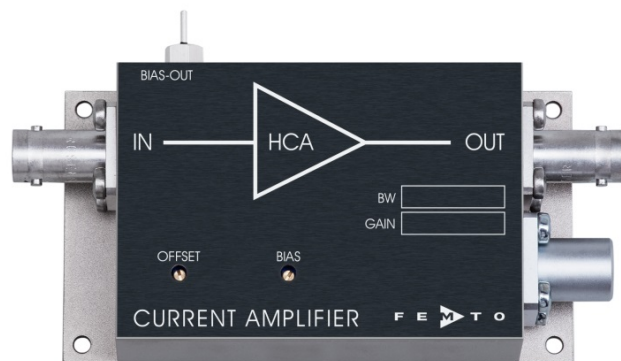


# High-Speed Current Amplifier



Features	<ul style="list-style-type: none"> <li>• <b>Bandwidth DC ... 400 MHz</b></li> <li>• <b>Rise / Fall Time 1 ns</b></li> <li>• <b>Optimized for Low Pulse Distortion – Almost No Overshoot or Ringing will Occur</b></li> <li>• <b>Transimpedance (Gain) <math>5 \times 10^3</math> V/A</b></li> </ul>																																																																								
Applications	<ul style="list-style-type: none"> <li>• <b>Photodiode and Photomultiplier Amplifier</b></li> <li>• <b>Spectroscopy</b></li> <li>• <b>Ionisation Detectors</b></li> <li>• <b>Ideal for Analyzing Digital Signals (No Baseline Shift at any Digital Code)</b></li> <li>• <b>Preamplifier for A/D Converters, Digitizers etc.</b></li> </ul>																																																																								
Specifications	<table border="0"> <tr> <td>Test Conditions</td> <td colspan="2"><math>V_s = \pm 15</math> V, <math>T_a = 25^\circ\text{C}</math></td> </tr> <tr> <td rowspan="2">Gain</td> <td>Transimpedance</td> <td><math>5 \times 10^3</math> V/A (@ 50 <math>\Omega</math> load)</td> </tr> <tr> <td>Gain Accuracy</td> <td><math>\pm 2</math> %</td> </tr> <tr> <td rowspan="5">Frequency Response</td> <td>Lower Cut-Off Frequency</td> <td>DC</td> </tr> <tr> <td rowspan="2">Upper Cut-Off Frequency (- 3 dB)</td> <td>400 MHz</td> <td>(<math>\pm 10</math> %, @ Csource 2 to 4 pF)</td> </tr> <tr> <td>350 MHz</td> <td>(<math>\pm 10</math> %, @ Csource 5 to 10 pF)</td> </tr> <tr> <td>Max. Source Capacitance</td> <td>10 pF</td> <td>(incl. cable, e.g. typical coax cable 1 pF/cm)</td> </tr> <tr> <td rowspan="2">Rise / Fall Time (10 % - 90 %)</td> <td>1.0 ns</td> <td>(@ Csource 2 to 4 pF)</td> </tr> <tr> <td>1.3 ns</td> <td>(@ Csource 5 to 10 pF)</td> </tr> <tr> <td>Gain Flatness</td> <td colspan="2"><math>\pm 0.3</math> dB</td> </tr> <tr> <td rowspan="9">Input</td> <td>Equ. Input Noise Current</td> <td>21 pA/<math>\sqrt{\text{Hz}}</math></td> <td>(@ 100 MHz)</td> </tr> <tr> <td>Equ. Input Noise Voltage</td> <td>3.5 nV/<math>\sqrt{\text{Hz}}</math></td> <td>(@ 100 MHz)</td> </tr> <tr> <td>Equ. Integrated Noise</td> <td>4 <math>\mu\text{A}</math> peak-peak</td> <td>(independent of Csource)</td> </tr> <tr> <td>Input Bias Current</td> <td>2 <math>\mu\text{A}</math> typ.