



SANYO Semiconductors

# DATA SHEET

## LA4919N — Monolithic Linear IC Two-Channel 10W BTL High-Efficiency TV Audio Output Power Amplifier

### Overview

The LA4919N is a 2-channel 10W BTL high-efficiency power amplifier. By using a signal following switching system for the power supply to the amplifier output stage and by including a nonlinear amplifier in the signal system, the LA4919N holds the number of external components to a minimum and reduces the power consumption (thermal loss) in the operating range to one half that of earlier class B power amplifiers.

The use of a DIP-28H package obviates the need for a separate heat sink and can contribute to internal space savings in end products.

### Features

- High-efficiency 2-channel  $\times$  10W BTL power amplifier ( $V_{CC} = 15V$ ,  $R_L = 8\Omega$ )
- Provided in a DIP-28H package (no heat sink is required)
- The number of required signal-following switching circuits has been held to a single circuit, thus reducing even further the number of external components required.
- The output is a fully analog signal, and no switching noise appears on the output lines.
- Built-in standby switch (amplifier block/headphone block)
- Built-in headphone amplifier : 2 inputs/2 outputs ( $V_G = 6dB$ ,  $P_O = 60mW$ )
- Built-in protection circuits (overvoltage and thermal protection circuits)

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max	No signal	24	V
Allowable power dissipation	$P_d$ max	With a infinity large heat sink	15	W
Thermal resistance	$\theta_{j-c}$		3	$^\circ C/W$
Maximum junction temperature	$T_J$ max		150	$^\circ C$
Operating temperature	$T_{opr}$		-25 to +75	$^\circ C$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ C$

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

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Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		15	V
Recommended load resistance	$R_L$	Amplifier block	8	$\Omega$
		Headphone block	32	$\Omega$
Operating supply voltage range	$V_{CC\ op}$	The range where the package Pd is not exceeded	7.5 to 18	V

## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC}$ (Pin 19), Pre $V_{CC}$ (Pin 11) = 15V, $R_L = 8\Omega$ , $f = 1\text{kHz}$ , $R_g = 600\Omega$ , See the specified board and circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Amplifier block]						
Quiescent current	$I_{CCO}$	$R_g = 0$	35	65	120	mA
Standby current	$I_{st}$	Amplifier off, headphone off		0	10	$\mu\text{A}$
Voltage gain	VG	$V_O = 0\text{dBm}$	28	30	32	dB
Output power	$P_O$	THD = 10%	8	10		W
Total harmonic distortion	THD	$P_O = 1\text{W}$ , LPF = 30kHz		0.04	0.4	%
Output noise voltage	$V_{NO}$	$R_g = 0$ , DIN AUDIO*1		0.05	0.3	mV
Channel separation	Chsep	$R_g = 10\text{k}\Omega$ , $V_O = 0\text{dBm}$ , DIN AUDIO*1	50	60		dB
Ripple rejection	SVRR	$R_g = 0$ , $f_R = 100\text{Hz}$ , $V_R = 0\text{dBm}$ , DIN AUDIO*1	60	70		dB
Input resistance	$R_i$		21	30	39	$\text{k}\Omega$
Output offset voltage	$V_{offset}$	$R_g = 0$	-120		+120	mV
Standby control voltage	$V_{ST}$	Amplifier on	2		18	V
		Amplifier off	0		1.0	V
Pin 7 sink current (DDL on current)*2	$I_{7pin}$	When +5V is applied to pin 7 through a $10\text{k}\Omega$ resistor, THD = 10%	100	150	200	$\mu\text{A}$
[Headphone block]						
Voltage gain	VG	$V_O = 0\text{dBm}$	5	6	7	dB
Output power	$P_O$	THD = 10%	50	60		mW
Total harmonic distortion	THD	$V_O = 0\text{dBm}$ , LPF = 30kHz		0.025	0.05	%
Channel separation	Chsep	$R_g = 10\text{k}\Omega$ , $V_O = 0\text{dBm}$ , DIN AUDIO*1	60	70		dB
Ripple rejection	SVRR	$R_g = 0$ , $f_R = 100\text{Hz}$ , $V_R = 0\text{dBm}$ , DIN AUDIO*1	75	85		dB
Input resistance	$R_i$		14	20	26	$\text{k}\Omega$
Output noise voltage	$V_{NO}$	$R_g = 0$ , DIN AUDIO*1		0.01	0.04	mV
Standby control voltage	$V_{ST}$	Headphone amplifier on	2		18	V
		Headphone amplifier off	0		1.0	V

