

Ordering number: EN 3607A

Monolithic Linear IC

**SANYO**

No.3607A

**LA4620**

**Two-channel Audio Power Amplifier**

## OVERVIEW

The LA4620 is a two-channel high-power audio amplifier for automotive stereo and general-purpose audio amplification equipment.

The LA4620 has a 6 to 22 V operating supply voltage range. Each channel uses a bridge configuration to obtain high output power from low supply voltages. Typical output power is 17 W per channel.

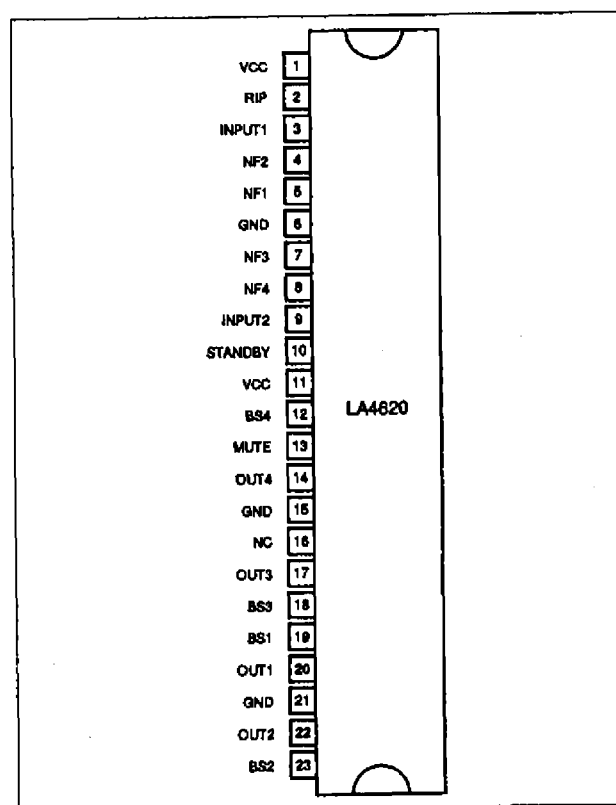
The LA4620 incorporates a thermal protection circuit, an output short-circuit protection circuit and a pop suppression circuit. It has low-power, logic-level standby control and mute control inputs.

The LA4620 is available in 23-pin SIPs and operates from a 15 V supply.

## FEATURES

- 17 W output power per channel
- 6 to 22 V supply voltage range
- Pop suppression
- Logic-controlled standby mode
- Thermal protection
- Short-circuit protection
- 60 dB channel separation
- 58 dB supply voltage ripple rejection
- 0.2% harmonic distortion
- 23-pin SIP

