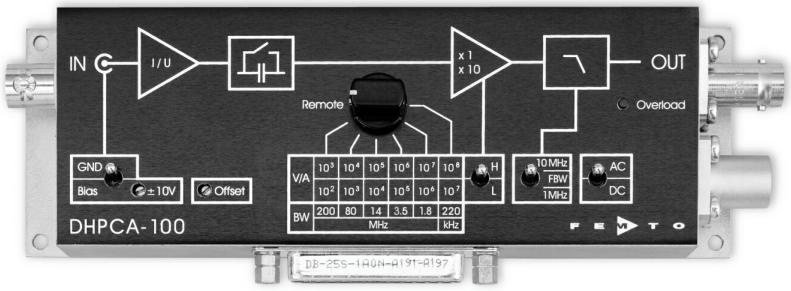
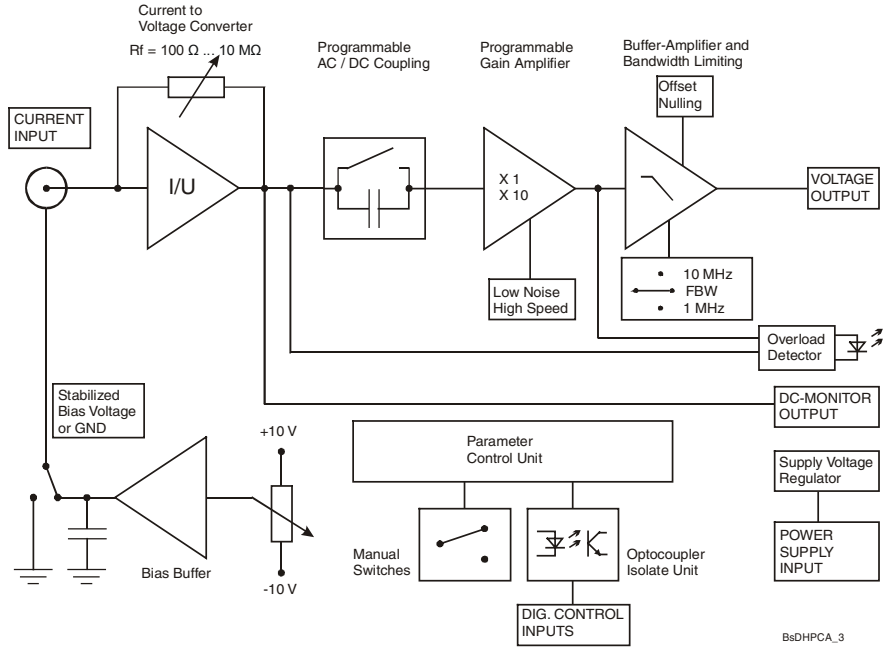
Variable-Gain High Speed Current Amplifier



Features	• **Transimpedance (Gain) Switchable from 1 x 10^2 to 1 x 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**
Applications	• **Photodiode and Photomultiplier Amplifier** • **Scanning Tunneling Microscopy (STM)** • **Spectroscopy** • **Preamplifier for Lock-Ins, A/D-Converters, etc.**
Block Diagram	

Variable-Gain High Speed Current Amplifier

Specifications

Test Conditions *Vs = ± 15 V, Ta = 25°C*

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
	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

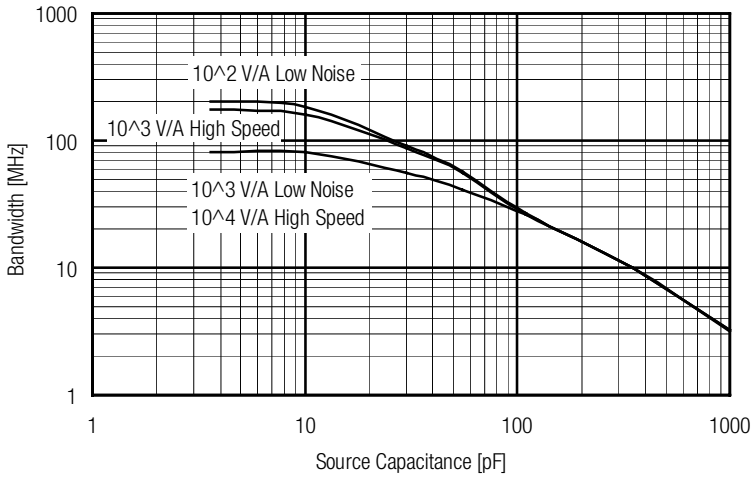
Gain setting (High Speed) (V/A)	10^3	10^4	10^5	10^6	10^7	10^8
Upper Cut-Off Frequency (- 3 dB)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
Rise / Fall Time (10% - 90%)	2.0 ns	4.4 ns	25 ns	0.1 µs	0.2 µs	1.6 µs
Equ. Input Noise Current (/√Hz)	140 pA	6.0 pA	1.5 pA	450 fA	150 fA	55 fA
measured at	1 MHz	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

