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# LA4631VC

Monolithic Linear IC

## 2-Channel SE AF Power Amplifier for Home Audio Use

### 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	$^\circ C$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**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	$\Omega$
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.

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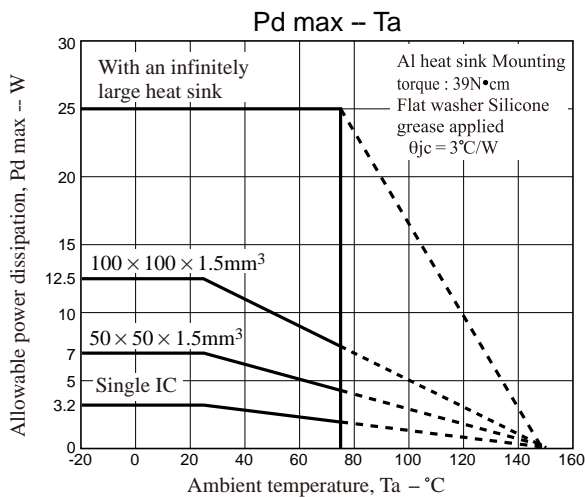
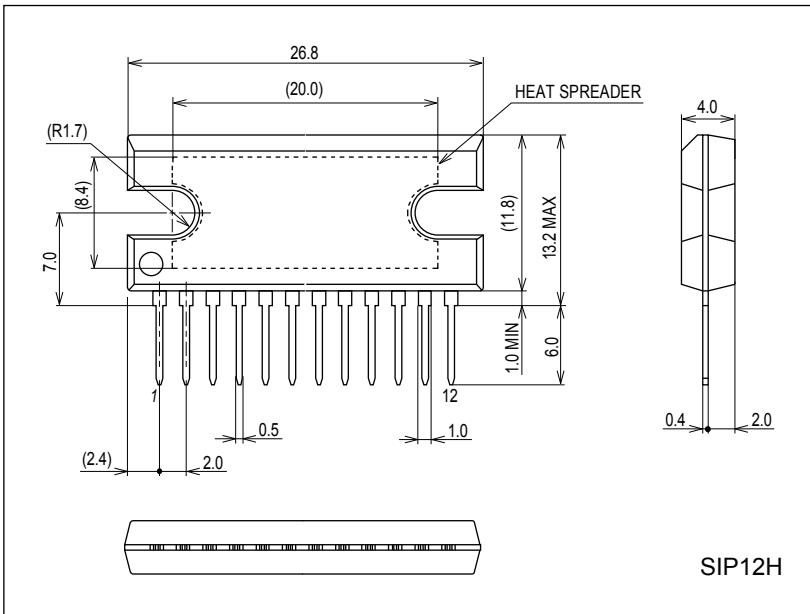
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 12\text{V}$ ,  $R_L = 3\Omega$ ,  $f = 1\text{kHz}$ ,  $R_g = 600\Omega$

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	$\mu\text{A}$
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

