Cooled butterfly-packaged SPAD device



Description

LPWBHT-BT10-G High-Temperature Geiger-Mode InGaAs/InP Single-Photon Avalanche Diode (SPAD) is a high-performance optoelectronic device specially designed for single-photon detection and counting in the near-infrared band. It is developed based on an InGaAs/InP heterojunction semiconductor material system and is specially optimized for single-photon detection scenarios over a wide temperature range of 0 °C and above. Under the premise of reducing cooling power consumption and system complexity, it achieves high-efficiency and low-dark-count single-photon signal acquisition, and can meet the stringent technical requirements of high-end fields such as quantum key distribution and weak-light detection.

The device provides a spectral response range covering the 900–1700 nm near-infrared band, offering ultra-high detection sensitivity at the single-photon level. At the same time, the optimized high-temperature-stable design ensures performance consistency over a wide operating temperature range. This not only meets the requirements for compact equipment integration, but also supports long-term stable operation under complex conditions such as outdoor base stations and industrial control environments.

Features

- Low dark count rate at high temperature:<150 cps @ 20% detection efficiency @ -30°C @ 100 MHz
- Supports high-speed gated mode: ≥100 MHz, as well as free-running mode applications
- Back-illuminated, 10-pin butterfly cooled package with FC-PC single-mode pigtail
- High detection efficiency with traveling-wave electrode: >20% with after-pulse probability below 2.5%

Operating Environment

- Operating temperature: -50°C to +80°C
- Storage temperature: -50°C to +85°C

SPAD Device Technical Specifications

Product Part Number	LPWBHT-BT10-G
Operation Temperature	-50~80℃
Storage Temperature	-50℃~+85℃

Optoelectronic Specifications

Parameter		Unit	Test Conditions	Min.	Max.
DC characteristic Te=23±2℃	Breakdown Voltage (Vbr)	V	Ia=10μA	50	70
	Responsivity (Re)	A/W	λ=1.55μm, V=Vbr-2V, Φe=1μW	8	-
	Dark Current (Ia)	nA	V=Vbr-2V, Φe=0	-	1
	Capacitance (Cot)	pF	V=Vbr-2V, f=1MHz	-	0.35
	Temperature Coefficient of Breakdown Voltage (n)	V℃	Top=-40~+ 30℃,I=10μA, Φe=0	-	0.15
Geiger-Mode Characteristics (Top = -30°C)	Photon Detection Efficiency (PDE)	%	0.1ph/pulse, λ=1.55μm	20	-

	Dark Count Rate (DCR)	kHz	fg=100MHz, PDE=20%	–	1.5
	Afterpulse Probability (APP)	%		–	2.5

TEC Specifications

Parameter		Unit	Max.
Performance (323 K / N_2)	△Tmax	K	119
	Qmax	W	0.8
	△Imax	A	2.5
	Umax	V	2.2
	ACR	Ohm	0.78

Absolute maximum rating

Thermistor 5 kS at 25℃

Thermistor Constant A=1.2548E-03,B=2.3738E-04,C=1.3222E-07

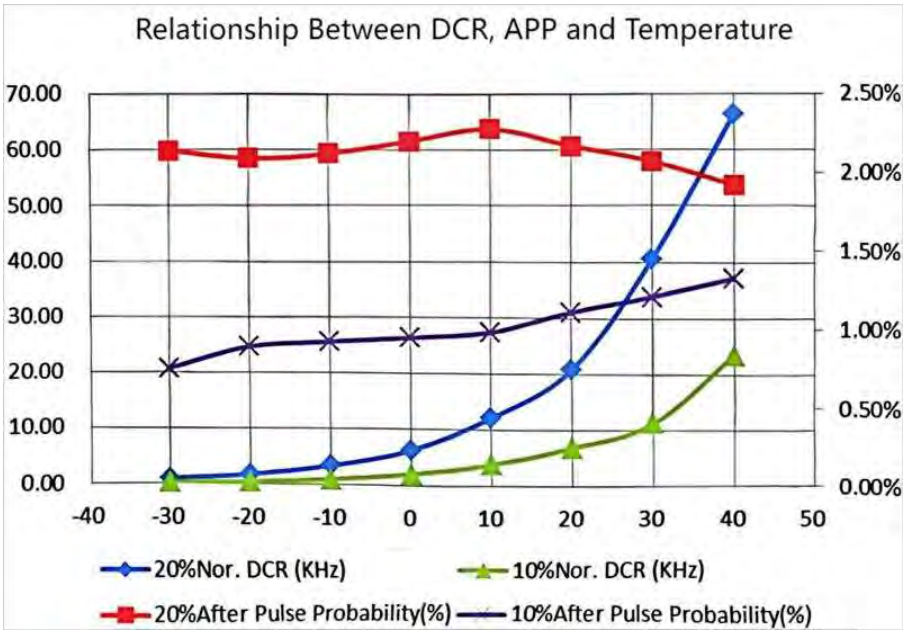
Parameter		Unit	Rated value
Parameter	Soldering Temperature, Tsd (Time)	℃	260(10s)
	DC Reverse Bias Voltage, Vr	V	Vbr
	Excess Bias Pulse Amplitude, Vg	V	10
	Input Optical Power, Φe (Continuous)	mW	1

