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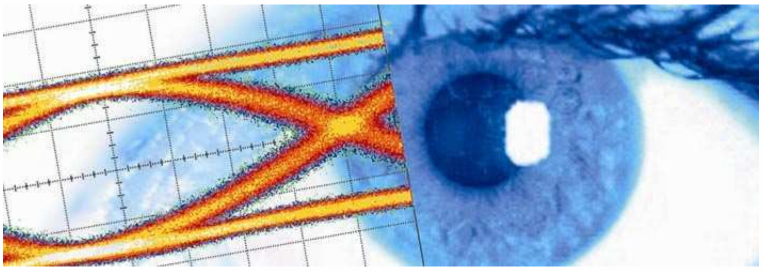
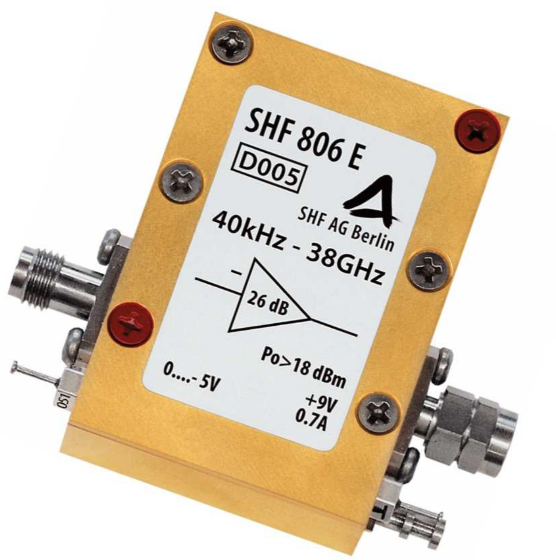


Datasheet

SHF 806 E



Description

The SHF 806 E is a modulator driver which conforms to OC-768. Together with high performance, the amplifier is extremely easy to use: a single power supply is all that is needed for operation.

A three stage amplifier design is employed 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 pass band ripple. A voltage regulator IC makes the amplifier insensitive to reverse voltage and line ripple.

Applications

- Optical Communications
- High-Speed Pulse Experiments
- Satellite Communications
- Research and Development
- Antenna Measurements
- Data Transmission

Available Options

- 01: DC return on input
- 02: Built-in bias tee on input
- 03: DC return on output
- 04: Built-in bias tee on output
- MT: Special tuning available to optimize performance with E/O modulators
  Positive gain slope of up to +3 dB possible
- MP: Matches the phase of two amplifiers

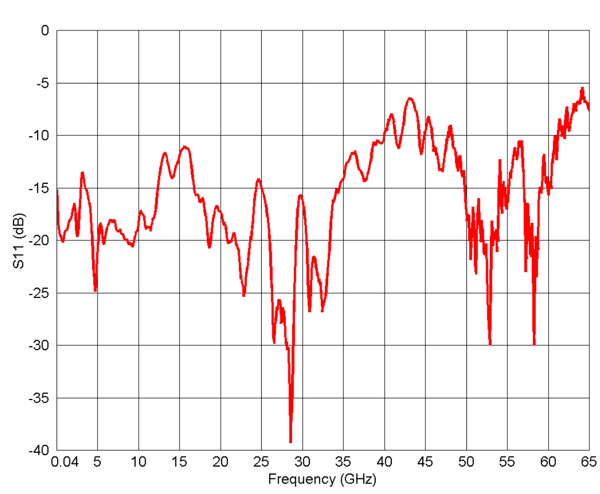
The following options cannot be combined:

