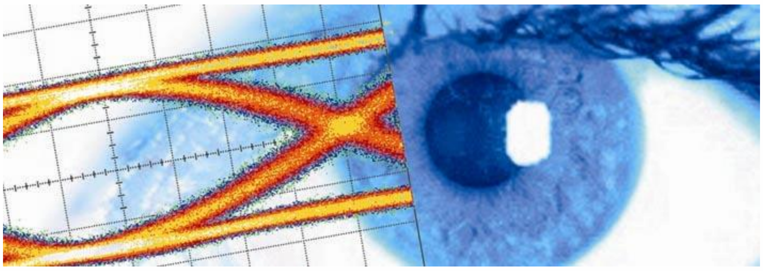
SHF Communication Technologies AG

Wilhelm-von-Siemens-Str. 23D • 12277 Berlin • Germany

Phone ++49 30 / 772 05 10 • Fax ++49 30 / 753 10 78

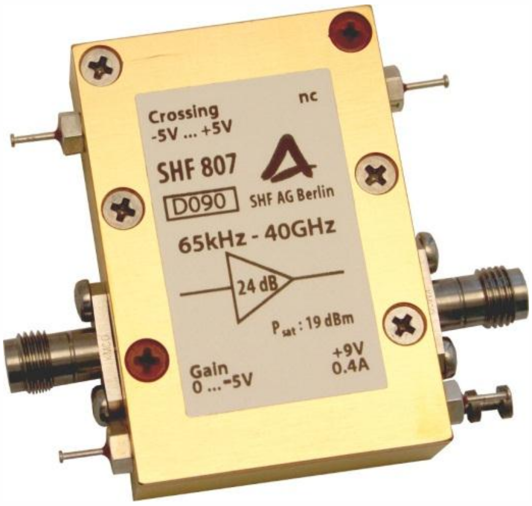
E-Mail: sales@shf.de • Web: http://www.shf.de



Datasheet

SHF 807

Linear Broadband Amplifier



Description

The SHF 807 is a linear modulator driver, optimized for amplification of multi-level and analog signals. It is an ideal amplifier for optical QAM-16 or OFDM where very important features of an amplifier are ultra-fast rise and fall time, zero ringing, broad band characteristic with Bessel roll-off, high linear output power and high third order intercept point.

A two stage amplifier design is employed using proprietary monolithic microwave integrated circuits (MMICs) inside special carriers to achieve ultra wide bandwidth and low noise performance. An internal voltage regulator makes the amplifier insensitive to reverse voltage and line ripple.

Available Options

01: DC return on input (max. ±1.75 V, max. 35 mA)

02: Built-in bias tee on input (max. ±9 V, max. 220 mA)

03: DC return on output (max. ±1.75 V, max. 35 mA)

04: Built-in bias tee on output (max. ±12 V, max. 220 mA)

MP: Matches the phase of two amplifiers

The options 01, 02, 03 and 04 cannot be combined.

Specifications – SHF 807

(At 40°C case temperature, unless otherwise stated)

Parameter	Unit	Symbol	Min	Typ	Max	Conditions
High Frequency 3 dB Point	GHz	f_{HIGH}	40	45		
Low Frequency 3 dB Point	kHz	f_{LOW}			65	
Gain	dB	S_{21}	23	24		non-inverting measured at -27 dBm input power
Gain Control Voltage	V	U_{gc}	-5		0	Reduction by up to ~3 dB Igc <= 20 mA If pin left open, max gain is achieved.
Crossing Control Voltage	V	U_{cc}	-5		5	Adjustment by ± 4%, Icc <= 20 mA If pin left open, ~50% is achieved.
Gain Ripple	dB	ΔS_{21}		±1	±1.5	
Group Delay Ripple	ps				±50	40 MHz…30 GHz, 100 MHz aperture
Max RF Input Voltage for Linear Operation	V	$V_{in\ lin}$			0.25	peak to peak voltage
Output Power at 1 dB Compression	dBm V	P_{01dB}	16 4	16.5 4,2		10 MHz…30 GHz peak to peak voltage
Output Power at 2 dB Compression	dBm V	P_{02dB}	18 5	18.5 5,3		10 MHz…30 GHz peak to peak voltage
Output Power at 3 dB Compression	dBm V	P_{03dB}	19 5,6	19.5 6		10 MHz…30 GHz peak to peak voltage
3rd Order Intercept Point	dBm	IP_3	28			
Jitter	fs	J_{RMS}		400 530	550 650	3 V ≤ Vout ≤ 4 V deconvoluted[1,2] , measured[1]
Input Return Loss	dB	S_{11}		-10	-7	< 40 GHz
Output Return Loss	dB	S_{22}		-10	-7	< 40 GHz
Maximum Input Power	dBm	$V_{in\ max}$			4 10	in operation without power supply
Rise Time/Fall Time	ps	t_r/t_f			9 13.5	20%...80%, 3 V ≤ Vout ≤ 4 V deconvoluted[1,3], measured[1]

