

# 12GHz RF over Fiber Mini-L Low Noise High SFDR



## Key Features:

- Frequency Range: 0.1-12GHz
- Low Noise RFoF HSFDR version
- Low spurious level
- High SFDR 112 dB/Hz
- Excellent phase linearity
- Excellent Phase Noise

## Configurations:

- Standard (stand-alone)
- 1U Generic enclosure (4 units)
- 1U Removable panel enclosure (2/4 units)
- Outdoor (2/4 units)

## Applications:

- Distributed Antenna
- Satcom
- Radio telescopes
- Telecommunication:
  - Antenna Remoting
  - Long RF links via fiber
- EW

## Options:

- Customized RF Gain, P1dB, Noise Figure by adding internal Pre & Post amplifier(s)
- Extended low-frequency bandwidth

**RFOptic's** analog RFoF compact modules enable long-distance transport of wideband RF signals. The Tx unit, using an optical transmitter, converts wideband RF signals to an Optical signal and the Rx unit converts the Optical signal back to the RF signal. The two units are connected by the customer's fiber.

In general, a wide range of spurious-free dynamic range (SFDR) is desirable when multiple signals of very different power levels are expected. This Low Noise RFoF HSFDR link offers improved Noise Figure performance. High SFDR transmission RFoF simplifies signal conditioning requirements intended to avoid signal saturation and subsequent consequences such as power level adjustment. During e.g., antenna testing, radar or communications system testing, high SFDR is essential due to the typical large amplitude ratios between main and side lobes or close and distant targets. The same applies to DF/ELINT systems which have to handle strong jammers concurrent with weak signals of interest.

RFOptic's 12, 18, 20, 30, and 40 GHz RFoF solutions provide high SFDR of minimum 111 dB/Hz. Due to their improved NF, an additional pre-amplifier may not be needed. These high-performance products are used in applications such as civil communication, antenna remoting, telemetry, defense systems, satellite communications, and more.

When looking for a high SFDR solution, our L (Low Noise) solutions are the preferred option compared to our Q (standard) solutions.

## RFoF-12GHz-L0-Mini Low Noise High SFDR Specifications

RF Parameter RF Tx-Rx Link	Unit	Specification (typical)
Frequency Range <sup>[1]</sup>	GHz	0.1-12
RF Gain <sup>[2,3]</sup>	dB	-17
Gain Flatness for the entire frequency range <sup>[4]</sup>	dB	±1.3
1dB Input gain compression point <sup>[3]</sup>	dBm	11
Noise Figure <sup>[2,3]</sup>	dB	23
SFDR (calculated) <sup>[3,5]</sup>	dB/Hz <sup>2/3</sup>	114
Maximum RF input level (No damage)	dB	16
VSWR Input	-	2:1
VSWR Output	-	2:1
Spurious <sup>[6]</sup>	dBc	≤-90
Phase Noise at 10KHz Offset	dBc/Hz	≤-130
Input / Output impedance	Ohm	50
<b>Optical and Electrical and Environmental (Tx, Rx)</b>		
Laser diode optical wavelength	μm	1.55
Receiver photodiode optical wavelength	μm	1.5-1.58
Operating temperature range	°C	0 to +70
Storage temperature	°C	-40 to +85
LED status indicators (Tx/Rx)	-	Blue/Green/Red
Input voltage <sup>[7]</sup>	VDC	5
Power consumption Tx module <sup>[8]</sup>	Watt	2
Power consumption Rx module <sup>[8]</sup>	Watt	0.25
<b>Mechanical (Tx/Rx)</b>		
Dimensions Tx/Rx unit	mm	75*154*33
Weight Tx/Rx unit	grams	450
RF Input / Output connectors	-	SMA
Optical Connector	-	FC/APC
Power connector and Data/monitor connector <sup>[9]</sup>	-	DB15

[1] Extended low frequency 0.01-12.0 GHz is optional.

[2] Excluding customer fiber loss.

[3] Measured at 10GHz. Typical values of Gain, P1dB and NF with Pre/Post Amps are indicated in the table below.

