



LA9410

Final Audio Output IC for LD Players

Overview

The LA9410 final audio output IC for laser disk players has an internal input amplifier for the 1-bit DAC, 40 kHz LPF, digital/analog signal select circuit, output mute, volume circuit, mixing amplifier and limiter circuit for RF output, and voltage regulator for plus and minus power supply. It provides a compact implementation of audio output circuitry for LD and CD compatible players and laser karaoke systems.

Functions

- Input amplifier for 1-bit DAC, LPF
- Input signal select (digital/analog audio)
- Output mute
- Volume circuit (for headphone amplifier. No headphone drive output amplifier is provided)
- Mixing amplifier for RF output (with internal limiter circuit)
- Regulated power supply circuit (internal use only. Cannot be output to external circuits)

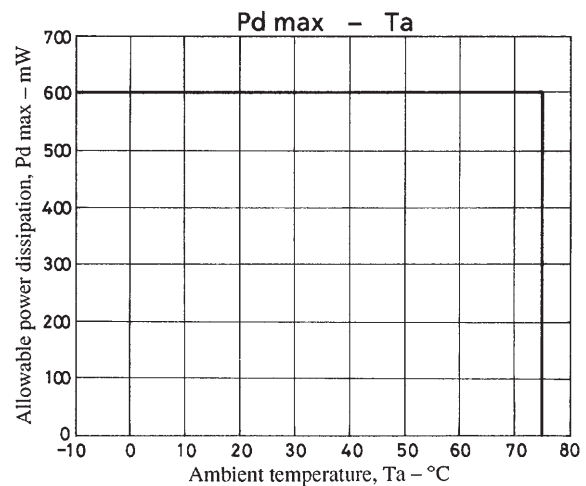
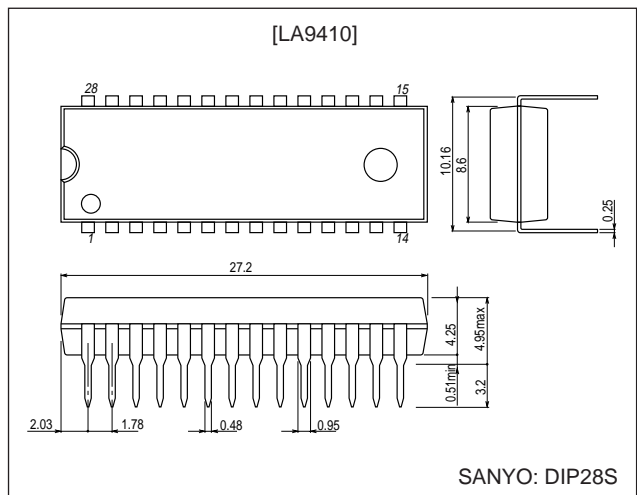
Features

- Provides compact implementation of LD player output circuits
- Suitable for 1-bit DAC
- Internal voltage regulator allows direct use of non-regulated power supply
- Package: DIP-28S

Package Dimensions

unit : mm

3063-DIP28S



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Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	$V_{CC\text{ max}}$	(IC only, $V_{CC}-V_{EE}$)	14	V
Allowable power dissipation	$P_d\text{ max}$		600	mW
Operating temperature	T_{opr}		-10 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_{sup}	(For use in application circuit)	± 14	V
Power supply voltage operating range	$V_{sup\text{ op}}$	(For use in application circuit)	± 11 to ± 18	V
Reference output voltage	V_r		2	V _{rms}

