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GEC PLESSEY
SEMICONDUCTORS

SL560

300MHz LOW NOISE AMPLIFIER

This monolithic integrated circuit contains three very high performance transistors and associated biasing components in an eight-lead TO-5 package forming a 300MHz low noise amplifier. The configuration employed permits maximum flexibility with minimum use of external components. The SL560C is a general purpose low noise, high frequency gain block.

The device is also available as the SL560AC which has guaranteed operation over the full Military Temperature Range and is screened to MIL-STD-883C Class B. Data is available separately.

FEATURES

- Gain up to 40dB
- Noise Figure less than 2dB (Rs 200 ohm)
- Bandwidth 300MHz
- Supply Voltage 2-15V (Depending on Configuration)
- Low Power Consumption

APPLICATIONS

- Radar IF Preamplifiers
- Infra-Red Systems Head Amplifiers
- Amplifiers in Noise Measurement Systems
- Low Power Wideband Amplifiers
- Instrumentation Preamplifiers
- 50 ohm Line Drivers
- Wideband Power Amplifiers
- Wide Dynamic Range IF Amplifiers
- Aerial Preamplifiers for VHF TV and FM Radio

ABSOLUTE MAXIMUM RATINGS

Supply voltage (Pin 4)	+15V
Storage temperature	-55°C to 150°C (CM)
	-55°C to 125°C (DP)
Junction temperature	150°C (CM) 125°C (DP)
Thermal resistance	
Junction-case	60°C/W (CM)
Junction ambient	220°C/W (CM) 230°C/W (DP)
Maximum power dissipation	See Fig 15
Operating temperature range	-55°C to +125°C (CM) at 100mW
	-55°C to +100°C (DP) at 100mW

