

80 WATT AUDIO AMP

160 WATT AUDIO AMP

IT IS VERY EASY TO BUILD A POWERFUL AUDIO AMP USING JUST ONE MAIN COMPONENT MADE BY NATIONAL SEMICONDUCTOR.

BELOW IS THE N.S. COMPONENT DATA SHEET FOR THE LM12 AND A SCHEMATIC OF THE AUDIO AMPLIFIER.

LM12 80W Operational Amplifier

General Description

The LM12 is a power op amp capable of driving $\pm 25V$ at $\pm 10A$ while operating from $\pm 30V$ supplies. The monolithic IC can deliver 80W of sine wave power into a 4 Ω load with 0.01% distortion. Power bandwidth is 60 kHz. Further, a peak dissipation capability of 600W allows it to handle reactive loads such as transducers, actuators or small motors without derating. Important features include:

- input protection
- controlled turn on
- thermal limiting
- overvoltage shutdown
- output-current limiting
- dynamic safe-area protection

The IC delivers $\pm 10A$ output current at any output voltage yet is completely protected against overloads, including shorts to the supplies. The dynamic safe-area protection is provided by instantaneous peak-temperature limiting within the power transistor array.

The turn-on characteristics are controlled by keeping the output open-circuited until the total supply voltage reaches 14V. The output is also opened as the case temperature

exceeds 150°C or as the supply voltage approaches the BVCEO of the output transistors. The IC withstands overvoltages to 80V.

This monolithic op amp is compensated for unity-gain feedback, with a small signal bandwidth of 700 kHz. Slew rate is 9V/ μs , even as a follower. Distortion and capacitive-load stability rival that of the best designs using complementary output transistors. Further, the IC withstands large differential input voltages and is well behaved should the common-mode range be exceeded.

The LM12 establishes that monolithic ICs can deliver considerable output power without resorting to complex switching schemes. Devices can be paralleled or bridged for even greater output capability. Applications include operational power supplies, high-voltage regulators, high-quality audio amplifiers, tape-head positioners, x-y plotters or other servo-control systems.

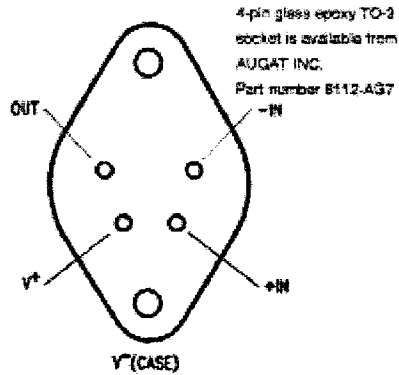
The LM12 is supplied in a four-lead, TO 3 package with V⁺ on the case. A gold eutectic die attach to a molybdenum interfac is used to avoid thermal fatigue problems. The LM12 is specified for either military or commercial temperature range.

Here is the pin layout of the LM12CLK:

NOTE THE CASE'S PIN DESIGNATION.

THE DEVICE MUST BE WELL HEAT SINKED WITH HEAT SINK COMPOUND AND COOLED WITH A SMALL FAN. USE A HEAT SINK THAT IS AT LEAST 8 TIMES LARGER THAN THE DEVICE, USE A SMALL MUFFIN FAN TO COOL.

Connection Diagram

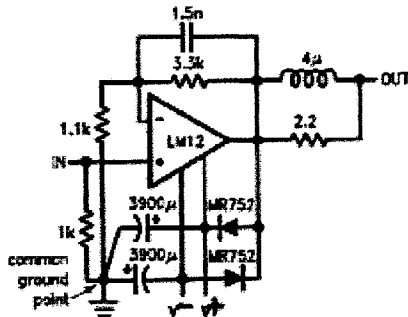


TL/H/8704-1

Bottom View

Order Number LM12CLK
See NS Package Number K04A

HERE IS A SCHEMATIC DIAGRAM OF THE AMPLIFIER WITH COMPONENT VALUES LISTED ON THE DIAGRAM.



TL/H/8704-2

*Low distortion (0.01%) audio amplifier

THE 4μ HENRY INDUCTOR MUST BE METAL CANNED FOR MAXIMUM DISTORTION FREE SOUND. THE ENTIRE CIRCUIT MUST BE EMI SHIELDED, AS IS COMMON PRACTICE WITH ALL HIGH QUALITY AMPS. TO ALLOW FOR EASY OPERATION AND LOW COST REPRODUCTION, YOU CAN USE A VOLTAGE CONVERTER OR DC TO DC CONVERTER TO OBTAIN YOUR V+ AND V- VOLTAGES RATHER THAN USE TWO POWER SUPPLIES, BUT IT'S UP TO YOU.

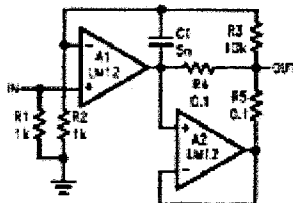
HERE IS THE SCHEMATIC DIAGRAM FOR THE 160 WATT PARALLEL OPERATION SYSTEM. THERE IS ONLY ONE DRAW BACK WHICH IS NOTED ON THE SPEC LISTING BELOW BUT THIS AMP WILL DO FINE FOR SUBWOOFER OR MIDRANGE DRIVING. REMEMBER THIS IS 160W RMS, NOT PEAK TO PEAK. SO ACTUAL AUDIO P-P POWER RATING IS AROUND 400WATTS OF POWER.

HERE IS THE SCHEMATIC FOR THE AMP:

ONCE AGAIN NOTE THAT THE HIGH FREQUENCY CAPABILITIES OF THIS ARRANGEMENT WILL ONLY ALLOW FOR WOOFER OR SUBWOOFER DRIVING OR MIDRANGE DRIVING IF YOU WANT TO RISK IT. GENERALLY TWEETER AND MIDRANGE DO NOT REQUIRE SUCH HIGH POWER AS THE SUBS AND WOOFERS.

With parallel operation there will be an increase in unloaded supply current related to the offset voltage of A_2 and A_3 across the equalization resistors. In some cases, it may be desirable to use input compensation on the followers for increased stability. It is important that the source resistance introduced by input compensation not increase the offset voltage overmuch.

A method of paralleling op amps that does not require a separate control amplifier is shown in *Figure 7*. The output buffer, A_2 , provides load current through R_5 equal to that supplied by the main amplifier, A_1 , through R_4 . Again, more output buffers can be added.



TUW/6710-13

Figure 7. Two power op amps can be paralleled using this master/slave arrangement, but high frequency performance suffers.

The cross-supply current between the outputs of paralleled amplifiers can be affected by gain error as the power-bandwidth limit is approached. In the first circuit, the operating-current increase will depend upon the matching of the high-frequency characteristics. In the second circuit, however, the entire input error of A_2 appears across R_4 and R_5 . The supply current increase can cause the power limiting to be activated as the slew limit is approached. This will not damage the LM12. It can be avoided in both cases by connecting A_1 as an inverting amplifier and restricting bandwidth with C_1 .