


**SANYO Semiconductors**

# DATA SHEET

An ON Semiconductor Company

## LA4631 — Monolithic Linear IC For Audio Applications 5W 2-Channel AF Power Amplifier

### Overview

The LA4631 (5W×2 channels) is a single-ended power amplifier that has a pin arrangement similar to the LA4632 BTL power amplifier (10W×2 channels). The LA4631's pin compatibility makes it possible to share a common printed circuit board among a series of end products differentiated by power rank. (Note that the LA4632 is provided in an SIP-12H package, and that it is necessary to provide a hole for the LA4631 pin 13 if the same printed circuit board is to be shared. Note also that certain external components differ.)

### Functions

- 2-channel power amplifier for audio applications

### Specifications

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

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	A
Allowable power dissipation	$P_d$ max	With an infinitely large heat sink	15	W
Maximum junction temperature	$T_j$ max		150	$^\circ\text{C}$
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		14	V
Recommended load resistance range	$R_L$ op		4	$\Omega$
Allowable operating supply voltage range	$V_{CC}$ op		5.5 to 22	V

\*:  $V_{CC}$ ,  $R_L$ , and the output level must be set for the size of the heat sink used so that the  $P_d$  max range is not exceeded.

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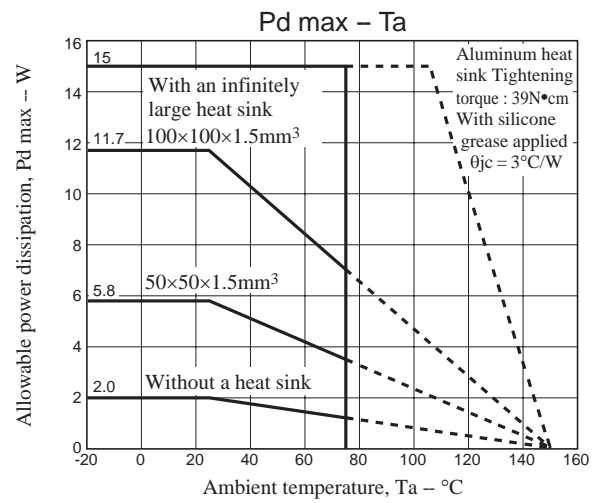
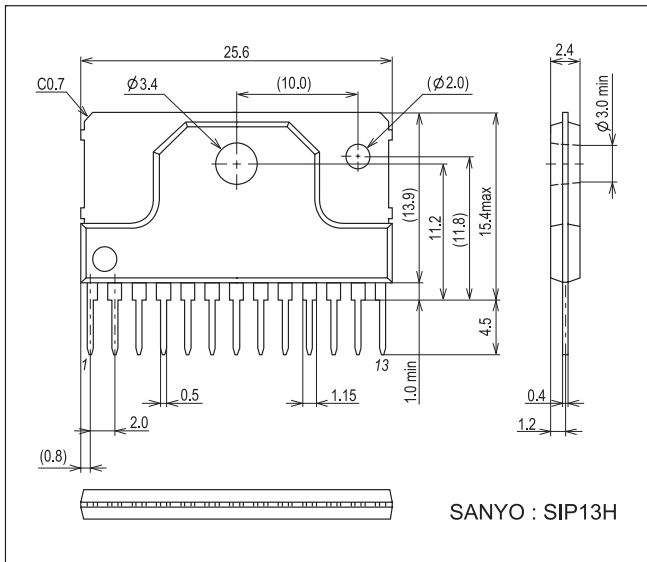
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 14\text{V}$ ,  $R_L = 4\Omega$ ,  $f = 1\text{kHz}$ ,  $R_g = 600\Omega$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby current	$I_{st}$	$V_{STB} = 0\text{V}$		1	10	$\mu\text{A}$
Quiescent current drain	$I_{CCO}$	$R_g = 0$ , $V_{STB} = 5\text{V}$	18	35	80	$\text{mA}$
Standby pin applied voltage	$V_{st}$	The pin 5 voltage such that the amplifier is on	1.5		5	$\text{V}$
Output power	$P_O$	$\text{THD} = 10\%$	4	5		$\text{W}$
Total harmonic distortion	$\text{THD}$	$V_O = 1\text{W}$		0.15	0.4	$\%$
Voltage gain	$V_G$	$V_O = 0\text{dBm}$	33	35	37	$\text{dB}$
Output noise voltage (rms)	$V_{NO}$	$R_g = 0$ , $\text{BPF} = 20\text{Hz to } 20\text{kHz}$		0.05	0.25	$\text{mVrms}$
Supply voltage rejection ratio	$\text{SVRR}$	$R_g = 0$ , $f_R = 100\text{Hz}$ , $V_{CCR} = 0\text{dBm}$	50	60		$\text{dB}$
Channel separation	$\text{CHsep}$	$R_g = 10\text{k}\Omega$ , $V_O = 0\text{dBm}$	45	55		$\text{dB}$
Input resistance	$R_i$		20	30	40	$\text{k}\Omega$

