PLESSEY
Semiconductors

T-74-05-01

ZN460, ZN460AM, ZN460CP

ULTRA LOW NOISE WIDEBAND PREAMPLIFIER

FEATURES

- **High Controlled Gain** : **60 dB ± 1 dB typical**
- **Programmable Gain** : **50-60 dB typical**
- **Programmable Bandwidth** : **6MHz downwards**
- **Low Noise** : **40Ω Equivalent Noise Resistance, or 800 pV/√Hz**
- **Low Supply Current** : **<3 mA from 5V**

ZN460

CM8

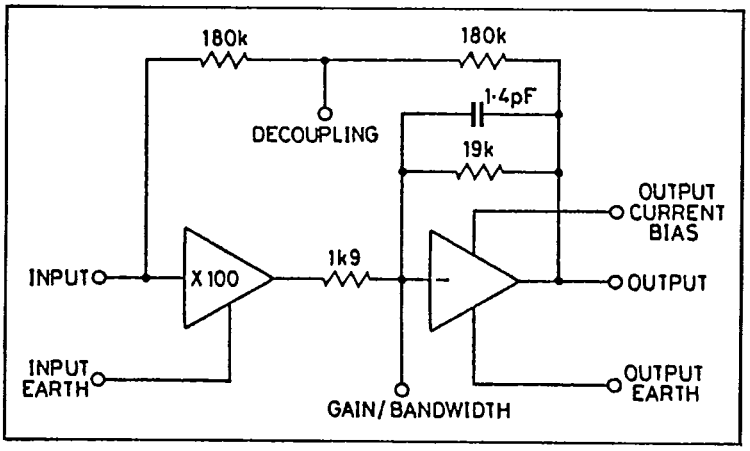
DESCRIPTION

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.

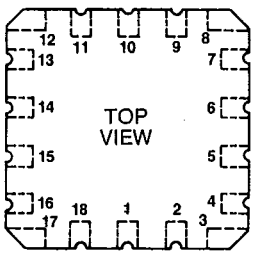
ZN460CP

DP8



CIRCUIT DIAGRAM

ZN460AM



AM18

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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°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	$pV/\sqrt{Hz}$	$R_S = 0$
L.F. Spot Noise	—	3		$nV/\sqrt{Hz}$	$R_S = 0$, f = 25 Hz
White Noise Current	—	1	—	$pA/\sqrt{Hz}$	
Output Level	1.5	2.0	2.5	V	
Output Swing	2	4 —		V_{pp} V_{pp}	$R_F = \infty$ $R_F = 6\ k\Omega$
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	

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.

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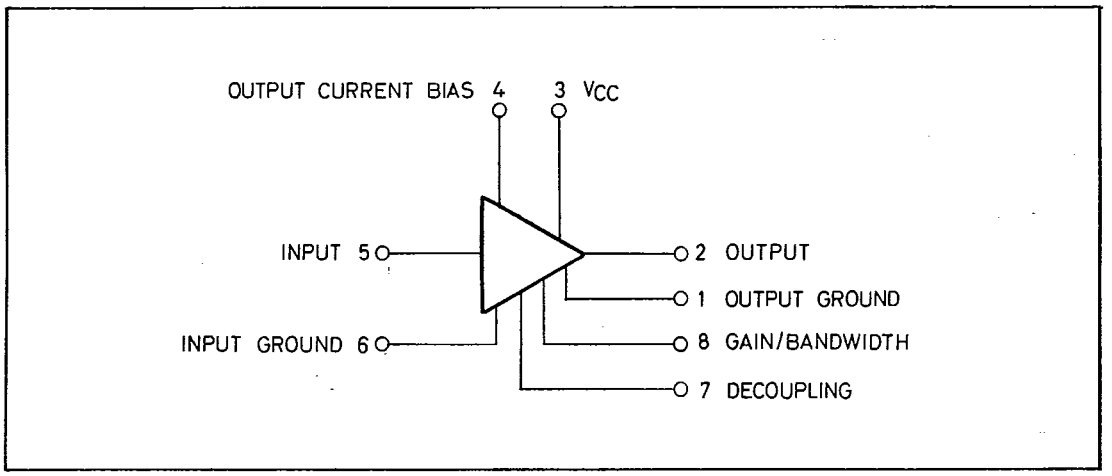
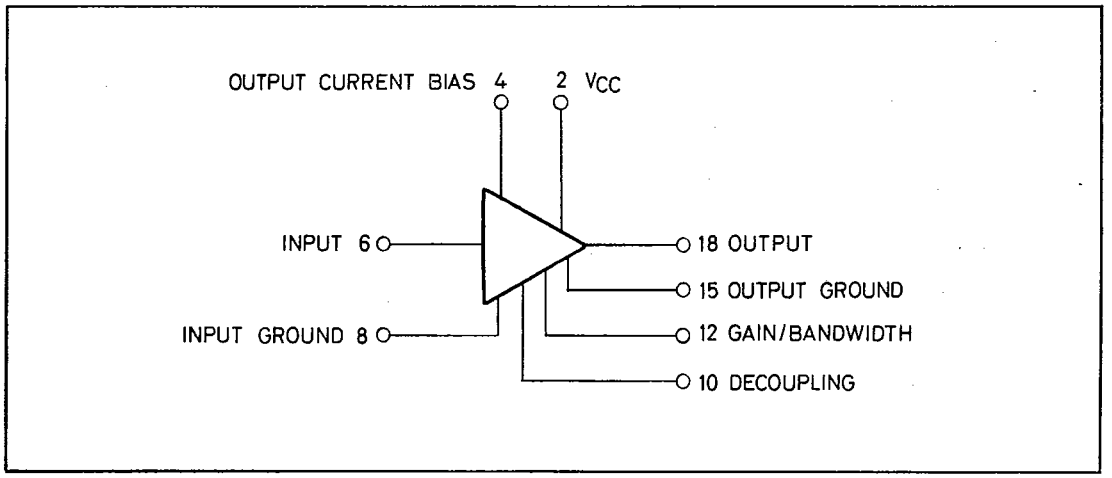