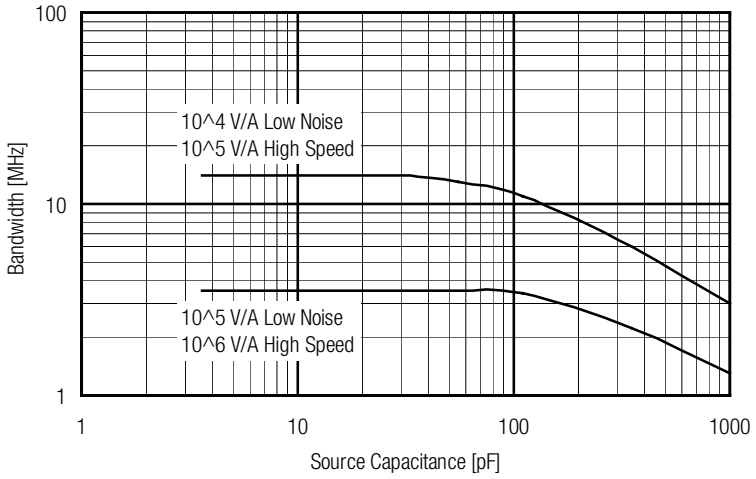
Upper cut-off frequencies and equivalent input noise currents given in this table are typical values only which will depend on the source capacitance. Keep the source capacitance as low as possible by using short cables at the input to achieve best possible bandwidth and noise performance. For the dependence of the upper cut-off frequencies on the source capacitance please see the diagrams on the next page.

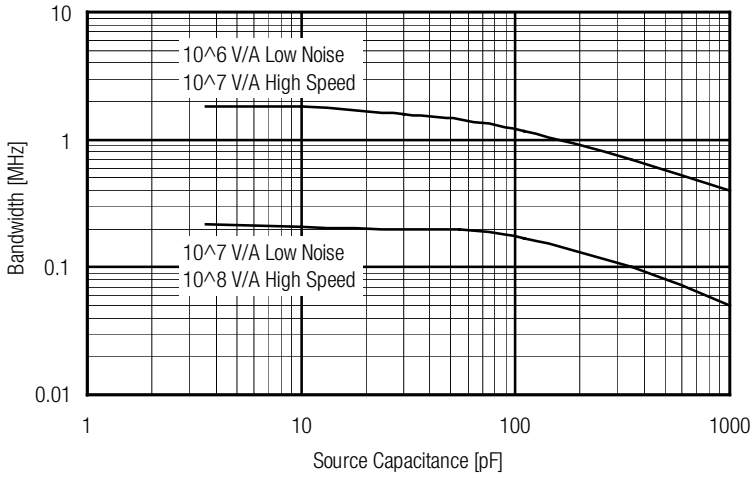
Variable-Gain High Speed Current Amplifier

Specifications (continued)

Dependence of Upper Cut-Off Frequency on Source Capacitance







Variable-Gain High Speed Current Amplifier

Specifications (continued)

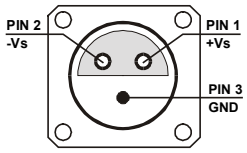
Output	Output Voltage	± 1 V (@ 50 Ω Load), for linear amplification
	Output Impedance	50 Ω
	Slew Rate	1,000 V/µs
DC Monitor Output	Monitor Output Gain	Mode: Low Noise — Monitor Gain: Gain Setting Divided by -1 Mode: High Speed — Monitor Gain: Gain Setting Divided by -10
	Monitor Output Polarity	Inverting
	Monitor Output Voltage Range	± 1 V (@ >10 kΩ Load)
	Monitor Output Bandwidth	DC ... 1 kHz
	Monitor Output Impedance	1 kΩ
Detector Bias	Bias Voltage Range	± 10 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 ...+ 1.2 V, High: 2.3 ... + 12 V
	Control Input Current	0 mA @ 0V, 1.5 mA @ + 5 V, 4.5 mA @ + 12 V
	Overload Output	Non Active: 0 V , max. -1 mA, Active: 5.1 V, max. 7 mA
Ext. Offset Control	Control Voltage Range	± 10 V
	Offset Control Input Impedance	15 kΩ
Power Supply	Supply Voltage	± 15 V
	Supply Current	typ. + 110 / - 90 mA
	Stabilized Power Supply Output	± 12 V, max. 150 mA, + 5V, max. 50 mA
Case	Weight	320 gr. (0.74 lbs)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature	-40 ... +100 °C
	Operating Temperature	0 ... +60 °C