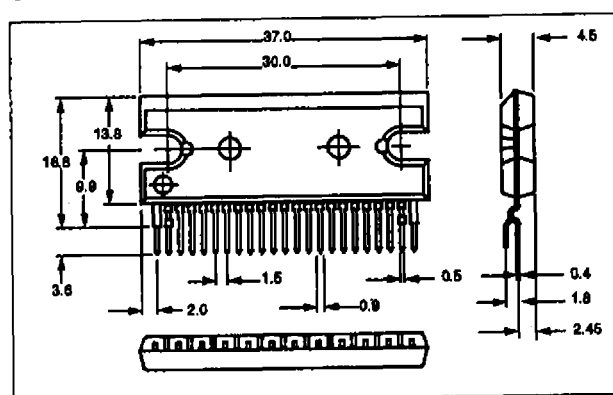
## PINOUT



## PACKAGE DIMENSIONS

Unit: mm

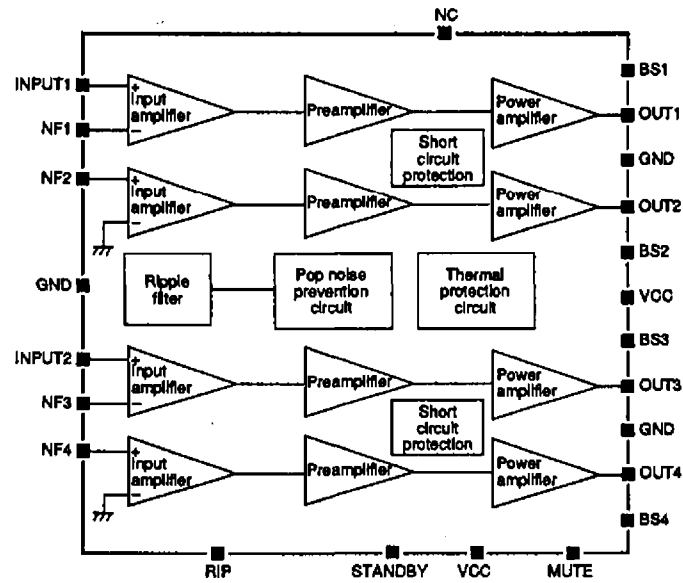
SIP23HZ-3160



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2071TS(US) No.3607-1/8

## BLOCK DIAGRAM



## PIN DESCRIPTION

| Number | Name    | Description                       |
|--------|---------|-----------------------------------|
| 1      | VCC     | Supply voltage                    |
| 2      | RIP     | Ripple filter                     |
| 3      | INPUT1  | Channel 1 input                   |
| 4      | NF2     | Channel 1 negative feedback input |
| 5      | NF1     | Channel 1 negative feedback input |
| 6      | GND     | Ground                            |
| 7      | NF3     | Channel 2 negative feedback input |
| 8      | NF4     | Channel 2 negative feedback input |
| 9      | INPUT2  | Channel 2 input                   |
| 10     | STANDBY | Standby switch                    |
| 11     | VCC     | Supply voltage                    |
| 12     | BS4     | Channel 2 bootstrap capacitor     |
| 13     | MUTE    | Muting control                    |
| 14     | OUT4    | Channel 2 output                  |
| 15     | GND     | Ground                            |
| 16     | NC      | No connection                     |
| 17     | OUT3    | Channel 2 output                  |
| 18     | BS3     | Channel 2 bootstrap capacitor     |
| 19     | BS1     | Channel 1 bootstrap capacitor     |
| 20     | OUT1    | Channel 1 output                  |
| 21     | GND     | Ground                            |
| 22     | OUT2    | Channel 1 output                  |
| 23     | BS2     | Channel 1 bootstrap capacitor     |

# LA4620

## SPECIFICATIONS

### Absolute Maximum Ratings

| Parameter                   | Symbol       | Rating     | Unit   |
|-----------------------------|--------------|------------|--------|
| Supply voltage              | $V_{CC}$ max | 24         | V      |
| Power dissipation           | $P_d$ max    | 37.5       | W      |
| Operating temperature range | $T_{opr}$    | -20 to 75  | deg. C |
| Storage temperature range   | $T_{stg}$    | -40 to 150 | deg. C |

### Recommended Operating Conditions

$T_a = 25$  deg. C

| Parameter            | Symbol   | Rating  | Unit     |
|----------------------|----------|---------|----------|
| Supply voltage       | $V_{CC}$ | 12, 15  | V        |
| Supply voltage range | $V_{CC}$ | 6 to 22 | V        |
| Load resistance      | $R_L$    | 4       | $\Omega$ |

#### Note

When operating at 22 V with a load of 4  $\Omega$ , ensure that the output power,  $P_o$ , does not exceed 1 W per channel.

