



LA7451M

Two-Channel, Noise Reduction Processor for 8-mm VCR PCM

Overview

The LA7451M is a two-channel, noise reduction processor IC for 8-mm video recorder, pulse code modulation (PCM) circuits.

The LA7451M incorporates two filters, one per channel, comprising emphasis circuits, weighting compensators, voltage-controlled amplifiers (VCA) and detectors. Filter control circuitry sets the emphasis and weighting of each filter.

The LA7451M operates from a 4.75V supply and is available in 30-pin MFPs.

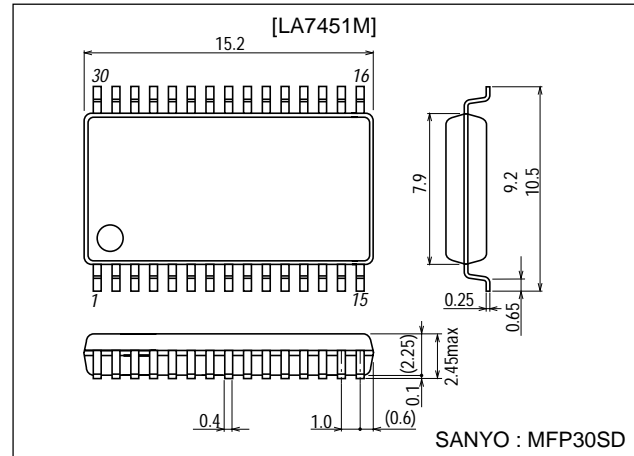
Features

- Filter control.
- Emphasis circuits.
- Weighting compensators.
- Voltage-controlled amplifiers (VCA).
- 4.75V supply.
- 30-pin MFP.

Package Dimensions

unit:mm

3073B-MFP30SD



Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		7	V
Power dissipation	$P_d \text{ max}$		300	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +150	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		4.75	V
Supply voltage range	V_{CC}		4.5 to 5.5	V