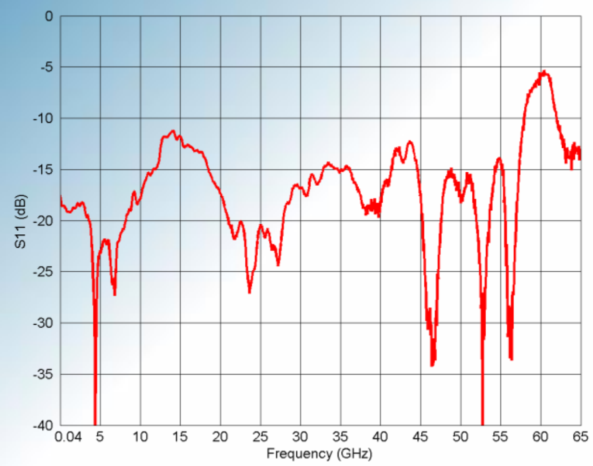
1 Measured with Agilent 86100A with 70 GHz sampling head and precision time base.

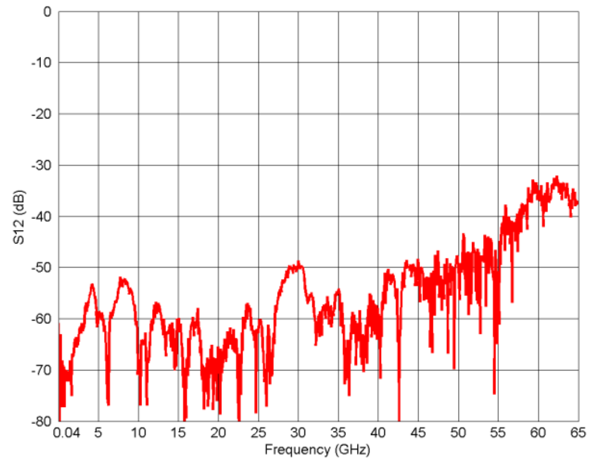
2 Calculation based on typical jitter of SHF BPG[1]: $J_{RMS\ deconvoluted} = \sqrt{(J_{RMS\ measured})^2 - (J_{RMS\ BPG})^2} = \sqrt{(J_{RMS\ measured})^2 - (350\ fs)^2}$

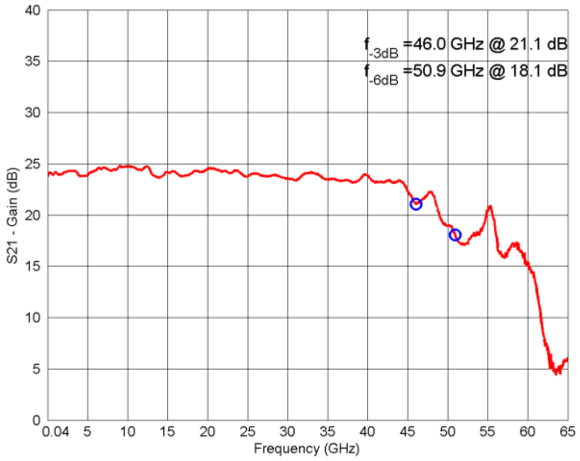
3 Calculation based on typical rise and fall time of SHF BPG[1]: $t_r/t_{f\ deconvoluted} = \sqrt{(t_r/t_{f\ measured})^2 - (t_r/t_{f\ BPG})^2} = \sqrt{(t_r/t_{f\ measured})^2 - (10\ ps)^2}$