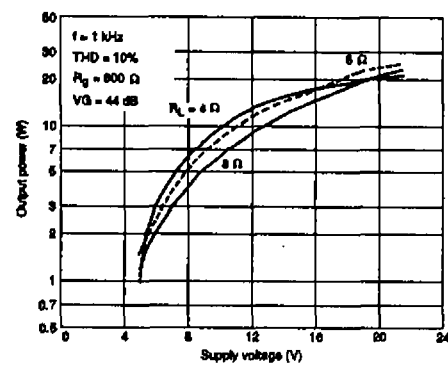
### Electrical Characteristics

$V_{CC} = 15$  V,  $T_a = 25$  deg. C,  $f_{IN} = 1$  kHz,  $R_L = 4$   $\Omega$ ,  $R_g = 600$   $\Omega$  unless otherwise noted

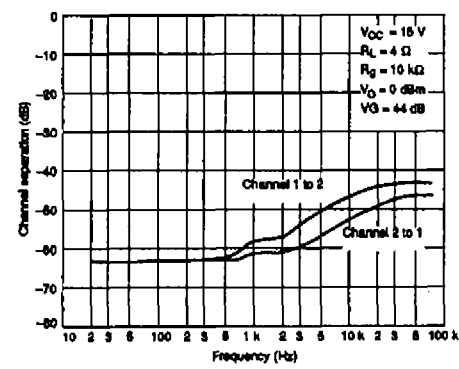
| Parameter                       | Symbol    | Condition                                                          | Rating |     |     | Unit       |
|---------------------------------|-----------|--------------------------------------------------------------------|--------|-----|-----|------------|
|                                 |           |                                                                    | Min    | Typ | Max |            |
| Quiescent current               | $I_{CCO}$ |                                                                    | 50     | 75  | 120 | mA         |
| Standby current                 | $I_{ST}$  |                                                                    | —      | 1   | 10  | $\mu$ A    |
| Output power                    | $P_{O1}$  | $V_{CC} = 12$ V, THD = 10%                                         | 10     | 13  | —   | W          |
|                                 | $P_{O2}$  | $V_{CC} = 15$ V, THD = 10%                                         | 14     | 17  | —   | W          |
| Total harmonic distortion       | THD       | $P_o = 1$ W                                                        | —      | 0.2 | 1.0 | %          |
| Input resistance                | $R_{IN}$  |                                                                    | 17     | 24  | 31  | k $\Omega$ |
| Voltage gain                    | VG        |                                                                    | 42     | 44  | 46  | dB         |
| Output noise voltage            | $V_{NO1}$ | $R_g = 0$ $\Omega$ , bandpass frequency range = 20 Hz to 20 kHz    | —      | 0.2 | 0.5 | mV         |
|                                 | $V_{NO2}$ | $R_g = 10$ k $\Omega$ , bandpass frequency range = 20 Hz to 20 kHz | —      | 0.5 | 1.0 | mV         |
| Channel separation              | SEP       | $R_g = 10$ k $\Omega$ , $V_o = 0$ dBm                              | 45     | 60  | —   | dB         |
| Supply voltage ripple rejection | SVRR      | $R_g = 0$ $\Omega$ , $f_R = 100$ Hz, $V_{CCR} = 0$ dBm             | 45     | 58  | —   | dB         |
| Offset voltage                  | $V_{OS}$  | $R_g = 0$ $\Omega$                                                 | -180   | —   | 180 | mV         |

