


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	θ_{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	$^\circ C$

■ Any and all SANYO Semiconductor products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO Semiconductor representative nearest you before using any SANYO Semiconductor products described or contained herein in such applications.

■ SANYO Semiconductor 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 products described or contained herein.

SANYO Semiconductor Co., Ltd.

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		15	V
Recommended load resistance	R_L	Amplifier block	8	Ω
		Headphone block	32	Ω
Operating supply voltage range	$V_{CC\text{ op}}$	The range where the package P_d 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	μA
Voltage gain	V _G	V _O = 0dBm	28	30	32	dB
Output power	P _O	THD = 10%	8	10		W
Total harmonic distortion	THD	P _O = 1W, 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 = 10kΩ, V _O = 0dBm, DIN AUDIO*1	50	60		dB
Ripple rejection	SVRR	R _g = 0, f _R = 100Hz, V _R = 0dBm, DIN AUDIO*1	60	70		dB
Input resistance	R _i		21	30	39	kΩ
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 10kΩ resistor, THD = 10%	100	150	200	μA
[Headphone block]						
Voltage gain	V _G	V _O = 0dBm	5	6	7	dB
Output power	P _O	THD = 10%	50	60		mW
Total harmonic distortion	THD	V _O = 0dBm, LPF = 30kHz		0.025	0.05	%
Channel separation	Chsep	R _g = 10kΩ, V _O = 0dBm, DIN AUDIO*1	60	70		dB
Ripple rejection	SVRR	R _g = 0, f _R = 100Hz, V _R = 0dBm, DIN AUDIO*1	75	85		dB
Input resistance	R _i		14	20	26	kΩ
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

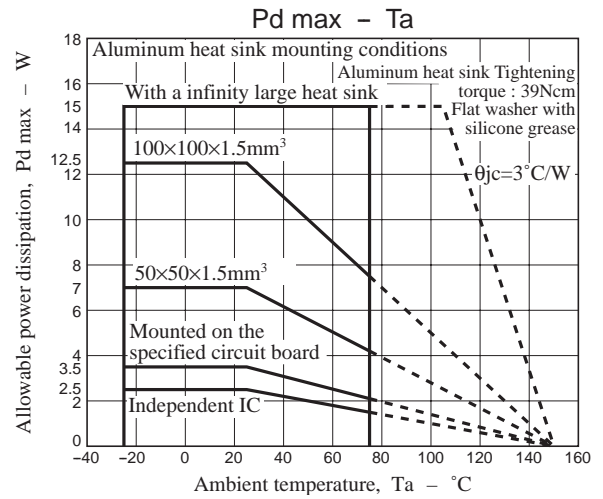
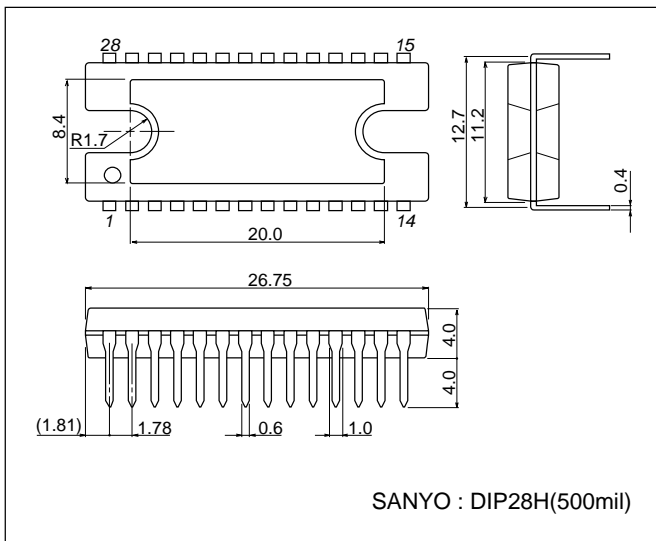
*1 : A DIN audio filter (20Hz to 20kHz) is used during testing.

