SHF Communication Technologies AG

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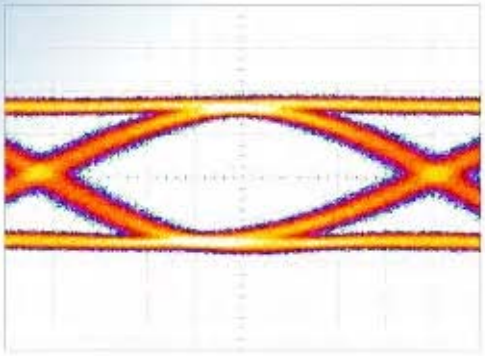


Datasheet

SHF 824

Broadband Amplifier

Specifications – SHF 824

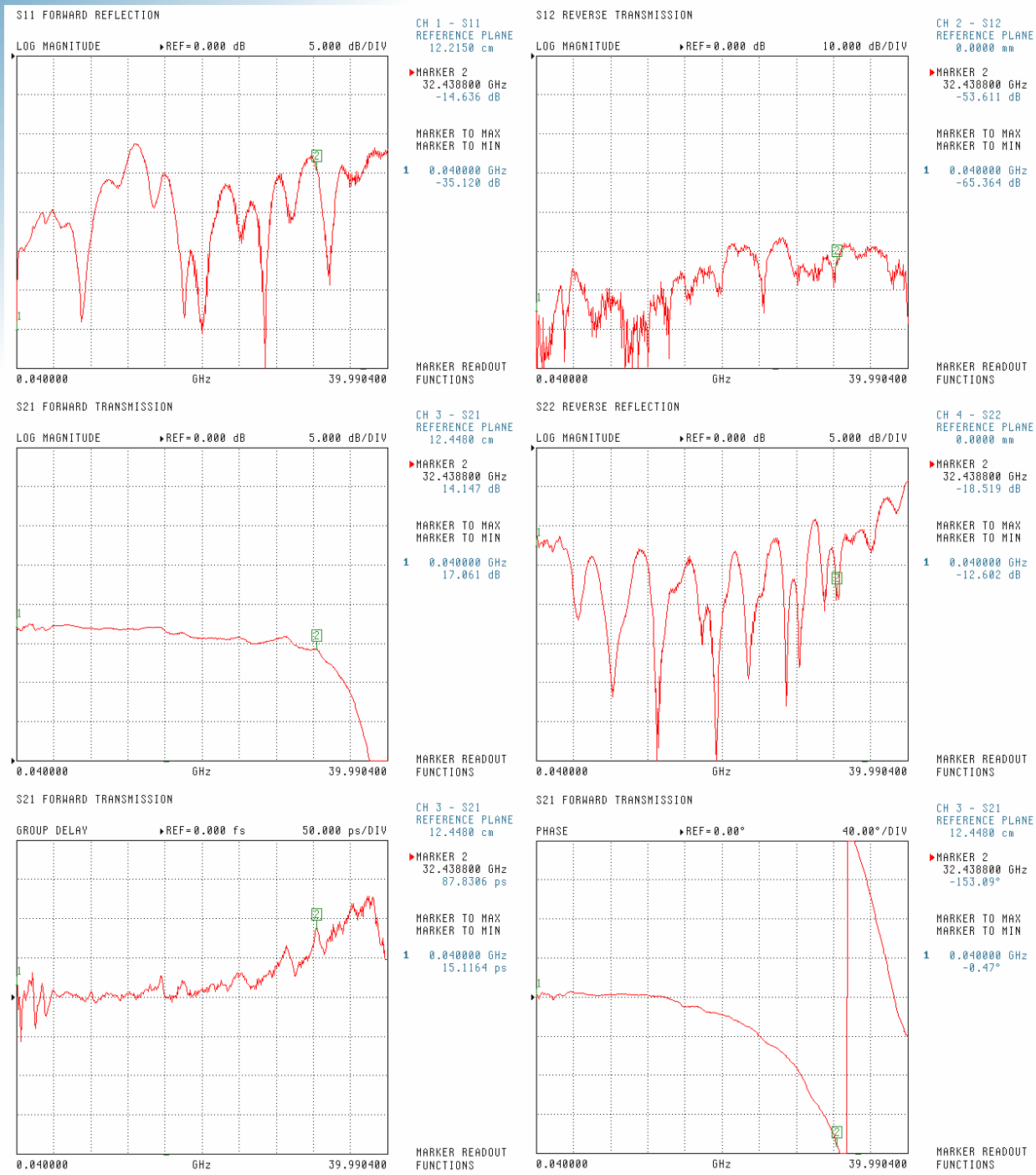
Parameter	Symbol	Unit	Min	Typ	Max	Conditions
High frequency 3 dB point	f_{HIGH}	GHz	28	31		
Low frequency 3 dB point	f_{LOW}	kHz		25	30	
Gain		dB	16	17	18	non-inverting
Gain control voltage current		V mA	0 0		-5 -10	reduces gain by up to 3 dB
Gain ripple		dB		±1	±1.5	
Output power at 1 dB compression	P_{01dB}	dBm (V)	25 (11.2) 23 (9)	26 (12.6) 24 (10)		<15 GHz <20 GHz
Output power at 2 dB compression	P_{02dB}	dBm (V)	25.5 (11.9)	26.5 (13.3)		<15 GHz
Output power at 3 dB compression	P_{03dB}	dBm (V)	26 (12.6)	27 (14.2)		<15 GHz
Input return loss	S_{11}	dB			-10	<28 GHz
Output return loss	S_{22}	dB			-10	<28 GHz
Maximum input power		dBm			14 14	in operation without power supply
Rise time/fall time	t_r/t_f	ps		16	20	20%...80%
Supply voltage		V	11		12	0.75 A, reverse voltage protected
Power consumption		W	8.3			using 11 V supply voltage
Input connector						2.9 mm / K female
Output connector						2.9 mm / K female
Dimensions		mm				51x40x16 excluding connectors

