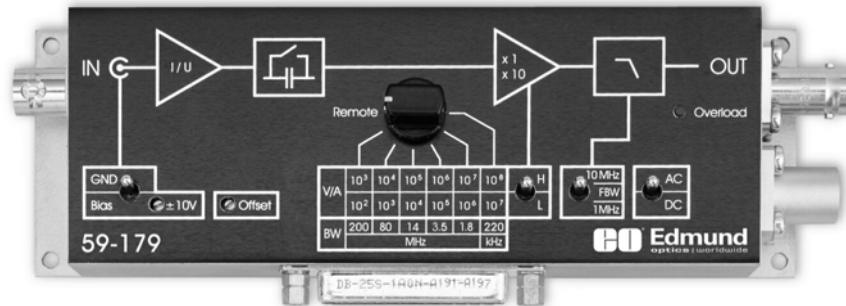


Variable-Gain High Speed Current Amplifier



<p>Features</p>	<ul style="list-style-type: none"> • Transimpedance (Gain) Switchable from 1×10^2 to 1×10^8 V/A • Bandwidth from DC up to 200 MHz • Upper Cut-Off Frequency Switchable to 1 MHz, 10 MHz or Full Bandwidth • Switchable AC/DC Coupling • Adjustable Bias Voltage for Use with External Photodetectors • Local and Remote Control of All Main Functions
<p>Applications</p>	<ul style="list-style-type: none"> • Photodiode and Photomultiplier Amplifier • Scanning Tunneling Microscopy (STM) • Spectroscopy • Preamplifier for Lock-Ins, A/D-Converters, etc.
<p>Block Diagram</p>	

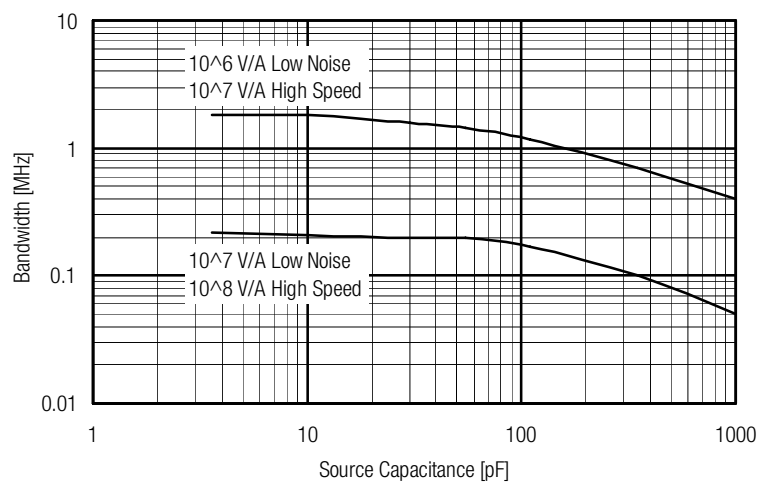
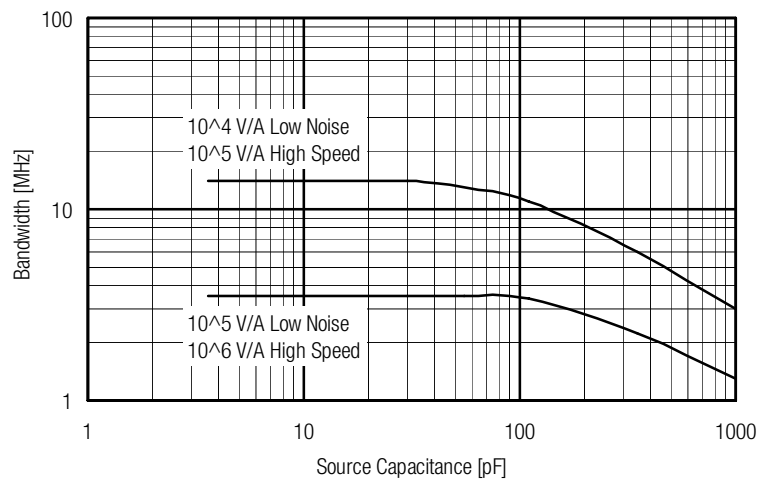
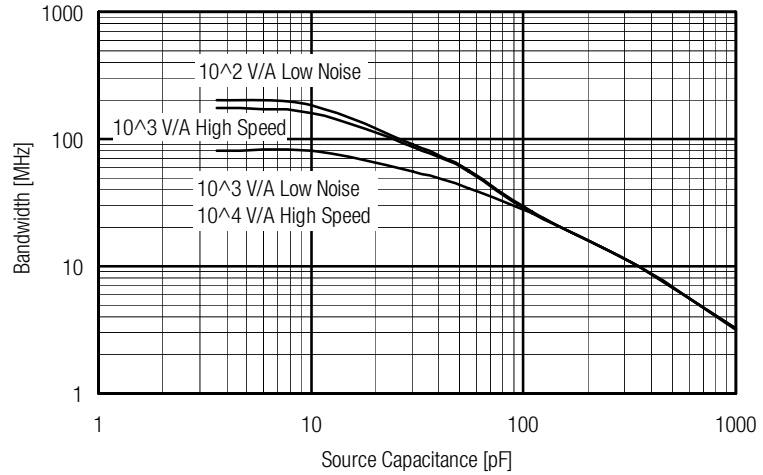
Variable-Gain High Speed Current Amplifier

