CHOPPER-STABILIZED OPERATIONAL AMPLIFIER

QUICK REFERENCE DATA	
Open loop gain	min. 10^7
Initial offset voltage	max. ± 10 μV
Average offset voltage drift with temperature	max. 0,1 μV/degC
Bias current	max. ± 70 pA
Noise voltage (0,01 to 1 Hz), peak to peak	0,7 μV

APPLICATION

The component possesses a high current and voltage stability therefore small d.c. and low-frequency signals receive accurate amplified reproduction. Changes due to environmental conditions such as temperature time and power supply voltages have only a minor influence on the circuit performance. Initial offsets are very small, therefore initial adjustments and periodic calibration can be eliminated in many applications.

DESCRIPTION

To obtain a high d.c. stability, the d.c. and low-frequency signals are chopped, amplified (a.c. amplifier) and then demodulated. The higher frequency component of the signal at the common input is fed via a capacitor directly to the wide-band amplifier (see block diagram, Fig.1). Offset and drift of the wide-band amplifier is reduced by a factor equal to the gain of the a.c. amplifier.

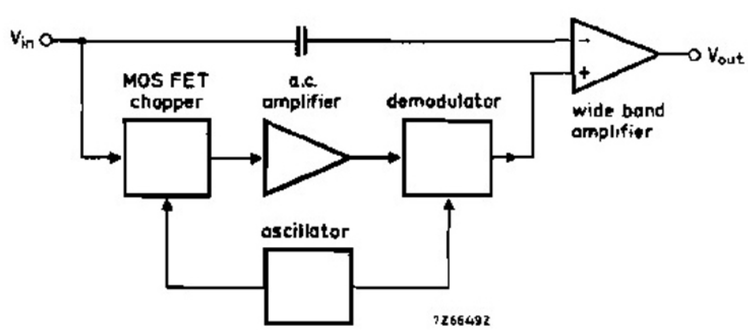
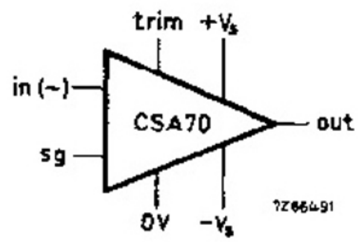


Fig.1 Block diagram



sg = signal earth
in (-) = inverting input
out = output
$+V_S$ = positive supply voltage
$-V_S$ = negative supply voltage
0 V = common supply voltage
trim - offset voltage adjustment

Fig. 2 Drawing symbol

MECHANICAL DATA

Dimensions (mm) and terminal location

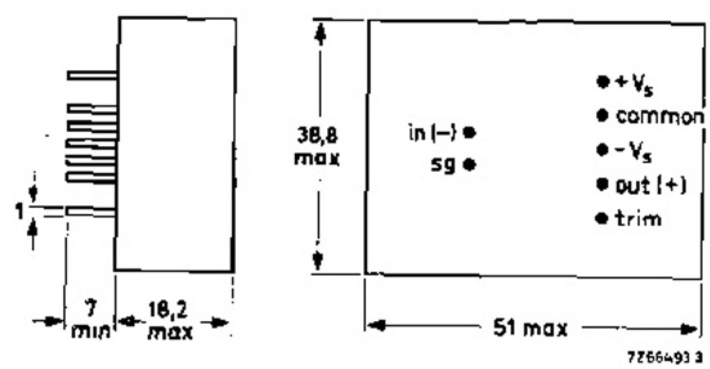


Fig. 3

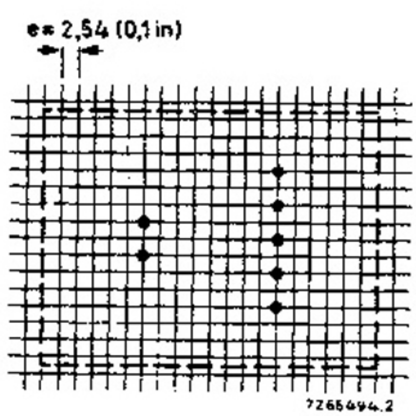


Fig. 4 Terminal location on 0, 1 inch grid.

ELECTRICAL DATA

Ambient temperature +25 °C, supply voltages +15/-15 V, unless stated otherwise.

Ambient temperature range

Operating, rated specification	0 to +60 °C
Storage	-40 to +85 °C

Power supply

Voltage, rated specification	± 15 V ± 3%
derated specification	± 12 V to ± 18 V
Typ. current at +15/−15 V	+7/-7 mA + load current
at +12/−12 V	+4/-5 mA + load current

Open loop gain (R_L = 2 kΩ) min. 10^7

Frequency response

Unity gain bandwidth (small signal)	min. 0,5 MHz (frequency roll-off 6 dB/oct.)
Full power frequency	min. 5 kHz
Slewing rate	min. 0,3 V/μs
Overload recovery time	typ. 3 s, max. 5 s

For method which will substantially reduce recovery time, see circuit of Fig. 5.

Input data

	typical	maximum
Initial offset voltage (adjustable to zero with 100 kΩ potentiom.*))		± 10 μV
Average offset voltage drift with temperature		0,1 μV/degC
Average offset voltage drift with supply voltage		0,1 μV/%
Average offset voltage drift with time	1 μV/month	
Bias current		± 70 pA
Average bias current drift with temperature		0,7 pA/degC
Average bias current drift with supply voltage	0,4 pA/%	
Average bias current drift with time	10 pA/month	

*) Potentiometer to be connected between $+V_S$ and $-V_S$, slider to "trim".

