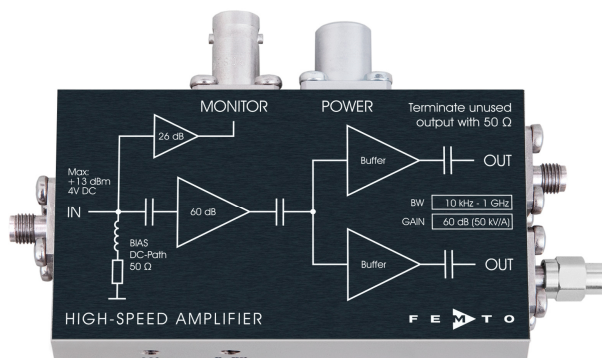


## 1 GHz High-Speed Amplifier



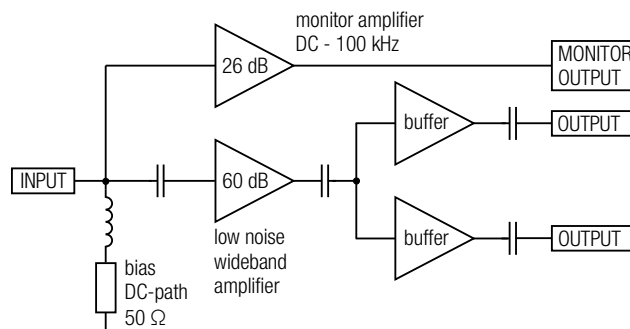
### Features

- **Bandwidth 10 kHz – 1.1 GHz**
- **Exceptional low 10 kHz lower cut-off frequency for optimal pulse processing without shape distortion**
- **Rise time 320 ps**
- **Gain 60 dB**
- **Noise figure 1.9 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-1-60 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 1.1 GHz. Operation is mostly self-explanatory. If in doubt, consult this document or contact [support@femto.de](mailto: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-1-60 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.

