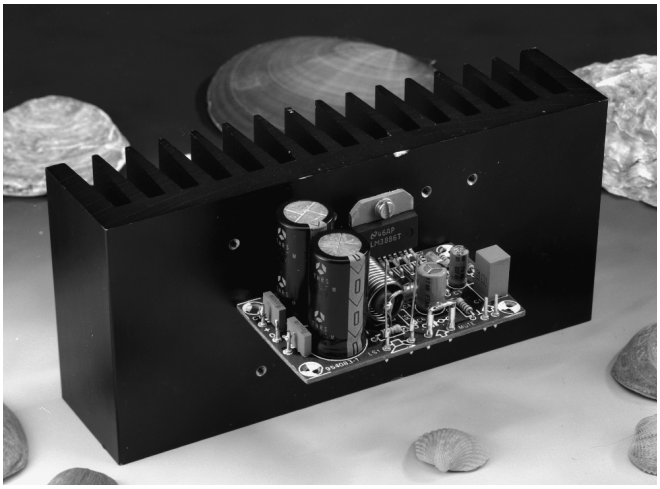
003 100-watt single-IC amplifier



Specifications *(8 Ω/1 kHz unless otherwise noted)*

Input sensitivity:	*1 V_{rms} (63 W into 8 Ω)*
Output power, 8 Ω:	*63 W (THD <1%)*
Output power, 4 Ω:	*108 W (THD <1%)*
Damping factor (8 Ω)	*>450 at 1 kHz*
	>170 at 20 kHz
Slew rate:	*>10 V/μs (rise time = 5 μs)*
Power bandwidth:	*8 Hz to 90 kHz*
Signal/noise ratio:	*94 dBA (1 W into 8 Ω)*

Design: T. Giesberts

According to National Semiconductor, the LM3886 is a high-performance 150W Audio Power Amplifier with Mute. The performance of the LM3886, say NS, utilising its Self Peak Instantaneous Temperature (°Ke) (SPIKe) protection circuitry, puts in a class above discrete and hybrid amplifiers by providing an inherently, dynamically protected Safe Operating Area (SOA). The LM3886T comes in an 11 (staggered-) lead non-isolated TO220 package.

We put the LM3886T through its paces, using two earlier publications (Ref. 1, 2) and an existing printed circuit board as a basis. For test purposes, the prototype of the amplifier was powered by a stabilised ±35-V supply. A maximum undistorted output power of about 63 watts into 8 ohms was obtained at a drive level of 1 Vrms. Dropping the load impedance to 4 ohms pushed the output power to no less then 108 watts. In practice, these power levels can be taken to mean 'music power', but do remember that the amplifier will not normally be powered from a regulated supply!

Great attention should be paid to the cooling of the amplifier IC. The cooling capacity offered by a heatsink as specified in the parts list is really only sufficient for load impedances of 6 ohms or more. Even if a heatsink with a thermal resistance lower than 1 K/W is employed, the amplifier IC will cause a 'hot spot' on the heatsink surface where the actual thermal resistance is much higher locally than the specification! With this in mind, it is recommended to drop the supply voltage to about ±30 V if the amplifier is used to drive a 4-ohm load. Also, bear in mind that heatsink isolating materials like mica and even ceramics tend to raise the thermal resistance by 0.2 K/W to 0.4 K/W. The metal tab at the back of the IC is at the negative supply potential.

Boucherot network C6-R6 is not normally required in this application, and should be omitted unless the amplifier is found to be unstable as a result of an application which is widely different from the one shown here.

Populating the amplifier board itself will be a piece of cake, and most of the time required to build the amplifier will go into drilling, cutting, mounting and isolating the heatsink. The printed circuit board shown here is available ready-made through the Publishers' Readers Services. Note that the radial electrolytic capacitors are rated at 40 volts, so you have to make sure that the supply voltage can never exceed that level. The performance of the prototype amplifier built and tested in our design lab is expressed by the Specifications box.

(984062-1)

COMPONENTS LIST

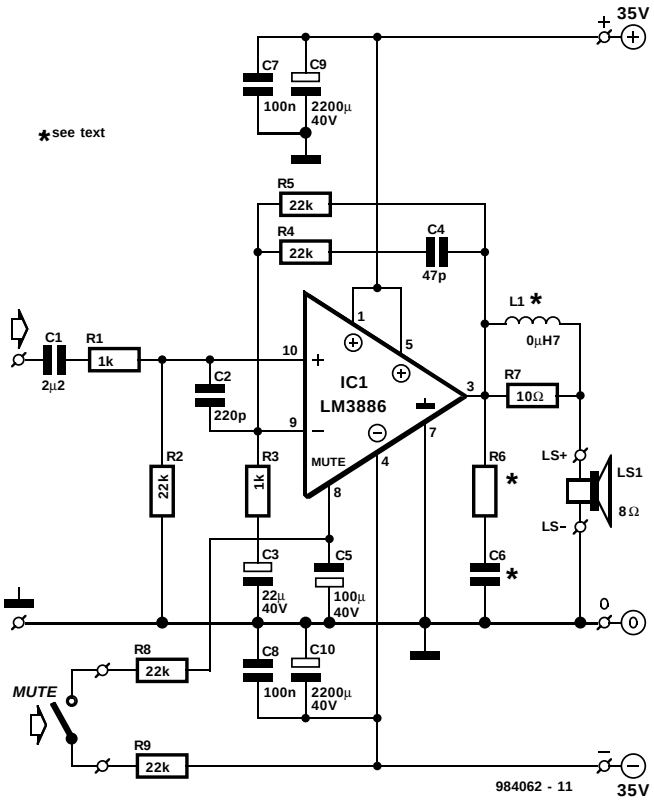
Resistors:
R1,R3 = 1kΩ
R2,R4,R5,R8,R9 = 22kΩ
R6 = not fitted, see text
R7 = 10Ω, 5W

Capacitors:
C1 = 2μF2, MKT (Siemens), pitch 5mm or 7.5mm
C2 = 220pF, 160V, axial, polystyrene (Siemens)
C3 = 22μF, 40V, radial
C4 = 47pF, 160V, axial, polystyrene (Siemens)
C5 = 100μF, 40V, radial
C6 = not fitted, see text
C7,C8 = 100nF
C9,C10 = 2200μF, 40V, radial, max. diameter 16mm

Inductor:
L1 = 0.7μH, 13 turns of 1.2-mm diameter (#18 SWG) enamelled copper wire, 10mm internal diameter, wound around R7.

Semiconductor:
IC1 = LM3886T (National Semiconductor)

Miscellaneous:
Heatsink for IC1: specification R_{th} < 1K/W
Printed circuit board, order code 954083-1.



References:

1. LM3886 150W Audio Power Amplifier with Mute (Application Note), *Elektor Electronics* May 1995.
2. Single-chip 50 W AF Amplifier, *Elektor Electronics* December 1995.