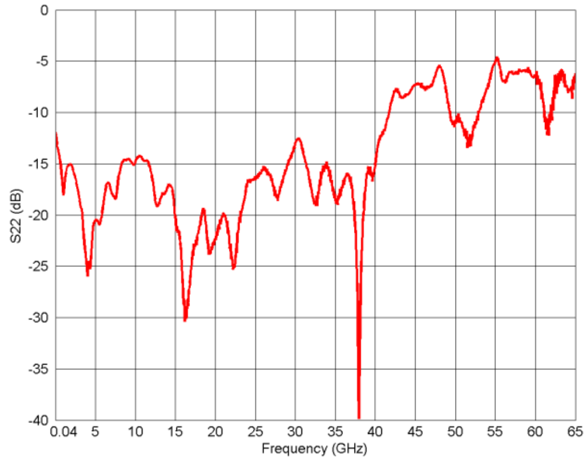
Parameter	Unit	Symbol	Min	Typ	Max	Conditions
DC input voltage	V				±9	AC coupled input
DC output voltage	V				±12	AC coupled output
Supply Voltage	V		9		12	0.4 A, reverse voltage protected
Power Consumption	W		3.6			9 V supply voltage
Case Temperature	T_{case}	°C	10	40	50	
Input Connector						1.85mm (V) female
Output Connector						1.85mm (V) female

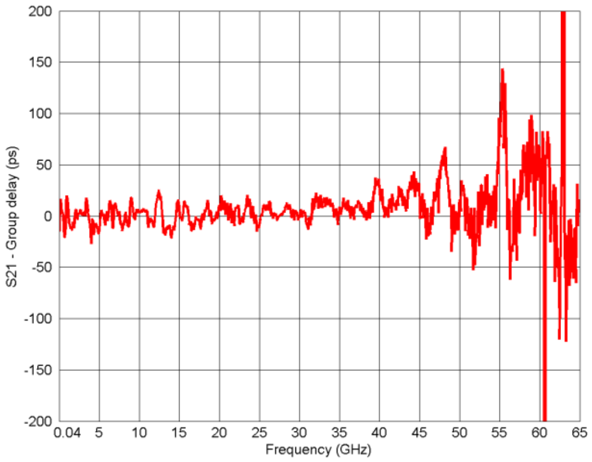
S-Parameters, Group Delay and Phase Response

