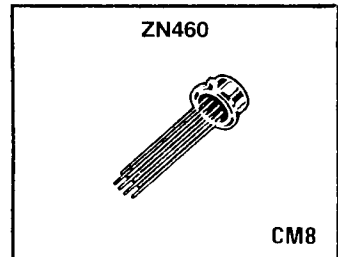


**ZN460, ZN460AM, ZN460CP**  
**ULTRA LOW NOISE WIDEBAND PREAMPLIFIER**

**FEATURES**

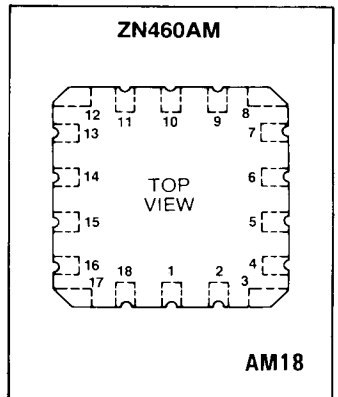
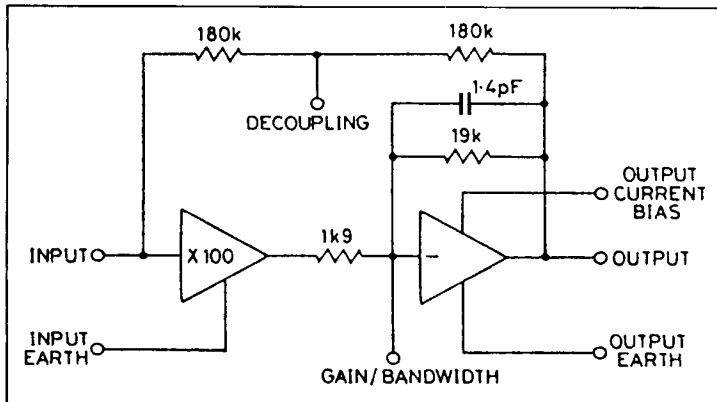
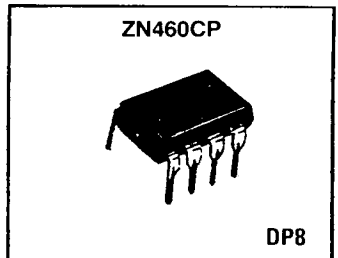
- **High Controlled Gain** : 60 dB  $\pm$  1 dB typical
- **Programmable Gain** : 50-60 dB typical
- **Programmable Bandwidth** : 6MHz downwards
- **Low Noise** : 40 $\Omega$  Equivalent Noise Resistance, or 800 pV/ $\sqrt{\text{Hz}}$
- **Low Supply Current** : <3 mA from 5V



**DESCRIPTION**

The ZN460 is a versatile high performance AC preamplifier, designed for applications requiring ultra low noise such as infra-red imaging and low noise wideband amplifiers e.g. microphone, acoustic emission, transducer bridge amplifier. The matching of open loop gain, coupled with small physical size, makes the ZN460 ideal for multichannel amplification.

The programmable gain feature allows variable detector gain factors to be trimmed out. The programmable bandwidth feature allows the noise bandwidth to be reduced to the required signal bandwidth, thus minimising the wideband output noise.



**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage .. .. . 6.0 Volts  
 Operating Temperature Range:  
 for ZN460 and ZN460AM .. .. . -55 to +125 °C  
 for ZN460CP .. .. . 0 to +70 °C  
 Storage Temperature Range .. .. . -55 to +125 °C

CHARACTERISTICS (at  $V_{CC} = 5V$ ,  $T_{amb} = 25^\circ C$ ).

