

# ROF-BPR Balanced Photodetector Series

## With amplified balanced light detection module

ROF-BPR series balanced optical detection module integrates two matching photodiodes and an ultra-low noise cross-resistance amplifier, effectively reduce laser noise and common mode noise, improve the signal-to-noise ratio of the system, with a variety of wavelength and bandwidth options, low noise, high gain, easy to use and other features. Mainly used in laser radar heterodyne detection, optical delay measurement, optical coherence tomography (OCT) and other fields.

### Feature

- Spectral range: 400-1100, 850-1650nm
- Typical wavelength: 850/1064/1310/1550nm
- 3dB bandwidth: Multiple bandwidth options are available
- High common-mode rejection ratio: > 25dB
- High gain: Optional gain adjustable
- supports a variety of customized solutions

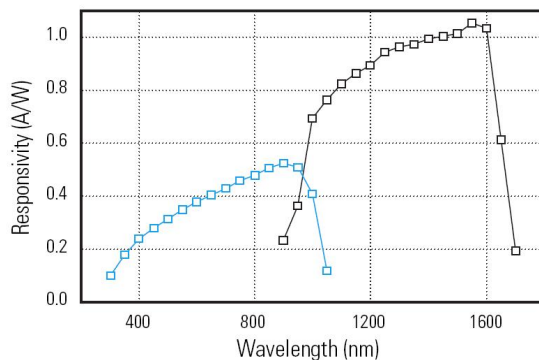


### Application

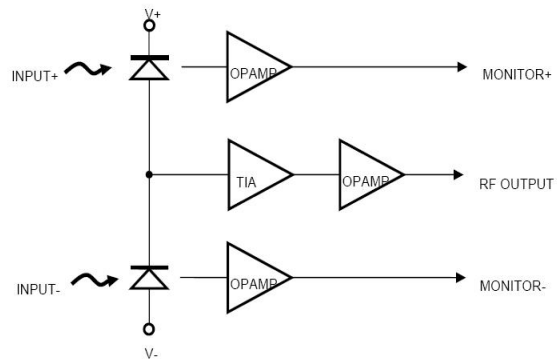
- LiDAR
- Optical delay measurement
- Optical coherence tomography



### Working principle



Typical spectral response curve



Internal circuit diagram

### Product application recommendation

Model number (ROF)	BPR-10M-B	BPR-200M-A	BPR-350M-A	BPR-400M-A	BPR-1G-A	BPR-1.6G-A
Bandwidth (Hz)	10MHz	200MHz	350MHz	400MHz	1GHz	1.6GHz
Typical wavelength	850/1550nm	1310/1550 nm		1064/1310/1550nm		
OCT	★★	★	★	★★★★	★★★★	★★
Laser radar	★	★★	★★★★	★	★★	★★

## mini high gain balanced optical detection module OCT system (ROF-BPR-10M-B-FC)

The mini balanced detection module optimized for OCT systems in ophthalmology has high gain and low noise characteristics, high common-mode rejection ratio and high output voltage amplitude (~12V) through wavelength optimization. It has been used in batch applications in medical OCT devices, and the detector can also be optimized for 1310nm and 1550nm wavelengths.

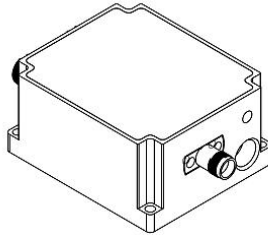
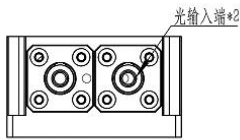
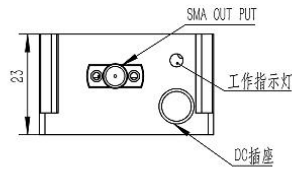
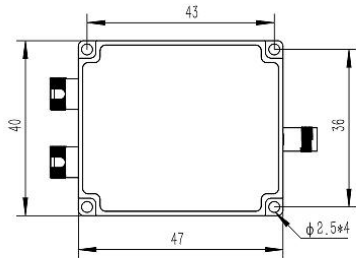
### Feature

