Datasheet
SHF 104P
broadband amplifier

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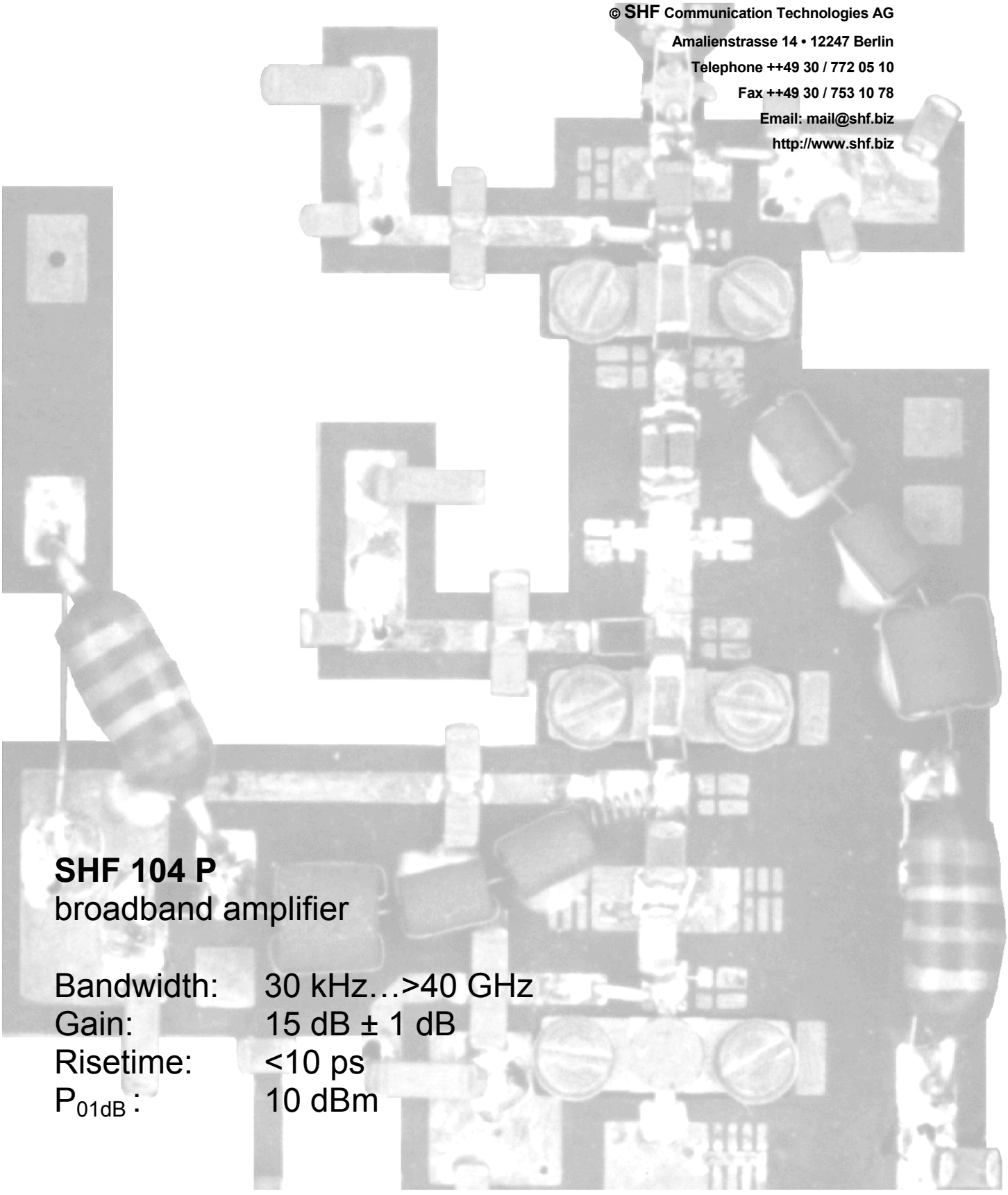

