

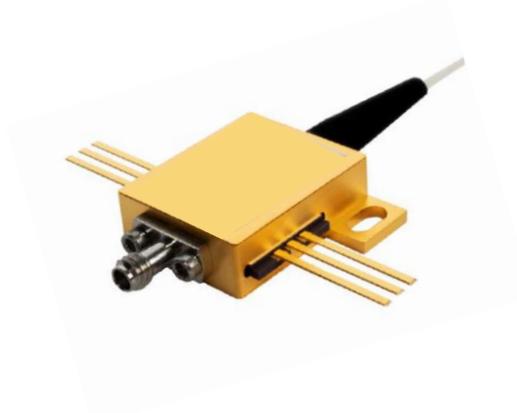
Product Datasheet

145 GHz C-Band Photodetector

XPDO5121R

PRODUCT FEATURES

- 145 GHz typical 3 dB bandwidth
- Wavelength 1550nm
- Flat frequency response
- High linearity
- Well matched 50 Ω output
- Unique on-chip integrated bias network
- 0.8 mm RF connector



Picture shows product example,
actual product might differ

APPLICATIONS

- Optical communications equipment
- High speed Lightwave characterization
- Test and Measurement applications
- Microwave Photonics

The XPDO5121R is an OEM product and comprises an optimized 145 GHz waveguide-integrated photodiode, which shows an extremely flat frequency response in both power and phase. The on-chip integrated bias network with an optimized RF design ensures an undisturbed frequency response from DC to the 3 dB cut-off frequency and saves costs for internal bias tees. The non-hermetic module is especially designed for optimal RF performance; therefore, the pulse response reveals virtually no ringing. A further advantage of the waveguide structure is the unbeatable high-power behavior. The photodetector shows a linear response up to an optical input power of 13 dBm. An output voltage swing of more than 0.5 V_{pp} can be achieved for short pulses without any degradation of the pulse response. Each photodetector module is characterized in the frequency domain using a heterodyne technique.

PRODUCT SELECTION

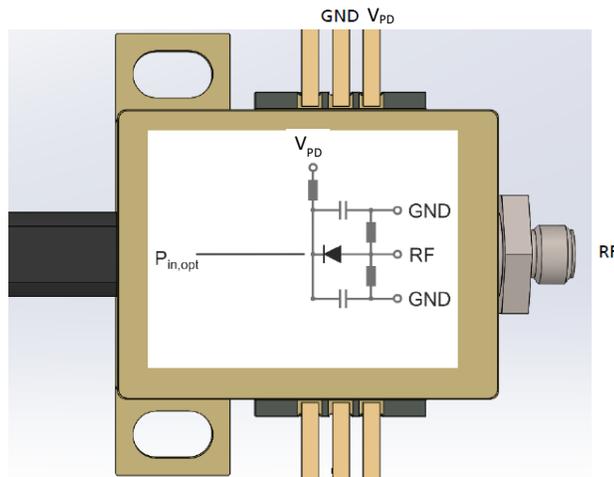
XPDO5121R-FF-zz

FF: 0.8 mm RF connector
zz: PFA = PM fiber with FC/APC connector

I. Pin Descriptions

# Pin	Symbol	Description
	V_{PD}	PD supply voltage
	GND	Ground = case ground

II. Block Diagram



III. Absolute Maximum Ratings

Stress beyond the absolute maximum ratings specified in the table below may cause permanent damage to the photodiode. Functional operation of the photodiode at these or any other conditions beyond those indicated in the operation conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Photodiode Supply Voltage	V_{PD}		0		3.5	V
Average Optical Input Power	P_{OPT_avg}	Continuous wave (cw)			16	dBm
Photodiode forward current	I_{PD}				2	mA
Fiber Bend Radius			30			mm

IV. Environmental Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Case Temperature	T_{CASE}		0		75	°C
Relative Humidity	RH	noncondensing	5		85	%
Storage Temperature	T_{STORE}		-40		85	°C

