


SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LA4631VC — Monolithic Linear IC For Home Audio Use 2-Channel SE AF Power Amplifier

Overview

The LA4631VC built-in a 2 channel single-ended output power amplifier that a power supply voltage range is wide and has additionally the standby function to reduce the current drain. It is a power amplifier IC suitable for driving speaker of various audio system equipments, which is especially useful for products that use batteries.

Functions

- Output power = 4.5W (typical) ($V_{CC} = 12V$, $R_L = 3\Omega$, THD+N = 10%)
- Built in standby function (Pin5)
- Built in thermal suht down circuit

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	With no input signal	24	V
Maximum output current	I_O peak	Per channel	2.5	A
Allowable power dissipation	P_d max	With an infinitely large heat sink	25	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 range	R_L op		3 to 8	Ω
Allowable operating supply voltage range	V_{CC} op		5.5 to 22	V

*: V_{CC} , R_L , and output level such that P_d max, is not exceeded for the size of heat sink used.

■ 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. 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 new introduction or other application different from current conditions on the usage of automotive device, communication device, office equipment, industrial equipment etc. , please consult with us about usage condition (temperature, operation time etc.) 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.

SANYO Semiconductor Co., Ltd.
<http://semicon.sanyo.com/en/network>

LA4631VC

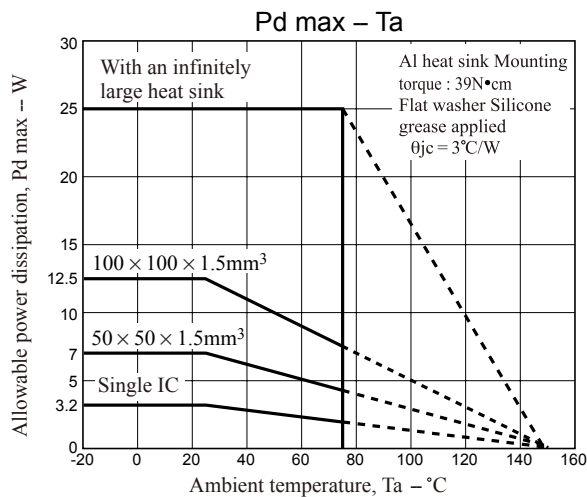
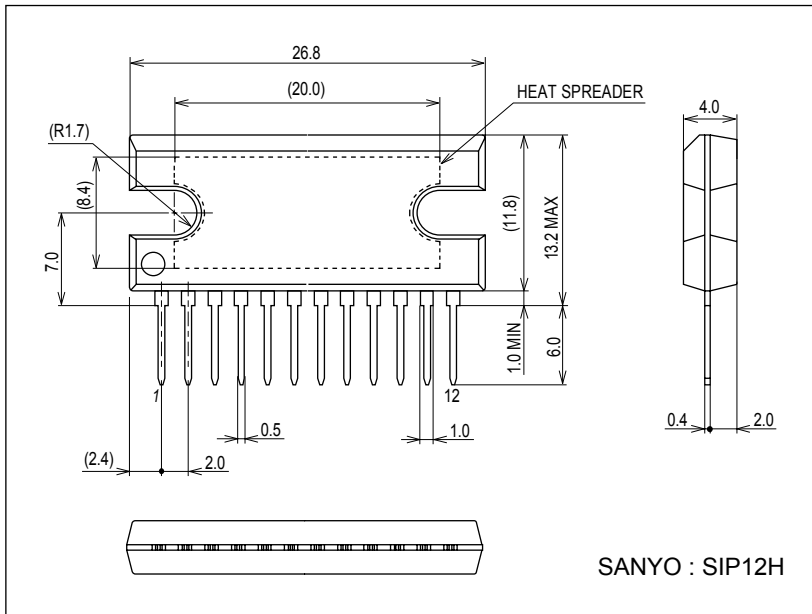
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$, $R_L = 3\Omega$, $f = 1\text{kHz}$, $R_g = 600\Omega$

