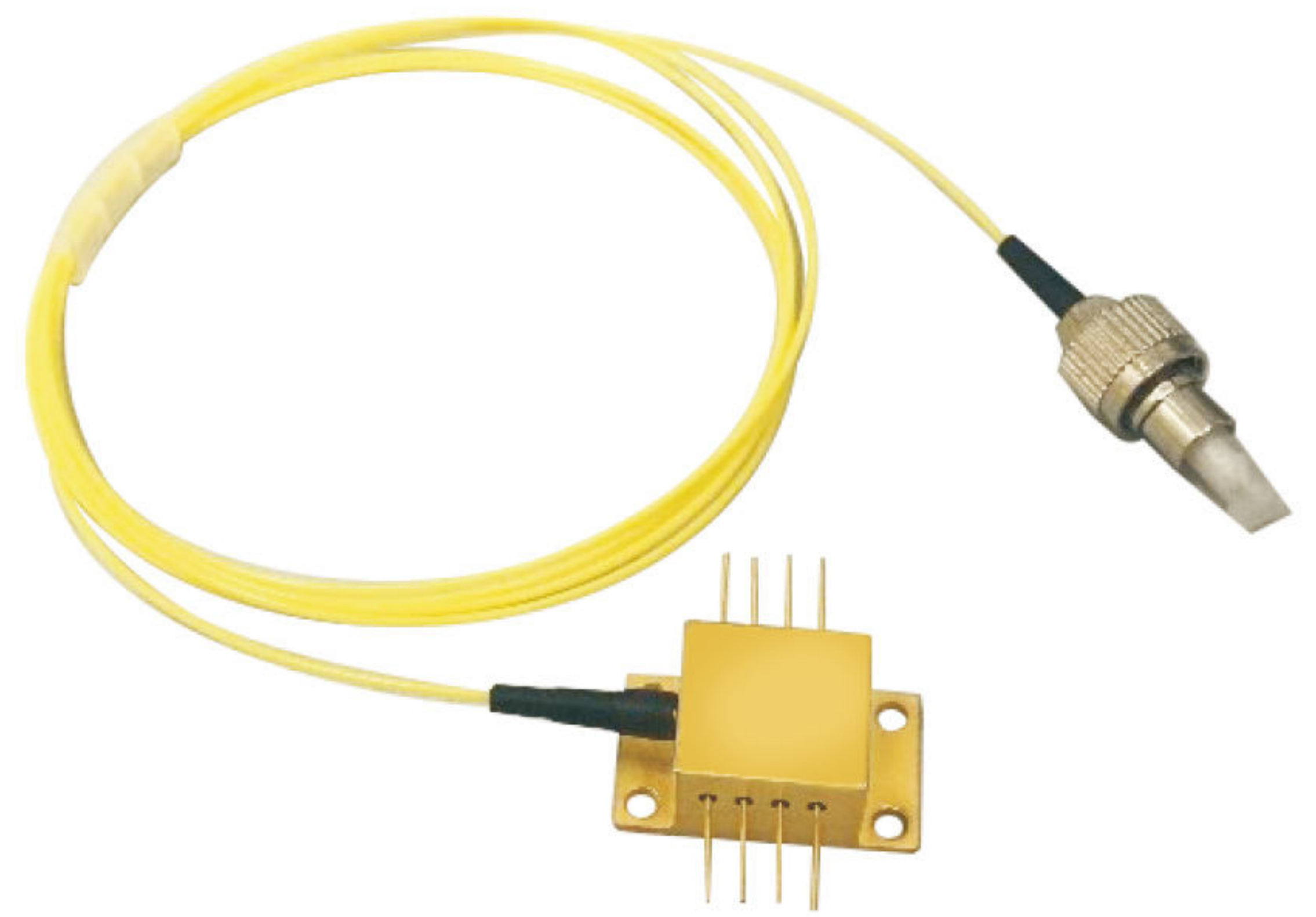


OP400D InGaAs SPAD Detector

Product Features

- Working wavelength: 0.95 μm ~1.65 μm ;
- Designed for single photon detection applications;
- Internal integrated three-stage TEC cooler;
- Butterfly hermetically sealed module with pigtail.