The SHF 824 is a two stage amplifier custom-design 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 designed for minimum passband ripple to get a near Bessel response. A voltage regulator IC makes the amplifier insensitive to overvoltage and line ripple.

Potential applications:

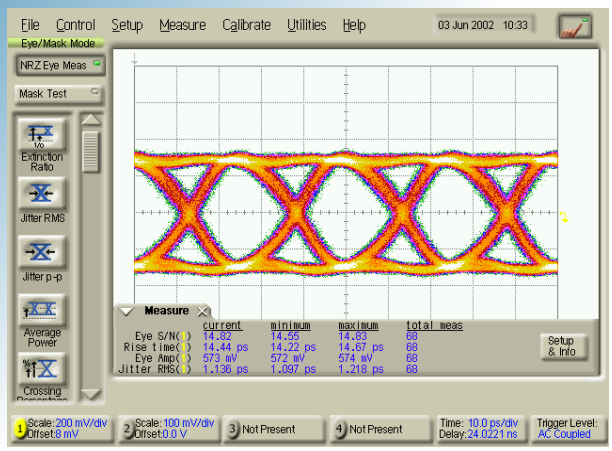
This amplifier is well suited for applications requiring extra amplitude drive level than conventional NRZ intensity modulation, for data rates at 20 GBit/s and above. The potential area of interest is the investigation of novel modulation techniques to further enhance the spectral efficiency and improve the resilience of signal propagation against fibre nonlinearities. Some of these techniques, for example, optical phase duobinary, and optical phase modulation by using a chirp-free Mach Zehnder modulator, require 2 V_π amplitude drive level to achieve the full benefits.