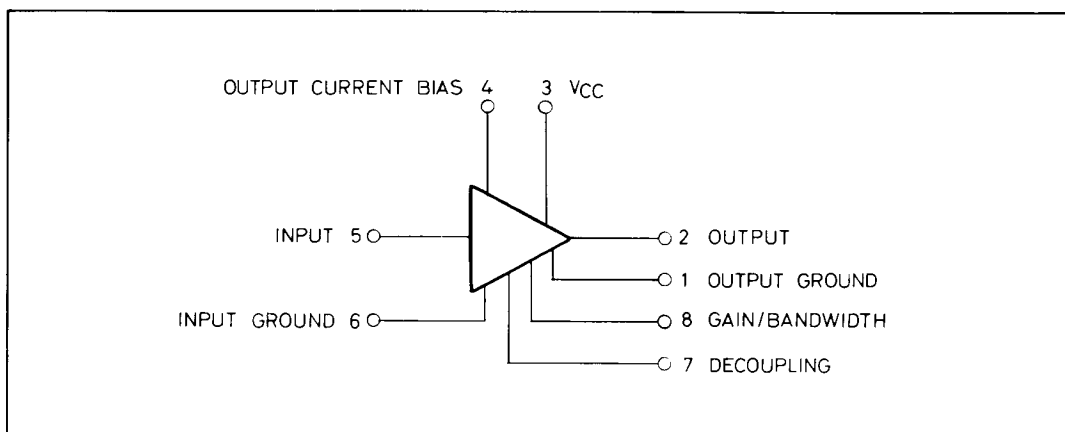
Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Current .. .. .	2.0	2.5	3.0	mA	
Voltage Gain .. .. .	59	60	61	dB	10 kHz (Note 1)
TC of Voltage Gain .. .. .	—	-0.2	—	%/°C	
$V_{CC}$ Coefficient of Voltage Gain	—	25	—	%/V	
Cut-off Frequency .. .. .	—	6	—	MHz	3 dB down (Note 1)
Input Resistance .. .. .	3.5	7		kΩ	10 kHz
Input Capacitance .. .. .	—	80	—	pF	Note 2
Noise Resistance .. .. .	—	40	—	Ω	$R_S = 0$
White Noise Voltage .. .. .	—	800	1100	pV/√Hz	$R_S = 0$
L.F. Spot Noise .. .. .	—	3		nV/√Hz	$R_S = 0$ , $f = 25$ Hz
White Noise Current .. .. .	—	1	—	pA/√Hz	
Output Level .. .. .	1.5	2.0	2.5	V	
Output Swing .. .. .	2	4		$V_{pp}$ $V_{pp}$	$R_F = \infty$ $R_F = 6$ kΩ
Supply Voltage Coefficient of Output Level .. .. .	—	0.34	—	V/V	
Output Current Limit .. .. .	0.6	0.8	1.1	mA	Note 3
Total Harmonic Distortion .. .. .	—	0.15	—	%	1 $V_{pp}$ at 10 kHz
Output Resistance .. .. .	—	75	—	Ω	10 kHz
Supply Rejection Ratio .. .. .	—	42.5	—	dB	
Delay Time .. .. .	—	20	—	ns	Small signal
Delay Time .. .. .	—	40	—	ns	100 mV rms input
Positive Input Overdrive .. .. .	—	—	10	mA	
Negative Input Overdrive .. .. .	—	—	-5	V	

**ZN460**

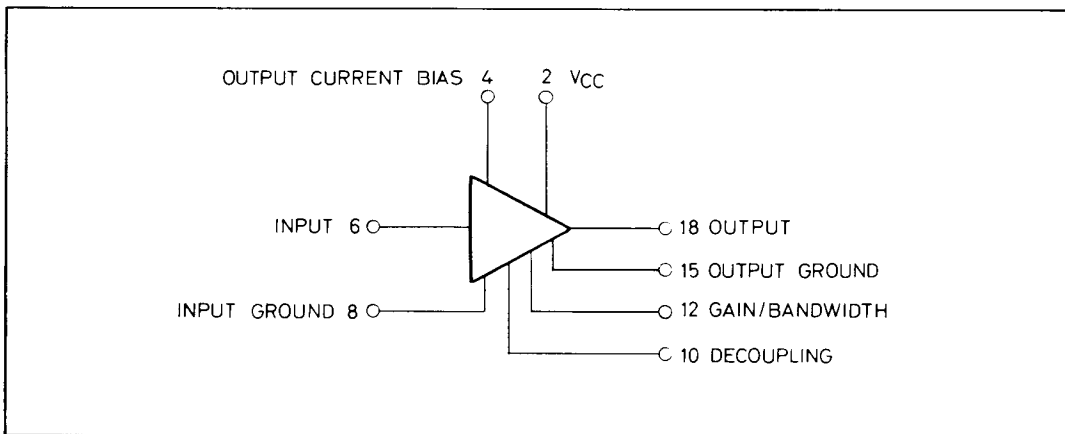
NOTE 1. Without external components.

