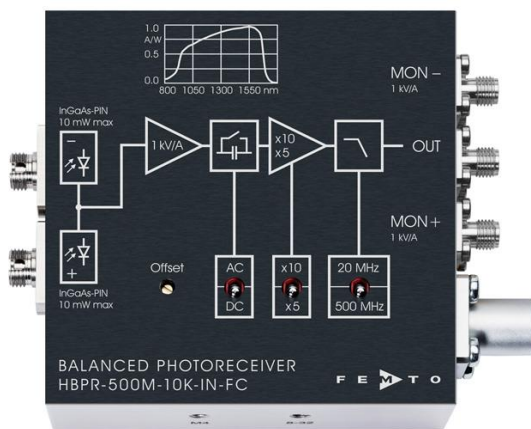


High-Speed Balanced Photoreceiver



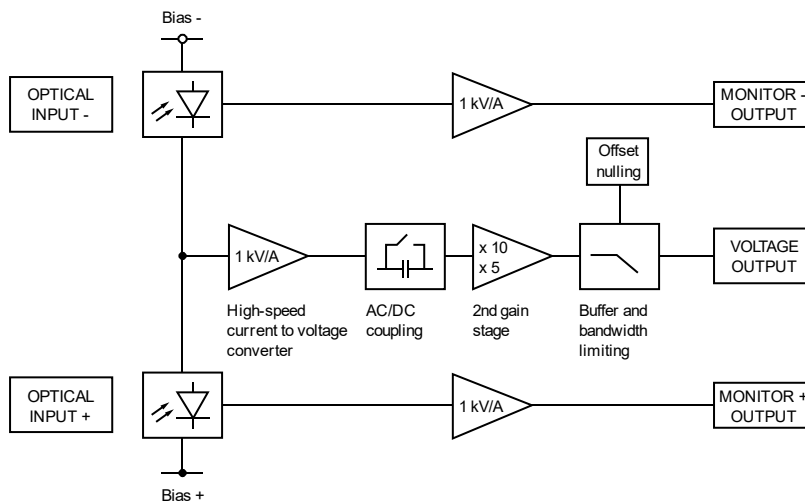
Features

- Bandwidth DC to 500 MHz
- Common-Mode Rejection Ratio (CMRR) 45 dB typ.
- InGaAs-PIN photodiodes
- FC fiber optic inputs
- Spectral range 900 - 1700 nm
- Very low NEP, down to 6.7 pW/√Hz
- Transimpedance gain switchable 5 x 10³ V/A, 10 x 10³ V/A
- High dynamic input range up to 2 x 10 mW balanced optical power
- Fast monitor outputs with 10 MHz bandwidth and 1 x 10³ V/A gain
- Switchable low pass filter for minimizing wideband noise
- UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread

Applications

- Spectroscopy
- Heterodyne detection
- Optical coherence tomography (OCT)
- Optical delay measurement
- Differential optical front-end for oscilloscopes, spectrum analyzers, A/D converters and RF lock-in amplifiers

Block Diagram



High-Speed Balanced Photoreceiver

Available Input Version

HBPR-500M-10K-IN-FC



fix/permanent FC fiber connector for high coupling efficiency, excellent conversion gain accuracy and common mode rejection ratio (CMRR).

Related Models

Various free space or fiber coupled HBPR models, with bandwidth up to 500 MHz, in the spectral range from 320 nm to 1700 nm are available.

Example: FST input



1.035"-40 threaded flange for free space applications, compatible with many optical standard accessories.

See further information and separate datasheets on www.femto.de

Available Accessory

PS-15



power supply, input: 100 - 240 VAC, output: ± 15 VDC, $+400/-250$ mA

Specifications

Test conditions

$V_S = \pm 15$ V, $T_A = 25$ °C, signal output terminated with 50Ω , Monitor outputs terminated with $1 M\Omega$

Gain

Transimpedance gain

5×10^3 V/A (2nd gain x5), 10×10^3 V/A (2nd gain x10) switchable (@ 50Ω load)

Gain accuracy

± 1 % electrical

Conversion gain

4.75×10^3 V/W typ. (@ 2nd gain x5, 1550 nm)
 9.50×10^3 V/W typ. (@ 2nd gain x10, 1550 nm)

Common mode rejection ratio (CMRR)

55 dB typ. ($f \leq 100$ MHz)
45 dB typ. ($f \leq 500$ MHz)

Frequency Response

Lower cut-off frequency

DC / 10 Hz, switchable

Upper cut-off frequency

500 MHz, switchable to 20 MHz

Time Response

Rise/fall time (10 % - 90 %)

