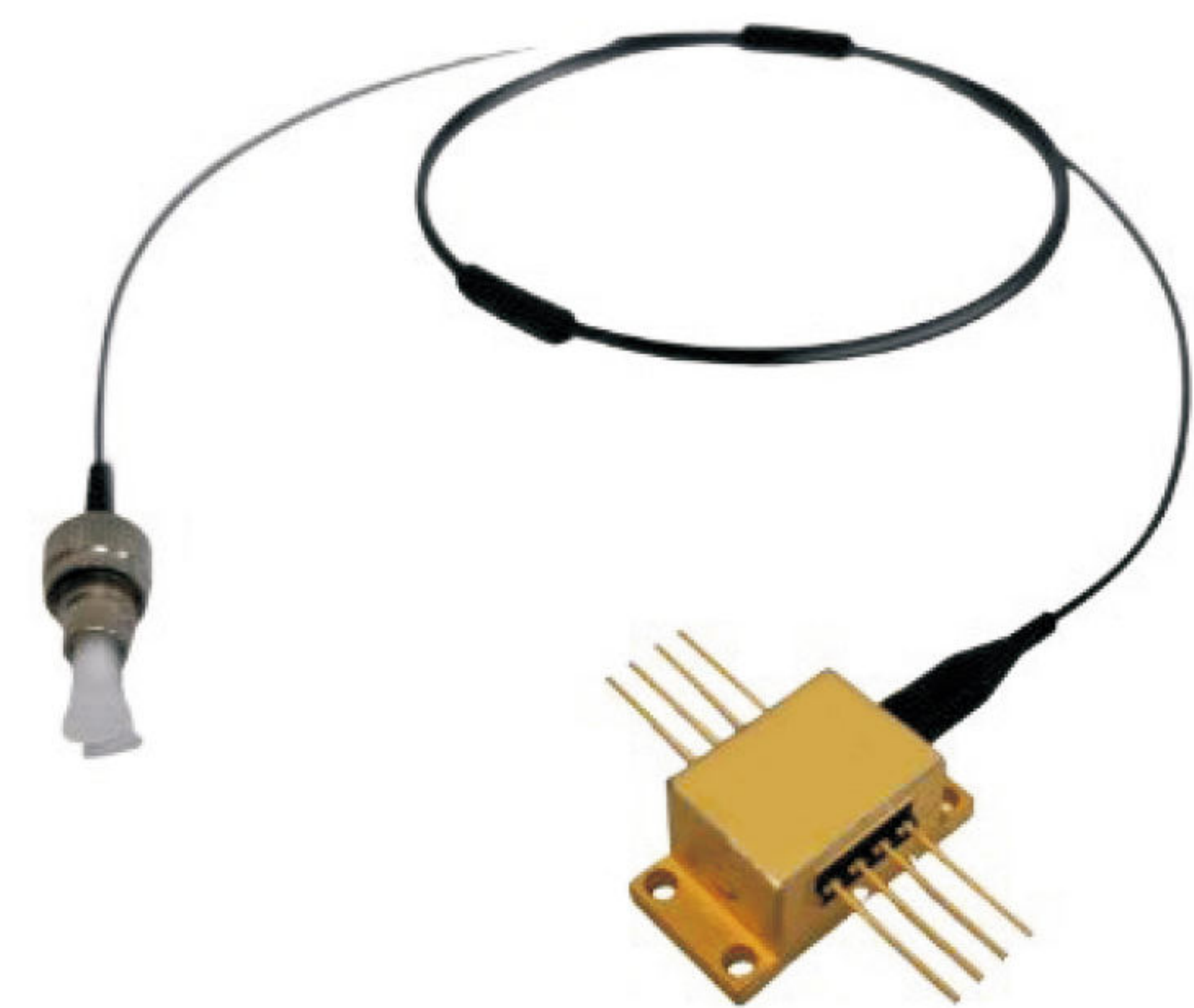


OP410D InGaAs Negative Feedback Avalanche Photodiode

Product Features

OP410D is an InGaAs avalanche photodiode photon counting module with Geiger mode operation, single-photon sensitivity, and monolithic integration of negative feedback resistor. Based on the high gain characteristic of Geiger mode, the product multiplies the detected photon Geiger into macroscopic current; the negative feedback resistor carries out dynamic voltage dividing to realize the self-quenching and self-recovery of the Geiger avalanche electric field in the avalanche photodiode.