S-Parameters, group delay and phase response at maximum gain

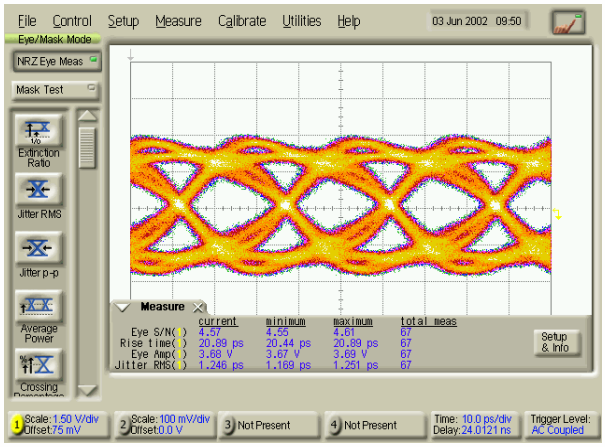


Aperture of group delay measurement: 100 MHz

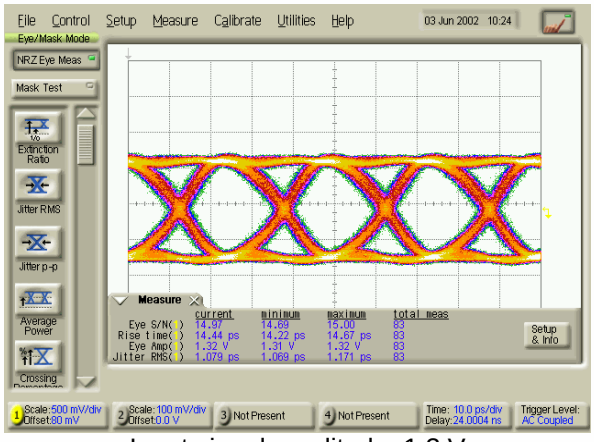
Eye diagrams at 40 GBit/s



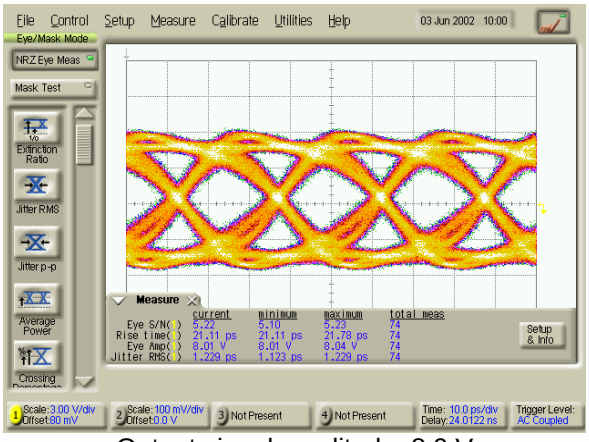
Input signal amplitude: 570 mV



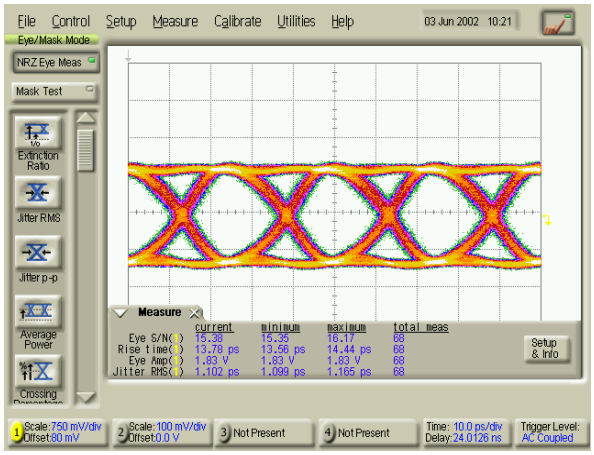
Output signal amplitude: 3.7 V