- Typical wavelength: 850/1064/1310/1550nm
- 3dB bandwidth: 10MHz
- High common-mode rejection ratio: > 25dB
- High gain:  $150 \times 10^3 \text{V/W}$

Model number	ROF-BPR-10M-A-FC-AC	ROF-BPR-10M-B-FC-AC
Spectral response range	850~1650nm	400~1100nm
Typical wavelength	1310nm/1550nm	850nm
responsivity	0.95A/W@1550nm	0.5A/W@850nm
3dB bandwidth	10K-10MHz	10K-10MHz
Common-mode rejection ratio CMRR	>25dB	>25dB
Gain @RF output	$300 \times 10^3 \text{V/W}$	$150 \times 10^3 \text{V/W}$
Noise voltage (RMS)	$< 15 \text{mV}_{\text{RMS}}$	$< 15 \text{mV}_{\text{RMS}}$
Saturated Optical Power (CW)	60 $\mu\text{W}$	110 $\mu\text{W}$
Maximum output	12Vpp	12Vpp



amplitude	
Damaged optical power	10mW
Operating temperature range	-20~+70 °C
Operating voltage	DC 12V
Working current	40mA
Input connector	FC
Output connector	SMA
Output impedance	50 ohms
Output coupling mode	AC coupling (DC optional)
Overall dimensions (mm)	47mm×40mm×23mm



单位：mm

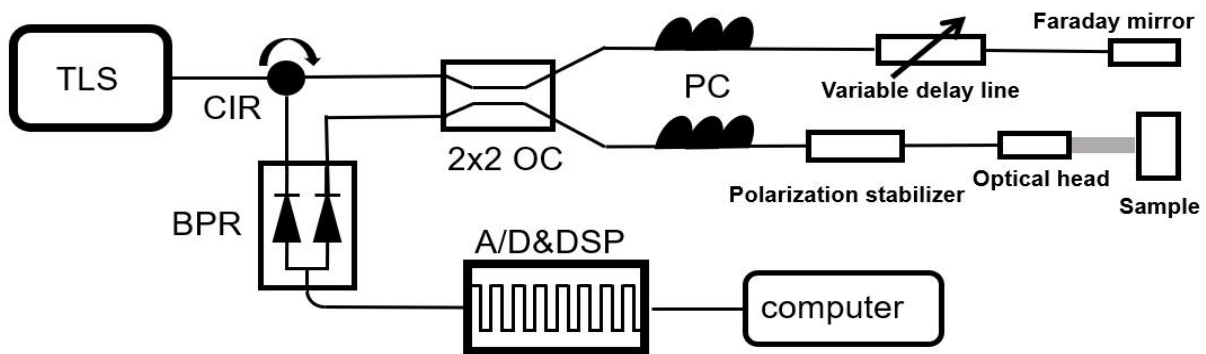
## High bandwidth fixed gain balanced optical detection module (400MHz/1GHz/1.6GHz)

High-gain balanced detection module optimized for third-generation OCT (SS-OCT) systems, with high gain and low noise characteristics, high common-mode rejection ratio through wavelength optimization, high output voltage amplitude ( $\sim 7V$ ), and configured Monitor monitoring signal (up to 10Vpp) output. The detector is available at DC-400MHz, 500K-1GHz, 500K-1.6GHz and is optimized for 1064nm and 1310nm wavelengths.

### Feature

- Typical wavelength: 850/1064/1310/1550nm
- 3dB bandwidth: 400MHz/1GHz/1.6GHz
- High common-mode rejection ratio:  $> 25dB$
- High gain:  $150 \times 10^3 V/W$

### SS-OCT schematic diagram



### BPR-400MHz

Model number	ROF-BPR-400M-A2-FC-AC	ROF-BPR-400M-A1-FC-AC
Spectral response range	1200-1700nm	900-1400
Typical wavelength	1310nm/1550nm	1064nm
responsivity	0.9A/W@1550nm	0.7A/W@1064nm
3dB bandwidth	10KHz-400MHz	10KHz-400MHz
Common-mode rejection ratio CMRR	$>25dB(30dB \text{ typ.})$	$>25dB(30dB \text{ typ.})$
Gain @ High resistance state	$14 \times 10^3 V/W$	$10 \times 10^3 V/W$
Noise voltage (RMS)	$< 5mV_{RMS}$	$< 5mV_{RMS}$
Saturated optical power	400 $\mu W$	800 $\mu W$



