

CHOPPER-STABILIZED OPERATIONAL AMPLIFIER

QUICK REFERENCE DATA	
Open loop gain	min. 10^7
Initial offset voltage	max. $\pm 10 \mu\text{V}$
Average offset voltage drift with temperature	max. $0,1 \mu\text{V}/\text{degC}$
Bias current	max. $\pm 70 \text{pA}$
Noise voltage (0,01 to 1 Hz), peak to peak	$0,7 \mu\text{V}$

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.

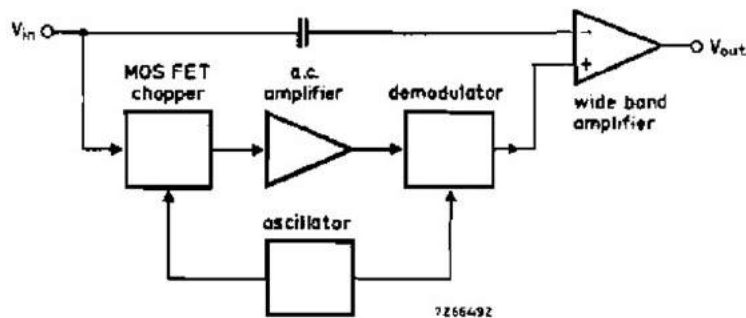
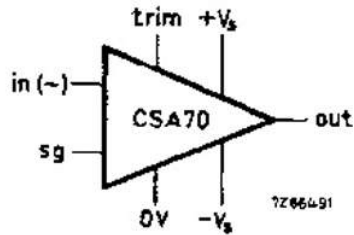


Fig.1 Block diagram



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

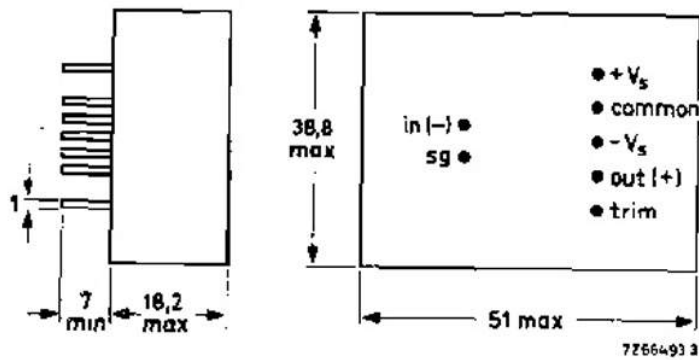


Fig. 3

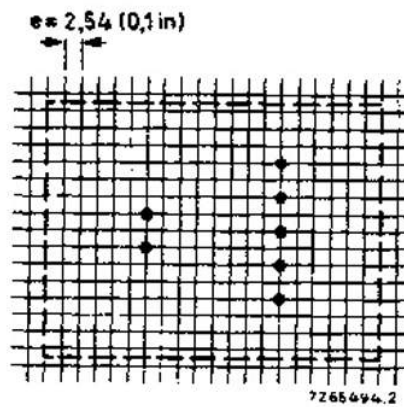


Fig. 4 Terminal location on 0,1 inch grid.

ELECTRICAL DATA

Ambient temperature $+25^{\circ}\text{C}$, supply voltages $+15/-15\text{ V}$, unless stated otherwise.

Ambient temperature range

Operating, rated specification	0 to $+60^{\circ}\text{C}$
Storage	-40 to $+85^{\circ}\text{C}$

Power supply

Voltage, rated specification	$\pm 15\text{ V} \pm 3\%$
derated specification	$\pm 12\text{ V}$ to $\pm 18\text{ V}$
Typ. current at $+15/-15\text{ V}$	$+7/-7\text{ mA}$ + load current
at $+12/-12\text{ V}$	$+4/-5\text{ mA}$ + load current

<u>Open loop gain ($R_L = 2\text{ k}\Omega$)</u>	min. 10^7
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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

	<u>typical</u>	<u>maximum</u>
Initial offset voltage (adjustable to zero with 100 k Ω potentiom. ^{*)}		$\pm 10\text{ }\mu\text{V}$
Average offset voltage drift with temperature		0,1 $\mu\text{V}/\text{degC}$
Average offset voltage drift with supply voltage		0,1 $\mu\text{V}/\%$
Average offset voltage drift with time	1 $\mu\text{V}/\text{month}$	
Bias current		$\pm 70\text{ pA}$
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 μ V	
0,01 Hz to 10 Hz, p-p	5 μ V	
10 Hz to 5 kHz, r. m. s.	2,5 μ V	
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 k Ω	< 15 μ V	
Input impedance	min. 200 k Ω	
<u>Output data</u>	<u>typical</u>	<u>minimum</u>
Output voltage, $R_L = 10$ k Ω	± 14 V	± 12 V
$R_L = 2$ k Ω	± 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.

