device allows for the detection of single photons in the wavelength range from 1.0 to 1.6μm.

The RMY SPAD described in this datasheet is a single mode fiber-pigtailed device in a standard three-stage TEC cooled 6 pin TO-8 can, two Geiger mode test reports measured at a low gating rate 2MHz and a high gating rate 100MHz are available.

2. Linear Mode Parameters (T_{OP}=298K, all voltages and currents are reverse biased)

Parameter Description	Test Conditions	Specifications			Unit
		Min	Typical	Max	
Effective Optical Diameter		10		16	μm
Breakdown voltage (V_b)	at I_d = 10μA	50	70	90	V
Temperature dependence of V_b	ΔVb/ΔT, linear approximation		0.1		V/°C
Quantum Efficiency (QE)	1550 nm, M=1 (Linear mode) 1300 nm, M=1 (Linear mode)		60 75		%
Responsivity (R)	1550 nm, M=1 (Linear mode) 1300 nm, M=1 (Linear mode)		0.75 0.75		A/W
Total Dark Current (I_D)	M=10; primarily non-multiplied I_d		0.3		nA
Capacitance (C)	M=10, 1MHz		0.25		pF

3. Low Rate Geiger Mode Parameters (T_{OP}=223K, No blanking)

Test Conditions	Parameter Description	Parameter Definition	PGA-308-TFX		PGA-308-TFZ		Unit
			Min	Max	Min	Max	
2MHz Rate Gating 1550nm 1MHz 0.1Photon/Pulse	Detection Efficiency(DE)	at DCR maximum	20		20		%
	Dark Count Rate(DCR)	at DE minimum		1		0.5	kHz
	Afterpulse Probability(APP)	at DE minimum		0.06%		0.04%	/Pulse

4. High Rate Geiger Mode Parameters (T_{OP}=223K, No blanking)

Test Conditions	Parameter Description	Parameter Definition	PGA-308-TFX		PGA-308-TFZ		Unit
			Min	Max	Min	Max	
100MHz Rate Gating 1550nm 10MHz 0.1Photon/Pulse	Detection Efficiency(DE)	at DCR maximum	20		20		%
	Dark Count Rate(DCR)	at DE minimum		1		0.5	kHz
	Afterpulse Probability(APP)	at DE minimum		4%		2%	/Pulse

5. 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	-(Vb+5)	V
Reverse Voltage	Pulsed (gated operation)	-(Vb+10)	V

Operation beyond maximum ratings may cause permanent device damage.

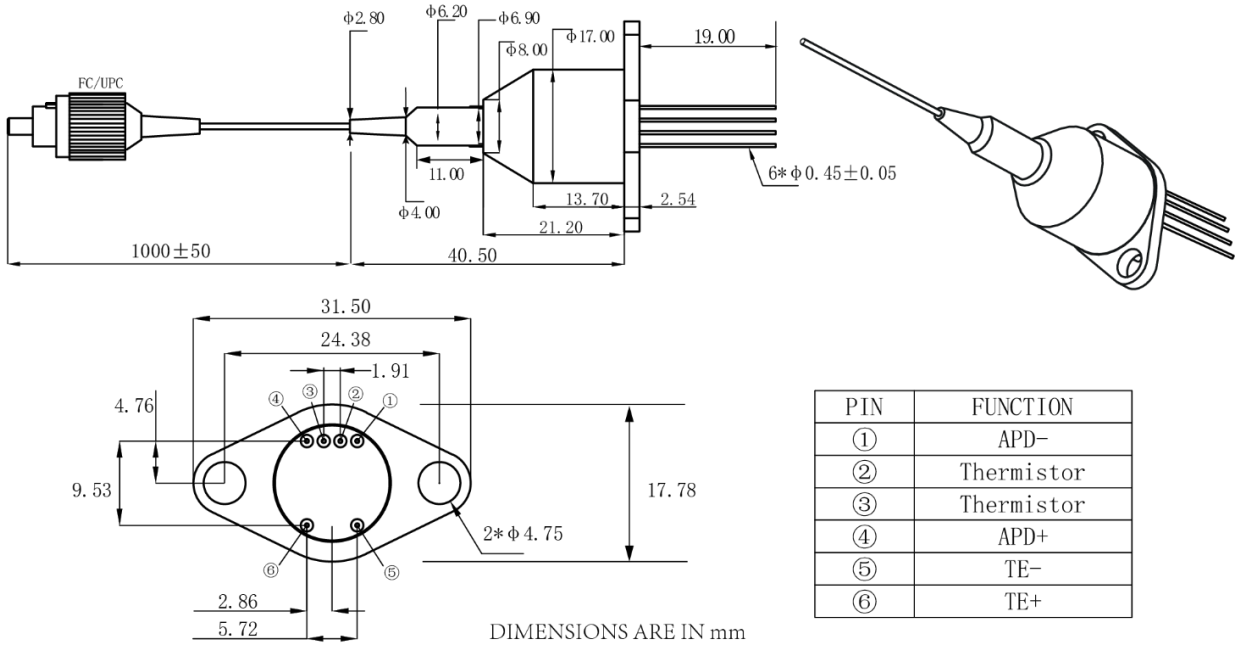
6. TEC SPECIFICATIONS

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

7. Mechanical Specifications

PGA-308 series is packaged in a standard 6 pin TO-8 header with a three stage thermo-electric cooler capable of cooling the SPAD from package temperature of 25°C to -50°C (223K). A single mode fiber (9/125μm) pigtail with a FC/PC connector is coupled to the SPAD.



PIN	FUNCTION
①	APD−
②	Thermistor
③	Thermistor
④	APD+
⑤	TE−
⑥	TE+

8. Product Handling

These 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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