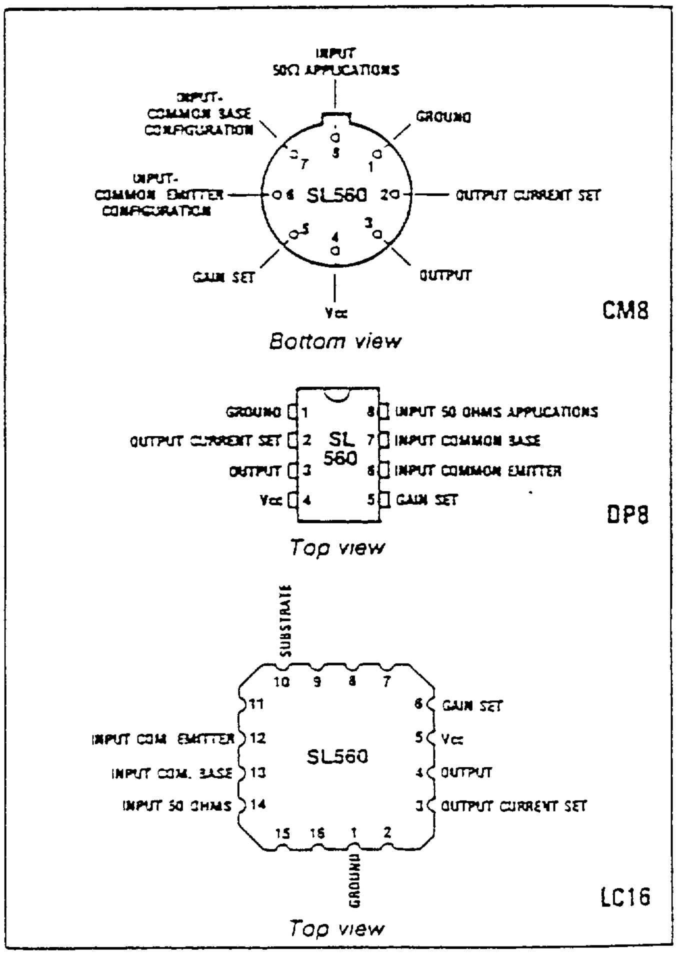

Fig 1 Pin connections

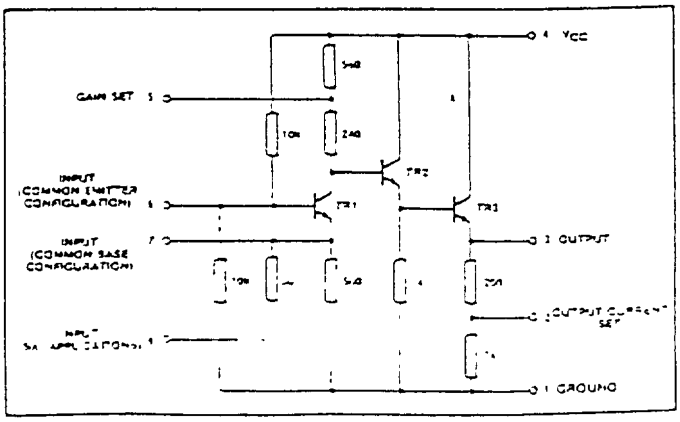

Fig 2 SL560C circuit diagram

ORDERING INFORMATION

SL560 AC CM
SL560 C CM
SL560 C DP
SL560 C LC
SL560 CB CM
SL560 C B 883C MAC

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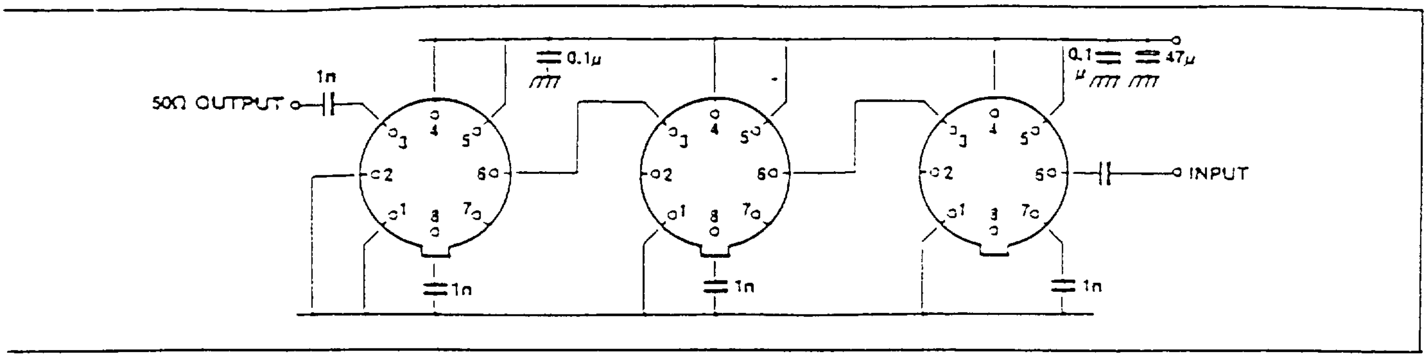


Fig.12 Three-stage directly-coupled high gain low noise amplifier

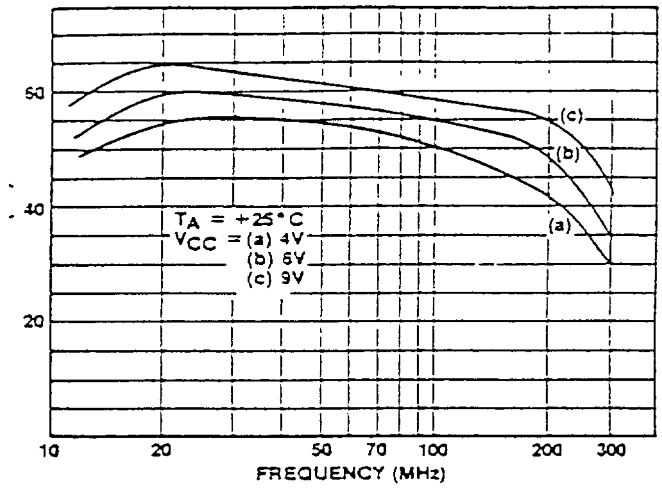


Fig.13 Frequency response of circuit shown in Fig.12 (typical)

