High-Speed Balanced Photoreceiver

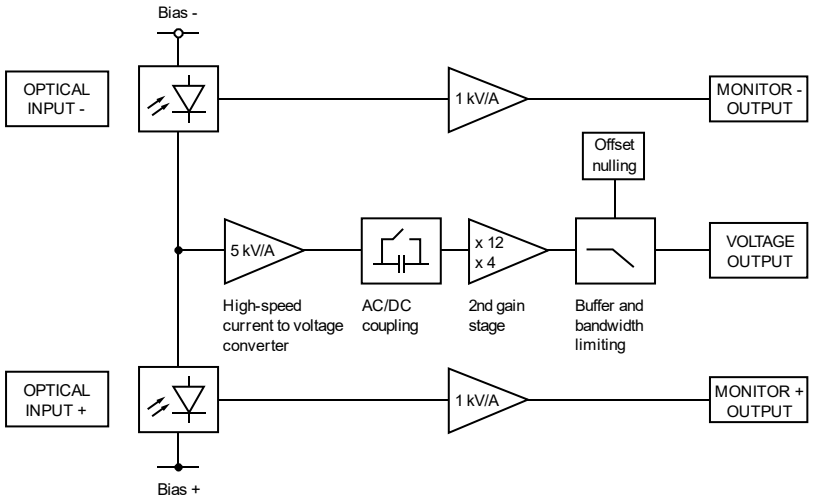
Features

- Bandwidth DC to 100 MHz
- Common-Mode Rejection Ratio (CMRR) 50 dB typ.
- SI-PIN detectors, 0.8 mm active diameter
- Spectral range 320 - 1000 nm
- Very low NEP, down to 6.5 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
- Easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters
- 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



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Available Input Versions

HBPR-100M-60K-SI-FST

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

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

Optional: Fiber adapters PRA-FC, PRA-FCA, PRA-FSMA

HBPR-100M-60K-SI-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 Accessories

PRA-FC
PRA-FCA
PRA-FSMA

fiber-adapter with external 1.035"-40 thread (suitable for FST models only)

PS-15

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

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Specifications		
	Test conditions	$V_S = \pm 15$ 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	10.8 x 10^3 V/W typ. (@ 2^{nd} gain x4, 850 nm) 32.4 x 10^3 V/W typ. (@ 2^{nd} gain x12, 850 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
Time Response	Rise/fall time (10 % - 90 %)	3.3 ns 17.5 ns (low pass filter 20 MHz)
Input	Noise equivalent power (NEP)	minimum 6.5 pW/√Hz (@ 850 nm) 7.4 pW/√Hz (@ 850 nm, 20 MHz) 12.0 pW/√Hz (@ 850 nm, 50 MHz) 19.0 pW/√Hz (@ 850 nm, 100 MHz)
	Maximum differential CW power for linear amplification	93 µW (@ 2^{nd} gain x4, DC-coupled, 850 nm) 31 µW (@ 2^{nd} gain x12, DC-coupled, 850 nm) 450 µW (@ AC-coupled, 850 nm)
	Max. optical CW balanced power (common mode power)	10 mW (on each photodiode, @ 850 nm)
	Monitor optical saturation power (limited by Maximum Rating)	12 mW (@ 850 nm)
Detector	Detector	SI-PIN photodiode
	Active area	∅ 800 µm
	Spectral range	320 - 1000 nm
	Sensitivity	0.54 A/W typ. (@ 850 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	2.0 mV_{RMS} (13 mV_{PP}) (@ 2^{nd} gain x4) 5.6 mV_{RMS} (37 mV_{PP}) (@ 2^{nd} gain x12) 0.5 mV_{RMS} (3.0 mV_{PP}) typ. (@ 2^{nd} gain x4, BW: 20 MHz) 1.3 mV_{RMS} (8.8 mV_{PP}) typ. (@ 2^{nd} gain x12, BW: 20 MHz) (@ 50 Ω load, no signal on detectors, measurement bandwidth 2 GHz)

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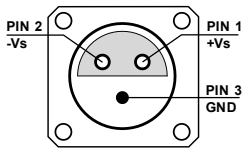
Specifications (Continued)			
Monitor Outputs	Monitor output gain	1 x 10^3 V/A (@ ≥ 100 kΩ load)	
	Monitor output voltage range	0 ... +10 V (@ ≥ 100 kΩ load)	
	Monitor output impedance	50 Ω (terminate with ≥ 100 kΩ load)	
	Monitor output max. output current	30 mA typ.	
	Monitor output bandwidth	DC ... 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)	
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	410 g (0.9 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-SI, 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-SI-FS	25 mm dia. unthreaded flange for free space applications
	HBPR-100M-60K-SI-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories

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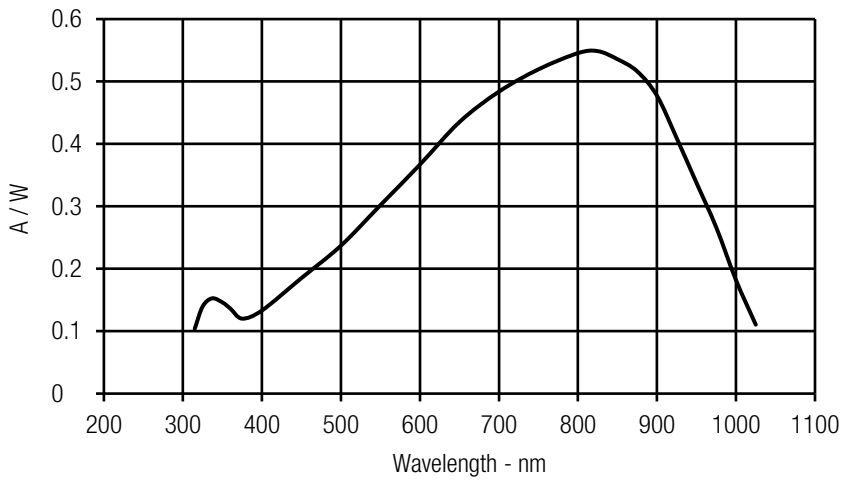
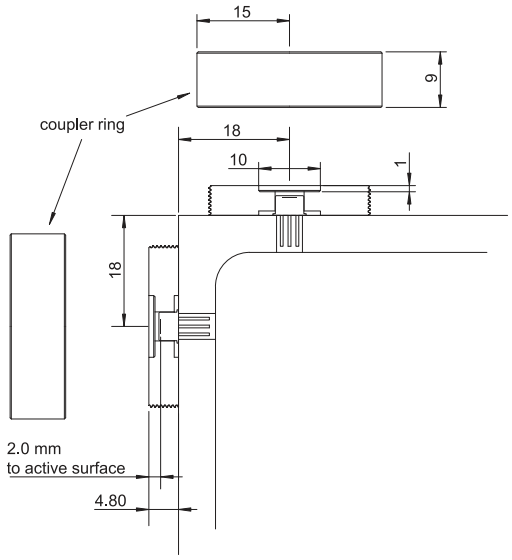
Spectral Responsivity

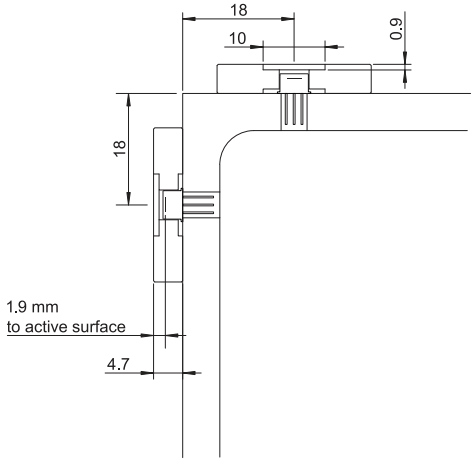


Detector Position

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



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



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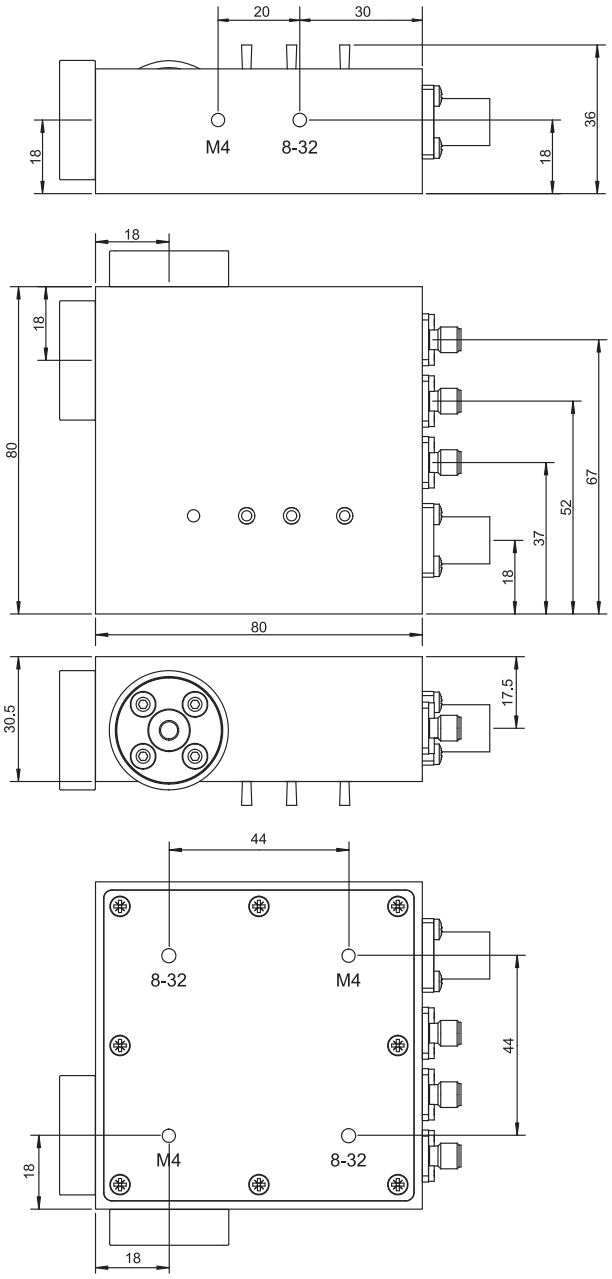
Dimensions

Case dimensions for HBPR-100M-60K-SI (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.

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