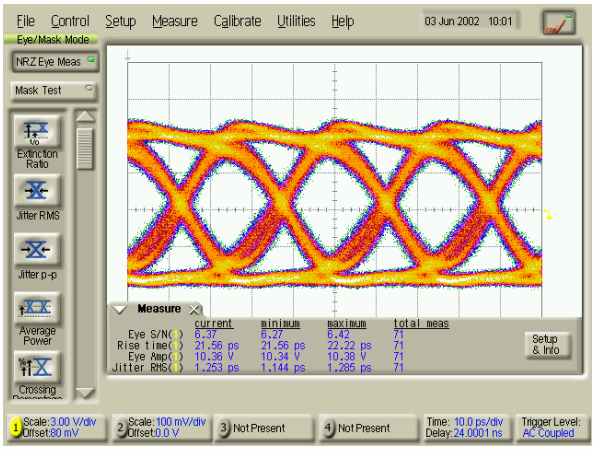
Input signal amplitude: 1.3 V



Output signal amplitude: 8.0 V

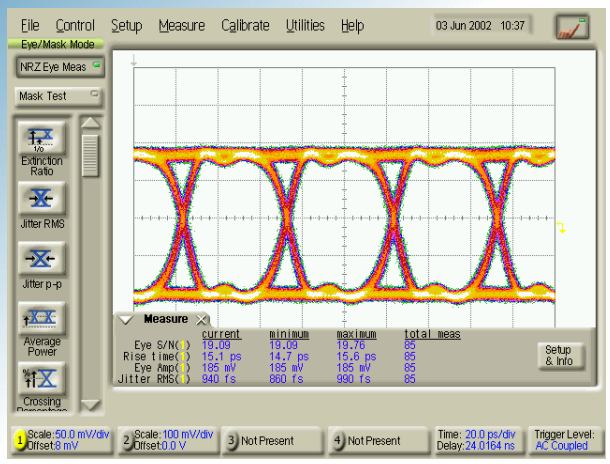


Input signal amplitude: 1.8 V

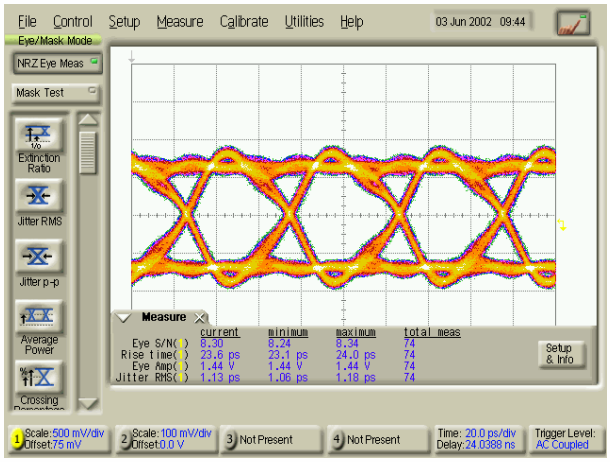


Output signal amplitude: 10.4 V

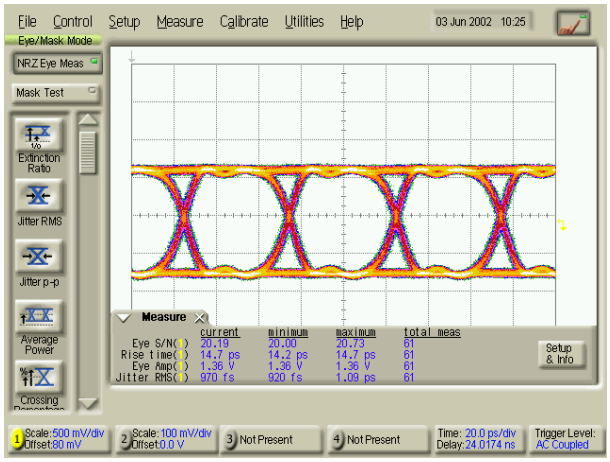
Eye diagrams at 20 GBit/s



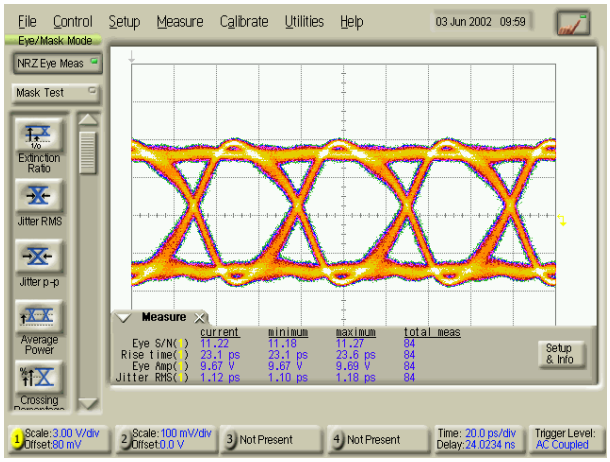
