



**SANYO Semiconductors**  
**DATA SHEET**

**LA4600** — **Monolithic Linear IC**  
**For Radio Cassette Recorders**  
**Audio Power Amplifier**

**Overview**

The LA4600 is an audio power amplifier which requires minimum count of external parts by incorporating BS capacitor, NF capacitor; and oscillation prevention CR components into the IC circuitry.

**Features**

- Output power :  $V_{CC} = 12V/4\Omega$ ..... 4.0W×2  
 $V_{CC} = 9V/4\Omega$  ..... 2.0W×2
- Built-in standby switch
- Built-in overheat protection (TSD)

**Specifications**

**Maximum Ratings** at  $T_a = 25^\circ C$

| Parameter                   | Symbol         | Conditions              | Ratings     | Unit         |
|-----------------------------|----------------|-------------------------|-------------|--------------|
| Maximum supply voltage      | $V_{CC}$ max   | $R_g = 0$ (No signal)   | 24          | V            |
| Allowable power dissipation | $P_d$ max      | With an arbitrary large | 12.5        | W            |
| Thermal resistance          | $\theta_{j-c}$ |                         | 10.0        | $^\circ C/W$ |
| Operating temperature       | $T_{opr}$      |                         | -20 to +75  | $^\circ C$   |
| Storage temperature         | $T_{stg}$      |                         | -40 to +150 | $^\circ C$   |

**Operating Conditions** at  $T_a = 25^\circ C$

| Parameter                       | Symbol      | Conditions             | Ratings   | Unit     |
|---------------------------------|-------------|------------------------|-----------|----------|
| Recommended supply voltage      | $V_{CC}$    |                        | 12        | V        |
| Recommended load resistance     | $R_L$       |                        | 4         | $\Omega$ |
| Operating supply voltage range  | $V_{CC}$ op | Within maximum ratings | 5.0 to 22 | V        |
| Operating load resistance range | $R_L$ op    |                        | 2.7 to 8  | $\Omega$ |

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

# LA4600

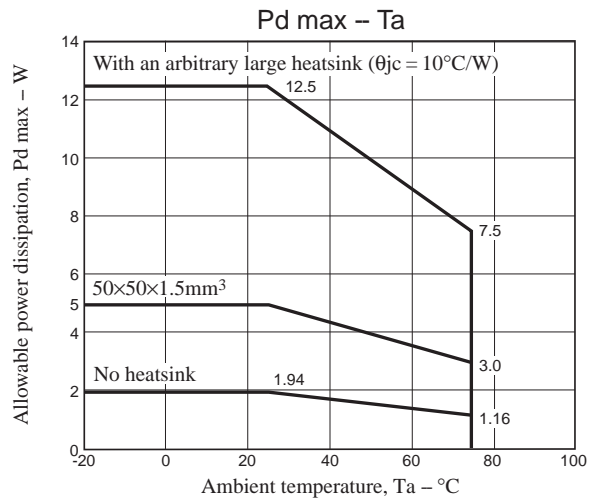
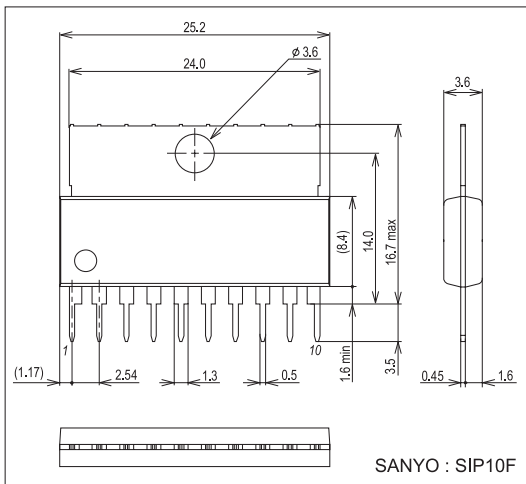
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 12\text{V}$ ,  $R_L = 4\Omega$ ,  $f = 1\text{kHz}$