Main photoelectric indicators

Linear mode parameters

Characteristic Parameters	Test conditions (TC=25 \pm 5 $^{\circ}$ C unless otherwise specified)	Minimal	Greatest	Unit
Effective detection surface diameter d	-	25	-	μm
Spectral Response Range	-	950	1650	nm
Reverse breakdown voltage V_{BR}	$I_R=10\ \mu\text{A}, \Phi_e=0$	60	85	V
Responsiveness R_e	$\Phi_e=1\ \mu\text{W}, VR=(V_{BR}-1)V, \lambda Q=1550\ \text{nm}\pm 50\ \text{nm}$	8	-	A/W
Dark Current I_D	$V_{DC}=(V_{BR}-1)V, \Phi_e=0$	-	1	nA
Capacitance C_{tot}	$V_{DC}=(V_{BR}-1)V, f=1\ \text{MHz}$	-	0.2	pF
Temperature coefficient of breakdown voltage η	$T_C=-45\sim+30^{\circ}\text{C}, I_R=10\ \mu\text{A}, \Phi_e=0$	0.10	0.2	V/ $^{\circ}$ C

Geiger model parameters

Characteristic Parameters	Test Condition	Minimal	Greatest	Unit
Single Photon Detection Efficiency PDE	$T_A = -40 \pm 5^{\circ}\text{C}, \mu = 1, f_g = 1.0\ \text{GHz}, f_p = 500\ \text{kHz}, DCR \leq 2.5\ \text{kHz}, \lambda = 1.55\ \mu\text{m}$	10	-	%
Dark Count Rate DCR	$T_A = -40 \pm 5^{\circ}\text{C}, f_g = 1.0\ \text{GHz}, SPDE = 20\%, \lambda = 1.55\ \mu\text{m}$	-	2.5	kHz
Post-Pulse Probability APP (500 ns)	$T_A = -40 \pm 5^{\circ}\text{C}, \mu = 1, f_g = 1.0\ \text{GHz}, f_p = 500\ \text{kHz}, DCR \leq 3.0\ \text{kHz}, SPDE = 10\%, \lambda = 1.55\ \mu\text{m}$	-	4	%
Time Jitter T_J	SPDE=10%	-	300	ps

Note: λ is the wavelength of incident light, T_A is the value of test temperature, μ is the average number of photons per pulse, f_g is the frequency of gating signal, and f_p is the frequency of optical pulse signal.

Absolute maximum ratings and recommended operating conditions

Serial Number	Parameters	Rated Value	
Absolutely Maximum Rating	1	Storage temperature T_{STG}	-50 $^{\circ}$ C~+85 $^{\circ}$ C
	2	Operating ambient temperature T_c	-50 $^{\circ}$ C~60 $^{\circ}$ C
	3	Welding temperature T_{sld} (time)	260 $^{\circ}$ C(10s)
	4	Reverse DC bias voltage V_{DC}	$V_{BR}+5V$
	5	Input optical power Φ_e (continuous)	1mW
	6	Forward current I_F (continuous)	200 μ A
	7	Electrostatic Discharge Sensitivity ESD	$\geq 300V$
	8	Pigtail Tension	3.0N
	9	TEC Voltage	11.9V
	10	TEC Current	0.8 A
Serial Number	Parameters	Rated Value	
Recommendation working conditions	1	APD chip operating temperature T_{th}	-50 $^{\circ}$ C~-30 $^{\circ}$ C
	2	Reverse DC bias voltage V_{DC}	$V_{BR}+1V$ to $V_{BR}+5V$