Input signal amplitude: 185 mV



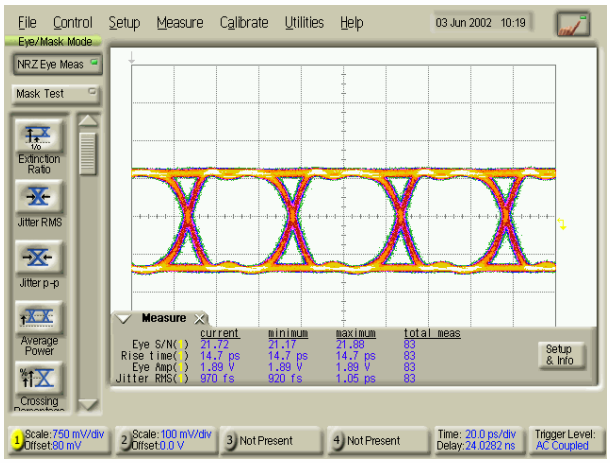
Output signal amplitude: 1.4 V



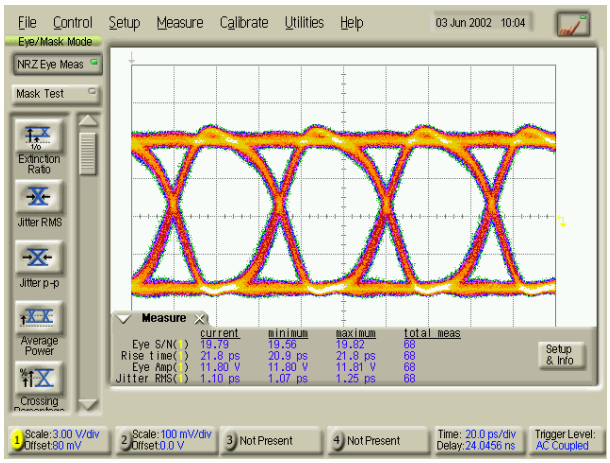
Input signal amplitude: 1.4 mV



Output signal amplitude: 9.7 V

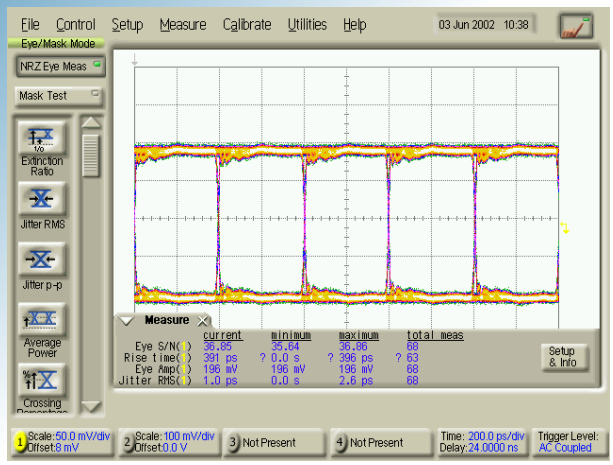


Input signal amplitude: 1.9 V

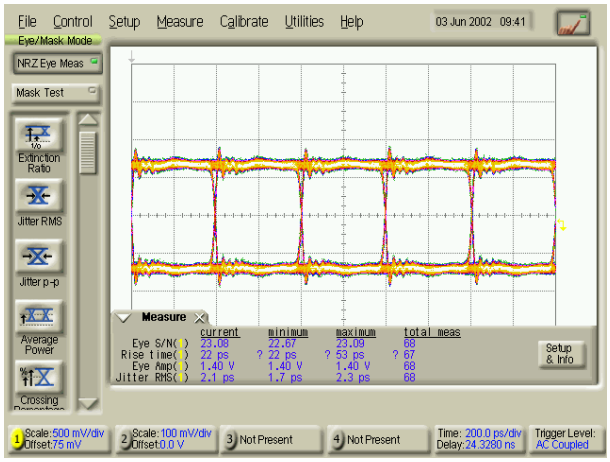