| Parameter                 | Symbol    | Conditions   | Ratings |      |      | Unit          |
|---------------------------|-----------|--|---------|------|------|---------------|
|                           |           |  | min     | typ  | max  |               |
| Standby current           | $I_{ST}$  | Standby pin $\rightarrow$ GND                                    |         | 1.0  | 10   | $\mu\text{A}$ |
| Quiescent current         | $I_{CCO}$ | $R_g = 0$  | 18      | 32   | 64   | mA            |
| Voltage gain              | $V_G$     | $V_O = 0\text{dBm}$  | 43.0    | 45.0 | 47.0 | dB            |
| Total harmonic distortion | THD       | $P_O = 1\text{W}$  |         | 0.2  | 0.8  | %             |
| Output noise voltage      | $V_{NO}$  | $R_g = 0$ , DIN AUDIO  |         | 0.15 | 0.5  | mV            |
| Output voltage            | $P_{O1}$  | THD = 10%  | 3.0     | 4.0  |      | W             |
|                           | $P_{O2}$  | $V_{CC} = 9\text{V}$ , THD = 10%                                 | 1.5     | 2.0  |      | W             |
| Channel separation        | CHsep     | $V_O = 0\text{dBm}$ , $R_g = 0$ , DIN AUDIO                      | 50      | 60   |      | dB            |
| Ripple rejection ratio    | SVRR      | $V_R = 0\text{dBm}$ , $R_g = 0$ , $f_r = 100\text{Hz}$ DIN AUDIO | 45      | 55   |      | dB            |
| Standby ON voltage        | $V_{ST}$  |  | 1.5     | 5.0  |      | V             |
| Input resistance          | $R_i$     |  | 2.0     | 30   | 40   | K $\Omega$    |

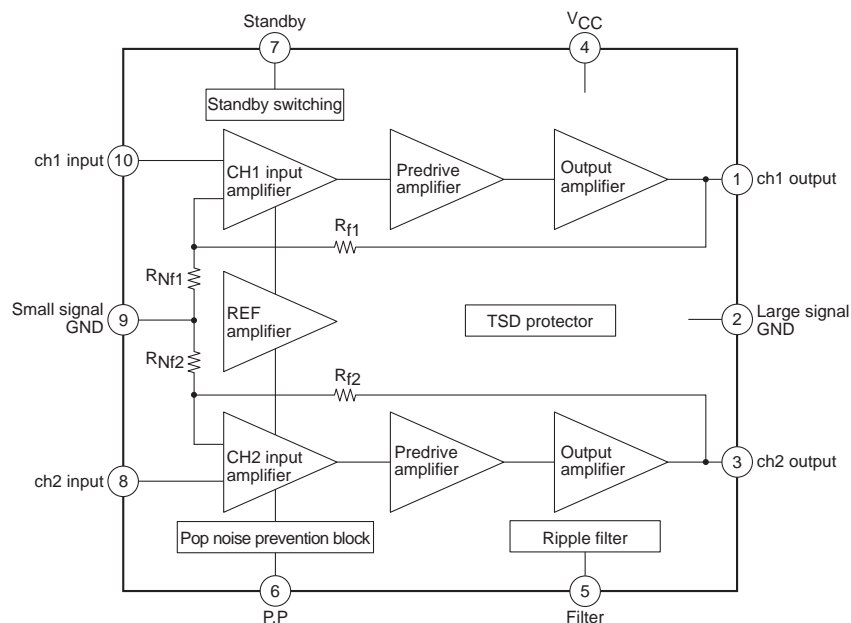
## Package Dimensions

unit : mm (typ)