NOTE 2. In P.C.B. The Input Capacitance may be reduced to 25 pF by screening between output and input

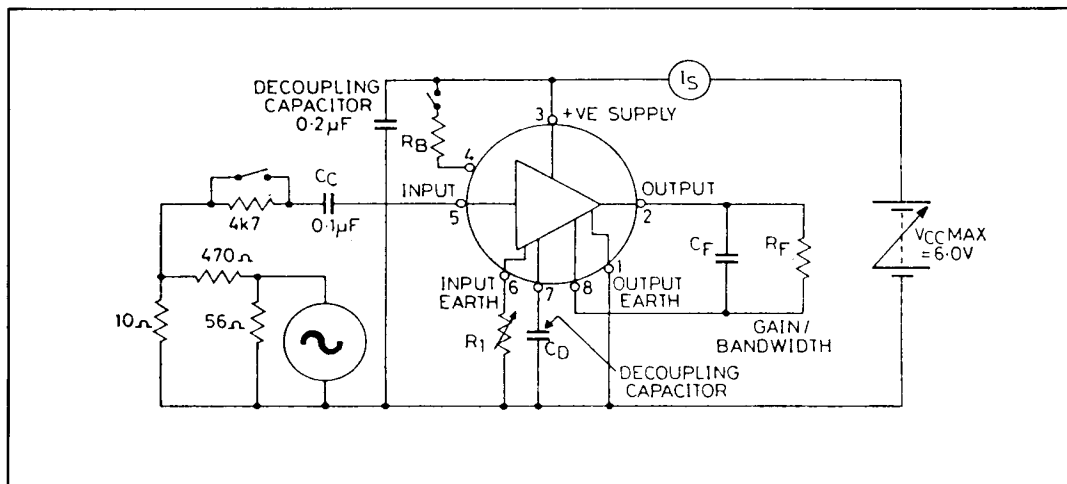
NOTE 3. Sink current without external bias resistor.



PINNING CONFIGURATION - ZN460 and ZN460CP



PINNING CONFIGURATION - ZN460AM



GAIN TEST CIRCUIT (ZN460)

The input impedance may be increased at the expense of noise by including  $R_1$  to vary the gain ( $R_1 = 0$ , gain =  $10^3$ ;  $R_1 = 470\Omega$ , gain =  $10^2$ ).

$C_D$  is required to decouple the internal feedback loop and in order to obtain a flat frequency response make  $C_D \geq C_C$ .

The earth lead of the supply decoupling capacitor should be as close as possible to that of  $R_1$ .

$R_B$  may be used to increase the output quiescent current up to a maximum of 5 mA. The value is given by:

$$I_O = \frac{10(V_{CC} - 1.34)}{R_{B'}}$$

where  $R_{B'}$  is the parallel combination of  $R_B$  and  $40\text{ k}\Omega$ .

The gain and bandwidth may be modified by means of  $R_F$  and  $C_F$ . The gain is given by:

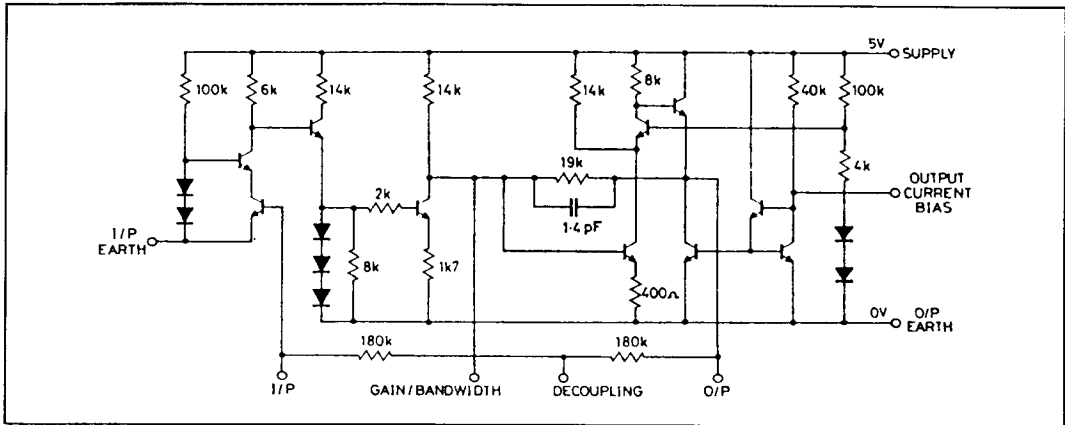
$$A = \frac{10^3 \cdot R_F}{R_F + 19} \text{ with } R_F \text{ in } \text{k}\Omega$$

and the bandwidth by:

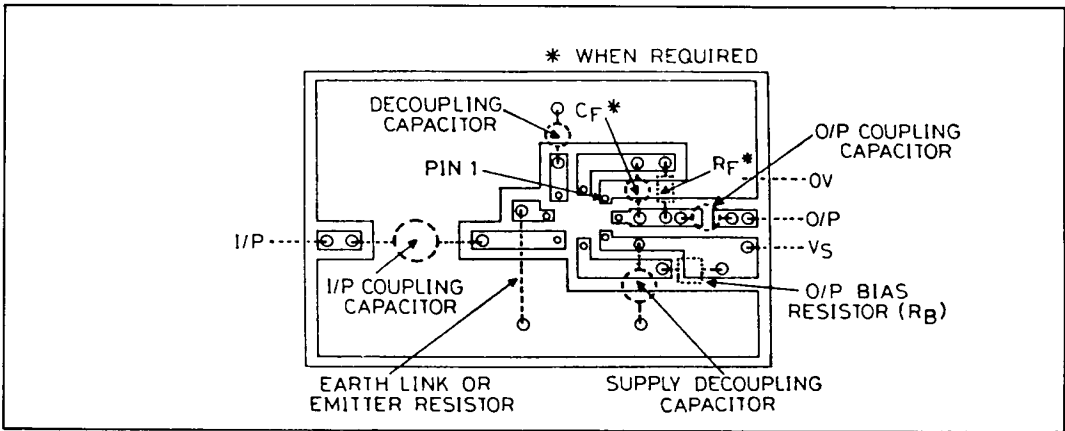
$$f_C = \frac{10^{12}}{2 \pi R_{F'} (C_F + 1.4)} \text{ Hz with } C_F \text{ in } \text{pF}$$

where  $R_{F'}$  is the parallel combination of  $R_F$  and  $19\text{ k}\Omega$ .

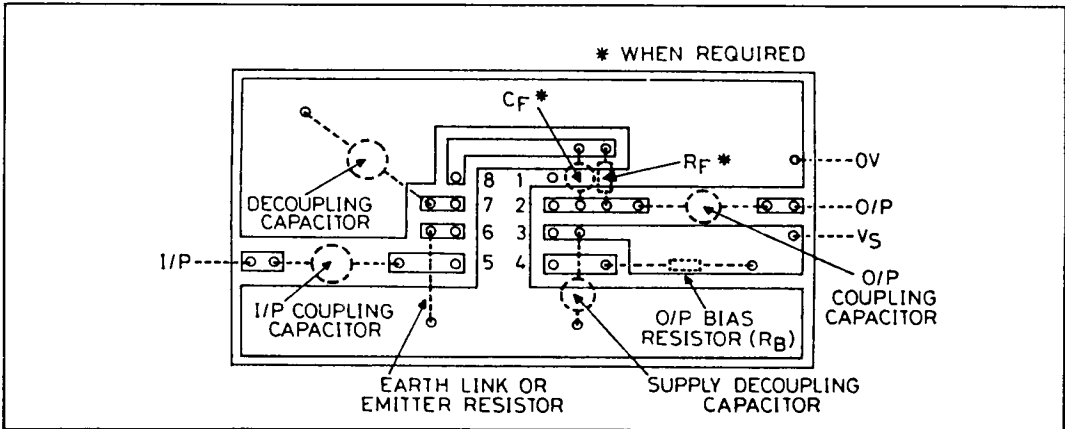
The recommended minimum value of  $R_F$  is  $6\text{ k}\Omega$  since a lesser value reduces the output swing below  $2V_{pp}$ .