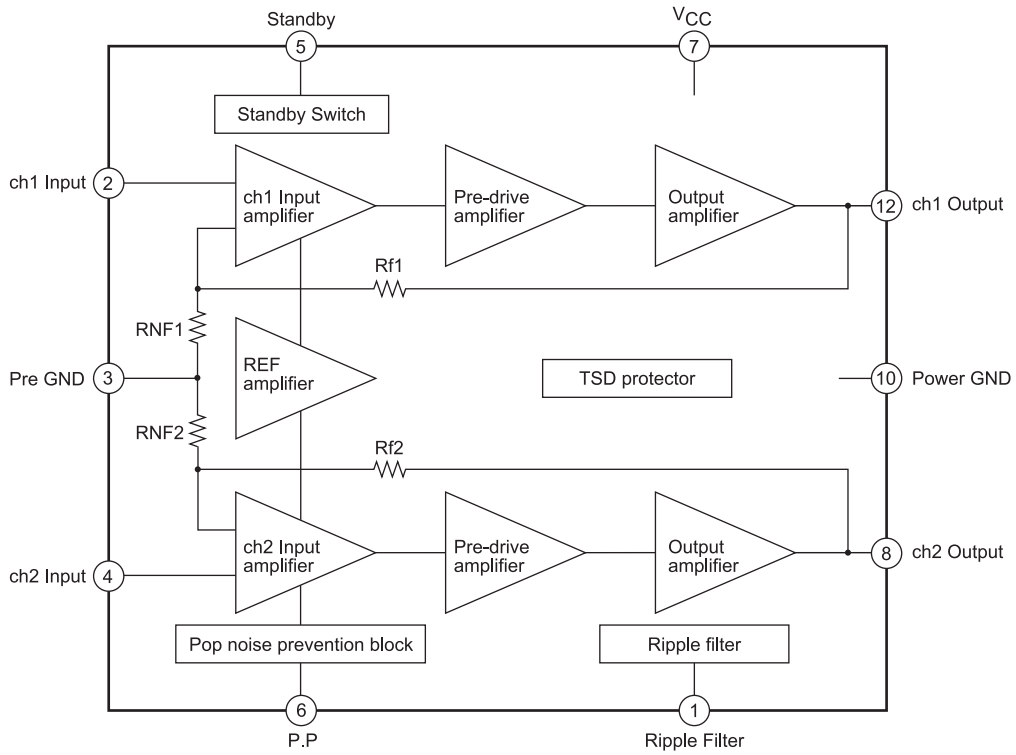
Unit : mm (typ)

3049C

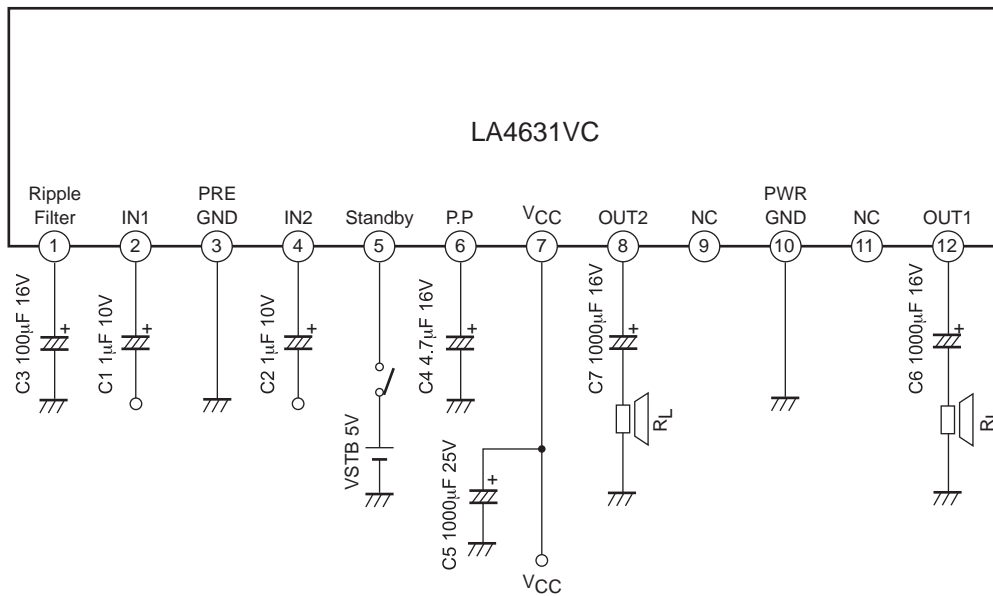


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## Block Diagram



## Application Circuit Example

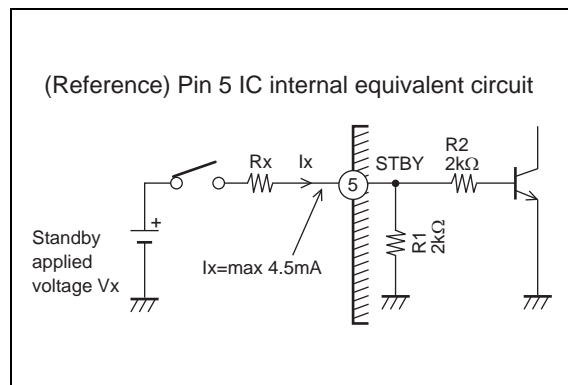


Top view

## External Components and Usage Notes

- C1, C2 : These are input coupling capacitors; we recommend a value of 1μF 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 1μF 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 100μF. Amplifier impulse noise when turned off (when the standby pin goes low) may be made worse if a value under 100μF is used. The pin 1 voltage is about 1/2V<sub>CC</sub>. 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 4.7μF. If a value of 2.2μF 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 10μF 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. ( $f_c = 1/2\pi C_{out} \times R_L$ )  
 $f_c$  = low band cutoff frequency,  $C_{out} = C6, C7$