SHF 104 P
broadband amplifier

Bandwidth:	30 kHz…>40 GHz
Gain:	15 dB ± 1 dB
Risetime:	<10 ps
P_{01dB} :	10 dBm

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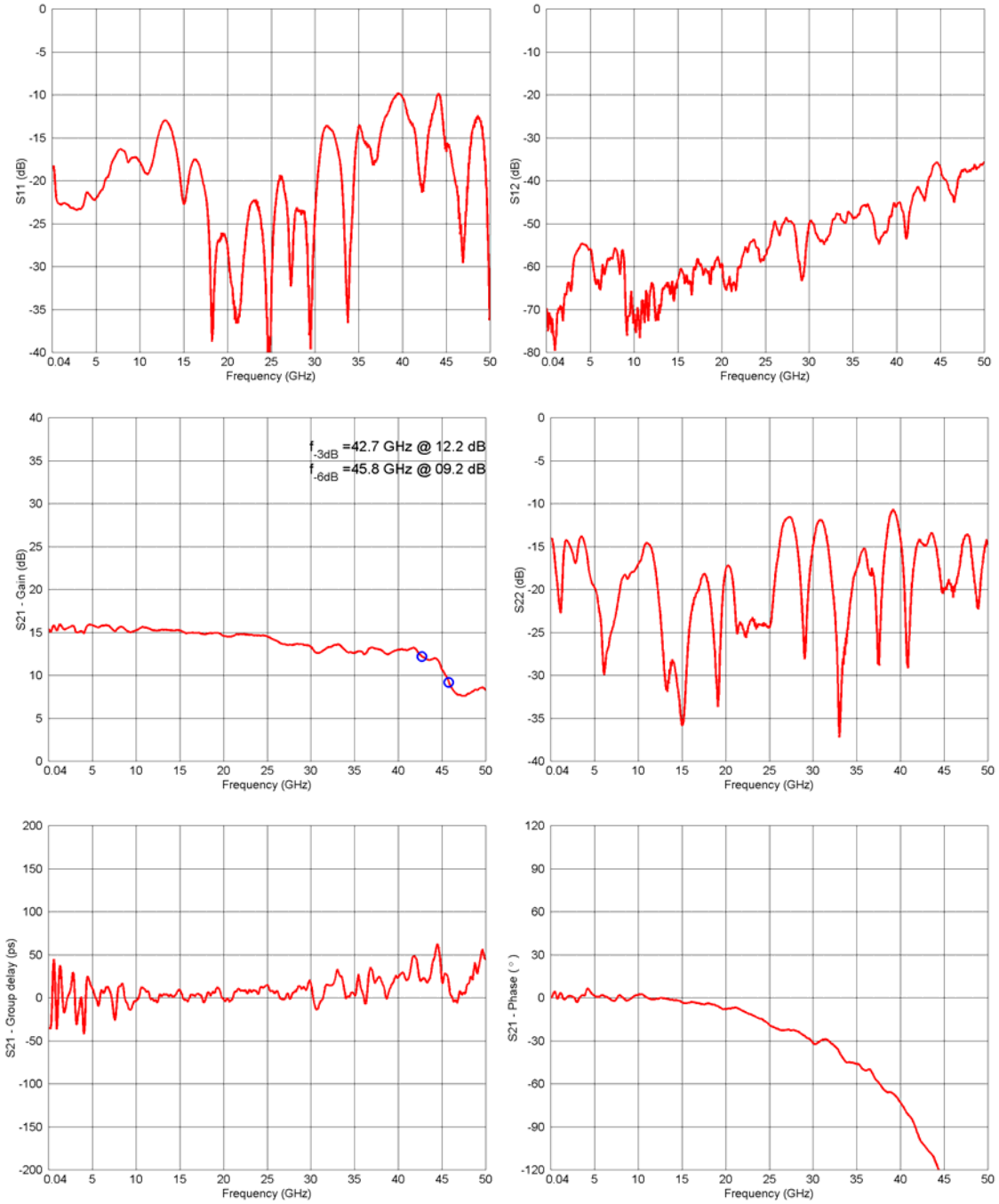
Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Low Frequency 3 dB point	f_{LOW}		25	30	kHz	
High Frequency 3 dB point	f_{HIGH}	40	42		GHz	
Gain		14	15	16	dB	non-inverting
Gain control voltage		0		-5	V	reduces gain by up to 3 dB
Gain ripple			±1	±1.5	dB	
Group delay ripple			± 40	± 50	ps	<38 GHz
Output power at 1dB compression	P_{01dB}	10 9			dBm	<20 GHz <40 GHz
Input return loss	S_{11}			-15 -10	dB	<10 GHz <35 GHz
Output return loss	S_{22}			-10	dB	<35 GHz
Maximum input power				4 10	dBm	in operation without power supply
Rise time / Fall time	t_r/t_f			10	ps	20% to 80%
Supply voltage		9		15	V	0.17 A, reverse voltage protected
Power consumption			1.6		W	using 9 V supply voltage
Input connector						2.9 mm female
Output connector						2.9 mm female
Dimensions (L x W x H)					mm	51 x 54 x 30 incl. connectors and heatsink 51 x 30 x 13.5 without connectors and heatsink

