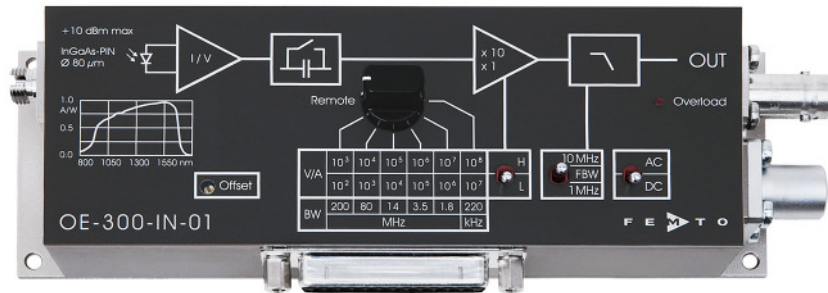


## 200 MHz Variable Gain Photoreceiver



The image shows model OE-300-IN-01-FC.

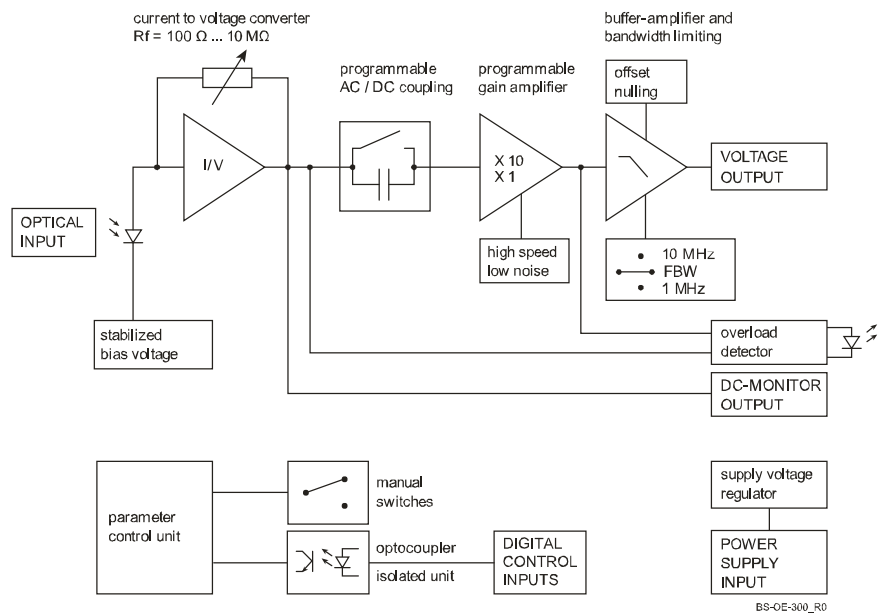
Features

- Adjustable transimpedance gain from  $10^2$  to  $10^8$  V/A
- Wide bandwidth up to 200 MHz
- InGaAs-PIN photodiode covering the 900 to 1,700 nm wavelength range
- FC fiber optic input
- High dynamic input range up to 10 mW optical power
- Very low noise, NEP down to 88 fW/vHz
- Switchable low pass filters for minimizing wideband noise
- 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-IN-01-FC

FC fiber optic input

Related OE-300 Models

See separate datasheets for following models on [www.femto.de](http://www.femto.de):