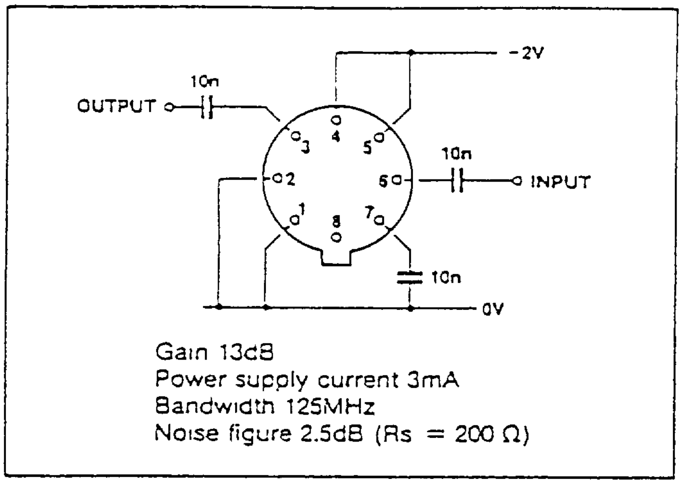


Fig.14 Low power consumption amplifier

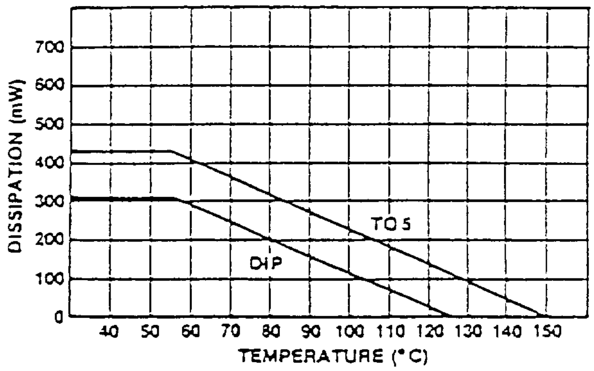
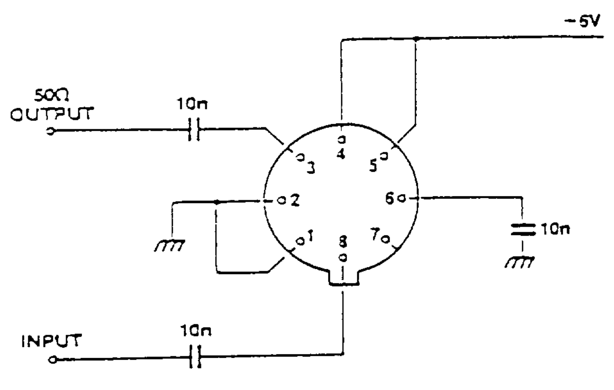


Fig.15 Ambient operating temperature v degrees centigrade (typical)

TYPICAL APPLICATIONS



Gain 14dB
Bandwidth 220MHz (P_{out} = 1mW, 50Ω)
200MHz (P_{out} = 5mW, 50Ω)
Input SWR 1.5:1

Fig.6 50Ω line driver. The response of this configuration is shown in Fig.4.