## Typical Performance Characteristics

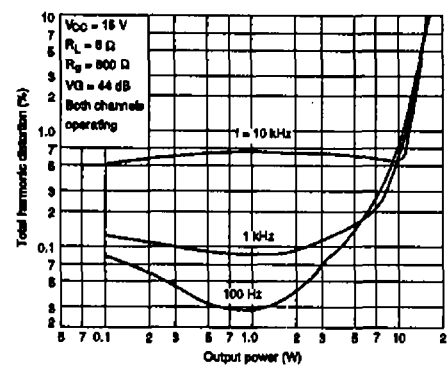
### Output power vs. supply voltage



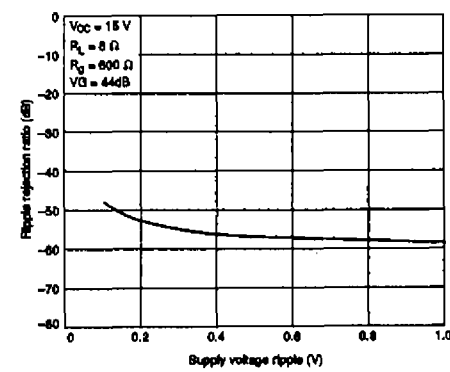
### Channel separation vs. frequency



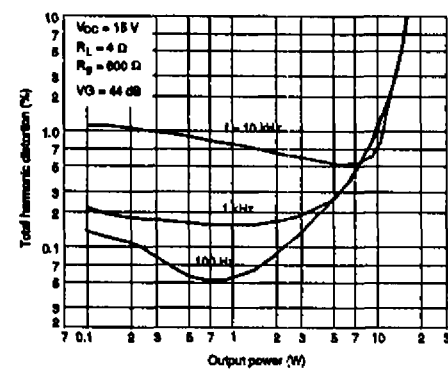
### THD vs. output power (1)



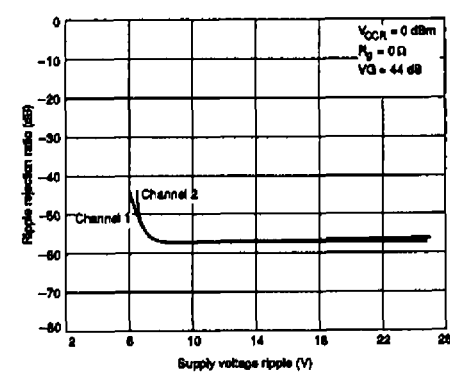
### Supply voltage ripple rejection vs. ripple voltage



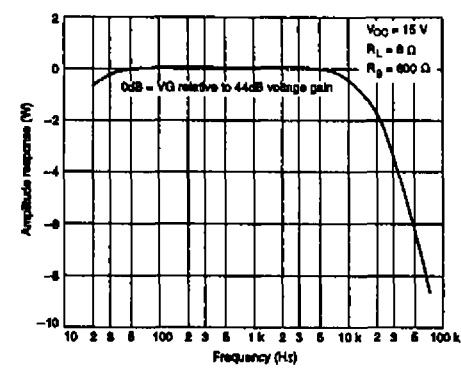
### THD vs. output power (2)



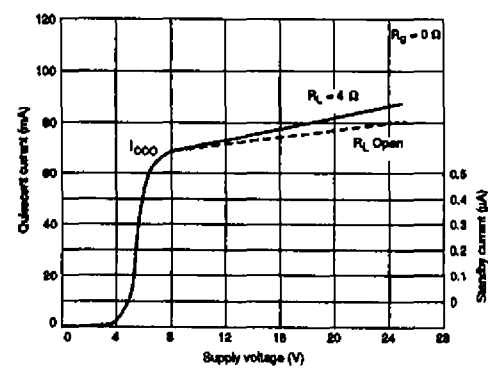
### Supply voltage ripple rejection vs. supply voltage



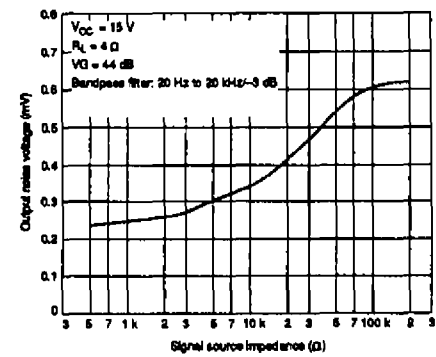
### Frequency response



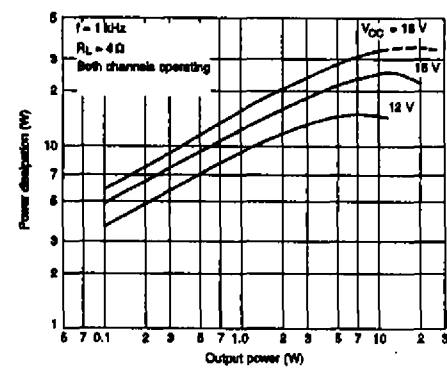
Quiescent and standby current vs. supply voltage



