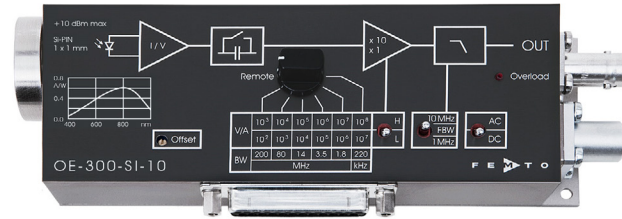


Datasheet

OE-300-SI-10

200 MHz Variable Gain Photoreceiver



The image shows model OE-300-SI-10-FST with 1.035"-40 threaded flange and coupler ring.

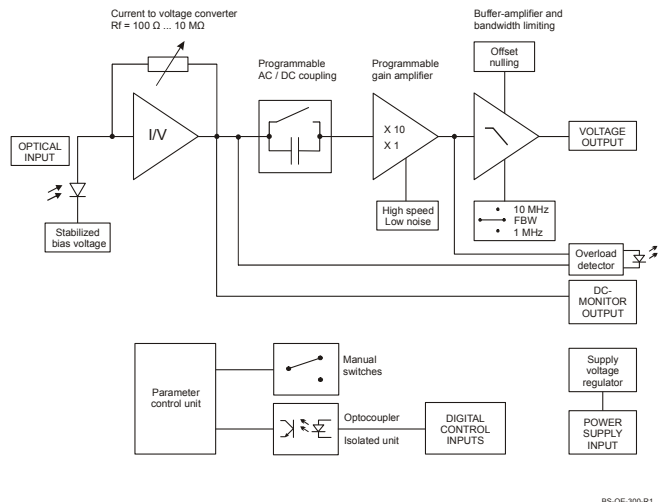
Features

- Adjustable transimpedance gain from  $10^2$  to  $10^8$  V/A
- Wide bandwidth up to 200 MHz
- Si-PIN photodiode covering the 400 to 1000 nm wavelength range
- Large optical detector size 1 x 1 mm
- High dynamic input range up to 10 mW optical power
- Very low noise, NEP down to 76 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



BS-OE-300-R1

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



DE-OE-300-SI-10\_R2/MG/JM/25OCT2018

**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Available Versions

OE-300-SI-10-FST



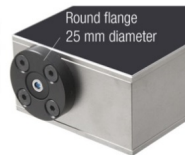
Internal threaded coupler ring with 30 mm outer diameter (included)

1.035"-40 threaded flange for free space applications compatible with many optical standard accessories and for use with various types of fiber connector adapters.

Optional: Fiber adapters PRA-FC and PRA-FSMA



OE-300-SI-10-FS



25 mm dia. unthreaded flange for free space applications compatible with many optical standard accessories.

Related OE-300 Models

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

OE-300-SI-30-FST Si-PIN,  $\phi$  3 mm, 320 - 1000 nm  
1.035"-40 threaded flange

OE-300-SI-30-FS Si-PIN,  $\phi$  3 mm, 320 - 1000 nm  
25 mm dia. unthreaded flange

OE-300-IN-01-FC InGaAs-PIN,  $\phi$  80  $\mu$ m, 900 - 1700 nm  
FC fiber receptacle only

OE-300-IN-03-FST InGaAs-PIN,  $\phi$  300  $\mu$ m, 800 - 1700 nm  
1.035"-40 threaded flange

OE-300-IN-03-FS InGaAs-PIN,  $\phi$  300  $\mu$ m, 800 - 1700 nm  
25 mm dia. unthreaded flange