Maximum output amplitude @ High resistance	5Vpp	5Vpp
Damaged optical power	10mW	
Operating temperature range	-20~+70 °C	
Operating voltage	DC ±12V (with low noise power adapter)	
Working current	60mA	
Input connector	FC	
Output connector	SMA	
Output impedance	50 ohms	
Output coupling mode	AC coupling (DC optional)	
Overall dimensions (mm)	78.5 mm * 71 mm * 25.7 mm	

**BPR-1GHz**

Model number	ROF-BPR-1G-A2-FC	ROF-BPR-1G-A1-FC
Spectral response range	1200-1700nm	900-1400
Typical wavelength	1310nm/1550nm	1064nm
responsivity	0.9A/W@1550nm	0.7A/W@1064nm
3dB bandwidth	500K-1GHz	500K-1GHz
Common-mode rejection ratio CMRR	>25dB(30dB typ.)	>25dB(30dB typ.)
Gain @ High resistance state	$36 \times 10^3 \text{ V/W}$	$28 \times 10^3 \text{ V/W}$
Noise voltage (RMS)	$< 8 \text{ mV}_{\text{RMS}}$	$< 8 \text{ mV}_{\text{RMS}}$
Saturated optical power	380μW	500μW
Maximum output amplitude @50 Ω	3.5Vpp	3.5Vpp
Damaged optical power	10mW	
Operating temperature range	-20~+70 °C	
Operating voltage	DC ±12V (with low noise power adapter)	
Working current	200mA	
Input connector	FC	
Output connector	SMA	



Output impedance	50 ohms
Output coupling mode	AC coupling
Overall dimensions (mm)	78.5 mm * 71 mm * 25.7 mm