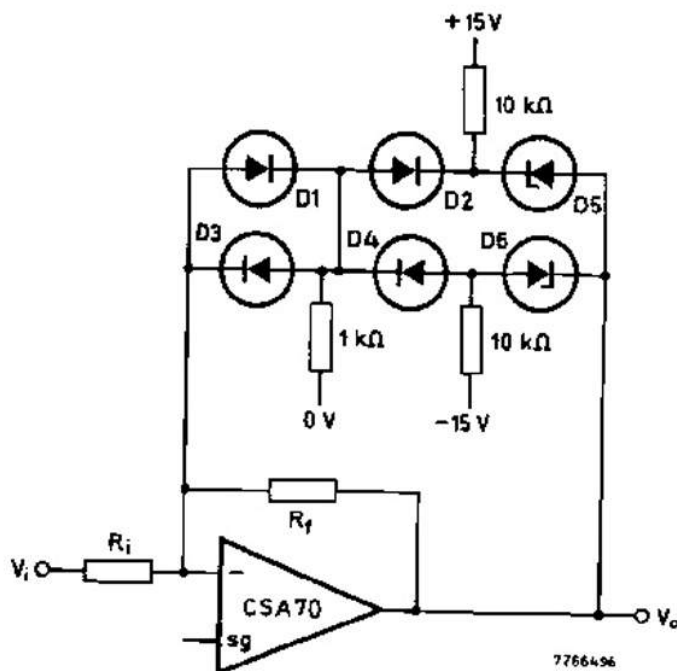


Fig.5

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.

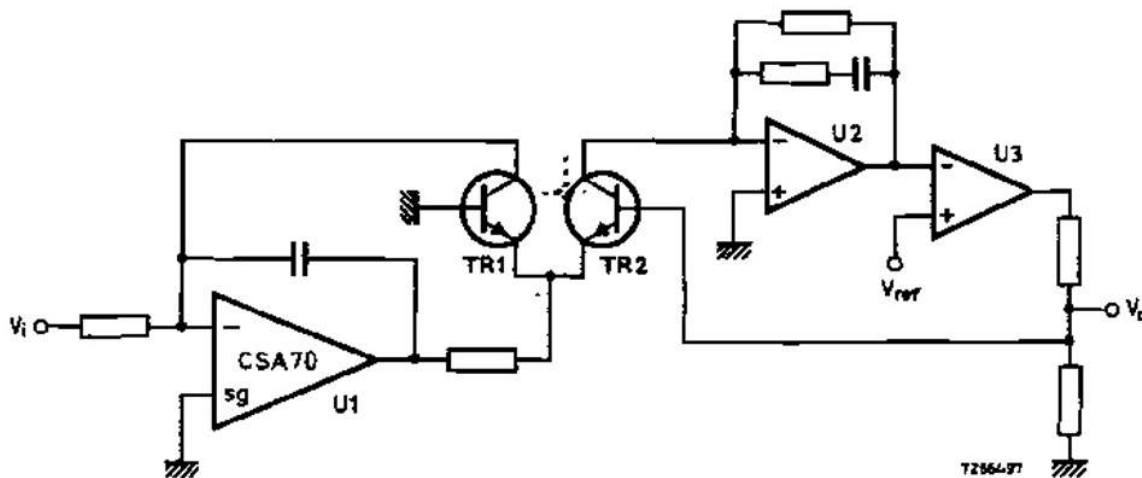
1. Logarithmic amplifier (6 decade)

Fig. 6 $V_i = 10 \mu\text{V}$ to 10 V .

TR1, TR2 = matched transistor pair, thermally coupled.

U2, U3 = general purpose amplifiers.

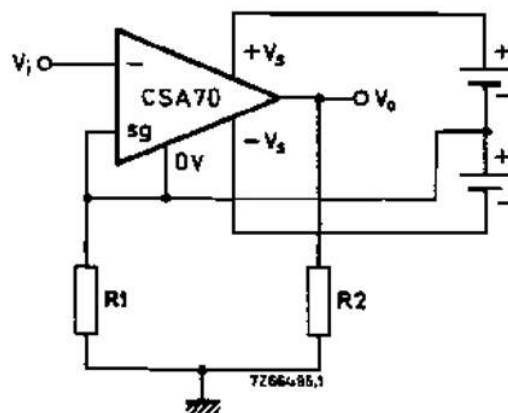
2. Inverting amplifier with very high input impedance

Fig. 7

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

$$V_o = \frac{R_2}{R_1} V_i$$

$$Z_i > 100 \text{ M}\Omega$$

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