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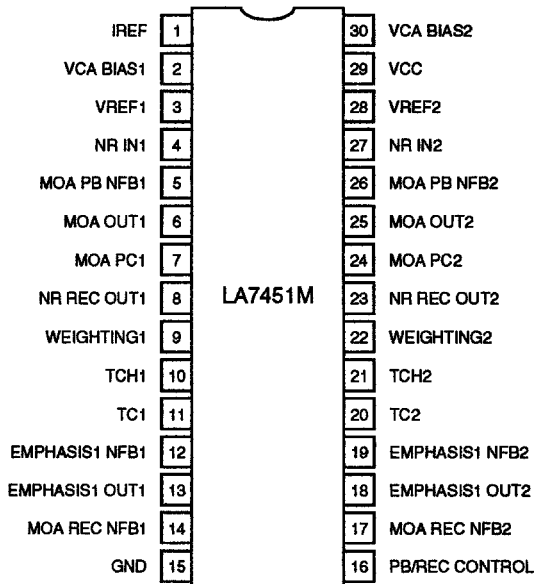
Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC}=4.75\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Recording-mode quiescent current	I_{CCR}		10.0	13.0	16.0	mA
Playback-mode quiescent current	I_{CCP}		10.0	13.0	16.0	mA
Reference voltage	V_{REF}	DC : pin 32	2.290	2.375	2.455	V
[PB mode]						
Output level	V_{OP}	$V_I=-16\text{dBs}$, $f=400\text{Hz}$, $R_L=10\text{k}\Omega$	-18.0	-16.0	-14.0	dBs
Channel output level differential	V_{OCH}	$V_I=-16\text{dBs}$, $f=400\text{Hz}$, $R_L=10\text{k}\Omega$	-1	0	+1	dB
Total harmonic distortion	THD_P	$V_I=-16\text{dBs}$, $f=400\text{Hz}$, $R_L=10\text{k}\Omega$		0.1	0.5	%
Maximum output level	V_{OMP}	$THD=1\%$, $f=400\text{Hz}$, $R_L=10\text{k}\Omega$	0.0	3.0		dBs
Maximum output noise level	V_{ONP}	$R_g=1\text{k}\Omega$, JIS-A filter		-103	-96	dBs
[REC mode]						
Output level	V_{OR}	$f=400\text{Hz}$, $R_L=2\text{k}\Omega$: $V_I=-16\text{dBs}$	-17.0	-16.0	-15.0	dBs
		$f=400\text{Hz}$, $R_L=2\text{k}\Omega$: $V_I=-36\text{dBs}$	-27.5	-26.5	-24.5	dBs
		$f=400\text{Hz}$, $R_L=2\text{k}\Omega$: $V_I=-56\text{dBs}$	-37.5	-36.0	-34.5	dBs
		$f=7\text{kHz}$, $R_L=2\text{k}\Omega$: $V_I=-16\text{dBs}$	-13.4	-11.9	-10.4	dBs
		$f=7\text{kHz}$, $R_L=2\text{k}\Omega$: $V_I=-36\text{dBs}$	-23.4	-21.9	-20.4	dBs
		$f=7\text{kHz}$, $R_L=2\text{k}\Omega$: $V_I=-56\text{dBs}$	-33.4	-31.9	-30.4	dBs
Total harmonic distortion	THD_R	$V_I=-16\text{dBs}$, $f=400\text{Hz}$, $R_L=2\text{k}\Omega$		0.2	0.5	%
Maximum input level	V_{IMR}	$THD=1\%$, $f=400\text{Hz}$, $R_L=2\text{k}\Omega$	0.0	3.0		dBs
Maximum output noise level	V_{ONR}	$R_g=1\text{k}\Omega$, JIS-A filter		-66	-60	dBs
Channel crosstalk rejection	CR	$V_I=-6\text{dBs}$, $f=1\text{kHz}$			-45	dB
[Control]						
Recording-mode select voltage	V_R	Measured at PB/REC CONTROL	0.0		1.0	V
Playback-mode select voltage	V_P	Measured at PB/REC CONTROL	3.0		V_{CC}	V