Typical Characteristic Curve

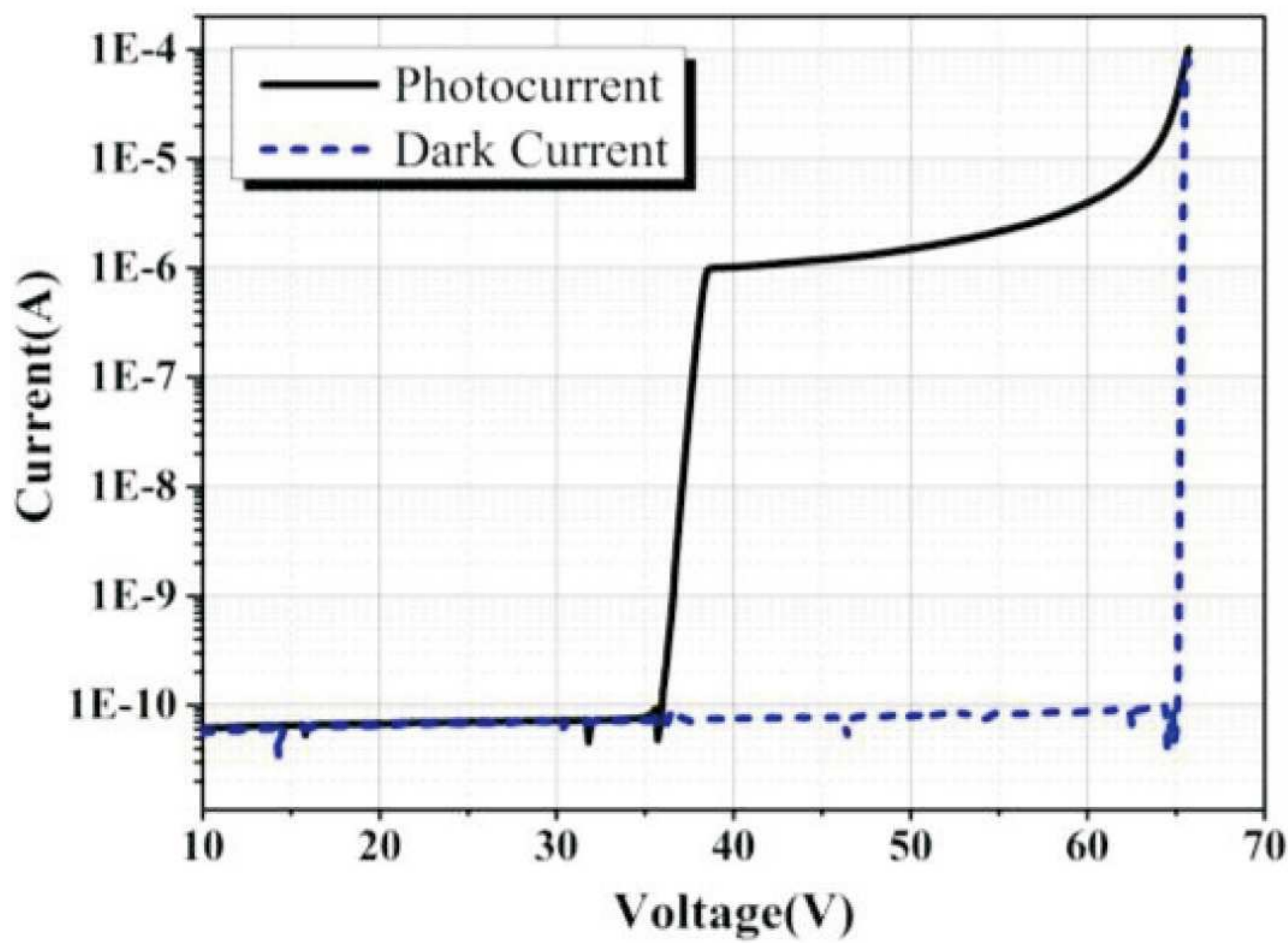


Fig. 1 Photocurrent and dark current curves

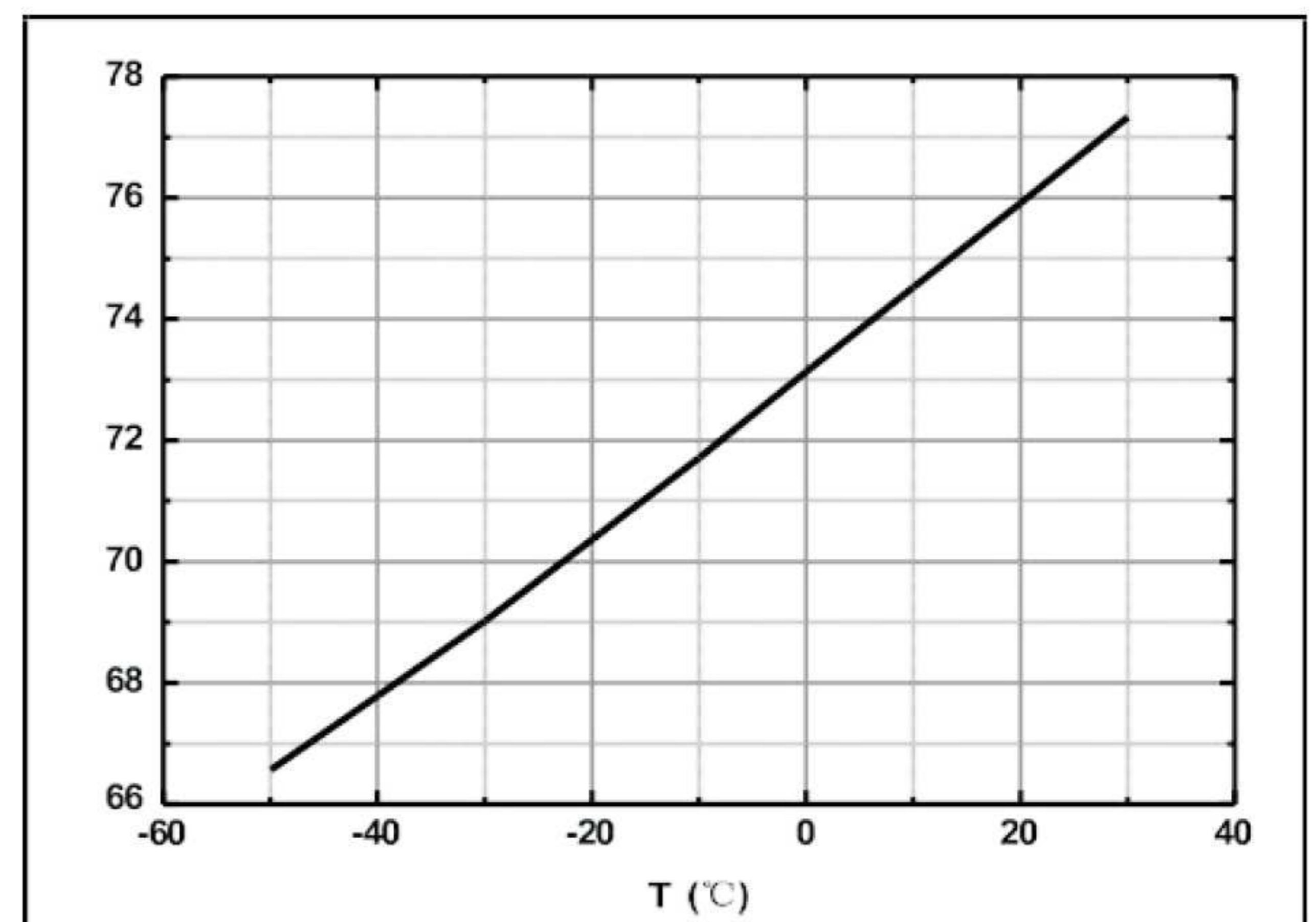


Fig. 2 Temperature coefficient of breakdown voltage

Package form factor, dimensions, equivalent circuitry, and pin definitions (in mm)