Parameter	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Quiescent current	I_{CCO}	$R_g = 0\Omega$	18	35	80	mA
Standby current	I_{st}			1	10	μA
Voltage gain	VG	$V_O = 0\text{dBm}$	33	35	37	dB
Total harmonic distortion	THD	$P_O = 1\text{W}$		0.15	0.4	%
Output power	P_{O1}	THD = 10%	3.0	4.5		W
	P_{O2}	$V_{CC} = 9\text{V}$, THD = 10%	2.0	2.5		W
Output noise voltage	V_{NO}	$R_g = 0\Omega$, BPF = 20Hz to 20kHz		0.05	0.25	mVrms
Ripple rejection	SVRR	$R_g = 0\Omega$, $f_R = 100\text{Hz}$, $V_{CC}R = 0\text{dBm}$	50	60		dB
Channel separation	CHsep	$R_g = 10\text{k}\Omega$, $V_O = 0\text{dBm}$	55	65		dB
Input resistance	R_i		20	30	40	$\text{k}\Omega$
Standby pin applied voltage	V_{st}	Amplifier on (Pin 5 voltage)	1.5	5.0		V

Package Dimensions

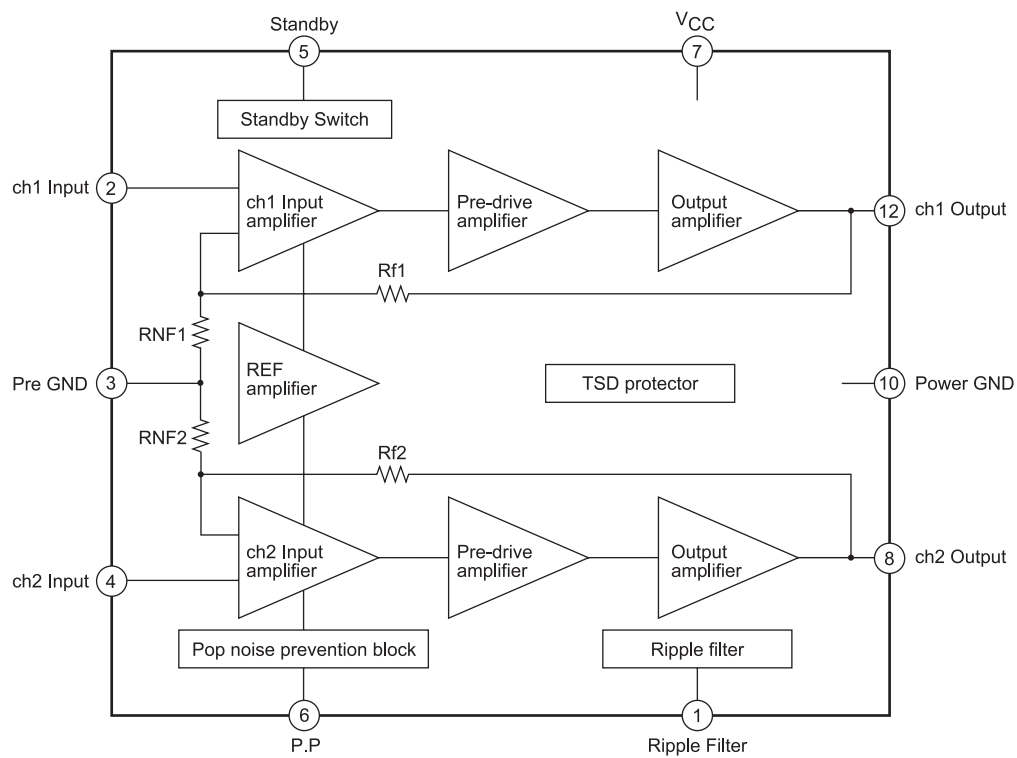
Unit : mm (typ)