Note

JIS=Japanese Industrial Standard

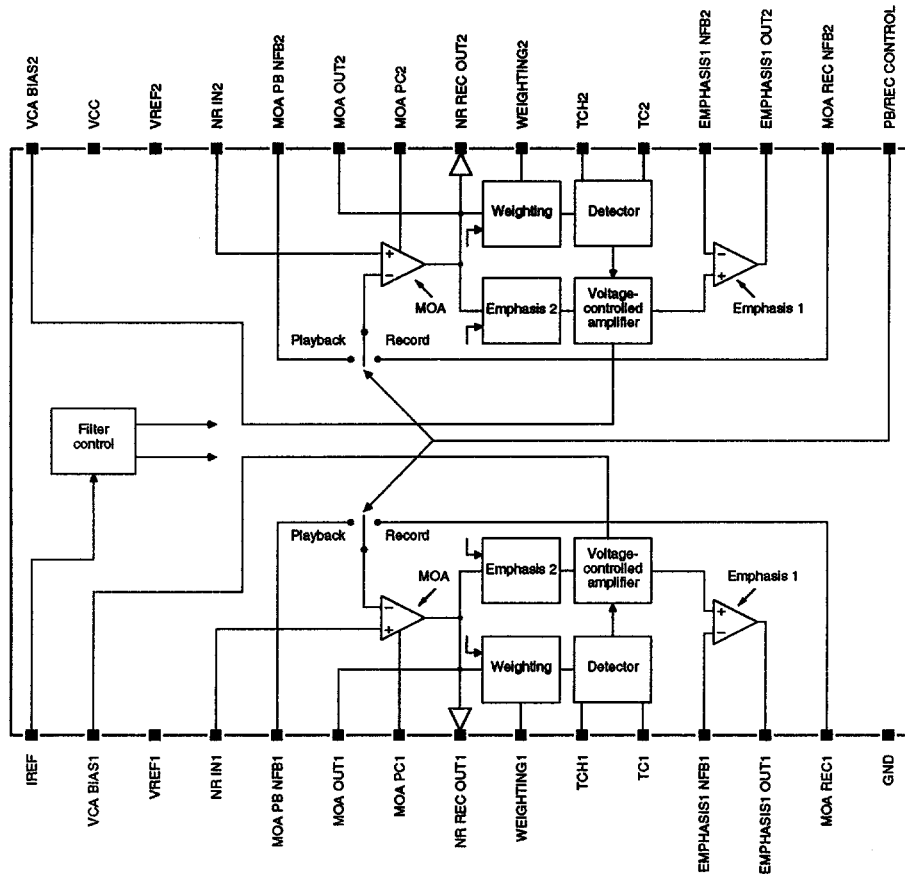
Pin Assignment



Top view

LA7451M

Block Diagram



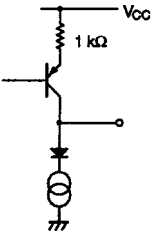
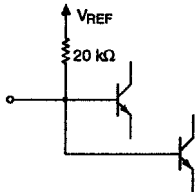

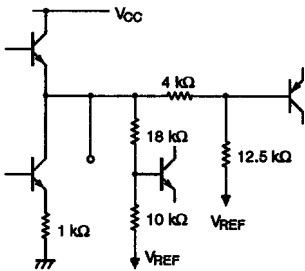
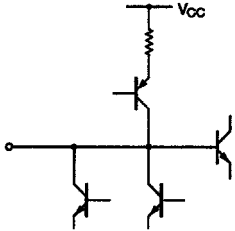
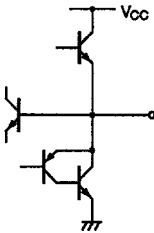
Pin Functions

Number	Name	Equivalent circuit	Function
1	IREF		Filter reference current resistor connection. The external IREF-to-GND resistance determines the reference current. Nominal voltage is 3V.
2	VCA BIAS 1		VCA DC offset capacitor connection. Input impedance is 10kΩ and nominal voltage is 2.4V.

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LA7451M

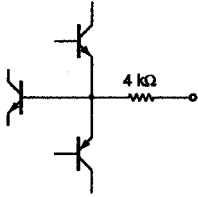
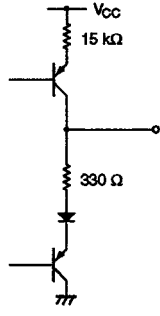
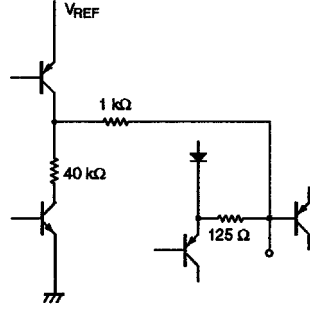

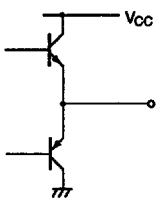
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Number	Name	Equivalent circuit	Function
3	VREF1		Channel 1 reference voltage output. Output impedance is 90Ω and nominal voltage is 2.4V (0.5V _{CC}).
4	NR IN1		Channel 1 input. Input impedance is 20kΩ and nominal voltage is 2.4V.
5	MOA PB NFB1		Main operating amplifier playback-mode negative feedback input 1. Used for aperture compensation. Nominal voltage is 2.4V.
6	MOA OUT1		Main operating amplifier output 1. Nominal voltage is 2.4V.
7	MOA PC1		Main operating amplifier phase compensation capacitor connection 1. Nominal voltage is 3.1V
8	NR REC OUT1		Recording-mode output 1. Low-impedance output buffer.