Output signal amplitude: 11.8 V

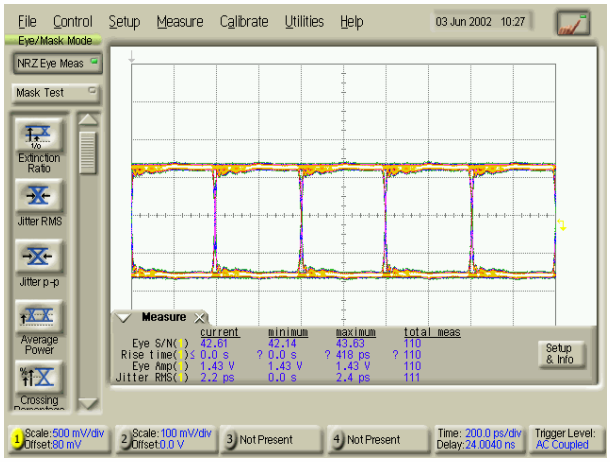
Eye diagrams at 2.5 Gbps



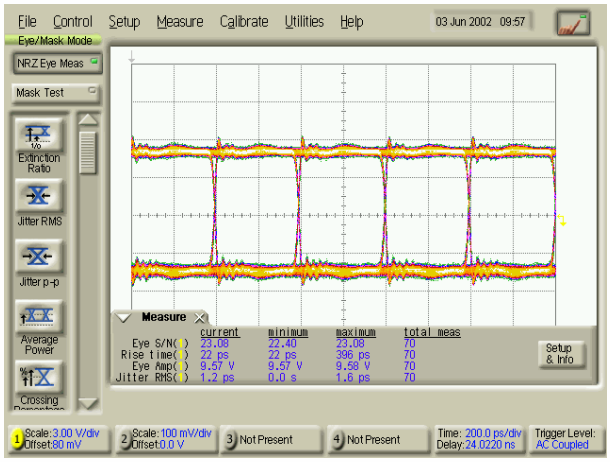
Input signal amplitude: 200 mV



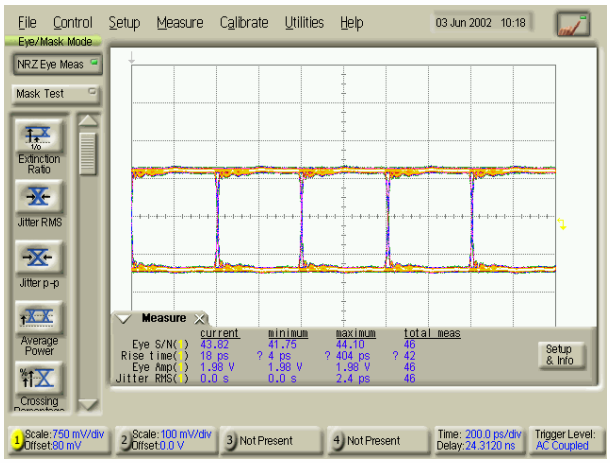
Output signal amplitude: 1.4 V



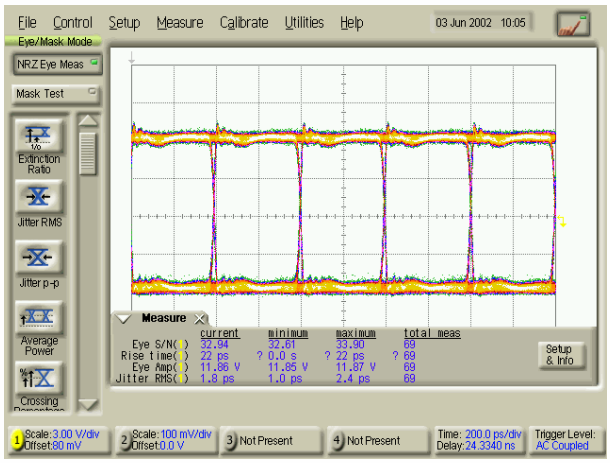
Input signal amplitude: 1.4 mV



Output signal amplitude: 9.6 V