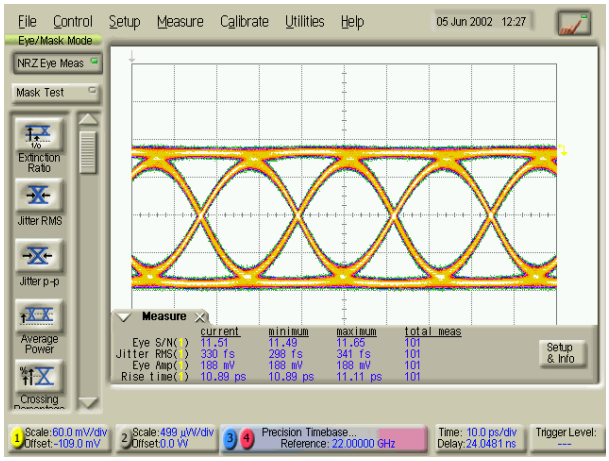
The SHF 104 P is a two stage amplifier design using special monolithic microwave integrated circuits (MMICs) inside special carriers to achieve ultra wide bandwidth and low noise performance. The custom made MMIC carrier is optimized for good input return loss between its interior and the 50 Ohm outside hybrid technology. The computer optimized broadband circuit is individually tuned for minimum passband ripple to get a near Bessel response. A voltage regulator IC makes the amplifier insensitive to overvoltage and line ripple.

S-Parameters, group delay and phase response (full gain)

