

Preliminary Product Specification

100GHz Balanced Photodetector

BPDV412xR

PRODUCT FEATURES

- 100GHz typical bandwidth
- Waveguide-integrated photodetector chip
- Excellent uniformity of photodiodes
- Integrated termination
- Detection of 64 Gbaud x-QAM signals
- Unique on-chip biasing network



APPLICATIONS

- Transmission systems up to 1Tb/s
- Coherent Test- & Measurement systems
- Research- and Development systems
- Microwave photonics

The BPDV412x balanced photodetector is a compact, non-hermetic module consisting of two optimized 100GHz waveguide-integrated photodiodes on a single chip. As a single device, this configuration ensures excellent uniformity of the paired photodiodes performance; biasing is achieved via an integrated biasing network. Due to the optimized design of waveguide and Photodiode, even at high optical power, a linear frequency response can be guaranteed. The integrated termination allows an excellent match of the electrical output signal. Custom configurations are available, such as BPDV matched pairs, and quad sets, including connector customization and fiber matching to enable coherent detection. A 90GHz version of this module is also available upon request.

PRODUCT SELECTION

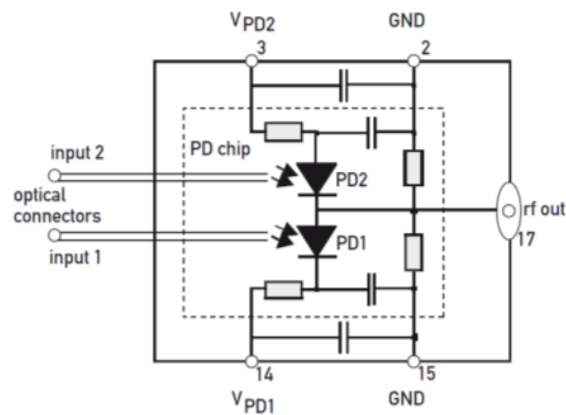
BPDV412xRy-WF-zz

x:	0:	f3dB > 90GHz
	1:	f3dB > 100GHz
Ry:	R	= single balanced detector
	RM	= dual pair of balanced detectors
	RQ	= quad set of balanced detectors
zz:	SA	= SC/APC connector (standard)
		Other available upon request

I. Pin Descriptions

# Pin	Symbol	Description
3	V_{PD2}	PD2 bias supply
2/15	GND	ground= case ground
14	V_{PD1}	PD1 bias supply

II. Block Diagram



III. Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Photodiode Bias Voltage	V_{PD1} V_{PD2}	—	0 -4.0		4.0 0	V
Maximum Average Optical Input Power	P_{opt}	Continuous wave (CW) 40Gb/s NRZ, per channel			16	dBm
Maximum Average Optical Input Power	P_{opt}	Pulse <25ps or RZ at 40Gb/s, per channel			19	dBm
Electro Static Discharge (ESD)	V_{ESD}	C= 100pF, R= 1.5kΩ HBM	-250		+250	V
Fiber Bend Radius			16			mm

IV. Environmental Specifications

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

V. Operating Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Average Optical Input Power Range	P_{OPT}	for each diode			10	dBm
Wavelength Range	λ		1525	1550	1575	nm
Photodiode Bias Voltage	V_{PD1}		2.8	3.3	3.8	V
	V_{PD2}		-3.8	-3.3	-2.8	V

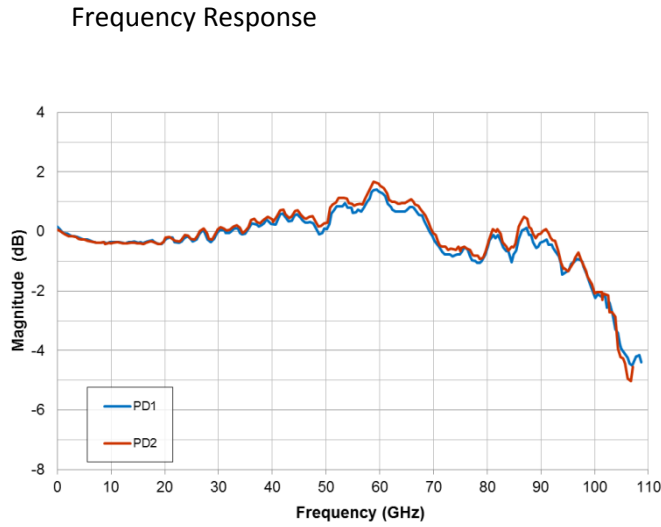
VI. Electro-Optical Specifications¹

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Photodiode DC Responsivity	R	optimum polarization	0.23	0.27		A/W
Imbalance of Responsivity	Imb	$Imb = 10 * \log_{10}(R_{PD1}/R_{PD2}) $		0.15	0.5	dB
Polarization Dependent Loss	PDL			0.75	0.95	dB
Photodiode Dark Current	I_{dark}			5	200	nA
Optical Return Loss	ORL		27			dB
3dB Cut-off Frequency ²	f_{3dB}	BPDV4121R	100	105		GHz
		BPDV4120R	90	95		
RF Common Mode Rejection Ratio	CMRR	$CMRR = 20 * \log_{10} (S21 - S31)/(S21 + S31) $		14		dB
Output Reflection Coefficient	S_{22}	0...15 GHz		-10	-9	dB
		15...30 GHz		-8	-7	
		30...67 GHz		-5	-4	
Skew				1		ps
Skew (Inter Detector Module)		RM & RQ version		4		ps