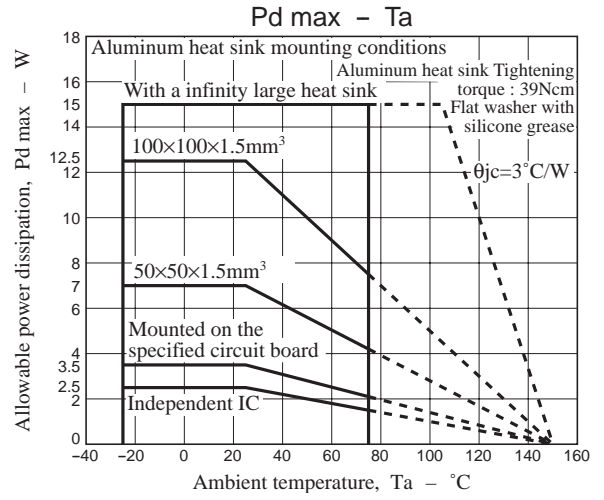
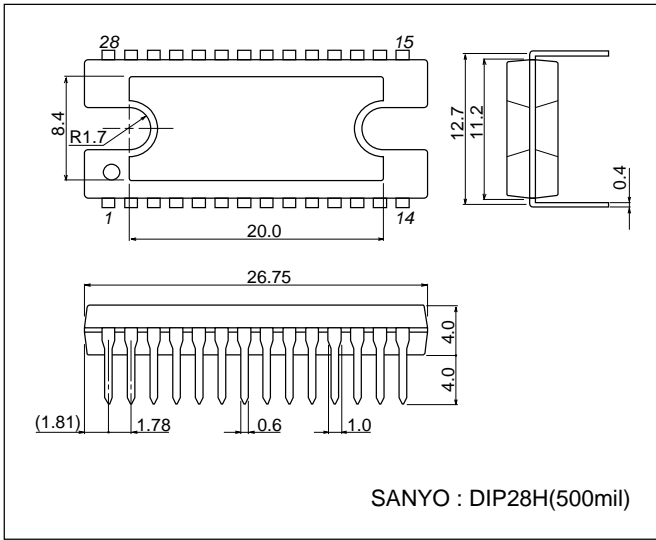
\*1 : A DIN audio filter (20Hz to 20kHz) is used during testing.