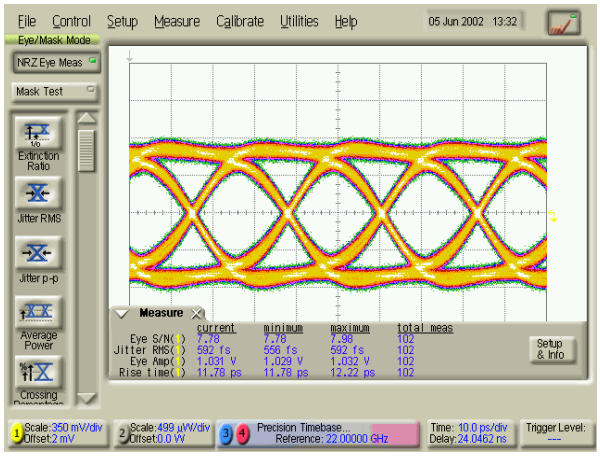


Aperture of Group Delay measurement: 400MHz

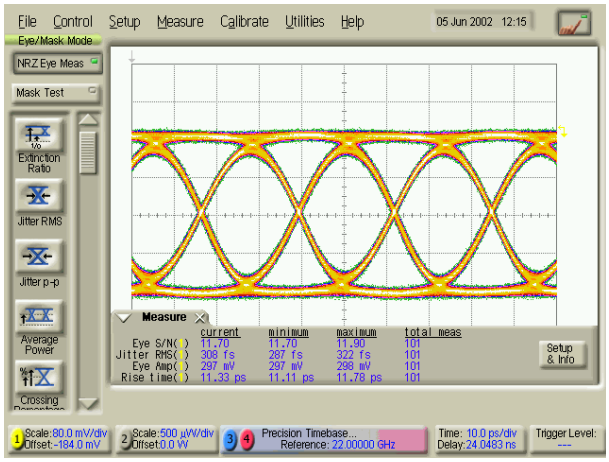
Eye Diagrams at 44 GBit/s



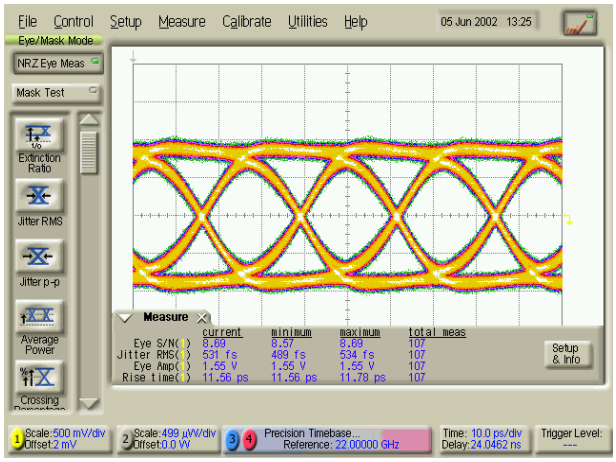
Input signal amplitude: 188 mV



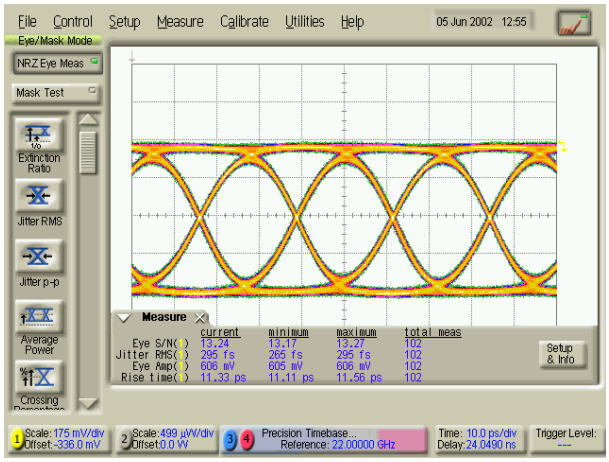
Output signal amplitude: 1.03 V



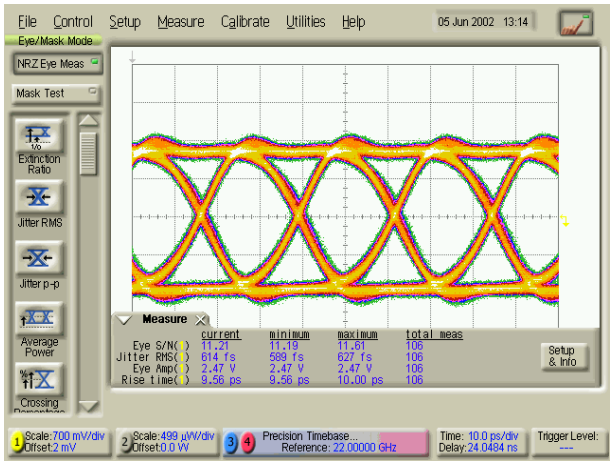
Input signal amplitude: 297 mV



Output signal amplitude: 1.55 V



