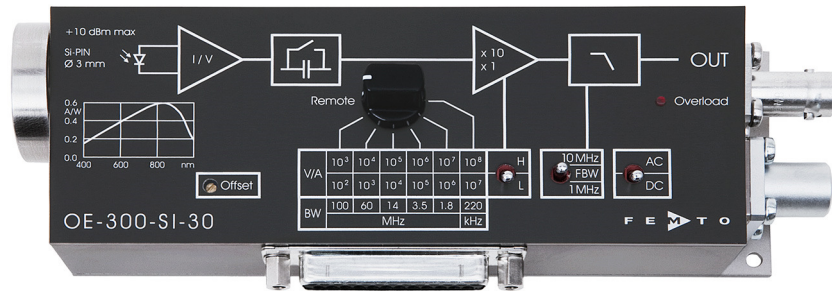


100 MHz Variable Gain Photoreceiver



The image shows model OE-300-SI-30-FST with 1.035"-40 threaded flange and coupler ring.

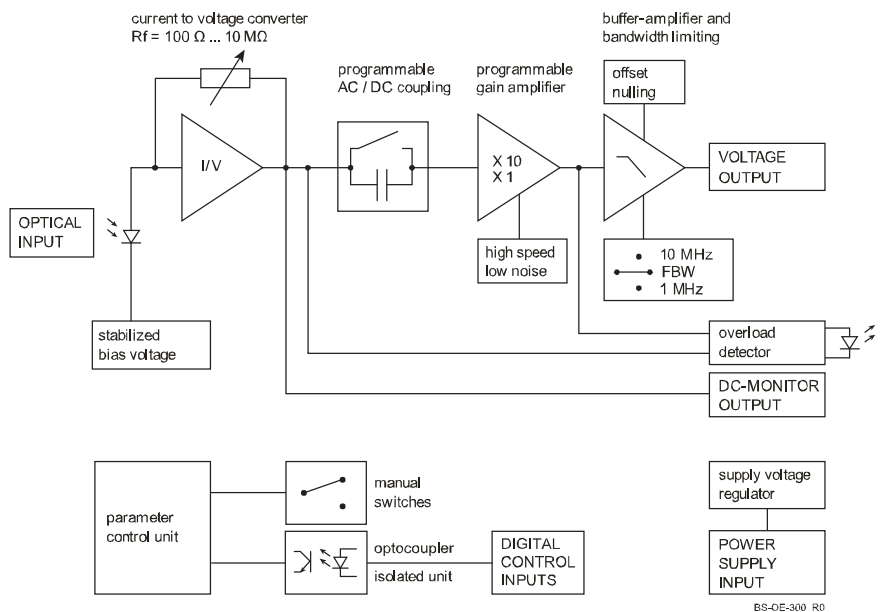
Features

- Adjustable transimpedance gain from 10^2 to 10^8 V/A
- Wide bandwidth up to 100 MHz
- Si-PIN photodiode covering the 320 to 1,000 nm wavelength range
- Large optical detector size 3 mm dia.
- High dynamic input range up to 10 mW optical power
- Very low noise, NEP down to 154 fW/√Hz
- Switchable low pass filters for minimizing wideband noise
- Threaded 1.035"-40 and unthreaded 25 mm dia. free space input available, compatible with many optical standard accessories
- 1.035"-40 input easily convertible to fiber optic input with optional adapter
- Full manual and remote control capability

Applications

- All purpose low-noise photoreceiver (O/E converter) for the MHz range
- Time resolved optical pulse and power measurements
- Laser intensity noise measurements (RIN)
- Optical front-end for oscilloscopes, spectrum analyzers, A/D converters and RF lock-in amplifiers

Block Diagram



200 MHz Variable Gain Photoreceiver

Available Versions

OE-300-SI-30-FST

1.035"-40 threaded flange
for free space applications and for use with various types
of fiber connector adapters

OE-300-SI-30-FS

25 mm dia. unthreaded flange
for free space applications

1.035"-40 threaded flange
Internal threaded coupler ring
(included)
Fiber-adapter PRA-FC
(optional)



Related OE-300 Models

See separate datasheets for following models on www.femto.de:

