# Ultra-Low Noise 2 kHz Photoreceiver with Si-PIN Photodiode


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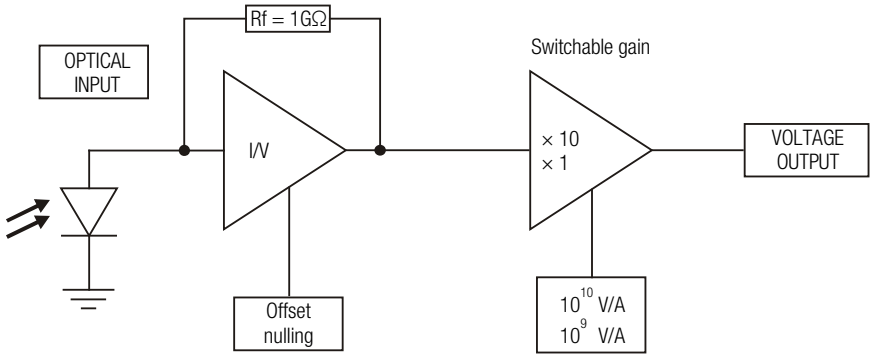
| Features | • **Si-PIN photodiode, 1.2 mm active diameter**<br>• **Bandwidth DC – 2 kHz**<br>• **Amplifier transimpedance gain switchable 1.0 × $10^9$ V/A, 1.0 × $10^{10}$ V/A**<br>• **Spectral range 320 – 1060 nm**<br>• **Ultra-low noise, NEP 9 fW/√Hz**<br>• **Free-space input 1.035"-40 threaded, easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters**<br>• **UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread** |
| Applications | • **Spectroscopy, reflection and transmission measurements**<br>• **Highly sensitive optoelectronic measurements**<br>• **Applications utilizing optical chopper modulation**<br>• **Optical front-end for oscilloscopes, A/D converters and lock-in amplifiers** |
| Block Diagram |  <br>BS01-PWPR_R01 |
| Intended Use | The PWPR-2K-SI is a ultra-low noise variable gain photoreceiver. It is designed for fast and precise conversion of small optical signals into equivalent output voltages. Operation is mostly self-explanatory. If in doubt, consult this document or contact support@femto.de.<br>For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and “Power Supply” sections of this document.<br>The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance. |

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| Available Version | PWPR-2K-SI-FST  | 1.035"-40 threaded flange with internally threaded coupler ring (outer diameter 30 mm) for free space applications, compatible with many optical standard accessories<br>Optionally available:<br>Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA, with the relative large 1.2 mm dia. photodiode installed in the PWPR-2K-SI input coupling is not critical, however, standard SM 9/125 fibers (PC or APC) with low numerical aperture (NA) are recommended for ensuring near 100% coupling efficiency |
| Related Model | PWPR-2K-IN-FST | InGaAs-PIN, ∅ 0.5 mm, 900 - 1700 nm<br>free space input, 1.035"-40 threaded flange |
| Available Accessories | PRA-FC<br>PRA-FCA<br>PRA-FSMA   | Fiber-adapter with external 1.035"-40 thread (suitable for FST models only) |
| | PRA-PAP   | Alternative mounting option: post adapter plate, easy to mount on FEMTO photoreceiver series OE, FWPR, PWPR, HCA-S and LCA-S |
| | PS-15-25-L  | Power Supply<br>input: 100 – 240 VAC<br>output: ±15 VDC |

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| Specifications | Test conditions | $V_S = \pm 15$ V, $T_A = 25$ °C, output load impedance 1 MΩ, warm-up 20 minutes (min. 10 minutes recommended) |
| Gain | Transimpedance gain | $1.0 \times 10^9$ V/A, $1.0 \times 10^{10}$ V/A, switchable (@ output load ≥ 100 kΩ) |
| | Gain accuracy | ±1 % (electrical) |
| | Conversion gain | $6.4 \times 10^8$ V/W, $6.4 \times 10^9$ V/W typ. (@ 900 nm, output load ≥ 100 kΩ) |
| Frequency Response | Lower cut-off frequency | DC |
| | Upper cut-off frequency (–3 dB) | 2 kHz |
| Time Response | Rise/fall time (10 % – 90 %) | 165 µs |
| Input | Input offset current (dark current) | 0.6 pA typ. |
| | Input offset current drift | factor 2 / 10 °C |
| | Input offset compensation range | ±120 pA (adjustable by offset potentiometer) |
| | Optical saturation power | 15.6 nW (@ $10^9$ V/A, 900 nm)<br>1.56 nW (@ $10^{10}$ V/A, 900 nm) |
| | NEP | 9 fW/√Hz (@ 900 nm, 100 Hz) |