### BPR-1.6GHz

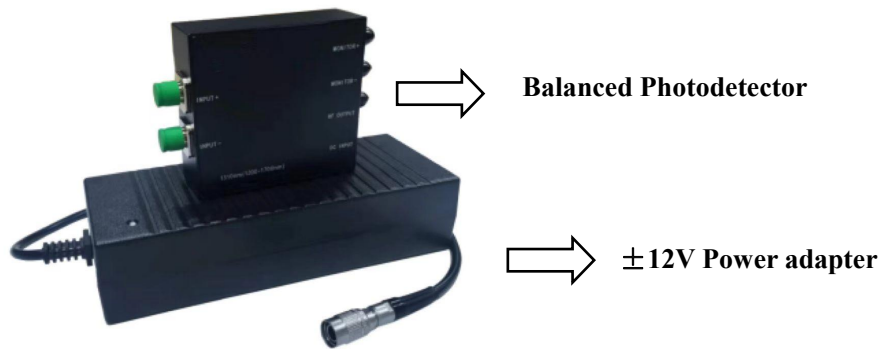
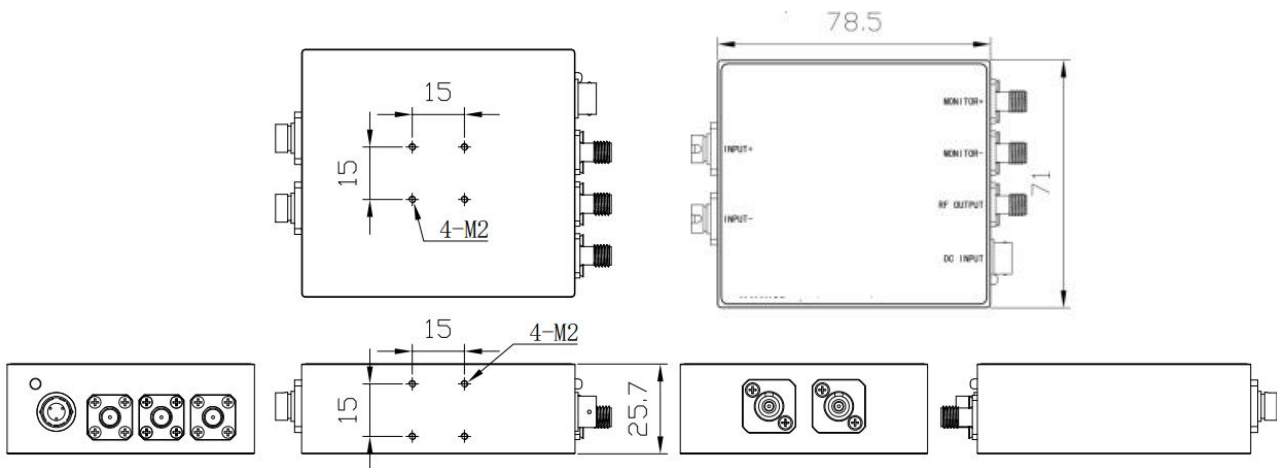
Model number	ROF-BPR-1.6G-A2-FC	ROF-BPR-1.6G-A1-FC
Spectral response range	1200-1700nm	900-1400
Typical wavelength	1310nm/1550nm	1064nm
responsivity	0.9A/W@1550nm	0.7A/W@1064nm
3dB bandwidth	500K-1.6GHz	500K-1.6GHz
Common-mode rejection ratio CMRR	>25dB(30dB typ.)	>25dB(30dB typ.)
Gain @ High resistance state	$16 \times 10^3 \text{V/W}$	$11 \times 10^3 \text{V/W}$
Noise voltage (RMS)	$< 10 \text{mV}_{\text{RMS}}$	$< 10 \text{mV}_{\text{RMS}}$
Saturated optical power	800 $\mu$ W	1mW
Maximum output amplitude @50 $\Omega$	3Vpp	3Vpp
Damaged optical power	10mW	
Operating temperature range	-20~+70 $^{\circ}\text{C}$	
Operating voltage	DC $\pm 12\text{V}$ (with low noise power adapter)	
Working current	350mA	
Input connector	FC	
Output connector	SMA	
Output impedance	50 ohms	
Output coupling mode	AC coupling	
Overall dimensions (mm)	78.5 mm * 71 mm * 25.7 mm	

### Monitor indicator

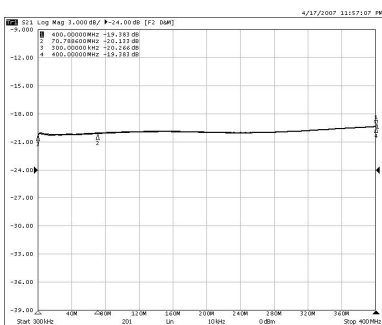


Monitor	ROF-BPR-XX-A2	ROF-BPR-XX-A1
Operating bandwidth	DC-5MHz	
Conversion gain	$10 \times 10^3 \text{V/W}$	$7 \times 10^3 \text{V/W}$
Noise voltage (RMS)	5mVpp	
Output impedance	200 ohms	
Output amplitude	10Vpp	