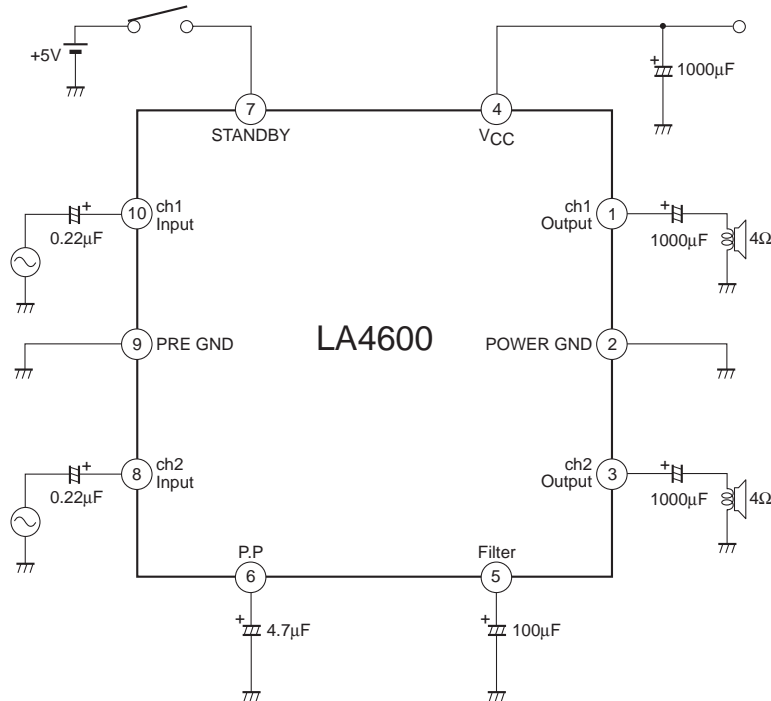
3046D



## Block Diagram



Sample Application



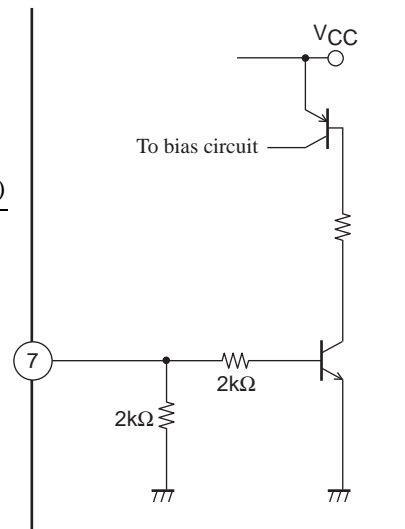
Pin Descriptions

1. Standby switching function (7)

Power is switched ON and OFF by controlling the High and Low states at pin 7, respectively (standby). To switch power ON, apply 1.5V or more, or 800µA to pin 7.

$$\text{Current supplied to pin 7} \approx \frac{\text{Applied voltage}}{2\text{k}\Omega} + \frac{\text{Applied voltage} - V_{BE} \text{ (approx. } 0.7\text{V)}}{2\text{k}\Omega}$$

- When directly connecting a microcontroller with this pin, add a resistor in series to optimize the current for the microcontroller.



2. Input pins (8, 10)

Voltage at the input pins is approx.  $2V_{BE}$  (1.4V).

Input impedance is approx. 30kΩ.

- The recommended value for the input capacitor is 0.22µF, but this can be varied in order to adjust the starting time ( $t_s$ ). (The starting time is the time required from applying voltage to the standby pin until sound output is obtained.)

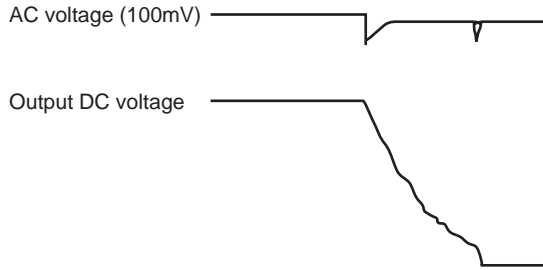
|                         |       |       |       |       |      |
|-------------------------|-------|-------|-------|-------|------|
| Input capacitor         | 1.0µF | 2.0µF | 3.3µF | 4.7µF | 10µF |
| Starting time ( $t_s$ ) | 0.2s  | 0.3s  | 0.5s  | 0.65s | 1.5s |

3. Filter (decoupling) pin (5)

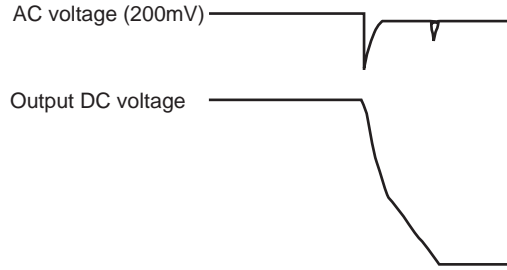
Pin voltage is approx.  $1/2V_{CC}$ .

The recommended value for the filter capacitor is  $100\mu\text{F}$ .

When capacitance is lower, pop noise when setting the standby pin to Low (power OFF) will increase.