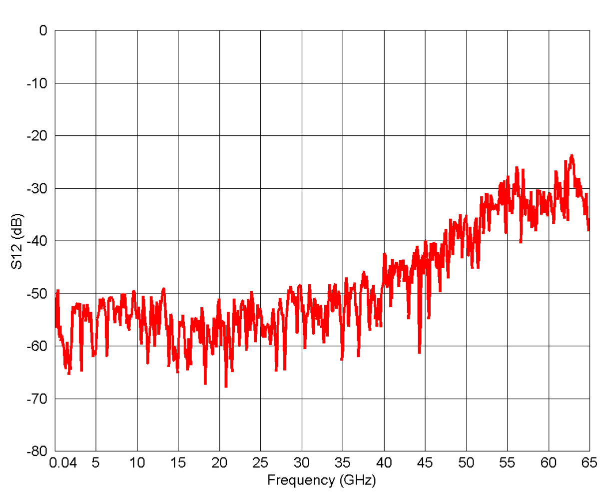
01 and 02
03 and 04
02 and 04

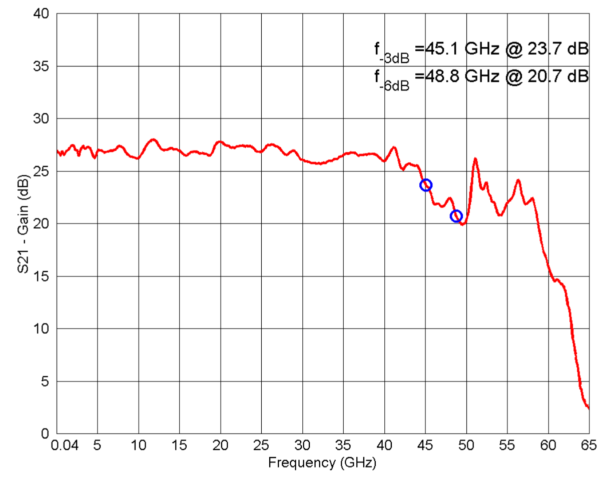
Electrical characteristics

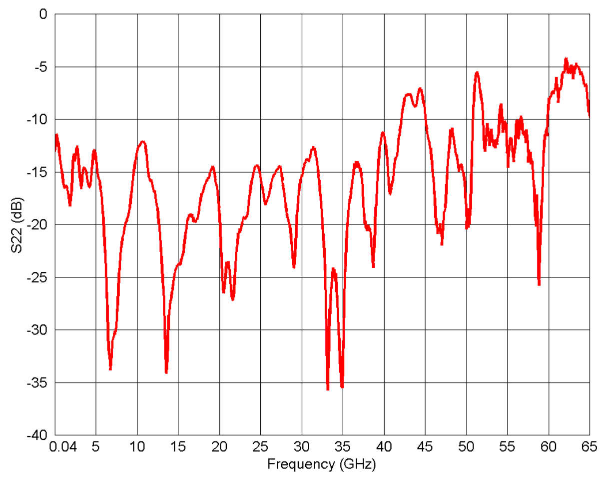
Parameter	Symbol	Units	Min.	Typ.	Max.	Conditions
High Frequency 3 dB point High Frequency 6 dB point	f_{HIGH}	GHz	38 45	42 50		
Low Frequency 3 dB point	f_{LOW}	kHz			40	
Gain		dB	25	26	27	inverting
Gain control voltage		V	0		–5	reduces gain by up to 3 dB
Gain ripple		dB		±1	±1.5	
Output power at 1dB compression	P_{01dB}	dBm	20 18			<25 GHz <35 GHz
Output power at 2 dB compression	P_{02dB}	dBm	21 19			<25 GHz <35 GHz
Output power at 3 dB compression	P_{03dB}	dBm	22 20			<25 GHz <35 GHz
Jitter (RMS)		fs			800	output in range 5…6 V
Input return loss	S_{11}			–15	–12 –10	<10 GHz <35 GHz
Output return loss	S_{22}				–10	<35 GHz
Maximum input power		dBm			4 10	in operation without power supply
Rise time / Fall time	t_r/t_f	ps		8	10	20% to 80%
Supply voltage		V	9		12	0.65 A, reverse voltage protected
Power consumption		W		5.85		using 9V supply voltage
Input connector						1.85 mm female
Output connector						1.85 mm male
Dimensions (L x W x H)		mm				59 x 144 x 40 incl. connectors and heatsink 51 x 35 x 13.5 without connectors and heatsink