Specifications	<i>Test Conditions</i>	<i>V_s = ± 15 V, T_a = 25°C</i>					
Gain	Transimpedance	1 x 10 ² ... 1 x 10 ⁸ V/A					
	Gain Accuracy	± 1 %					
Frequency Response	Lower Cut-Off Frequency	DC / 100 Hz, switchable					
	Upper Cut-Off Frequency	Dependent on gain setting up to 200 MHz (see table), switchable to 10 MHz or 1 MHz					
Input	Equ. Input Noise Current	See table					
	Equ. Input Noise Voltage	typ. 2.8 nV/√Hz					
	Input Bias Current	typ. 20 pA					
	DC Input Impedance	50 Ω					
	Output Offset Compensation	Adjustable by offset-trimpot and external control voltage, min. ± 100 mV					
Performance depending on Gain Setting	Gain Setting (Low Noise) (V/A)	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷
	Upper Cut-Off Frequency (-3 dB)	200 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise / Fall Time (10% - 90%)	1.8 ns	4.4 ns	25 ns	0.1 μs	0.2 μs	1.6 μs
	Equ. Input Noise Current (/√Hz)	200 pA	16 pA	2.1 pA	500 fA	170 fA	60 fA
	measured at	1 MHz	1 MHz	1 MHz	10 kHz	10 kHz	10 kHz
	Max. Input Current (±)	10 mA	1 mA	0.1 mA	10 μA	1 μA	0.1 μA
	Gain setting (High Speed) (V/A)	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁸
	Upper Cut-Off Frequency (-3 dB)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise / Fall Time (10% - 90%)	2.0 ns	4.4 ns	25 ns	0.1 μs	0.2 μs	1.6 μs
	Equ. Input Noise Current (/√Hz)	140 pA	6.0 pA	1.5 pA	450 fA	150 fA	55 fA
	measured at	1 MHz	1 MHz	1 MHz	10 kHz	10 kHz	10 kHz
	Max. Input Current (±)	1 mA	0.1 mA	10 μA	1 μA	0.1 μA	10 nA
	Upper cut-off frequencies and equivalent input noise currents given in this table are typical values only which will depend on the source capacitance. Keep the source capacitance as low as possible by using short cables at the input to achieve best possible bandwidth and noise performance. For the dependence of the upper cut-off frequencies on the source capacitance please see the diagrams on the next page.						

Variable-Gain High Speed Current Amplifier

Specifications (continued)