Filter capacitor =  $100\mu\text{F}$



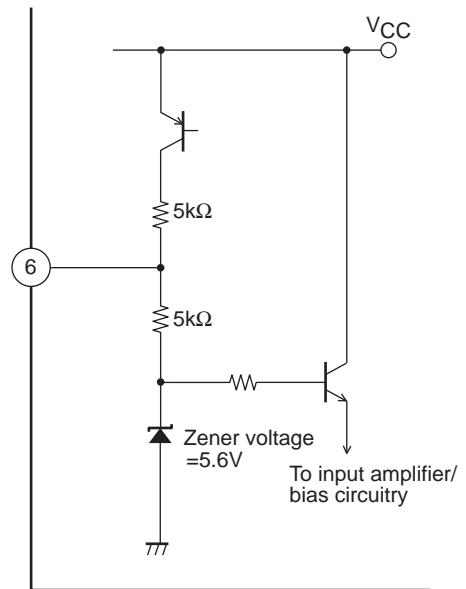
Filter capacitor =  $47\mu\text{F}$

4. P.P (pop noise) pin (6)

$$\text{Voltage at pin 6} \approx \frac{V_{CC} - V_{CE} (\text{approx. } 0.3\text{V}) - 5.6\text{V}}{2\text{k}\Omega} + 5.6\text{V}$$

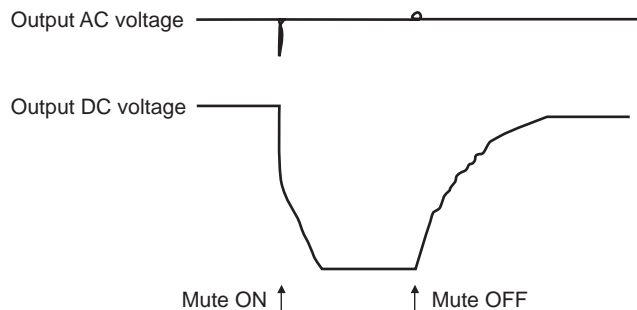
- The recommended value for the P.P capacitor is  $4.7\mu\text{F}$ .  
When capacitance is lower than  $2.2\mu\text{F}$ , pop noise when setting the standby pin to Low (power OFF) will increase.

When capacitance is higher than  $10\mu\text{F}$ , the sound will not be cut off when setting the standby pin to Low (power OFF).