[4] Each of the pre/post amplifiers (optional) add about ±1.2dB to the gain flatness.

[5] Excluding in-band harmonics. SFDR (calculated) = 2/3x[(IP1dB+10)+174-NF] dB/Hz<sup>2/3</sup>.

[6] Measured with input signal at Ip1dBc - 3dB at 1GHz. Ultra with 30dB post amplifier spurious level is about -85dBc

[7] Recommended Power Supplies: Meanwell P/N GSM25U05-P1J (USA); GSM25E05-P1J (Europe); GE40I05-P1J (all purpose).

[8] Each of the pre/post amplifiers (optional) add about 1.8W to the module power consumption.

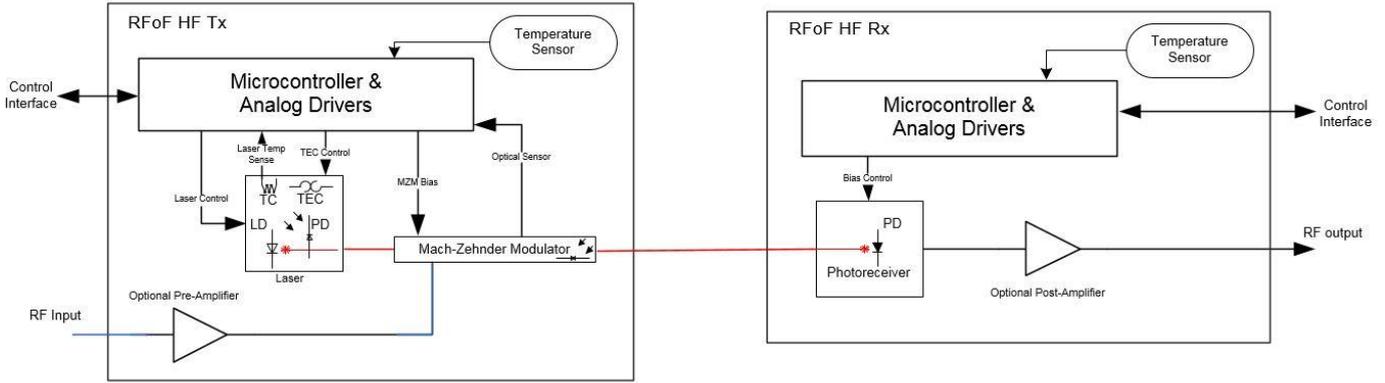
[9] For USB monitor, download the software here: <https://rfoptic.com/software-download-rfof/> (ask your local representative for the password).