Dependence of Upper Cut-Off Frequency on Source Capacitance



Variable-Gain High Speed Current Amplifier

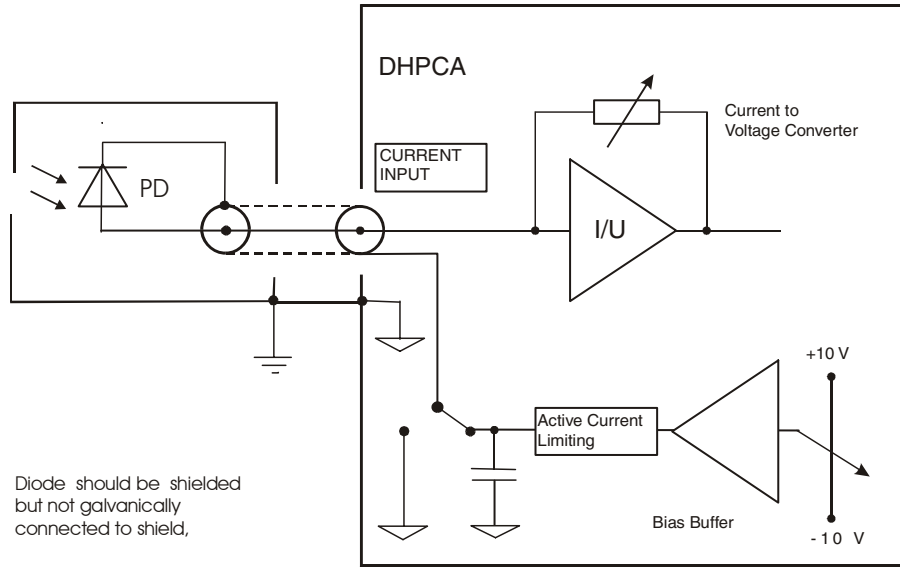
Specifications (continued)								
Output	Output Voltage	$\pm 1\text{ V}$ (@ $50\ \Omega$ Load), for linear amplification						
	Output Impedance	$50\ \Omega$						
	Slew Rate	$1,000\text{ V}/\mu\text{s}$						
DC Monitor Output	Monitor Output Gain	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Mode</th> <th style="text-align: left;">Monitor Gain</th> </tr> </thead> <tbody> <tr> <td>Low Noise</td> <td>Gain Setting Divided by -1</td> </tr> <tr> <td>High Speed</td> <td>Gain Setting Divided by -10</td> </tr> </tbody> </table>	Mode	Monitor Gain	Low Noise	Gain Setting Divided by -1	High Speed	Gain Setting Divided by -10
	Mode	Monitor Gain						
	Low Noise	Gain Setting Divided by -1						
	High Speed	Gain Setting Divided by -10						
	Monitor Output Polarity	Inverting						
	Monitor Output Voltage Range	$\pm 1\text{ V}$ (@ $>10\text{ k}\Omega$ Load)						
Monitor Output Bandwidth	DC ... 1 kHz							
Monitor Output Impedance	$1\text{ k}\Omega$							
Detector Bias	Bias Voltage Range	$\pm 10\text{ V}$, max. 22 mA , connected to shield of BNC input connector, switchable to GND						
	Warning	A bias current of 20 mA may destroy sensitive detectors. Please pay attention to the correct polarity and careful adjustment of the bias voltage to protect your detector. Put the bias switch to GND (ground) if you don't want to use the internal bias voltage. The positive and the negative supply voltage of the amplifier must be switched "on" and "off" simultaneously in order to avoid overvoltage at the bias output.						
Indicator LED	Function	Overload						
Digital Control	Control Input Voltage Range	Low: -0.8 V ... $+1.2\text{ V}$, High: 2.3 V ... $+12\text{ V}$						
	Control Input Current	0 mA @ 0 V , 1.5 mA @ $+5\text{ V}$, 4.5 mA @ $+12\text{ V}$						
	Overload Output	Non Active: 0 V , max. -1 mA , Active: 5.1 V , max. 7 mA						
Ext. Offset Control	Control Voltage Range	$\pm 10\text{ V}$						
	Offset Control Input Impedance	$15\text{ k}\Omega$						
Power Supply	Supply Voltage	$\pm 15\text{ V}$						
	Supply Current	typ. $+110 / -90\text{ mA}$						
	Stabilized Power Supply Output	$\pm 12\text{ V}$, max. 150 mA , $+5\text{ V}$, max. 50 mA						
Case	Weight	320 gr. (0.74 lbs)						
	Material	AlMg4.5Mn, nickel-plated						
Temperature Range	Storage Temperature	$-40\text{ ... }+100\text{ }^\circ\text{C}$						
	Operating Temperature	$0\text{ ... }+60\text{ }^\circ\text{C}$						
Absolute Maximum Ratings	Signal Input Voltage	$\pm 5\text{ V}$						
	Control Input Voltage	$-5\text{ V} / +16\text{ V}$						
	Power Supply Voltage	$\pm 20\text{ V}$						
	Transient Input Voltage	$\pm 1.5\text{ kV}$ (out of a 1 nF Source)						