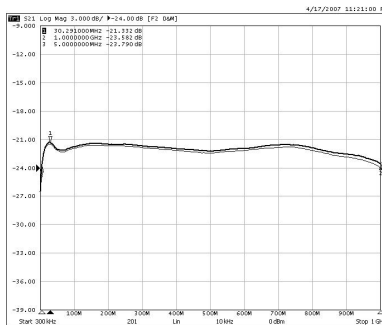
**Size (mm)**



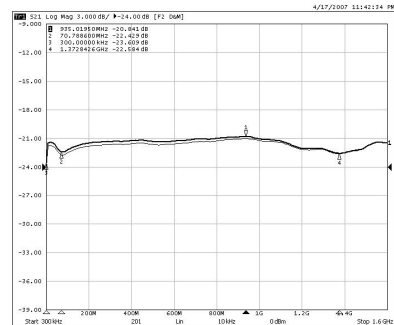
**Frequency response curve (S21)**



ROF-BPR-400M



ROF-BPR-1G



ROF-BPR-1.6G

## Low bandwidth fixed gain balanced optical detection module (200MHz/350MHz)

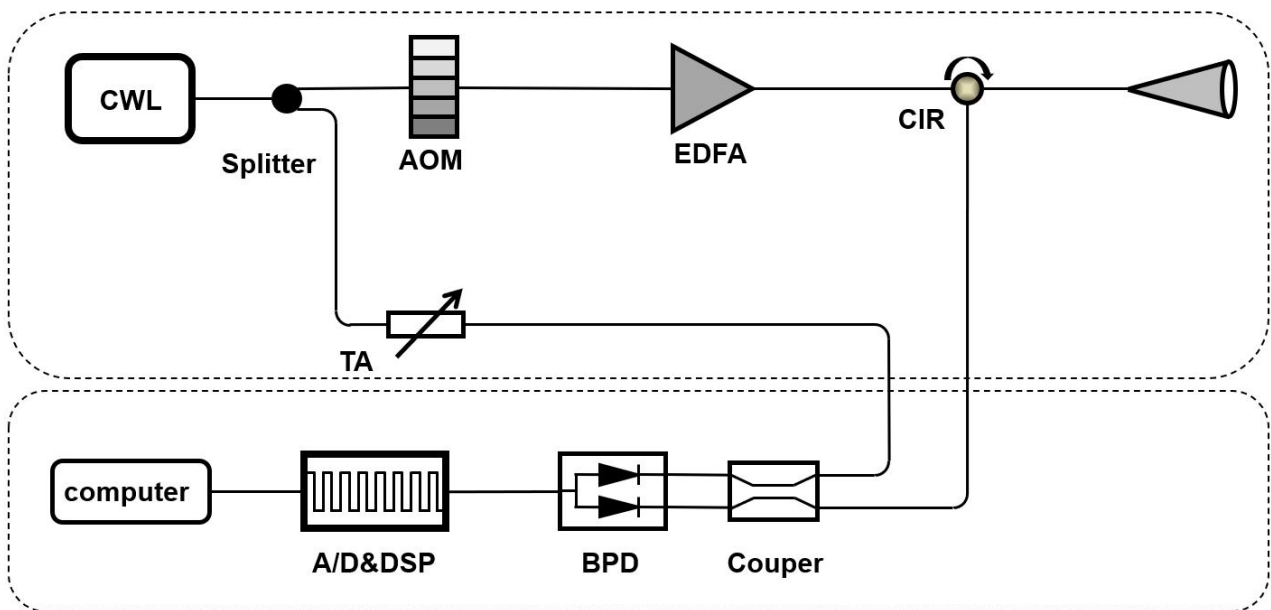
Rof-BPR series 200M and 350M high-gain balanced detection modules, with high gain and low noise characteristics, through two PIN tube response optimization to achieve high common-mode rejection ratio and high output voltage amplitude (~3.5V), this detection module can provide different gain and coupling output modes according to customer requirements. It is very suitable for coherent detection systems such as coherent Doppler wind radar.

### Feature

- Wavelength range: 900-1700nm (400-1100nm optional)
- 3dB bandwidth: DC-200MHz/350MHz
- High common-mode rejection ratio: 30dB
- High gain:  $38 \times 10^3 \text{V/W}$  (other gains can be customized)



