

Ultra High Speed Photoreceiver
with Si-PIN Photodiode



The picture shows model HSPR-X-I-1G4-SI-FST.

Features	<ul style="list-style-type: none">• Si-PIN photodiode• Bandwidth 10 kHz – 1.4 GHz• Amplifier transimpedance gain 5.0×10^3 V/A (inverting)• Max. conversion gain 2.55×10^3 V/W @ 760 nm• Spectral range 320 – 1000 nm• Free-space input 1.035"-40 threaded, easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters• Fiber optic input also available as permanently mounted FC-input• UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread
Applications	<ul style="list-style-type: none">• Spectroscopy• Ultra-fast pulse and transient measurements• Optical triggering• Optical front-end for oscilloscopes and ultra-fast A/D converters
Block Diagram	<p>The block diagram illustrates the internal circuit of the photoreceiver. It starts with a photodiode symbol on the left, with an arrow indicating incident light. The photodiode is connected to a 'Bias' terminal at the bottom. The other terminal of the photodiode is connected to a node that also branches to a 'DC-path' to ground. This node then connects to the non-inverting input of an inverting amplifier, represented by a triangle with a circle at its output. The output of the amplifier is connected to a 'VOLTAGE OUTPUT' block through a series of two capacitors. The identifier 'BS01-HSPR-I_R01' is located in the bottom right corner of the diagram area.</p>
Intended Use	<p>The HSPR-X-I-1G4-SI photoreceiver consists of an Si photodiode and a subsequent low-noise fixed gain amplifier. It is designed for ultra-fast 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.</p> <p>For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and "Power Supply" sections of this document.</p> <p>The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance.</p>

Ultra High Speed Photoreceiver with Si-PIN Photodiode

Available Versions

HSPR-X-I-1G4-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 and for use with various types of fiber connector adapters.

Optionally available:

Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA.

With the relative large 0.4 mm dia. photodiode installed in the HSPR-X-I-1G4-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.

HSPR-X-I-1G4-SI-FC



Fix/permanent FC fiber connector for high coupling efficiency and excellent conversion gain accuracy.

Related Models

HSA-X-S-1G4-SI-FST

Si-PIN, \varnothing 0.4 mm, 320 – 1000 nm, 1.4 GHz, free space input, 1.035"-40 threaded flange

HSA-X-S-1G4-SI-FC

Si-PIN, integrated ball lens, 320 – 1000 nm, 1.4 GHz, FC fiber connector (fix/permanent)

HSA-X-S-2G-IN-FST

InGaAs-PIN, \varnothing 0.1 mm, 900 – 1700 nm, 2 GHz, free space input, 1.035"-40 threaded flange

HSA-X-S-2G-IN-FC

InGaAs-PIN, integrated ball lens, 900 – 1700 nm, 2 GHz, FC fiber connector (fix/permanent)

HSPR-X-I-2G-IN-FST

InGaAs-PIN, \varnothing 0.1 mm, 900 – 1700 nm, 2 GHz, inverting output, free space input, 1.035"-40 threaded flange

HSPR-X-I-2G-IN-FC

InGaAs-PIN, integrated ball lens, 900 – 1700 nm, 2 GHz, inverting output, FC fiber connector (fix/permanent)

Available Accessories

PRA-FC
PRA-FCA
PRA-FSMA



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

PS-15-25-L

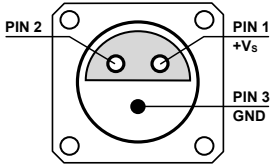
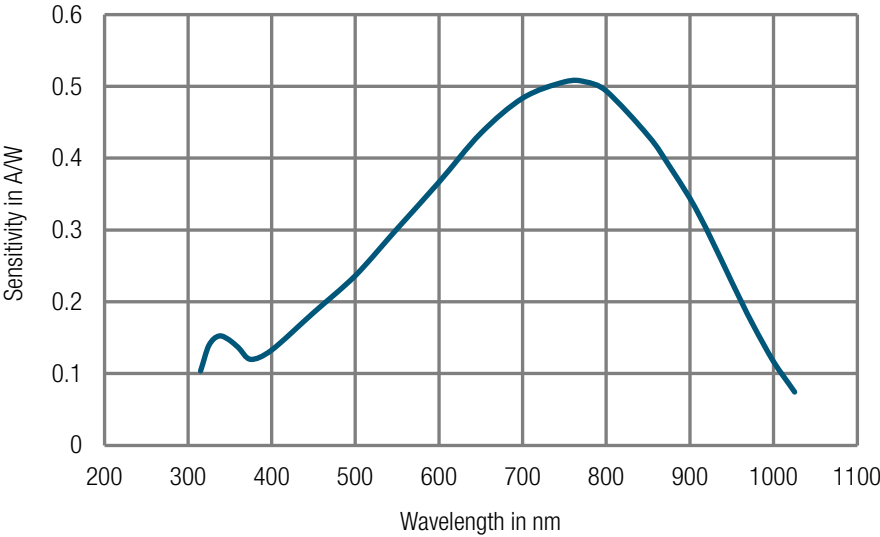