OP410D internal integration of NFAD chip, chip capacitors, thermistors, ceramic carriers, thermoelectric cooler and other components, the overall butterfly shell package, metalized fiber optic components coupled to form a hermetically sealed single-channel module. The incoming optical interface is a multi-mode (62.5μm) fiber with FC/UPC connector (0.9mm tight protection tube).



Main photoelectric indicators

Linear mode parameters

Characteristic parameters	Test conditions (TC=25±5°C unless otherwise specified)	Minimal	Greatest	Unit
Spectral Response Range	-	950	1650	nm
Reverse breakdown voltage V_{BR}	$I_R=0.1 \mu A, \Phi_e=0$	60	85	V
Responsiveness R_e	$\Phi_e=1 \mu W, VR=(V_{BR}-1)V, \lambda=1550 \text{ nm} \pm 50 \text{ nm}$	8	-	A/W
Dark Current I_D	$V_{DC} = (V_{BR}-1) V, \Phi_e=0$	-	1	nA
Capacitance C_{tot}	$V_{DC} = (V_{BR}-1) V, f = 1 \text{ MHz}$	-	0.6	pF
Integrated resistor value R_s	$I_F=200 \mu A, \Phi_e=0$	200±50		KΩ
Temperature coefficient of breakdown voltage η	$T_C=-45 \sim +30^\circ C, I_R = 10 \mu A, \Phi_e=0$	0.10	0.15	V/°C

Geiger mode parameters

Characteristic parameters	Test condition (TC=-40±3°C, $f_p=50\text{KHz}$)	Minimal	Greatest	Unit
Single Photon Detection Efficiency PDE	$\lambda=1550\text{nm}$	15	-	%
Dark Count Rate DCR	$PDE=15\%$	-	10	kcps
Post-Pulse Probability APP	$PDE=15\%, \lambda=1550\text{nm}, \Delta t=1\mu s$	-	15	%
Pulse output amplitude V_{out}	$PDE=15\%, R=50\Omega$	0.5	-	ps

Note: λ is the wavelength of incident light, f_p is the frequency of optical pulse signal, and R is the sampling resistance.

Absolute maximum ratings and recommended operating conditions

Serial Number	Parameters	Rated Value
Absolutely Maximum Rating	1 Storage temperature T_{STG}	-50°C~+85°C
	2 Operating ambient temperature T_c	-50°C~60°C
	3 Welding temperature T_{sld} (time)	260°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)	200μA
	7 Electrostatic Discharge Sensitivity ESD	≥300V
	8 Pigtail Tension	3.0N

serial number		parameters	Rating Value
Recommendation	1	APD chip operating temperature T_{th}	-50°C~-30°C
Referral working conditions	2	Reverse DC bias voltage V_{DC}	$V_{BR}+1V$ to $V_{BR}+5V$