### Coherent Doppler wind radar schematic diagram



### Parameters

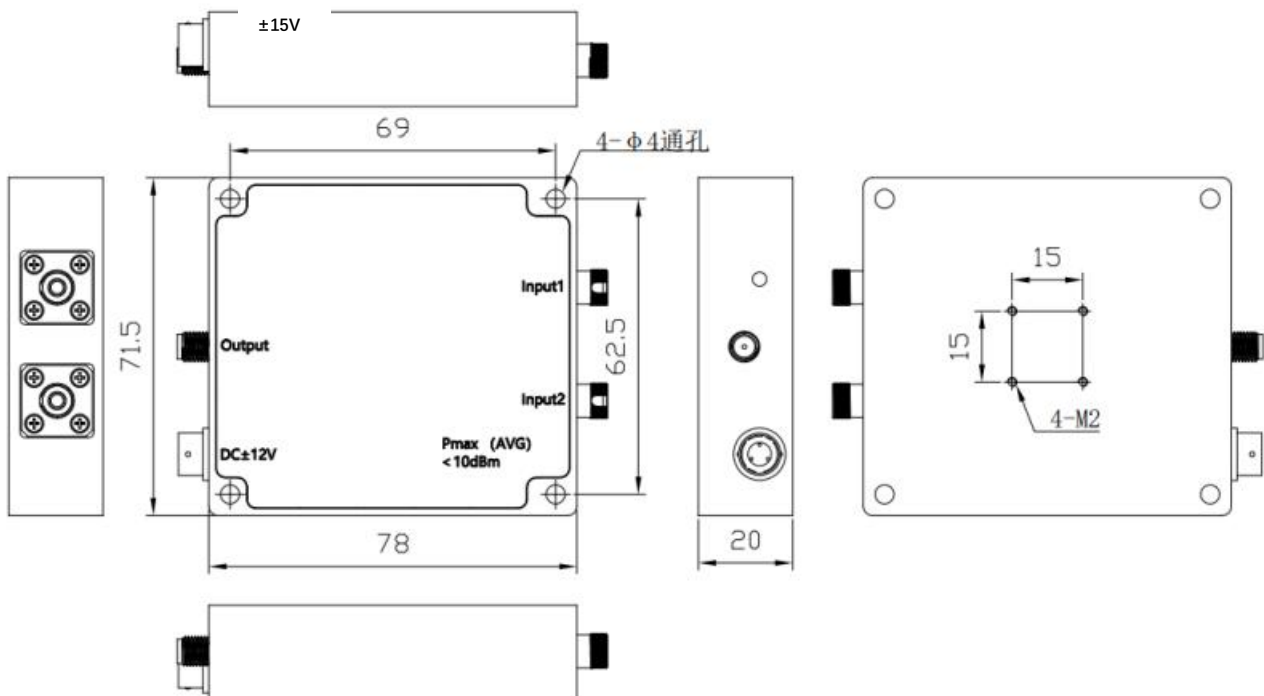
Model number	ROF-BPR-200M-A-FC-H-DC	ROF-BPR-200M-A-FC-DC	ROF-BPR-350M-A-FC-DC
Spectral response range	900-1700nm	900-1700nm	900-1700nm
Typical wavelength *	1310nm/1550nm	1310nm/1550nm	1310nm/1550nm
responsivity	0.95A/W@1550nm	0.95A/W@1550nm	0.95A/W@1550nm
3dB bandwidth	DC-200MHz	DC-200MHz	DC-350MHz
Common-mode	>25dB (30dB typ.)	>25dB (30dB typ.)	>25dB (30dB typ.)





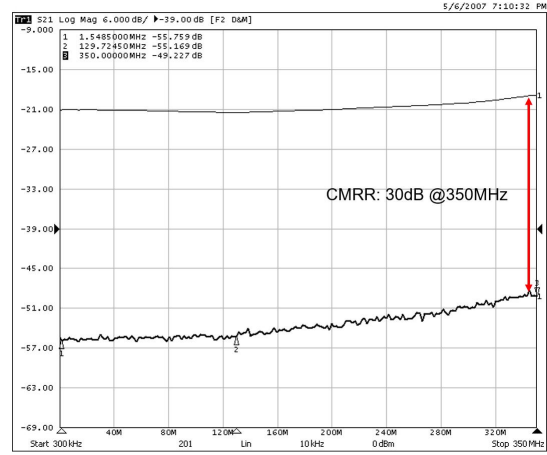
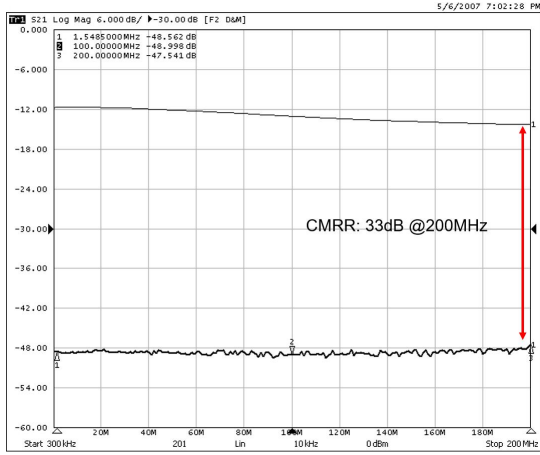
rejection ratio CMRR			
Gain @ High resistance state	$38 \times 10^3 \text{V/W}$	$20 \times 10^3 \text{V/W}$	$14 \times 10^3 \text{V/W}$
Noise voltage (RMS)	$< 20 \text{mV}_{\text{RMS}}$	$< 10 \text{mV}_{\text{RMS}}$	$< 10 \text{mV}_{\text{RMS}}$
sensitivity	-26dBm	-33dBm	-33dBm
Saturated Optical Power (CW)	-9dBm	-12dBm	-5dBm
Maximum output amplitude	3.5Vpp	3.5Vpp	3.5Vpp
Damaged optical power	10mW		
Operating temperature range	-20~+70 °C		
Operating voltage	DC $\pm 15\text{V}$		
Working current	50mA		
Input connector	FC		
Output connector	SMA		
Output impedance	50 ohms		
Output coupling mode	Default DC coupling (AC optional)		
Overall dimensions (mm)	78.5mm×71.5mm×20mm		