OE-300-SI-10-FST

Si-PIN, 1 x 1 mm, 400 - 1000 nm
1.035"- 40 threaded flange

OE-300-SI-10-FS

Si-PIN, 1 x 1 mm, 400 - 1000 nm
25 mm dia. unthreaded flange

OE-300-IN-01-FC

InGaAs-PIN, \varnothing 80 μ m, 900 - 1700 nm
FC fiber receptacle only

OE-300-IN-03-FST

InGaAs-PIN, \varnothing 300 μ m, 800 - 1700 nm
1.035"-40 threaded flange

OE-300-IN-03-FS

InGaAs-PIN, \varnothing 300 μ m, 800 - 1700 nm
25 mm dia. unthreaded flange

OE-300-S

customized versions available on request

Available Accessories

PRA-FC (picture)
PRA-FSMA



fiber-adapter with external
1.035"-40 thread

PRA-PAP



post adapter plate,
easy to mount on
FEMTO photoreceiver series
OE, FWPR, HCA-S and LCA-S

PS-15

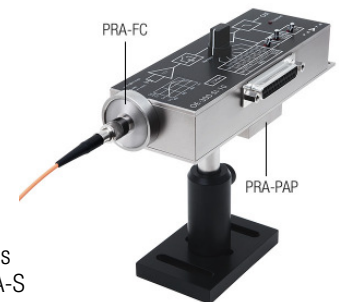


power supply,
input: 100 - 240 VAC,
output: \pm 15 VDC, +400/-250 mA

LUCI-10



compact digital I/O interface for USB remote control,
supports opto-isolation of amplifier signal path from PC
USB port, 16 digital outputs, 3 opto-isolated digital inputs,
bus-powered operation