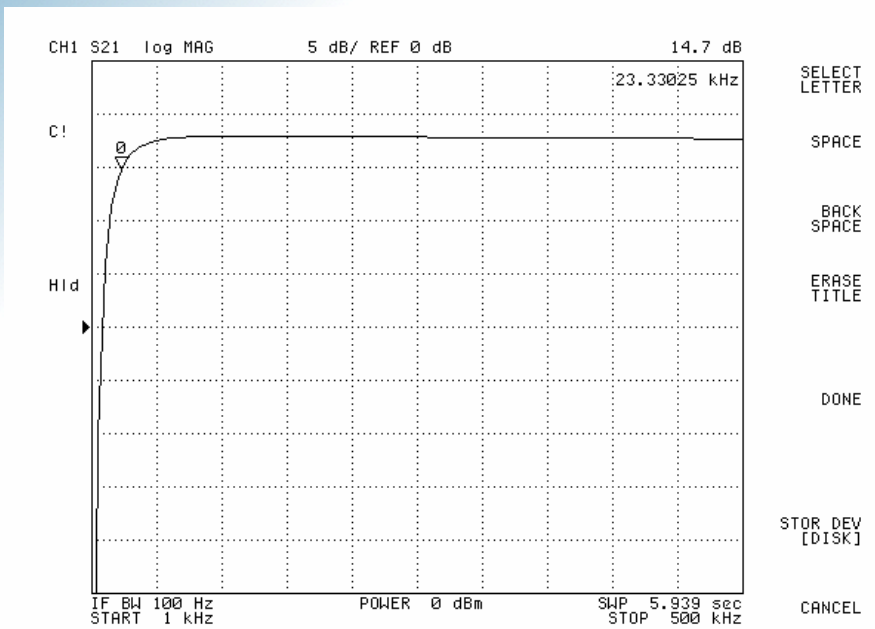


Input signal amplitude: 2.0 V

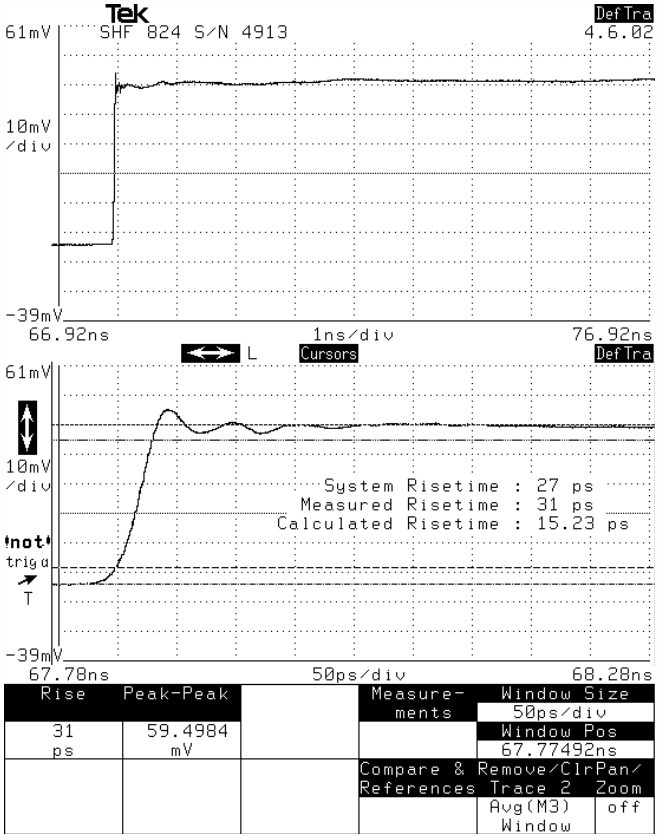


Output signal amplitude: 11.9 V

Low frequency response (<1 MHz)

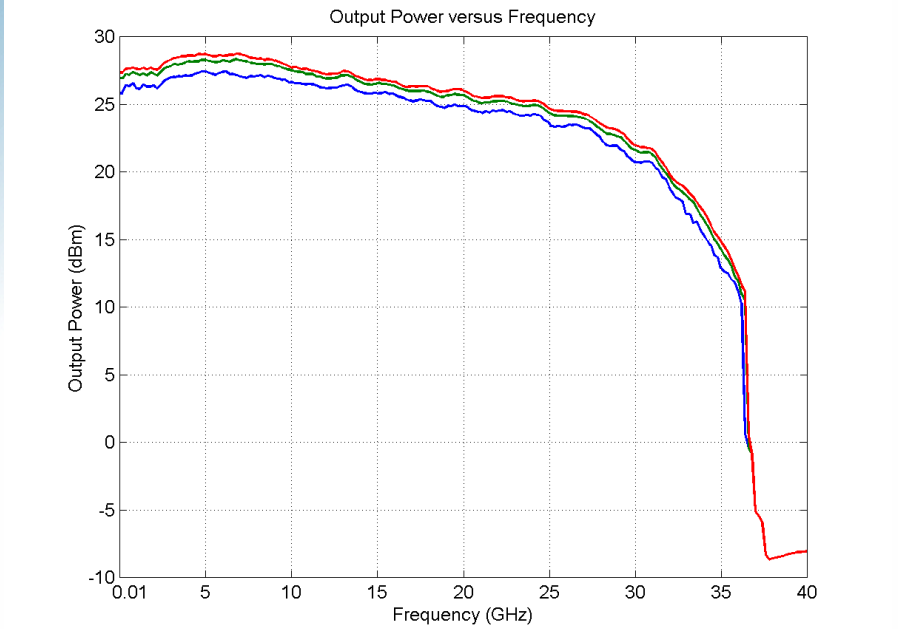


Step response



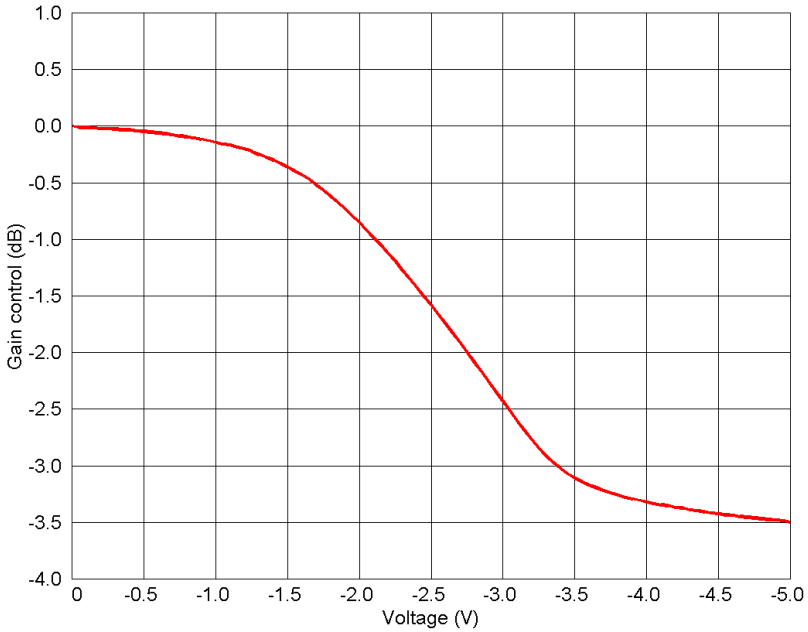
system rise time measured as 27 ps, giving a deconvoluted amplifier rise time of 15.2 ps.