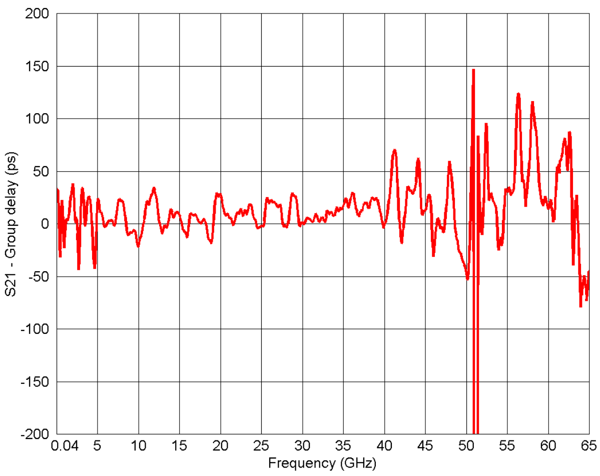
S-Parameters

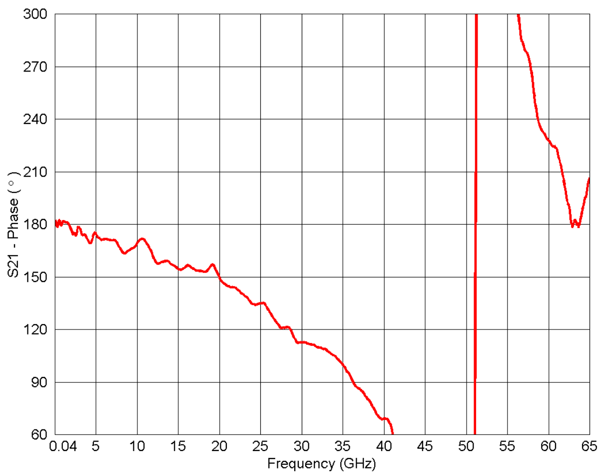






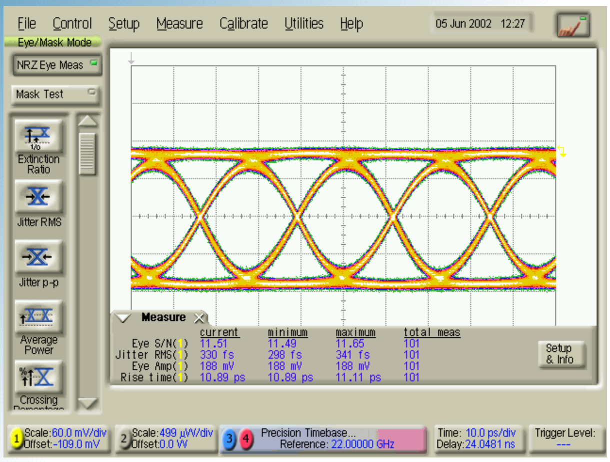




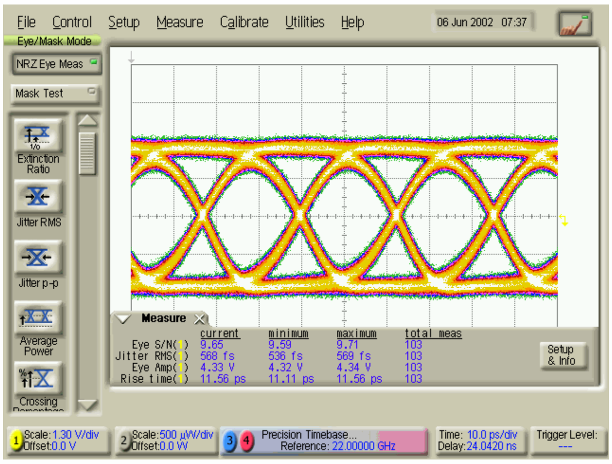


Aperture of Group Delay measurement: 400 MHz

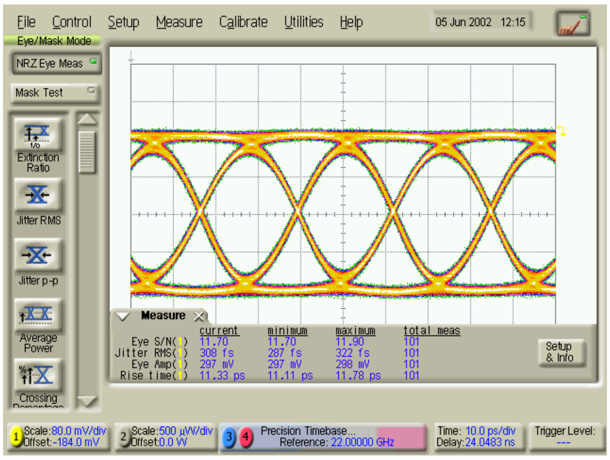
Eye diagrams at 44 GBit/s



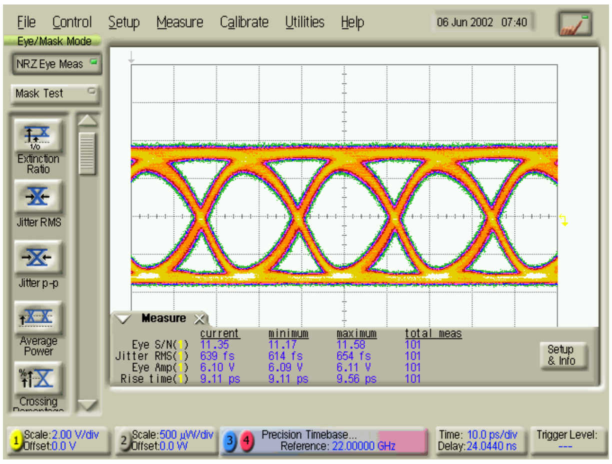
Input signal amplitude: 190 mV



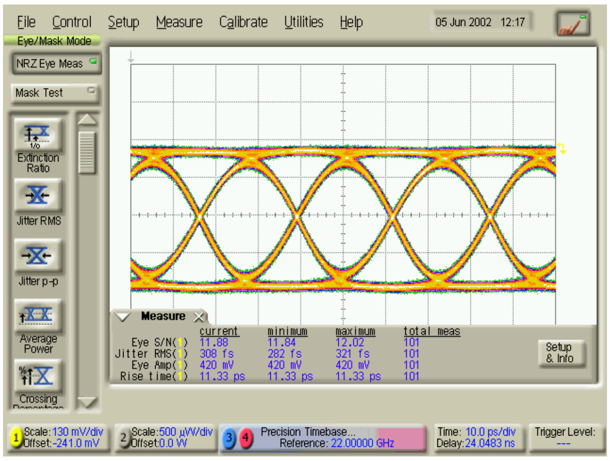
Output signal amplitude: 4.3 V



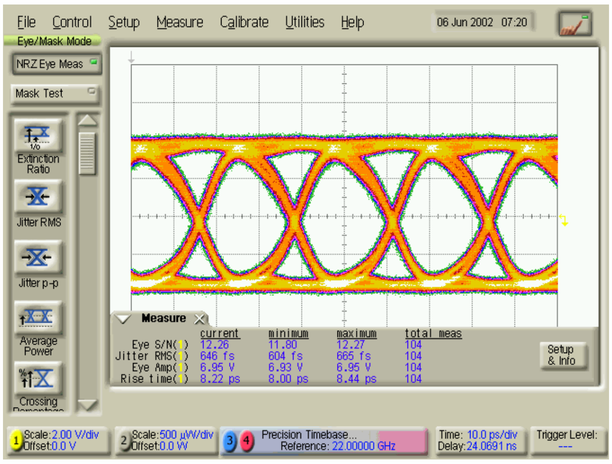