\*2 : DDL : Dynamic Distortion Limiter

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## Package Dimensions

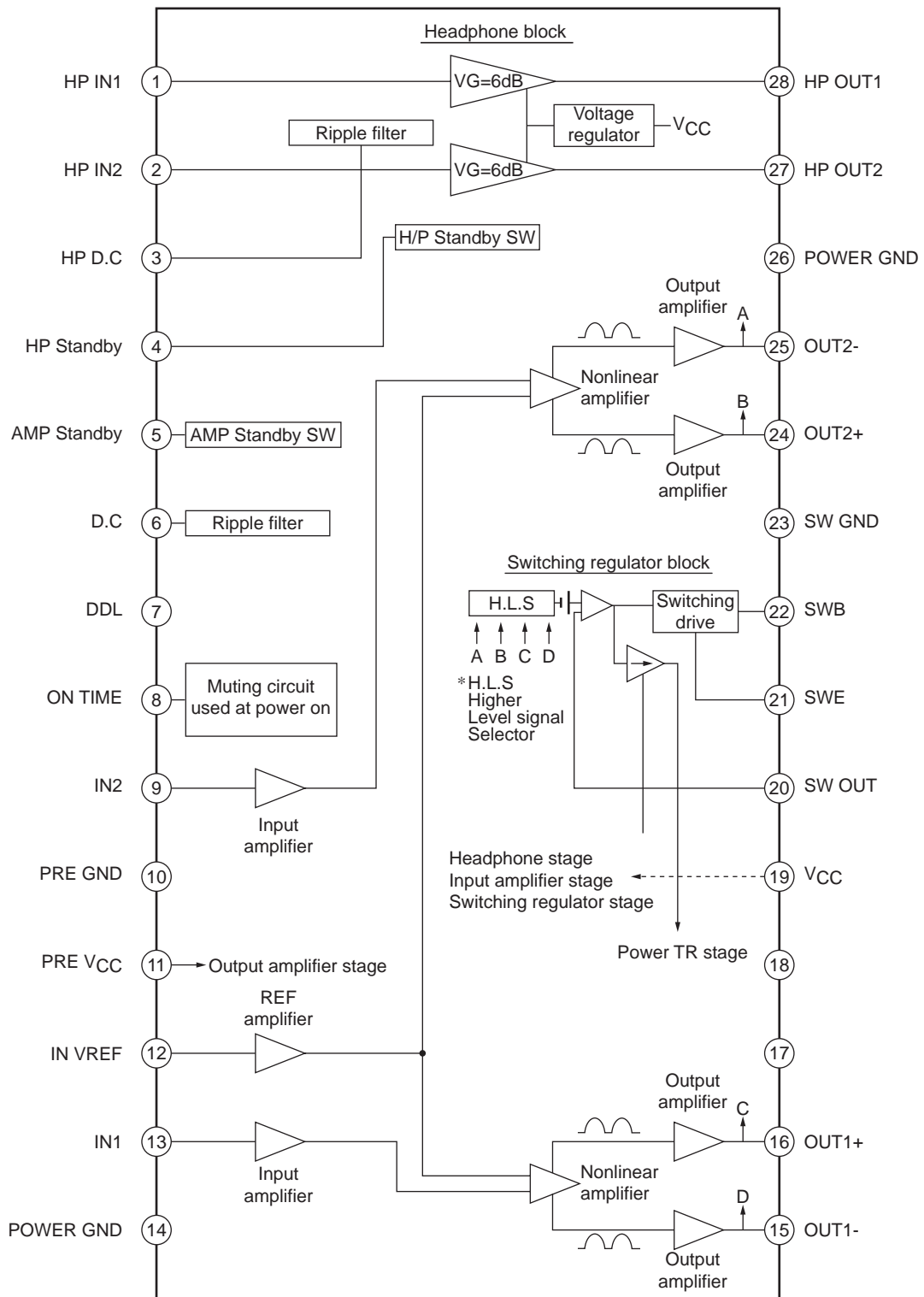
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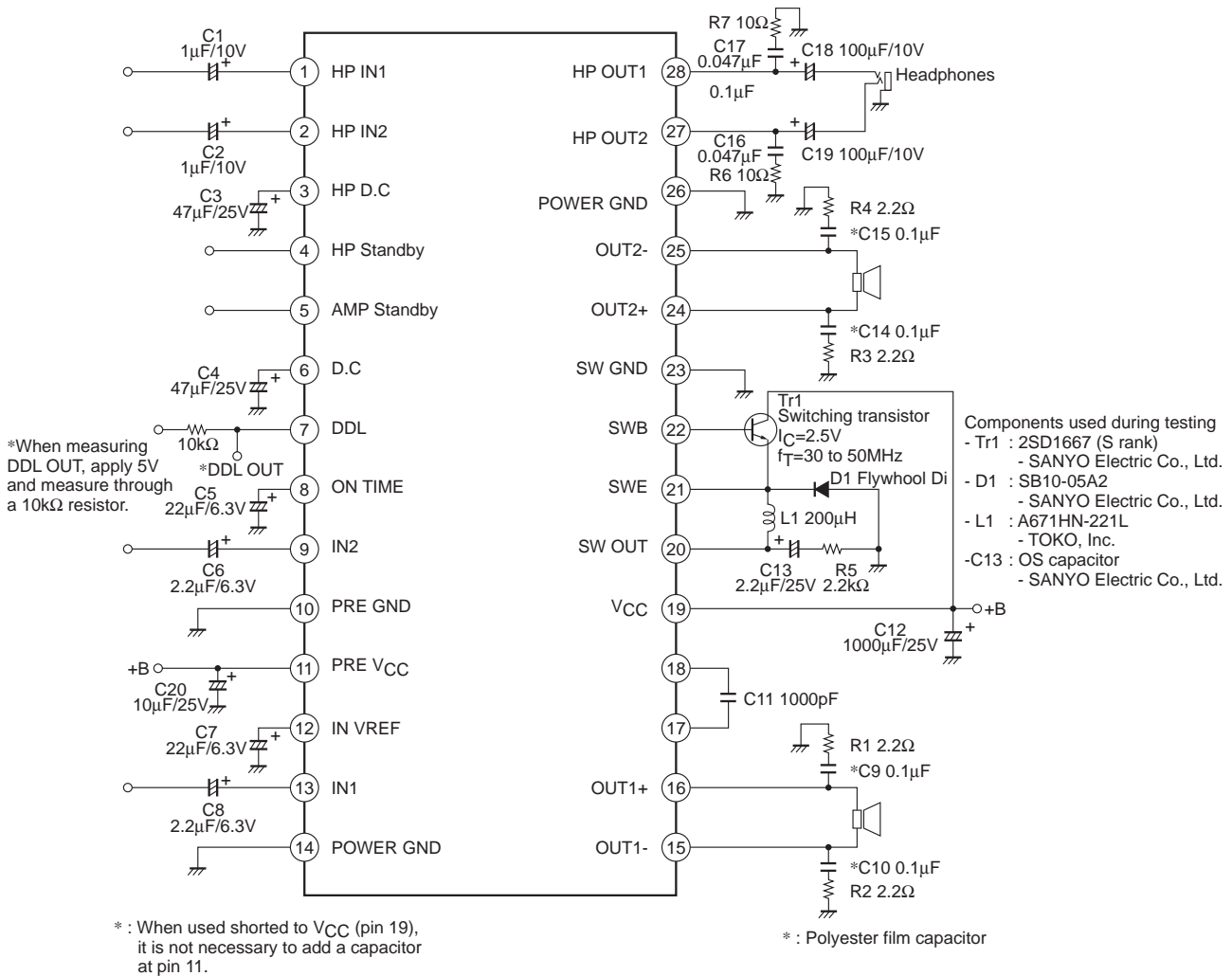