0.78 ns (@ 2nd gain x5); 0.9 ns (@ 2nd gain x10)
17.5 ns (low pass filter 20 MHz)

Input

Noise equivalent power (NEP)

minimum 6.7 pW/ $\sqrt{\text{Hz}}$ (@ 1550 nm)
6.9 pW/ $\sqrt{\text{Hz}}$ (@ 1550 nm, 20 MHz)
15.0 pW/ $\sqrt{\text{Hz}}$ (@ 1550 nm, 200 MHz)
28.0 pW/ $\sqrt{\text{Hz}}$ (@ 1550 nm, 500 MHz)

Maximum differential CW power for linear amplification

210 μW (@2nd gain x5, DC-coupled, 1550 nm)
105 μW (@2nd gain x10, DC-coupled, 1550 nm)
1.3 mW (@ AC-coupled, 1550 nm)

Max. optical CW balanced power (common mode power)

10 mW (on each photodiode, @ 1550 nm)

Monitor optical saturation power (limited for linear amplification)

10.5 mW (@ 1550 nm)

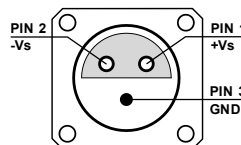
High-Speed Balanced Photoreceiver

| | | |
|----------------------------|------------------------------------|---|
| Specifications (continued) | | |
| Detector | Detector | InGaAs-PIN photodiode FC fiber connector |
| | Active area | Ø 80 µm, integrated ball lens suitable for fibers up to 50 µm core diameter |
| | Spectral range | 900 - 1700 nm |
| | Sensitivity | 0.95 A/W typ. (@ 1550 nm) |
| Signal Output | Output voltage range | ±1.0 V (@ 50 Ω load) for linear operation and low harmonic distortion |
| | Max. output voltage | ±2.0 V (@ 50 Ω load) |
| | Offset voltage compensation | ±100 mV typ., adjustable by offset potentiometer |
| | Output impedance | 50 Ω (terminate with 50 Ω load) |
| | Slew rate | 2800 V/µs |
| | Max. output current | 70 mA |
| | Output return loss S22 | -30 dB @ < 100 MHz -20 dB @ < 800 MHz |
| | Output noise | 2.2 mV _{RMS} (15 mV _{PP}) (@ 2 nd gain x5) 3.8 mV _{RMS} (25 mV _{PP}) (@ 2 nd gain x10) 0.25 mV _{RMS} (1.7 mV _{PP}) typ. (@ 2 nd gain x5, BW: 20 MHz) 0.4 mV _{RMS} (2.7 mV _{PP}) typ. (@ 2 nd gain x10, BW: 20 MHz) (@ 50 Ω load, no signal on detectors, measurement bandwidth 2 GHz) |
| Monitor Outputs | Monitor output gain | 1 x 10 ³ V/A (@ ≥ 100 kΩ load) |
| | Monitor output voltage range | 0 ... +10 V (@ ≥ 100 kΩ load) |
| | Monitor output impedance | 50 Ω (terminate with ≥ 100 kΩ load) |
| | Monitor output max. output current | 30 mA typ. |
| | Monitor output bandwidth | DC ... 10 MHz |
| | Monitor output noise | 0.6 mV _{RMS} (4 mV _{PP}) (@ 100 kΩ load, no signal on detectors, measurement bandwidth 200 MHz) |
| Power Supply | Supply voltage | ±15 V (±14.5 V ... ±16.5 V) |
| | Supply current | -90 / +120 mA (depends on operating conditions, recommended power supply capability min. ±200 mA) |
| Case | Weight | 350 g (0.77 lbs) |
| | Material | AlMg3Mn, nickel-plated |
| Temperature Range | Storage temperature | -40 ... +85 °C |
| | Operating temperature | 0 ... +60 °C |
| Absolute Maximum Ratings | Max. CW power (averaged) | 12 mW (on each photodiode) |
| | Power supply voltage | ±20 V |

High-Speed Balanced Photoreceiver

Connectors

Input FC fiber optic connector (FC/PC and FC/APC compatible)
 Output SMA jack (female)
 Power supply Lemo® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)



