PRODUCTS

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Differential Amplifiers

DA1822A and DA1820A

DISCONTINUED PRODUCTS

Leading Features

- DC to 10 MHz Bandwidth
- 100,000 to 1 CMRR
- Gain of 1, 10, 100 & 1000
- Full Upper & Lower Bandwidth Limits

The DA1820A/1822 is a stand-alone, high-performance 10 MHz differential amplifier. It is intended to act as a signal conditioning preamplifier for oscilloscopes and network and spectrum analyzers, providing differential measurement capability to instruments having only a single-ended input.

Amplifier gain can be set to 1, 10, 100 or 1000. The high gain of the DA1822A can extend the sensitivity of a scope with 2 mV/div to 2 µV/div. A built-in input attenuator can be separately set to attenuate signals by a factor of 10, allowing gains of 1000, 100, 10, 1, or 0.1 and common mode dynamic range of ± 15.5 V (÷ 1) or ± 155 V (÷ 10). Optional probes further increase the maximum input signal and common mode ranges in proportion to their attenuation ratio, but not exceeding the probe's maximum input voltage rating. Effective gain of the DA1822A, including probe attenuation, amplifier gain and attenuator settings, is automatically displayed.

The DA1820A/1822 have a bandwidth of DC to 10 MHz, but the operator can select from a full complement of high- and low-frequency -3 dB points. In critical measurements, the signal-to-noise ratio can be greatly improved by restricting the amplifier bandwidth to the frequency range of interest.

The DA1822A features a built-in Precision Voltage Generator (PVG) that can be set to any voltage between ± 15.5 volts (± 10 volts in Differential Offset) with up to $5^{1}/_{2}$ digit resolution. The PVG's output can be selected as an input to the inverting (-) input of the amplifier for operation as a differential comparator or applied internally as a true differential offset voltage. The voltage is also available to be used externally through a rear

panel connector. The PVG is not included in the model 1820.

The DA1820A/1822 operate from 100 to 250 V AC line without line switching. A wide range of high-performance differential probes are available for use with the DA1820A/1822. These include the DXC100A selectable (÷ 10/÷ 100) attenuation probes, the DXC350A ÷ 100 high-impedance (92 meg/2.4 pF) probe and the ÷ 1 DXC200A probes.

Comparator Mode (DA1822A only)

The DA1822A becomes a differential comparator when the internal Precision Voltage Generator (PVG) output is selected as the amplifier's inverting (-) input. In this mode, the DA1822A can be used to very accurately measure relatively small signals that are riding on large AC or DC components. Due to the precision and $5^{1}/_{2}$ digit resolution of the voltage generator, an oscilloscope, when used with the DA1822A, can make voltage measurements that are much more accurate than the oscilloscope is capable of by itself. The output of the PVG is available for external use via a rear-panel connector. When used in the comparison mode, the DA1822A's "-" Input is connected to the output of the PVG, and the DA1822A's "-" Input probe is no longer used. The operator can then use the PVG as a very accurate position or offset control to compare to the PVG's value with any point on the "+" Input signal. The decimal point in the PVG readout is automatically positioned to account for the DA1822A's attenuator and any probe attenuation.

True Differential Offset Mode

The built-in PVG can be used to generate a true differential offset while still allowing both inputs to be used as differential inputs. Operation in the differential offset mode is very similar to that of the comparison mode, except the "-" Input of the DA1820A/1822 is still functional. In this mode, the output of the PVG is used to generate an offset within the DA1822A's amplifier (an external voltage can be supplied to the DA1820A). The PVG now functions as if a zero impedance adjustable voltage source were placed in series with the "-" Input. The decimal point in the PVG readout is automatically placed to account for DA1822A attenuator and probe attenuation factors as well as the DA1822A's gain setting.

This mode facilitates making measurements such as changes to a transistor's base to emitter voltage caused by variations in temperature and/or current. Used in this mode, the voltage generator can be set to a value that will zero out the static value of the junction's on voltage. The DA1822A's differential measurement capability will reject any dynamic signal common to both sides of the junction, and the oscilloscope is left to measure only the changes in the junction
voltage.

Precision Voltage Generator (DA1822A only)

The Precision Voltage Generator is controlled from the oscilloscope offset knob. Each digit can be individually incremented or decremented and rollover automatically carries to the next digit. The range of the generator is ± 15.5 V for the comparator mode and ± 10.0 V for differential offset mode. This range is multiplied by the attenuation factor of the probes and internal attenuator. The generator's temperature-controlled oven allows for a DC accuracy specification of 0.05% +500 µV.

The DA1820A/1822 input is protected to ± 250 V and will automatically

disconnect large signals.

Upper & Lower Bandwidth Limits

The DA1820A/1822 allows the user to select both the upper and lower frequency -3 dB points. Selections for the high frequency -3 dB points are 3 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, 1 kHz, 300 Hz, and 100 Hz. Selections for the lower frequency -3 dB points are 0.1 Hz, 1 Hz, 10 Hz, 100 Hz, and 1 kHz. These filters make it possible to improve the signal-to-noise ratio when making measurements on microvolt magnitude signals.

Autobalance

Each time any of the gain buttons is pressed, the DA1820A/1822 adjusts the amplifiers DC balance.