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## Block Diagram

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## External Components

〈Amplifier Block〉

- C4 : Ripple filter capacitor. We recommend a value of 47µF.
- C5 : Sets the amplifier turn-on delay time. We recommend a value of 22µF. (The turn-on delay time for this value will be about 0.7 seconds.) While the speed with which the amplifier turns on can be increased by reducing the value of this capacitor, this can result in impulse noise. We recommend using a value of over 10µF.
- C6 and C8 : Input capacitors. We recommend a value of 22µF. Note that if modified, 3.3µF or lower values should be used due to the relationship with impulse noise.
- C7 : Input reference amplifier capacitor. The same value as that for C6 and C8 must be used.
- C9 and C10 : Oscillation prevention capacitors. We recommend using polyester film capacitors with excellent thermal characteristics. These are used together with R1, R2, R3, and R4.
- C14 and C15
- C11 : Switching regulator oscillation prevention capacitor. We recommend a value of 1000pF.
- C12 : Power supply capacitor
- C13 : Switching regulator output smoothing capacitor. The LA4919N adopts a self-excited switching regulator technique. Since this capacitor influences the self excitation stability characteristics and the regulator efficiency, we recommend using a capacitor with a low equivalent series resistance and excellent thermal characteristics. For the same reason, resistor R5 (2.2Ω) is used together with this capacitor.
- C20 : Pre-V<sub>CC</sub> power supply capacitor. This capacitor is not required when used connected to V<sub>CC</sub>.

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Tr1 :	External switching transistor. We recommend using a device with $I_C = 2.5A$ and $f_T = 30$ to 50MHz. Note that if a transistor with $f_T = 100MHz$ or higher is used, it may induce oscillation in the switching waveform. In this case, we recommend adding a base resistor of about $10\Omega$ , and adjusting the circuit so that oscillation does not occur.
D1 :	Flywheel diode to take up the energy from the coil. We recommend using a Schottky barrier diode with a low VF.
L1 :	We recommend using a $200\mu H$ coil. In particular, we recommend a coil in the inductance range 180 to $220\mu H$ , a DC resistance of under $0.3\Omega$ , and a maximum allowable current of over 0.4A.
〈Headphone Block〉	
C1 and C2 :	Input capacitors. We recommend a value of $0.1\mu F$ .
C3 :	Ripple filter capacitor. We recommend a value of $47\mu F$ .
C16 and C17 :	Oscillation prevention capacitors. We recommend using polyester film capacitors with excellent thermal characteristics. These are used together with R6 and R7.
C18 and C19 :	Output capacitors. We recommend a value of $100\mu F$ .

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