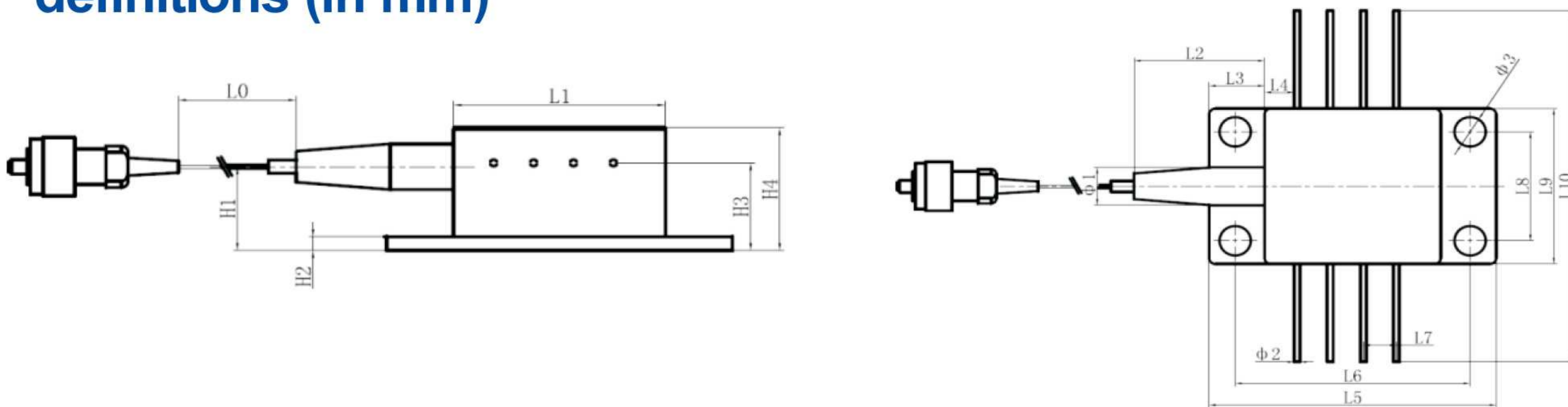


Figure 3 Product form factor

notation	minimum value	nominal value	maximum value	notation	minimum value	nominal value	maximum value	notation	minimum value	nominal value	maximum value
H1	6.0	-	6.6	L2	10.0	-	30.0	L8	8.6	-	9.2
H2	0.8	-	1.2	L3	4.0	-	4.6	L9	12.4	-	13.0
H3	6.1	-	6.6	L4	2.1	-	2.5	L10	28.4	-	29.0
H4	9.0	-	10.5	L5	21.7	-	22.3	φ1	3.0	-	6.6
L0	1000.0	-	-	L6	17.8	-	18.2	φ2	0.35	-	0.50
L1	13.2	-	13.8	L7	-	2.54	-	φ3	2.2	-	2.6