Specifications

General

Amplifier gain:	1, 10, 100 or 1000
Gain accuracy:	± 1% + uncertainty of termination resistance
Bandwidth:	(x1 or x10 GAIN) DC to 10 MHz (x100 GAIN) DC to 3 MHz (x1000 GAIN) DC to 1 MHz
Risetime:	(x1 or x10 GAIN) <35 ns
Output impedance:	50 ohm
Intended output load:	50 ohm
Maximum output:	limited at ± 5 V into 50 ohm
Input attenuation:	÷ 1 or ÷ 10
÷ 10 Attenuator accuracy:	± 0.05%

Max differential linear input:

$$\frac{5\text{V}}{\text{Gain Setting}} \times \text{(combined internal and probe's attenuation factor)}$$

Input noise (x10 GAIN):	< 9 nV/sqrt Hz, broadband
DC drift (x10 GAIN):	50 µV/°C
Common mode rejection ratio:	See graph on previous page.
Max common mode input range:	(÷ 1 Attenuator): ± 15.5 V (÷ 10 Attenuator): ± 155 V (÷ 10 Attenuator and x10 probe): ± 1.55 kV
Input resistance	
(÷ 1 Attenuator):	1 M(ohm) or 100 M(ohm)
(÷ 10 Attenuator and/or with attenuating probe attached):	1 M(ohm)
Input capacitance (÷ 1 or ÷ 10 Attenuator):	20 pF
Bandwidth limit filters	
Upper:	3 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10

	kHz, 3 kHz, 1 kHz, 300 Hz and 100 Hz
Lower:	0.1 Hz, 1 Hz, 10 Hz, 100 Hz and 1 kHz
Filter characteristics:	6 dB/octave
+ Input selections:	AC, OFF (precharge), DC
- Input selections:	AC, OFF (precharge), DC, VCOMP
Input coupling capacitor:	0.1 µF,400 V DC
Input gate current (x1 and x10 GAIN, ÷ 1 Attenuator):	<10 pA, 0-45°C
Input protection:	protected to ± 250 V, automatic input disconnect with manual reset.
Differential Offset (VDIFF) Mode	
Differential offset range (referred to input):	
(x10 GAIN or higher,÷ 1 Attenuator):	± 1 V
(x1 GAIN, ÷ 1 Attenuator):	± 10 V
(x10 GAIN or higher, ÷ 10 Attenuator):	± 10 V
(x1 GAIN, ÷ 10 Attenuator):	± 100 V
(x1 GAIN, ÷ 10 Attenuator, x10 probe):	± 1.0 kV
Differential Offset Accuracy	
(x10 GAIN or higher, ÷ 1 Attenuator):	0.1% + 50 µV
(x1 GAIN, ÷ 1 Attenuator):	0.1% + 500 µV
(x10 GAIN or higher,÷ 10 Attenuator):	0.15% + 500 µV
(x1 GAIN, ÷ 10 Attenuator):	0.15% + 5 mV
Comparison Offset (VCOMP) Mode	
Effective comparison voltage range (not effected by gain setting):	
(÷ 1 Attenuator):	± 15.5 V
(÷ 10 Attenuator):	± 155 V
(÷ 10 probe and ÷ 10 Attenuator):	1.55 kV

Precision Voltage Source

Output range:	± 15.5 V
DC accuracy:	0.05% of reading +500 µV (15° to 45°C)
Resolution:	up to 100 µV ($5^{1}/_{2}$ digit)
Temperature coefficient:	typically <5 ppm/°C of full scale
Type:	Oven stabilized buried zener.
Output:	Applied to inverting input and available at rear panel.
Autozero:	Sets output to zero when 0.0 volts selected and periodically thereafter.

Power Requirements

Line voltage requirement:	100 to 250 V AC
Line frequency range:	48 - 66 Hz
Power requirement:	~ 28 W, ~ 39 UA

Environmental Characteristics

Operating Range:	0° to 50°C
Non-Operating:	-4° to 75°C

Physical Characteristics

Height:	7.29 cm (2.87")
Width:	21.2 cm (8.36")
Depth:	23.2 cm (9.12")
Weight:	2.15 kg (4.75 lb)
Shipping Weight:	3.12 kg (6.88 lb)
Warranty:	3 years

Ordering Information

Amplifiers

Model	Description	
DA1822A DISCONTINUED	10 MHz Differential Amplifier with Precision Source; Probe Sensing	
DA1822A-PR2 DISCONTINUED	2 Ch, 10 MHz Differential Amplifier and Comparator with Full Upper and Lower Bandwidth	
DA1820A DISCONTINUED	10 MHz Differential Amplifier	
DA1820A-PR2 DISCONTINUED	2 Ch 10 MHz Differential Amplifier and Comparator with Full Upper and Lower Bandwidth Limits.	

Accessories

Model	Description
DXC100A	100:1 or 10:1 Selectable 250 MHz Passive Differential Probe Pair

DXC200	1:1, 50 MHz Passive Differential Probe Pair
DXC350A DISCONTINUED	100:1, 250 MHz, 92 MOhm, 2.6 pF Differential Probe Pair
DXC5100	100:1, 250 MHz, 2.5kV High Voltage Probe Pair
DA101	10:1, 1 MOhm Passive Attenuator
DA18XX-RM01	Rackmount Adapter for DA18XX-PR2, Size (2U)