

# SL561

## ULTRA LOW NOISE PREAMPLIFIERS

This integrated circuit is a high gain, low noise preamplifier designed for use in audio and video systems at frequencies up to 6MHz. Operation at low frequencies is eased by the small size of the external components and the low  $1/f$  noise. Noise performance is optimised for source impedances between  $20\Omega$  and  $1\text{ k}\Omega$  making the device suitable for use with a number of transducers including photo-conductive IR detectors, magnetic tape heads and dynamic microphones.

The SL561 B is only available in the TO-5 package  
The SL561 C is only available in the Plastic package.

### FEATURES

- High Gain 60dB
- Low Noise  $0.8\text{ nV}/\sqrt{\text{Hz}}$  ( $R_s = 50\Omega$ )
- Bandwidth 6MHz
- Low Power Consumption 10mW ( $V_{cc} = 5\text{V}$ )

### APPLICATIONS

- Audio Preamplifiers (low noise from low impedance source)
- Video Preamplifier
- Preamplifier for use in Low Cost Infra-Red Systems

### ORDERING INFORMATION

SL561 AC CM  
SL561 C DP

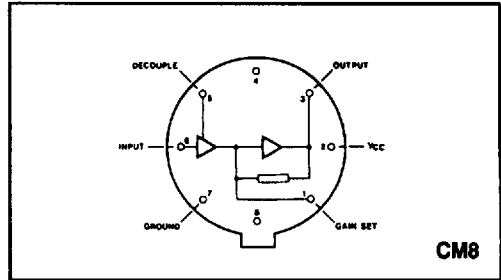


Fig.1 Pin connections (view as above) SL561B

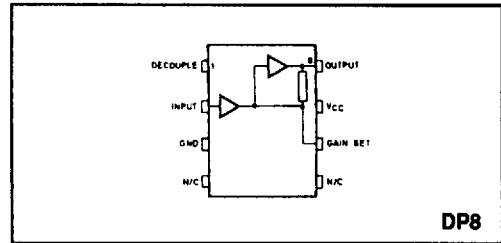


Fig.2 Pin connections (view as above) SL561C

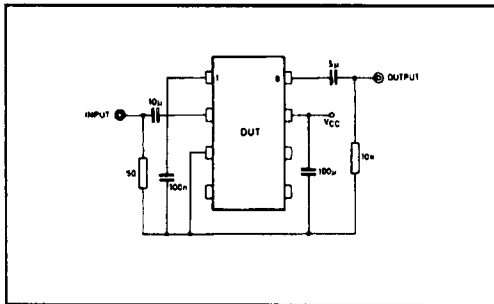


Fig.3 Test circuit

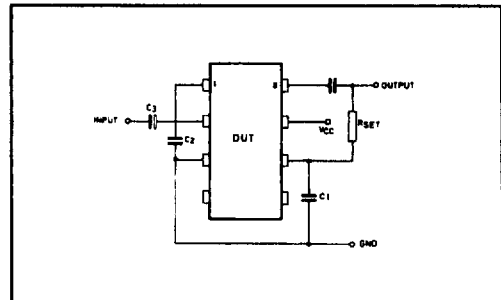


Fig.4 Typical application

## SL561

### ELECTRICAL CHARACTERISTICS

These characteristics are guaranteed over the following conditions (unless otherwise stated):

|                  |              |
|------------------|--------------|
| $V_{cc}$         | 5V           |
| Source impedance | 50 $\Omega$  |
| Load impedance   | 10k $\Omega$ |
| $T_{amb}$        | 25°C         |

## SL561C

| Characteristic                 | Value |      |      | Units           | Conditions                 |
|--------------------------------|-------|------|------|-----------------|----------------------------|
|                                | Min.  | Typ. | Max. |                 |                            |
| Voltage gain                   | 57    | 60   | 63   | dB              | Pin 6 O/C<br>100Hz to 6MHz |
| Equivalent input noise voltage |       | 0.8  |      | nV/ $\sqrt{Hz}$ |                            |
| Input resistance               |       | 3    |      | k $\Omega$      |                            |
| Input capacitance              |       | 15   |      | pF              |                            |
| Output impedance               |       | 50   |      | $\Omega$        |                            |
| Output voltage                 | 2     | 3    |      | V p-p           | See note                   |
| Supply current                 |       | 2    | 3    | mA              |                            |
| Bandwidth                      |       | 6    |      | MHz             |                            |

### OPERATING NOTES (Pin numbers refer to DIL package)

#### Upper cut-off frequency

The bandwidth of the amplifier can be reduced from 6MHz to any desired value by a capacitor from pin 6 to ground. This is shown in Fig.5. No degradation in noise or output swing occurs when this capacitor is used. The high frequency roll off is approximately 6dB/octave.