OE-300-SI-10-FST

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

OE-300-SI-10-FS

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

OE-300-SI-30-FST

Si-PIN,  $\varnothing$  3 mm, 320 - 1000 nm  
1.035"-40 threaded flange

OE-300-SI-30-FS

Si-PIN,  $\varnothing$  3 mm, 320 - 1000 nm  
25 mm dia. unthreaded flange

OE-300-IN-03-FST

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

OE-300-IN-03-FS

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

OE-300-S

customized versions available on request

Available Accessories

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	DC/100 Hz, switchable					
	Upper cut-off frequency	up to 200 MHz (see table below), switchable to 1 MHz or 10 MHz					
Input	Noise equivalent power (NEP)	see table below					
	Max. CW saturation power	see table below					
Detector	Detector	InGaAs-PIN photodiode					
	Active area	80 $\mu\text{m}$ dia.					
	Spectral response	900 - 1700 nm					
	Sensitivity R	0.95 A/W typ. @ 1550 nm					
	Dark current	0.02 nA typ.					
Performance Depending on Gain Setting	Gain setting (low noise) (V/A)	$10^2$	$10^3$	$10^4$	$10^5$	$10^6$	$10^7$
	Upper cut-off frequency (-3 dB)	200 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise/fall time (10 % - 90 %)	1.8 ns	4.4 ns	25 ns	0.1 $\mu\text{s}$	0.2 $\mu\text{s}$	1.6 $\mu\text{s}$
	NEP ( $\sqrt{\text{Hz}}$ , @ 1550 nm)	217 pW	17 pW	6.3 pW	1.7 pW	363 fW	96 fW
	Measured at	20 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
	Integrated input noise (rms)*	4.9 $\mu\text{W}$	380 nW	23 nW	3.3 nW	0.84 nW	71 pW
	CW sat. power (@ 1550 nm)	10 mW	1.0 mW	100 $\mu\text{W}$	10 $\mu\text{W}$	1.0 $\mu\text{W}$	100 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)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise/fall time (10 % - 90 %)	2 ns	4.4 ns	25 ns	0.1 $\mu\text{s}$	0.2 $\mu\text{s}$	1.6 $\mu\text{s}$
	NEP ( $\sqrt{\text{Hz}}$ , @ 1550 nm)	151 pW	7.2 pW	1.7 pW	549 fW	339 fW	88 fW
	Measured at	18 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
	Integrated input noise (rms)*	3.0 $\mu\text{W}$	285 nW	21 nW	3.2 nW	0.84 nW	71 pW
	CW sat. power (@ 1550 nm)	1.0 mW	100 $\mu\text{W}$	10 $\mu\text{W}$	1.0 $\mu\text{W}$	100 nW	10 nW
<p>* The integrated input noise is measured with a shaded input in the full bandwidth ("FBW") setting (referred to 1550 nm). The measurement bandwidth is 3 x the upper cut-off frequency at the specific gain setting; filter slope is a 1<sup>st</sup> 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> $U_{\text{Output noise rms}} = P_{\text{Input noise rms}} \times \text{gain} \times R$ $U_{\text{Output noise peak-to-peak}} = U_{\text{Output noise rms}} \times 6 = P_{\text{Input noise rms}} \times \text{gain} \times 6 \times R$ <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>							

**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)	
Ext. Offset Control	Slew rate	1,000 V/μs	
	Max. output current	±40 mA	
	Output offset compensation	adjustable by offset potentiometer and external control voltage, output offset compensation range min. ±100 mV	
	Control voltage range	±10 V	
	Offset control input impedance	15 kΩ	
Indicator LED	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)	
Case	Stabilized power supply output	±12 V, max. 20 mA, +5 V, max. 150 mA	
	Weight	320 g (0.74 lb.)	
DC Monitor Output	Material	AlMg4.5Mn, nickel-plated	
	Monitor output gain	Mode	Monitor gain
Temperature Range	Monitor output polarity	Low noise	Gain setting divided by -1
	Monitor output voltage range	High speed	Gain setting divided by -10
	Monitor output bandwidth	inverting	
	Monitor output impedance	±1 V (@ ≥1 MΩ load)	
	Storage temperature	DC ... 1 kHz	
	Operating temperature	1 kΩ (designed for ≥1 MΩ load)	
Absolute Maximum Ratings	Max. CW power (averaged)	-40 ... +80 °C	
	Digital control input voltage	0 ... +60 °C	
	Analog control input voltage	12 mW	
	Power supply voltage	-5 V/+16 V relative to digital ground DGND (pin 9)	