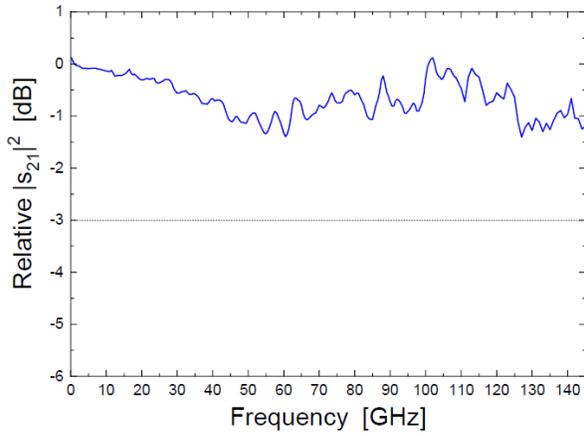
V. Operating Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Wavelength Range		C-band	1490		1620	nm
Average Optical Input Power	P_{OPT_avg}				13	dBm
Photodiode Supply Voltage	V_{PD}		0		3.0	V

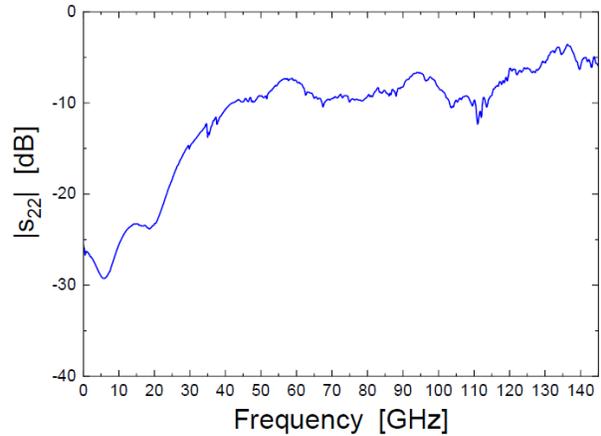
VI. Electro-Optical Specifications¹⁾

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Photodiode DC Responsivity ²⁾	R	$V_{PD}=2.5V$, $T_{CASE}=25^{\circ}C$, TE pol'd	0.3	0.4		A/W
Polarization-Dependent Loss	PDL	1550 nm	3		8	dB
Photodiode Dark Current	I_{DARK}			5	200	nA
Optical Return Loss	ORL	$V_{PD}=3.5V$, $T_{CASE}=25^{\circ}C$		-25		dB
3 dB Cut-off Frequency ³⁾	f_{3dB}	$V_{PD}=2.5V$		145		GHz
Notes:						
1. $\lambda = 1550$ nm, $V_{PD} = 2.5$ V, $T_{CASE} = 25$ °C, $P_{OPT_avg} -3$ dBm						
2. TE polarization, slow axis of PM fiber						
3. Measured using Lightwave Component Analyzer						