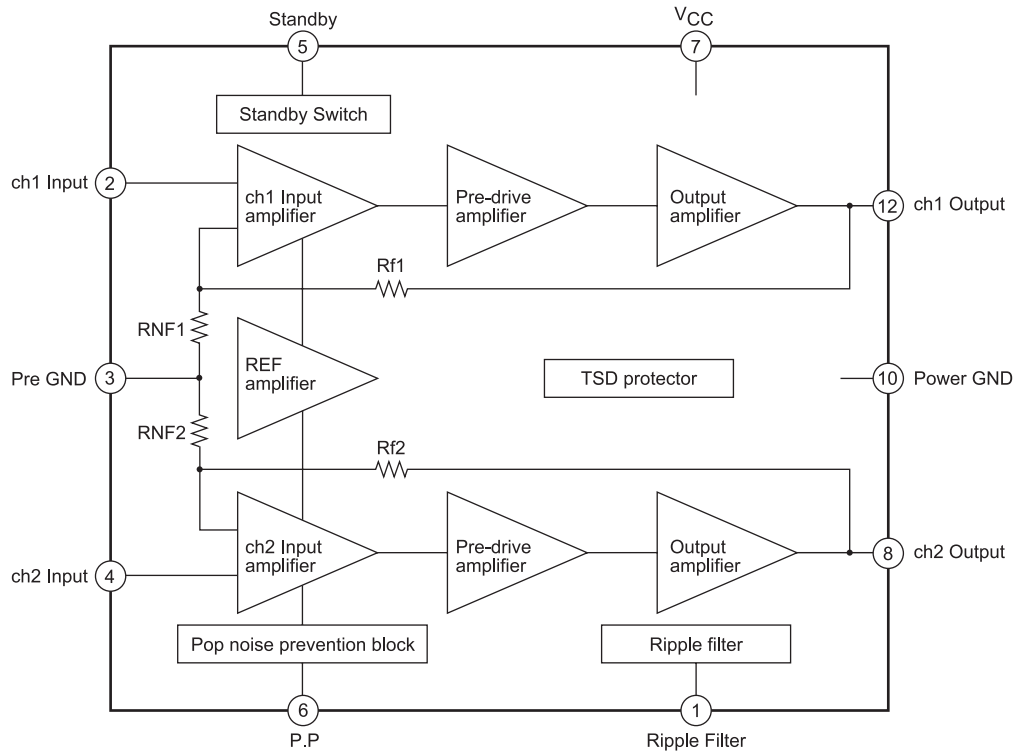
## Package Dimensions

unit : mm (typ)

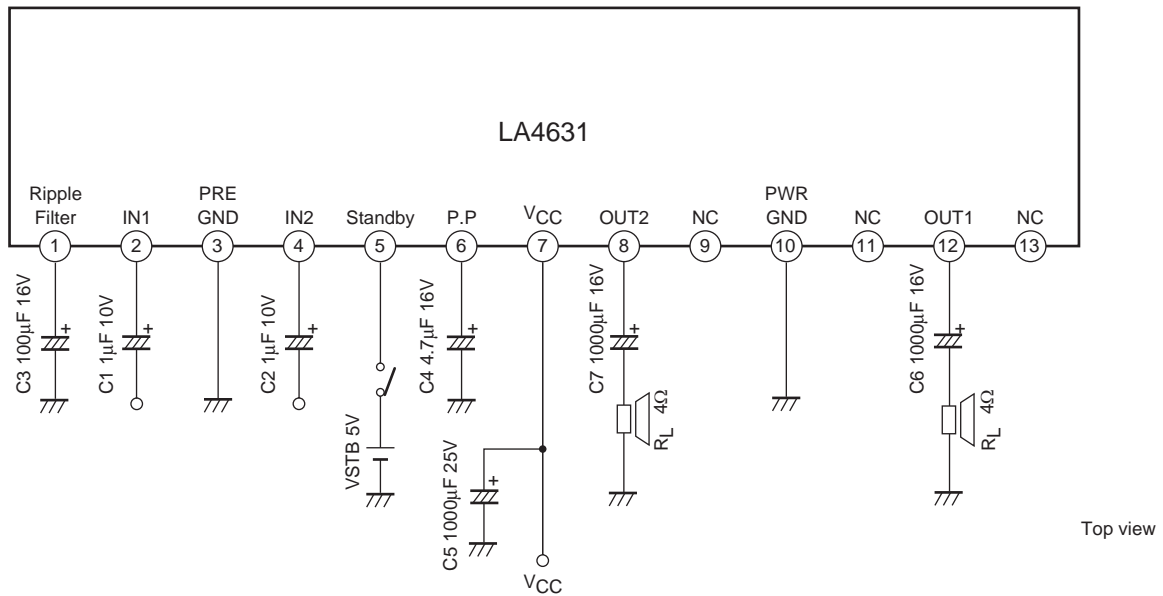
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## Block Diagram