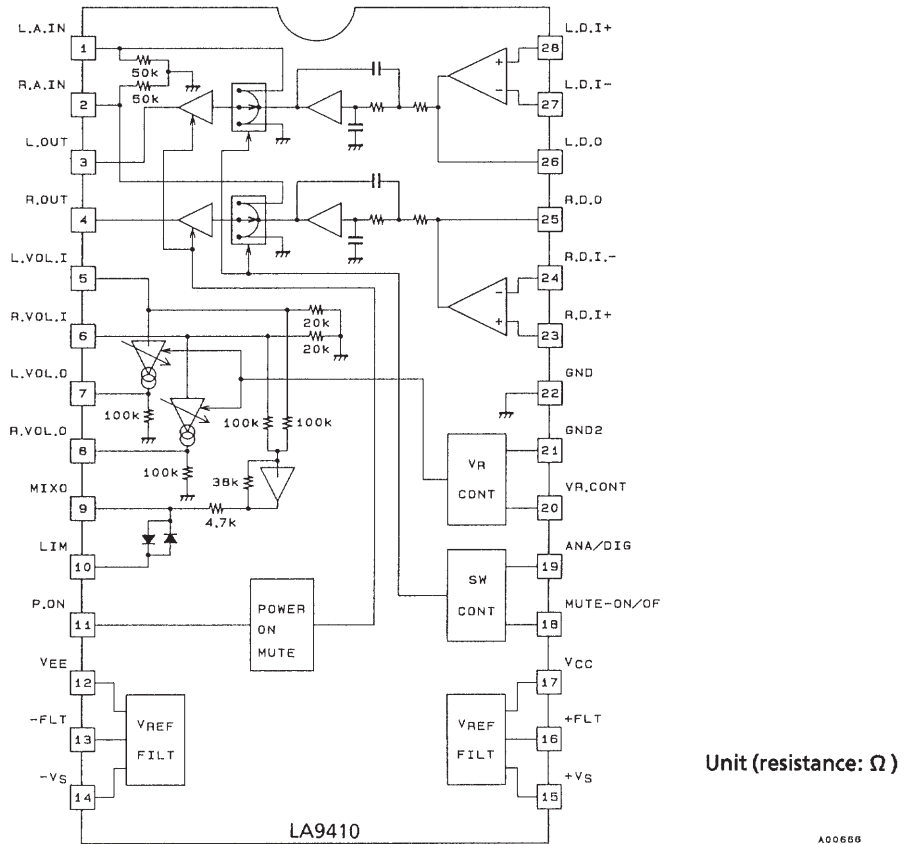
Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{sup} = \pm 14\text{V}$, $V_i = 2V_{rms} = 0\text{dB}$, 1kHz , $R_L = 10\text{k}\Omega$, $V_{cont} = 0\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent supply current	I_{CCO}	No signal	± 17	± 21	± 25	mA
Line output level / digital	V_{od}	Digital input, line output	-1	0	+1	dB
Line output level / analog	V_{oa}	Analog input, line output	-1	0	+1	dB
Volume output level	V_{Ro}	Volume input/output	-3	0	+3	dB
Mixing output level	V_{Mo}	Volume input, Mixed output for L&R in-phase input	-5	-3	-1	dB
Line frequency response / digital 1	F1	Digital input, -20dB, 20kHz/1kHz, line output	0	0.7	1.5	dB
Line frequency response / digital 2	F2	Digital input, -20dB, 40kHz/1kHz, line output	0	2.5	5	dB
Muting ratio	M_r	Digital input, line output	90	110		dB
Volume attenuation level 1	V_{Rr1}	Volume input/output, $V_{cont} = 1\text{V}$	-15.5	-12.5	-9.5	dB
Volume attenuation level 2	V_{Rr2}	Volume input/output, $V_{cont} = 5\text{V}$		-58	-50	dB
Signal/noise ratio digital	$S/N1$	Digital input mode, 20kHz/LPF, line output	86	99		dB
Signal/noise ratio analog	$S/N2$	Analog input mode, 20kHz/LPF, line output	86	99		dB
Channel separation	Sep	Digital input, line output	86	96		dB
Crosstalk	Cr	Digital input mode, line output	86	98		dB
Total harmonic distortion (digital 1)	THD1	1kHz, 0dB, Digital input, line output		0.005	0.009	%
Total harmonic distortion (digital 2)	THD2	10kHz, -10dB, Digital input, line output		0.02	0.07	%
Total harmonic distortion (analog)	THD3	1kHz, 0dB, Analog input, line output		0.008	0.03	%
Line output offset voltage	V_{off}	Digital input mode, line output	-50	0	+50	mV
Pin 18 threshold voltage	V_{th18}		1.5	2.1	3	V
Pin 19 threshold voltage	V_{th19}		1.5	2.1	3	V