**Dimensions (mm)**





CMRR Test (S21)



## Gain adjustable balance detection module (DC~150MHz)

ROF-GBPR Series gain adjustable balance detection module, support up to 5 gear gain adjustable, different gain corresponding to different bandwidth, customers can choose different gear gain according to the actual optical signal to be detected, flexible and convenient use.

### Feature

- Wavelength response: 850-1650nm (400-1100nm optional)
- 3dB bandwidth: DC-150 MHz
- common-mode rejection ratio: > 25dB
- Gain adjustable: Five gain gears are adjustable

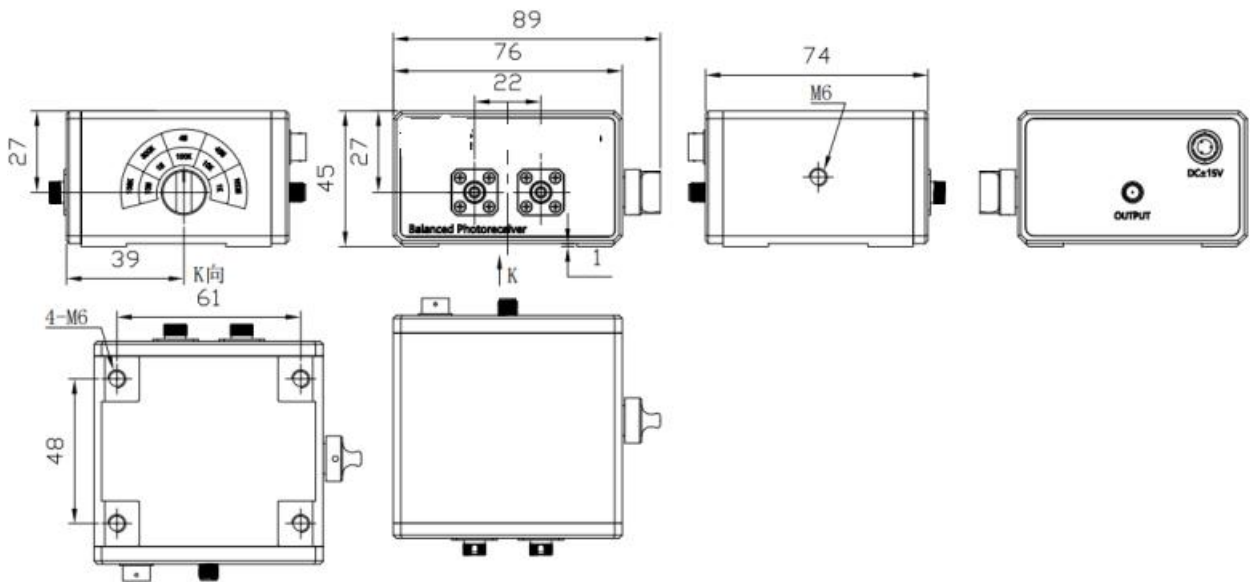


Parameters	symbol	ROF-GBPR-150M-A-DC	ROF-GBPR-150M-B-DC
Spectral response range	$\lambda$	850~1650nm	400~1100nm
Detector type		InGaAs / PIN	Si/PIN
responsivity	R	$\geq 0.95@1550\text{nm}$	$\geq 0.5@850\text{nm}$
3dB bandwidth	B	DC - 150, 45, 4, 0.3, 0.1 MHz	
Common mode rejection ratio	CMRR	>25dB	
Conversion gain @ high resistance state	G	$10^3, 10^4, 10^5, 10^6, 10^7$ V/A	
Noise voltage	$V_{\text{RMS}}$	DC - 0.1 MHz: 30mV <sub>RMS</sub> DC - 0.3 MHz: 12mV <sub>RMS</sub> DC - 4.0 MHz: 10mV <sub>RMS</sub> DC - 45 MHz: 6mV <sub>RMS</sub> DC - 150 MHz: 3mV <sub>RMS</sub>	DC - 0.1 MHz: 30mV <sub>RMS</sub> DC - 0.3 MHz: 12mV <sub>RMS</sub> DC - 4.0 MHz: 10mV <sub>RMS</sub> DC - 45 MHz: 6mV <sub>RMS</sub> DC - 150 MHz: 3mV <sub>RMS</sub>
sensitivity	S	DC - 0.1 MHz: -60dBm DC - 0.3 MHz: -47dBm DC - 4.0 MHz: -40dBm DC - 45 MHz: -30dBm DC - 150 MHz: -23dBm	DC - 0.1 MHz: -57dBm DC - 0.3 MHz: -44dBm DC - 4.0 MHz: -37dBm DC - 45 MHz: -27dBm DC - 150 MHz: -20 dBm