Input signal amplitude: 300 mV



Output signal amplitude: 6.1 V

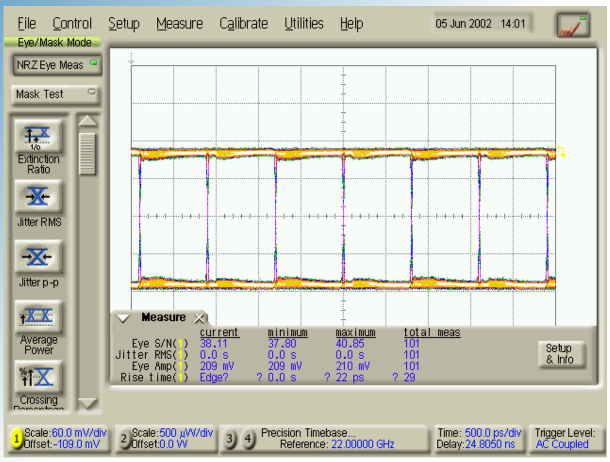


Input signal amplitude: 420 mV

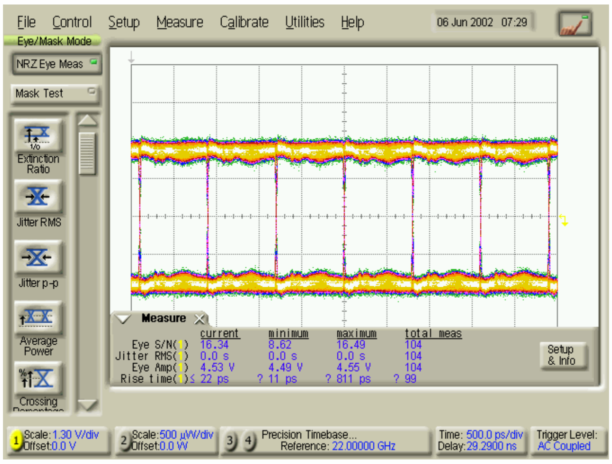


Output signal amplitude: 7.0 V

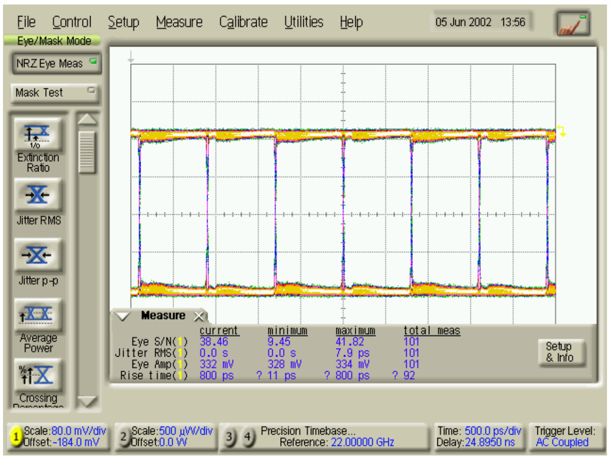
Eye diagrams at 2.5 GBit/s



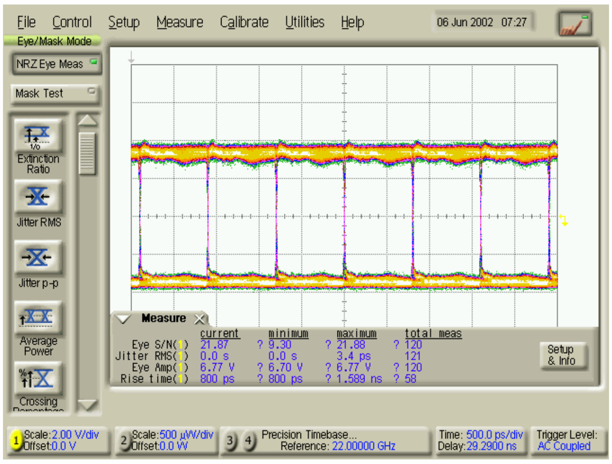
Input signal amplitude: 200 mV



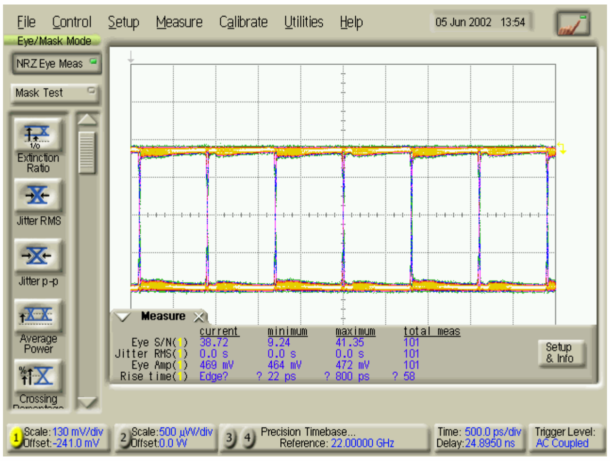
Output signal amplitude: 4.5 V



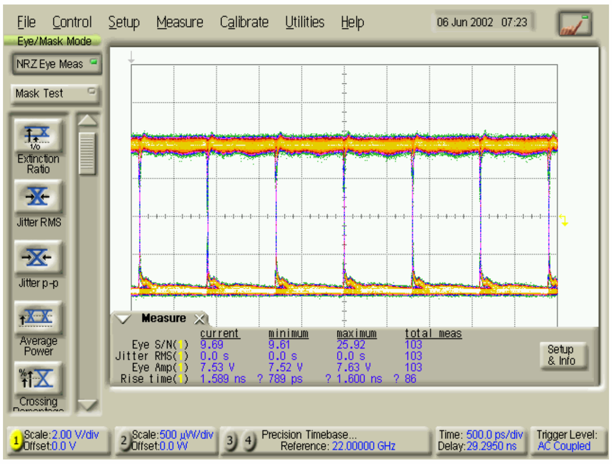