### RFoF 12GHz Module Options

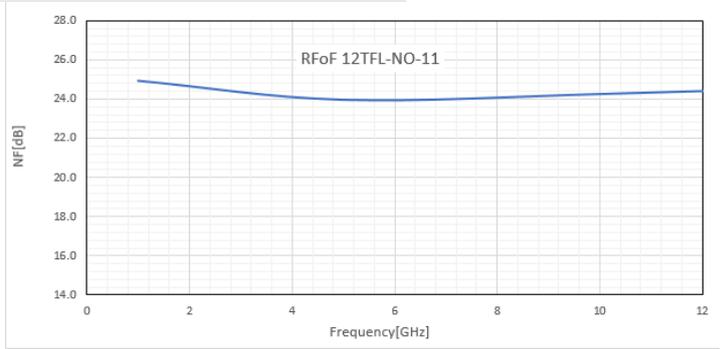
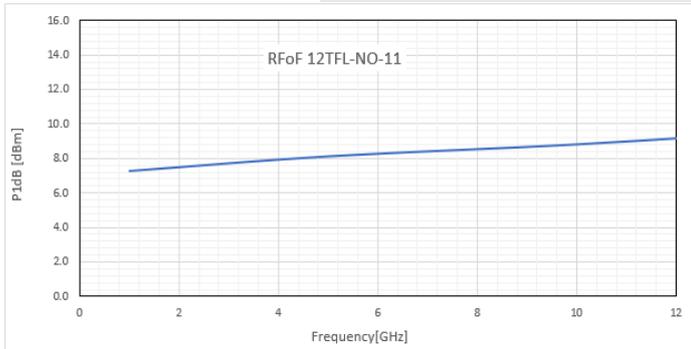
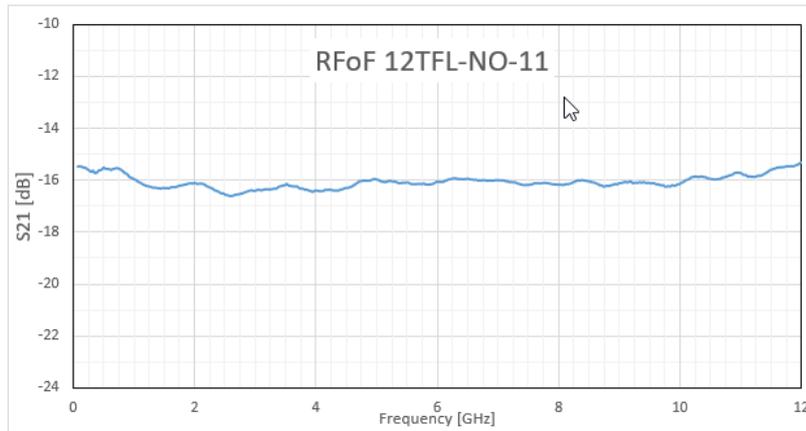
Parameter	Unit	HSFDR 12GHz Transceiver	HSFDR 12GHz Transceiver with Pre-Amp	HSFDR 12GHz Transceiver with Post-Amp	HSFDR 12GHz Transceiver with Pre and Post-Amp
P/N	-	RFoF-12GHz-L0-Mini	RFoF-12GHz-L1-Mini	RFoF-12GHz-L0-Mini-P	RFoF-12GHz-L2-Mini
Gain*	dB	-17	-1	14	14
Input P1dB*	dBm	11	-4	7	-4
Noise Figure*	dB	23	9	25	10
SFDR*	dBc/Hz	114	114	111	113

\* Measured at 10GHz. For HSFDR units integrated in Indoor or Outdoor enclosures: NF and P1dB values will increase in ~2dB and Gain will decrease in ~2dB.

### RFoF 12GHz – Simplified Block Diagram



### RFoF Low NF 12GHz – Typical Test Results



### RFoF Enclosure Options

Parameter	19" 1U Enclosure for RFoF	Outdoor Enclosure for RFoF
<b>Dimensions (mm)</b>	19" 1U Generic: 445(W)* 476(L)*44(H) 19" 1U Removable: 442(W)* 402(L)*44(H)	Small Outdoor: 270(W)*230(L)*85(H) Large Outdoor: 330(W)*350(L)*85(H)
<b>RF Input / Output Connector</b>	SMA female	N Type female
<b>Optical Connector</b>	FC/APC or SC/APC	MPO/APC 4/8 male <sup>[1]</sup>
<b>Data Connector</b>	USB2/RJ-45	RJ45 female <sup>[2]</sup>
<b>Power Connector</b>	HP Socket	DC female/ AC male <sup>[2,3]</sup>
<b>Power</b>	110/220 VAC	9-36DC / 110/220VAC <sup>[2,3]</sup>

[1] MPO 4/8 optical cable (female) should be ordered by the customer according to the required length and conditions.