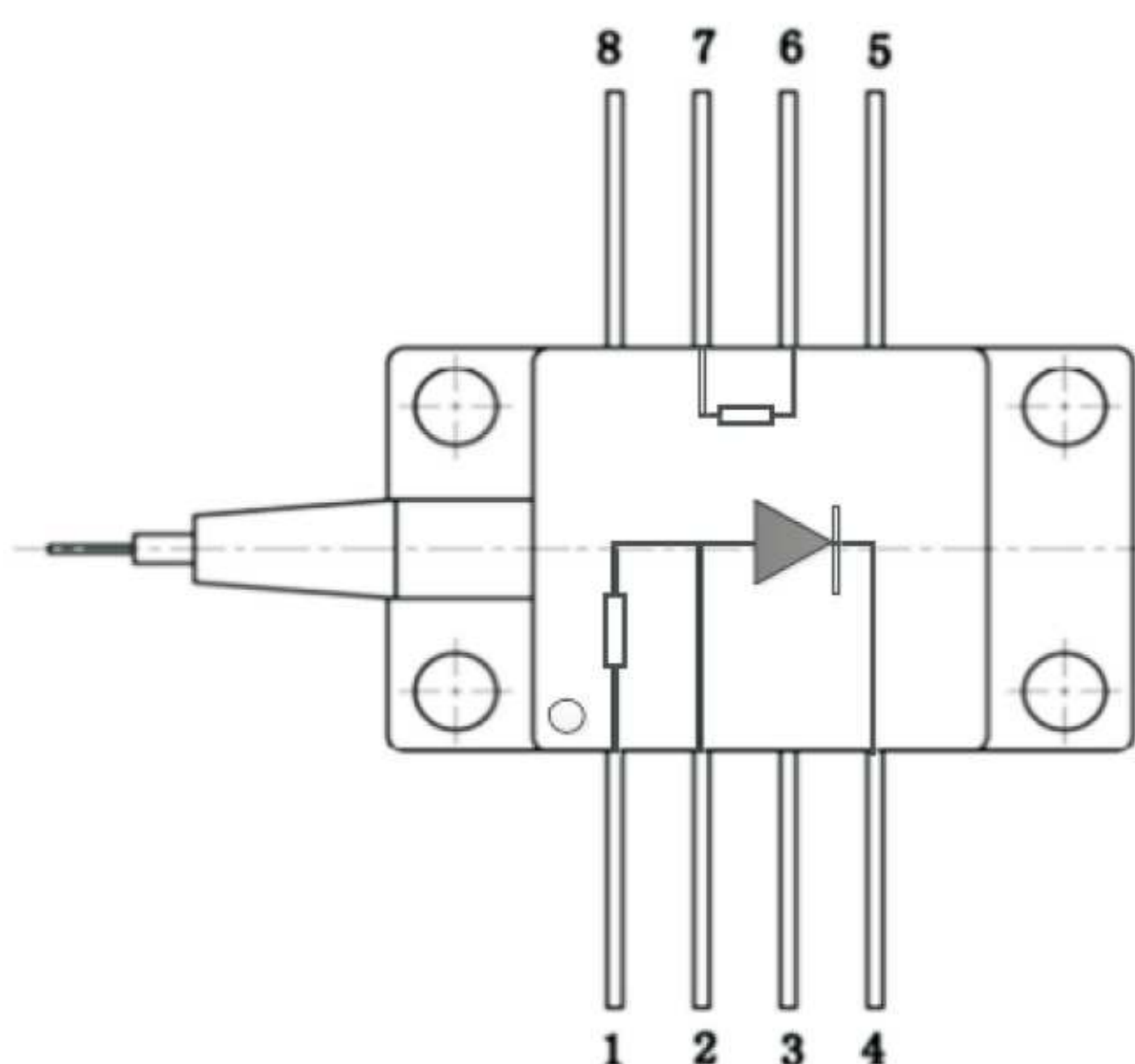


Fig. 4 Pin arrangement and numbering (top view)

Outlet Numbering	Name (symbol)	Outlet Numbering	name (of a thing)
1	Diode P-pole (APD_P)	5	Chiller Negative (TEC-)
2	Signal Sampling End (OUT)	6	Thermistor (R _{th})
3	Not Connected (NC)	7	Thermistor (R _{th})
4	Diode N-pole (APD_N)	8	Chiller Positive (TEC+)

TEC\NTC Electrical Parameters

NTC (Temperature Sensitive Resistor): $R_T = 10k\Omega @ 25^\circ C$, $\beta = 3450$, 5%.

TEC (temperature difference cooler): $I_{MAX} = 0.8 A$, $V_{MAX} = 11.9 V$, $T_{HMAX} = 200^\circ C$.