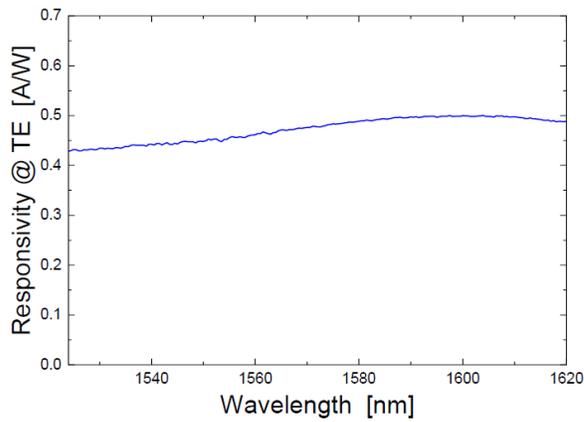
VII. Typical Performance



Typical s21 XPDO5121R

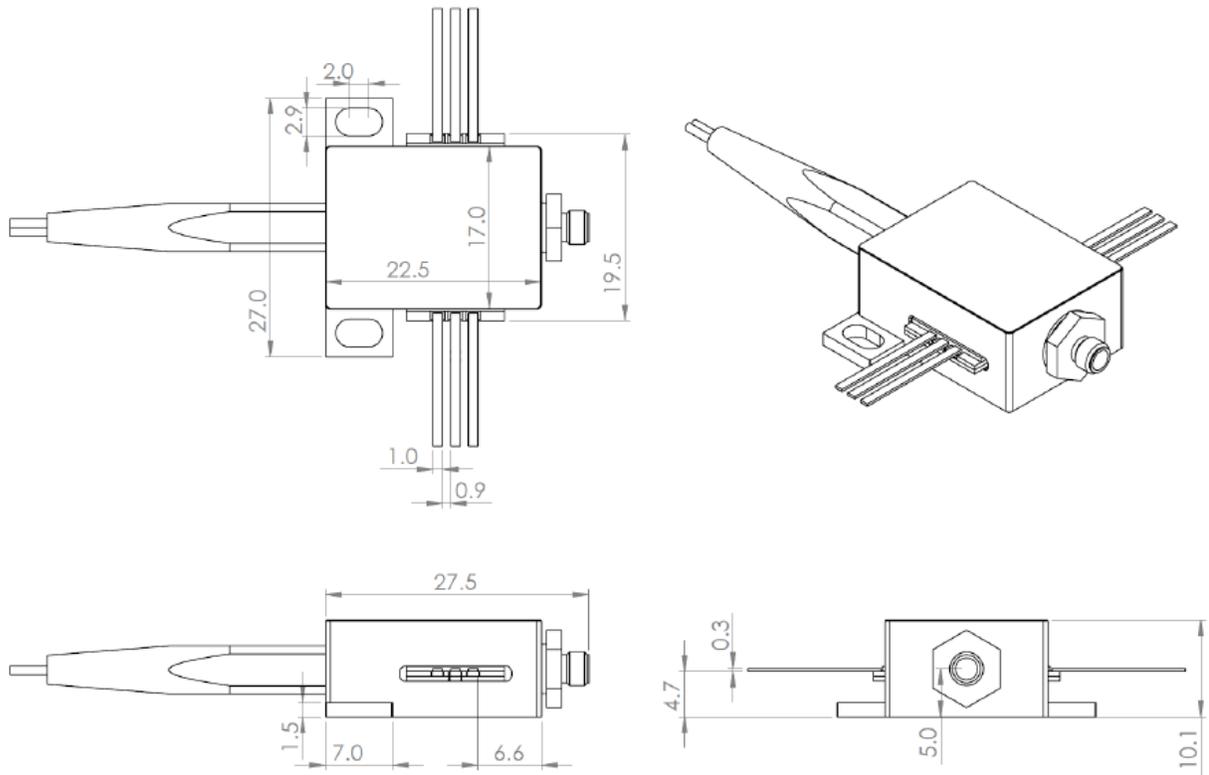


Typical s22 XPDO5121R



Typical behavior Responsivity vs. wavelength

VIII. Mechanical Specifications



Parameter	Description
Signal fiber	Polarization Maintaining Fiber (PM Panda), slow axis (TE) locked to APC narrow connector key

IX. Accessories

Accessories serving easy use of the product are being offered. Details can be found in separate datasheets.

A. Photodetector Evaluation Board

EVA-XPDO



Picture shows product example with DUT, actual product might

X. Product Handling

Please read supporting documentation such as the Manual carefully before using the product. Damages because of mishandling are not covered by the warranty.

Biasing:

- 1st pin: biasing PD; 2nd pin: ground
- Use spike-protected sources, e.g. battery
- When using bias-T, set SMU to high capacity mode
- No reverse polarity protection (set current compliance)

Maximum Power:

- CW optical input power @ 1 dB compression: 10 dBm @ 2 V and DC current < 10 mA @ 2 V;
- Characterize setup for different optical input powers in advanced and operate below measured saturation point

Temperature:

- Between 15 °C and 45 °C

RF Connector:

- Only use 0.8 mm torque and counter wrench for tightening
- Avoid leverage on connector by mechanical support below the module

Electrostatic Discharge:

- Avoid ESD damage by handling with appropriate grounding
- Connect housing (case GND) at first and disconnect at last

Operation:

- Do not inject light without biasing
- Only apply optical power at reverse bias
- Do not operate without RF-load

Notes

- Any trademarks used in this document are properties of their respective owners.
- COHERENT Incorporated reserves the right to make changes without notice.

Revision History

Revision	Date	Description
A00	2025-07	Initial version