</td> <td></td> </tr> <tr> <td>Input Bias Current Drift</td> <td>0.07 <math>\mu\text{A} / ^\circ\text{C}</math></td> <td></td> </tr> <tr> <td>Offset Current Compensation</td> <td colspan="2"><math>\pm 200</math> <math>\mu\text{A}</math>, adjustable by offset trimpot</td> </tr> <tr> <td>Input Current Range</td> <td colspan="2"><math>\pm 200</math> <math>\mu\text{A}</math> (for linear amplification)</td> </tr> <tr> <td>Input Offset Voltage</td> <td colspan="2">&lt; 2 mV</td> </tr> <tr> <td>DC Input Impedance</td> <td colspan="2">50 <math>\Omega</math> (virtual) // 5 pF</td> </tr> <tr> <td rowspan="3">Output</td> <td>Output Voltage Range</td> <td><math>\pm 1.0</math> V</td> <td>(@ 50 <math>\Omega</math> load) for linear operation and low harmonic distortion</td> </tr> <tr> <td>Max. Output Voltage Range</td> <td><math>\pm 1.5</math> V</td> <td>(@ 50 <math>\Omega</math> load)</td> </tr> <tr> <td>Output Impedance</td> <td colspan="2">50 <math>\Omega</math> (terminate with 50 <math>\Omega</math> load for best performance)</td> </tr> <tr> <td rowspan="2">Bias Output</td> <td>Bias Output Voltage Range</td> <td colspan="2"><math>\pm 12</math> V, adjustable by bias trimpot</td> </tr> <tr> <td>Bias Output Impedance</td> <td colspan="2">10 k<math>\Omega</math> // 1 <math>\mu\text{F}</math></td> </tr> </table>	Test Conditions	$V_s = \pm 15$ V, $T_a = 25^\circ\text{C}$		Gain	Transimpedance	$5 \times 10^3$ V/A (@ 50 $\Omega$ load)	Gain Accuracy	$\pm 2$ %	Frequency Response	Lower Cut-Off Frequency	DC	Upper Cut-Off Frequency (- 3 dB)	400 MHz	( $\pm 10$ %, @ Csource 2 to 4 pF)	350 MHz	( $\pm 10$ %, @ Csource 5 to 10 pF)	Max. Source Capacitance	10 pF	(incl. cable, e.g. typical coax cable 1 pF/cm)	Rise / Fall Time (10 % - 90 %)	1.0 ns	(@ Csource 2 to 4 pF)	1.3 ns	(@ Csource 5 to 10 pF)	Gain Flatness	$\pm 0.3$ dB		Input	Equ. Input Noise Current	21 pA/ $\sqrt{\text{Hz}}$	(@ 100 MHz)	Equ. Input Noise Voltage	3.5 nV/ $\sqrt{\text{Hz}}$	(@ 100 MHz)	Equ. Integrated Noise	4 $\mu\text{A}$ peak-peak	(independent of Csource)	Input Bias Current	2 $\mu\text{A}$ typ.		Input Bias Current Drift	0.07 $\mu\text{A} / ^\circ\text{C}$		Offset Current Compensation	$\pm 200$ $\mu\text{A}$ , adjustable by offset trimpot		Input Current Range	$\pm 200$ $\mu\text{A}$ (for linear amplification)		Input Offset Voltage	< 2 mV		DC Input Impedance	50 $\Omega$ (virtual) // 5 pF		Output	Output Voltage Range	$\pm 1.0$ V	(@ 50 $\Omega$ load) for linear operation and low harmonic distortion	Max. Output Voltage Range	$\pm 1.5$ V	(@ 50 $\Omega$ load)	Output Impedance	50 $\Omega$ (terminate with 50 $\Omega$ load for best performance)		Bias Output	Bias Output Voltage Range	$\pm 12$ V, adjustable by bias trimpot		Bias Output Impedance	10 k $\Omega$ // 1 $\mu\text{F}$	
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High-Speed Current Amplifier