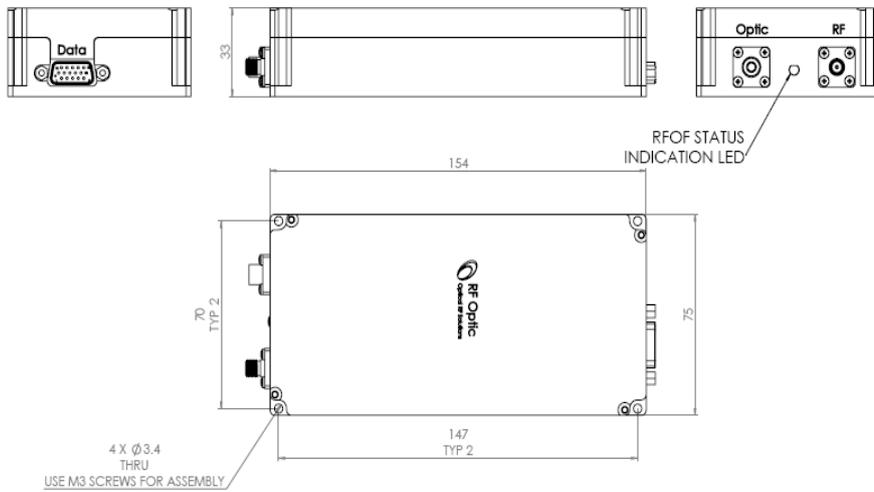
Example: GoFoton: P/N BPF3P15M015FLR020 (4 fibers) / BPF3P1FM015FLR021 (8 fibers). XXX = 015m fiber length.

[2] IP-54 Data, AC and DC opposite connectors are provided as accessories with the module (cables are not included).

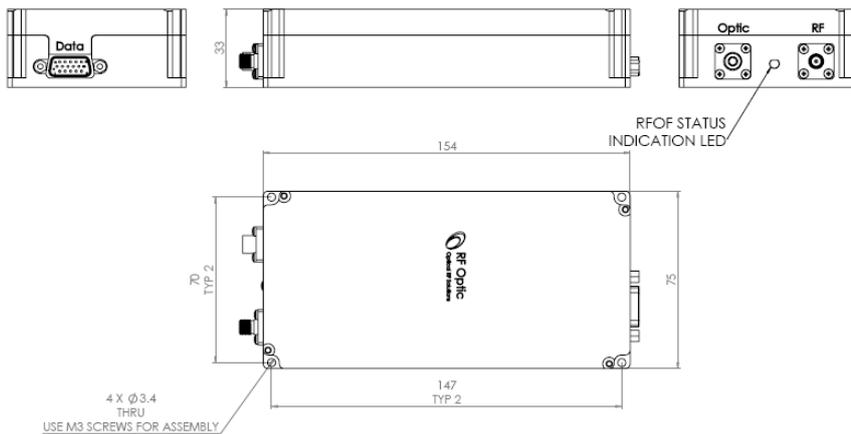
[3] DC and AC versions of the outdoor enclosures are available.

## Mechanical Outline Drawing - 12GHz RFoF Tx and Rx modules

### Tx module



### Rx module



### Ordering Information

P/N	Description	Tx	Rx
<b>RFoF-12G-L0-Mini</b>	Transceiver 12GHz, HSFDR	RFoF12TFL-N0-11	RFoF12RFL-N0-11
<b>RFoF-12G-L1-Mini</b>	Transceiver 12GHz, HSFDR with Pre-Amp	RFoF12TFL-A0-11	RFoF12RFL-N0-11
<b>RFoF-12G-L0-Mini-P</b>	Transceiver 12GHz, HSFDR, with Post-Amp	RFoF12TFL-N0-11	RFoF12RFL-A1-11
<b>RFoF-12G-L2-Mini</b>	Transceiver 12GHz, HSFDR, with Pre and Post-Amp	RFoF12TFL-A0-11	RFoF12RFL-A0-11
<b>HSFDR-Cable-Data-DC</b> <sup>[1]</sup>	2 X D15 to USB 150cm & D15 to DC 25cm special cable	For stand-alone HSFDR link	
<b>Outdoor Data &amp; AC set</b> <sup>[2]</sup>	Data and 110/220 AC opposite connectors – accessories	For outdoor enclosure with AC supply	
<b>Outdoor Data &amp; DC set</b> <sup>[2]</sup>	Data and 5VDC opposite connectors – accessories	For outdoor enclosure with DC supply	

[1] Accessory for HSFDR stand-alone link - supplied with the RFoF-12G-L0-Mini.

[2] Accessories / connectors for Outdoor enclosure - supplied with the RFoF-12G-L0-Mini.