Ordering number : ENN*5714A

Monolithic Linear IC

LA4906

17-W, 2-Channel BTL AF High-Efficiency Power Amplifier for Car Audio Systems

Preliminary

Overview

The LA4906 is a BTL two-channel power amplifier for use in car audio systems. It uses a signal-following switching technique in the power supply for the amplifier output stage and a newly-developed nonlinear amplifier that features nonlinear characteristics in the signal system. These features hold increases in the number of external components to a minimum, and reduce power dissipation (and thus heat generation) in the practical operating region to about 1/2 that of earlier class B amplifier ICs. This can contribute significantly to miniaturization and weight reduction in the heat sink and to reduction of the heat generated within the end product case.

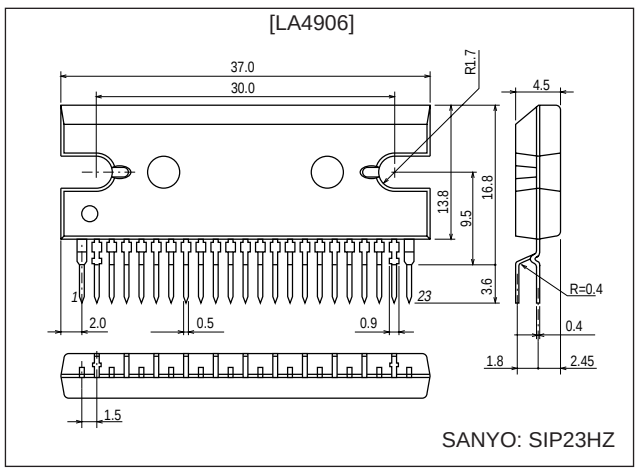
Features

- Power dissipation reduced by 50% (for music at average power levels, as compared to earlier Sanyo products)
- The number of required signal-following switching circuits has been reduced to just one circuit for two channels, reducing the number of external components.
- The output is a pure analog signal; no switching noise whatsoever appears on the output lines.
- Uses a single-voltage power supply from 8 to 18 V.
- Provides a full range of built-in protection circuits, including shorting of output pin to V_{CC}, shorting of output pin to ground, overvoltage, and thermal shutdown protection.
- Built-in standby switch
- Clipping detection function

Package Dimensions

unit: mm

3160-SIP23HZ



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max1	With no signal, t = 1 minute	18	V
	V_{CC} max2		16	V
Maximum output current	I_O Peak	Per channel	4.5	A
Allowable power dissipation	Pd max	With an arbitrarily large heat sink	37.5	W
Operating temperature	Topr		–35 to +85	°C
Storage temperature	Tstg		–40 to +150	°C

Notes: 1. Set V_{CC} and R_L to be in the range where Pd max does not exceed 37.5 W.
2. The overvoltage protection circuit operates at V_{CC} = 26 V or higher.

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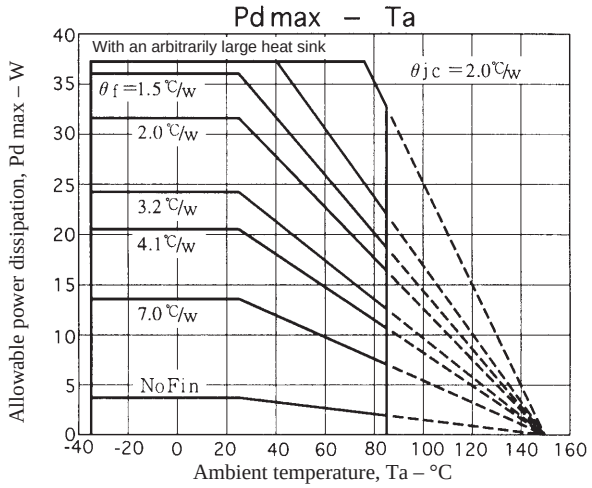
Operating Conditions at Ta = 25°C