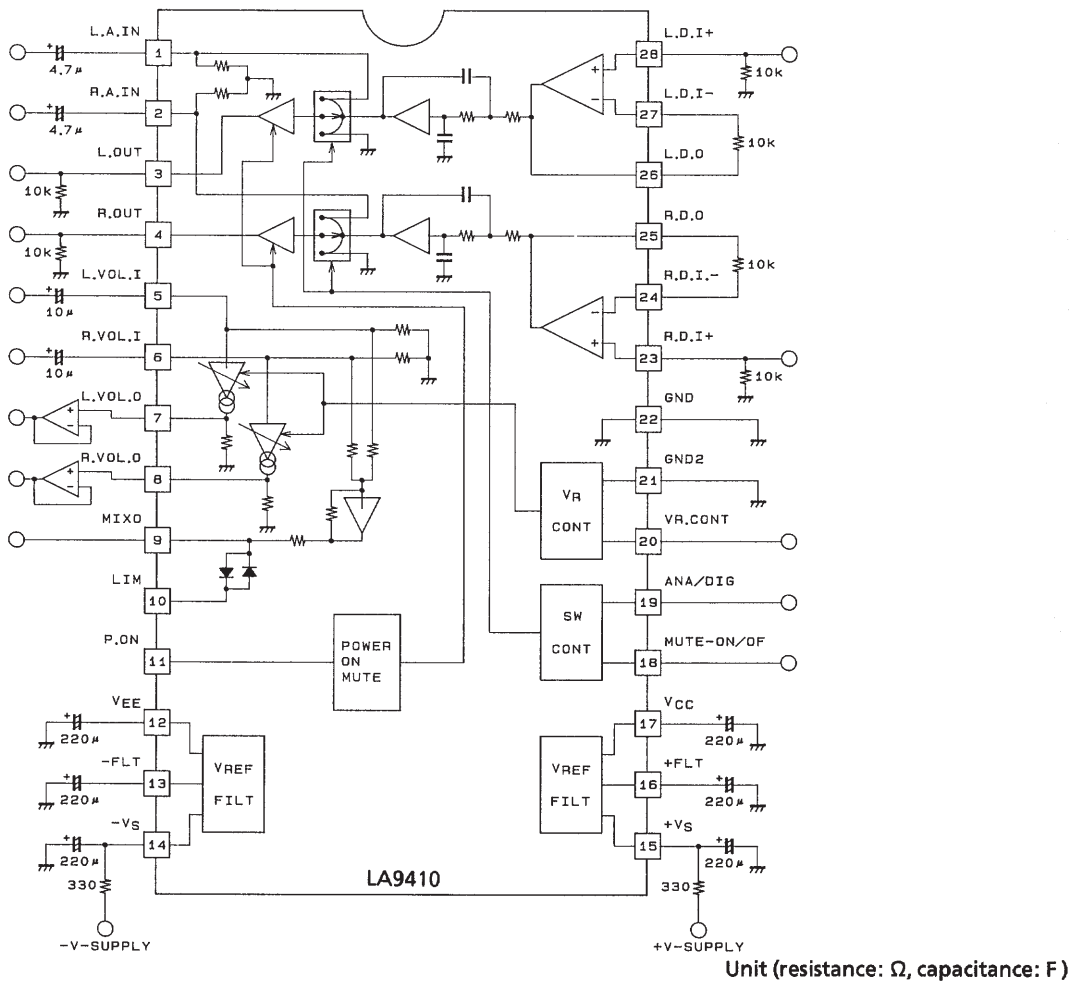
Note: Unless otherwise specified, a 400Hz to 30kHz bandpass filter is used.