Input signal amplitude: 330 mV



Output signal amplitude: 6.8 V



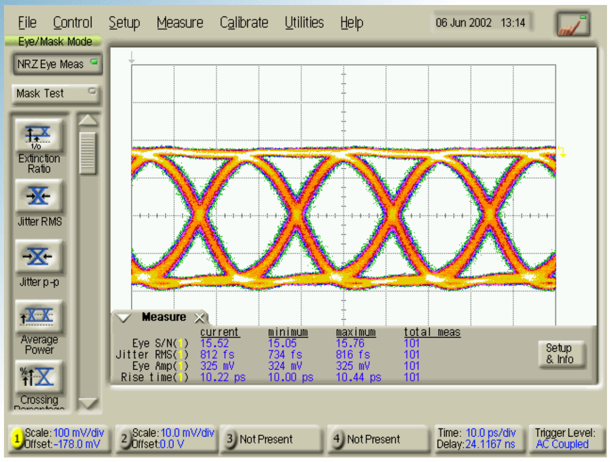
Input signal amplitude: 470 mV



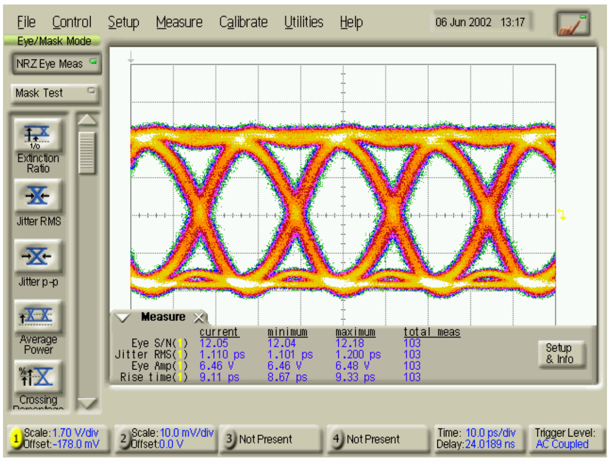
Output signal amplitude: 7.5 V

Jitter measurements at 44 GBit/s

Measured with 50 GHz sampling module and standard timebase

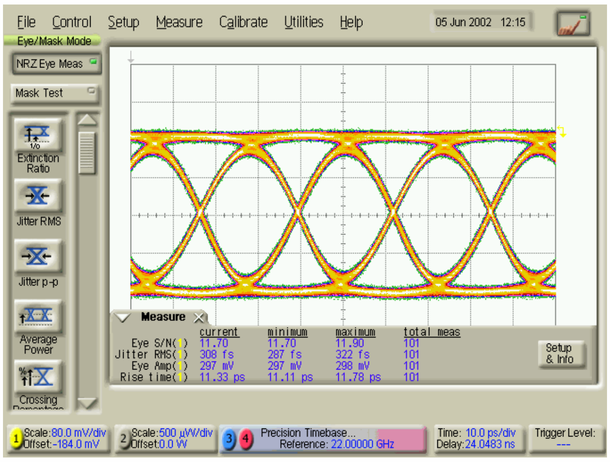


Jitter: 812 fs

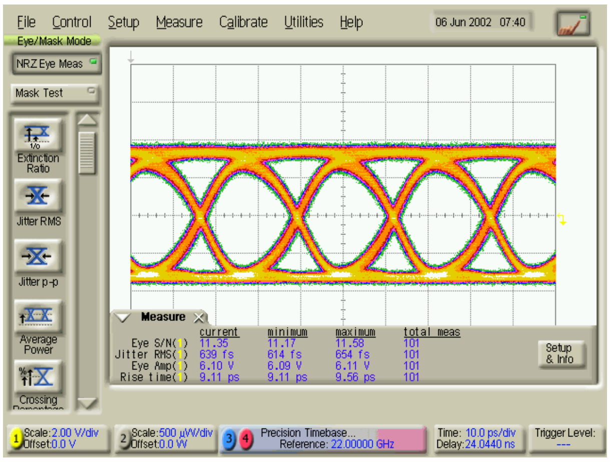


Jitter: 1110 fs

Measured with 63 GHz sampling module and precision timebase.