3049C

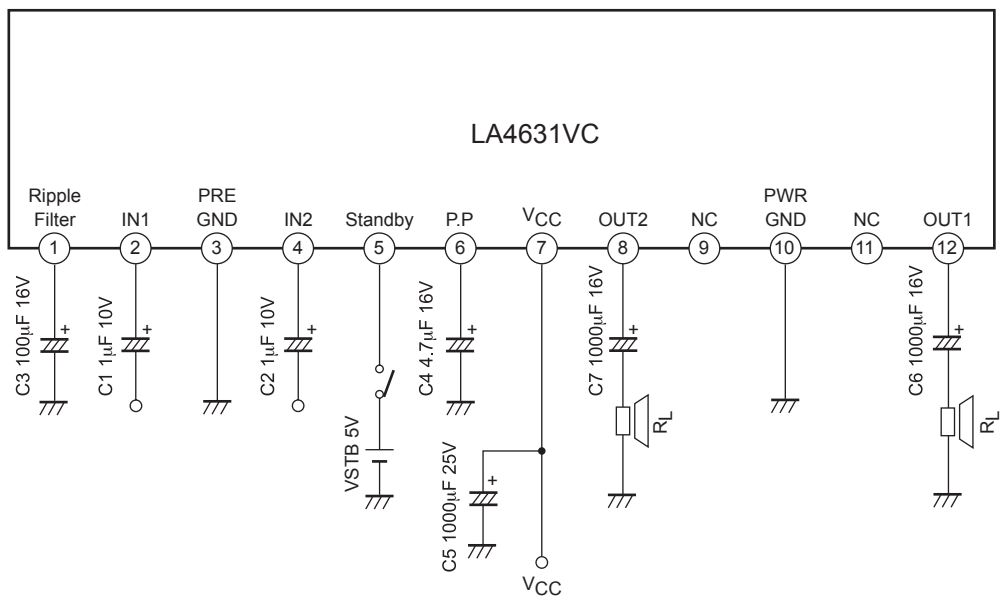


LA4631VC

Block Diagram



Application Circuit Example

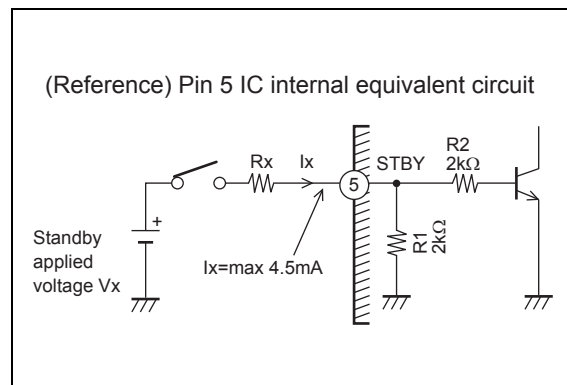


Top view

External Components and Usage Notes

- C1, C2 : These are input coupling capacitors; we recommend a value of $1\mu\text{F}$ or lower. The LA4631VC input pin potential is about 1.4V , and the polarity must be considered due to the DC potential of the circuits connected to the LA4631VC front end. The amplifier's startup time (the time from the point power is first applied until the point an output is generated) will change proportionally with the values of these input capacitors. (When $1\mu\text{F}$ capacitors are used, the startup time will be about 0.2 seconds.)
- C3 : This capacitor is used as a ripple filter. We recommend a value of $100\mu\text{F}$. Amplifier impulse noise when turned off (when the standby pin goes low) may be made worse if a value under $100\mu\text{F}$ is used. The pin 1 voltage is about $1/2V_{\text{CC}}$. A DC mute function can be applied if pin 1 is connected to ground through a 300 to 500Ω resistor. Note that the muting activation voltage will be too low if a resistor value of 750Ω or higher is used.
- C4 : This is an impulse noise prevention capacitor. The recommended value is $4.7\mu\text{F}$. If a value of $2.2\mu\text{F}$ or lower is used for C4, impulse noise when the amplifier is turned off (when the standby pin goes low) may be made worse. Also, if a value of $10\mu\text{F}$ or higher is used, an "incomplete muting" phenomenon may occur when the amplifier is turned off (when the standby pin goes low).
- C5 : Power supply capacitor. This capacitor should be located as close as possible to the IC (to minimize increases in the power supply line impedance) to achieve stable amplifier operation.
- C6, C7 : Output capacitors. These capacitors influence the amplifiers low band frequency characteristics. ($f_c = 1/2\pi C_{\text{out}} \times R_L$)
 f_c = low band cutoff frequency, $C_{\text{out}} = \text{C6, C7}$