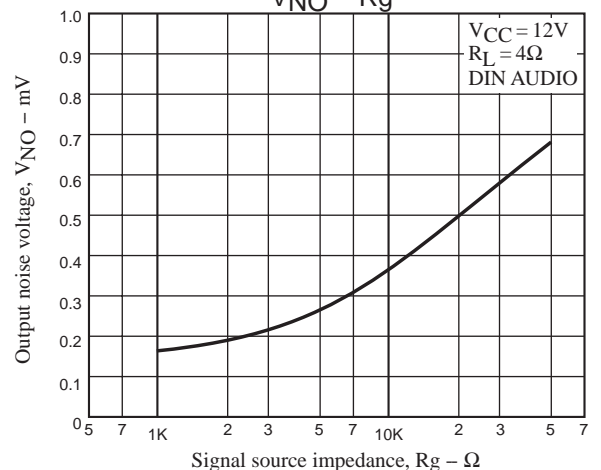
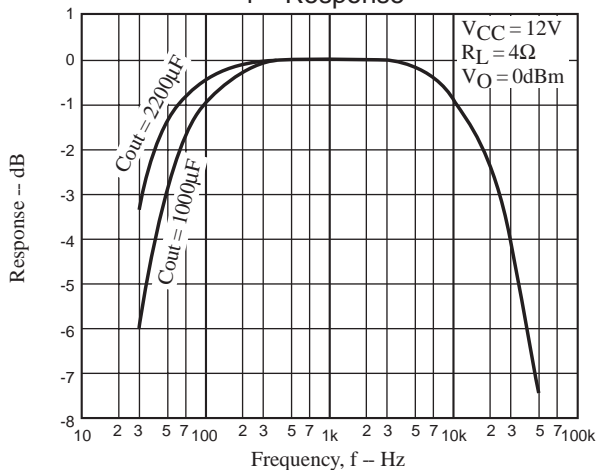
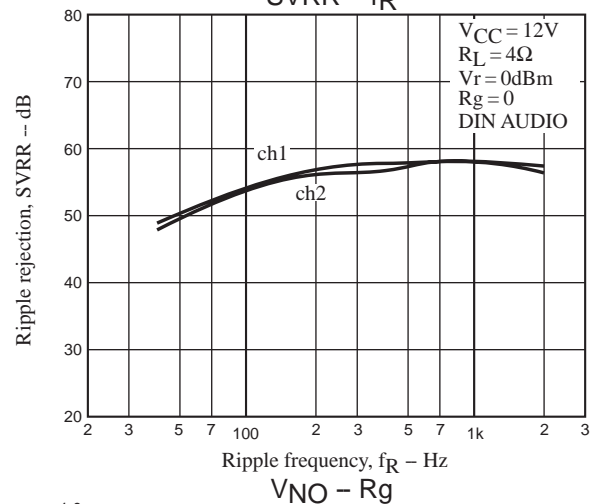
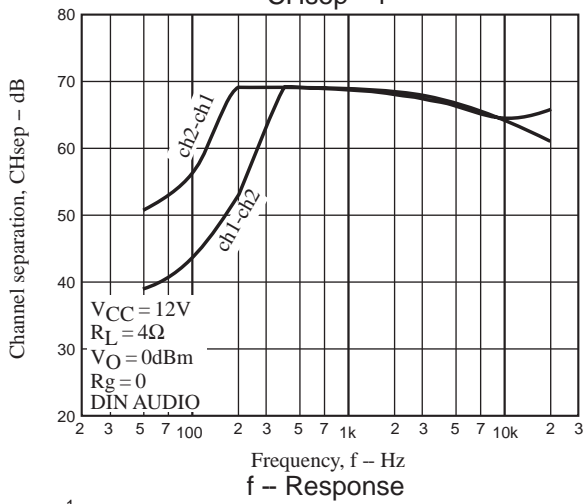
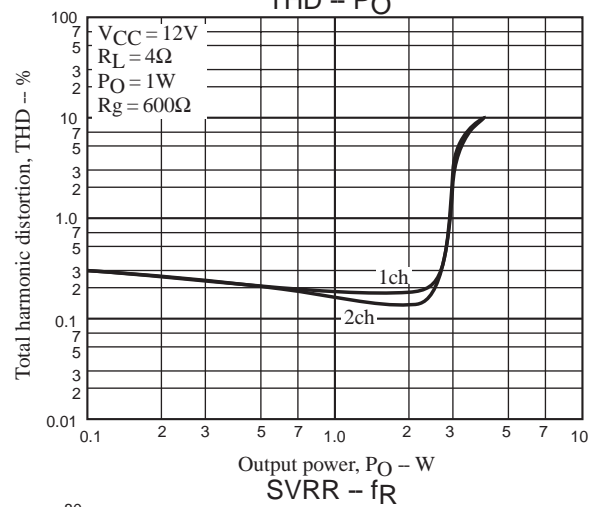
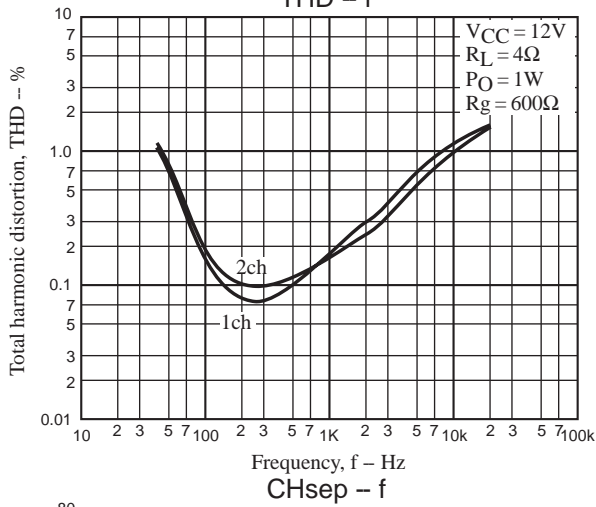
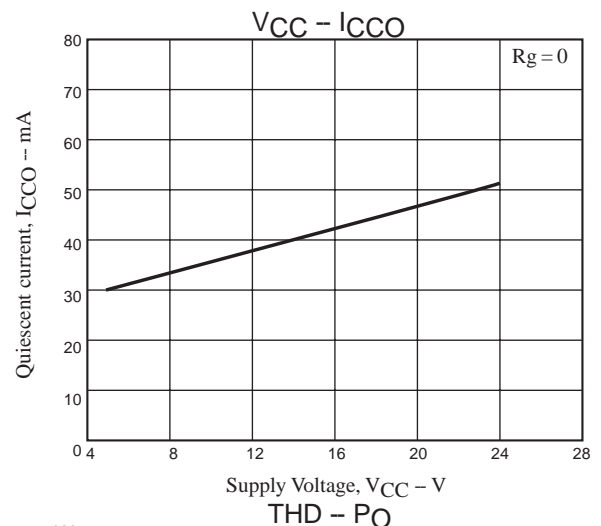
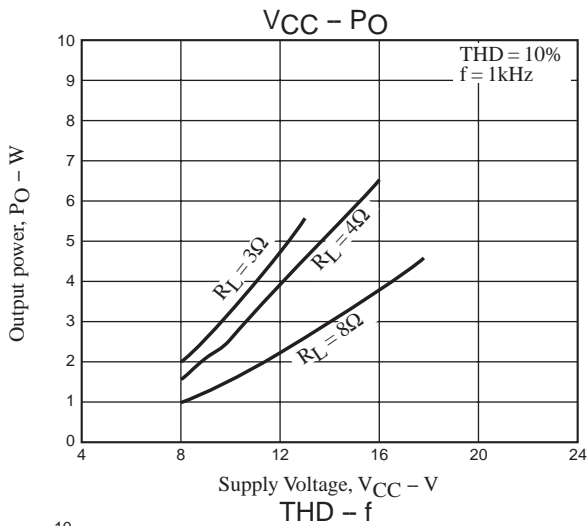