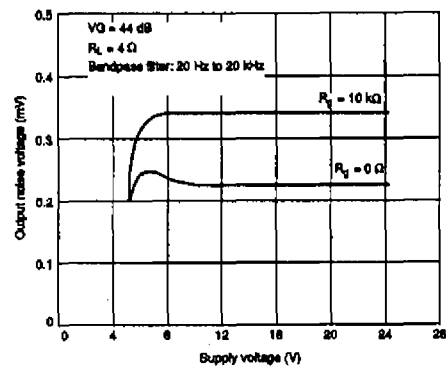
Noise voltage vs. source impedance



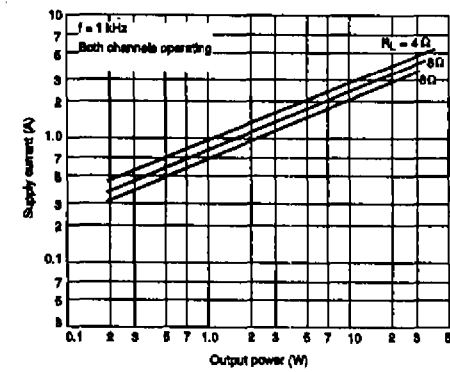
Power dissipation vs. output power



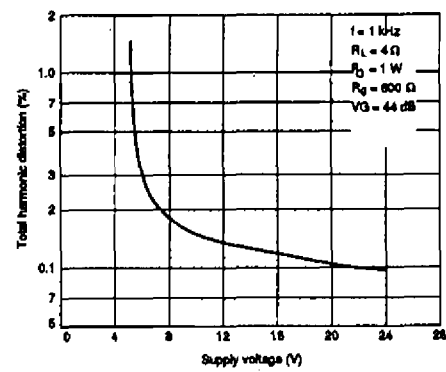
Noise voltage vs. supply voltage



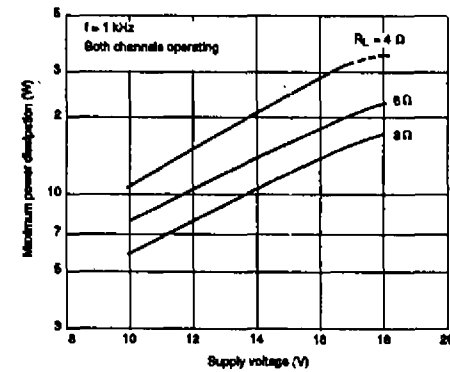
Supply current vs. output power



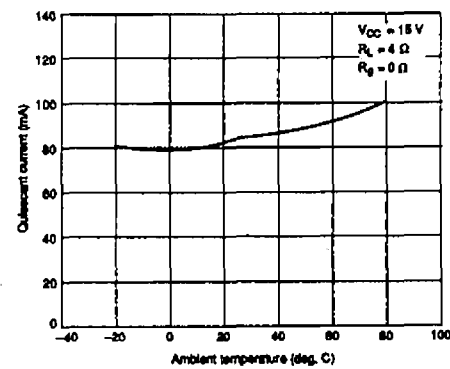
Total harmonic distortion vs. supply voltage



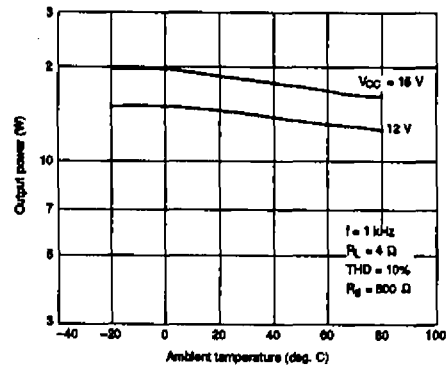
Maximum power dissipation vs. supply voltage