ZN460 CIRCUIT DIAGRAM (Typical Values)

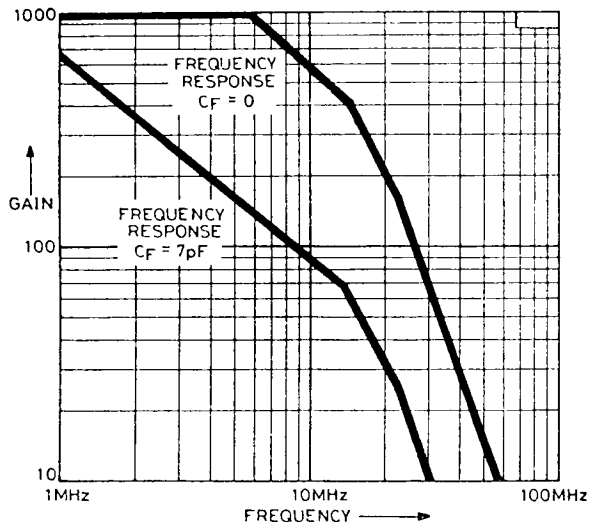


PCB LAYOUT -ZN460

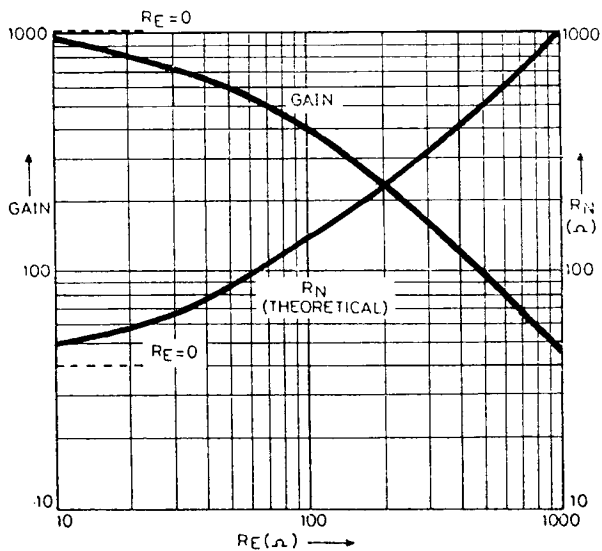


PCB LAYOUT ZN460CP

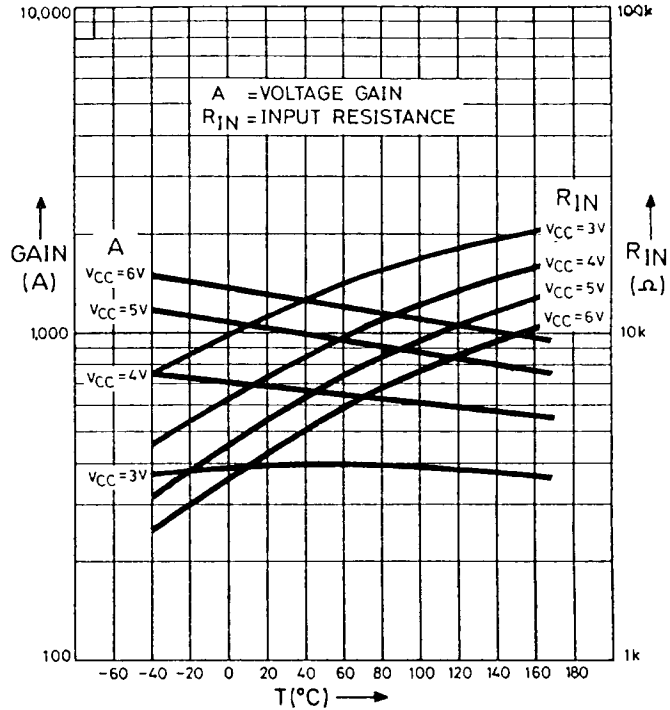
TYPICAL CHARACTERISTICS



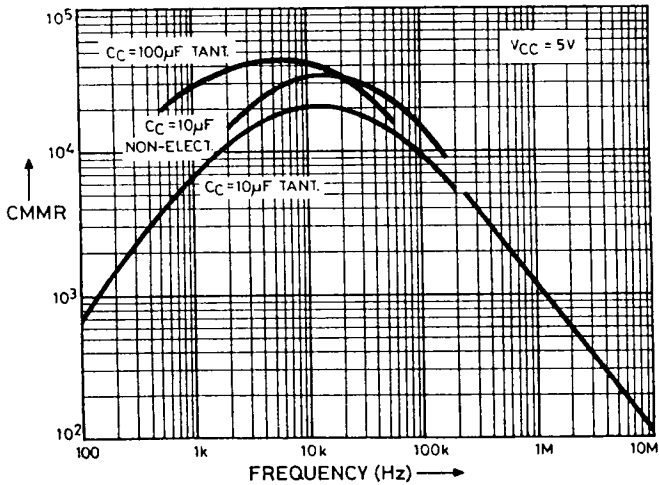
GAIN  $V_S$  FREQUENCY ( $R_F = \infty$ )