#### Low frequency response

The capacitors  $C_2$  and  $C_3$  (Fig.4) determine the lower cut-off frequency.  $C_2$  decouples an internal feedback loop and if its value is close to that of  $C_3$ , an increase in gain at low frequencies can occur. For a flat response either make  $C_2$  less than 0.05  $C_3$  or make  $C_2$  greater than 5  $C_3$ .

#### Gain set facility

Provision is made to adjust the gain by means of a resistor between pin 6 and the output. Gains as low as 10dB can be selected. This resistor increases the feedback around the output stage and stability problems can result if the bandwidth of the amplifier is not reduced as indicated in Note 1. Fig.6 shows recommended values of  $C_1$  for each gain range. Since the input stage is a common emitter stage without emitter degeneration (for best noise) at values of gain less than 40dB this input stage, rather than the output stage, determines the

maximum output voltage swing. For a distortion of less than 10% the input voltage should be restricted to less than 5mV (see Fig.9).

#### Driving low impedance loads

The quiescent current of the output emitter follower is 0.5mA. If larger voltage swings are required into low impedance loads this current can be increased by a resistor from pin 8 to ground. To avoid exceeding the ratings of the output transistor the resistor should not be less than 200 $\Omega$ .

#### Noise performance

The equivalent input voltage for the amplifier is shown in Fig.7. From this the input noise voltage and current generators can be derived. They are:

$$e_n = 0.8 \text{ nV}/\sqrt{\text{Hz}}$$

$$i_n = 2.0 \text{ pA}/\sqrt{\text{Hz}}$$

Flicker or 1/f noise is not normally a problem, the knee frequency being typically below 100Hz.

### ABSOLUTE MAXIMUM RATINGS

|                             |                 |
|-----------------------------|-----------------|
| Supply Voltage              | +10V            |
| Storage Temperature Range   |                 |
| SL561 CM                    | -65°C to +150°C |
| SL561 DP                    | -55°C to +150°C |
| Operating Temperature Range |                 |
| SL561 AC                    | -55°C to +125°C |
| SL561 C                     | -30°C to +85°C  |
| Thermal Resistance          |                 |
| Chip - to - Ambient         |                 |
| SL561 CM                    | 225°C/W         |
| SL561 DP                    | 111°C/W         |
| Chip - to - case            |                 |
| SL561 CM                    | 65°C/W          |
| SL561 DP                    | 71°C/W          |

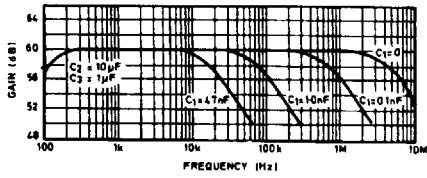


Fig.5 Gain v. frequency

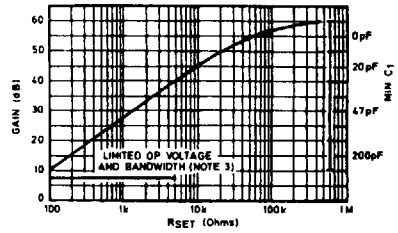


Fig.6 Gain v.  $R_{set}$

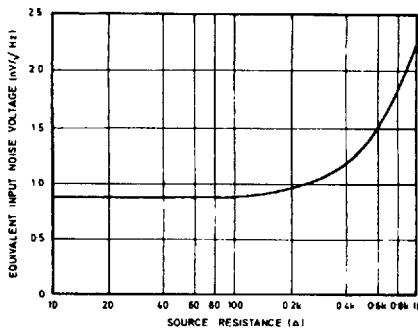


Fig.7 Noise v. source impedance

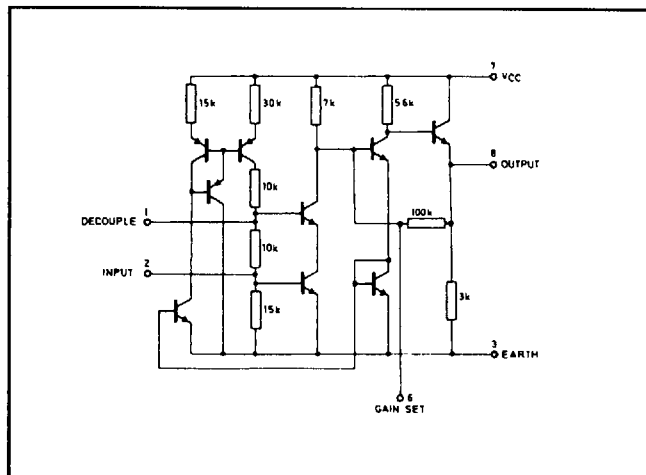


Fig.8 Circuit diagram