Typical Characteristic Curve

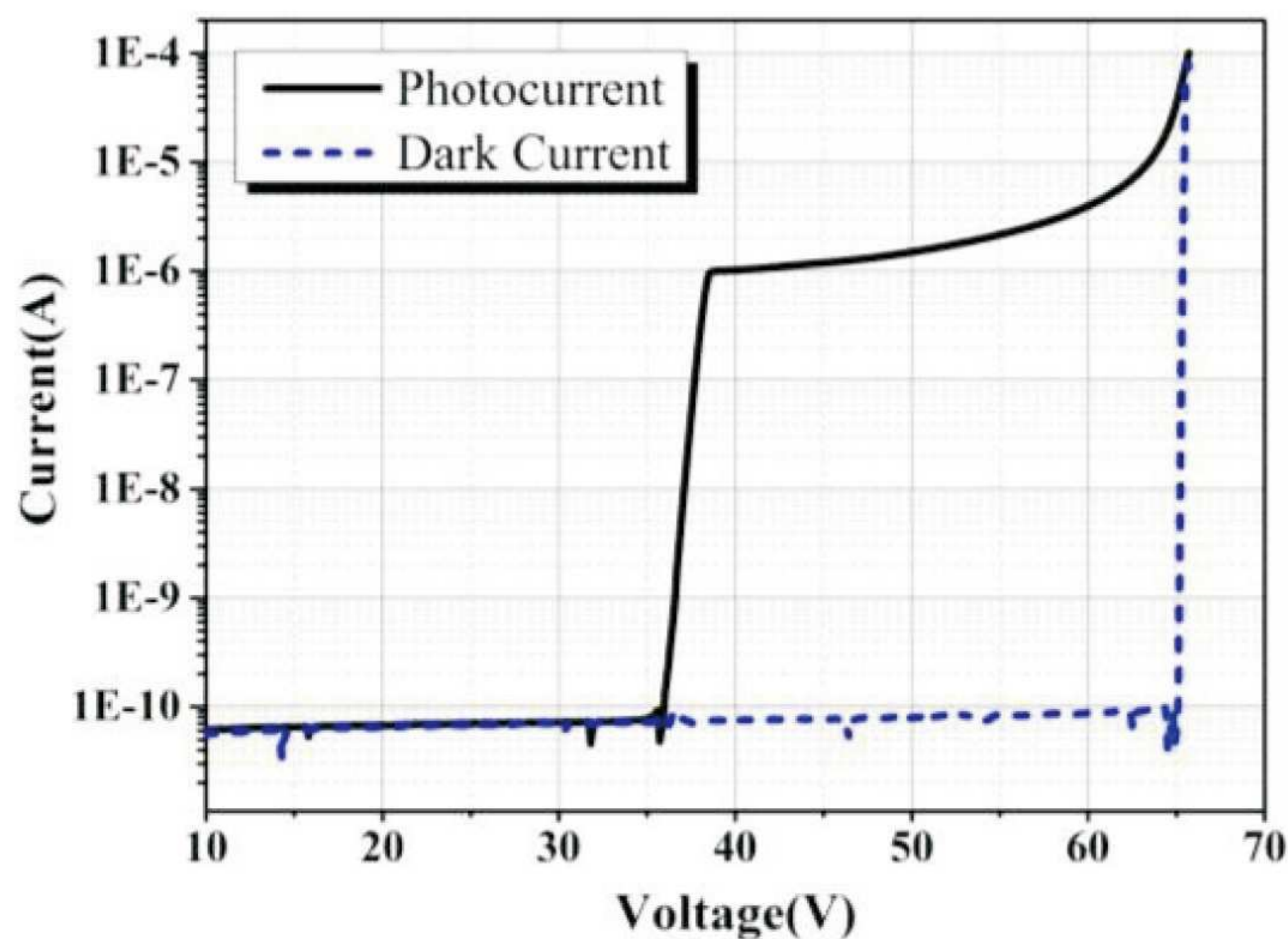


Fig. 1 Photocurrent and dark current curves

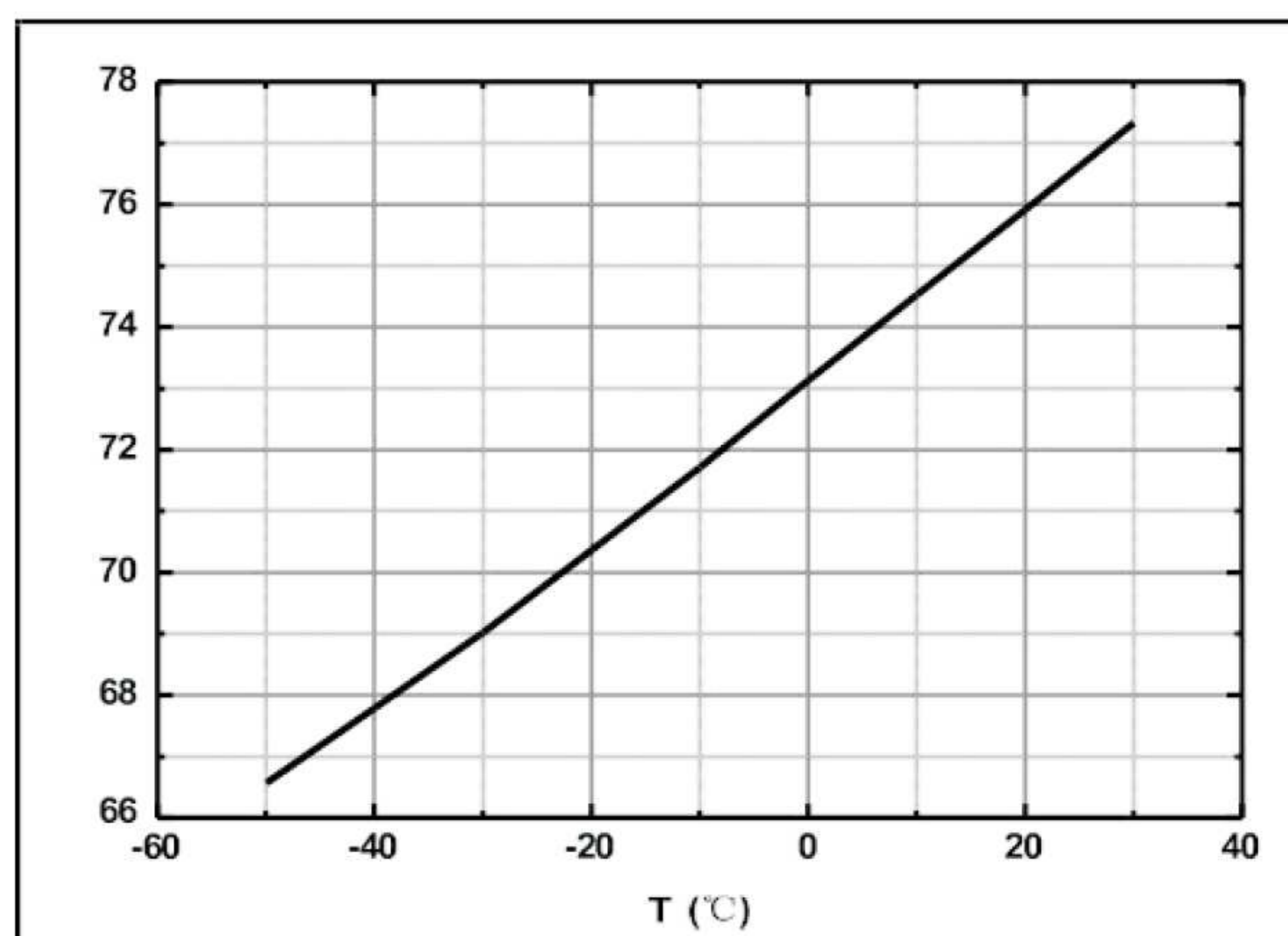


Fig. 2 Temperature coefficient of breakdown voltage

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

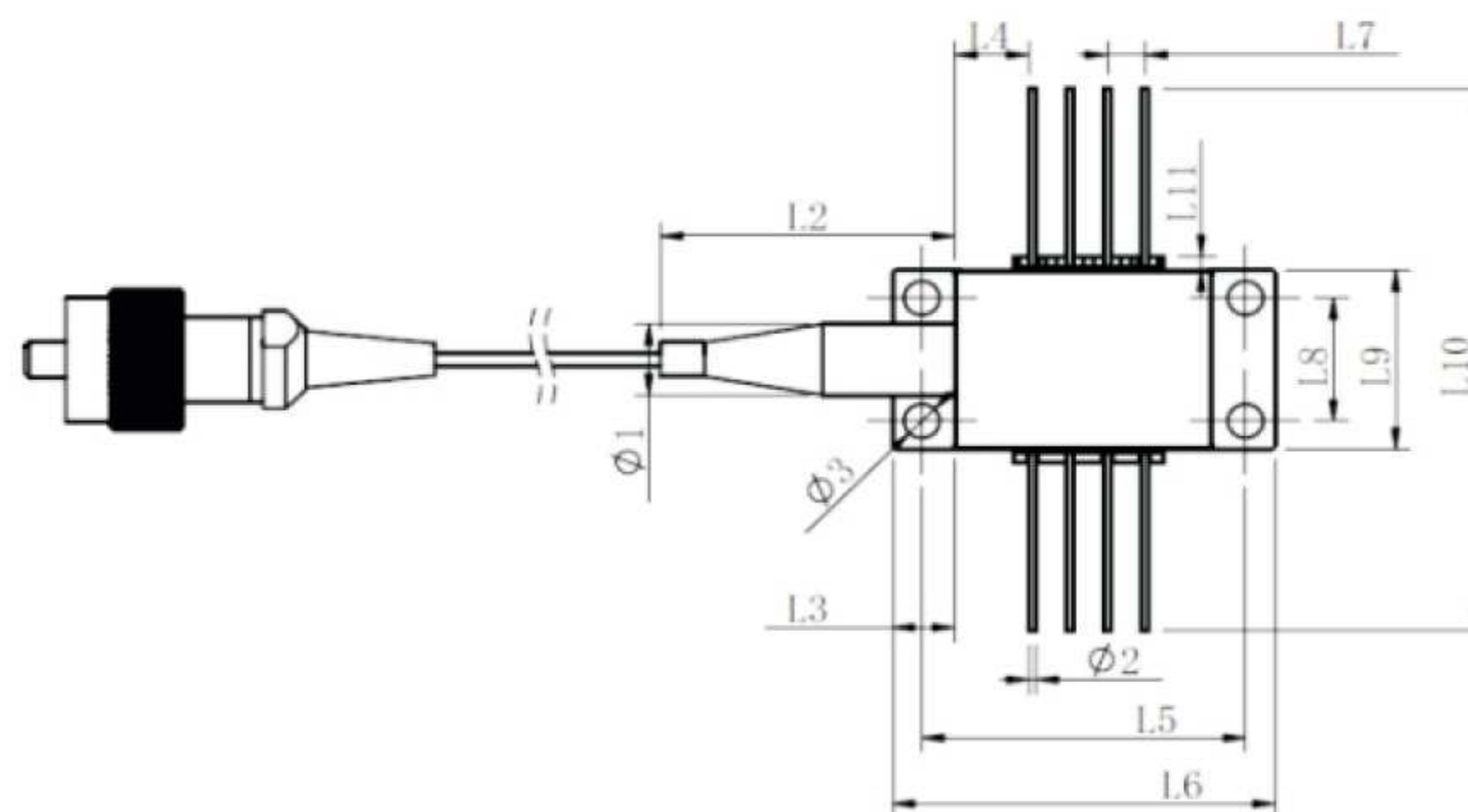