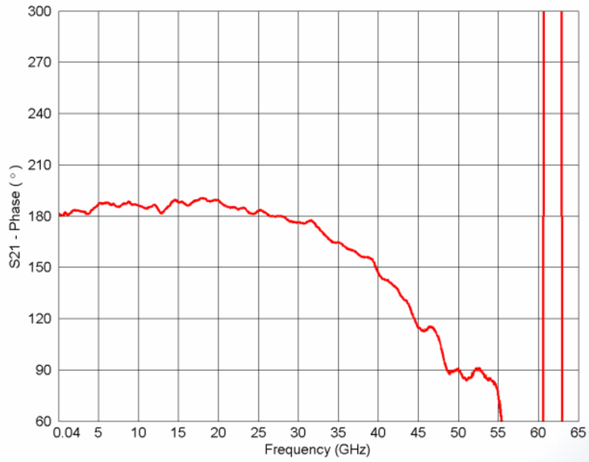






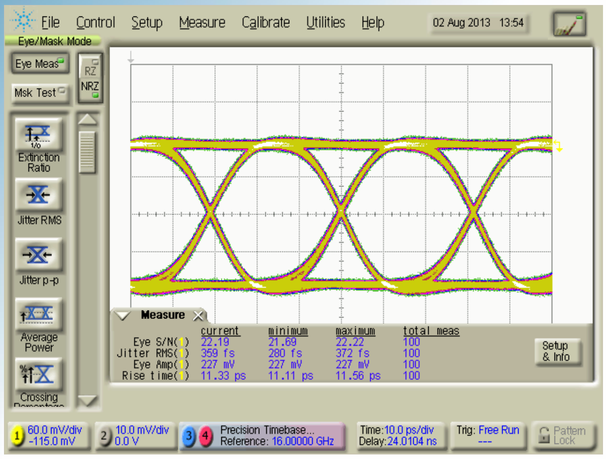




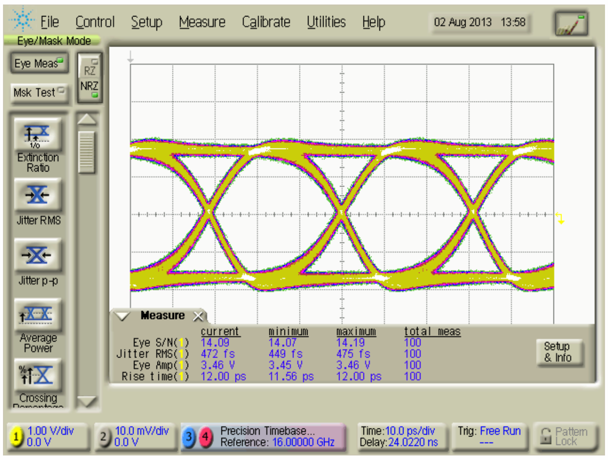


Aperture of group delay measurement: 100 MHz

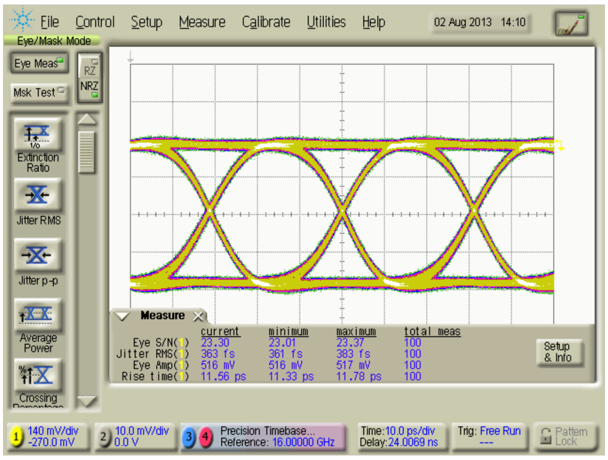
Binary Eye diagrams



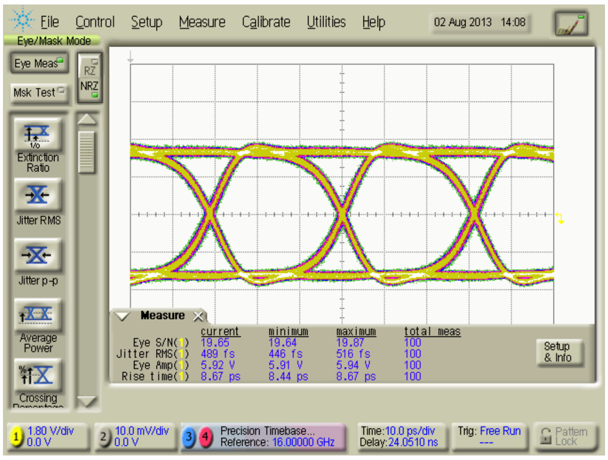
Input Signal @ 32 Gbps, Eye amplitude: 227 mV