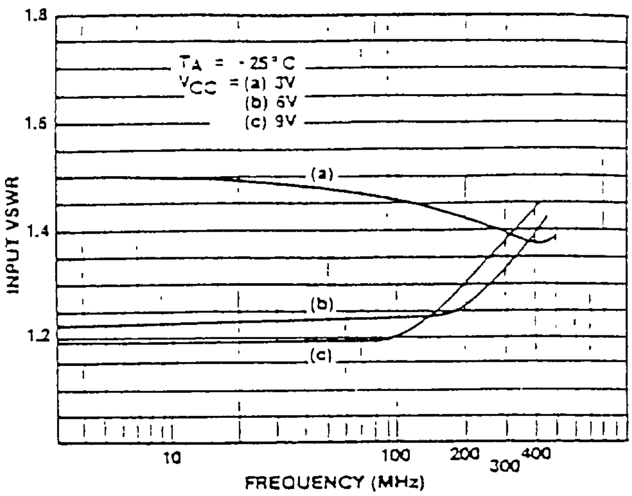
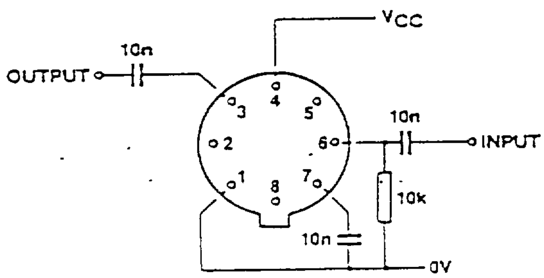


Fig.7 Input standing wave ratio plot of circuit shown in Fig 6 (typical)



Voltage gain 32dB at 6V
35dB at 10V
Noise figure 1.8dB (Rs = 200Ω)
Supply current 6mA at 6V
12mA at 10V
Bandwidth 75MHz (see Fig 9)

Fig 8 Low noise preamplifier

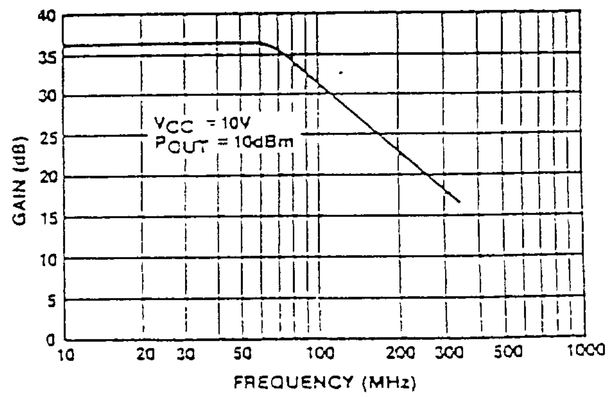
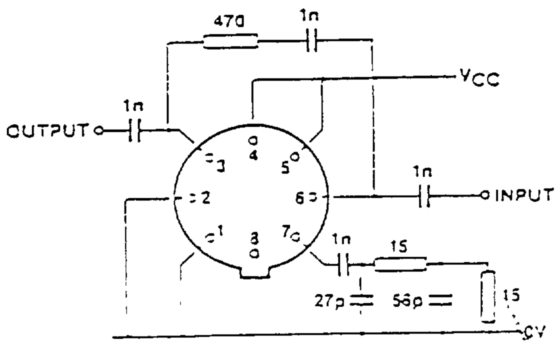
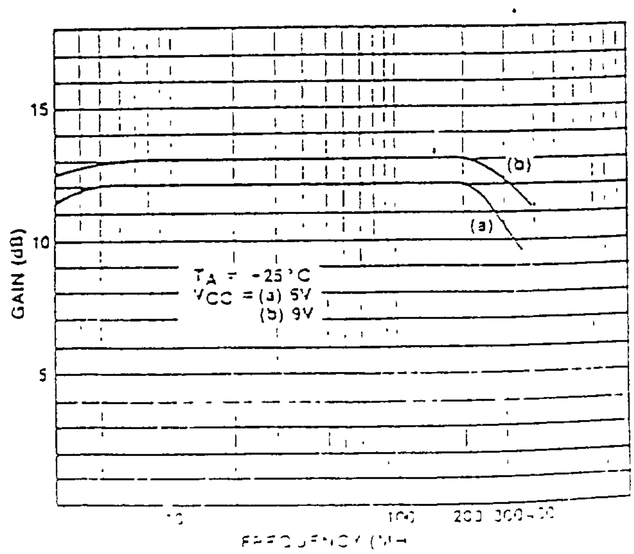