Absolute Maximum Ratings	Signal Input Voltage	± 5 V
	Control Input Voltage	- 5 V / + 16 V
	Power Supply Voltage	± 20 V
	Transient Input Voltage	± 1.5 kV (out of a 1 nF Source)

Variable-Gain High Speed Current Amplifier

Connectors

Input	BNC, Isolated
Output	BNC
Power Supply	LEMO Series 1S, 3-pin fixed Socket Pin 1: + 15V Pin 2: - 15V Pin 3: GND



Control Port	Sub-D 25-pin, female, Qual. Class 2 Pin 1: +12V (Stabilized Power Supply Output) Pin 2: -12V (Stabilized Power Supply Output) Pin 3: AGND (Analog Ground) Pin 4: +5V (Stabilized Power Supply Output) Pin 5: Digital Output: Overload Pin 6: DC Monitor Pin 7: BIAS Monitor Pin 8: Offset Control Voltage Pin 9: DGND (Ground for Digital Control Pins) Pin 10: Digital Control Input: Gain, LSB Pin 11: Digital Control Input: Gain Pin 12: Digital Control Input: Gain, MSB Pin 13: Digital Control Input: AC/DC Pin 14: Digital Control Input: High Speed / Low Noise Pin 15: Upper BW Limit 10 MHz PIN 16: Upper BW Limit 1 MHz PIN 17-25 NC

Variable-Gain High Speed Current Amplifier

Remote Control Operation

General

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.
Mixed operation, i.e. local gain setting and remote controlled AC/DC setting, is also possible.

Switch setting “Bias / GND” is not remote controllable.

Gain Setting

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

AC/DC Setting

Coupling	Pin 13
AC	High
DC	Low

Low Pass Filter Setting

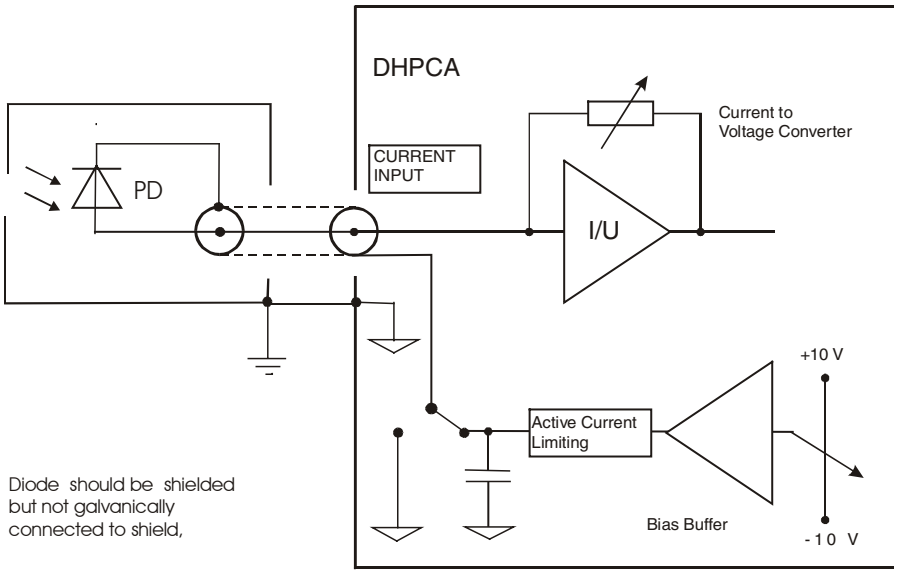
Upper Bandwidth Limit	Pin 15	Pin 16
Full Bandwidth	Low	Low
10 MHz	High	Low
1 MHz	Low	High