## (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 800μA 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<sub>x</sub>, exceeding 5V is to be applied, current limiting resistor (R<sub>x</sub>) should be inserted to limit the inflow current to 4.5mA. (See following equation.)

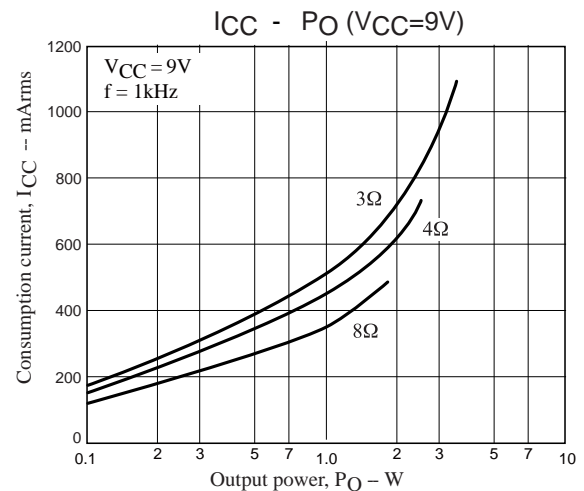
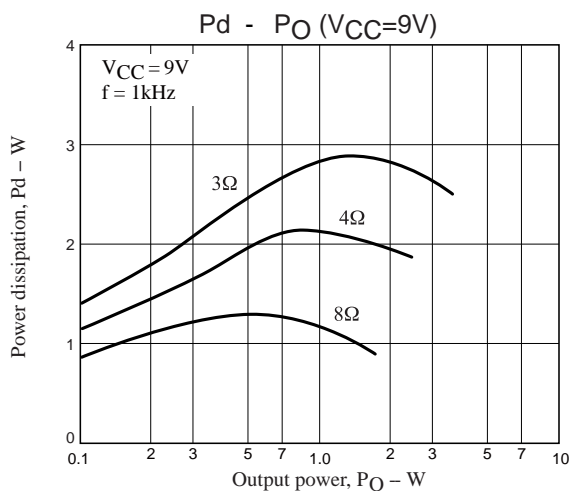
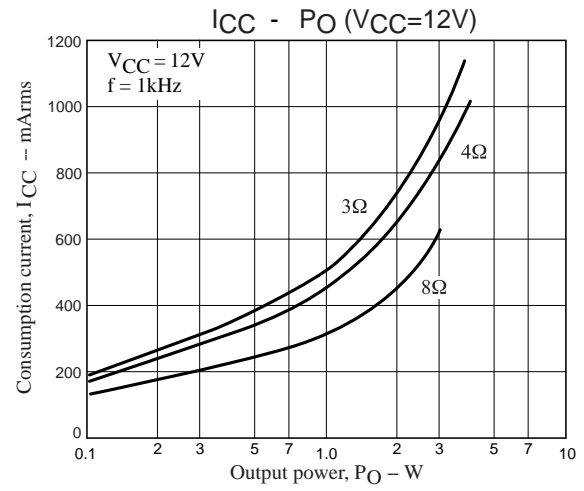
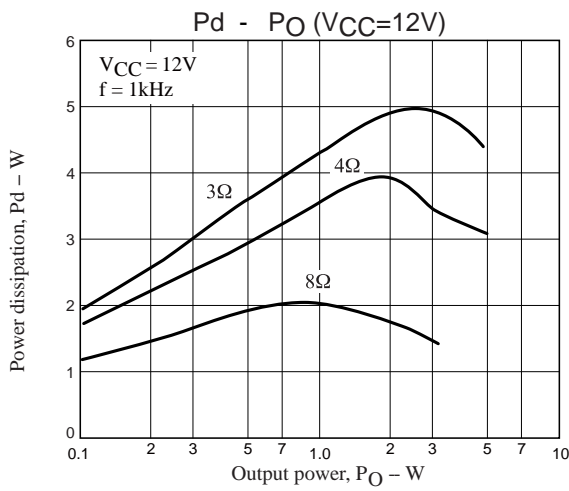
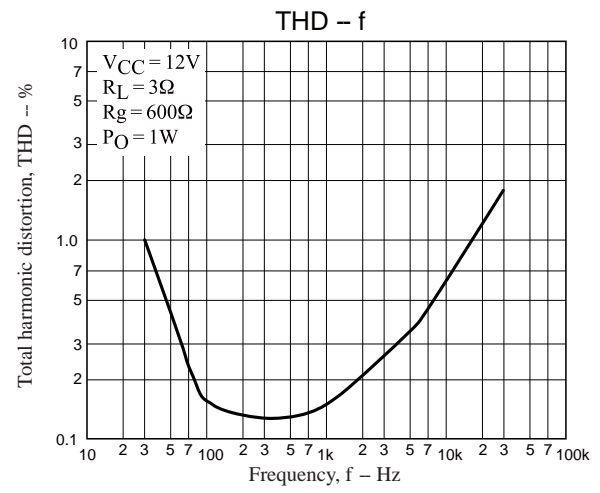
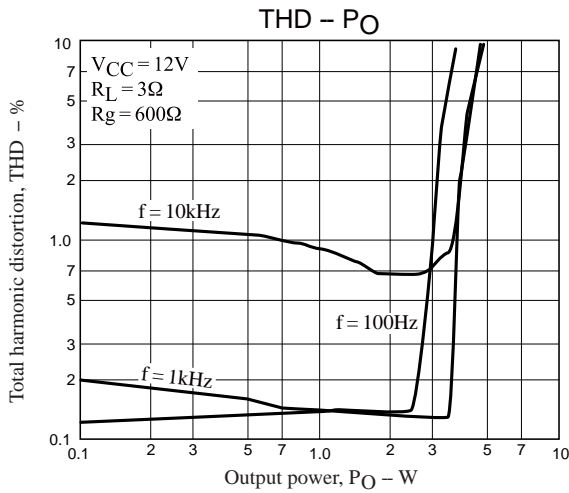
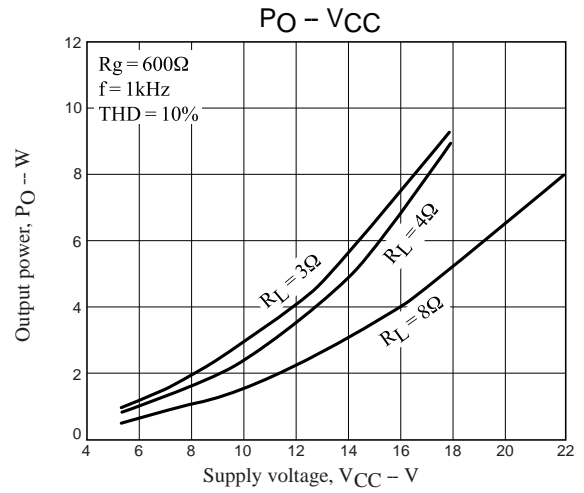
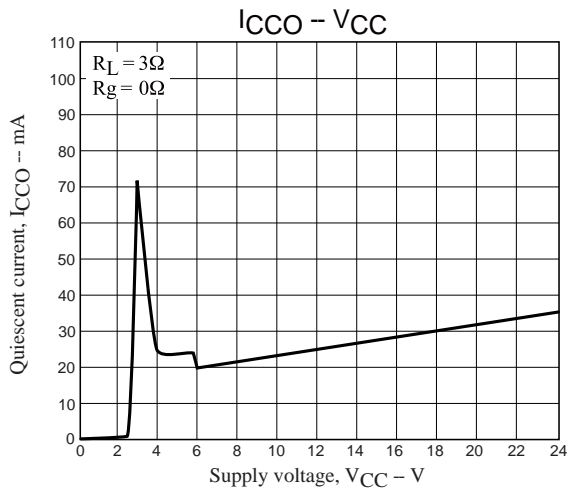
$$R_x = (V_x - 5V) / 4.5mA$$