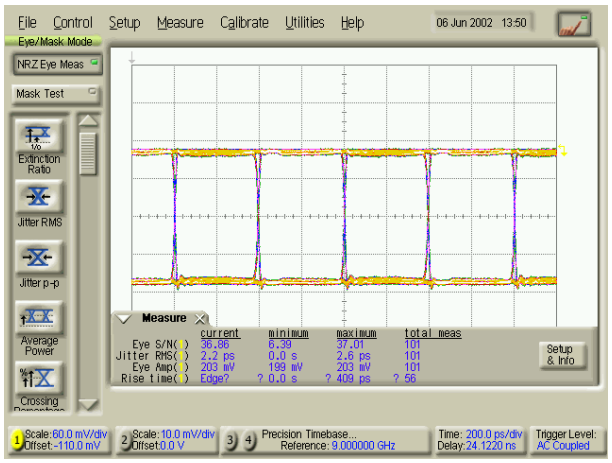
Input signal amplitude: 606 mV



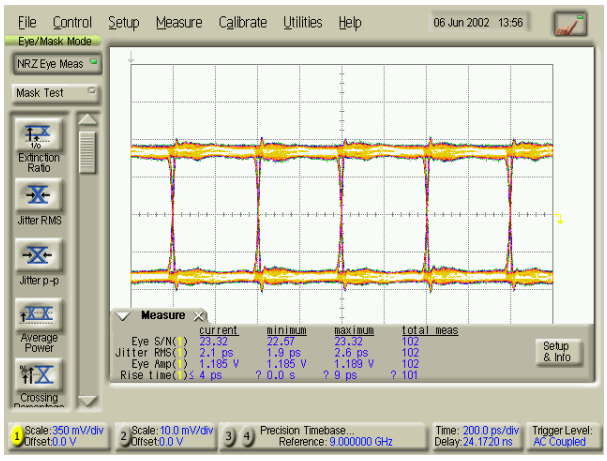
Output signal amplitude: 2.47 V

Rise time measured as 20% to 80%

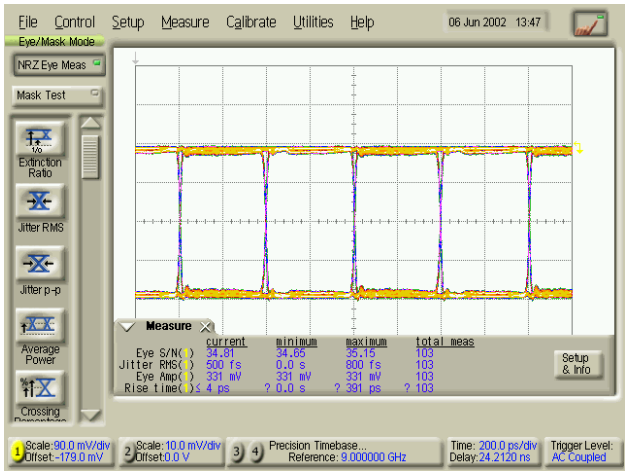
Eye Diagrams at 2.5 GBit/s



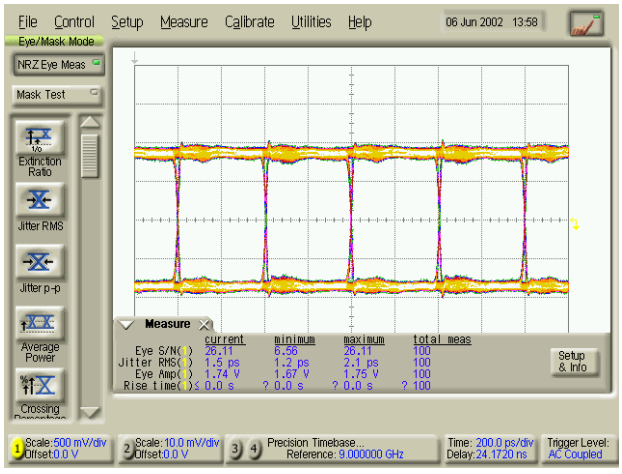
Input signal amplitude: 209 mV



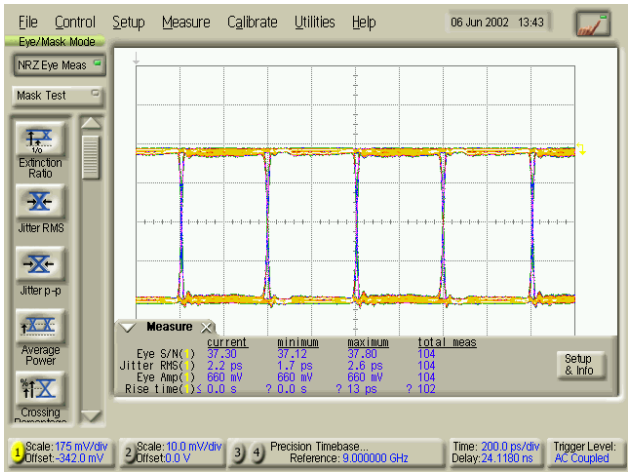
Output signal amplitude: 1.19 V