PINNING CONFIGURATION - ZN460 and ZN460CP



PINNING CONFIGURATION - ZN460AM

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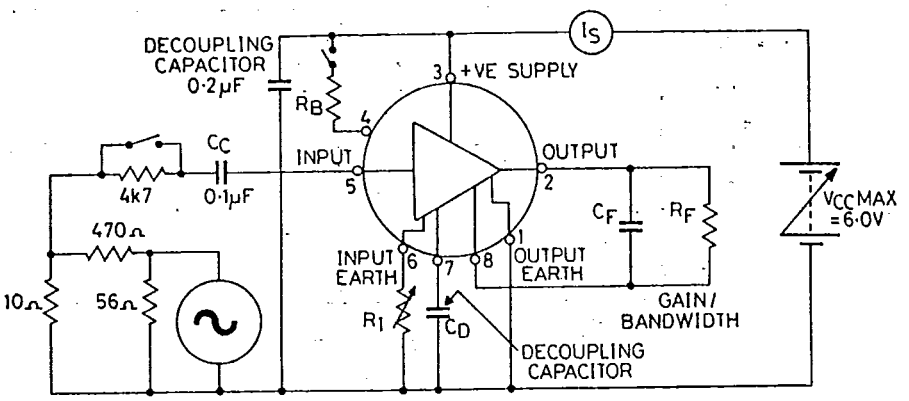


GAIN TEST CIRCUIT (ZN460)

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 $C_D \geqslant C_C$.

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 kΩ.

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

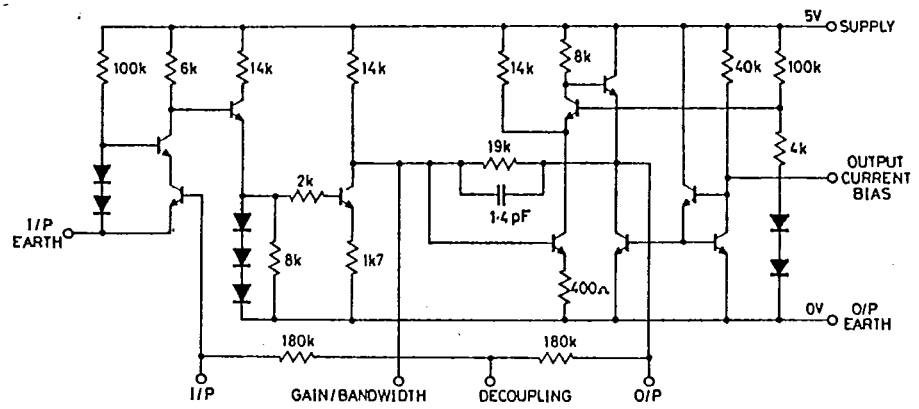
$$A = \frac{10^3 . R_F}{R_F + 19} \text{ with } R_F \text{ in k}\Omega$$

and the bandwidth by:

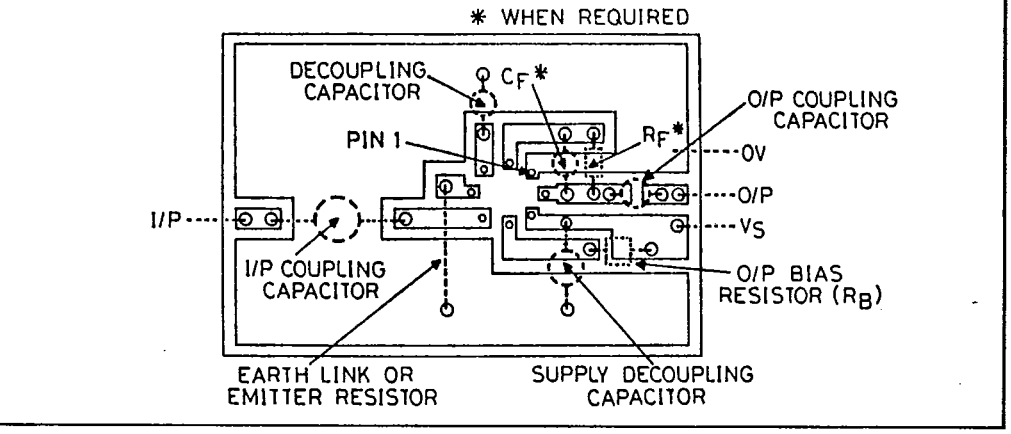
$$f_C = \frac{10^{12}}{2\pi R_F' (C_F + 1.4)} \text{ Hz with } C_F \text{ in pF}$$

where R_F' is the parallel combination of R_F and 19 kΩ.

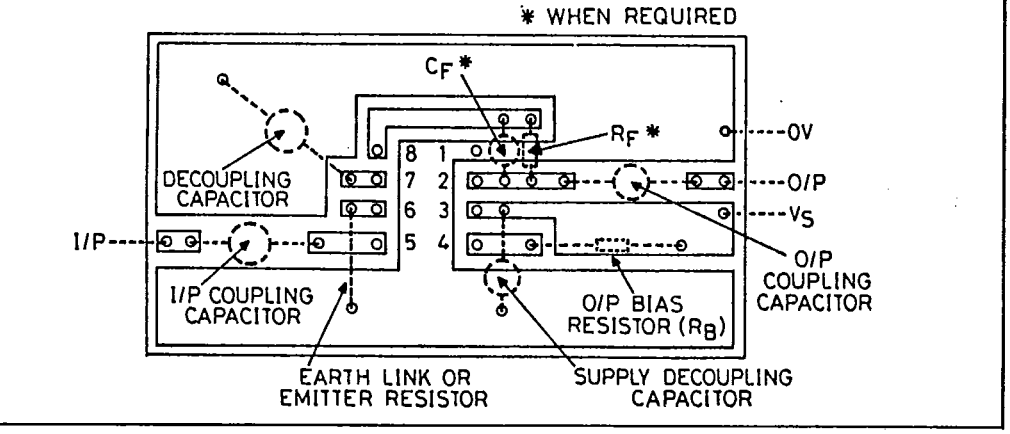
The recommended minimum value of R_F is 6 kΩ since a lesser value reduces the output swing below $2V_{pp}$.



ZN460 CIRCUIT DIAGRAM (Typical Values)



