AMPLIFIER PROJECTS

In use, there is little to distinguish between the four, low powered amplifiers, all perform well. There are, however, differences which make one device more suitable than another for a particular application.

Low current consumption is important when equipment is powered from dry batteries. Quiescent current drawn by the small amplifiers is in the region of 6mA (13mA for the LM380).

In the case of the LM386N, TBA820M and LM380, current rises to around 120mA when 500mW is being delivered into an 8 ohm load. Current consumed by the TDA7052 is approximately 220mA, or almost double, under these conditions.

In all cases, the signal input pin has been connected to the slider (moving contact) of the Volume control potentiometer (via a blocking capacitor in the case of the TDA2003). This minimises hum and noise and ensures that a more or less constant impedance is presented to the signal source. Potentiometers of 4700 ohms or 10 kilohms (10k) are usual, but the value can be increased to 100k to raise input impedance.

This will, however, make the circuits more vulnerable to mains hum, r.f. interference and instability, and the value should be kept as low as the signal source impedance permits. This applies particularly to the TDA7052, where the value of the Volume control should, if possible, be no more than 10k. Earlier comments regarding stability are of relevance here.

LM386N-1 AMPLIFIER

A circuit diagram for a simple amplifier using the low-voltage LM386N-1 power amplifier i.c. is shown in Fig.1. Also shown are the general performance and electrical characteristics of the circuit.

Blocking capacitor C1 prevents any disturbance of the d.c. conditions in the signal source and potentiometer VR1 (the Volume control) sets the input level. The manufacturers of the chip, National Semiconductor, suggest an input network to roll-off high frequencies and resistor R1 and capacitor C2 perform this function.

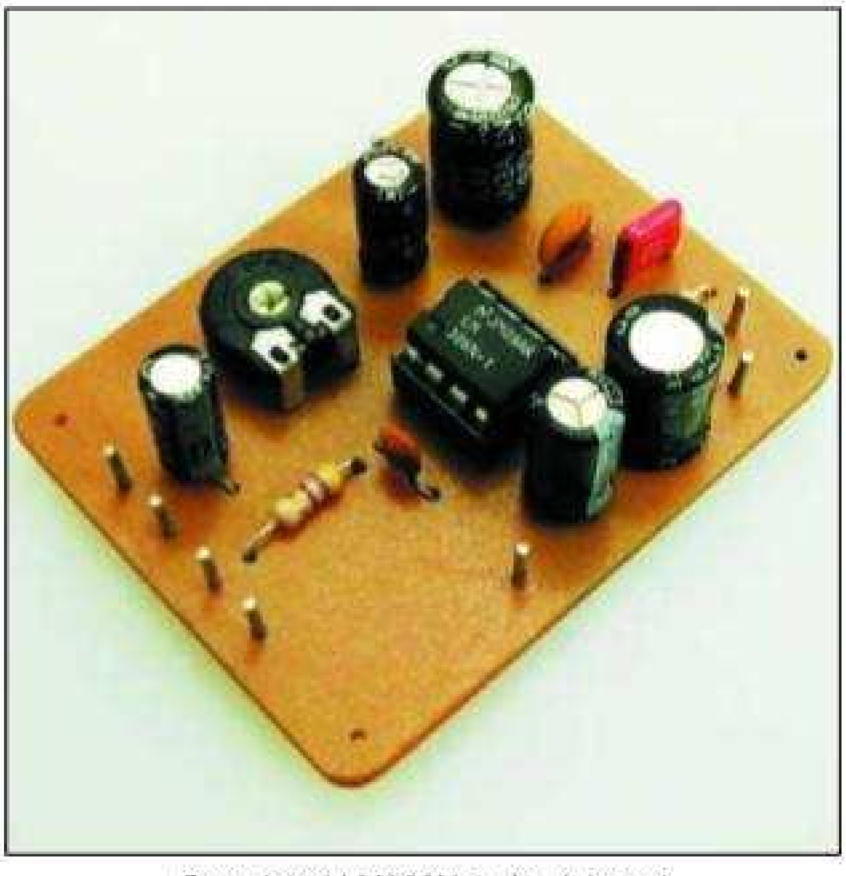
The unused non-inverting input (pin 3) is grounded to avoid instability when gain is set high. Capacitors C3 and C4, connected across the supply rails, prevent low and high frequency instability.