Fig 9 Frequency response of circuit shown in Fig 8 (typical)



Gain 13dB at Vcc = 9V
-1dB at 6MHz and 300MHz



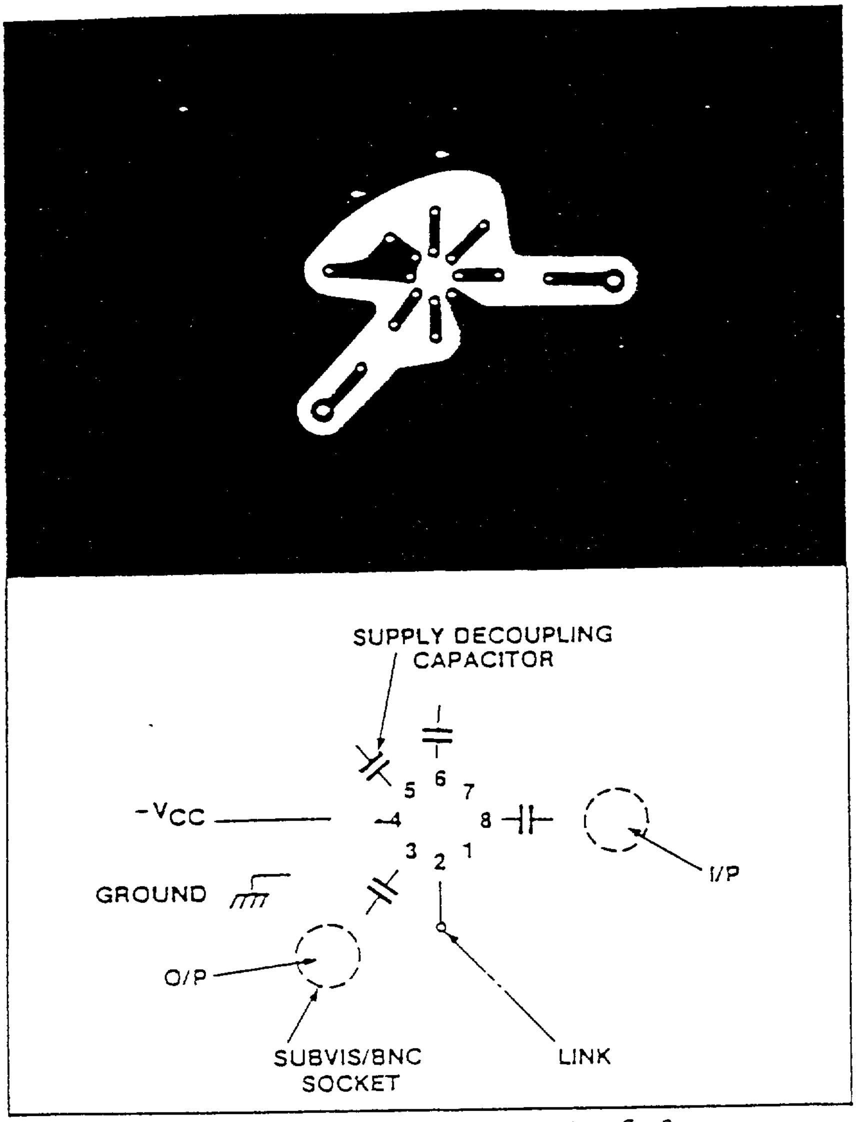


Fig 3 PC layout for 50Ω line driver (see Fig.6)

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated):
Frequency = 30MHz; Vcc = 6V; Rs = RL = 50Ω; Tamb = 25°C, Test Circuit Fig.6

Characteristic	Value			Units	Conditions
	Min.	Typ.	Max.		
Small signal voltage gain	11	14	17	dB	
Gain flatness		±1.5		dB	10MHz - 220MHz
Upper cut-off frequency		250		MHz	
Output swing	+5	+7		dBm	Vcc 6V } See Fig 5
		+11		dBm	Vcc = 9V } See Fig 5
Noise figure (common emitter)		1.8		dB	Rs = 200Ω
		3.5		dB	Rs = 50Ω
Supply current		20	30	mA	

CIRCUIT DESCRIPTION

Three high performance transistors of identical geometry are employed. Advanced design and processing techniques enable these devices to combine a low base resistance ($R_{bb'}$) of 17Ω (for low noise operation) with a small physical size - giving a transition frequency, f_T, in excess of 1GHz.