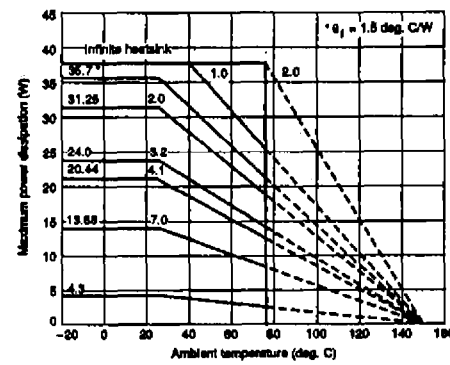
Quiescent current vs. ambient temperature



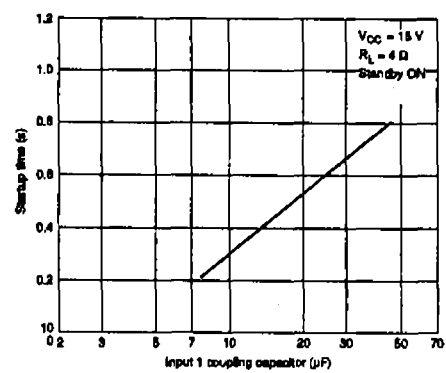
Output power vs. ambient temperature



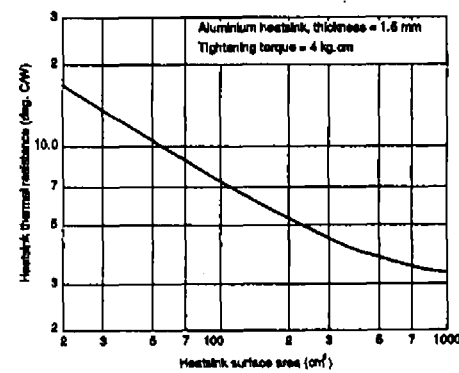
Maximum power dissipation vs. ambient temperature



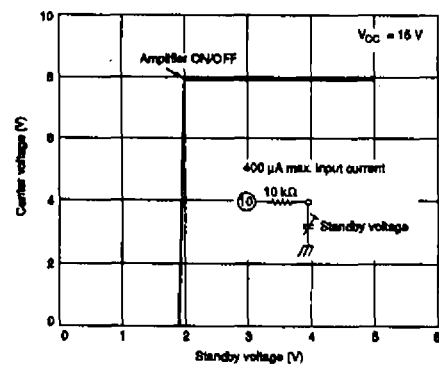
Startup time vs. C9



Maximum heatsink thermal resistance vs. surface area



Standby switching characteristic



## FUNCTIONAL DESCRIPTION

### Standby Mode Control

Applying 1.5 V or more to R3 at STANDBY SW enables the amplifier. The maximum input current is 400  $\mu$ A.