Output Signal @ 32 Gbps, Eye amplitude: 3.46 V

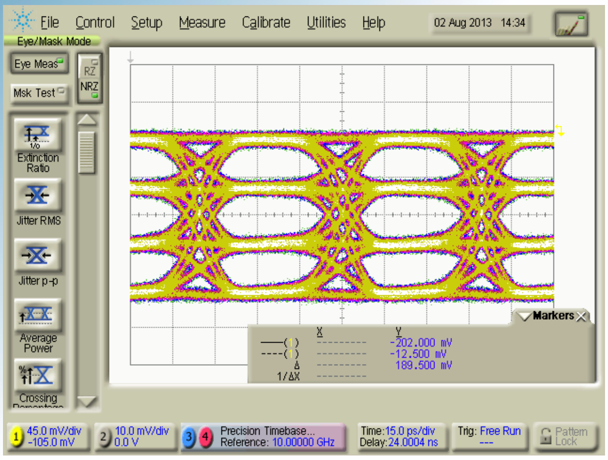


Input Signal @ 32 Gbps, Eye amplitude: 516 mV

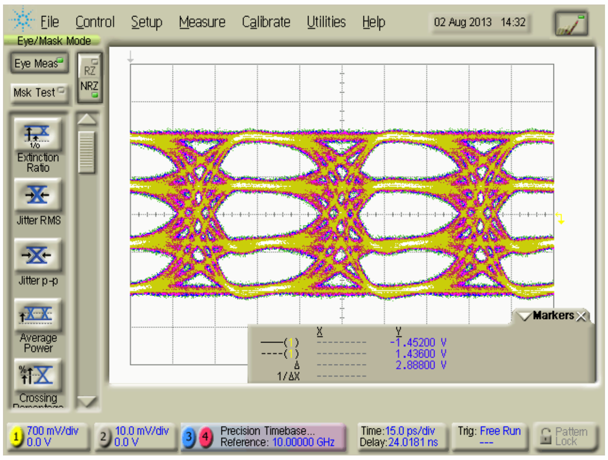


Output Signal @ 32 Gbps, Eye amplitude: 5.92 V

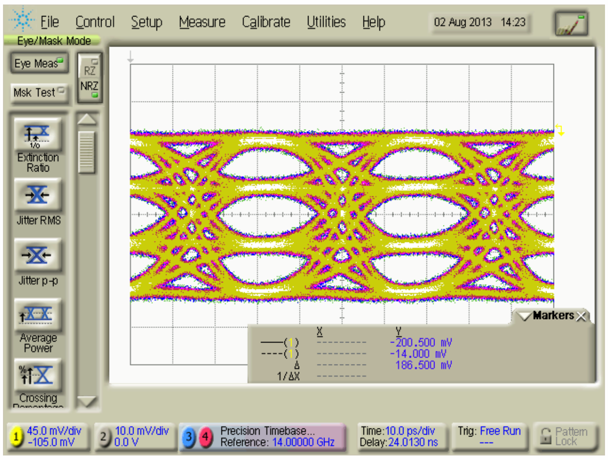
4-Level Eye diagrams



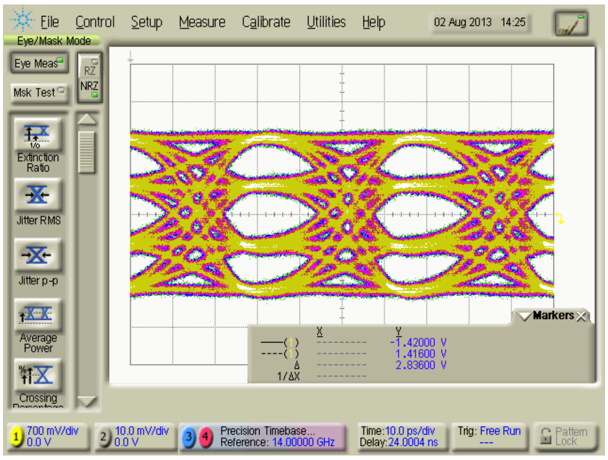
Input Signal @ 20 GBaud, 190mVpp