200 MHz Variable Gain Photoreceiver

Specifications	Test conditions $V_s = \pm 15\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, system impedance = $50\ \Omega$																																																																																																		
Gain	Transimpedance gain $1 \times 10^2 \dots 1 \times 10^8\ \text{V/A}$ Gain accuracy $\pm 1\ \%$																																																																																																		
Frequency Response	Lower cut-off frequency Upper cut-off frequency DC/100 Hz, switchable up to 100 MHz (see table below), switchable to 1 MHz or 10 MHz																																																																																																		
Input	Noise equivalent power (NEP) Max. CW saturation power see table below see table below																																																																																																		
Detector	Detector Active area Spectral response Sensitivity R Dark current Si-PIN photodiode 3 mm dia. ($7.1\ \text{mm}^2$) 320 - 1000 nm 0.59 A/W typ. @ 850 nm 0.1 nA typ.																																																																																																		
Performance Depending on Gain Setting	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Gain setting (low noise) (V/A)</th> <th>10^2</th> <th>10^3</th> <th>10^4</th> <th>10^5</th> <th>10^6</th> <th>10^7</th> </tr> </thead> <tbody> <tr> <td>Upper cut-off frequency (-3 dB)</td> <td>100 MHz</td> <td>60 MHz</td> <td>14 MHz</td> <td>3.5 MHz</td> <td>1.8 MHz</td> <td>220 kHz</td> </tr> <tr> <td>Rise/fall time (10 % - 90 %)</td> <td>3.5 ns</td> <td>5.9 ns</td> <td>25 ns</td> <td>0.1 μs</td> <td>0.2 μs</td> <td>1.6 μs</td> </tr> <tr> <td>NEP ($\sqrt{\text{Hz}}$, @ 850 nm)</td> <td>340 pW</td> <td>29 pW</td> <td>10 pW</td> <td>2.7 pW</td> <td>568 fW</td> <td>200 fW</td> </tr> <tr> <td>Measured at</td> <td>10 MHz</td> <td>6 MHz</td> <td>1.4 MHz</td> <td>350 kHz</td> <td>180 kHz</td> <td>22 kHz</td> </tr> <tr> <td>Integrated input noise (rms)*</td> <td>5.5 μW</td> <td>430 nW</td> <td>56 nW</td> <td>8.7 nW</td> <td>1.9 nW</td> <td>130 pW</td> </tr> <tr> <td>CW saturation power (@ 850 nm)</td> <td>10 mW</td> <td>1.7 mW</td> <td>170 μW</td> <td>17 μW</td> <td>1.7 μW</td> <td>170 nW</td> </tr> </tbody> <thead> <tr> <th style="text-align: left;">Gain setting (high speed) (V/A)</th> <th>10^3</th> <th>10^4</th> <th>10^5</th> <th>10^6</th> <th>10^7</th> <th>10^8</th> </tr> </thead> <tbody> <tr> <td>Upper cut-off frequency (-3 dB)</td> <td>80 MHz</td> <td>60 MHz</td> <td>14 MHz</td> <td>3.5 MHz</td> <td>1.8 MHz</td> <td>220 kHz</td> </tr> <tr> <td>Rise/fall time (10 % - 90 %)</td> <td>4.4 ns</td> <td>5.9 ns</td> <td>25 ns</td> <td>0.1 μs</td> <td>0.2 μs</td> <td>1.6 μs</td> </tr> <tr> <td>NEP ($\sqrt{\text{Hz}}$, @ 850 nm)</td> <td>249 pW</td> <td>12 pW</td> <td>2.9 pW</td> <td>876 fW</td> <td>513 fW</td> <td>154 fW</td> </tr> <tr> <td>Measured at</td> <td>8 MHz</td> <td>6 MHz</td> <td>1.4 MHz</td> <td>350 kHz</td> <td>180 kHz</td> <td>22 kHz</td> </tr> <tr> <td>Integrated input noise (rms)*</td> <td>3.6 μW</td> <td>275 nW</td> <td>54 nW</td> <td>8.6 nW</td> <td>1.9 nW</td> <td>130 pW</td> </tr> <tr> <td>CW saturation power (@ 850 nm)</td> <td>1.7 mW</td> <td>170 μW</td> <td>17 μW</td> <td>1.7 μW</td> <td>170 nW</td> <td>17 nW</td> </tr> </tbody> </table> <p style="margin-top: 20px;">* The integrated input noise is measured with a shaded input in the full bandwidth ("FBW") setting (referred to 850 nm). The measurement bandwidth is 3 x the upper cut-off frequency at the specific gain setting; filter slope is a 1st order roll-off.</p> <p>The input referred peak-peak noise can be calculated from the rms noise as follows:</p> $P_{\text{Input noise peak-to-peak}} = P_{\text{Input noise rms}} \times 6$ <p>The output noise is given by:</p> $U_{\text{Output noise rms}} = P_{\text{Input noise rms}} \times \text{gain} \times R$ $U_{\text{Output noise peak-to-peak}} = U_{\text{Output noise rms}} \times 6 = P_{\text{Input noise rms}} \times \text{gain} \times R \times 6$ <p>The integrated noise will be reduced considerably by setting the low pass filter to "1 MHz" or "10 MHz" instead of "FBW". This is especially useful for continuous wave (CW) measurements.</p>	Gain setting (low noise) (V/A)	10^2	10^3	10^4	10^5	10^6	10^7	Upper cut-off frequency (-3 dB)	100 MHz	60 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz	Rise/fall time (10 % - 90 %)	3.5 ns	5.9 ns	25 ns	0.1 μs	0.2 μs	1.6 μs	NEP ($\sqrt{\text{Hz}}$, @ 850 nm)	340 pW	29 pW	10 pW	2.7 pW	568 fW	200 fW	Measured at	10 MHz	6 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz	Integrated input noise (rms)*	5.5 μW	430 nW	56 nW	8.7 nW	1.9 nW	130 pW	CW saturation power (@ 850 nm)	10 mW	1.7 mW	170 μW	17 μW	1.7 μW	170 nW	Gain setting (high speed) (V/A)	10^3	10^4	10^5	10^6	10^7	10^8	Upper cut-off frequency (-3 dB)	80 MHz	60 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz	Rise/fall time (10 % - 90 %)	4.4 ns	5.9 ns	25 ns	0.1 μs	0.2 μs	1.6 μs	NEP ($\sqrt{\text{Hz}}$, @ 850 nm)	249 pW	12 pW	2.9 pW	876 fW	513 fW	154 fW	Measured at	8 MHz	6 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz	Integrated input noise (rms)*	3.6 μW	275 nW	54 nW	8.6 nW	1.9 nW	130 pW	CW saturation power (@ 850 nm)	1.7 mW	170 μW	17 μW	1.7 μW	170 nW	17 nW
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200 MHz Variable Gain Photoreceiver

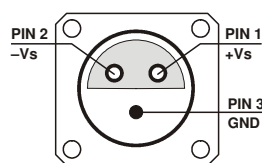
Specifications (continued)

