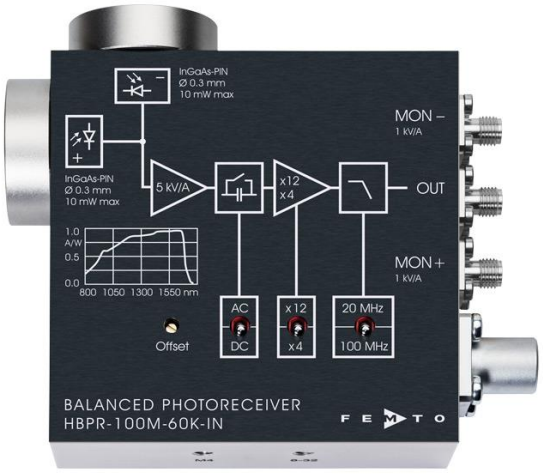
High-Speed Balanced Photoreceiver



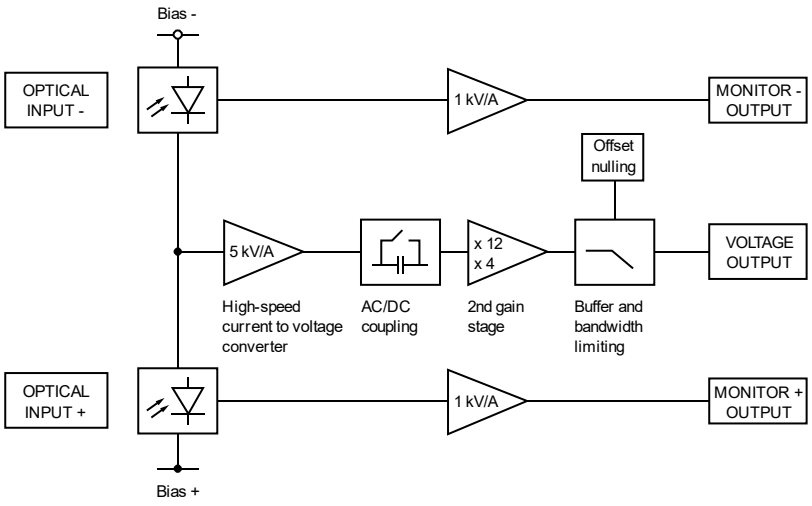
Features

- Bandwidth DC to 100 MHz
- Common-Mode Rejection Ratio (CMRR) 50 dB typ.
- InGaAs-PIN detectors, 0.3 mm active diameter
- Spectral range 800 - 1700 nm
- Very low NEP, down to 3.7 pW/√Hz
- Transimpedance gain switchable 20 x 10^3 V/A, 60 x 10^3 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 10^3 V/A gain
- Switchable low pass filter for minimizing wideband noise
- Free-space input 1.035"-40 threaded, alternatively 25 mm diameter unthreaded
- 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 Versions

HBPR-100M-60K-IN-FST

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

Picture shows two 1.035"-40 threaded flanges with internally threaded coupler rings mounted (outer diameter 30 mm)

HBPR-100M-60K-IN-FS

25 mm dia. unthreaded flange for free space applications compatible with many optical standard accessories.

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: FC input

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

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 = ±15 V, T_A = 25 °C, signal output terminated with 50 Ω, Monitor outputs terminated with 1 MΩ
Gain	Transimpedance gain	20 x 10^3 V/A (2^{nd} gain x4), 60 x 10^3 V/A (2^{nd} gain x12) switchable (@ 50 Ω load)
	Gain accuracy	±1 % electrical
	Conversion gain	19 x 10^3 V/W typ. (@ 2^{nd} gain x4, 1550 nm) 57 x 10^3 V/W typ. (@ 2^{nd} gain x12, 1550 nm)
	Common mode rejection ratio (CMRR)	50 dB typ. (f ≤ 100 MHz)
Frequency Response	Lower cut-off frequency	DC / 10 Hz, switchable
	Upper cut-off frequency	100 MHz, switchable to 20 MHz

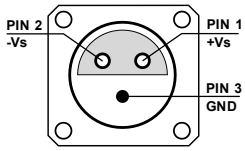
High-Speed Balanced Photoreceiver

Specification (continued)