### Mute Control

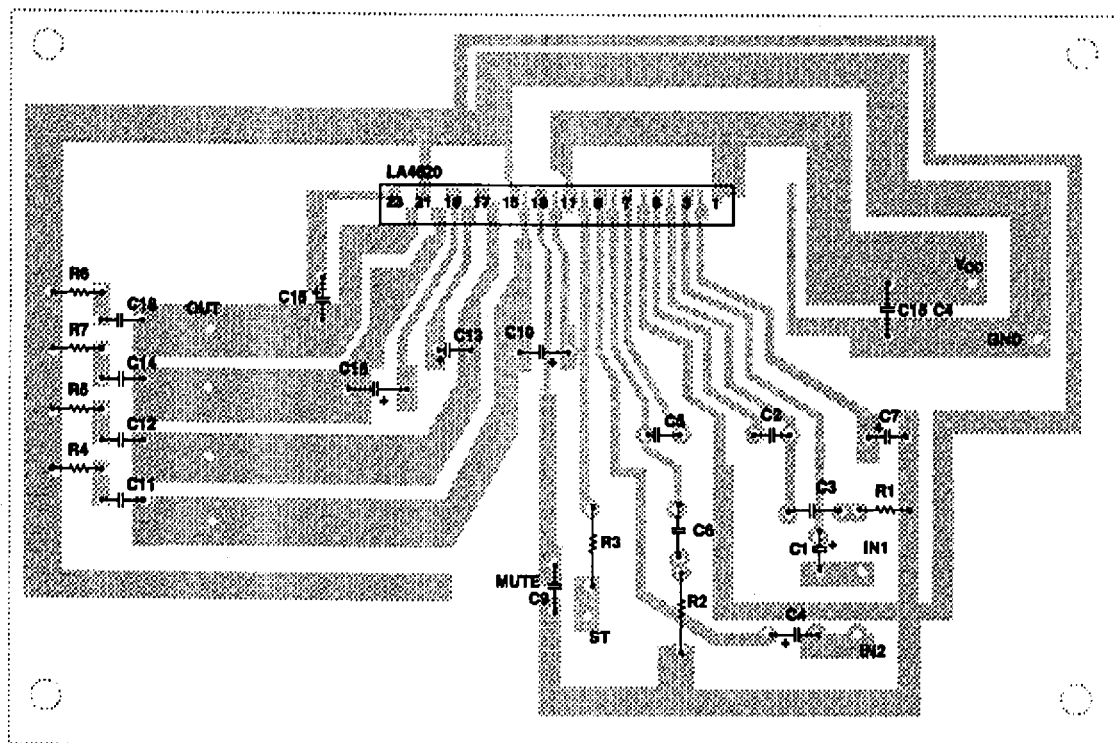
Pulling MUTE to ground mutes the amplifier. The start-up time and recovery time when MUTE is pulled HIGH can be adjusted by changing C9.

### Short-circuit Protection

The LA4620 incorporates a protection circuit for short circuits between output pins. However, this is inadequate for short circuits to ground or the supply. See the design notes.

