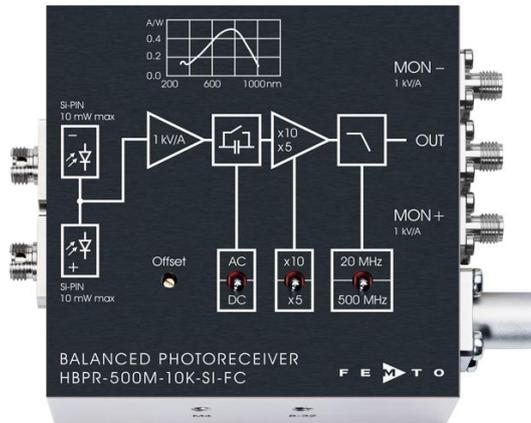


High-Speed Balanced Photoreceiver



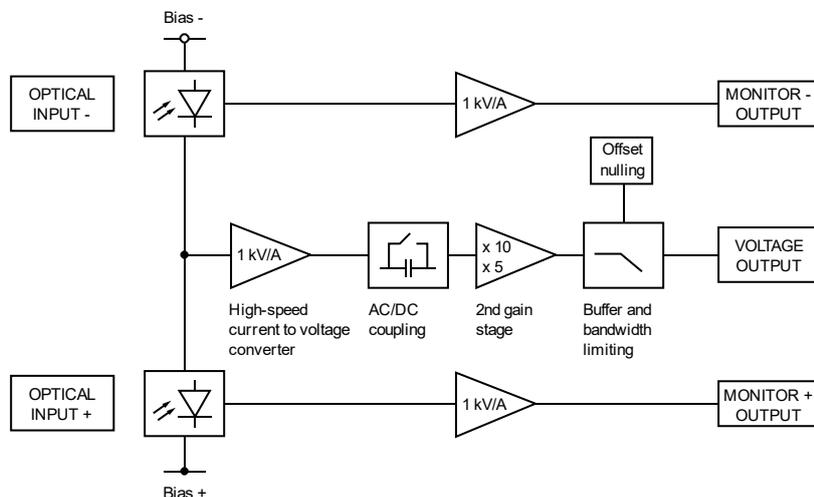
Features

- Bandwidth DC to 500 MHz
- Common-Mode Rejection Ratio (CMRR) 45 dB typ.
- Si-PIN photodiodes
- FC fiber optic inputs
- Spectral range 320 - 1000 nm
- Very low NEP, down to 12 pW/ $\sqrt{\text{Hz}}$
- Transimpedance gain switchable 5×10^3 V/A, 10×10^3 V/A
- High dynamic input range up to 2×10 mW balanced optical power
- Fast monitor outputs with 10 MHz bandwidth and 1×10^3 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-SI-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

$V_s = \pm 15 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$, signal output terminated with $50 \text{ } \Omega$, Monitor outputs terminated with $1 \text{ M}\Omega$

Gain

Transimpedance gain

$5 \times 10^3 \text{ V/A}$ (2nd gain x5), $10 \times 10^3 \text{ V/A}$ (2nd gain x10) switchable (@ $50 \text{ } \Omega$ load)

Gain accuracy

±1 % electrical

Conversion gain

$2.55 \times 10^3 \text{ V/W}$ typ. (@ 2nd gain x5, 760 nm)
 $5.1 \times 10^3 \text{ V/W}$ typ. (@ 2nd gain x10, 760 nm)

Common mode rejection ratio (CMRR)

50 dB typ. ($f \leq 100 \text{ MHz}$)
40 dB typ. ($f \leq 500 \text{ MHz}$)

Frequency Response

Lower cut-off frequency

DC / 10 Hz, switchable

Upper cut-off frequency

500 MHz (@ 2nd gain x5); 460 MHz (@ 2nd gain x10), switchable to 20 MHz

Time Response

Rise/fall time (10 % - 90 %)

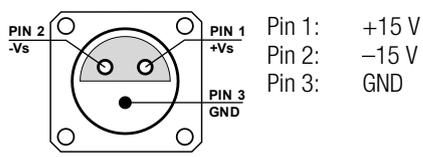
0.85 ns (@ 2nd gain x5); 0.95 ns (@ 2nd gain x10)
17.5 ns (low pass filter 20 MHz)