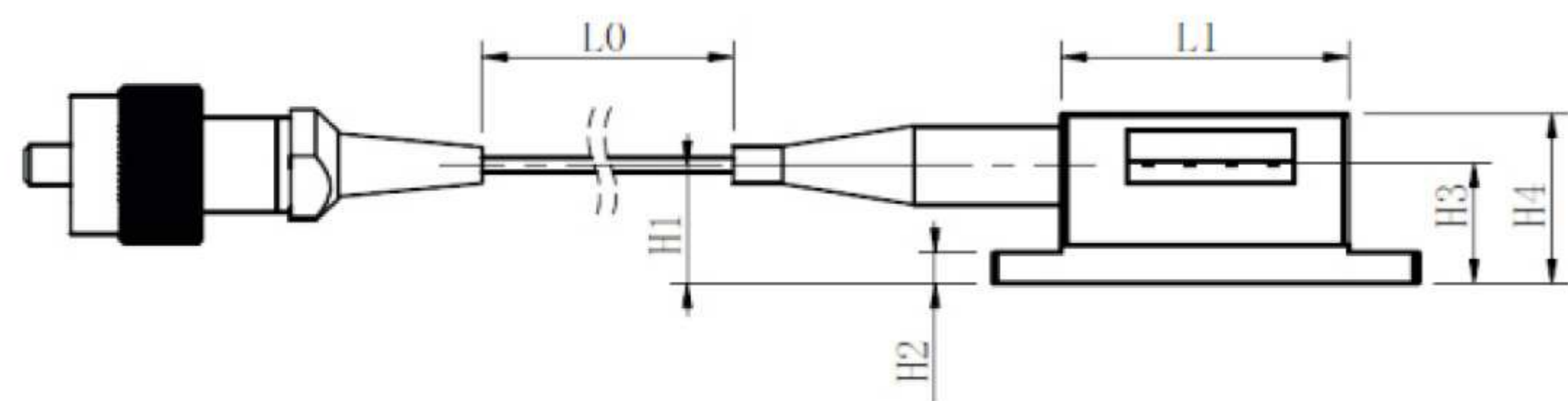


Figure 3 Product form factor

The external dimensions of the product are shown in Table 2.

notation	minimum value	nominal value	maximum value	notation	minimum value	nominal value	maximum value	notation	minimum value	nominal value	maximum value
H1	7.40	7.45	7.50	L2	10.00	13.50	30.00	L8	8.70	8.90	9.10
H2	1.80	2.00	2.20	L3	4.05	4.25	4.45	L9	12.50	12.70	12.90
H3	7.57	7.77	7.97	L4	3.74	3.94	4.14	L10	38.20	38.40	38.60
H4	10.50	10.70	10.90	L5	21.80	22.00	22.20	$\phi 1$	3.00	3.50	6.60
L0	1000.0	-	-	L6	25.80	26.00	26.20	$\phi 2$	0.40	0.50	0.60
L1	17.30	17.50	17.70	L7	-	2.54	-	$\phi 3$	2.20	2.40	2.60