## 1 GHz High-Speed Amplifier

Available Accessories	PS-15-25-L  Power supply Input: AC 100 – 240 V Output: DC $\pm 15$ V																						
Related Models	<table> <tr> <td>HSA-Y-1-40</td><td>Gain 40 dB, 10 kHz – 1 GHz, noise figure 1.9 dB</td></tr> <tr> <td>HSA-Y-2-20</td><td>Gain 20 dB, 10 kHz – 2 GHz, noise figure 5.2 dB</td></tr> <tr> <td>HSA-Y-2-40</td><td>Gain 40 dB, 10 kHz – 1.9 GHz, noise figure 4.9 dB</td></tr> </table>	HSA-Y-1-40	Gain 40 dB, 10 kHz – 1 GHz, noise figure 1.9 dB	HSA-Y-2-20	Gain 20 dB, 10 kHz – 2 GHz, noise figure 5.2 dB	HSA-Y-2-40	Gain 40 dB, 10 kHz – 1.9 GHz, noise figure 4.9 dB																
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Specifications	<table> <tr> <td>Test conditions</td><td><math>V_S = \pm 15</math> V, <math>T_A = 25</math> °C, system impedance 50 <math>\Omega</math>, warm-up 20 minutes (min. 10 minutes recommended)</td></tr> <tr> <td>Gain</td><td>           Gain 60 dB dB (<math>\times 1000</math>)            Transimpedance gain 50,000 V/A (50 <math>\Omega</math> input impedance <math>\times 1000</math> gain)            Gain accuracy <math>\pm 1</math> dB            Gain drift vs. temperature 0.022 dB/°C typ.         </td></tr> <tr> <td>Frequency Response</td><td>           Lower cut-off frequency (–3 dB) 10 kHz            Upper cut-off frequency (–3 dB) 1.1 GHz         </td></tr> <tr> <td>Time Response</td><td>           Rise/fall time (10% - 90%) 320 ps            Group delay 1.2 ns typ.         </td></tr> <tr> <td>Input</td><td>           DC input impedance 50 <math>\Omega</math>            RF input impedance 50 <math>\Omega</math>            50 <math>\Omega</math> noise figure 1.9 dB (@ <math>f &lt; 700</math> MHz)            Equ. input noise voltage 330 pV/<math>\sqrt{\text{Hz}}</math> (@ <math>f &lt; 700</math> MHz)            Equ. input noise current 6.6 pA/<math>\sqrt{\text{Hz}}</math> (calculated: 330 pV/<math>\sqrt{\text{Hz}}</math> divided by 50 <math>\Omega</math>)            Input reflection S11 –16 dB (@ <math>f &lt; 3</math> GHz)         </td></tr> <tr> <td>Output</td><td>           Two identical RF outputs:            Output peak-peak voltage range 2 V (<math>\pm 1</math> V) (@ <math>&lt; 500</math> MHz, for linear amplification)            Output power <math>P_{1\text{dB}}</math> +13 dBm (@ <math>f &lt; 500</math> MHz)            Output impedance 50 <math>\Omega</math> (terminate with 50 <math>\Omega</math> load)            Output reflection S22 –16 dB (@ <math>f &lt; 3</math> GHz)            Isolation between outputs 16 dB (@ <math>f &lt; 3</math> GHz)         </td></tr> <tr> <td>Monitor Output</td><td>           Gain 26 dB (1 kV/A)            Monitor output impedance 50 <math>\Omega</math> (terminate with <math>\geq 10</math> k<math>\Omega</math> load, for best performance)            Lower cut-off frequency DC            Upper cut-off frequency 100 kHz            Output voltage <math>\pm 10</math> V (@ 10 k<math>\Omega</math> load)         </td></tr> <tr> <td>Power Supply</td><td>           Supply voltage <math>\pm 15</math> V (<math>\pm 14.75</math> V ... <math>\pm 16.5</math> V)            Supply current +180 / –10 mA typ. (depends on operating conditions, recommended power supply capability min. <math>\pm 250</math> mA)         </td></tr> <tr> <td>Case</td><td>           Weight 190 g (0.42 lbs) including 50 <math>\Omega</math> SMA terminator            Material AlMg4.5Mn, nickel-plated         </td></tr> <tr> <td>Temperature Range</td><td>           Storage temperature –40 °C ... +85 °C            Operating temperature 0 °C ... +60 °C         </td></tr> <tr> <td>Absolute Maximum Ratings</td><td>           DC input voltage <math>\pm 4</math> V            RF input power +13 dBm            Power supply voltage <math>\pm 20</math> V         </td></tr> </table>	Test conditions	$V_S = \pm 15$ V, $T_A = 25$ °C, system impedance 50 $\Omega$ , warm-up 20 minutes (min. 10 minutes recommended)	Gain	Gain 60 dB dB ( $\times 1000$ ) Transimpedance gain 50,000 V/A (50 $\Omega$ input impedance $\times 1000$ gain) Gain accuracy $\pm 1$ dB Gain drift vs. temperature 0.022 dB/°C typ.	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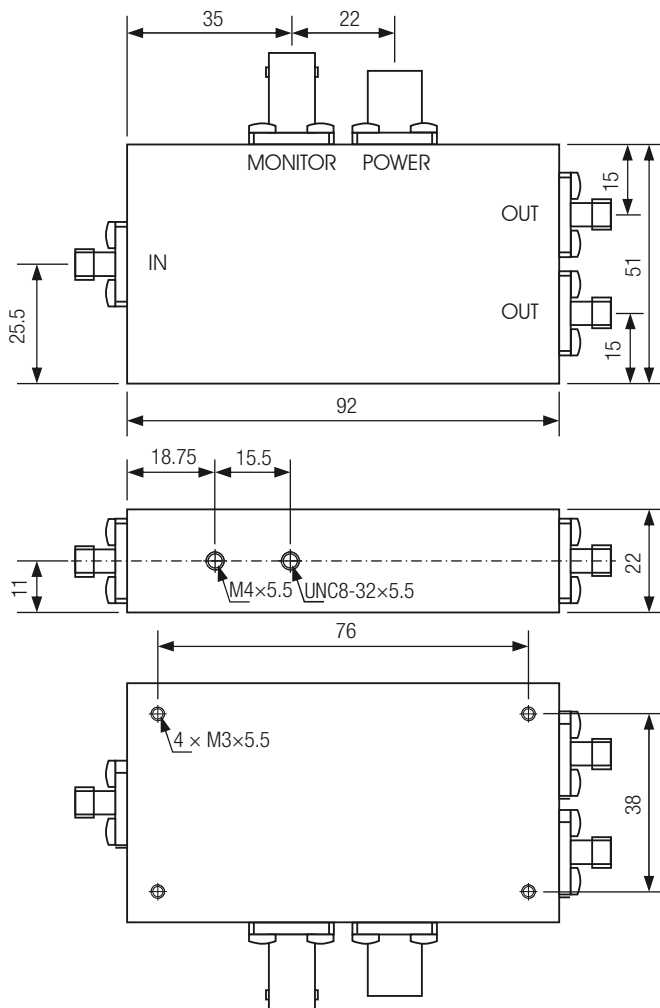
1 GHz High-Speed Amplifier

Connectors	<div>InputSMA jack (female)</div> <div>RF Output2 × SMA jack (female)</div> <div>Monitor outputBNC jack (female)</div> <div>Power supplyLEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)</div> <div><div><div><div>PIN 2</div><div>−V<sub>s</sub></div></div><div><div>PIN 1</div><div>+V<sub>s</sub></div></div><div><div>PIN 3</div><div>GND</div></div></div><div><div>Pin 1: +15 V</div><div>Pin 2: −15 V</div><div>Pin 3: GND</div></div></div>
Scope of Delivery	HSA-Y-1-60, 50 Ω SMA terminator, LEMO® 3-pin connector, datasheet, transport package
Ordering Information	<div>HSA-Y-1-60</div> <div>High-speed GHz amplifier</div>

## 1 GHz High-Speed Amplifier

### Dimensions

HSA-Y-1-60



DZ-HSA-Y\_23\_R01

all dimensions in mm unless otherwise noted

FEMTO Messtechnik GmbH  
Klosterstr. 64  
10179 Berlin · Germany  
Phone: +49 30 280 4711-0  
Fax: +49 30 280 4711-11  
Email: [info@femto.de](mailto:info@femto.de)  
[www.femto.de](http://www.femto.de)

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