*2 : DDL : Dynamic Distortion Limiter

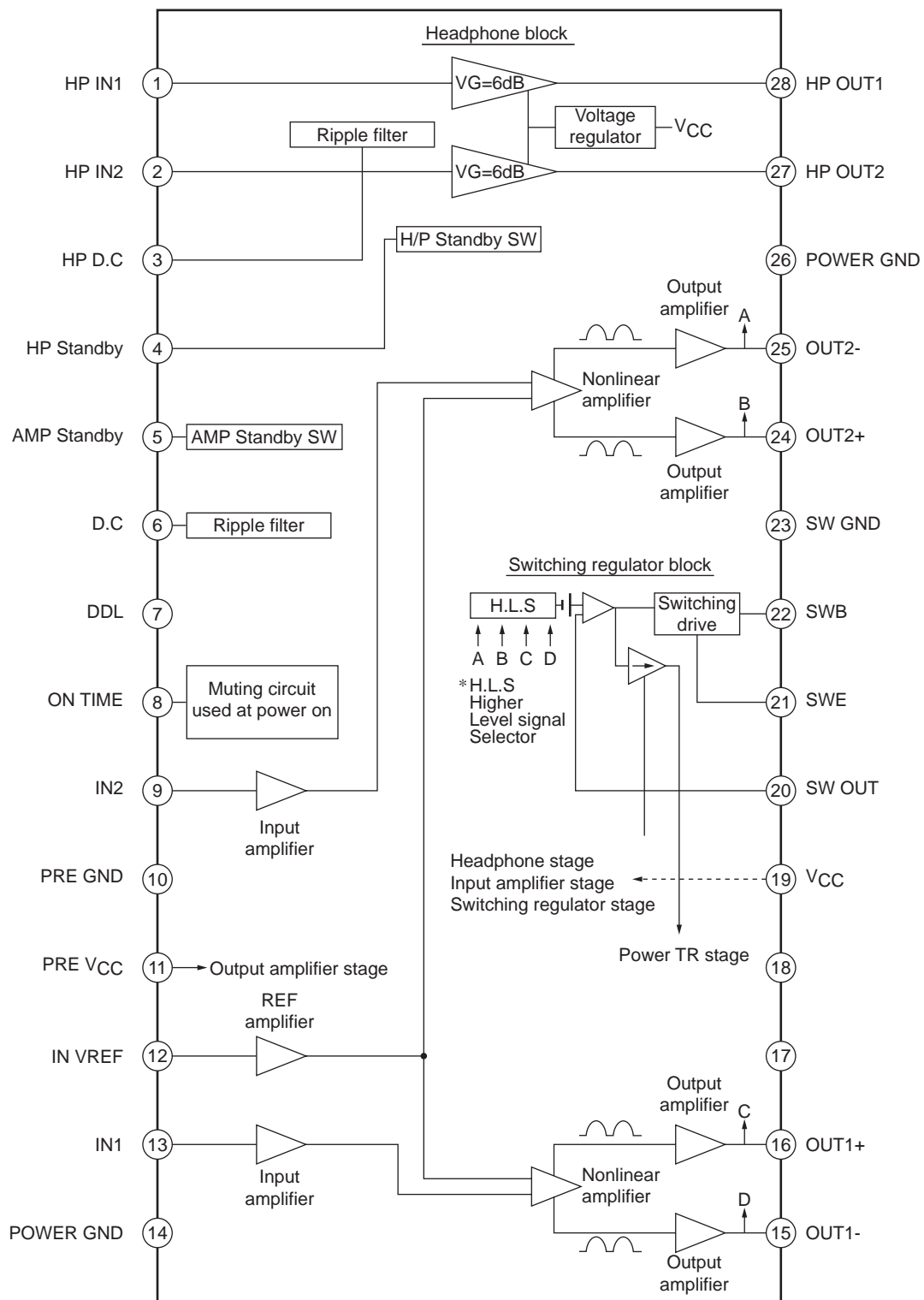
Package Dimensions

unit : mm (typ)