Power Supply
Input: 100 – 240 VAC
Output: \pm 15 VDC

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Specifications	Test conditions	$V_S = +15\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, output load impedance $50\text{ }\Omega$, warm-up 20 minutes (min. 10 minutes recommended)
Gain	Transimpedance gain Conversion gain	$5.0 \times 10^3\text{ V/A}$ (inverting, @ output load $50\text{ }\Omega$) $2.55 \times 10^3\text{ V/W typ.}$ (@ 760 nm , output load $50\text{ }\Omega$)
Frequency Response	Lower cut-off frequency (-3 dB) Upper cut-off frequency (-3 dB)	10 kHz $1.4\text{ GHz } (\pm 15\%)$
Time Response	Rise/fall time ($10\text{ }\% - 90\text{ }\%$)	$250\text{ ps } (\pm 15\%)$
Input	Noise equivalent power (NEP) Optical saturation power	$19\text{ pW}/\sqrt{\text{Hz}}$ (@ 760 nm , 100 MHz) $390\text{ }\mu\text{W AC}$ (for linear amplification, @ 760 nm) 10 mW CW (to prevent saturation, @ 760 nm)
Detector	Detector Active area (FST version) Active area (FC version) Spectral range Max. sensitivity	Si-PIN photodiode $\varnothing 400\text{ }\mu\text{m}$ integrated ball lens suitable for fibers up to $400\text{ }\mu\text{m}$ core diameter $320 - 1000\text{ nm}$ 0.51 A/W typ. (@ 760 nm)
Output	Output voltage range Output reflection S22 Output impedance Output noise	2.0 V peak-peak (@ $50\text{ }\Omega$ output load) for linear operation and low harmonic distortion -15.5 dB (@ $f < 2.5\text{ GHz}$) $50\text{ }\Omega$ (terminate with $50\text{ }\Omega$ load) 2.5 mV RMS (17 mV peak-peak) typ. (@ $50\text{ }\Omega$ load, no signal on detector, measurement bandwidth 4 GHz)
Optical Input Connector	Material FST flange Material FST coupler ring Material FC receptacle	$1.4305\text{ stainless steel, nickel-plated}$ $1.4305\text{ stainless steel, glass bead blasted}$ nickel silver
Power Supply	Supply voltage Supply current	$+15\text{ V}$ 150 mA (depends on operating conditions, recommended power supply capability min. 200 mA)
Case	Weight Material	133 g (0.29 lbs) HSPR-X-I-1G4-SI-FST incl. coupler ring 110 g (0.24 lbs) HSPR-X-I-1G4-SI-FC $\text{AlMg4.5Mn, nickel-plated}$
Temperature Range	Storage temperature Operating temperature	$-30\text{ }^\circ\text{C} \dots +85\text{ }^\circ\text{C}$ $0\text{ }^\circ\text{C} \dots +60\text{ }^\circ\text{C}$
Absolute Maximum Ratings	Optical input power (CW) Power supply voltage	12 mW (averaged) 18.5 V