The input transistor (TR1) is normally operated in common base, giving a well defined low input impedance. The full voltage gain is produced by this transistor and the output voltage produced at its collector is buffered by the two emitter followers (TR2 and TR3). To obtain maximum bandwidth the capacitance at the collector of TR1 must be minimised. Hence to avoid bonding pad and can capacitances, this point is not brought out of the package The collector load resistance of TR1 is split, the tapping being accessible via pin 5. If required, an external roll-off capacitor can be fixed to this point.

The large number of circuit nodes accessible from the outside of the package affords great flexibility, enabling the operating currents and circuit configuration to be optimised for any application. In particular, the input transistor (TR1) can be operated in common emitter mode by decoupling pin 7 and using 6 as the input. In this configuration, a 2dB noise figure (Rs = 200Ω) can be achieved. This configuration can give a gain of 35dB with a bandwidth of 75MHz (see Figs. 8 and 9) or, using feedback 14dB with a bandwidth of 300MHz (see Figs. 10 and 11).

Because the transistors used in the SL560C exhibit a high value of f_T, care must be taken to avoid high frequency instability Capacitors of small physical size should be used, the leads of which must be as short as possible to avoid oscillation brought about by stray inductance The use of a ground plane is recommended.

Further applications information is available in the 'Broadband Amplifier Applications' booklet.

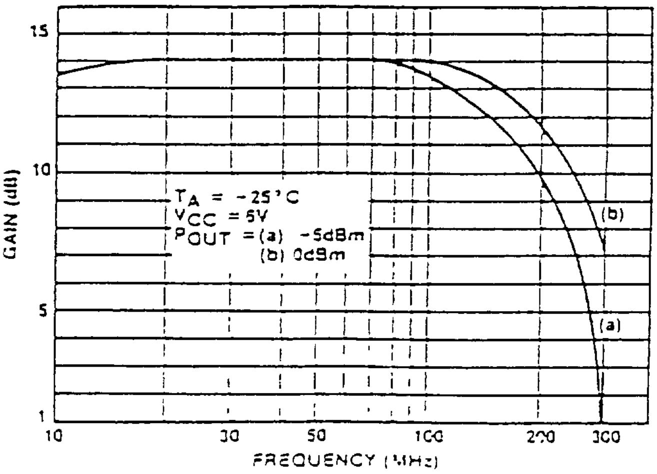


Fig 4 Frequency response small signal gain [illegible] of a typical device

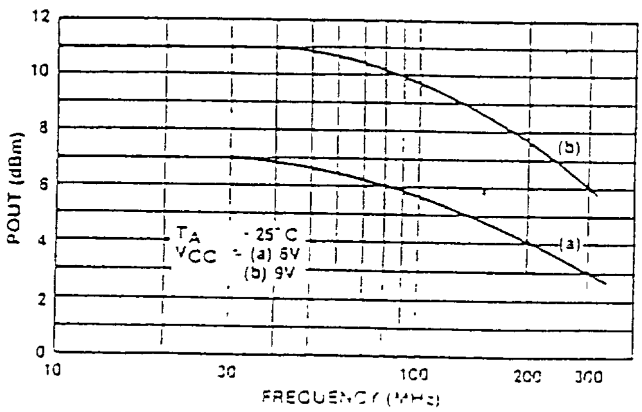


Fig 5 Frequency response [illegible] output power with frequency for 1dB gain compression, typical