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

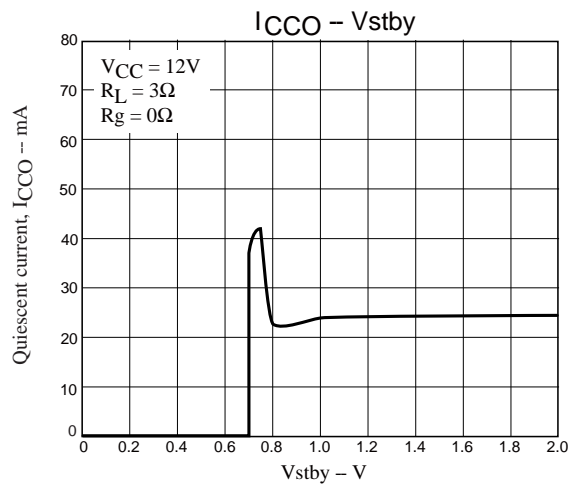
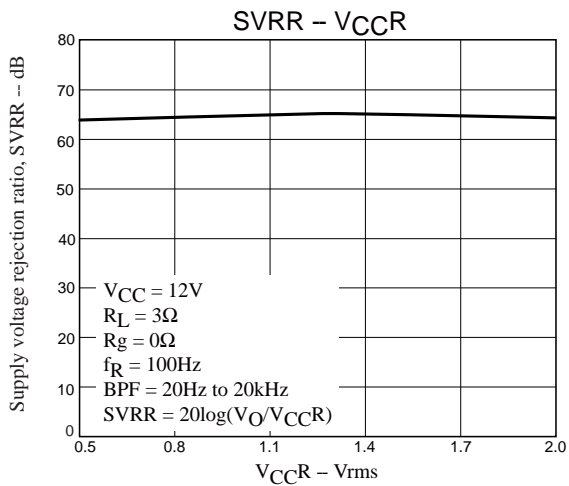
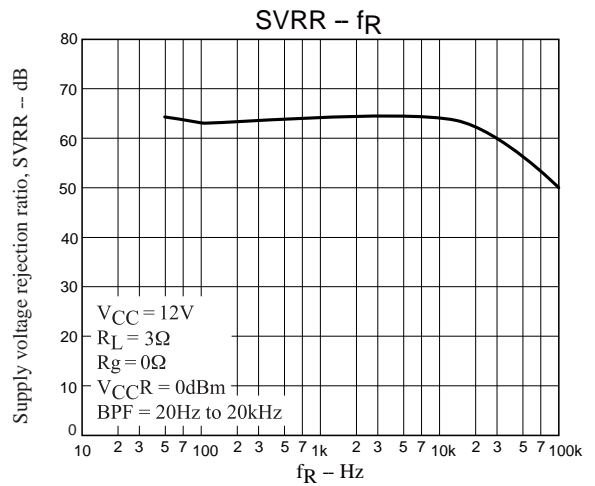
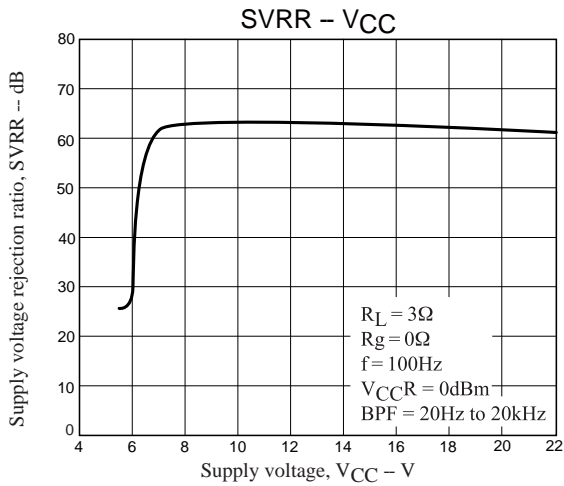
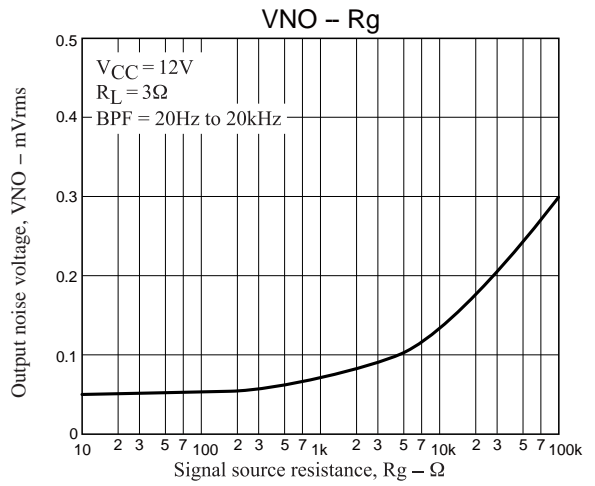