Specifications (continued)

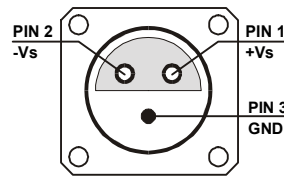
Power Supply	Supply Voltage	$\pm 15\text{ V}$
	Supply Current	$\pm 60\text{ mA typ.}$ (depends on operating conditions, recommended power supply capability minimum $\pm 150\text{ mA}$ )
Case	Weight	210 g (0.5 lbs)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature	$-40 \dots +100\text{ }^\circ\text{C}$
	Operating Temperature	$0 \dots +60\text{ }^\circ\text{C}$

Absolute Maximum Ratings

Input Voltage	$\pm 5\text{ V}$
Power Supply Voltage	$\pm 22\text{ V}$

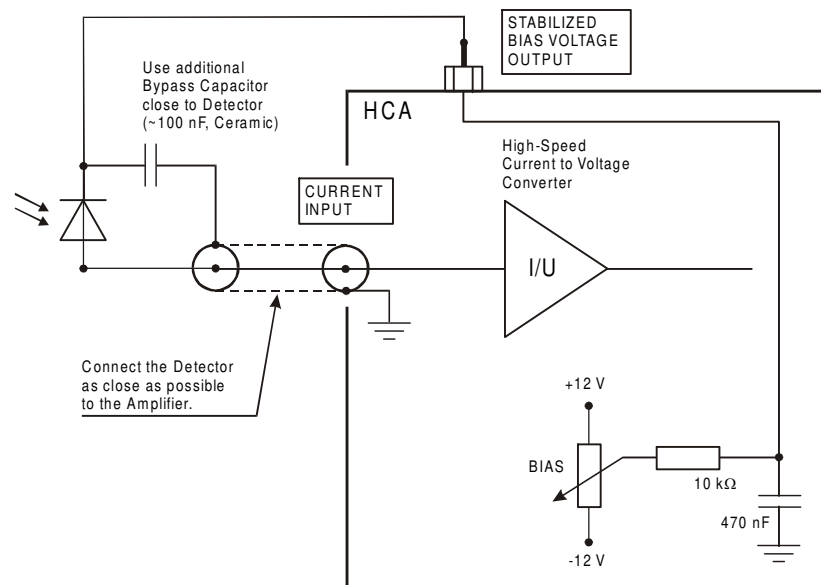
Connectors

Input	BNC
Output	BNC
Power Supply	LEMO series 1S, 3-pin fixed socket
	Pin 1: $+15\text{ V}$
	Pin 2: $-15\text{ V}$
	Pin 3: GND



Application Diagrams

Photo Detector Biasing in Photoconductive Mode:  
Best choice for high speed applications and optimum signal to noise performance.



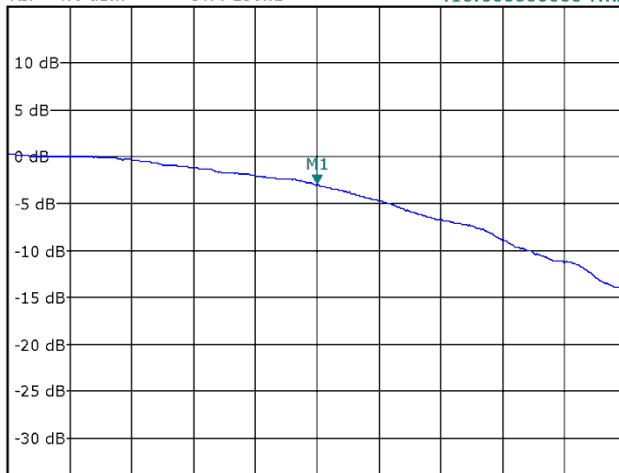
AZ01-0201-20

### High-Speed Current Amplifier

Typical Performance Characteristics

#### Frequency Response

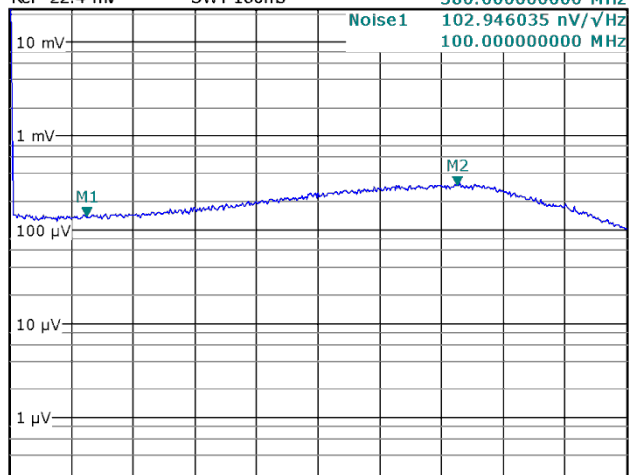
Offs 16.0 dB      RBW 3 MHz  
Att 0 dB      \* VBW 10 kHz      M1[1]      -2.94 dB  
Ref -4.0 dBm      SWT 130ms      410.000000000 MHz



Start 20.0 MHz      Stop 800.0 MHz

#### Noise Spectrum

RBW 3 MHz  
Att 0 dB      \* VBW 3 kHz      Noise2      219.730591 nV/√Hz  
Ref 22.4 mV      SWT 180ms      580.000000000 MHz