## LA4620

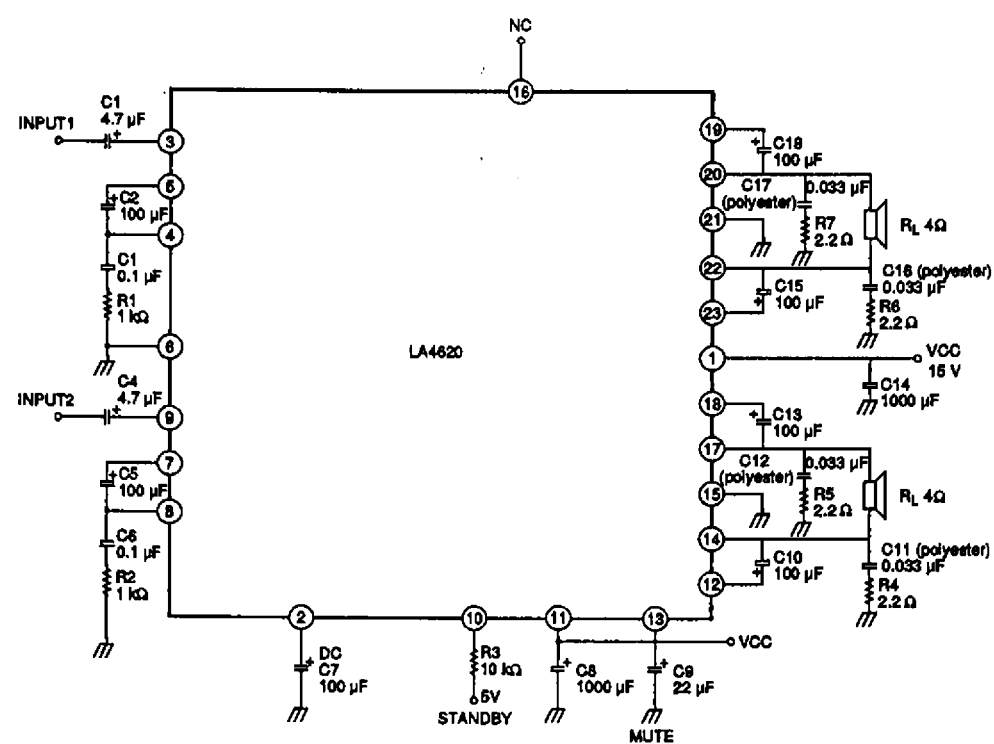
### PRINTED CIRCUIT BOARD LAYOUT



#### Note

Board size: 125 × 85 mm  
Surface finish: Copper foil

### TYPICAL APPLICATION



## DESIGN NOTES

### Input Capacitors

C1 and C4 are input coupling capacitors. They should both be 4.7  $\mu\text{F}$  or less.

### Feedback Capacitors

C2 and C5 form the negative feedback network. They should both be between 47 and 100  $\mu\text{F}$ .

### Supply Decoupling Capacitor

C7 should be 100  $\mu\text{F}$ .

### Supply Ripple Filter Capacitors

C8 and C14 smooth the supply voltage. Both should be at least 1,000  $\mu\text{F}$ , and one of at least 2,000  $\mu\text{F}$  can be used.

### Startup Time Capacitor

C9 determines the amplifier startup time.

### Bootstrapping Capacitors

C10, C13, C15 and C18 improve the device linearity for a wide range of input signals. These capacitors should be between 47 and 100  $\mu\text{F}$  to improve the low-frequency response.

### Oscillation Suppression

The R1 and C3, and R2 and C6 networks suppress oscillation. Use ceramic or mylar capacitors of 0.1  $\mu\text{F}$  or more. Avoid using very large capacitances as these can cause high-frequency distortion.

C11, C12, C16, and C17 form RC networks with R4, R5, R6 and R7, respectively. Use mylar capacitors of 33 nF or more to prevent instability caused by circuit board layout.

### Standby Control Current Limiting Resistor

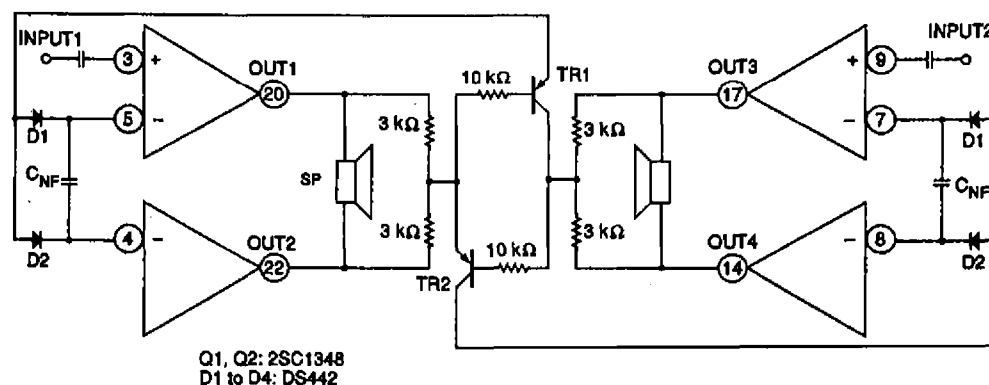
R3 limits the current applied to STANDBY SW. It should be 10  $\Omega$  or more.

### Heatsinking

The LA4620 should always be operated with a heatsink. If the heatsink does not provide adequate thermal dissipation, the thermal protection circuit will attenuate the signal level when the device overheats to prevent long-term thermal stress.

### Short-circuit Protection

If outputs can be shorted either to ground or the supply, use an external circuit to protect the device as shown in the following figure.



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