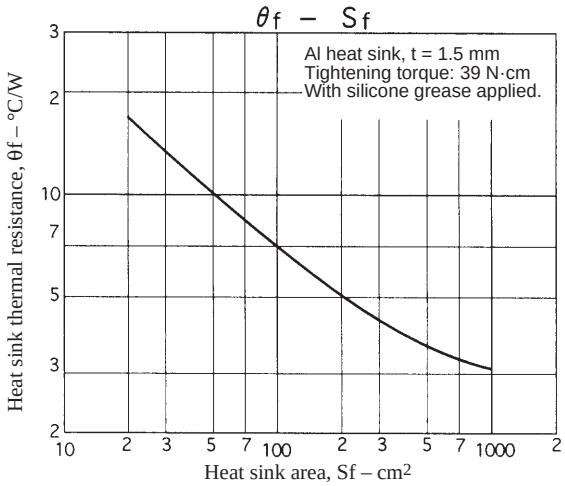
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		13.2	V
Allowable operating voltage range	V_{CC} op		8 to 16	V
Recommended load resistance	R_L		4	Ω
Recommended load resistance range	R_L op		2 to 4	Ω

Note: Set V_{CC} and R_L to be in the range where Pd max does not exceed 37.5 W.

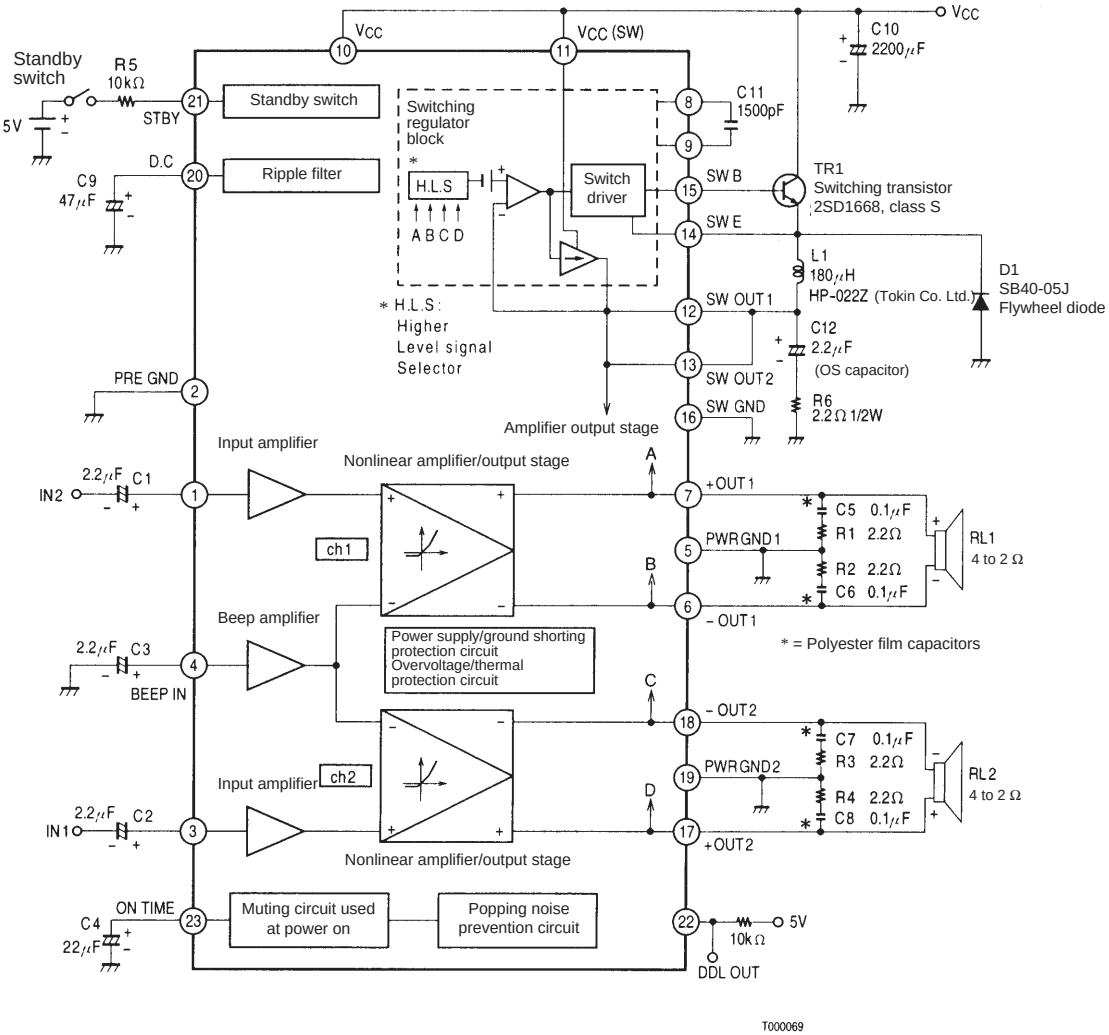
Operating Characteristics at Ta = 25°C, V_{CC} = 13.2 V, R_L = 4 Ω, f = 1 kHz, RG = 600 Ω, in the recommended circuit