OE-300-S customized versions available on request

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Available Accessories

PRA-FSMA  
PRA-FC



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

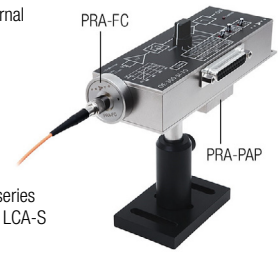


power supply,  
input: 100 - 240 VAC,  
output:  $\pm 15$  VDC, +400/-250 mA

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



Specifications

Test conditions	$V_s = \pm 15$ V, $T_a = 25$ °C, system impedance = 50 $\Omega$
Gain	<p>Transimpedance gain <math>1 \times 10^2 \dots 1 \times 10^6</math> V/A</p> <p>Gain accuracy <math>\pm 1</math> %</p>
Frequency Response	<p>Lower cut-off frequency DC/100 Hz, switchable</p> <p>Upper cut-off frequency up to 200 MHz (see table below), switchable to 1 MHz or 10 MHz</p>
Input	<p>Noise equivalent power (NEP) see table below</p> <p>Max. CW saturation power see table below</p>
Detector	<p>Detector Si-PIN photodiode</p> <p>Active area 1 mm x 1 mm (1 mm<sup>2</sup>)</p> <p>Spectral response 400 - 1000 nm</p> <p>Sensitivity R 0.58 A/W typ. @ 850 nm</p> <p>Dark current 0.12 nA typ.</p>

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Specifications (continued)

Performance Depending  
on Gain Setting

Gain setting (low noise) (V/A)	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>
Upper cut-off frequency (-3 dB)	200 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
NEP ( $\sqrt{\text{Hz}}$ , @ 850 nm)	322 pW	25 pW	2.9 pW	740 fW	260 fW	78 fW
Measured at	20 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
Integrated input noise (RMS)*	7.5 $\mu\text{W}$	580 nW	35 nW	4.9 nW	1.3 nW	100 pW
CW sat. power (@ 850 nm)	10 mW	1.7 mW	170 $\mu\text{W}$	17 $\mu\text{W}$	1.7 $\mu\text{W}$	170 nW
Gain setting (high speed) (V/A)	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>8</sup>
Upper cut-off frequency (-3 dB)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
NEP ( $\sqrt{\text{Hz}}$ , @ 850 nm)	231 pW	10 pW	2.2 pW	670 fW	228 fW	76 fW
Measured at	18 MHz	8 MHz	1.4 MHz	350 kHz	180 kHz	22 kHz
Integrated input noise (RMS)*	4.5 $\mu\text{W}$	440 nW	31 nW	4.8 nW	1.3 nW	100 pW
CW sat. power (@ 850 nm)	1.7 mW	170 $\mu\text{W}$	17 $\mu\text{W}$	1.7 $\mu\text{W}$	170 nW	17 nW

\* 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 1<sup>st</sup> order roll-off.

The input referred peak-peak noise can be calculated from the RMS noise as follows:

$$P_{\text{Input noise peak-to-peak}} = P_{\text{Input noise RMS}} \times 6$$

The output noise is given by:

$$U_{\text{Output noise RMS}} = P_{\text{Input noise RMS}} \times \text{gain} \times R$$

$$U_{\text{Output noise peak-to-peak}} = U_{\text{Output noise RMS}} \times 6 = P_{\text{Input noise RMS}} \times \text{gain} \times R \times 6$$

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.

Output

Output voltage range	$\pm 1$ V (@ 50 $\Omega$ load), for linear amplification
Output impedance	50 $\Omega$ (designed for 50 $\Omega$ load)
Slew rate	1000 V/ $\mu\text{s}$
Max. output current	$\pm 40$ mA
Output offset compensation	adjustable by offset potentiometer and external control voltage, output offset compensation range min. $\pm 100$ mV

Ext. Offset Control

Control voltage range	$\pm 10$ V
Offset control input impedance	15 k $\Omega$

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	$\pm 15$ V
Supply current	+110/-90 mA (depends on operating conditions, recommended power supply capability min $\pm 200$ mA)
Stabilized power supply output	$\pm 12$ V, max. 20 mA, +5 V, max. 150 mA

Case

Weight	320 g (0.74 lb.)
Material	AlMg4.5Mn, nickel-plated

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



**Datasheet**

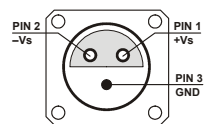
**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Specifications (continued)