PCB LAYOUT -ZN460



PCB LAYOUT ZN460CP

TYPICAL CHARACTERISTICS

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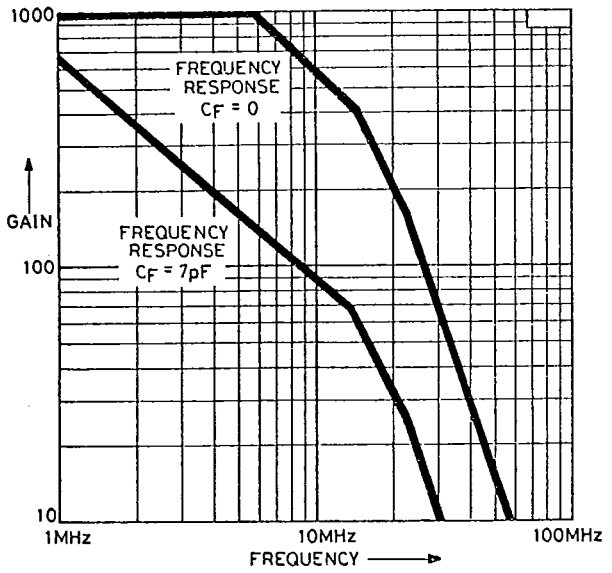
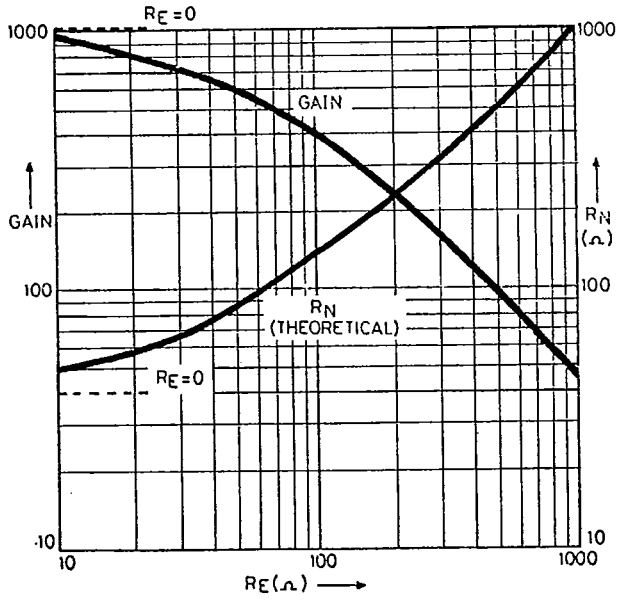


GAIN V_S FREQUENCY ($R_F = \infty$)



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

PLESSEY SEMICONDUCTORS

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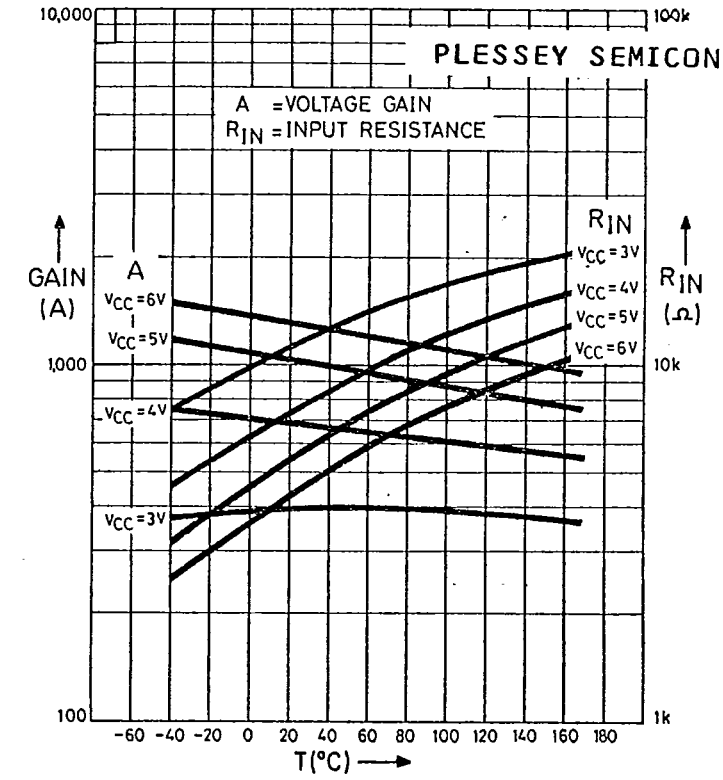
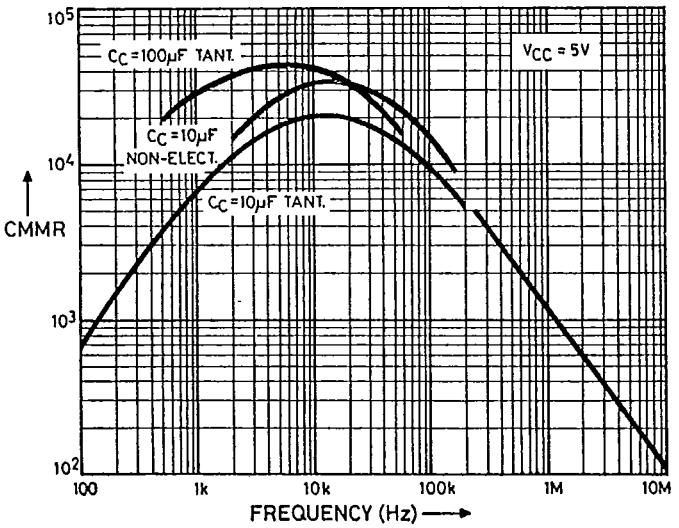