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current drain	I_{CCO}	R_L = ∞, V_{IN} = 0	80	110	150	mA
Standby current	Ist			0	10	μA
Voltage gain	VG	V_O = 0 dBm	28	30	32	dB
Total harmonic distortion	THD	P_O = 1 W, LPF = 30 kHz		0.07	0.2	%
Output power	P_O1	THD = 10 %, RL = 4 Ω	14	17		W
	P_O2	THD = 10 %, RL = 2 Ω		25		W
Output noise voltage	V_{NO}	Rg = 0, BPF = 20 Hz to 20 kHz		0.10	0.3	mVrms
Ripple rejection ratio	SVRR	Rg = 0, V_{CCR} = 0 dBm, BPF = 20 Hz to 20 kHz	60	75		dB
Channel separation	CH sep	Rg = 10 kΩ, V_O = 0 dBm, BPF = 20 Hz to 20 kHz	45	60		dB
Input resistance	Ri		21	30	39	kΩ
Output offset voltage	VN offset	Rg = 0	–200		+200	mV
Standby on voltage	V_{STH}	AMP = on, applied through a 10 kΩ resistor	3		V_{CC}	V
Clipping detect off current	I_{DOFF}	THD = 1 %		1	10	μA
Clipping detect on current	I_{DON}	THD = 10 %	100	150	200	μA





Equivalent Circuit Block Diagram



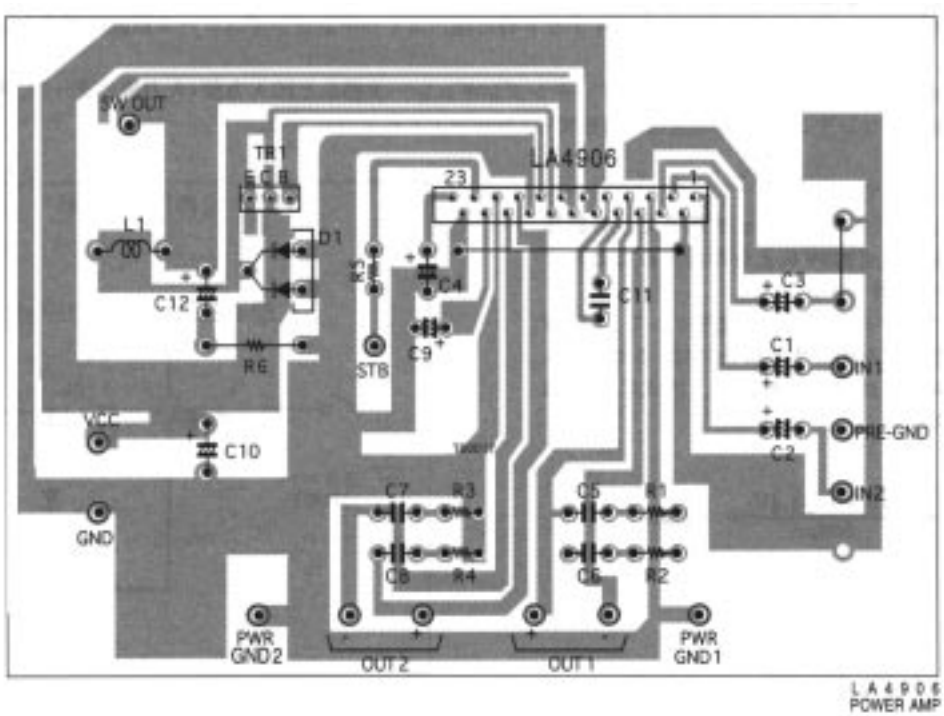
Pin Voltages (At V_{CC} = 13.2 V, with 5 V applied to STBY through a 10 kΩ resistor, using a digital voltmeter)