Time Response	Rise/fall time (10 % - 90 %)	3.4 ns 17.5 ns (low pass filter 20 MHz)
Input	Noise equivalent power (NEP)	minimum 3.7 pW/√Hz (@ 1550 nm) 4.3 pW/√Hz (@ 1550 nm, 20 MHz) 7.1 pW/√Hz (@ 1550 nm, 50 MHz) 12.0 pW/√Hz (@ 1550 nm, 100 MHz)
	Maximum differential CW power for linear amplification	53 µW (@ 2nd gain x4, DC-coupled, 1550 nm) 18 µW (@ 2nd gain x12, DC-coupled, 1550 nm) 275 µW (@ AC-coupled, 1550 nm)
	Max. optical CW balanced power (common mode power)	10 mW (on each photodiode, @ 1550 nm)
	Monitor optical saturation power (limit for linear amplification)	10.5 mW (@ 1550 nm)
Detector	Detector	InGaAs-PIN photodiode
	Active area	∅ 300 µm
	Spectral range	800 - 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	2000 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}) (@ 2nd gain x4) 6.2 mV_{RMS} (41 mV_{PP}) (@ 2nd gain x12) 0.5 mV_{RMS} (3.1 mV_{PP}) typ. (@ 2nd gain x4, BW: 20 MHz) 1.3 mV_{RMS} (8.8 mV_{PP}) typ. (@ 2nd gain x12, 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)
Input Flange	Material	1.4305 stainless steel, nickel-plated (FST flange) AlMg4.5Mn, nickel-plated (FS flange)

High-Speed Balanced Photoreceiver

Specification (continued)			
Coupler Ring (FST version only)	Material	1.4305 stainless steel, glass bead blasted	
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	400 g (0.88 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	FS version	25 mm dia. unthreaded flange for free space applications
		FST version	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories
	Output	SMA jack (female)	
	Power supply	Lemo® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)	



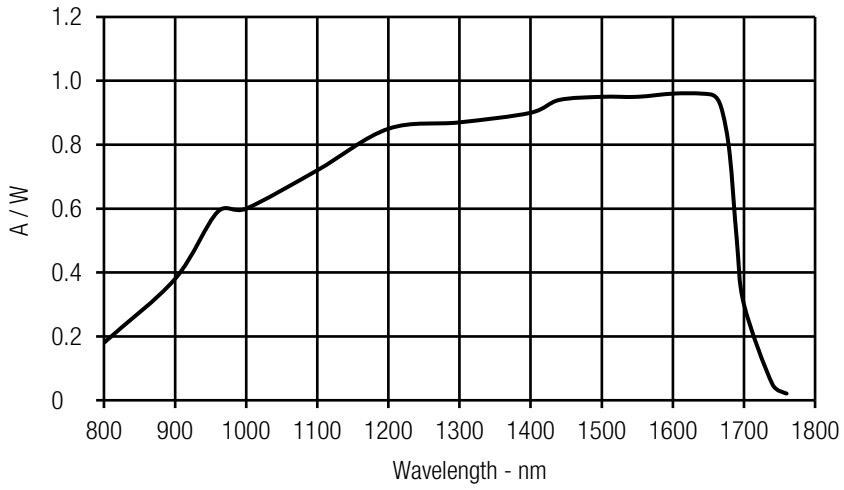
Pin 1: +15 V
Pin 2: –15 V
Pin 3: GND

Scope of Delivery	HBPR-100M-60K-IN, 2 x threaded coupler ring (FST version only), Lemo® 3-pin connector, 3 x adapter SMA (male) to BNC (female), datasheet

Ordering Information	HBPR-100M-60K-IN-FS	25 mm dia. unthreaded flange for free space applications
	HBPR-100M-60K-IN-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories

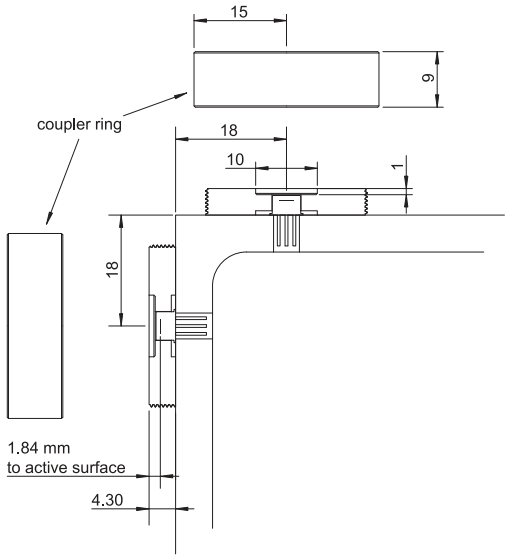
High-Speed Balanced Photoreceiver

Spectral Responsivity

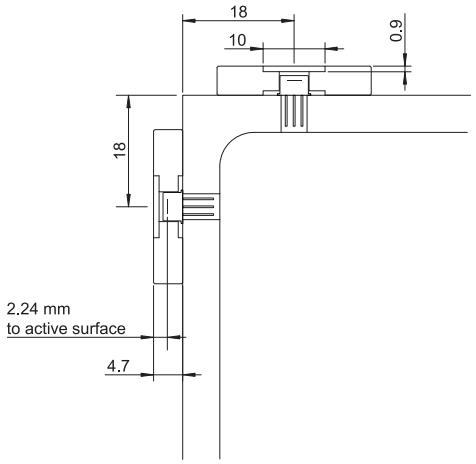


Detector Position

HBPR-100M-60K-IN-FST (1.035"-40 threaded free space input)



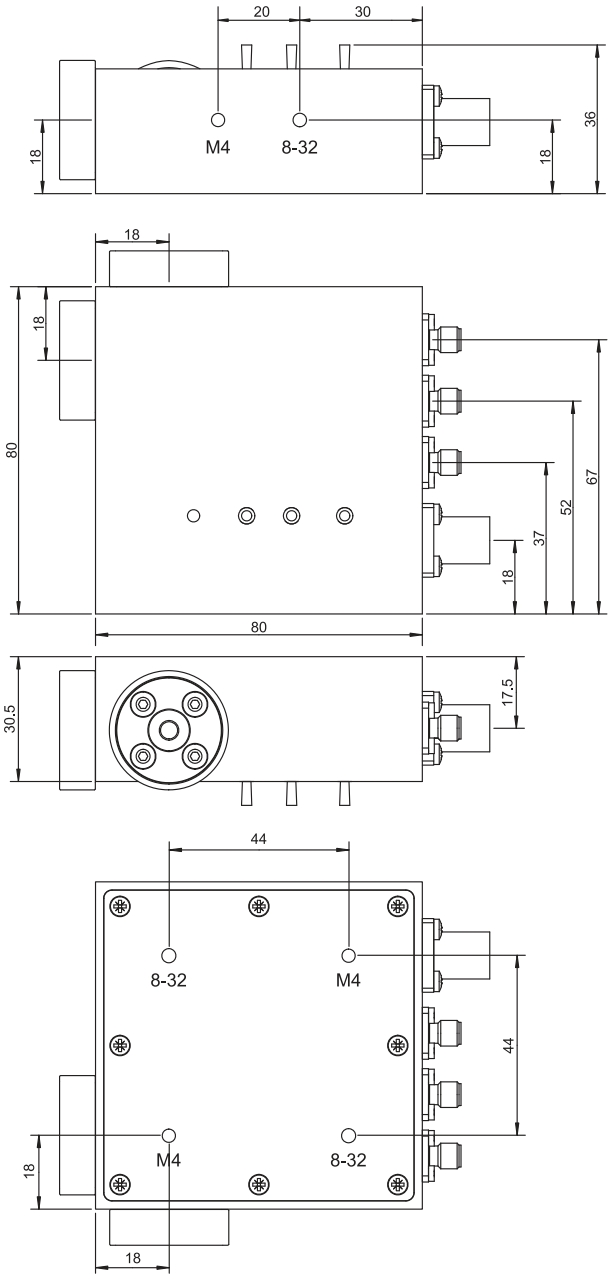
HBPR-100M-60K-IN-FS (25 mm dia. unthreaded free space input)



High-Speed Balanced Photoreceiver

Dimensions

Case dimensions for HBPR-100M-60K-IN (FS/FST model):



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.

FEMTO Messtechnik GmbH
Klosterstr. 64
10179 Berlin · Germany
Phone: +49 30 280 4711-0
Fax: +49 30 280 4711-11
Email: info@femto.de
www.femto.de