Input voltage range	± 20 V	
Noise voltage		
0,01 Hz to 1 Hz, p-p	0,7 μV	
0,01 Hz to 10 Hz, p-p	5 μV	
10 Hz to 5 kHz, r.m.s.	2,5 μV	
Noise current		
0,01 Hz to 1 Hz, p-p	5 pA	
0,01 Hz to 10 Hz, p-p	40 pA	
Burst noise (popcorn noise) peak voltage of CSA70L, measured across 100 kΩ	< 15 μV	
Input impedance	min. 200 kΩ	
Output data	typical	minimum
Output voltage, R_L = 10 kΩ	± 14 V	± 12 V
R_L = 2 kΩ	± 13 V	± 10 V
Output current	± 12 mA	
Output resistance (without feedback)		max. 200 Ω

Continuous short circuit is allowed between the output and earth, or between the output and supplies.

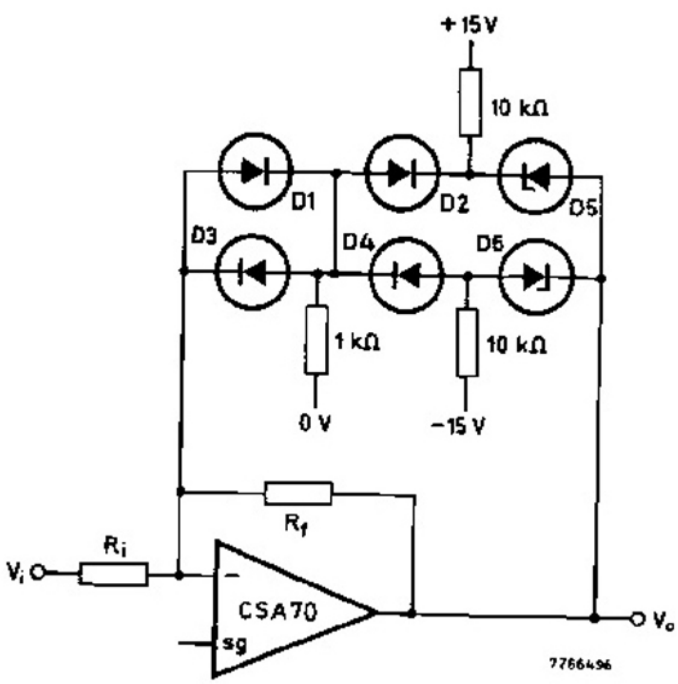


Fig. 5

D1 – D4 = BAW62

D5, D6 = BZX79/C10 or BZY88/C10

The resistors are carbon types, 1/8 W, 5%

APPLICATION INFORMATION

For extensive information on theoretical background and practical applications of operational amplifiers refer to our Application Book: "Measurement and Control using 40-series modules", order number 9399 263 05901.

1. Logarithmic amplifier (6 decade)

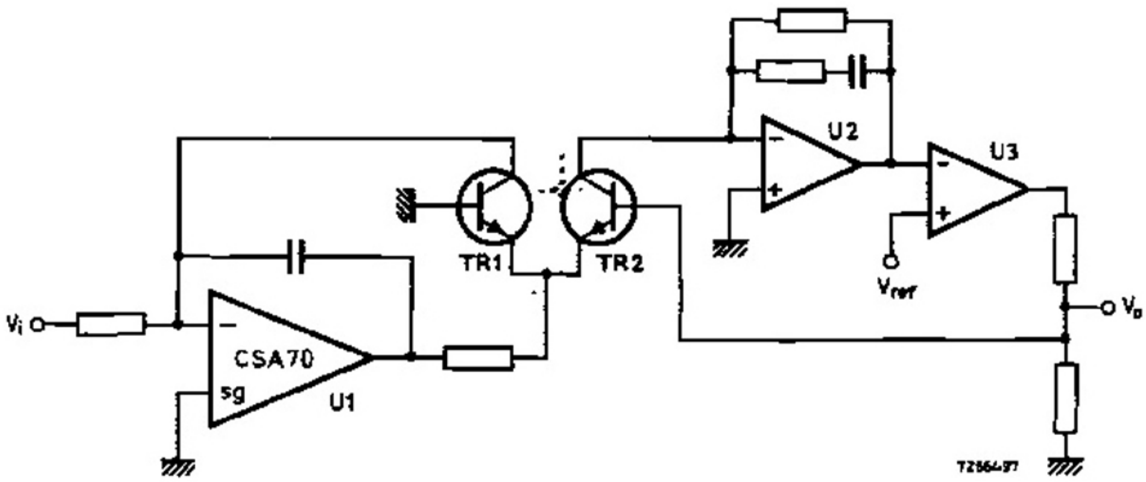


Fig. 6 V_i = 10 μV to 10 V.
TR1, TR2 = matched transistor pair, thermally coupled.
U2, U3 = general purpose amplifiers.

2. Inverting amplifier with very high input impedance

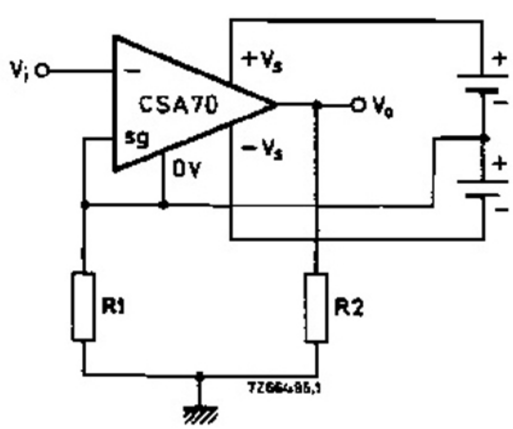


Fig. 7

$+V_S$ and $-V_S$ must be floating.

$$V_o = \frac{R2}{R1} V_i$$

$Z_i > 100$ MΩ

(Note that input floats with respect to supplies, and that gain can be chosen less than unity.)