Input Flange	Material	1.4305 stainless steel, glass bead blasted (1.035"-40 threaded flange) AlMg4.5Mn, nickel-plated (25 mm dia. unthreaded flange)						
Coupler Ring	Material	1.4305 stainless steel, glass bead blasted						
DC Monitor Output	Monitor output gain	<table border="1"> <thead> <tr> <th>Mode</th> <th>Monitor gain</th> </tr> </thead> <tbody> <tr> <td>Low noise</td> <td>Gain setting divided by -1</td> </tr> <tr> <td>High speed</td> <td>Gain setting divided by -10</td> </tr> </tbody> </table>	Mode	Monitor gain	Low noise	Gain setting divided by -1	High speed	Gain setting divided by -10
	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

Connectors	Input	OE-300-SI-10-FST	1.035"-40 threaded flange for free space applications and for use with various types of fiber connector adapters
		OE-300-SI-10-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 - 16)
		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)

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



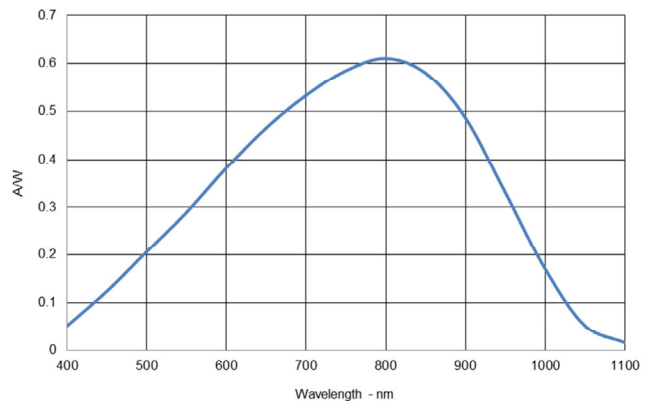
**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Scope of Delivery	OE-300-SI-10, threaded coupler ring ("FST" version only), Lemo® 3-pin connector, datasheet, transport package					
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", "DC", "L" (low noise mode) and "FBW", 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=LOW	High speed Gain (V/A) Pin 14=HIGH	Pin 12 MSB	Pin 11	Pin 10 LSB
		10 <sup>2</sup>	10 <sup>3</sup>	LOW	LOW	LOW
		10 <sup>3</sup>	10 <sup>4</sup>	LOW	LOW	HIGH
		10 <sup>4</sup>	10 <sup>5</sup>	LOW	HIGH	LOW
	10 <sup>5</sup>	10 <sup>6</sup>	LOW	HIGH	HIGH	
	10 <sup>6</sup>	10 <sup>7</sup>	HIGH	LOW	LOW	
	10 <sup>7</sup>	10 <sup>8</sup>	HIGH	LOW	HIGH	
	AC/DC setting	Coupling	Pin 13			
		DC	LOW			
		AC	HIGH			
	Low pass filter setting	Upper cut-off freq. 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



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



**Datasheet**

**OE-300-SI-10**

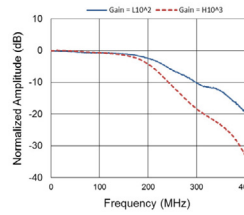
**200 MHz Variable Gain Photoreceiver**

Typical Performance  
Characteristic

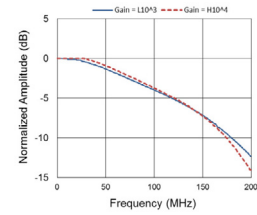
Frequency response

$$V_{\text{Supply}} = \pm 15 V_{\text{DC}}; R_{\text{Load}} = 50 \Omega$$

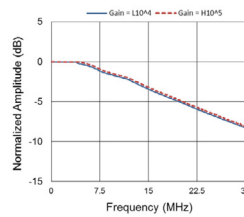
Gain setting: L10<sup>2</sup>, H10<sup>3</sup>



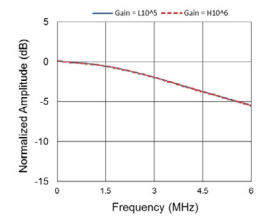
Gain setting: L10<sup>3</sup>, H10<sup>4</sup>



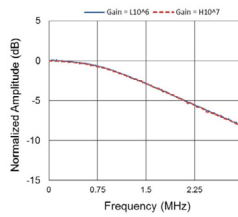
Gain setting: L10<sup>4</sup>, H10<sup>5</sup>