Start 0.0 Hz      Stop 800.0 MHz

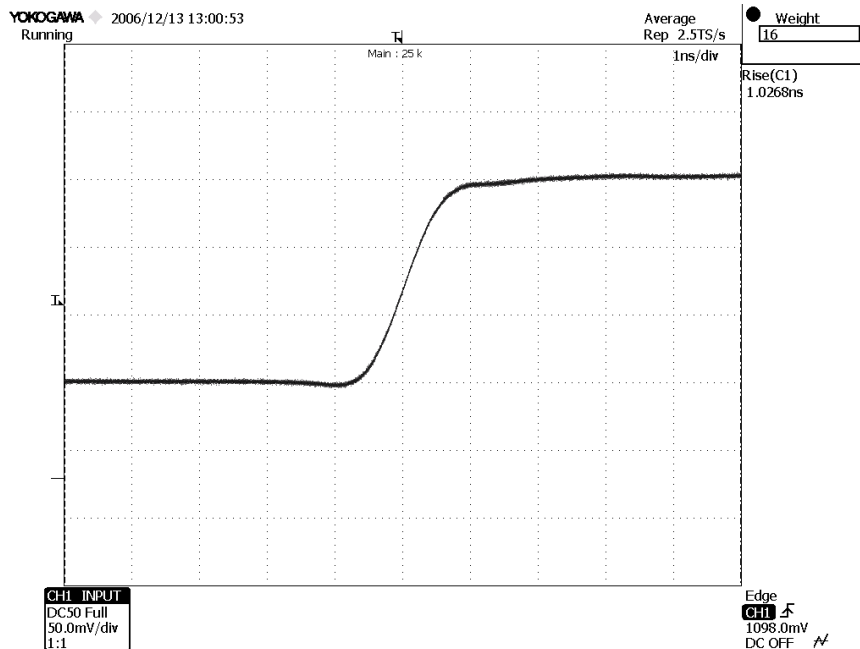
Note: Spectral noise data is measured at the amplifier output with open but shielded input. To determine the spectral input noise divide the measured output noise by the amplifier gain of  $5 \times 10^3$  V/A, i.e.:

Marker	Frequency	Output Noise	Resulting Input Noise
1	100 MHz	103 nV/√Hz	21 pA√Hz
2	580 MHz	220 nV/√Hz	44 pA√Hz

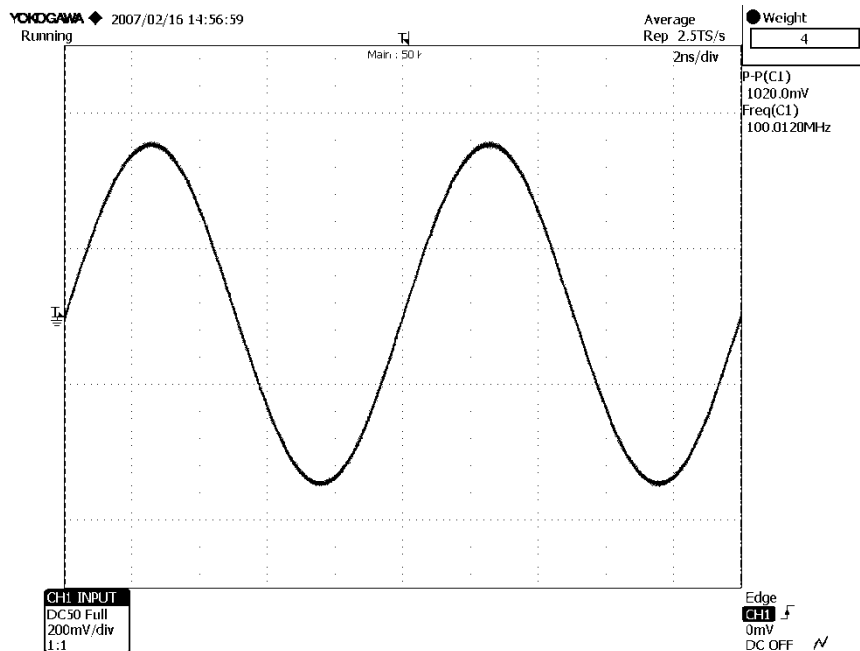
# High-Speed Current Amplifier

Typical Performance Characteristics (continued)

Pulse Response to Square Wave Input Signal (with 16 times averaging)



