

10G Avalanche Photodiode (APD) Chip

PA009211



The Lumentum APD chip is an indium phosphide (InP) based device designed for high performance telecoms receiver applications up to 11.3 Gbps. The optical signal is received via top illumination of the central active region through a ring shaped contact which provides a 30 μm aperture.

A reverse electrical bias is applied across the active region by the P (anode) and N (cathode) contacts. The circular P bond pad has a diameter of 70 microns suitable for wire bonding.

The APD is suitable for operation at up to 11.3 Gbps at a multiplication gain factor between M3 and M10.

Performance is checked by on wafer testing comprising DC, CV and AC test measurements.

Proven reliability of <1FIT derived from over 40 billion field hours.

Telcordia ESD rating: minimum 500 V human body model.

Key Features

- 400 x 400 x 80 μm size
- Top illumination 30 μm aperture
- High bandwidth
- Excellent responsivity
- 0.2 pF capacitance
- Top side wirebond pads
- Optimized for epoxy attach
- -40 to +85°C operation

Benefits:

- Excellent performance to 11.3 Gbps
- Very high reliability
- Large volume production
- Robust ESD performance
- Full 6/6 RoHS compliance
- Fully Telcordia qualified

Applications:

- Long-haul networks
- Single-mode datacom and telecom
- 10G PON

Optical Characteristics

The following parametric limits detailed are for a case temperature range of 25 ±1°C

Parameter	Conditions	Symbol	Min	Typical	Max	Units
Breakdown voltage	In dark, at $I_d=10\ \mu\text{A}$	V_{br}	-26	-28	-32	V
Dark current	In dark at $V_{br} * 0.9$	I_{d9}			50	nA
3dB Bandwidth at M=10 [1,2]	10 μW incident 1550 nm, $I=100\ \mu\text{A}$	BW_{M10}	6.0			GHz
3dB Bandwidth at M=3 [1,2]	10 μW incident 1550 nm, $I=30\ \mu\text{A}$	BW_{M3}	6.0			GHz
Responsivity [1]	10 μW , 1550 nm	R		1.0		A/W
Responsivity ratio at 1610 nm compared with 1550 nm	At fixed voltage (both at V_{M3} and V_{M10} , $P_{opt} = 10\ \mu\text{W}$, $\lambda=1550\ \text{nm}$) ratio of currents when 1610 nm	R_{1610}/R_{1550}	0.75			
Responsivity ratio at 1300 nm compared with 1550 nm	At fixed voltage (both at V_{M3} and V_{M10} , $P_{opt} = 10\ \mu\text{W}$, $\lambda=1550\ \text{nm}$) ratio of currents when 1300 nm	R_{1300}/R_{1550}	0.70			
Temperature coefficient of V_{br}	-40 to +85°C	dV_{br}/dT	0.040	0.050	0.061	Vdeg ⁻¹
Total capacitance	At $V_{br} * 0.9$	C		0.22	0.25	pF
Optical overload	M3	PovId	-2			dBm

Note:

[1]: Gain M is DEFINED for assumed DC responsivity 1.0 A/W at 1550 nm: i.e. $M = \text{Current (A)} / \text{Optical power (W)}$

[2]: s21 measurement made on wafer with GS probe and plane-ended SMF optical coupling at normal incidence into the optical aperture. 50Ω load

Absolute Maximum Ratings

Parameter	Conditions	Rating	Unit
Storage temperature	Non operating, in dry nitrogen (dew point -60°C at 1 ATM).	-50 to +100	°C
Maximum continuous forward current	All	3	mA
Maximum forward voltage	All	1	V
Maximum reverse voltage	All	V_{br}	V
Maximum power dissipation (including instantaneous)	All [1]	160	mW
Maximum reverse current	Biased at V_{m3} or lower [2,3]	6	mA
Maximum continuous input power	Photocurrent and bias voltage cannot exceed maximum power dissipation spec. Biased at V_{m3} or lower [2,3]	+4	dBm

Notes:

[1] Power dissipation is the product of the APD photocurrent and reverse-bias voltage and gives rise to self-heating of the device junction. Dissipated power in excess of 200 mW can give rise to damage to the device.

[2] In the case of high optical power the device should be operated at low gain to limit the dissipated power. It is recommended that a fast response current limiting diode is used in the protection circuit.

[3] The maximum power dissipation must not be exceeded. V_{m3} is the bias voltage which gives gain M=3 at low optical power: -20 dBm.

Ordering Information:

For more information on this or other products and their availability, please contact your local Lumentum account manager or Lumentum directly at customer.service@lumentum.com.

Product Description	Part Number
APD chips are shipped on UV film, 6 inch diameter rings	PA009211
Sample APD chips are shipped in 2" x 2" antistatic gel packs containing up to 400 units	PA013594



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