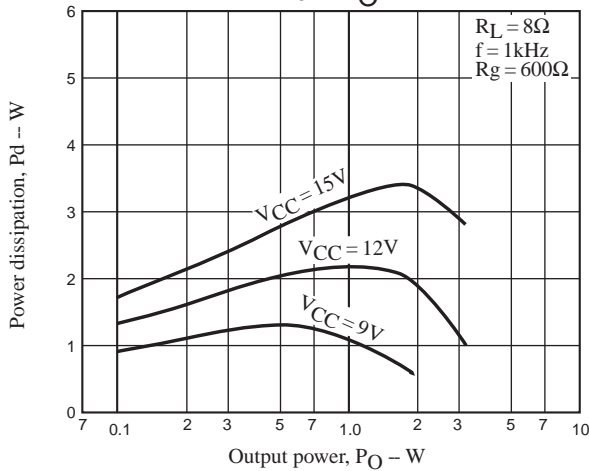
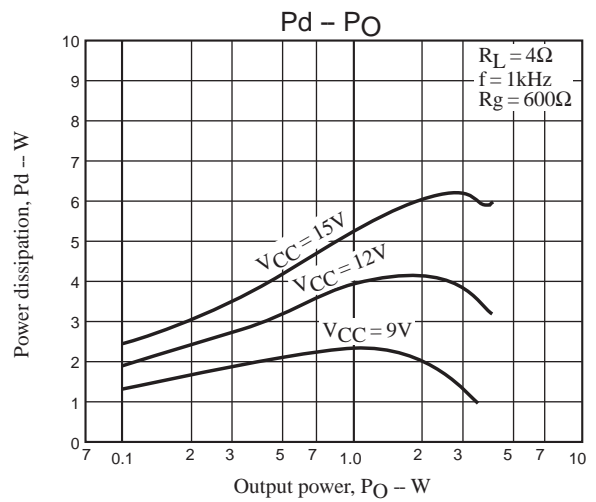
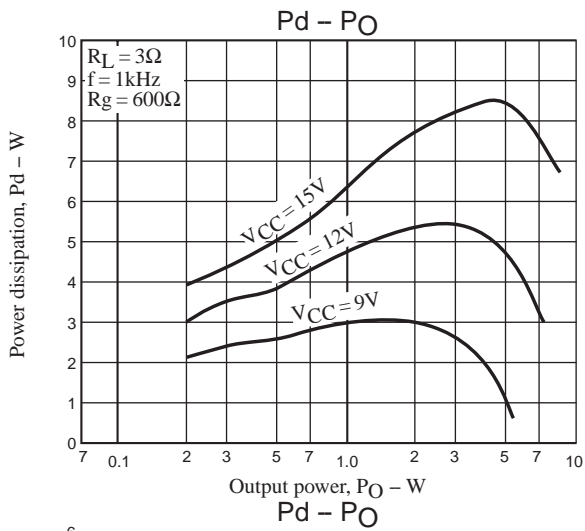
5. Muting

The output signal can be controlled by connecting pin 5 (Filter) to ground via a resistance of 300 to  $500\Omega$ . If resistance is higher than  $750\Omega$ , the suppression ratio will decrease.



# LA4600





- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of October, 2008. Specifications and information herein are subject to change without notice.