Variable-Gain High Speed Current Amplifier

Remote Control Operation	General	<p>Remote Control Input Pins are optically isolated. Corresponding control bits are connected by logical OR function to local switch setting allowing for mixed mode operation. For pure remote control set the corresponding local switch to "Remote", "AC" , "L" (Low Noise), "FBW" and select the desired setting via a bit-code at the corresponding digital inputs.</p> <p>Mixed operation, i.e. local gain setting and remote controlled AC/DC setting, is also possible.</p> <p>Switch setting "Bias / GND" is not remote controllable.</p>																																			
	Gain Setting	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Low Noise Gain (V/A) Pin 14= Low</th> <th style="text-align: left;">High Speed Gain (V/A) Pin 14= High</th> <th style="text-align: left;">Pin 10 LSB</th> <th style="text-align: left;">Pin 11</th> <th style="text-align: left;">Pin 12 MSB</th> </tr> </thead> <tbody> <tr><td>10^2</td><td>10^3</td><td>Low</td><td>Low</td><td>Low</td></tr> <tr><td>10^3</td><td>10^4</td><td>High</td><td>Low</td><td>Low</td></tr> <tr><td>10^4</td><td>10^5</td><td>Low</td><td>High</td><td>Low</td></tr> <tr><td>10^5</td><td>10^6</td><td>High</td><td>High</td><td>Low</td></tr> <tr><td>10^6</td><td>10^7</td><td>Low</td><td>Low</td><td>High</td></tr> <tr><td>10^7</td><td>10^8</td><td>High</td><td>Low</td><td>High</td></tr> </tbody> </table>	Low Noise Gain (V/A) Pin 14= Low	High Speed Gain (V/A) Pin 14= High	Pin 10 LSB	Pin 11	Pin 12 MSB	10^2	10^3	Low	Low	Low	10^3	10^4	High	Low	Low	10^4	10^5	Low	High	Low	10^5	10^6	High	High	Low	10^6	10^7	Low	Low	High	10^7	10^8	High	Low	High
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	AC/DC Setting	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Coupling</th> <th style="text-align: left;">Pin 13</th> </tr> </thead> <tbody> <tr><td>AC</td><td>High</td></tr> <tr><td>DC</td><td>Low</td></tr> </tbody> </table>	Coupling	Pin 13	AC	High	DC	Low																													
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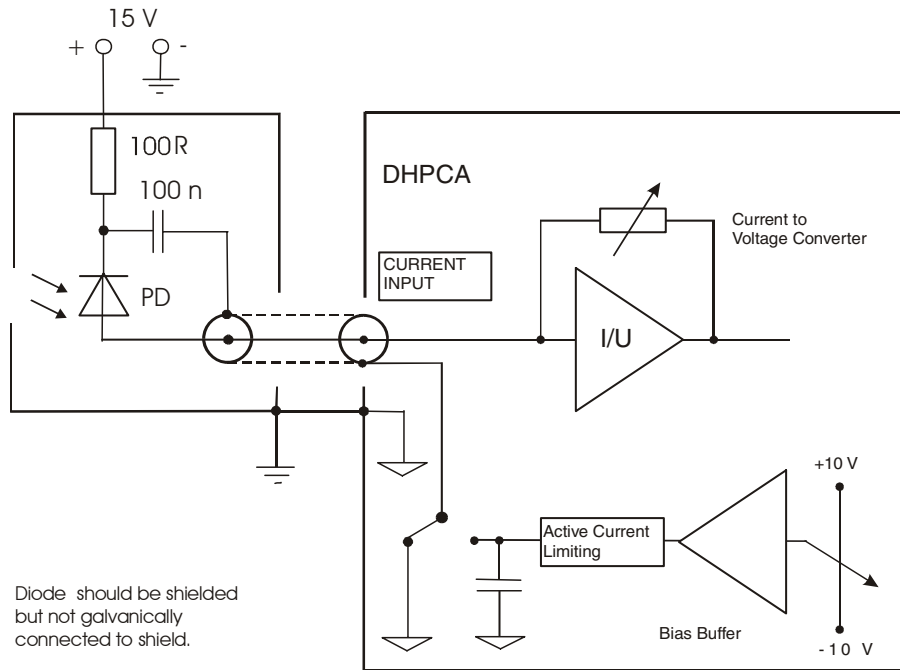
Variable-Gain High Speed Current Amplifier

Application Diagram



DHPCA-Biasing_internal

Internal Biasing (set switch to BIAS)



DHPCA-Biasing_extern

External Biasing (set switch to GND)