## 200 MHz Variable Gain Photoreceiver

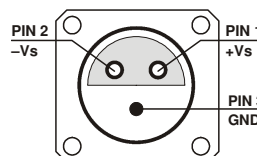
Connectors

Input  
Output

FC fiber optic receptacle  
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)

Scope of Delivery

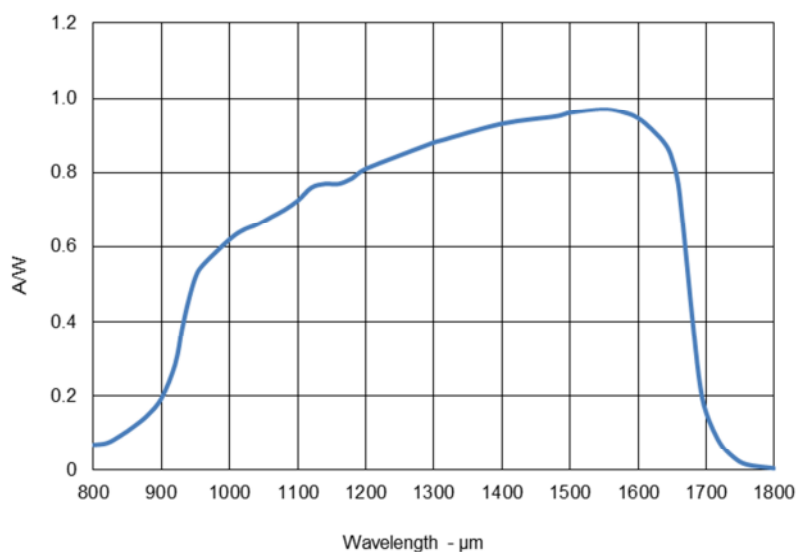
OE-300-IN-01-FC, Lemo® 3-pin connector, datasheet, transport package

## 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		

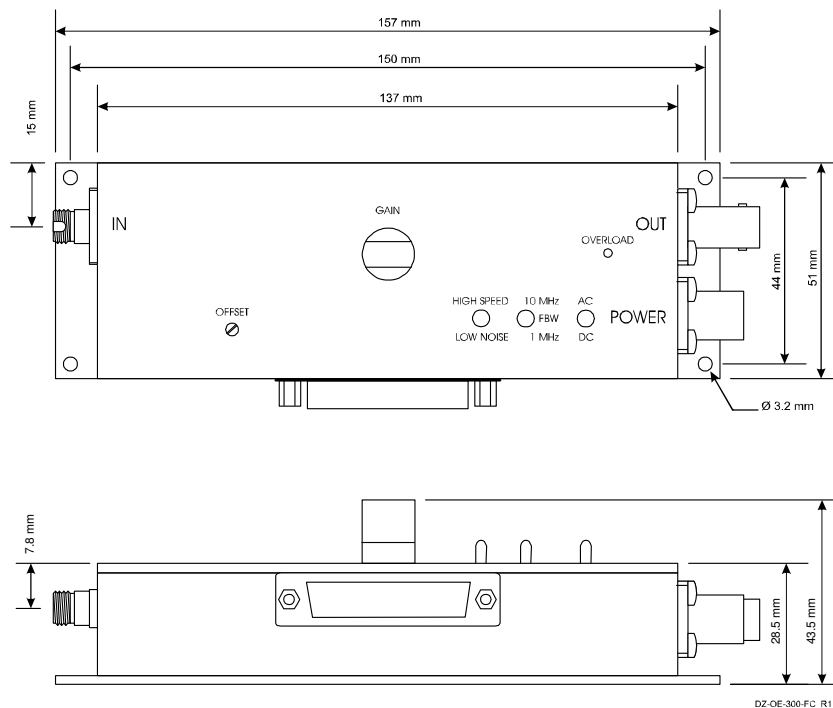
Spectral Responsivity



## 200 MHz Variable Gain Photoreceiver

Dimensions

Fiber optic input OE-300-IN-01-FC:



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