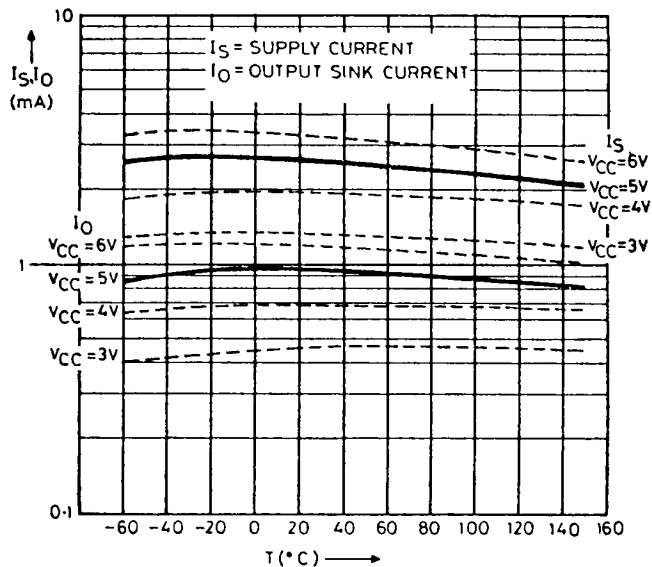
GAIN AND NOISE RESISTANCE  $V_S$  EMITTER RESISTANCE ( $R_F = \infty$ )



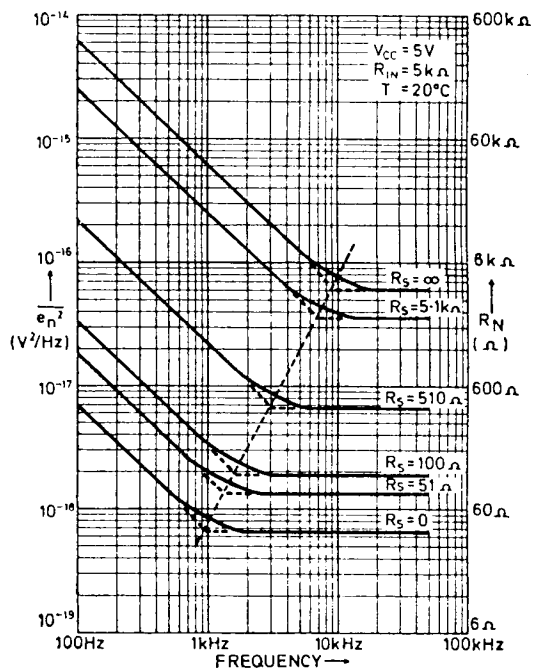
GAIN AND INPUT IMPEDANCE



COMMON MODE REJECTION  $V_S$  FREQUENCY  
 (Measured between input earth and output earth)

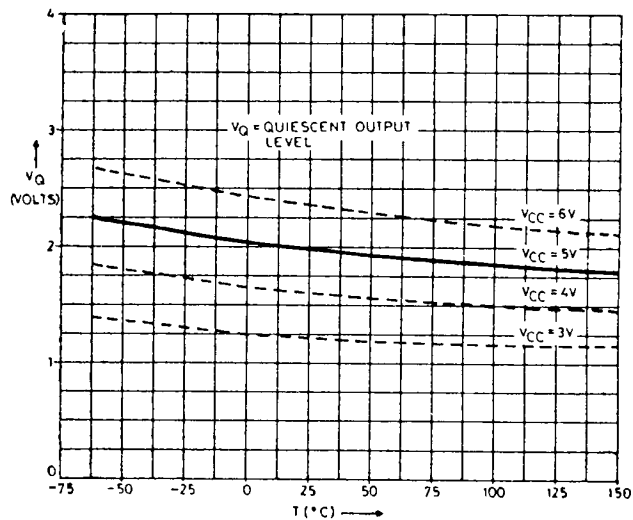


SUPPLY CURRENT AND OUTPUT SINK CURRENT ( $R_B = \infty$ )



NOISE VOLTAGE





QUIESCENT OUTPUT LEVEL