High-Speed Balanced Photoreceiver

<p>Specifications (continued)</p> <p>Input</p>	<p>Noise equivalent power (NEP) minimum 12 pW/√Hz (@ 760 nm) 13 pW/√Hz (@ 760 nm, 20 MHz) 29 pW/√Hz (@ 760 nm, 200 MHz) 60 pW/√Hz (@ 760 nm, 500 MHz)</p> <p>Maximum differential CW power for linear amplification 400 μW (@ 2nd gain x5, DC-coupled, 760 nm) 200 μW (@ 2nd gain x10, DC-coupled, 760 nm) 2.5 mW (@ AC-coupled, 760 nm)</p> <p>Max. optical CW balanced power (common mode power) 10 mW (on each photodiode, @ 760 nm)</p> <p>Monitor optical saturation power (limited by Maximum Rating) 12 mW (@ 760 nm)</p>
<p>Detector</p>	<p>Detector SI-PIN photodiode FC fiber connector</p> <p>Active area ∅ 400 μm, integrated ball lens suitable for fibers up to 200 μm core diameter</p> <p>Spectral range 320 - 1000 nm</p> <p>Sensitivity 0.51 A/W typ. (@ 760 nm)</p>
<p>Signal Output</p>	<p>Output voltage range ±1.0 V (@ 50 Ω load) for linear operation and low harmonic distortion</p> <p>Max. output voltage ±2.0 V (@ 50 Ω load)</p> <p>Offset voltage compensation ±100 mV typ., adjustable by offset potentiometer</p> <p>Output impedance 50 Ω (terminate with 50 Ω load)</p> <p>Slew rate 2800 V/μs</p> <p>Max. output current 70 mA</p> <p>Output return loss S22 -30 dB @ < 100 MHz -20 dB @ < 800 MHz</p> <p>Output noise 2.3 mV_{RMS} (15 mV_{PP}) (@ 2nd gain x5) 3.9 mV_{RMS} (26 mV_{PP}) (@ 2nd gain x10) 0.25 mV_{RMS} (1.7 mV_{PP}) typ. (@ 2nd gain x5, BW: 20 MHz) 0.4 mV_{RMS} (2.5 mV_{PP}) typ. (@ 2nd gain x10, BW: 20 MHz) (@ 50 Ω load, no signal on detectors, measurement bandwidth 2 GHz)</p>
<p>Monitor Outputs</p>	<p>Monitor output gain 1 x 10³ V/A (@ ≥ 100 kΩ load)</p> <p>Monitor output voltage range 0 ... +10 V (@ ≥ 100 kΩ load)</p> <p>Monitor output impedance 50 Ω (terminate with ≥ 100 kΩ load)</p> <p>Monitor output max. output current 30 mA typ.</p> <p>Monitor output bandwidth DC ... 10 MHz</p> <p>Monitor output noise 0.6 mV_{RMS} (4 mV_{PP}) (@ 100 kΩ load, no signal on detectors, measurement bandwidth 200 MHz)</p>
<p>Power Supply</p>	<p>Supply voltage ±15 V (±14.5 V ... ±16.5 V)</p> <p>Supply current -90 / +120 mA (depends on operating conditions, recommended power supply capability min. ±200 mA)</p>