## Application Circuit Example

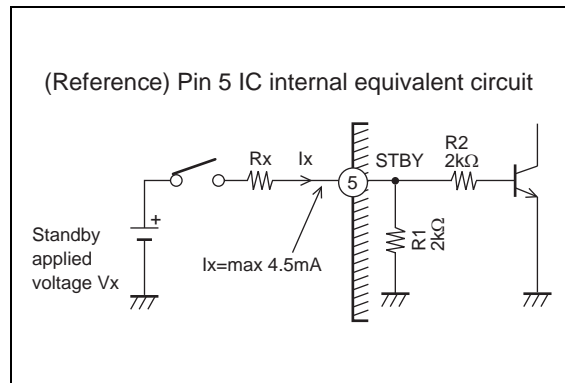


## External Components and Usage Notes

- C1, C2 : These are input coupling capacitors; we recommend a value of 1μF or lower. The LA4631 input pin potential is about 1.4V, and the polarity must be considered due to the DC potential of the circuits connected to the LA4631 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

### • Caution

Although the LA4631 is basically pin compatible with the LA4632, there are certain differences in the external components and the way the devices are used.



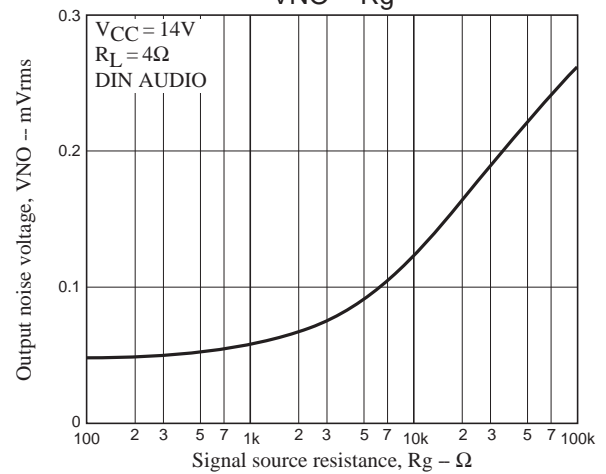
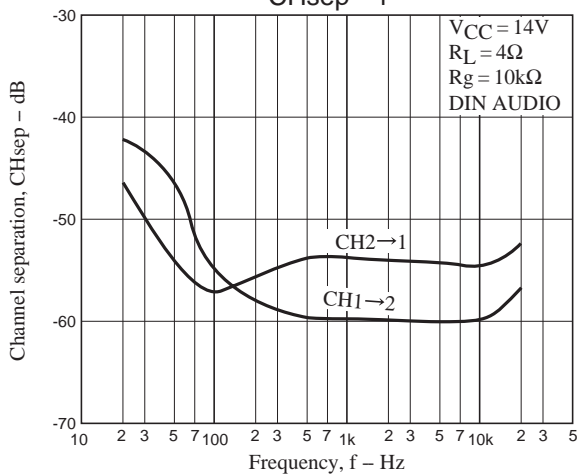
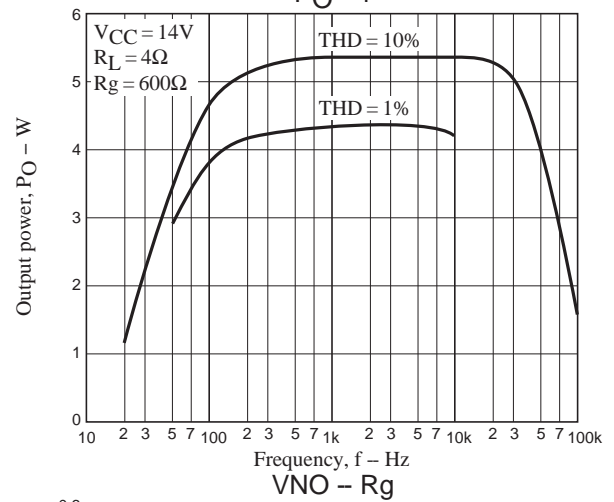