Jitter: 308 fs



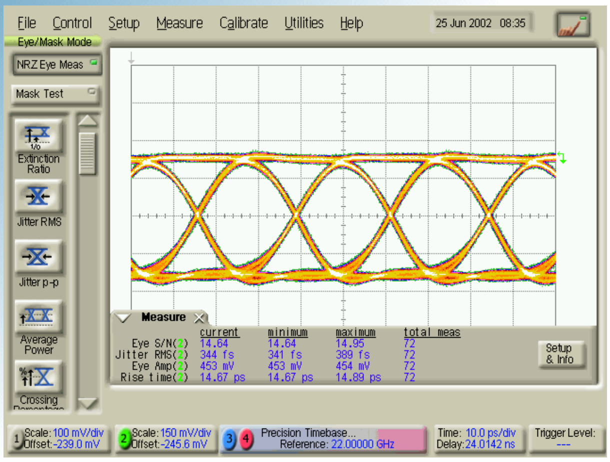
Jitter: 639 fs

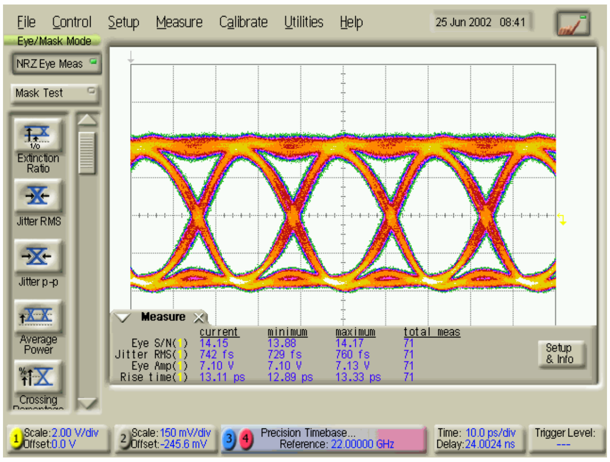
The specification for jitter is based on the measurement using the 63 GHz sampling module and precision timebase. The figure (<800 fs) is **not** deconvoluted from the total system jitter; it is the displayed figure on the oscilloscope for the whole system (multiplexer, amplifier, sampling head and oscilloscope). It is taken at an output level between 5 and 6 V, which is relevant for most applications.

Using a standard timebase and 50 GHz sampling module, we specify a maximum jitter figure of 1.25 ps.

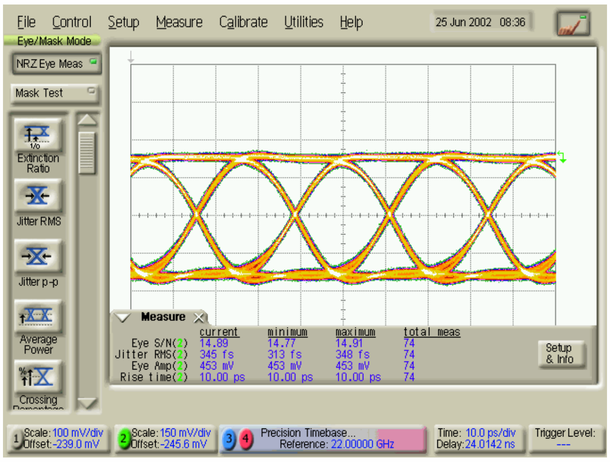
Rise/Fall times

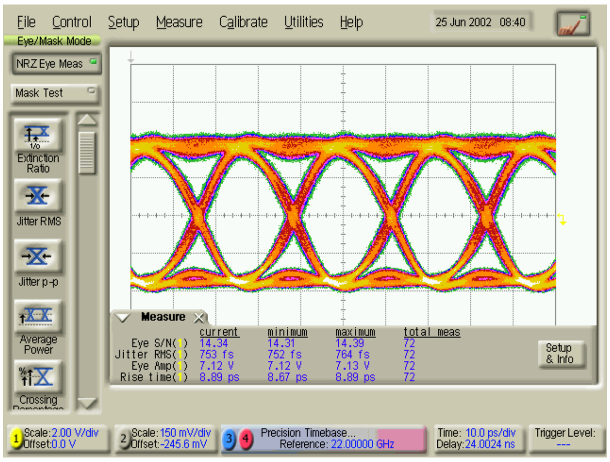
Input signal | 7 V output from SHF 806 E





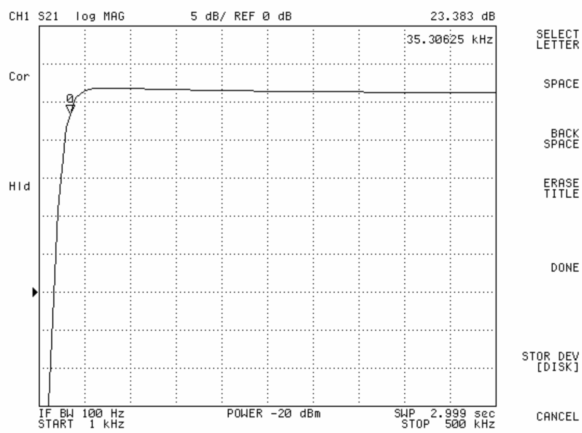
14.7 ps | Measured from 10% to 90% | 13.1 ps



