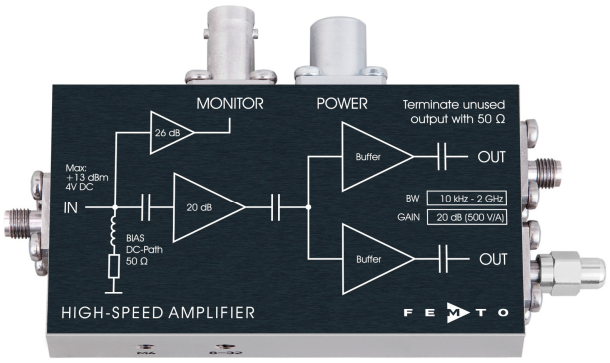
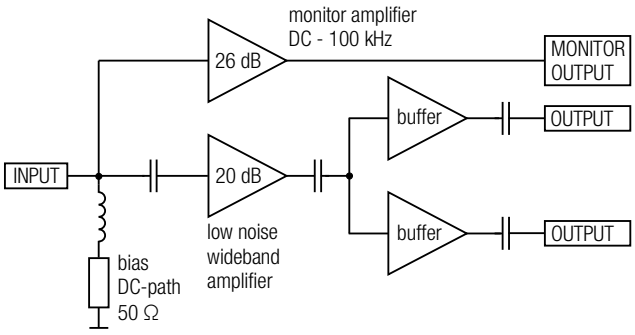
1 GHz High-Speed Amplifier



Features	• **Bandwidth 10 kHz – 2 GHz** • **Exceptional low 10 kHz lower cut-off frequency for optimal pulse processing without shape distortion** • **Rise time 175 ps** • **Gain 20 dB** • **Input return loss 23.1 dB** • **Integrated bias circuit** • **Monitor output** • **Two identical signal outputs**
Applications	• **Preamplifier for ultra-fast detectors (microchannel-plates, photomultipliers, avalanche-photodiodes, PIN-photodiodes etc.)** • **Oscilloscope and transient-recorder preamplifier** • **Time-resolved pulse and transient measurements**
Block Diagram	 BS-HSA-Y_23_R01
Intended Use	The HSA-Y-2-20 amplifier is a fixed gain wideband GHz amplifier. It is designed for ultra fast amplification of small voltage and current signals in the frequency range from 10 kHz to 2 GHz. Operation is mostly self-explanatory. If in doubt, consult this document or contact support@femto.de. For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and “Power Supply” sections of this document.
Application Notes	CAUTION! Do not exceed the maximum allowable input power of +13 dBm (20 mW). If in doubt, use attenuators on the amplifier input. The HSA-Y-2-20 offers two identical RF outputs. For operation it is mandatory that both RF outputs are terminated with 50 Ω loads. If only one output is used, the unused SMA output socket must be terminated with a 50 Ω terminator which is included in delivery.

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Available Accessories	PS-15-25-L		Power supply Input: AC 100 – 240 V Output: DC ±15 V
Related Models	HSA-Y-1-40	Gain 40 dB, 10 kHz – 1 GHz, noise figure 1.9 dB	
	HSA-Y-1-60	Gain 60 dB, 10 kHz – 1.1 GHz, noise figure 1.9 dB	
	HSA-Y-2-40	Gain 40 dB, 10 kHz – 1.9 GHz, noise figure 4.9 dB	
Specifications	Test conditions	V_S = ±15 V, T_A = 25 °C, system impedance 50 Ω, warm-up 20 minutes (min. 10 minutes recommended)	
Gain	Gain	20 dB (× 10)	
	Transimpedance gain	500 V/A (50 Ω input impedance × 10 gain)	
	Gain accuracy	±1 dB	
	Gain drift vs. temperature	0.015 dB/°C typ.	
Frequency Response	Lower cut-off frequency (–3 dB)	10 kHz	
	Upper cut-off frequency (–3 dB)	2 GHz	
Time Response	Rise/fall time (10% - 90%)	175 ps	
	Group delay	0.8 ns typ.	
Input	DC input impedance	50 Ω	
	RF input impedance	50 Ω	
	50 Ω noise figure	5.2 dB (@ f <1 GHz)	
	Equ. input noise voltage	680 pV/√Hz (@ f <1 GHz)	
	Equ. input noise current	13.6 pA/√Hz (calculated: 680 pV/√Hz divided by 50 Ω)	
	Input reflection S11	–23.1 dB (@ f <1.5 GHz) –16.5 dB (@ f <3 GHz)	
Output	Two identical RF outputs:		
	Output peak-peak voltage range	2.5 V (±1.25 V) (@ <500 MHz, for linear amplification)	
	Output power P_{1dB}	+12.5 dBm (@ f <1 GHz)	
	Output impedance	50 Ω (terminate with 50 Ω load)	
	Output reflection S22	–7.4 dB (@ f <3 GHz)	
	Isolation between outputs	15 dB (@ f <3 GHz)	
Monitor Output	Gain	26 dB (1 kV/A)	
	Monitor output impedance	50 Ω (terminate with ≥10 kΩ load, for best performance)	
	Lower cut-off frequency	DC	
	Upper cut-off frequency	100 kHz	
	Output voltage	±10 V (@ 10 kΩ load)	
Power Supply	Supply voltage	±15 V (±14.75 V ... ±16.5 V)	
	Supply current	+160 / –10 mA typ. (depends on operating conditions, recommended power supply capability min. ±250 mA)	
Case	Weight	190 g (0.42 lbs) including 50 Ω SMA terminator	
	Material	AlMg4.5Mn, nickel-plated	
Temperature Range	Storage temperature	–40 °C ... +85 °C	
	Operating temperature	0 °C ... +60 °C	
Absolute Maximum Ratings	DC input voltage	±4 V	
	RF input power	+13 dBm	
	Power supply voltage	±20 V	

