AF amplifier, VOGAD and sidetone amplifier

The SL622 and SL1626 are audio amplifier circuits with internal AGC designed to provide a constant output of about 100mV rms for 60dB of input range. In addition the SL622 has a separate sidetone output, not available in the SL1626.

When operated with single-ended input the SL622 and SL1626 have a dynamic range limited to about 40dB.

In general the following application notes apply to both these devices but there are some differences which have been noted.

Applications exist for these circuits wherever microphones are used: transmitters, intercommunication systems and telephone systems are obvious examples. They can also be usefully employed in radio receivers (in addition to the normal receiver AGC) to stabilise audio output.

CIRCUIT DESCRIPTION

The circuit consists of a two-section amplifier, AGC system, sidetone amplifier and voltage regulator. The SL1626 uses different circuit techniques to operate over the same supply range (+6V to +12V) without the use of a voltage regulator. Pin connections of the SL622 differ from those of the SL1626 which are shown in brackets.

CIRCUIT APPLICATIONS

Main Amplifier

The input stage is balanced and connected to pins 5(4) and 6(5). The input impedance is quite low (300 ohms balanced, 180 ohms single ended) and the inputs are self-biased. The pins may be connected together via a DC path or not, whichever is convenient, but they should not be connected to any other point at DC.

The dynamic range of the SL622 and SL1626 is about 40dB when driven single ended with the other input decoupled to ground. When driven push-pull with a balanced input, the range is about 60dB (100 microvolts to 100 millivolts rms).

AGC is applied just after the input stage and the output from the controlled stage coupled via a capacitor to the output stage. This capacitor sets the LF rolloff of the system.

A 2.2 microfarad capacitor, giving a 3dB point about 100Hz, is generally used. It is connected between pin 2(2) and 7(8); if a polarised capacitor is used the positive connection should be to pin 2. The HF rolloff is set by a capacitor between the output pin 8(9) and pin 7(8).

If the dynamic range of the circuit is too large (for instance in a mobile transmitter where vehicle background noise can be a problem) it may be reduced by placing a resistor between these two pins. The internal resistance between them is 10 kilohms and an external resistor of 1kilohms reduces the dynamic range to 40dB, 500 ohms to 34dB. The resistor should not be less than 500 ohms. The value of the HF rolloff capacitor depends on the value of

resistance between pins 7(8) and 8(9) and the 3dB frequency is the frequency at which the capacitive reactance equals the resistance. Hence, with no external resistor, a capacitor of 5nF is necessary for a 3dB point of 3kHz.

The output stage is an emitter follower and should therefore not be expected to drive a capacitive load. Its output impedance is about 50 ohms.

The AGC detector is connected to the main output and controls it to about 100mV rms. The AGC time constant is set by a resistor and capacitor in parallel from pin 1(10) to ground. The attack time constant is proportional to the capacitor, which should not be less than 22 microfarads, and is 0.4ms/microfarad. The decay time constant is proportional to the time constant of the resistor and capacitor and is 20dB/sec for a time constant of 50 seconds.The resistor should lie between 500 kilohms and 1.5 megohms. The usual values of R and C are 1 megohm and 50 microfarads which give about 20ms attack and 20dB/sec decay.

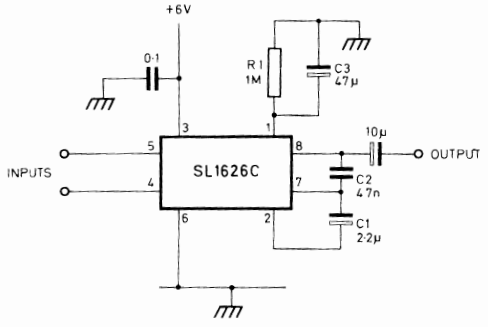

Fig. 14 Connection diagram for SL1626C used as a microphone amplifier

The problems associated with amplitude distortion inherent in simple VOGAD circuits have been largely overcome in the design of the SL622C. In certain circumstances, however, some distortion of the leading edge of the first spoken syllable can occur, but only after a considerable pause in speech. The effect is due to overshoot, which in turn results from capacitor C2 being allowed to discharge below the AGC threshold. In most applications however, the distortion is not of sufficient significance to justify the additional circuitry necessary for its elimination.

Since the device has only one earth connection for both input and output, care must be taken to avoid high impedance earth connections which might cause instability. In conditions where high RF fields may be encountered the can should be separately earthed to pin 7 or to a ground plane.

External Gain Control

Since the gain control voltage range of the SL622C is very small it is not really practicable to use the device as a VCA by applying a control voltage to the timing pin. However, the device can be easily muted by connecting the timing pin to +2V or held at full gain by earthing it. Some provision must be made for discharging C3 when the muting voltage is removed or the muting period will be prolonged until the capacitor has discharged through R1 (Fig. 14).

The Voltage Regulator (SL622C only)

The power supply is connected to pin 1; pin 3, which may be decoupled at LF to reduce supply ripple and improve sidetone linearity, is the +4.7V stabilised supply. It is recommended that pin 3 also be decoupled at HF by a 0.05 microfarad capacitor. Some users of the SL622C may wish to take small currents from pin 3 to other circuits requiring a stabilised supply. Whilst this is unlikely to harm the circuit if only one or two milliamperes are taken, the device may not perform to full specification. The current consumption of the integrated circuit rises from 14mA at 6V to 24mA at 12V.

Sidetone Amplifier (SL622C only)

The sidetone output is taken from pin 4 and is not frequency-shaped. The output impedance is 200 ohms and, like the main output, the sidetone output should not be used to drive capacitive loads.