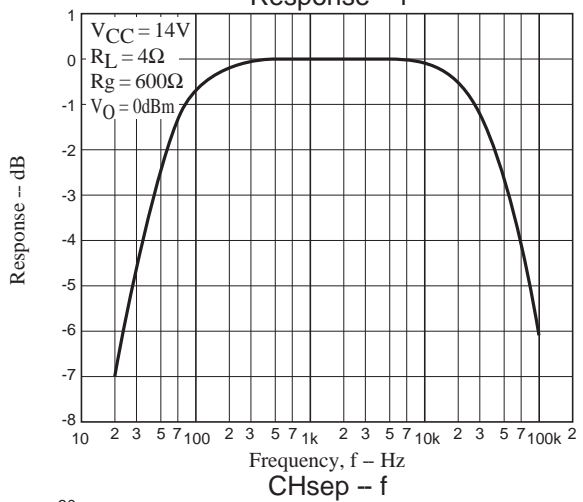
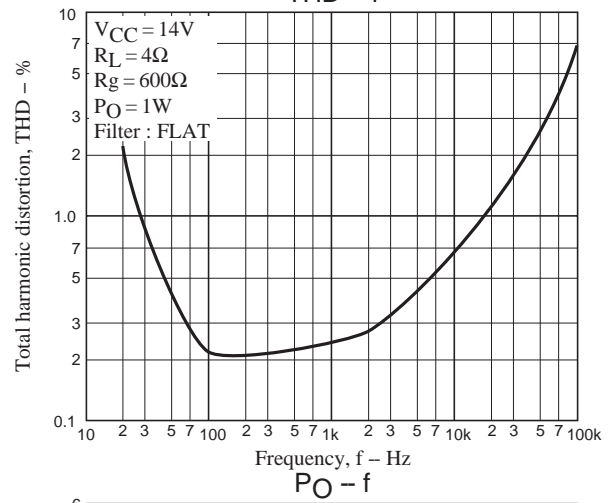
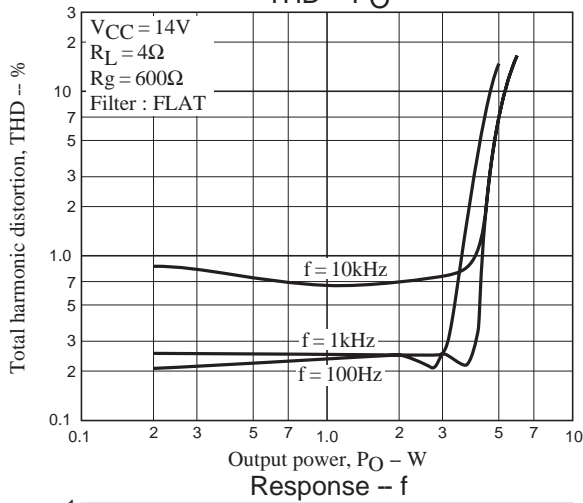
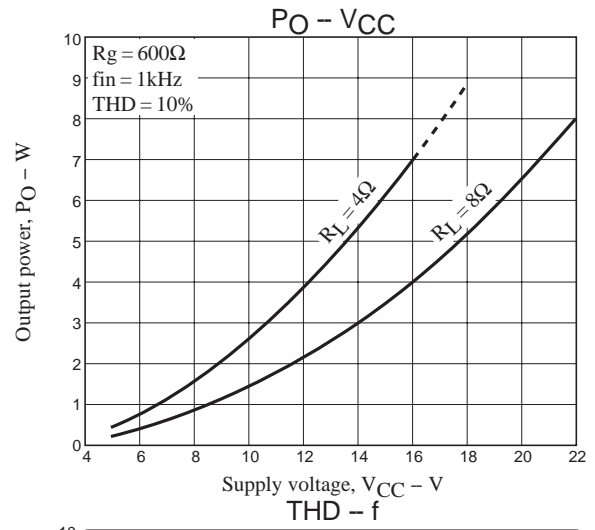
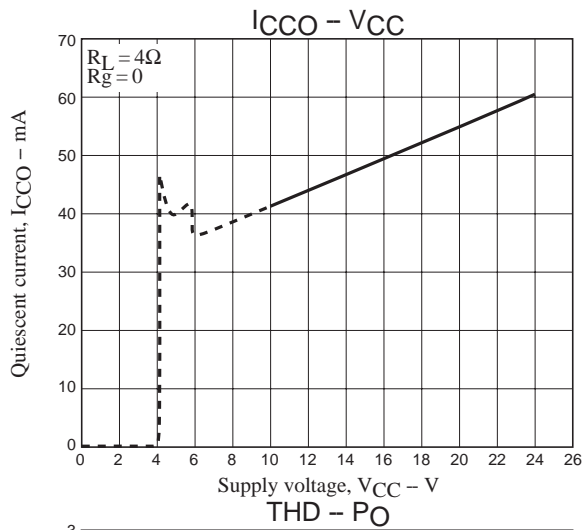
- The amplifier can be turned on or off by controlling the high/low state of pin 5.
- The amplifier is turned on by applying a voltage of 1.5V or higher or an influx current of 800μA or higher. (If a 5V level is applied directly to pin 5, the pin 5 influx current will be about 4.5mA.)
- If a voltage, V<sub>x</sub>, that exceeds 5V will be applied, insert a current limiter resistor (R<sub>x</sub>) so that the influx current does not exceed 4.5mA. (See the formula below.)