Saturation power



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

Gain reduction function



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

Available Options

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

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

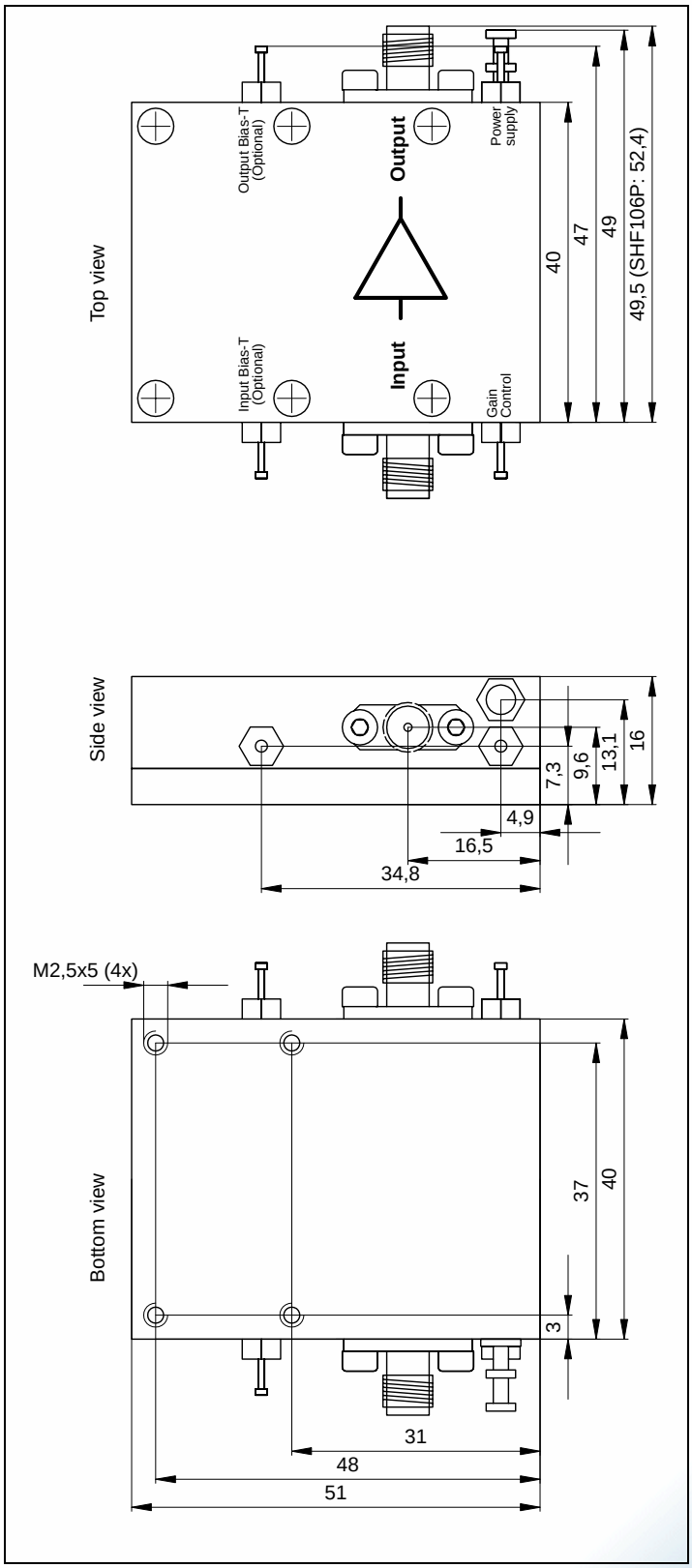
03: DC return on output (max. ±1.75 V, max. 35 mA)

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

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



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 11…12 V, 0.8 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 11 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 than 40 GHz (K/ 2.9mm attenuators)!
6. An input signal of about 2.5 V_{pp} equivalent to 12 dBm will produce saturated output swing of 12.6V_{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.
9. While using a reflective load the output voltage has to be reduced to a safe operating level below 12.6 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 may lead to the immediate destruction of the amplifier (within a few ps)!
10. The input voltage should never be greater than 3 V_{pp} equivalent to 14 dBm input power.
11. Hint: Pulse shape tuning of the amplifier has been performed after warm up at about 35°C case temperature. Considerably more over and undershoot will be present at low temperature!