High Speed / Low Noise Setting

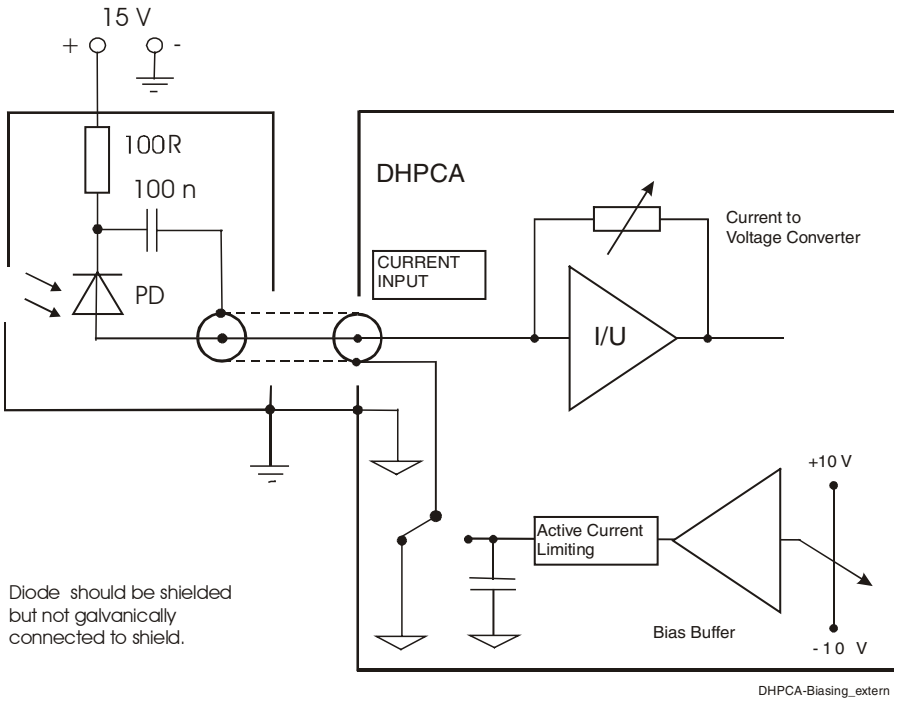
Mode	Pin 14
Low Noise	Low
High Speed	High

Variable-Gain High Speed Current Amplifier

Application Diagram



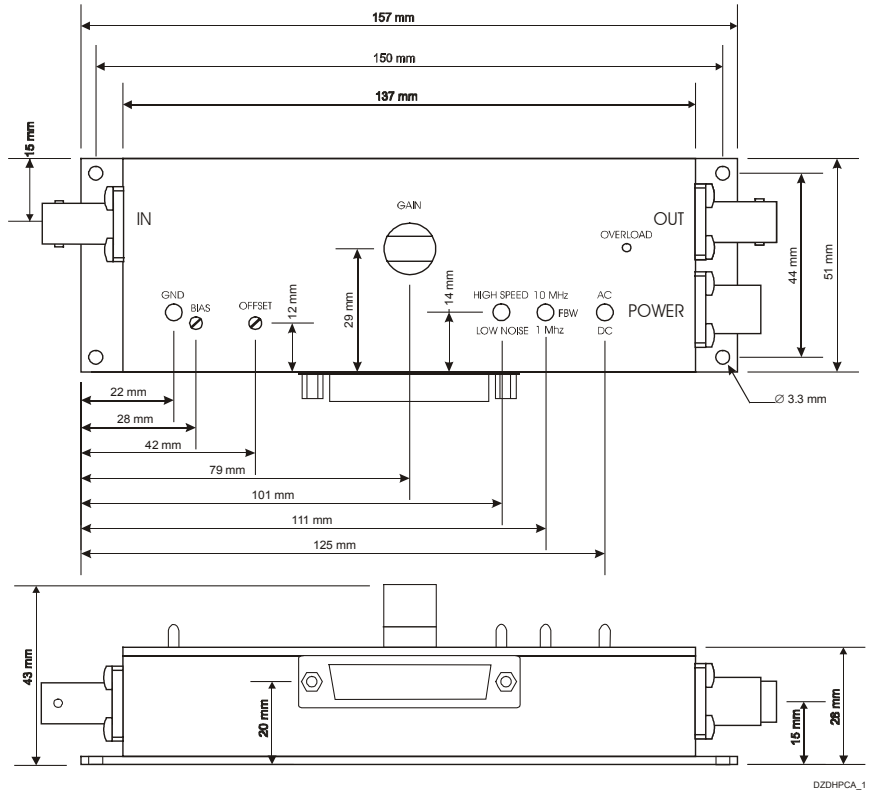
Internal Biasing (set switch to BIAS)



External Biasing (set switch to GND)

Variable-Gain High Speed Current Amplifier

Dimensions



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