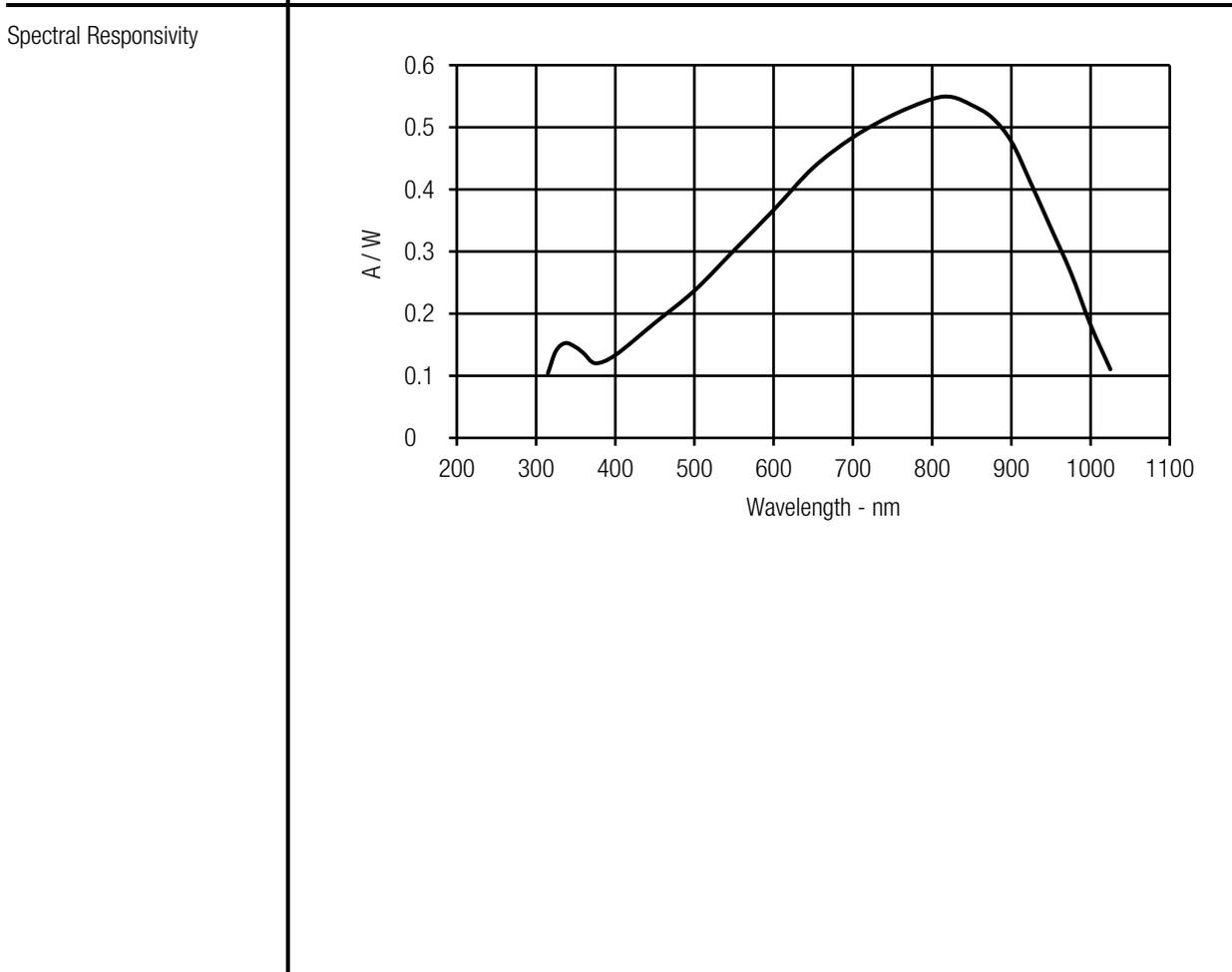
High-Speed Balanced Photoreceiver

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
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)



Scope of Delivery	HBPR-500M-10K-SI-FC, Lemo® 3-pin connector, 3 x adapter SMA (male) to BNC (female), datasheet	
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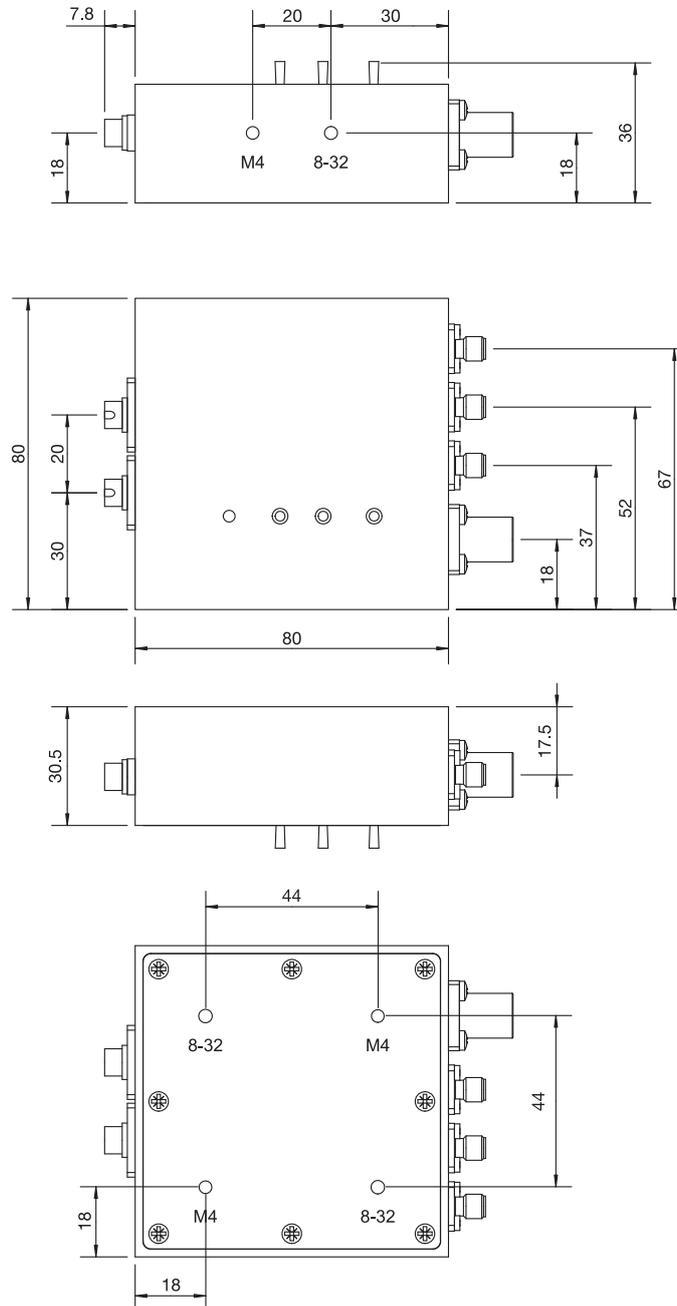
Ordering Information	HBPR-500M-10K-SI-FC	FC fiber optic connector (FC/PC and FC/APC compatible)
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High-Speed Balanced Photoreceiver

Dimensions

Case dimensions for HBPR-500M-10K-SI-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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