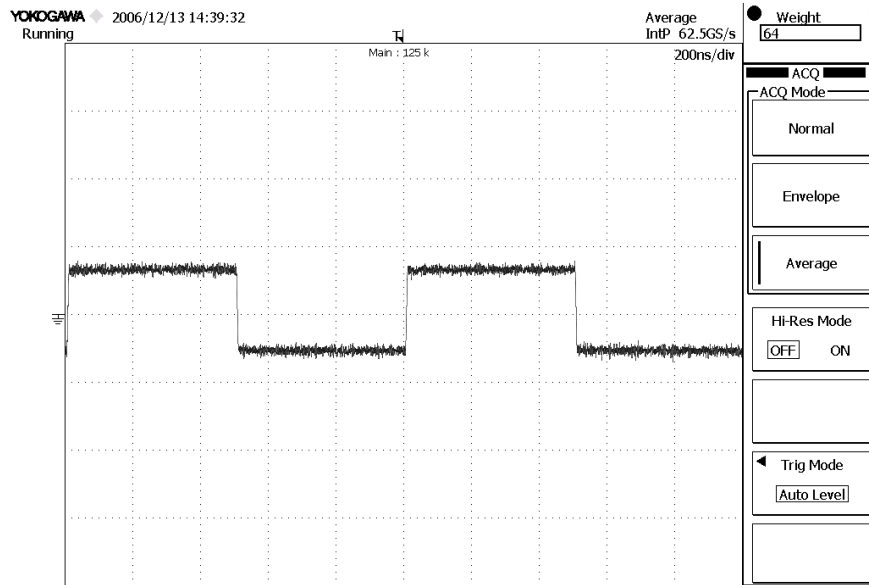
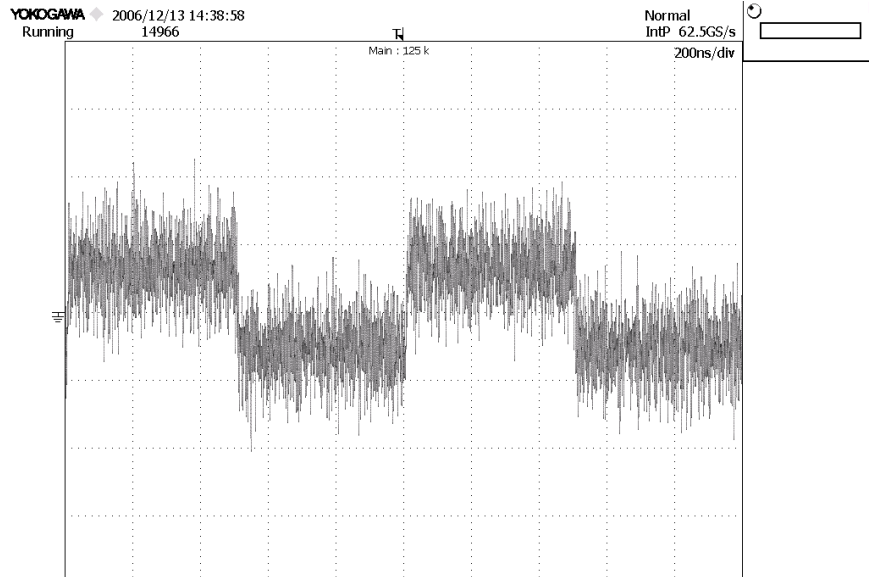
Large Signal Response output signal for 100 MHz, 200  $\mu$ A peak-peak input signal (with 4 times averaging)



# High-Speed Current Amplifier

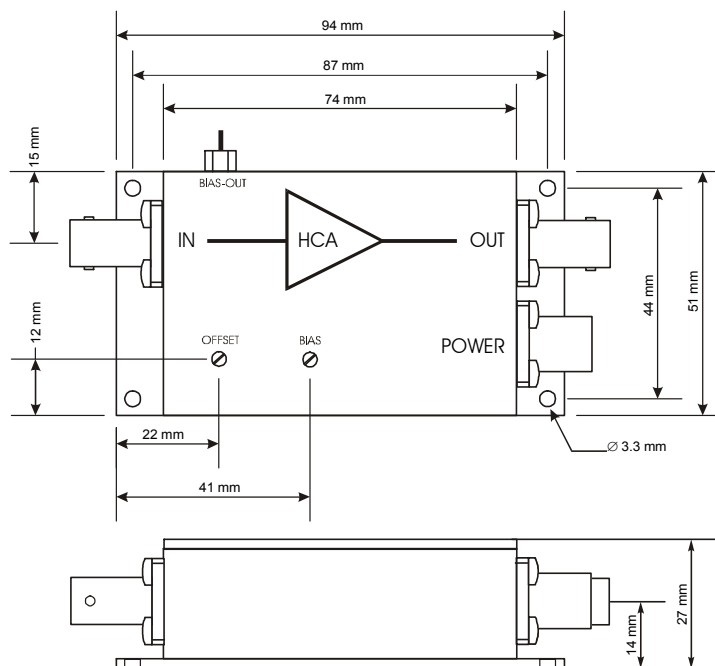
Typical Performance Characteristics (continued)

Small Signal Response  
output signal for 1 MHz, 2.4  $\mu$ A peak-peak square wave input signal (without (top) and with 64 times averaging (bottom))



High-Speed Current Amplifier

Dimensions



DZ01-0201-22

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