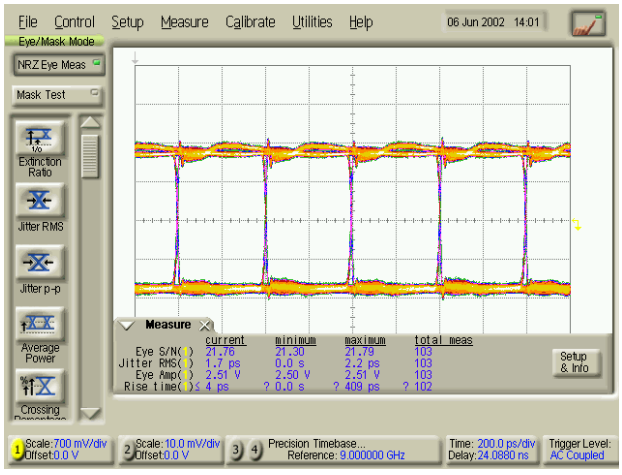
Input signal amplitude: 331 mV



Output signal amplitude: 1.74 V

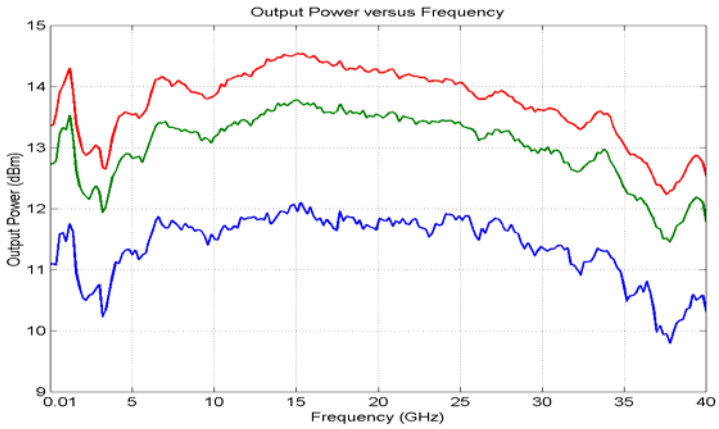


Input signal amplitude: 660 mV



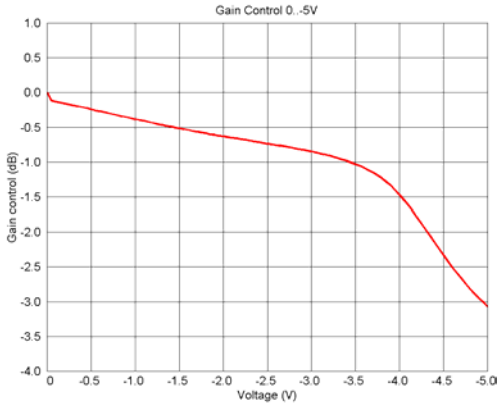
Output signal amplitude: 2.51 V

Saturation power



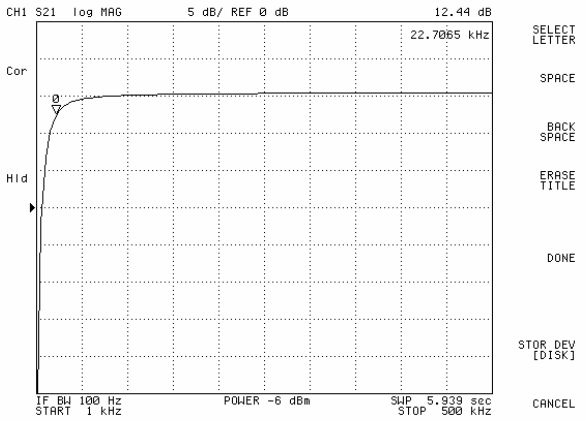
Top (red) : 3 dB compression; Middle (green) : 2 dB compression; Bottom (blue) : 1 dB compression