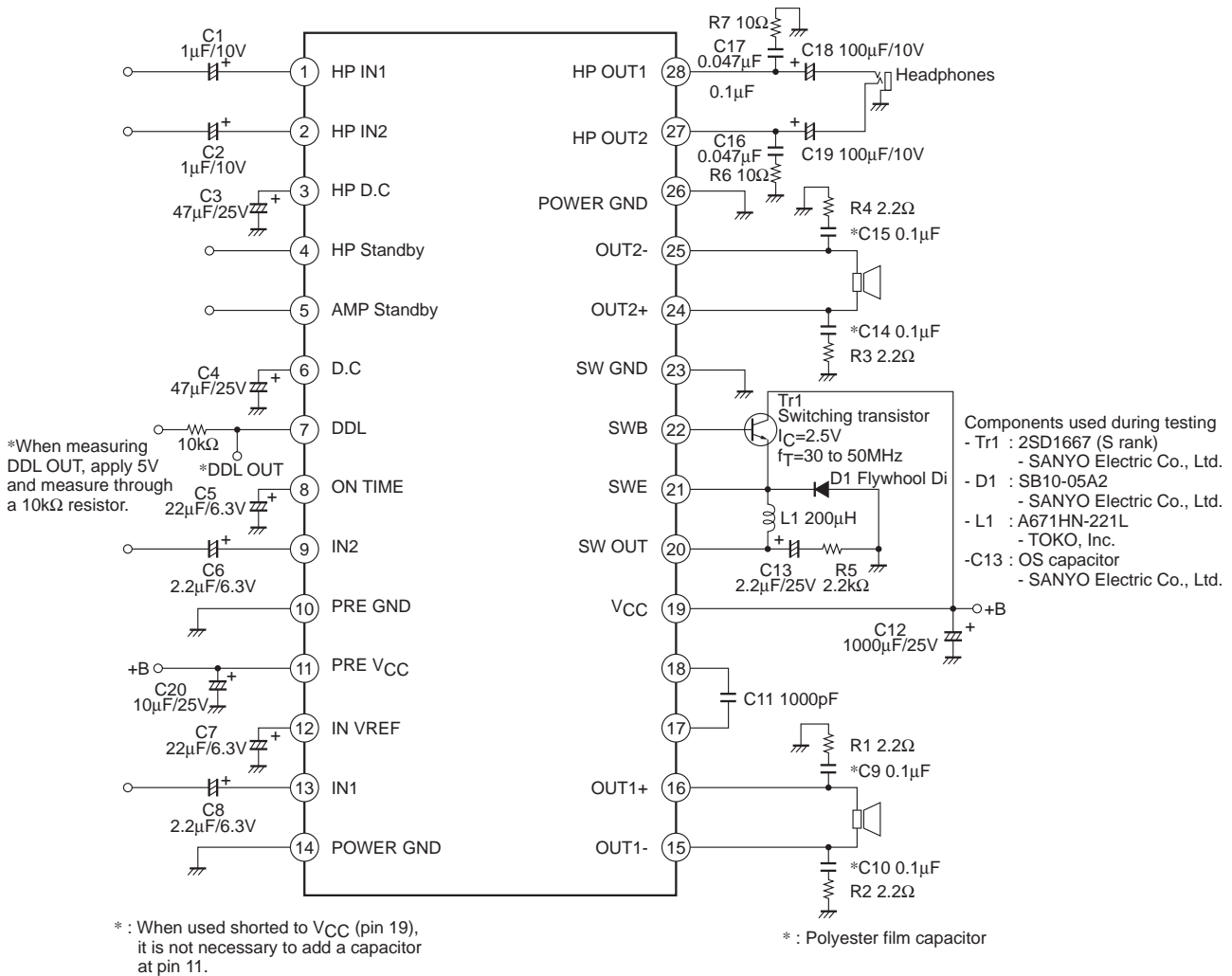
3147C



Block Diagram



Test Circuit



External Components

〈Amplifier Block〉

- C4 : Ripple filter capacitor. We recommend a value of 47 μ F.
- C5 : Sets the amplifier turn-on delay time. We recommend a value of 22 μ F. (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 10 μ F.
- C6 and C8 : Input capacitors. We recommend a value of 22 μ F. Note that if modified, 3.3 μ F 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 (2.2 Ω) is used together with this capacitor.
- C20 : Pre-V_{CC} power supply capacitor. This capacitor is not required when used connected to V_{CC}.

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 10Ω , 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 0.3Ω , 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 $100\mu F$.

- Specifications of any and all SANYO Semiconductor 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. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or 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 products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining 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 permission 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 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. SANYO Semiconductor believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of November, 2006. Specifications and information herein are subject to change without notice.