Saturated Optical Power (CW)	$P_s$	DC - 0.1 MHz: -33dBm DC - 0.3 MHz: -23dBm DC - 4.0 MHz: -13dBm DC - 45 MHz: -3dBm DC - 150 MHz: 0dBm	DC - 0.1 MHz: -30dBm DC - 0.3 MHz: -20dBm DC - 4.0 MHz: -10dBm DC - 45 MHz: 0dBm DC - 150 MHz: 3dBm
Operating voltage	U	DC $\pm 15\text{V}$	
Working current	I	<100mA	
Maximum input optical power	$P_{\text{max}}$	10mW	



Output impedance	R	50Ω
Operating temperature	T <sub>w</sub>	-20-70°C
Storage temperature	T <sub>s</sub>	-40-85°C
Output coupling mode	-	Default DC coupling (AC coupling optional)
Input optical connector	-	FC/APC
Electrical output interface	-	SMA

**Dimensions (mm)**





## Ordering information

ROF	XXX	XX	X	XX	XX	X
	BPR-- Fixed gain balanced detector GBPR-- Gain adjustable balance detector	-3dB bandwidth: 10M---10MHz 80M---80MHz 200M---200MHz 350M---350MHz 400M---400MHz 1G---1GHz 1.6G---1.6GHz	Operating wavelength: A---850~1650nm (1550nm test) B---320~1000nm (850nm test) A1---900~1400nm (1064nm test) A2---1200~1700nm (1310nm or 1550nm test)	Input type: FC----Fiber coupling FS----Free space	Coupling type: DC---DC Coupling AC---AC Coupling	Gain type: Null-- Normal gain H--High gain requirement

**Note:**

1, 10 M, 80MHz, 200MHz, 350MHz and 400 MHz bandwidth detectors support operating bands A and B; Coupling Type Both AC and DC coupling are optional.

2, 1GHz, 1.6GHz, support working bands A1 and A2; Coupling type Only AC coupling is supported.

3, the gain is adjustable (150MHz) to support the working band A and B; Coupling Type Both AC and DC coupling are optional.

4, example, ROF-BPR-350M-A-FC-AC: 350MHz fixed gain balanced probe module, operating wavelength 1550nm(850-1650nm), AC coupled output.