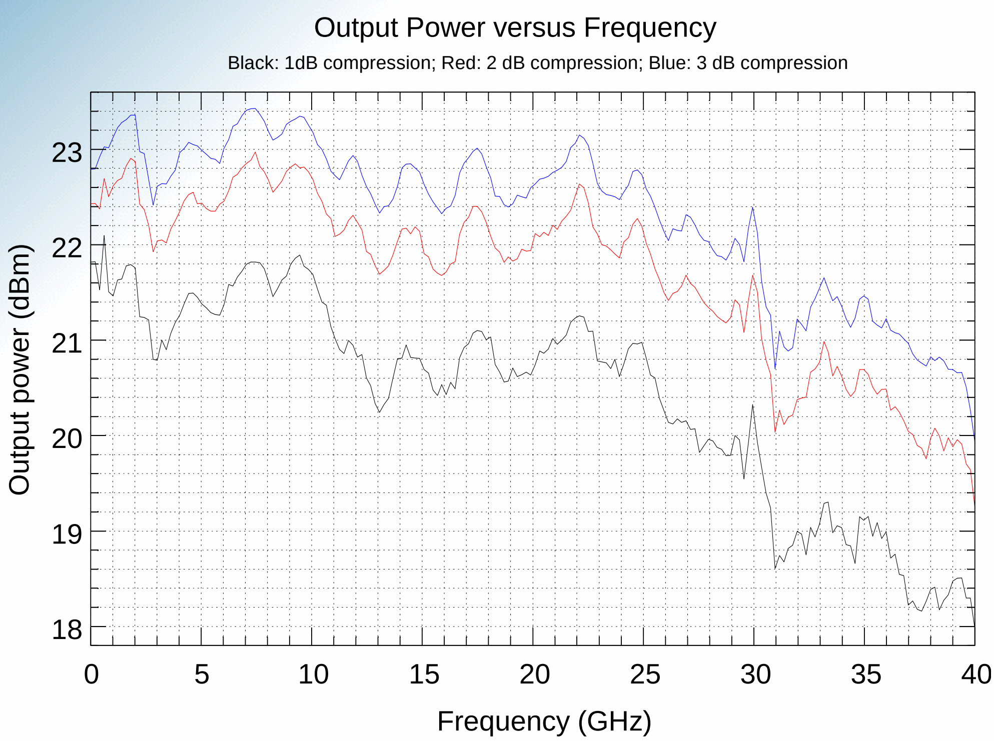


10.0 ps | Measured from 20% to 80% | 8.9 ps

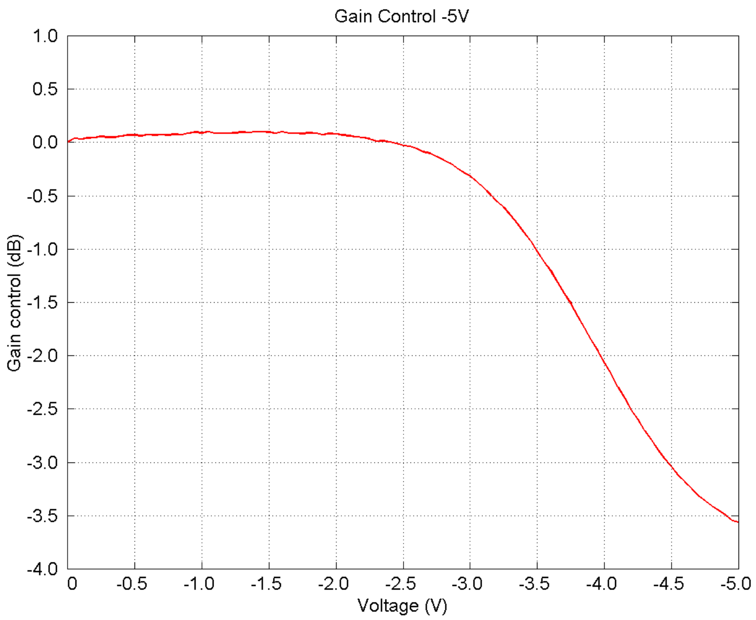
Low frequency response (<500 kHz)