(Reference) Pin 5 Equivalent Circuit Inside IC



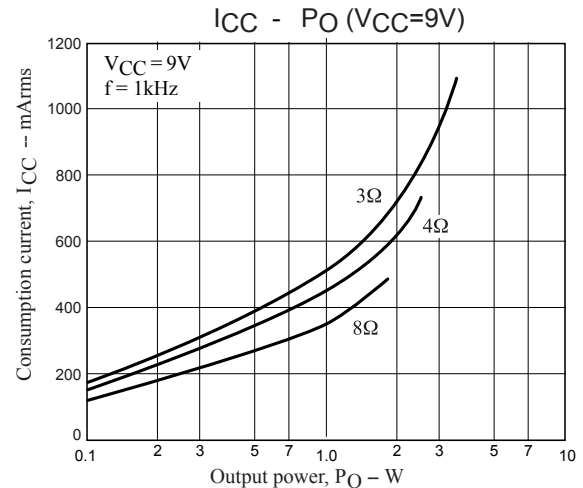
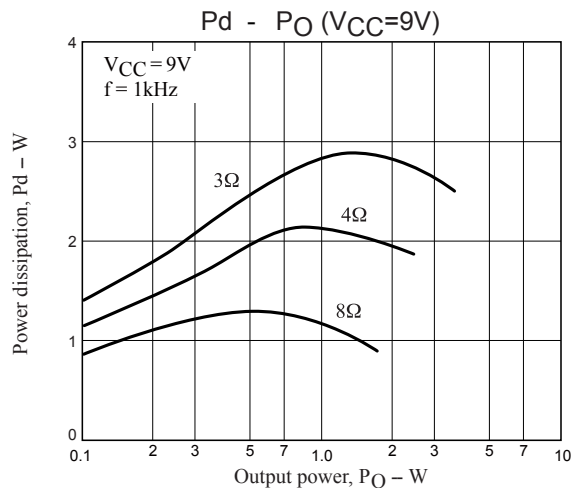
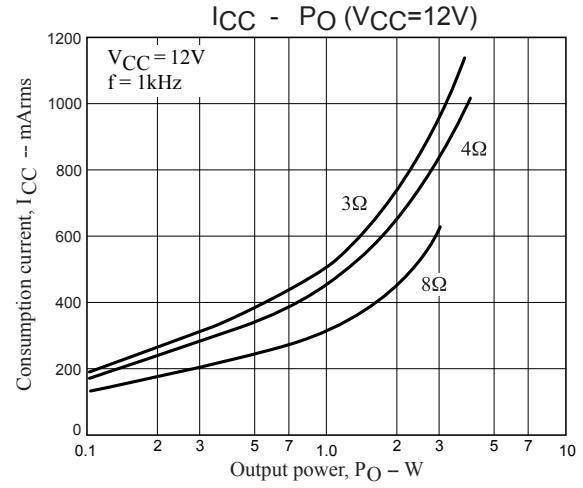
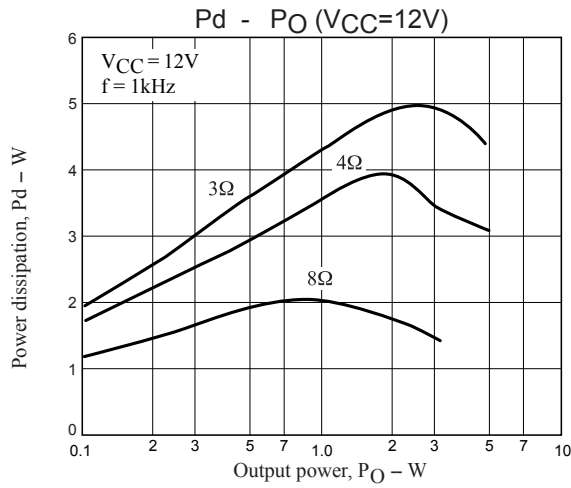
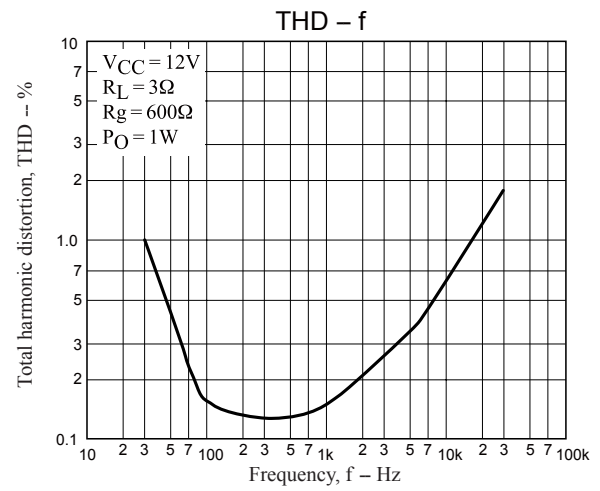
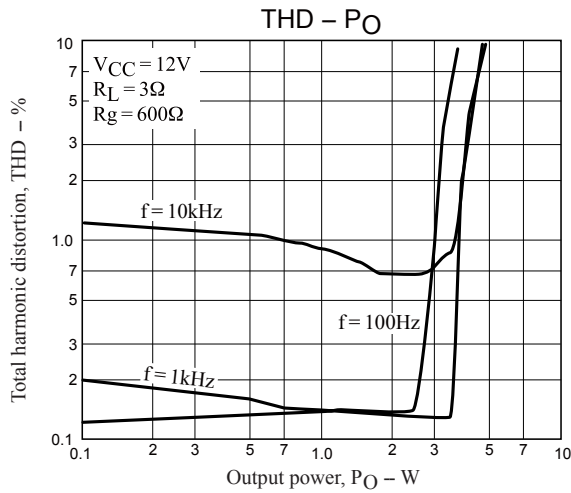
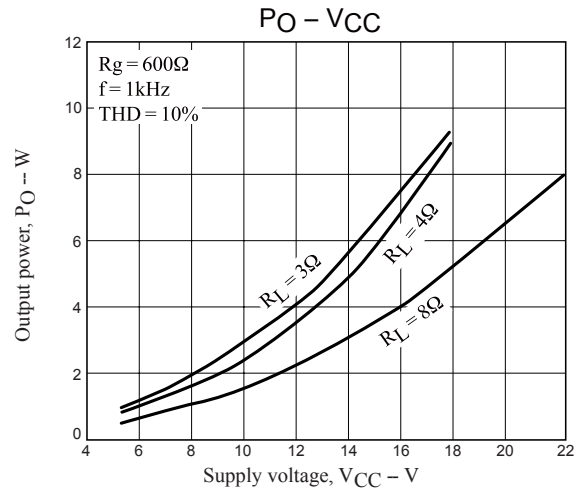
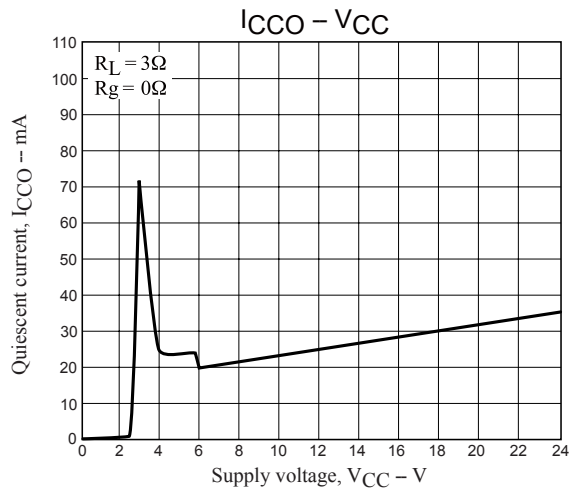
- The amplifier can be turned on and off by controlling the level (high/low) of Pin 5.
- Applying a signal equal or greater than 1.5V and $800\mu\text{A}$ to Pin 5 turns on the amplifier. (If 5V is applied directly to Pin 5 the inflow current of Pin 5 is approximately 4.5mA .)
- If a voltage, V_x , exceeding 5V is to be applied, current limiting resistor (R_x) should be inserted to limit the inflow current to 4.5mA . (See following equation.)