FEEDBACK

An internal negative feedback path can be accessed via pin 1 and pin 8. Bypass capacitor C5 reduces the feedback and increases the gain of the chip from 23 to 170 times (as measured: samples will vary). Preset potentiometer VR2 (wired as a variable resistor) controls the bypassing effect of C5 and enables the gain to be set within these limits.

Bypass capacitor C6 makes the device more immune to supply line ripple, and C8 couples the output to the speaker LS1. The Zobel network, formed by resistor R2 and capacitor C7, ensures that the speaker always presents a resistive load to the amplifier. Without these components there is a risk of high level transients causing damage to the output transistors.

Tabulated power output levels for various supply voltages and speaker impedances are included below the circuit diagram. Sustained operation at more than 300mW is not recommended.



Completed LM386N-1 circuit board.

CIRCUIT BOARD

The printed circuit board component layout, wiring details and full-size copper foil master pattern are shown in Fig.2. This board is available from the *EPE PCB Service*, code 343 (LM386N-1).

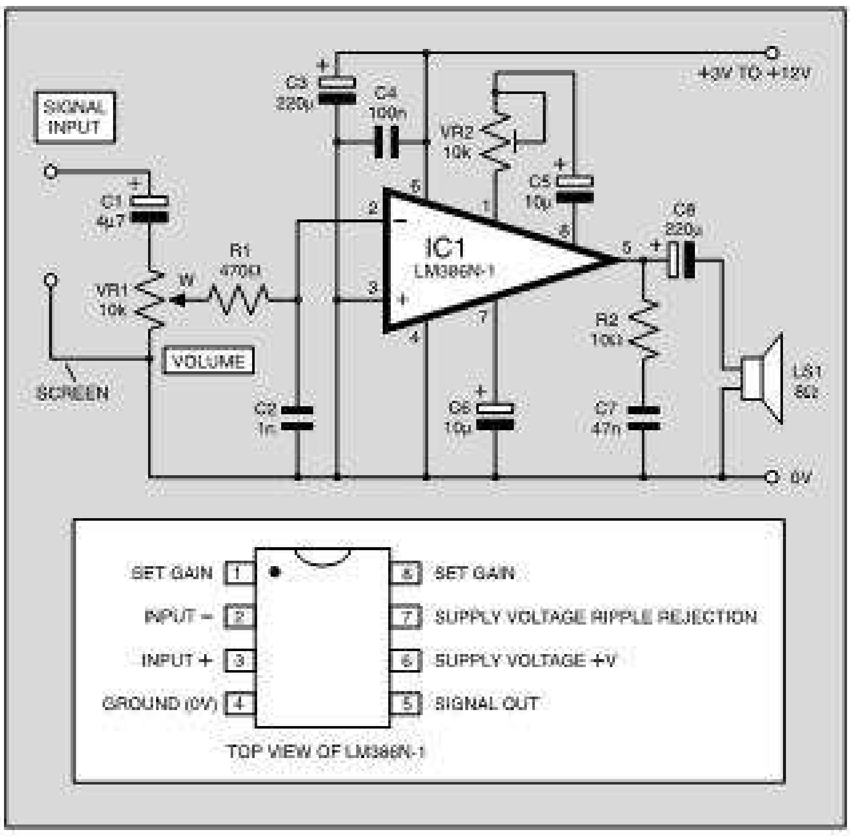


Fig.1. Circuit diagram and pinout details for the LM386N-1 Power Amplifier.

LM386N-1 POWER AMPLIFIER

R.M.S. power output just before the onset of waveform clipping

Speaker Impedance ohms	Supply Voltage 3V	4·5V	6V	9V	12V
4	60mW	150mW	320mW	500mW	–
8	26mW	105mW	200mW	560mW	900mW
16	15mW	60mW	110mW	320mW	605mW
32	-	35mW	62mW	170mW	330mW

Quiescent current:	6mA
Input resistance:	50k ohms
Input sensitivity for 560mW output (8 ohm load, 9V supply),	
(a) VR2 set for maximum resistance:	90mV r.m.s. (gain 23)
(b) VR2 set for minimum resistance:	12mV r.m.s. (gain 170)
Absolute maximum supply voltage, beyond which damage will occur:	15V
Suggested maximum supply voltage with a 4 ohm speaker	6V
Frequency response	up to 300kHz