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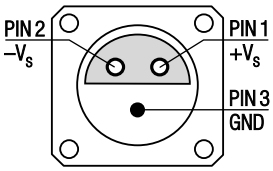
Connectors	Input	SMA jack (female)
	RF Output	2 × SMA jack (female)
	Monitor output	BNC jack (female)
	Power supply	LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)



Pin 1: +15 V
Pin 2: –15 V
Pin 3: GND

Scope of Delivery	HSA-Y-2-20, 50 Ω SMA terminator, LEMO® 3-pin connector, datasheet, transport package	
Ordering Information	HSA-Y-2-20	High-speed GHz amplifier

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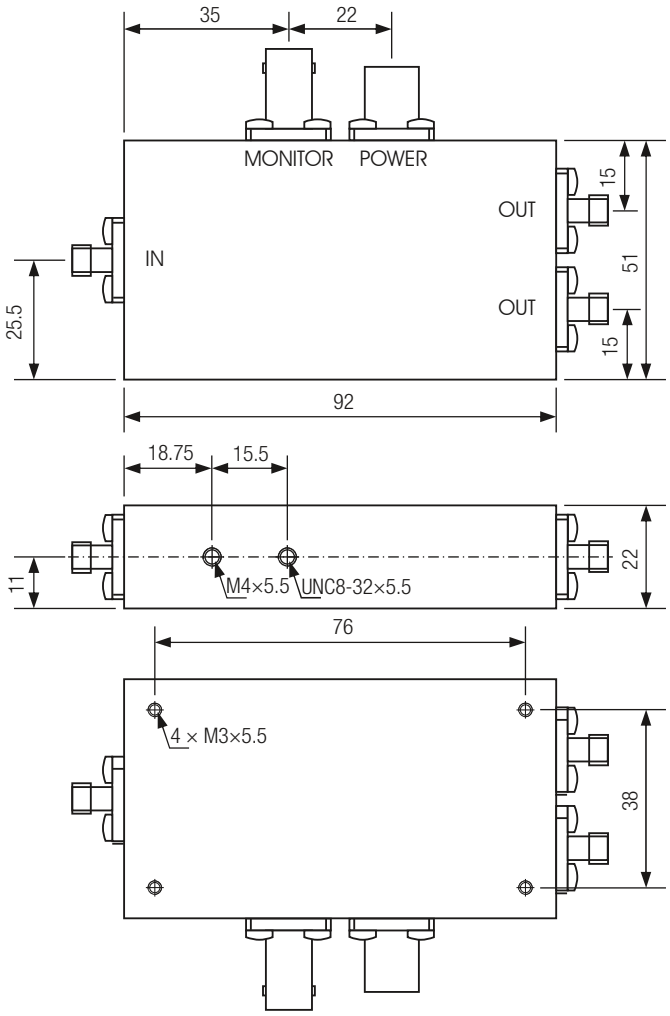
Dimensions

HSA-Y-2-20



all dimensions in mm unless otherwise noted

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