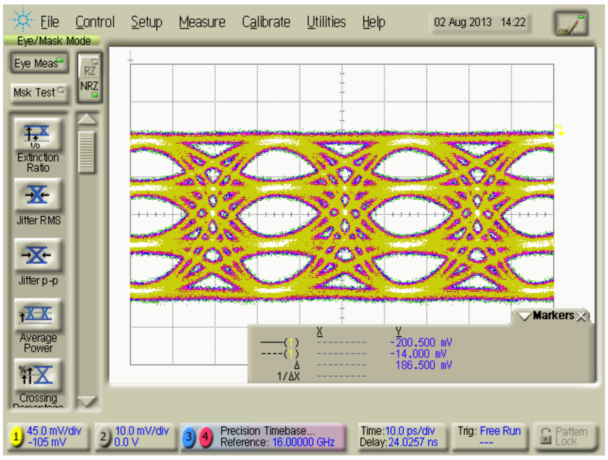
Output Signal @ 20 GBaud, 2.89 Vpp



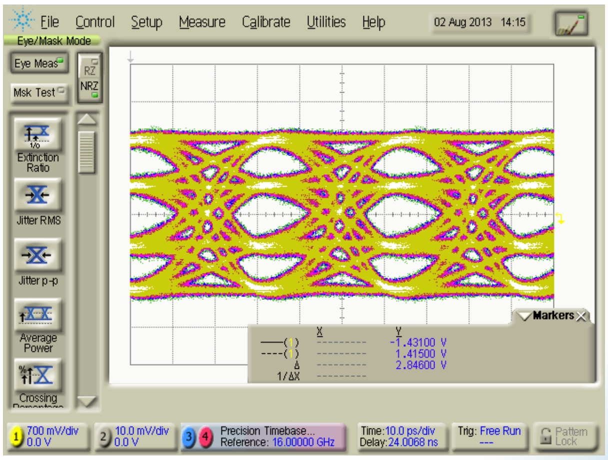
Input Signal @ 28 GBaud, 187mVpp



Output Signal @ 28 GBaud, 2.84 Vpp

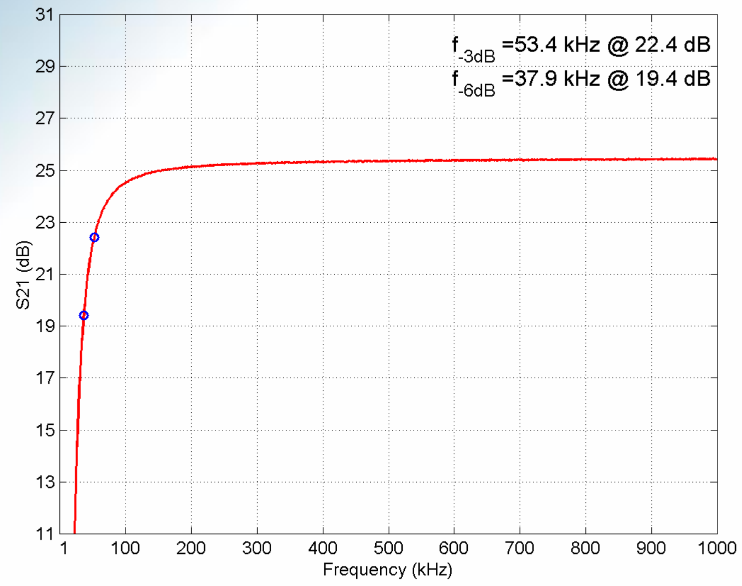


Input Signal @ 32 GBaud, 187mVpp

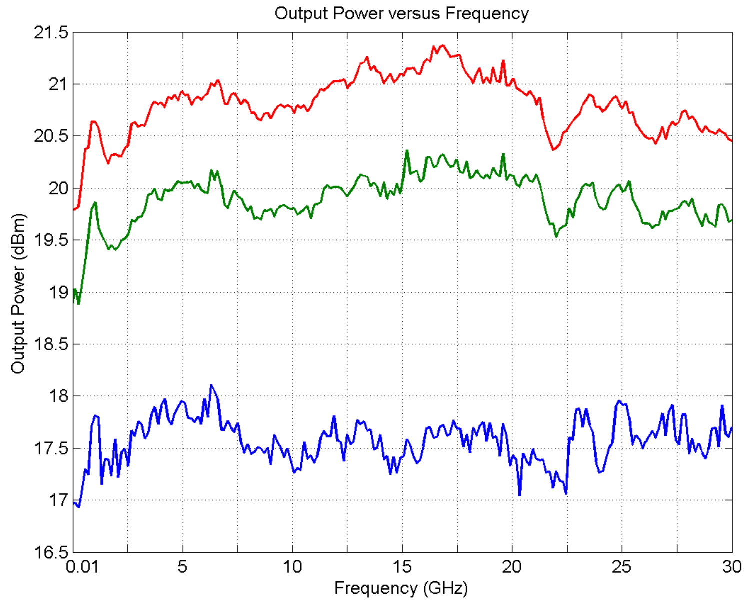


Output Signal @ 32 GBaud, 2.85 Vpp

Low Frequency Response (<1 MHz)