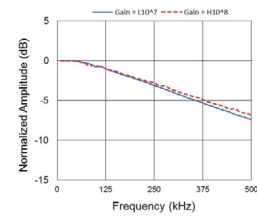
Gain setting: L10<sup>5</sup>, H10<sup>6</sup>



Gain setting: L10<sup>6</sup>, H10<sup>7</sup>



Gain setting: L10<sup>7</sup>, H10<sup>8</sup>



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



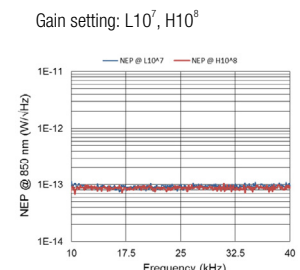
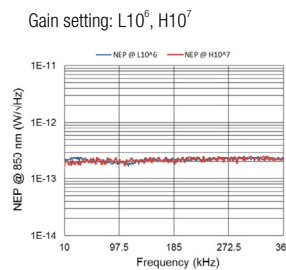
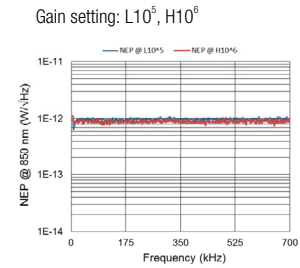
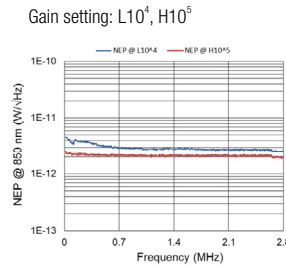
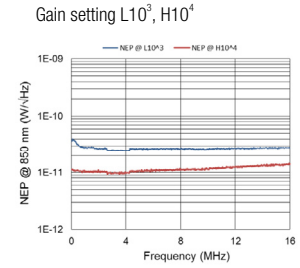
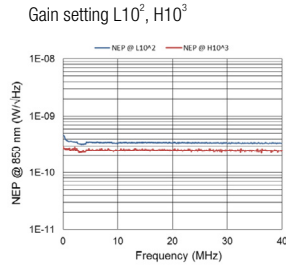
**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Typical Performance  
Characteristic (continued)

Input noise equivalent power (NEP)



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY





**Datasheet**

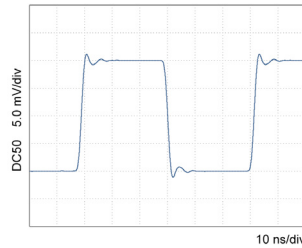
**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

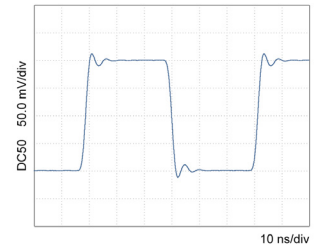
Typical Performance  
Characteristic (continued)