Output	Output voltage range	±1 V (@ 50 Ω load), for linear amplification	
	Output impedance	50 Ω (designed for 50 Ω load)	
	Slew rate	1,000 V/μs	
	Max. output current	±40 mA	
Ext. Offset Control	Output offset compensation	adjustable by offset potentiometer and external control voltage, output offset compensation range min. ±100 mV	
	Control voltage range	±10 V	
Indicator LED	Offset control input impedance	15 kΩ	
	Function	overload	
Digital Control	Control input voltage range	LOW bit: -0.8 ... +1.2 V, HIGH bit: +2.3 ... +12 V	
	Control input current	0 mA @ 0 V, 1.5 mA @ +5 V, 4.5 mA @ +12 V	
	Overload output	non active: <0.4 V @ 0 ... -1 mA	
		active: typ. 5 ... 5.1 V @ 0 ... 2 mA	
Power Supply	Supply voltage	±15 V	
	Supply current	+110/-90 mA (depends on operating conditions, recommended power supply capability min ±200 mA)	
	Stabilized power supply output	±12 V, max. 20 mA, +5 V, max. 150 mA	
Case	Weight	320 g (0.74 lb.)	
	Material	AlMg4.5Mn, nickel-plated	
Input Flange	Material	1.4301 stainless steel, glass-beaded (1.035"-40 threaded flange)	
		AlMg4.5Mn, nickel-plated (25 mm dia. unthreaded flange)	
Coupler Ring	Material	1.4301 stainless steel, glass-beaded	
DC Monitor Output	Monitor output gain	Mode	Monitor gain
		Low noise	Gain setting divided by -1
	High speed	Gain setting divided by -10	
	Monitor output polarity	inverting	
	Monitor output voltage range	±1 V (@ ≥1 MΩ load)	
	Monitor output bandwidth	DC ... 1 kHz	
	Monitor output impedance	1 kΩ (designed for ≥1 MΩ load)	
Temperature Range	Storage temperature	-40 ... +80 °C	
	Operating temperature	0 ... +60 °C	
Absolute Maximum Ratings	Max. CW power (averaged)	12 mW	
	Digital control input voltage	-5 V/+16 V relative to digital ground DGND (pin 9)	
	Analog control input voltage	±15 V relative to analog ground AGND (pin 3)	
	Power supply voltage	±20 V	

200 MHz Variable Gain Photoreceiver

Connectors

Input	OE-300-SI-30-FST	1.035"-40 threaded flange for free space applications and for use with various types of fiber connector adapters
	OE-300-SI-30-FS	25 mm unthreaded round flange for free space applications
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	



Control port	Sub-D 25-pin, female, qual. class 2 Pin 1: +12 V (stabilized power supply output) Pin 2: -12 V (stabilized power supply output) Pin 3: AGND (analog ground for pins 1 - 8) Pin 4: +5 V (stabilized power supply output) Pin 5: digital output: overload (referred to pin 3) Pin 6: DC Monitor output Pin 7: NC (= not connected) Pin 8: output offset control voltage input Pin 9: DGND (ground for digital control pins 10 - 14) Pin 10: digital control input: gain, LSB Pin 11: digital control input: gain Pin 12: digital control input: gain, MSB Pin 13: digital control input: AC/DC Pin 14: digital control input: high speed / low noise Pin 15: upper cut-off frequency limit 10 MHz Pin 16: upper cut-off frequency limit 1 MHz Pin 17 - 25: NC (= not connected)	
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Scope of Delivery

OE-300-SI-30, threaded coupler ring ("FST" version only), Lemo® 3-pin connector, datasheet, transport package

200 MHz Variable Gain Photoreceiver

Remote Control Operation

General

Remote control input bits are opto-isolated and connected by a logical OR function to the local switch settings. For remote control set the corresponding local switches to "Remote", "AC" and "H" and select the desired setting via a bit code at the corresponding digital inputs. Mixed operation, e.g. local AC/DC setting and remote controlled gain setting, is also possible.