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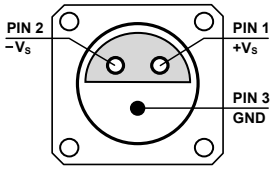
| Specifications (continued) | | |
| Detector | Detector | Si-PIN photodiode |
| | Active area | ∅ 1.2 mm |
| | Spectral range | 320 – 1060 nm |
| | Max. sensitivity | 0.64 A/W typ. (@ 900 nm) |
| Output | Output voltage range | –1.2 V ... +10 V (@ ≥ 100 kΩ output load) |
| | Output impedance | 50 Ω (terminate with ≥ 100 kΩ load) |
| | Max. output current | 30 mA (short-circuit proof) |
| | Output noise | 0.45 mV RMS (3 mV peak-peak) typ. (@ $10^9$ V/A, ≥ 100 kΩ load, no signal on detector, measurement bandwidth 8 KHz) |
| Optical Input Connector | Material FST flange | 1.4305 stainless steel, nickel-plated |
| | Material FST coupler ring | 1.4305 stainless steel, glass bead blasted |
| Power Supply | Supply voltage | ±15 V (±14.5 V ... ±16.5 V) |
| | Supply current | +32 mA / –25 mA (depends on operating conditions, recommended power supply capability min. ±100 mA) |
| Case | Weight | 220 g (0.49 lbs) PWPR-2K-SI-FST incl. coupler ring |
| | Material | AlMg4.5Mn, nickel-plated |
| Temperature Range | Storage temperature | –30 °C ... +85 °C |
| | Operating temperature | 0 °C ... +50 °C |
| Absolute Maximum Ratings | Optical input power (CW) | 10 mW |
| | Power supply voltage | ±20 V |
| Connectors | Input | 1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories |
| | Output | BNC 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

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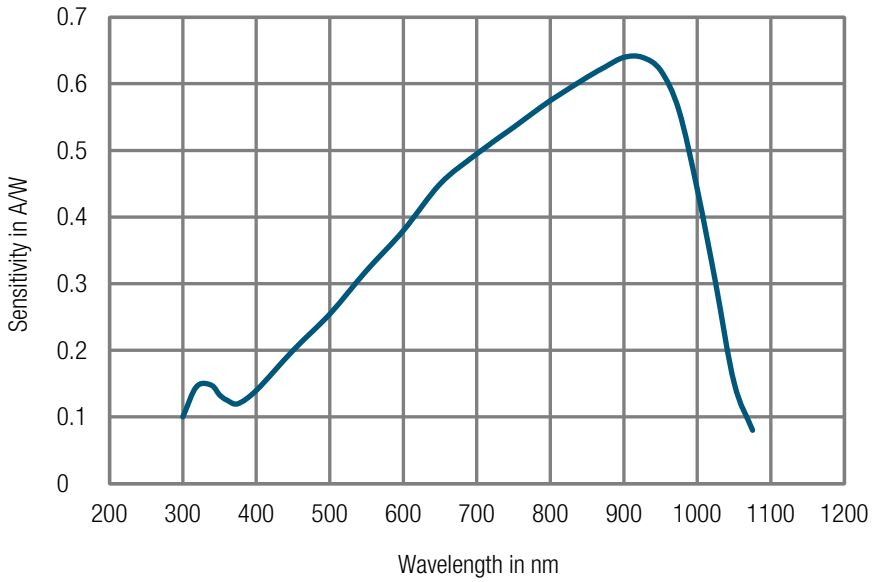
| Scope of Delivery | PWPR-2K-SI, internally threaded coupler ring, LEMO® 3-pin connector, datasheet, transport package |
| Ordering Information | PWPR-2K-SI-FST — 1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories |

# Ultra-Low Noise 2 kHz Photoreceiver with Si-PIN Photodiode

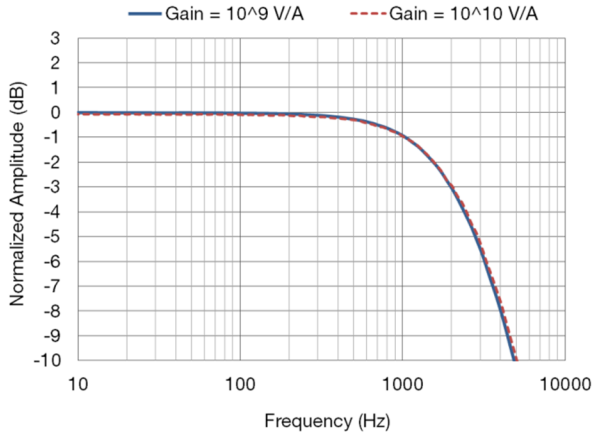
Spectral Responsivity



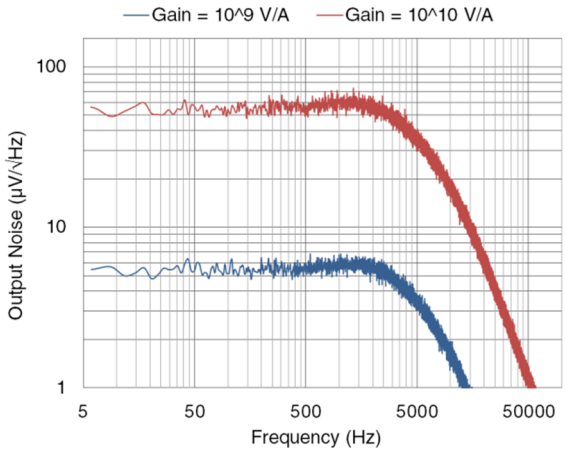

DB-Sens-PWPR-2K-SI_R02

Typical Performance Characteristics

Frequency Response



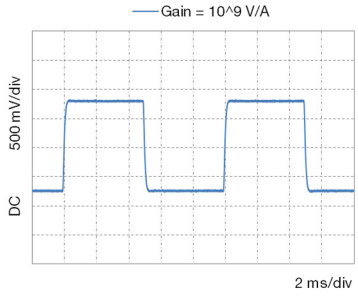

Output Noise



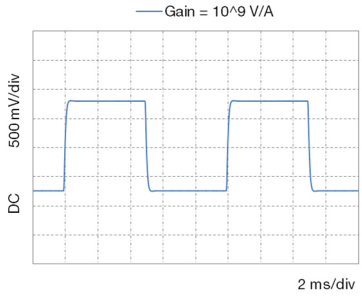
# Ultra-Low Noise 2 kHz Photoreceiver with Si-PIN Photodiode

Typical Performance Characteristics (continued)

Step Signal Response @ 2500 pW (p-p, 850 nm)

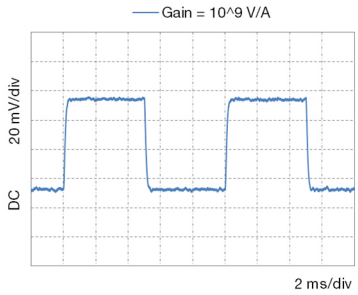



acquisition without averaging

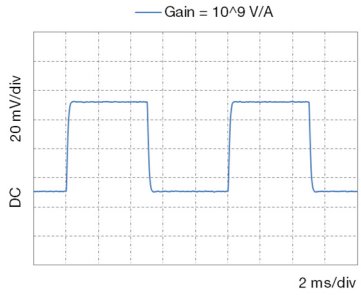



acquisition with 64x averaging

Step Signal Response @ 100 pW (p-p, 850 nm)

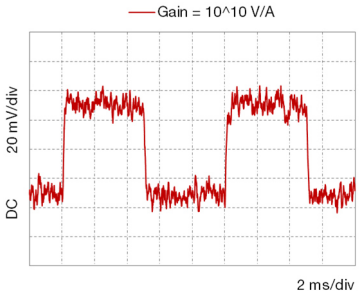



acquisition without averaging

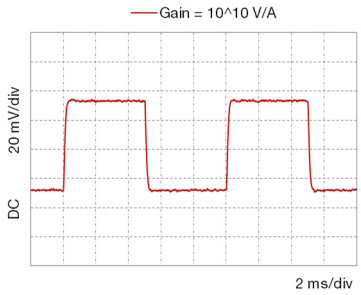



acquisition with 64x averaging

Step Signal Response @ 10 pW (p-p, 850 nm)




acquisition without averaging

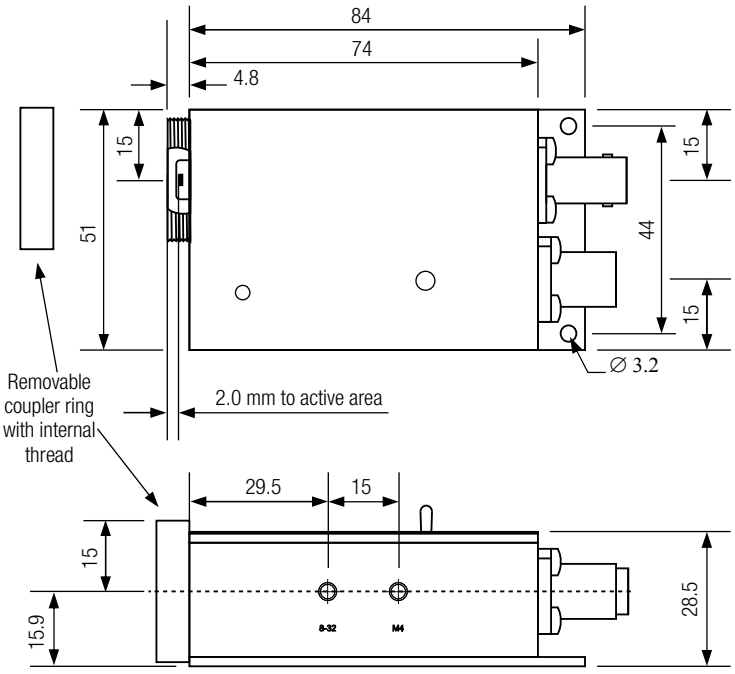



acquisition with 64x averaging

# Ultra-Low Noise 2 kHz Photoreceiver with Si-PIN Photodiode

Dimensions

PWPR-2K-SI-FST




DZ-PWPR-2K-FST_R02

all dimensions in mm unless otherwise noted

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