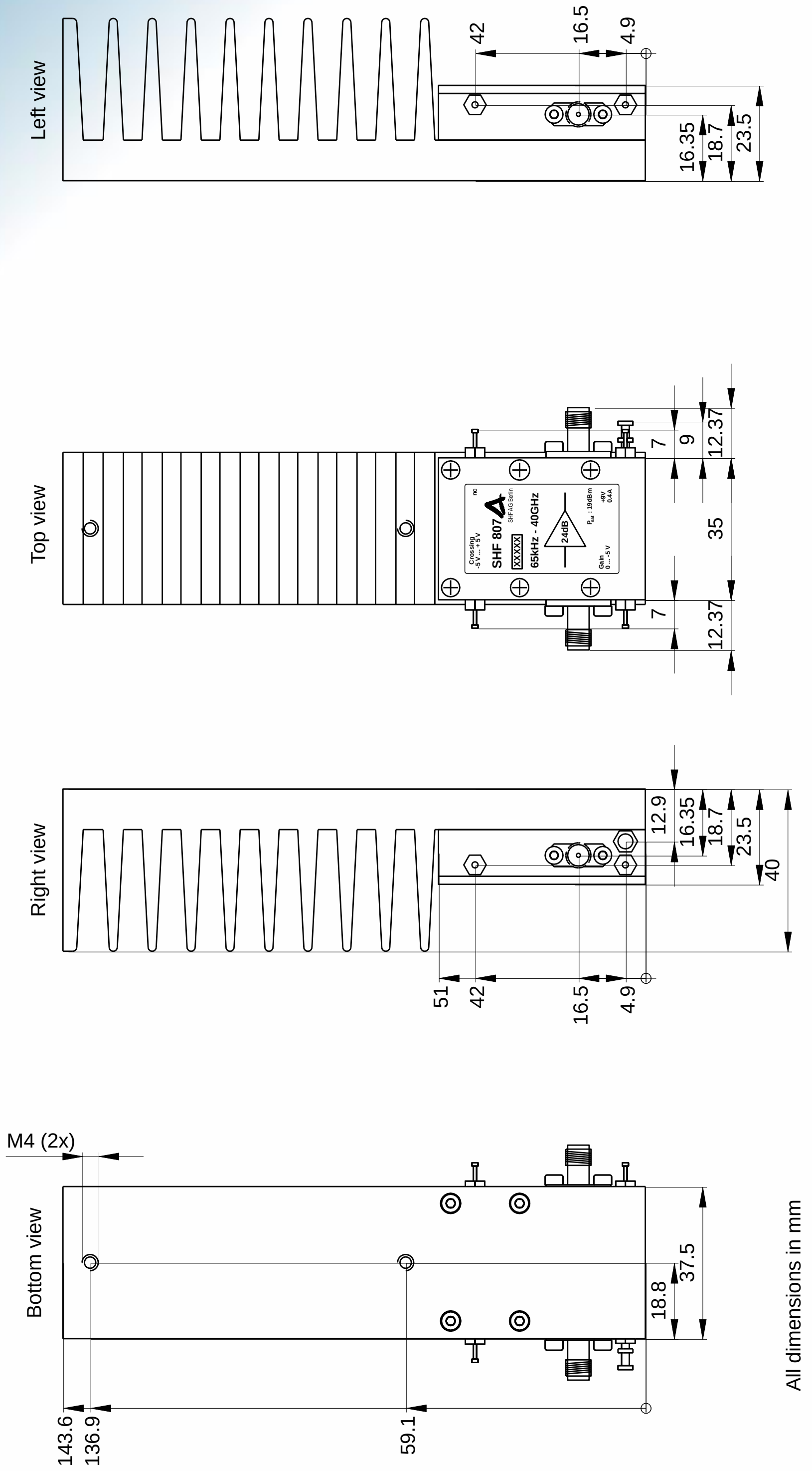


Saturation power



Top (red): 3 dB compression;
Middle (green): 2 dB compression;
Bottom (blue): 1 dB compression