LA9410

Block Diagram

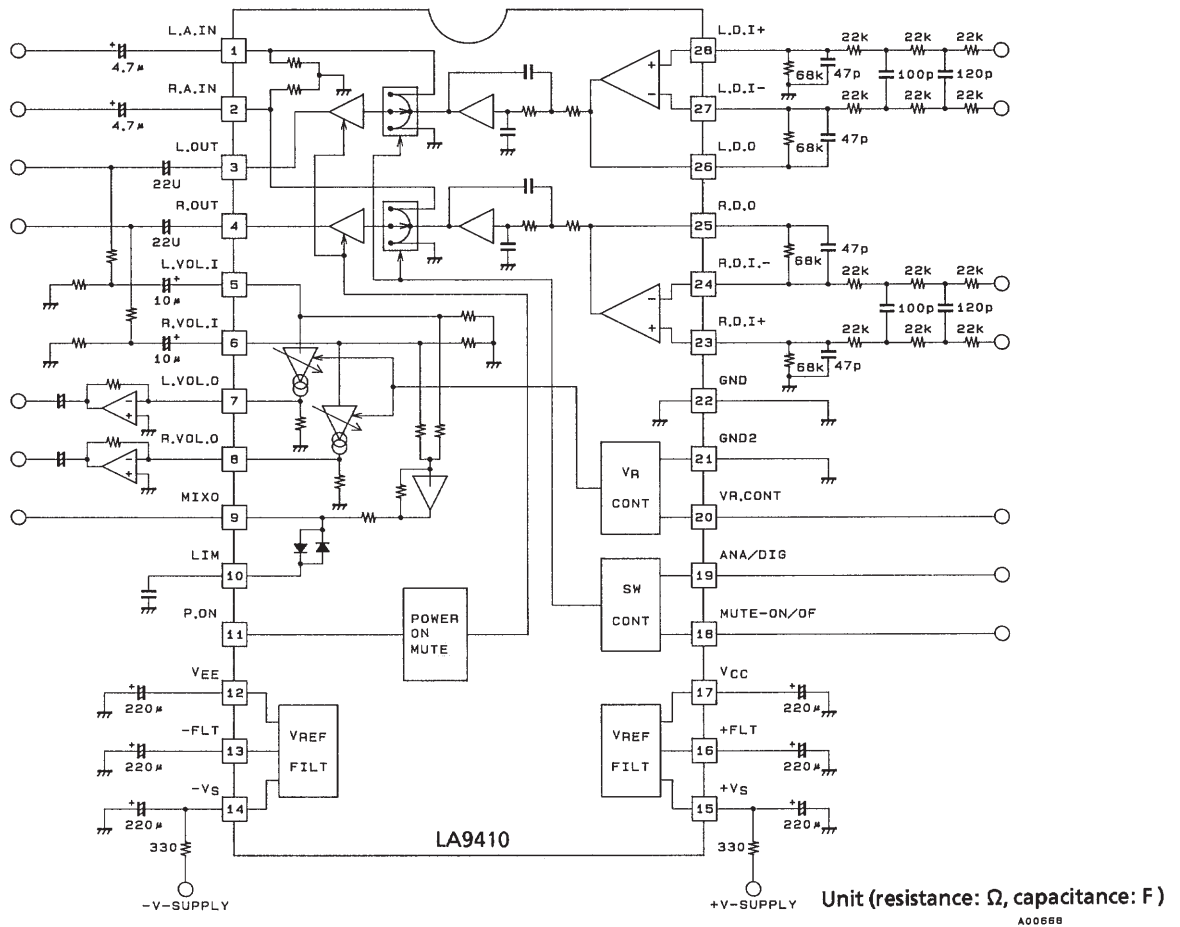


Test Circuit



LA9410

Sample Application Circuit

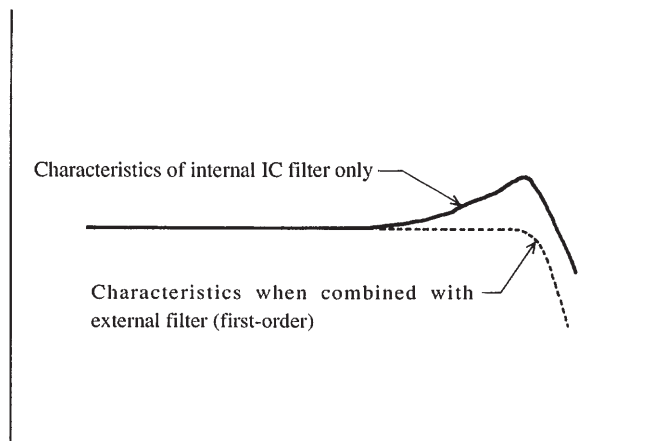


Technical information

1. Internal digital input filter

The filter internal to the LA9410 is designed to form a third-order filter when used in combination with an external first-order filter. Characteristics when used alone and when used in conjunction with the external filter are illustrated below.

Reference Figure 1



2. External components for input circuit for 1-bit DAC

The LA9410 circuit is directly connected from the input to line output. If the differential of the external components used for the input circuit (differential input) of the 1-bit DAC is large, it will become a DC offset, and may cause popping noise during selection and muting.

3. Power supply

In the LA9410 the IC is protected from high voltage inputs by series resistors located in the power supply, and voltage regulator circuits in the IC. This means that IC current dissipation will be strongly affected by supply voltage and the series resistance. Power supply design requires sufficient leeway so that the allowable power dissipation of the IC is not exceeded.

Note: Use a series resistance in the power supply so that the IC current dissipation is 38mA or less.

4. Measurement of separation and crosstalk

The effects of the IC evaluation circuit board pattern may make accurate measurement of crosstalk and separation impossible. This is especially common when the peripheral resistor of the 1-bit DAC input circuit has a high resistance.

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