Signal pulse response

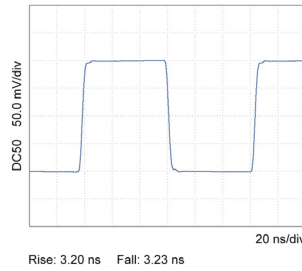
Gain setting L10<sup>2</sup>



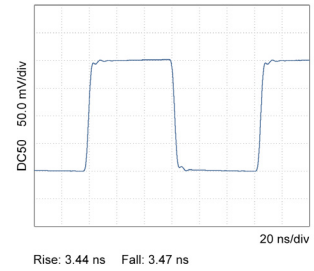
Gain setting H10<sup>3</sup>



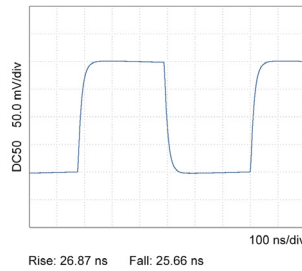
Gain setting L10<sup>3</sup>



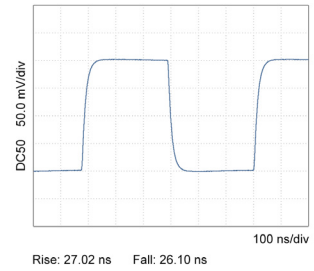
Gain setting H10<sup>4</sup>



Gain setting L10<sup>4</sup>



Gain setting H10<sup>5</sup>



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY

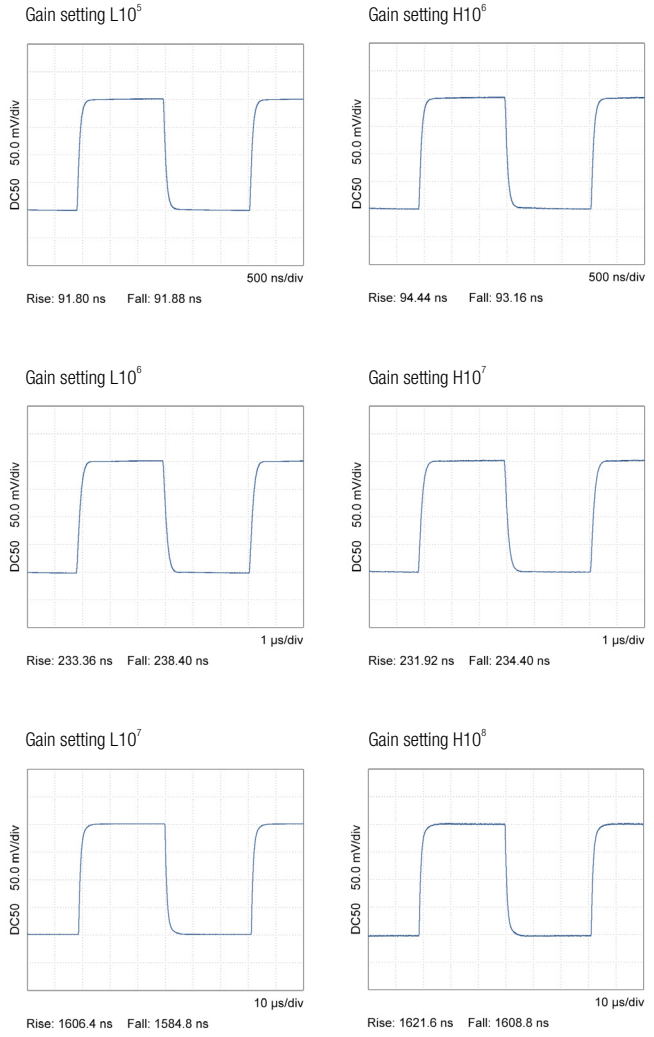


**Datasheet**

**OE-300-SI-10**

**200 MHz Variable Gain Photoreceiver**

Typical Performance  
Characteristic (continued)



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



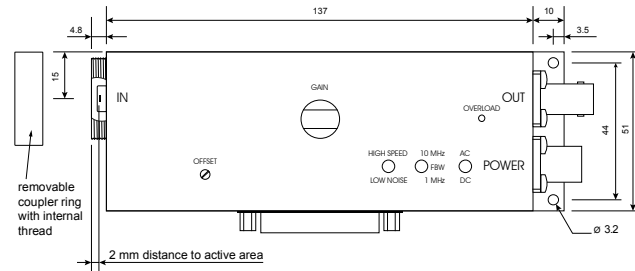
**Datasheet**

**OE-300-SI-10**

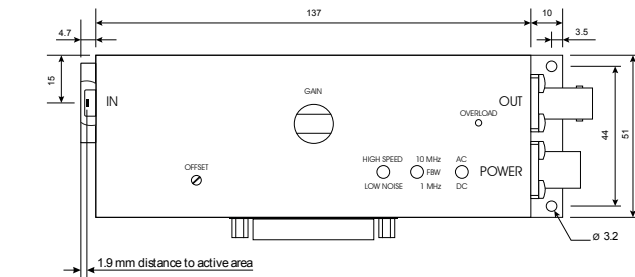
**200 MHz Variable Gain Photoreceiver**

Dimensions

Threaded free space input OE-300-SI-10-FST:



Free space input OE-300-SI-10-FS:



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SOPHISTICATED TOOLS FOR SIGNAL RECOVERY