Pin No.	1	2	3	4	5	6	7	8
Pin	IN2	Pre - GND	IN1	BEEP	PWR - GND 1	–OUT1	+OUT1	C
Pin voltage (V)	1.36	0	1.36	1.36	0	2.03	2.03	13.0

Pin No.	9	10	11	12	13	14	15	16
Pin	C	V_{CC}	V_{CC} (SW)	SW OUT1	SW OUT2	SW E	SE B	SW - GND
Pin voltage (V)	3.92	13.2	13.2	3.70	3.70	3.73	4.0	0

Pin No.	17	18	19	20	21	22	23	
Pin	+OUT2	–OUT2	PWR - GND2	D. C	STAND-BY	DDL OUT	ON-TIME	
Pin voltage (V)	2.03	2.03	0	12.1	3.21	0	2.81	

Sample Printed Circuit Board



1. External component descriptions

C1 and C2

· Input capacitors. A value of 2.2 µF is recommended for these capacitors. Note that the low-frequency area characteristics can be adjusted by changing f_L, which is determined by the values of C1 and C2. However, due to impulse (pop) noise considerations, the value of C1 and C2 should not exceed 3.3 µF when C4 is 22 µF.

C3

· Beep amplifier input capacitor. A value the same as that of C1 and C2 is used. If the beep function is not used, connect the beep input to PRE-GND through C3.

C4

· Set the amplifier turn-on time. A value of 22 µF is recommended. (This will result in a turn-on time of about 0.7 second.) The on time is proportional to the value of this capacitor, and any value may be used. However, due to impulse (pop) noise considerations, a value of 22 µF or larger should be used.

C5, C6, C7, and C8

· Oscillation prevention capacitors. Polyester film (Mylar) capacitors with good temperature characteristics must be used. (These are used together with R1, R2, R3, and R4.) We recommend values of 0.1 µF or higher for these capacitors since the stability will differ somewhat depending on the printed circuit board layout actually used.

C9

· Decoupling capacitor (ripple filter)

C10

· Power-supply capacitor

C11

· Oscillation prevention capacitor for the switching regulator. A value of 1500 pF is recommended.

C12

· Switching regulator output smoothing capacitor. The LA4906 adopts a self-excited switching regulator technique. The value of this capacitor must be optimized, since it influences both the self-excitation stability and the regulator efficiency. We recommend using a 2.2-µF 25-V OS (Organic Semiconductor) capacitor with a low series resistance and good temperature characteristics. Note that for the same reason a 2.2-Ω 1/2-W resistor should be used for the associated resistor R6.

R5

· Standby switch current limiter resistor. A value of 10 kΩ is recommended. (When the voltage applied to the standby switch is in the range 3 to 13.2 V.) Note that this resistor cannot be removed from this circuit.