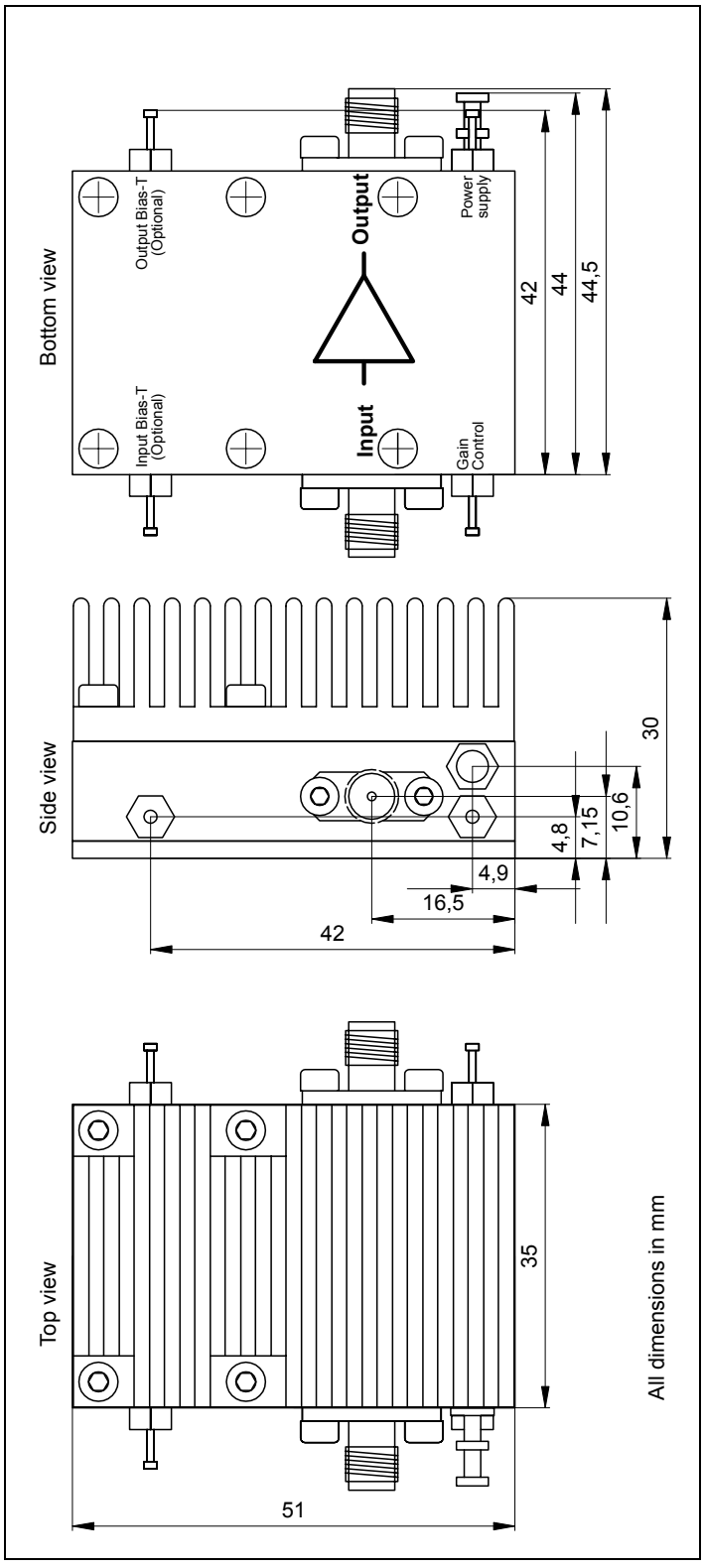
Gain reduction



All SHF amplifiers have a feature which allows the output gain to be reduced by up to approximately 3 dB by applying a negative voltage to the gain reduction pin.

Low frequency response (<500 kHz)





Thermal resistance of heatsink approx 5 K/W

For permanent mounting, remove the heatsink from the amplifier. In that case, ensure that adequate cooling of the amplifier is guaranteed.

To remove the heatsink from the amplifier, unscrew the four screws on the heatsink.

The view of the amplifier without heatsink is shown on the following page.