GAIN AND INPUT IMPEDANCE



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

PLESSEY SEMICONDUCTORS

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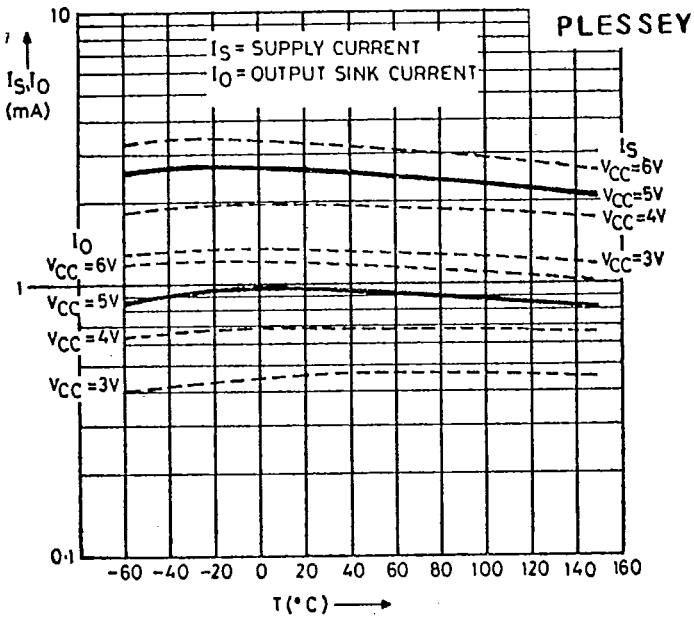
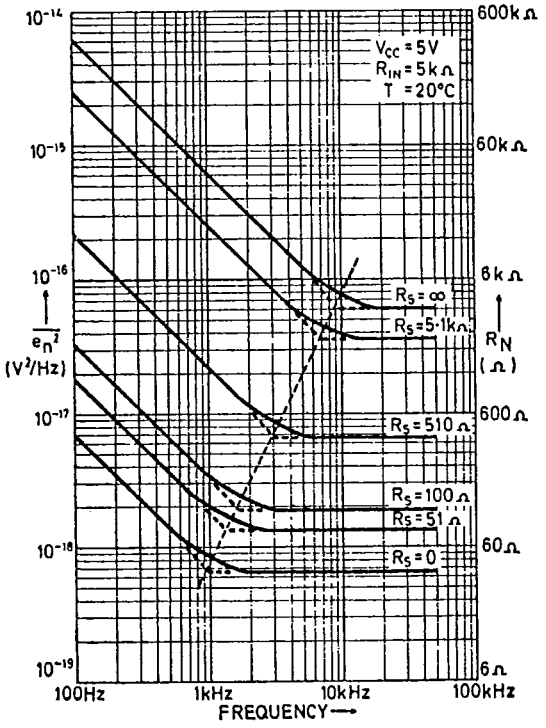


SUPPLY CURRENT AND OUTPUT SINK CURRENT ($R_B = \infty$)



NOISE VOLTAGE

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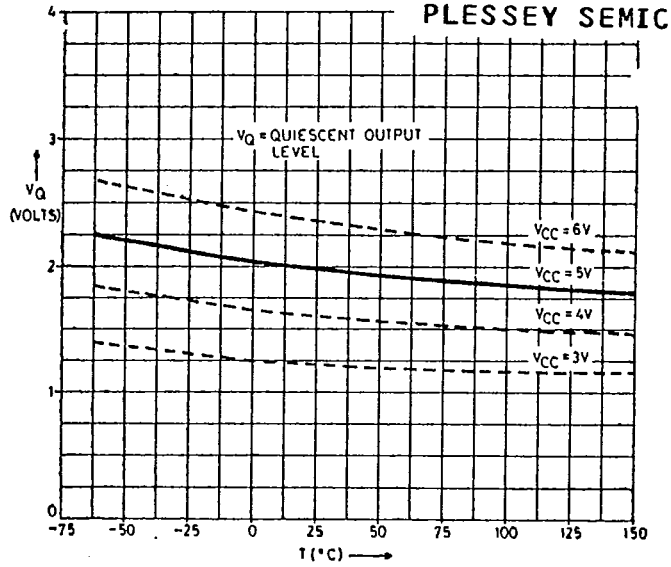

QUIESCENT OUTPUT LEVEL