Mechanical Drawing with Heat Sink

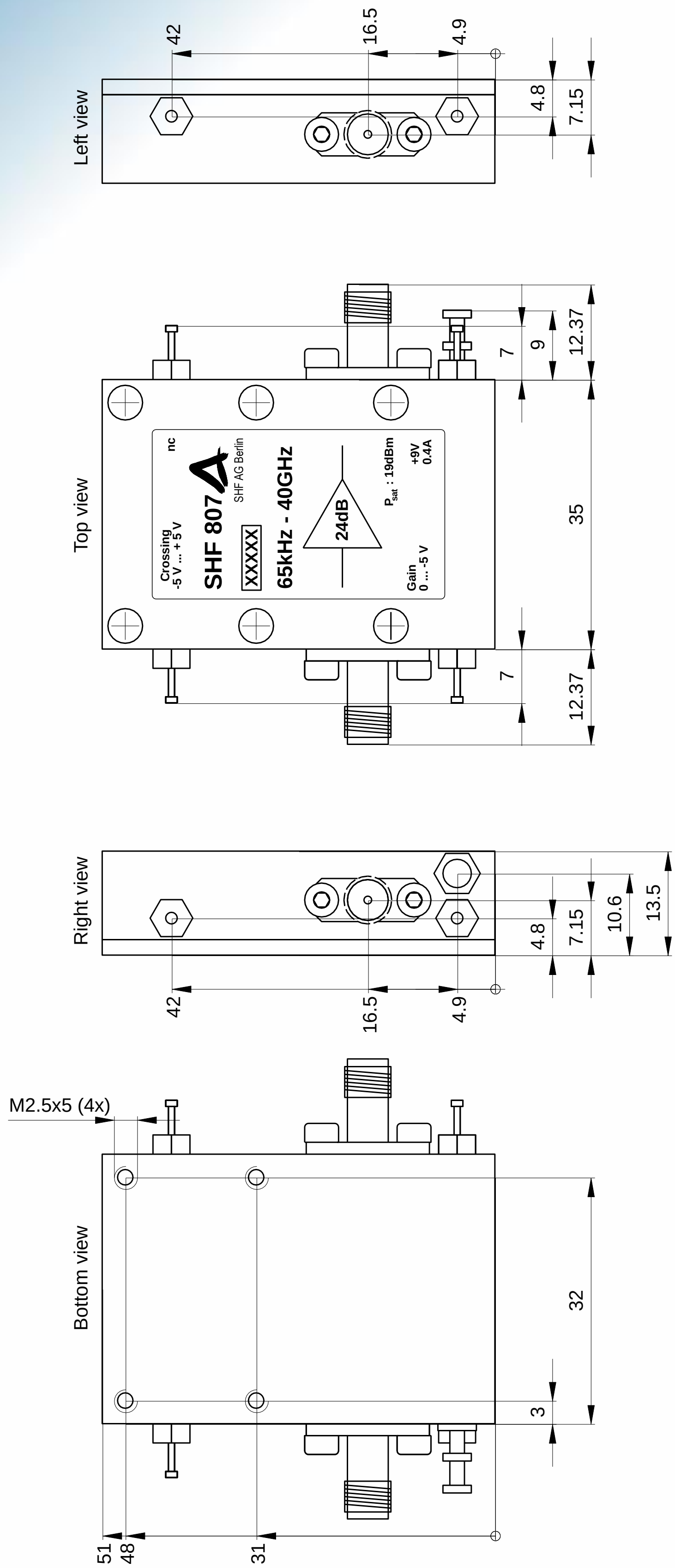


Pin assignment might change if a bias tee option is chosen.

Thermal resistance of heat sink approx. 1.6 K/W

For permanent mounting remove the heat sink from the amplifier. In that case please ensure that adequate cooling of the amplifier is guaranteed. It is recommended to use thermal paste or a thermal gap pad for the mounting. In order to separate the heat sink from the amplifier, remove the four screws on the heat sink. Please note, thermal paste is used between the heat sink and the amplifier housing.

Mechanical Drawing without Heat Sink



Pin assignment might change if a bias tee option is chosen.

Please ensure that adequate cooling of the amplifier is guaranteed.

User Instructions

ATTENTION!

Electrostatic sensitive GaAs FET amplifier

1. To prevent damage through static charge build up, cables should be always discharged before connecting them to the amplifier!
2. Attach a 50 Ohm output load **before** supplying DC power to the amplifier!
3. The supply voltage can be taken from any regular 9…12 V, 0.4 A DC power supply and can be connected to the supply feed-through filter via an ON / OFF switch.
4. The minimum supply voltage is 9 V. A higher one increases the power dissipation of the internal voltage regulator.
5. Using a 3 dB or 6 dB input attenuator will result in a 6 dB or 12 dB increase of the input return loss. For minimal degradation of amplifier rise time, these attenuators should have a bandwidth specification of greater 50 GHz (V/ 1.85mm attenuators)!
6. An input signal of about 0.7 V_{pp} equivalent to 0 dBm will produce saturated output swing of 6 V_{pp}.
7. Higher input voltages will drive the amplifier's output stage into saturation, leading to waveform peak clipping.
8. Saturated output voltages can only be used without damage while the amplifier is connected to a 50 Ohm precision load with a VSWR of less than 1.2 or better than 20 dB return loss up to 40 GHz.
9. While using a reflective load the output voltage has to be reduced to a safe operating level according to the magnitudes of the reflections.

   ATTENTION: At frequencies up to 50 GHz a capacitive load can be transformed to an inductive one through transmission lines! With an output stage driven into saturation this may lead to the immediate destruction of the amplifier (within a few ps)!
10. The input voltage should never be greater than 1 V_{pp} equivalent to 4 dBm input power.

    The input voltage without DC power supplied to the amplifier should never be greater than 2 V_{pp} equivalent to 10 dBm input power.