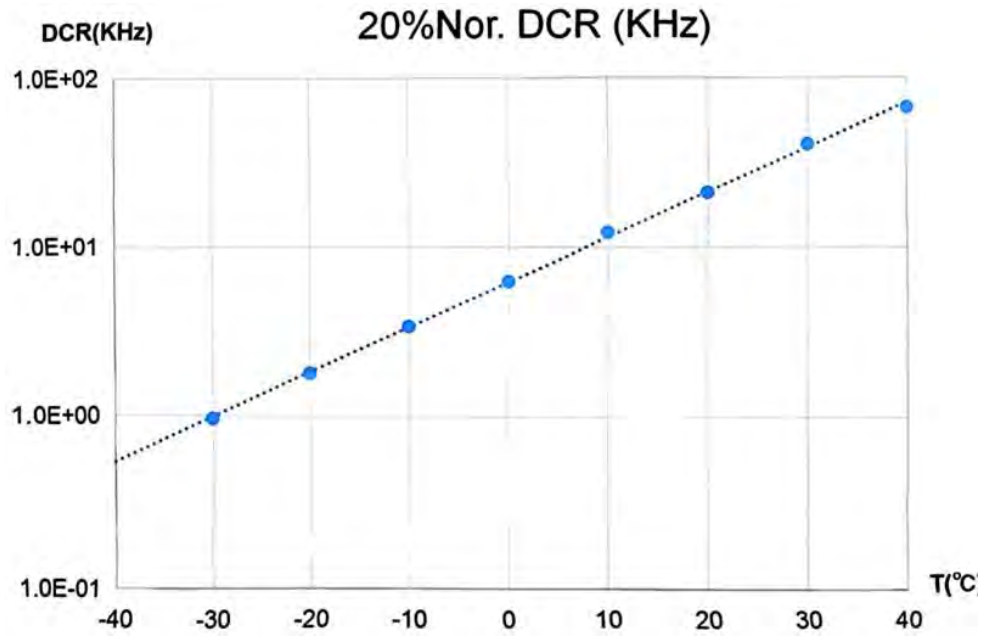
	Forward Current, Ie (Continuous)	mA	1

Mechanical structure

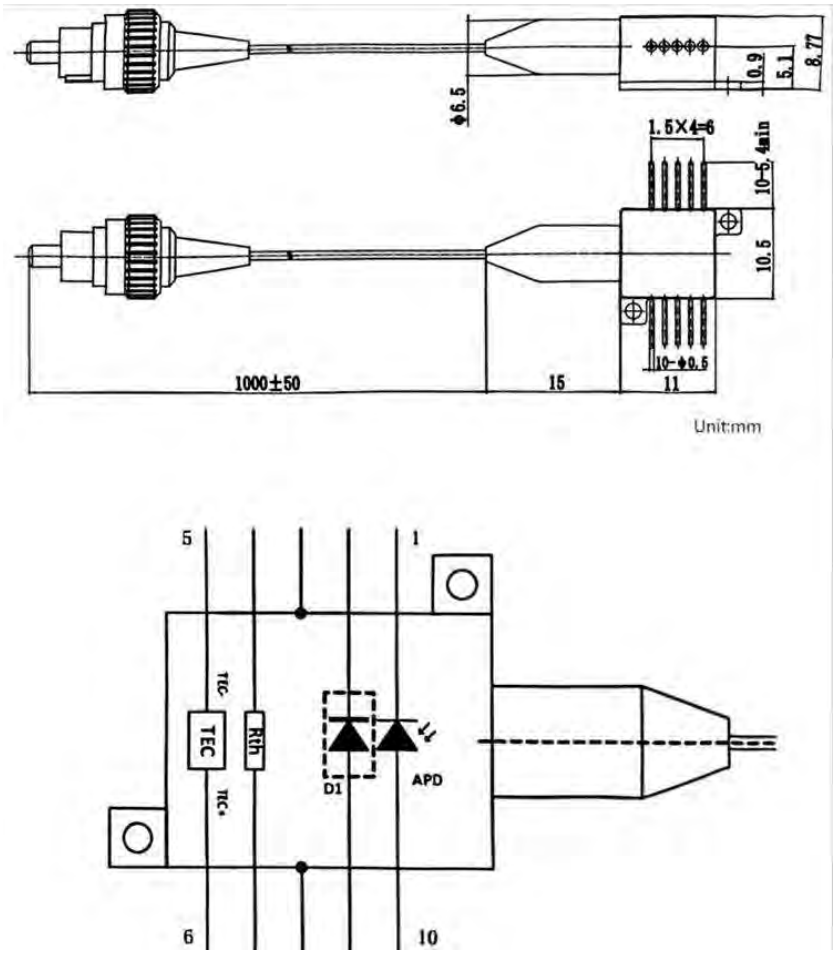
Package structure	Dimensions	mm	1000(L)×10.5(W)×8.77(H)
	Package type	-	Hermetic / Non-Hermetic
Fiber Pigtail	FC-PC Single-Mode Fiber Pigtail		
ESD Test	Standard: MIL-STD-883E, Method 3015.7, Class 1 (≥300 V)		
Product Standards	Compliant with relevant requirements of GJB8119-2013 “General Specification for Semiconductor Optoelectronic Devices”		

Typical curve





Product dimensions



Pin definition

PIN#	Symbol	Description
1	APD_C	APD cathode
2	D1_C	Balance diode cathode
3	GND	Case ground
4	TH1	Thermistor terminal 1
5	TEC−	TEC negative terminal
6	TEC+	TEC positive terminal
7	TH2	Thermistor terminal 2
8	GND	Case ground
9	D1_A	Balance diode anode

Version Description

No.	Version	Revision Date	Revision Content
1	V1.0	2025.12.5	New document added

Application

- Quantum cryptography / Quantum key distribution (QKD)
- Biomedical instrumentation
- Long-range LiDAR systems
- Low-light-level detection applications