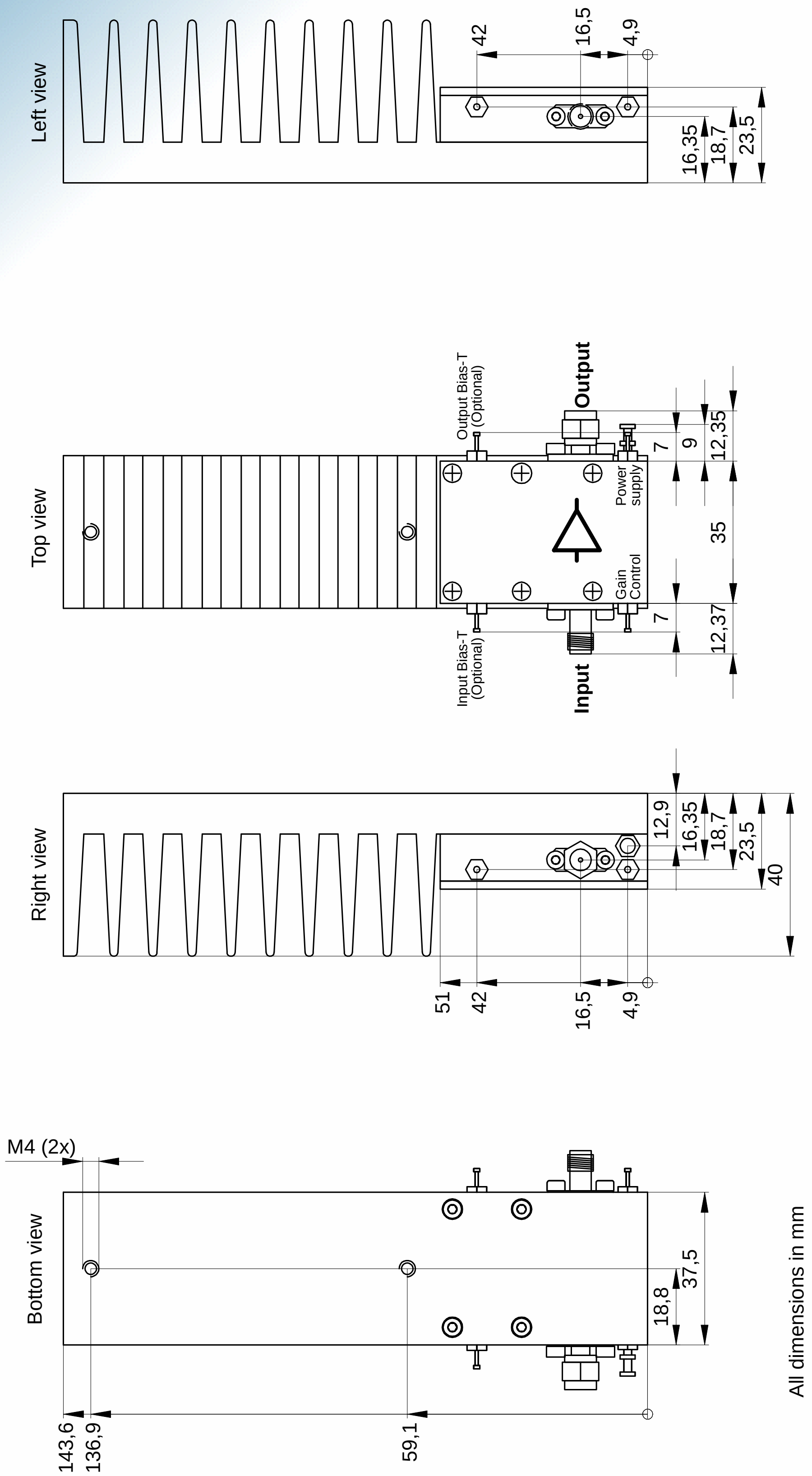
Saturation power



Gain reduction function

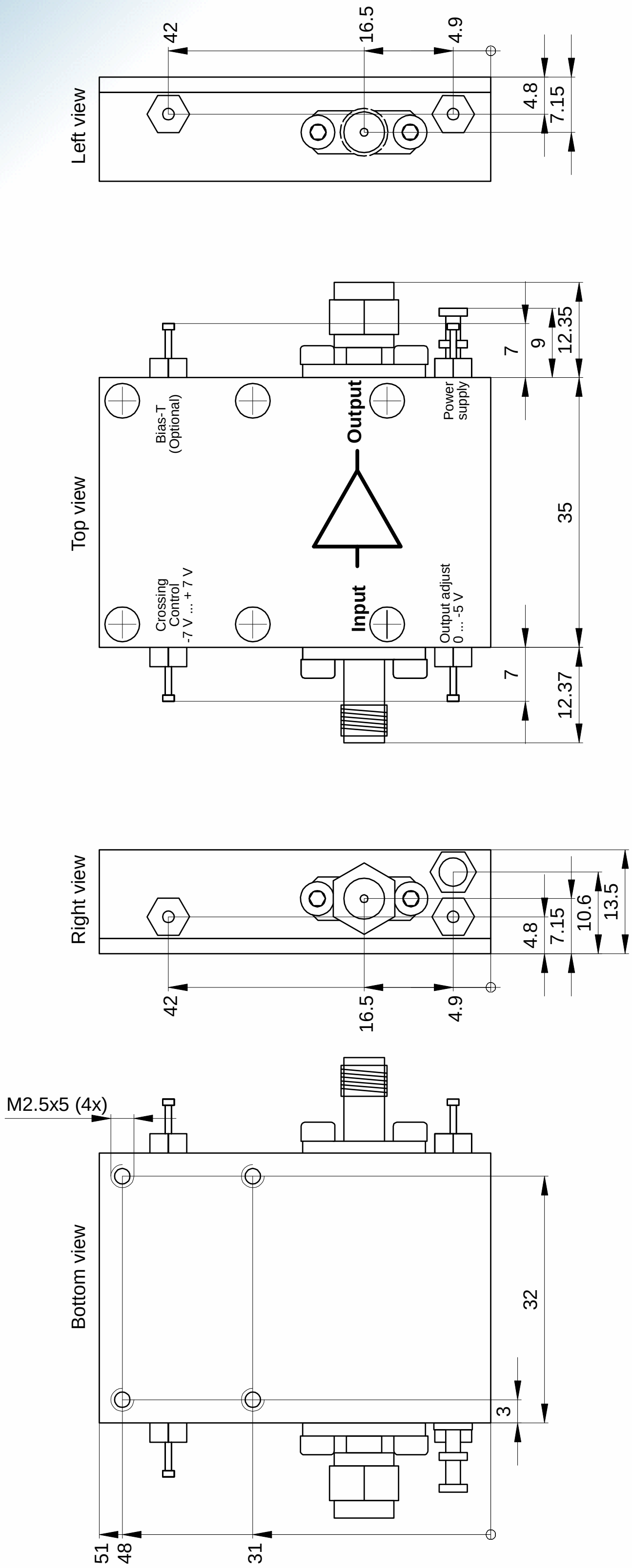


Mechanical drawing with Heatsink



Thermal resistance of heatsink approx 1.6 K/W

Mechanical drawing without Heatsink



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.

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…12V, 1A DC power supply and can be connected to the supply feed-through filter via an ON / OFF switch.**
4. **The minimum supply voltage is 9V. 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/ 1.85mm or 2.4mm - attenuators) !**
6. **An input signal of about 0.7 V_{pp} equivalent to 1 dBm will produce the full swing output of 8 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 between 10 MHz and 40 GHz 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 26 GHz.**

   Thus the amplifier will tolerate an overdrive of 6 dB resulting in 0.5V_{pp} equivalent to -2 dBm at the input from a CW generator having 50 Ohm output resistance and less than 1.2 VSWR. In this case, the amplifier output will be close to 8 V.
9. **While using a reflective load the output voltage has to be reduced to a safe operating level below 8 V_{pp} according to the magnitudes of the reflections.**

   ATTENTION: At frequencies up to 20 GHz a capacitive load can be trans-formed 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.
11. **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 there at low temperature!**