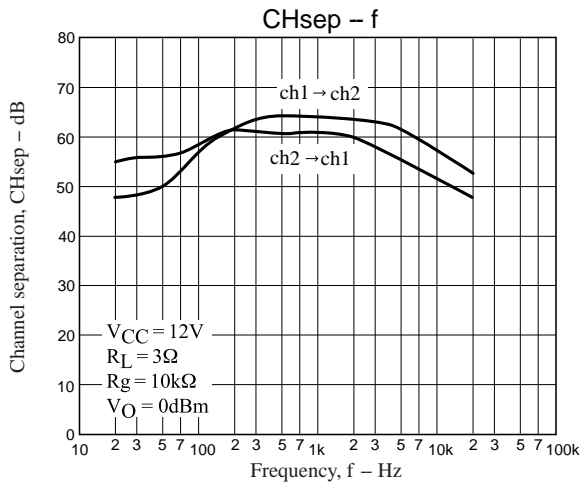
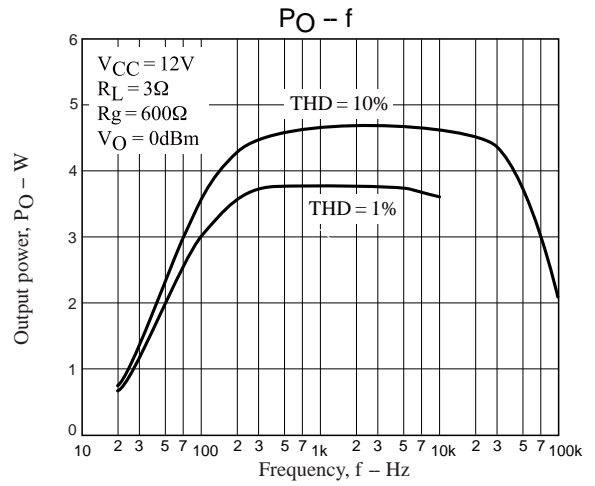
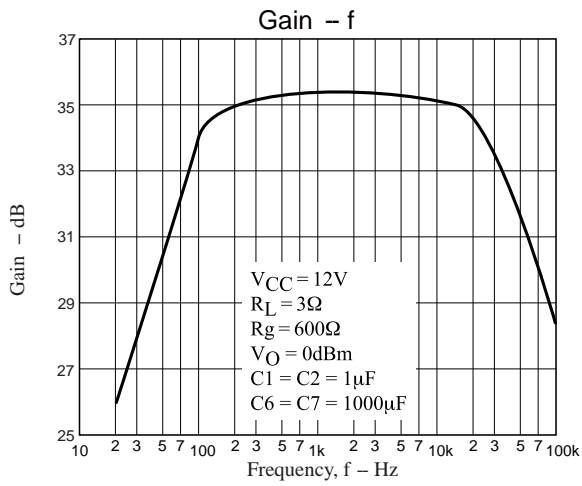
$$R_x = (V_x / I_x) - R1 (2k\Omega)$$

Note: When apply voltage to standby (Pin 5), please add resistor (R<sub>x</sub>).

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