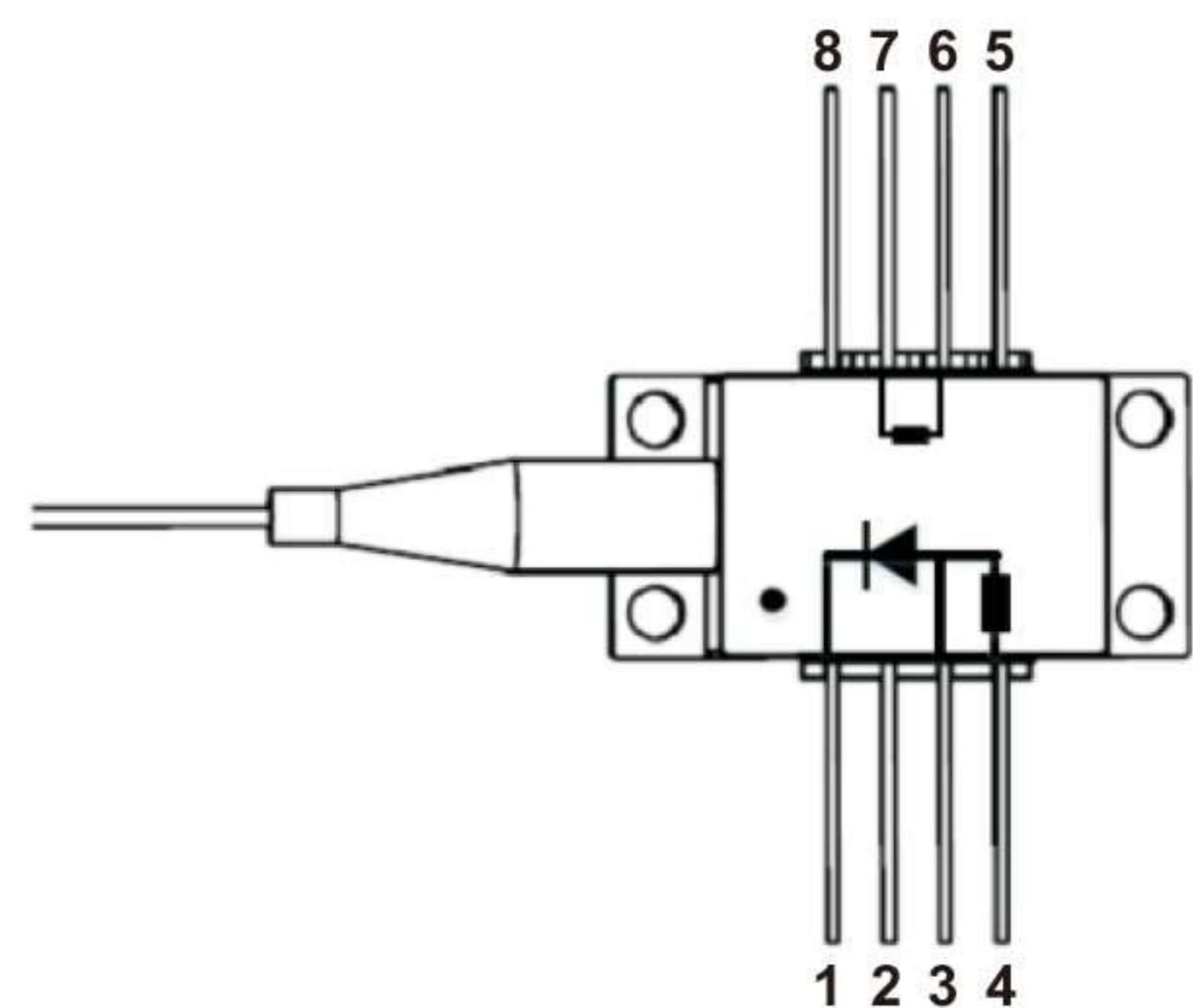


Fig. 4 Pin arrangement and numbering (top view)

Outlet Numbering	Name (symbol)	Outlet Numbering	name (of a thing)
1	Diode N-pole (APD_N)	5	Chiller Negative (TEC-)
2	Shell Ground (GND)	6	Thermistor (R_{th})
3	Diode P-pole (APD_P)	7	Thermistor (R_{th})
4	Signal Ground (DGND)	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): $I_{MAX} = 0.8 A$, $V_{MAX} = 11.9 V$, $T_{HMAX} = 200^\circ C$.