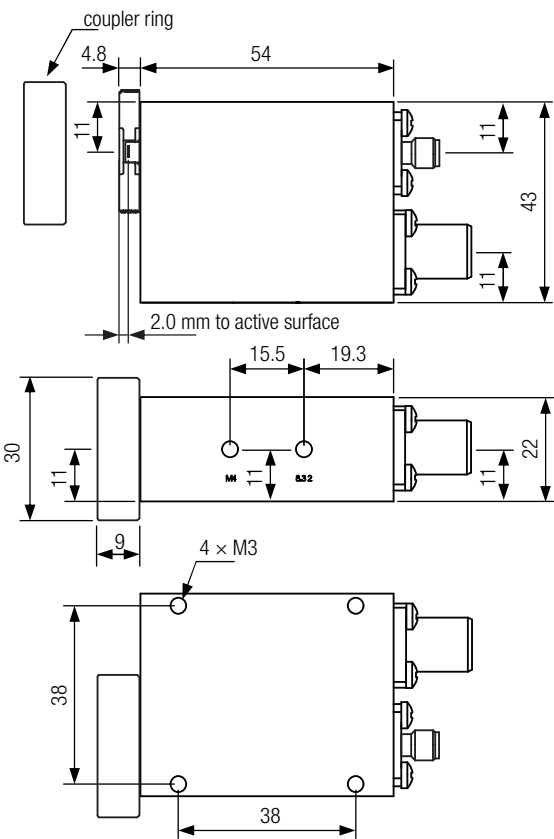
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Connectors	<div>Input<div>HSPR-X-I-1G4-SI-FST1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories</div><div>HSPR-X-I-1G4-SI-FCFC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible)</div></div> <div>Output<div>SMA jack (female)</div></div> <div>Power supply<div>LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)</div><div><div>Pin 1: +15 V Pin 2: NC Pin 3: GND</div></div></div>																						
Scope of Delivery	HSPR-X-I-1G4-SI, internally threaded coupler ring (FST version only), LEMO® 3-pin connector, datasheet, transport package																						
Ordering Information	<div>HSPR-X-I-1G4-SI-FST1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories.</div> <div>HSPR-X-I-1G4-SI-FCFC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible).</div>																						
Spectral Response	<div><table border="1"><caption>Spectral Response Data (Approximate)</caption><thead><tr><th>Wavelength (nm)</th><th>Sensitivity (A/W)</th></tr></thead><tbody><tr><td>300</td><td>0.10</td></tr><tr><td>350</td><td>0.15</td></tr><tr><td>400</td><td>0.12</td></tr><tr><td>500</td><td>0.25</td></tr><tr><td>600</td><td>0.40</td></tr><tr><td>700</td><td>0.50</td></tr><tr><td>750</td><td>0.52</td></tr><tr><td>800</td><td>0.50</td></tr><tr><td>900</td><td>0.35</td></tr><tr><td>1000</td><td>0.10</td></tr></tbody></table></div> <div>DB-Sens-HSPR-X-I-1G4-SI_R01</div>	Wavelength (nm)	Sensitivity (A/W)	300	0.10	350	0.15	400	0.12	500	0.25	600	0.40	700	0.50	750	0.52	800	0.50	900	0.35	1000	0.10
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Dimensions

HSPR-X-I-1G4-SI-FST (1.035"-40 threaded free space input)



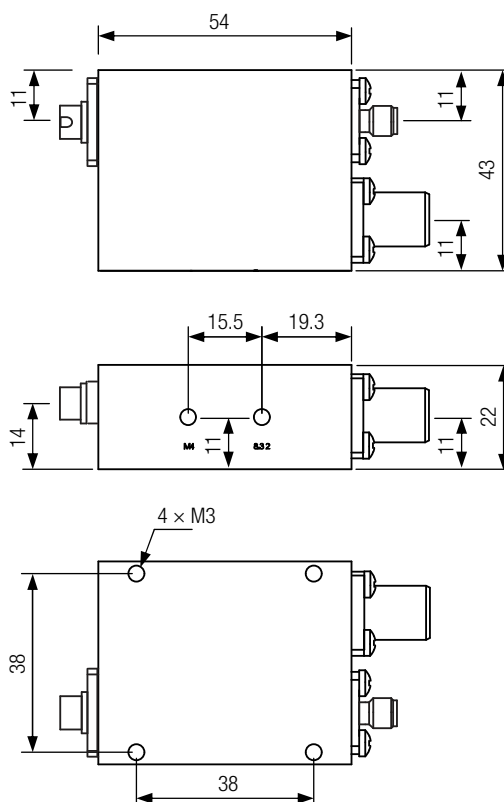
DZ-HS-FST_R1

all dimensions in mm unless otherwise noted

Ultra High Speed Photoreceiver with Si-PIN Photodiode

Dimensions (continued)

HSPR-X-I-1G4-SI-FC (FC fiber optic connector)



DZ-HS_FC_R1

all dimensions in mm unless otherwise noted

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