Pin 1: +15 V
 Pin 2: -15 V
 Pin 3: GND

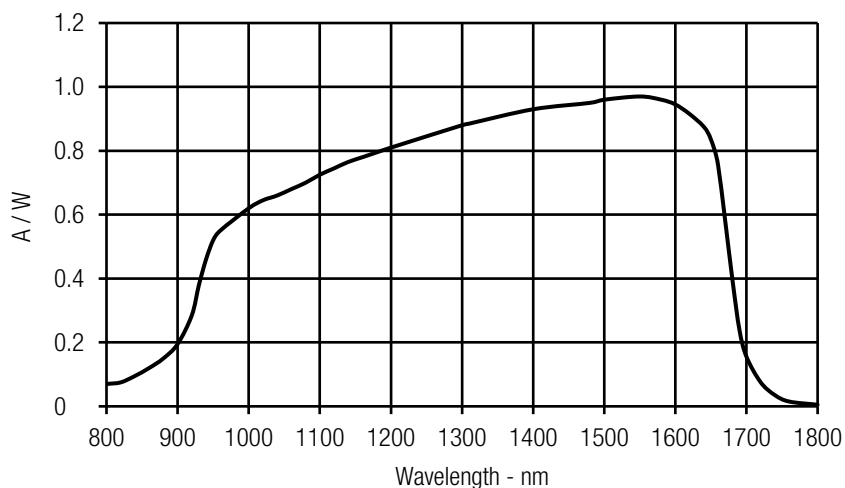
Scope of Delivery

HBPR-500M-10K-IN-FC, Lemo® 3-pin connector, 3 x adapter SMA (male) to BNC (female), datasheet

Ordering Information

HBPR-500M-10K-IN-FC FC fiber optic connector (FC/PC and FC/APC compatible)

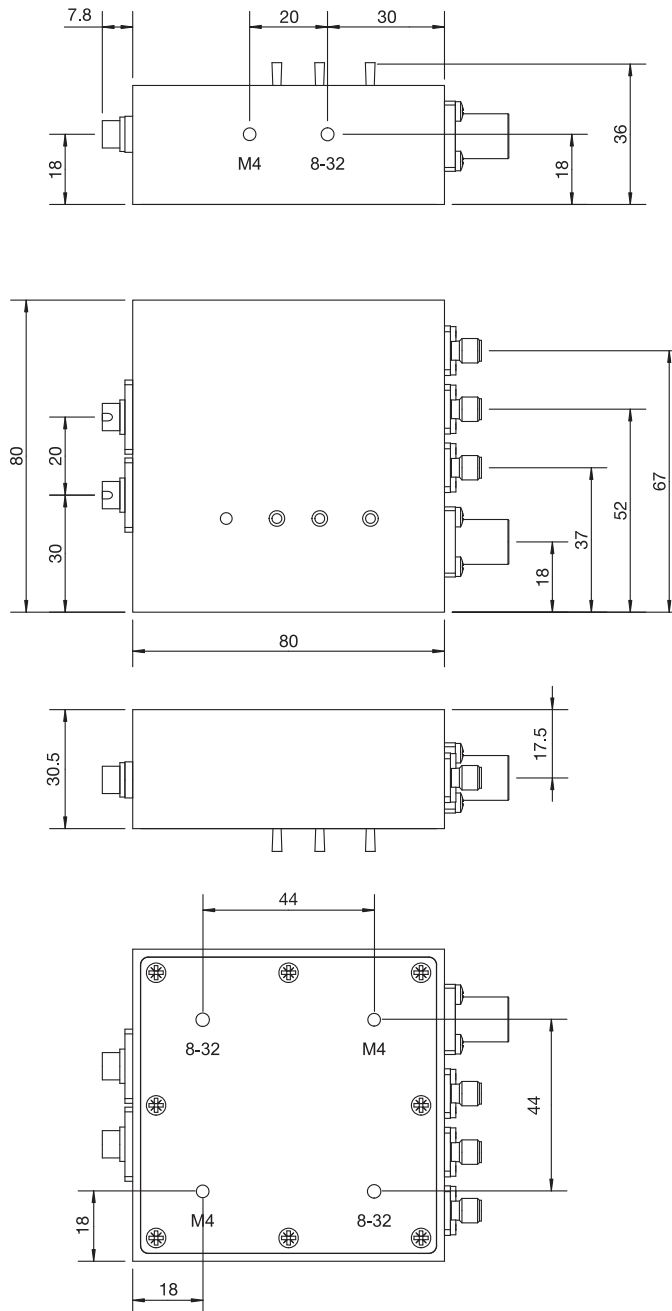
Spectral Responsivity



High-Speed Balanced Photoreceiver

Dimensions

Case dimensions for HBPR-500M-10K-IN-FC:



All measures in mm unless otherwise noted.

The bottom plate may be rotated to match the appropriate mounting thread to the optical axis by unscrewing the 8 screws.

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