Gain setting

Low noise Gain (V/A) Pin 14=HIGH	High speed Gain (V/A) Pin 14=LOW	Pin 12 MSB	Pin 11	Pin 10 LSB
10^2	10^3	LOW	LOW	LOW
10^3	10^4	LOW	LOW	HIGH
10^4	10^5	LOW	HIGH	LOW
10^5	10^6	LOW	HIGH	HIGH
10^6	10^7	HIGH	LOW	LOW
10^7	10^8	HIGH	LOW	HIGH

AC/DC setting

Coupling	Pin 13
DC	LOW
AC	HIGH

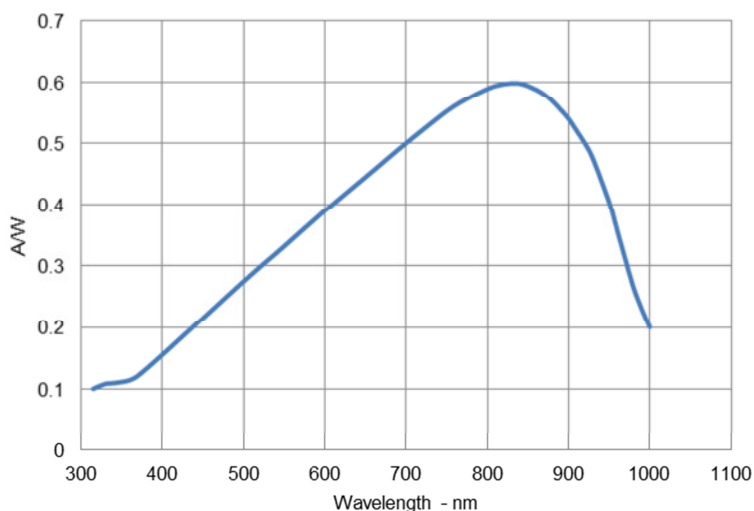
Low pass filter setting

Upper cut-off frequ. limit	Pin 15	Pin 16
full bandwidth	LOW	LOW
10 MHz	HIGH	LOW
1 MHz	LOW	HIGH

High speed / low noise setting

Mode	Pin 14
low noise mode	LOW
high speed mode	HIGH

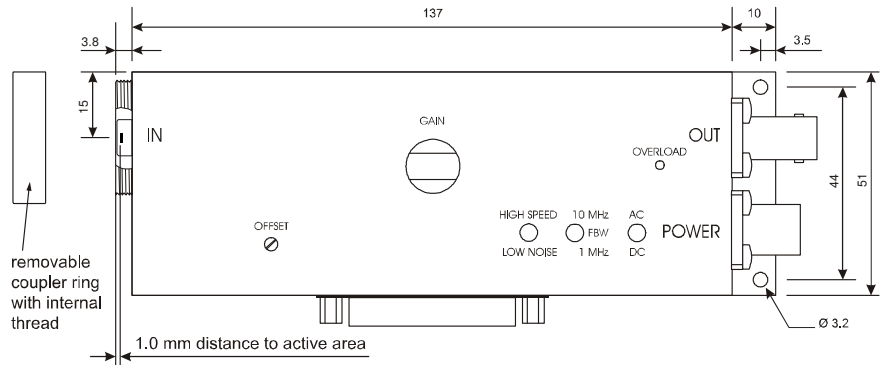
Spectral Responsivity



200 MHz Variable Gain Photoreceiver

Dimensions

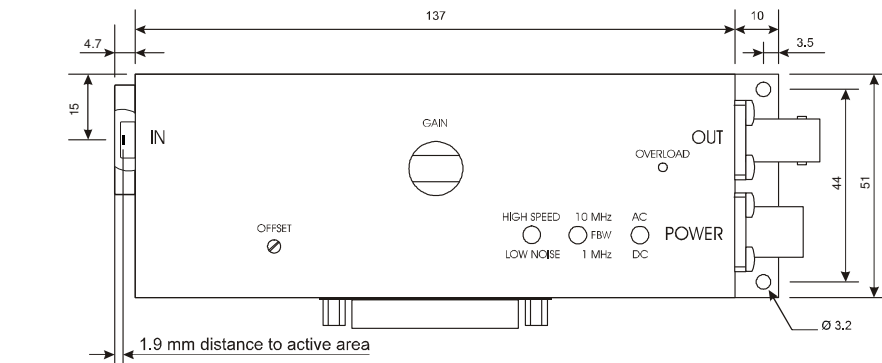
Threaded free space input OE-300-SI-30-FST:



All measurements in mm unless otherwise noted.

DZ-OE-300-FST_R1

Free space input OE-300-SI-30-FS:



All measurements in mm unless otherwise noted.

DZ-OE-300-FS_R1

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