

43 GHz BALANCED PHOTODETECTOR

BPDV21x0R

The BPDV21x0R consists of two optimized 43 GHz waveguide-integrated photodiodes on a single chip that show an extremely flat frequency response, both in power and in phase. Coherent's 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 an external bias tee. The hermetic module is especially designed for use in the optical window at 1550 nm and optimal RF performance. The pulse response reveals virtually no ringing. It is best suited for test and measurement or microwave photonics applications up to 35 GHz. 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 10 dBm. Tailored configurations are available, such as BPDV dual pair and quad sets, including connector customization and fiber-matching to enable coherent detection.



FEATURES

- 43 GHz typical bandwidth with flat response
- Excellent pulse behavior
- Unsurpassed high-power handling capability
- Unique on-chip integrated bias network

APPLICATIONS

- 43 Gbps coherent communication systems
- Advanced test and measurement systems
- High-speed optical sensing

Product Selection

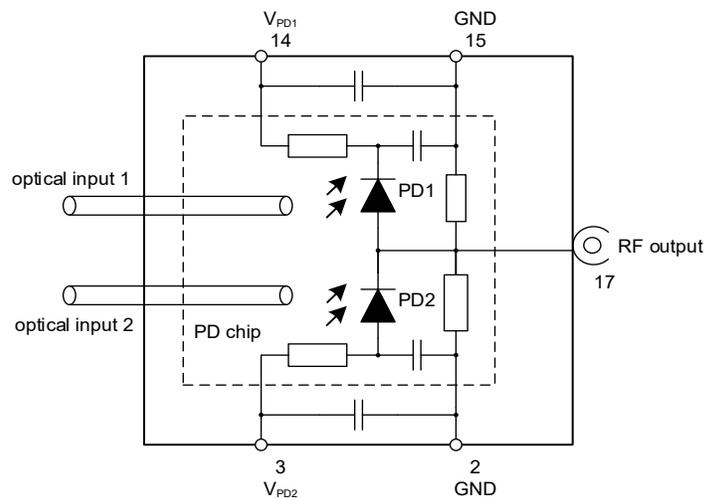
BPDV21x0Rv-Vy-zz

x	2	= standard PDL
	5	= low PDL
Rv	R	= single balanced detector
	RM	= dual pair of balanced detectors (only BPDV2150R)
	RQ	= quad set of balanced detectors (only BPDV2150R)
Vy	VF	= female V [®] connector (standard)
	VM	= male V [®] connector
zz	FP	= FC/PC connector (standard), Customized configurations upon request

Pin Descriptions

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

Block Diagram



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 datasheet. 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) 40 Gbps NRZ, per channel			16	dBm
Maximum Peak Optical Input Power	P _{peak}	Pulse < 25 ps or RZ at 40 Gbps, per channel			19	dBm
Electrostatic Discharge (ESD)	V _{ESD}	C = 100 pF, R = 1.5 kΩ HBM	-250		+250	V
Fiber Bend Radius			16			mm

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

Electro-Optical Specifications ¹

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Photodiode DC Responsivity	R	Optimum polarization	0.45			A/W
Imbalance of Responsivity	Imb	$Imb = 10 \cdot \log_{10}(R_{PD1}/R_{PD2}) $		0.15	0.5	dB
Polarization-Dependent Loss	PDL	BPDV2120		0.4	0.8	dB
		BPDV2150		0.2	0.4	dB
Photodiode Dark Current	I_{dark}			5	200	nA
Optical Return Loss	ORL		27			dB
3 dB Cut-off Frequency	f_{3dB}		37	42		GHz
RF Common Mode Rejection Ratio	CMRR	$CMRR = 20 \cdot \log_{10} (S_{21} - S_{31}) / (S_{21} + S_{31}) $		18		dB
Output Reflection Coefficient	S_{22}	0...50 GHz		-5	-3	dB
Skew					2	ps
Skew (Inter Detector Module)		RM & RQ version			10	ps

Notes:

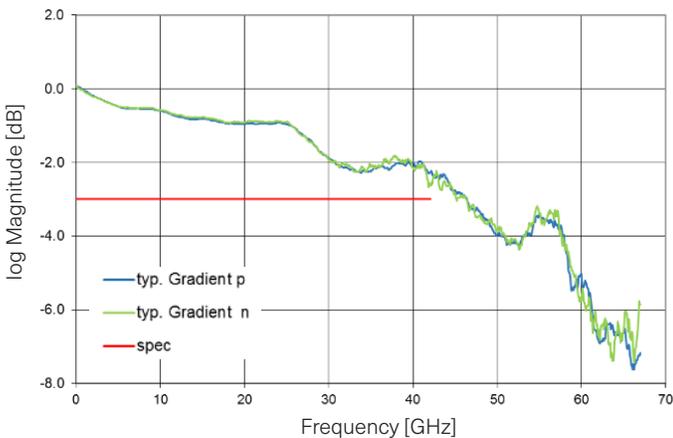
1. $\lambda = 1550$ nm, $V_{PD} = \pm 2.8$ V, $T = 25$ °C, $P_{OPT} = -3$ dBm.

