PRELIMINARY

Pigtailed Coaxial Single Photon Avalanche Diode (SPAD)

PGA-314-50

1. Product 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 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 0.95 to 1.65 µm.

The RMY SPAD described in this datasheet is a back-illuminated device with 16µm diameter chip, provided in a SMF-28 single mode fiber pigtailed TO-46 can. Two Geiger mode test reports measured at a low rate 2MHz and a high rate 50MHz (gated mode) are available.

2. Performance Specifications

Linear Mode Parameters

Parameter Description	Test Conditions	Specifications			Unit
		Min	Typ	Max	
Linear Mode Parameters (1550nm, all voltages and currents are reverse biased)					
Breakdown voltage, V_b	case temperature 295 K, I_d = 10 uA	50	70	90	V
Temperature dependence of V_b, γ	$\Delta V_b/\Delta T$, linear approximation		0.1		V/°C
Total Dark Current, I_d	case temperature 295 K, M=10; primarily non-multiplied I_d		0.3		nA
Capacitance, (C)	M=10, 1MHz		0.25		pF

Low Rate Geiger Mode Parameters (Case Temperature=233K, No blanking, 1550nm)

Test Conditions	Parameter Description	Parameter Definition	PGA-314-50		Unit
			Min	Max	
2MHz Repetition Rate Gating, 1550nm 1MHz 0.1Photon/Pulse	Detection Efficiency(DE)	at DCR maximum	20		%
	Dark Count Rate(DCR)	at DE minimum		10	kHz
	Afterpulse Probability(APP)	at DE minimum		0.2%*	/Pulse

* Afterpulse Probability(APP) 0.2%/Pulse is equivalent to $4x10^{-4}$/Trigger

High Rate Geiger Mode Parameters (Case Temperature=233K, No blanking, 1550nm)

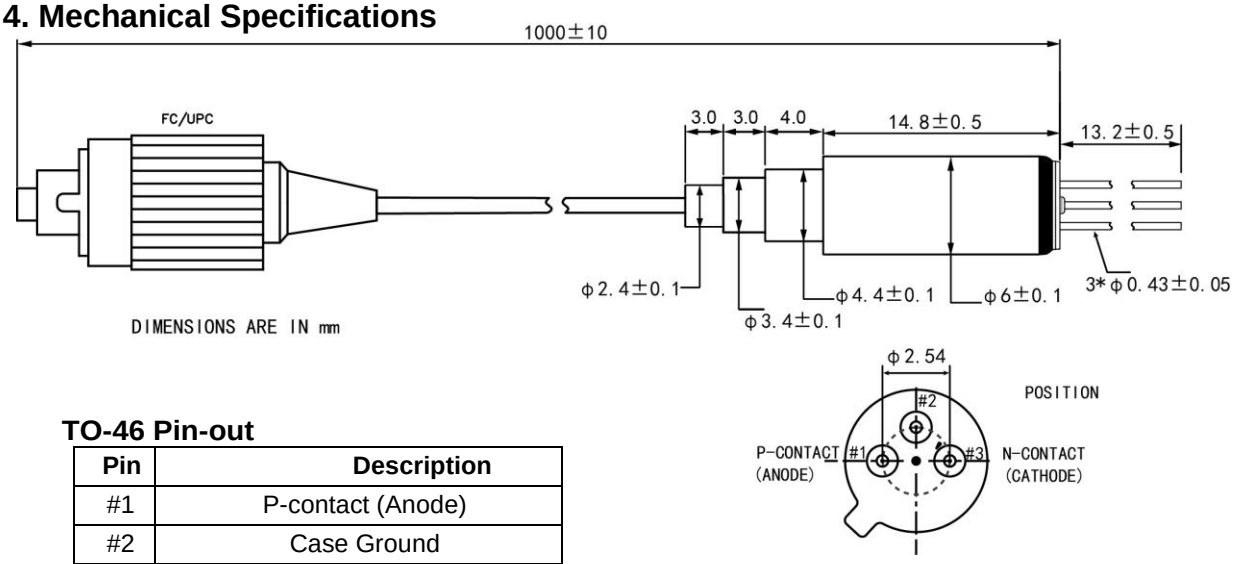
Test Conditions	Parameter Description	Parameter Definition	PGA-314-50		Unit
			Min	Max	
50MHz Repetition Rate Gating, 1550nm 5MHz 0.1Photon/Pulse	Detection Efficiency(DE)	at DCR maximum	20		%
	Dark Count Rate(DCR)	at DE minimum		10	kHz
	Afterpulse Probability(APP)	at DE minimum		10%	/Pulse

3.Maximum Ratings

Parameter	Conditions	Min.	Max.	Units
Forward Current	Continuous bias		+1	mA
Forward Voltage	Continuous bias		+1	V
Reverse Current	Continuous bias		-1	mA
Reverse Voltage	Continuous bias		$-(V_b+5)$	V
Reverse Voltage	Pulsed (gated operation)		$-(V_b+10)$	V
Optical Power	Continuous wave (CW)		1	mW
Case Temperature		-60	65	°C

Maximum ratings indicate conditions that the device can be exposed for short periods of time without damage. Although InGaAs SPADs are sometimes operated at temperatures below -60 °C, these devices have not yet been tested to establish their reliability characteristics at very low temperatures and under extreme conditions of thermal cycling.

4. Mechanical Specifications



TO-46 Pin-out

Pin	Description
#1	P-contact (Anode)
#2	Case Ground
#3	N-contact (Cathode)

5. 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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