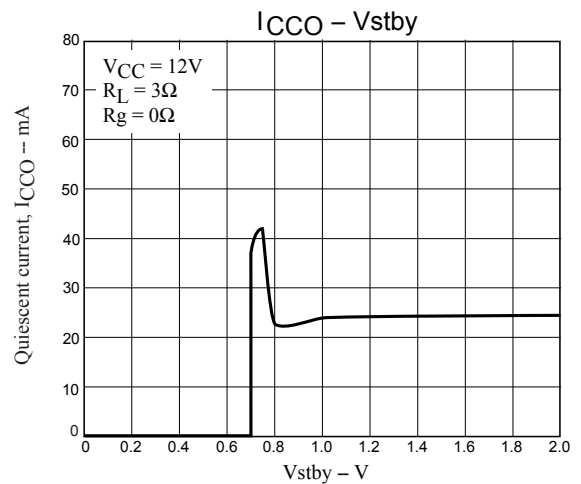
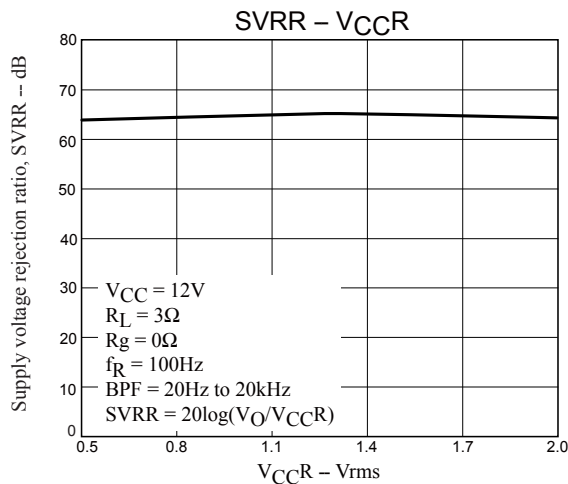
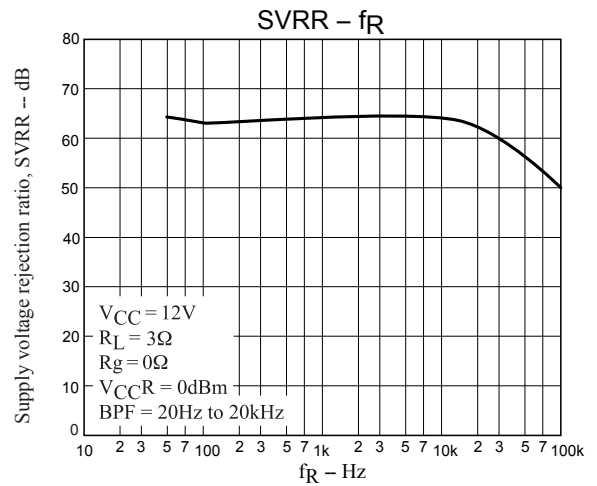
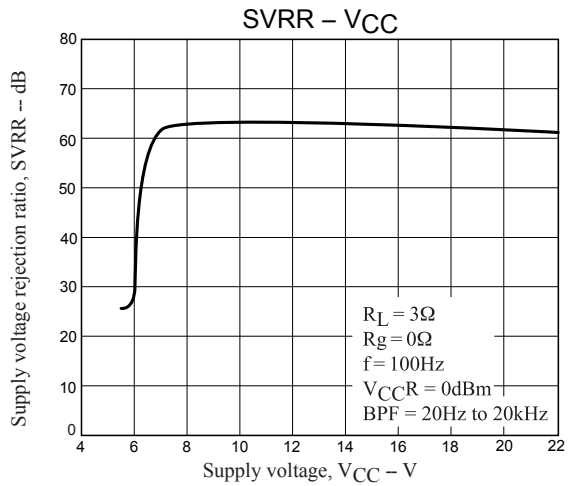
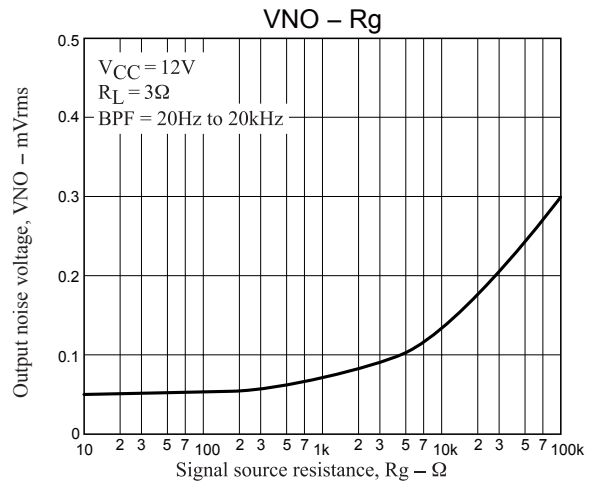
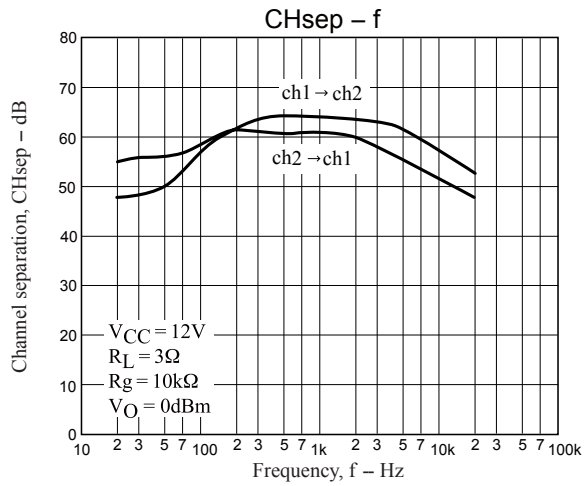
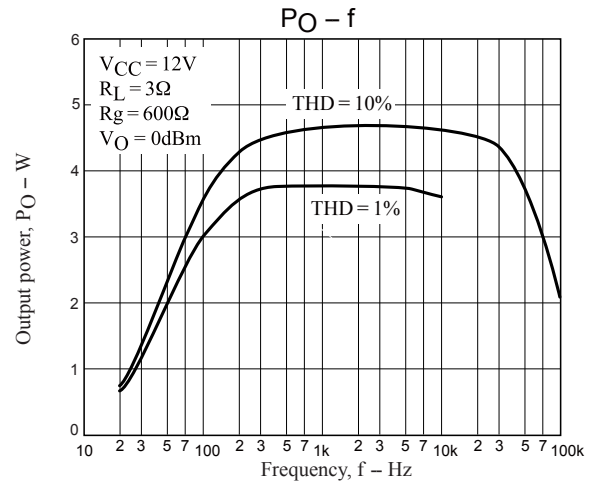
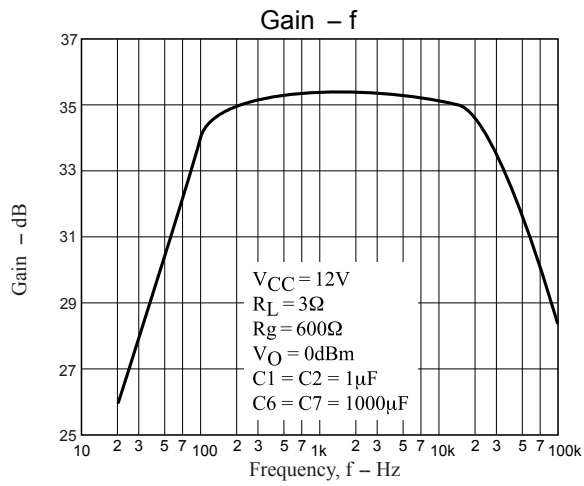
$$R_x = (V_x - 5\text{V})/4.5\text{mA}$$

- If Pin 5 is to be controlled by the microprocessor, the Pin 5 inflow current (I_x) should be optimized for the capacity of the microprocessor by calculating R_x using the following equation, as a general guideline, and then confirming the inflow current through actual measurement.

$$R_x = (V_x/I_x) - R_1 (2\text{k}\Omega)$$

Note: When apply voltage to standby (Pin 5), please add resistor (R_x).





- 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.
- 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 April, 2012. Specifications and information herein are subject to change without notice.