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}		2.0	2.8	3.3	V
	V_{PD2}		-3.3	-2.8	-2.0	V

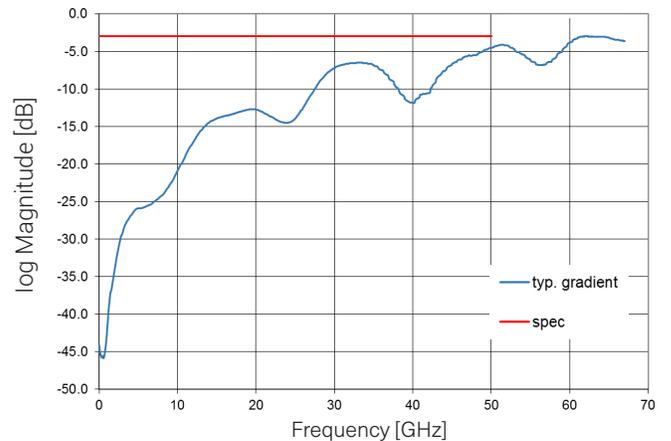
Typical Performance

O/E Bandwidth Log Magnitude Plot



Typical s21 plot measured with LCA

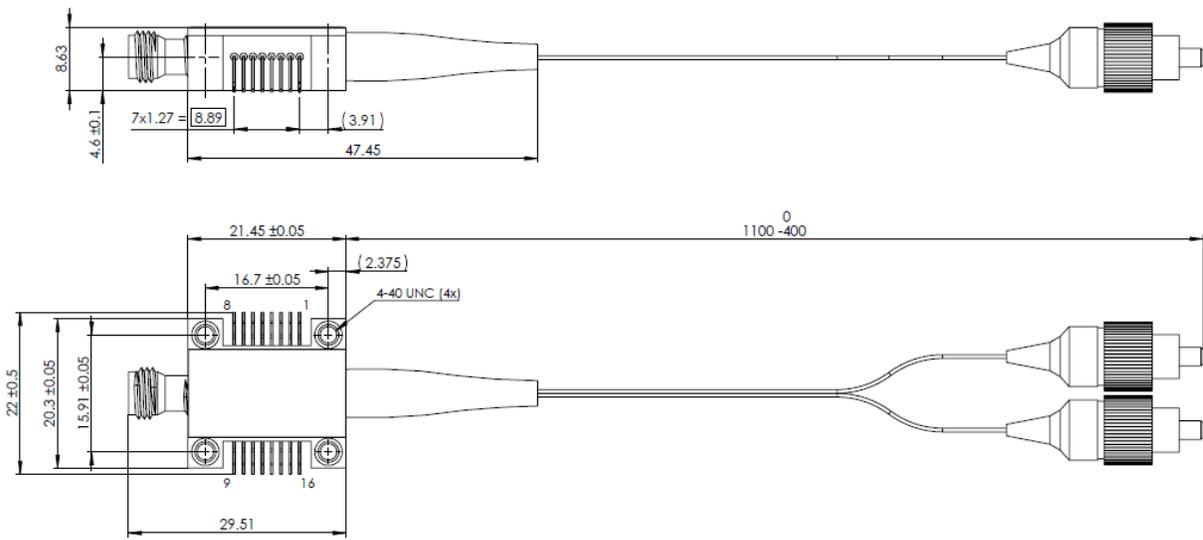
S22 Log Magnitude Plot



Typical s22 plot measured with LCA

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Mechanical Specifications



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

Accessories

A. Evaluation Kit

The kit serves as an easy-to-use utility to characterize the balanced photodetector under laboratory conditions and consists of a printed circuit board (PCB), four screws to establish removable connectivity between photodetector and board, and 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 a portable device, it provides a stable bias voltage supply and a front display for review of 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 1.5 V batteries.



Notes

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