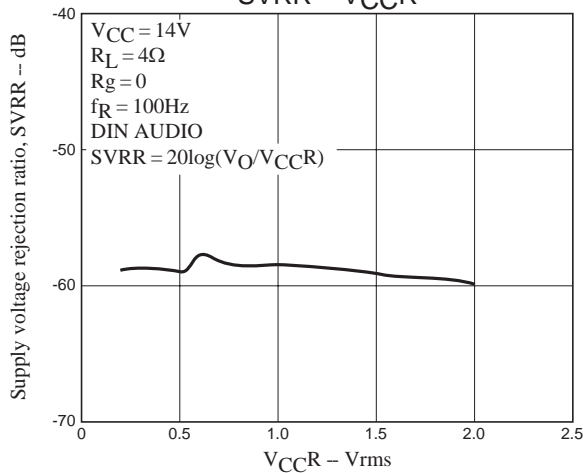
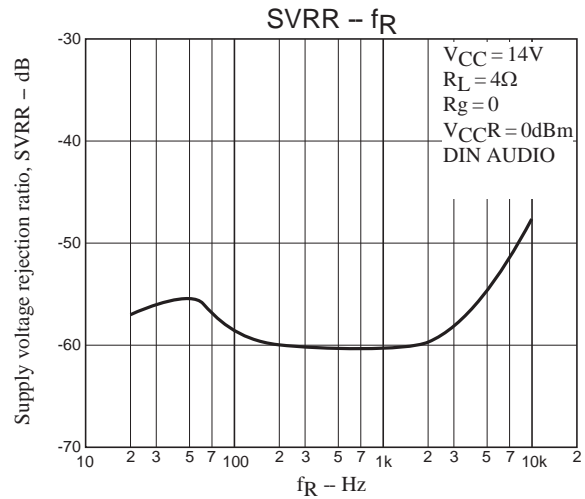
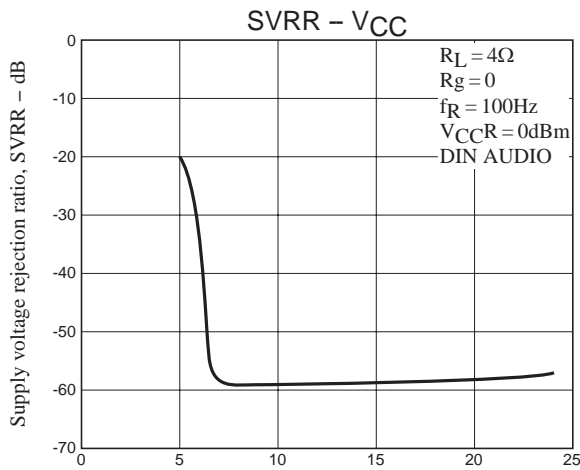
$$R_x = (V_x - 5V) / 4.5mA$$

- When pin 5 is controlled by a microcontroller, to set up a pin 5 influx current (I<sub>x</sub>) optimal for the drive capacity of the microcontroller, calculate R<sub>x</sub> from the following formula as a first approximation and measure the influx current to verify that level.

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

- \*: When a voltage is applied to the standby pin (pin 5), refer to the above and insert a resistor (R<sub>x</sub>) to limit the influx current if required.





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