- **Available Options**

01: DC return on input

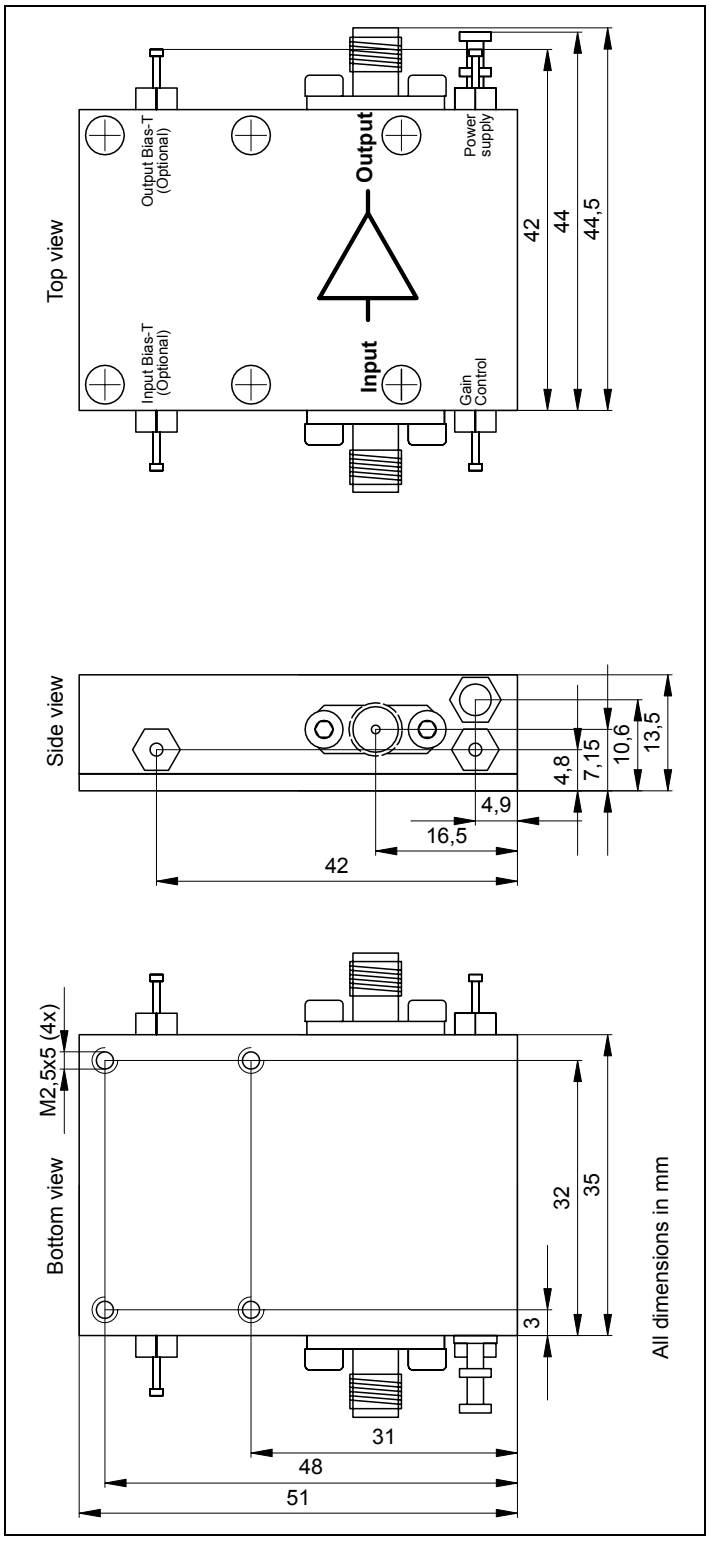
02: Built-in bias-T on input

03: DC return on output

04: Built-in bias-T on output

MP: Matches the phase of two amplifiers

The following options cannot be combined:
01 and 02
03 and 04
02 and 04



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 to 15 V, 0.17 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 stabilizer.**
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/ 1.85 mm or 2.4 mm attenuators)!**
6. **An input signal of about 0.39 V_{pp}, equivalent to –4 dBm, will produce the full swing output of 2 V_{pp} .**
7. **Higher input voltages will drive the amplifier's output stage into saturation, leading to waveform peak clipping.**
8. **While using a reflective load, the output voltage has to be reduced to a safe operating level below 2 V_{pp} according to the magnitudes of the reflections.**

   ATTENTION: At frequencies up to 20 GHz, a capacitive load can be transformed to an inductive one through transmission lines! With an output stage driven into saturation this will lead to the immediate destruction of the amplifier (within a few ps)!
9. **Without DC power supplied to the amplifier, the input voltage should never be greater than 1 V_{pp}, equivalent to 4 dBm input power.**
10. **Hint: Pulse shape tuning of the amplifier has been performed after warm up at about 40 °C case temperature. Considerably more over- and undershoot will be present at low temperature!**