Notes:

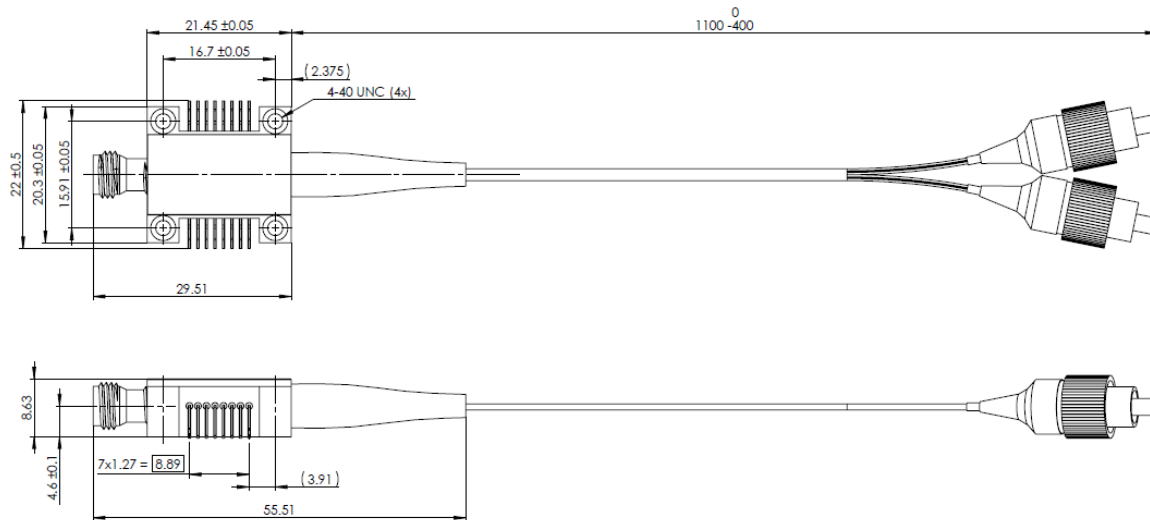
- $\lambda = 1550\text{nm}$, $V_{PD} = \pm 3.3\text{V}$, $T = 25^\circ\text{C}$, $P_{OPT} = -3\text{dBm}$
- Measured using heterodyne measurement

VII. Typical Performance



VIII. Mechanical Specifications

All Dimensions in mm

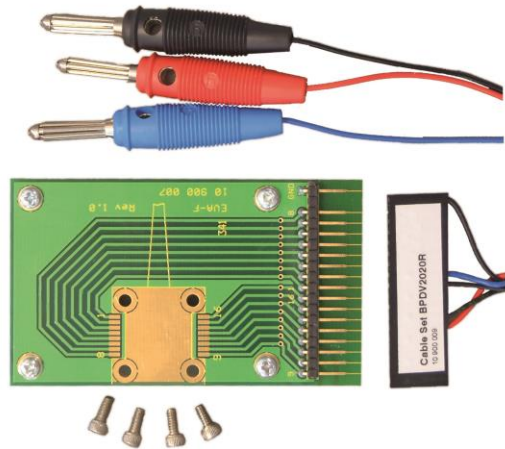


Parameter	Description
Signal fiber PD1	SMF-28, 900µm loose buffer, yellow, label "1"
Signal fiber PD2	SMF-28, 900µm loose buffer, yellow, label "2"

IX. Accessories

A. Evaluation Kit

The kit serves as easy-to-use utility to characterize the balanced photodetector under laboratory conditions and contents of a printed circuit board (PCB), four screws to establish removable connectivity between photodetector and board, as one DC cable to ensure the photodiode bias voltage.



ORDERING INFORMATION

EVA-BPDV

Evaluation board for all balanced detectors; includes 1x PCB, 1x DC cable set and 4x socket head screws 4-40 UNC

B. Photodetector Power Supply

We recommend usage of our individually accessible photodetector power supply (PPS), in particular for optimized performance at high optical input levels. As portable device it provides stable biasing voltage supply and a front display for review on photocurrent.



ORDERING INFORMATION

PPS-03-B

Photodetector power supply for all balanced detectors; includes 2x PPS, 1x cable-set B-type. The PPS is compatible with EVA-board (specified scheme applicable to RM & RQ version). PPS units include 2x 1.5V batteries

Notes

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- II-VI Incorporated reserves the right to make changes without notice.

X. Revision History

Revision	Date	Description
A04	2020-02	Transition to II-VI template adjusted specification for R and PDL