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LA7451M

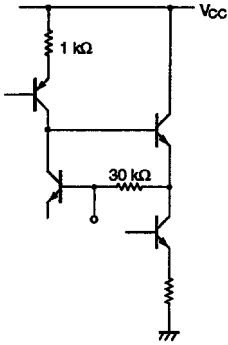
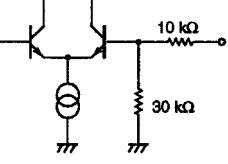
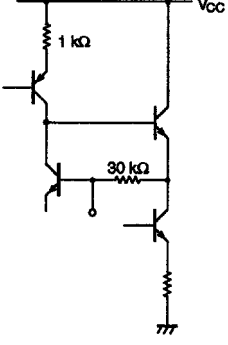
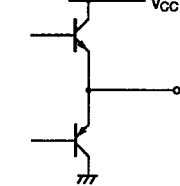
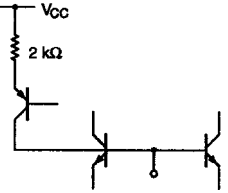
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Number	Name	Equivalent circuit	Function
9	WEIGHTING 1		Weighting compensator 1 full-wave rectifier capacitor connection. Input impedance is 4kΩ and nominal voltage is 2.4V.
10	TCH1		Detector hold time adjustment capacitor connection 1. Nominal voltage is 2.6V
11	TC1		Detector attack and recovery time adjustment capacitor connection 1. Nominal voltage is 2V.
12	EMPHASIS1 NFB1		Emphasis amplifier negative feedback input 1. Nominal voltage is 2.4V.
13	EMPHASIS 1 OUT1		Emphasis amplifier output 1. Nominal voltage is 2.4V.

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LA7451M

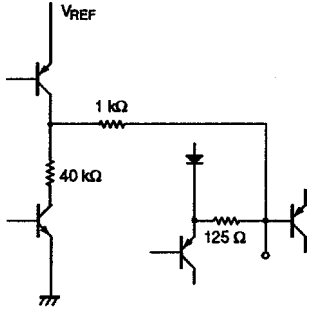
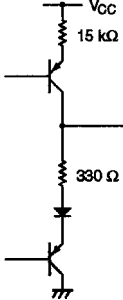
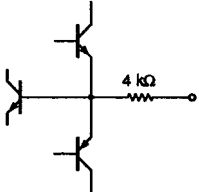
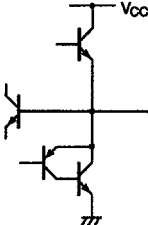
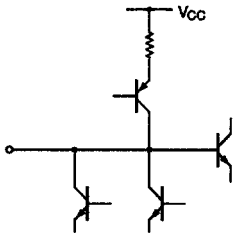
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Number	Name	Equivalent circuit	Function
14	MOA REC NFB1		Main operating amplifier recording-mode negative feedback input 1. Nominal voltage is 2.4V.
15	GND		Ground
16	PB/REC CONTROL		Playback/recording select input. Recording when LOW or open, playback, when HIGH.
17	MOA REC NFB2		Main operating amplifier recording-mode negative feedback input 2. Nominal voltage is 2.4V.
18	EMPHASIS 1 OUT2		Emphasis amplifier output 2. Nominal voltage is 2.4V.
19	EMPHASIS 1 NFB2		Emphasis amplifier negative feedback input 2. Nominal voltage is 2.4V.

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LA7451M

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Number	Name	Equivalent circuit	Function
20	TC2		Detector attack and recovery time adjustment capacitor connection 2. Nominal voltage is 2V.
21	TCH2		Detector hold time adjustment capacitor connection 2. Nominal voltage is 2.6V.
22	WHIGHTING2		Weighting compensator 2 full-wave recifier capacitor connection. Input impedance is 4kΩ and nominal voltage is 2.4V.
23	NR REC OUT2		Recording-mode output 2. Low-impedance output buffer.
24	MOA PC2		Main operating amplifier phase compensation capacitor connection 2. Nominal voltage is 3.1V.

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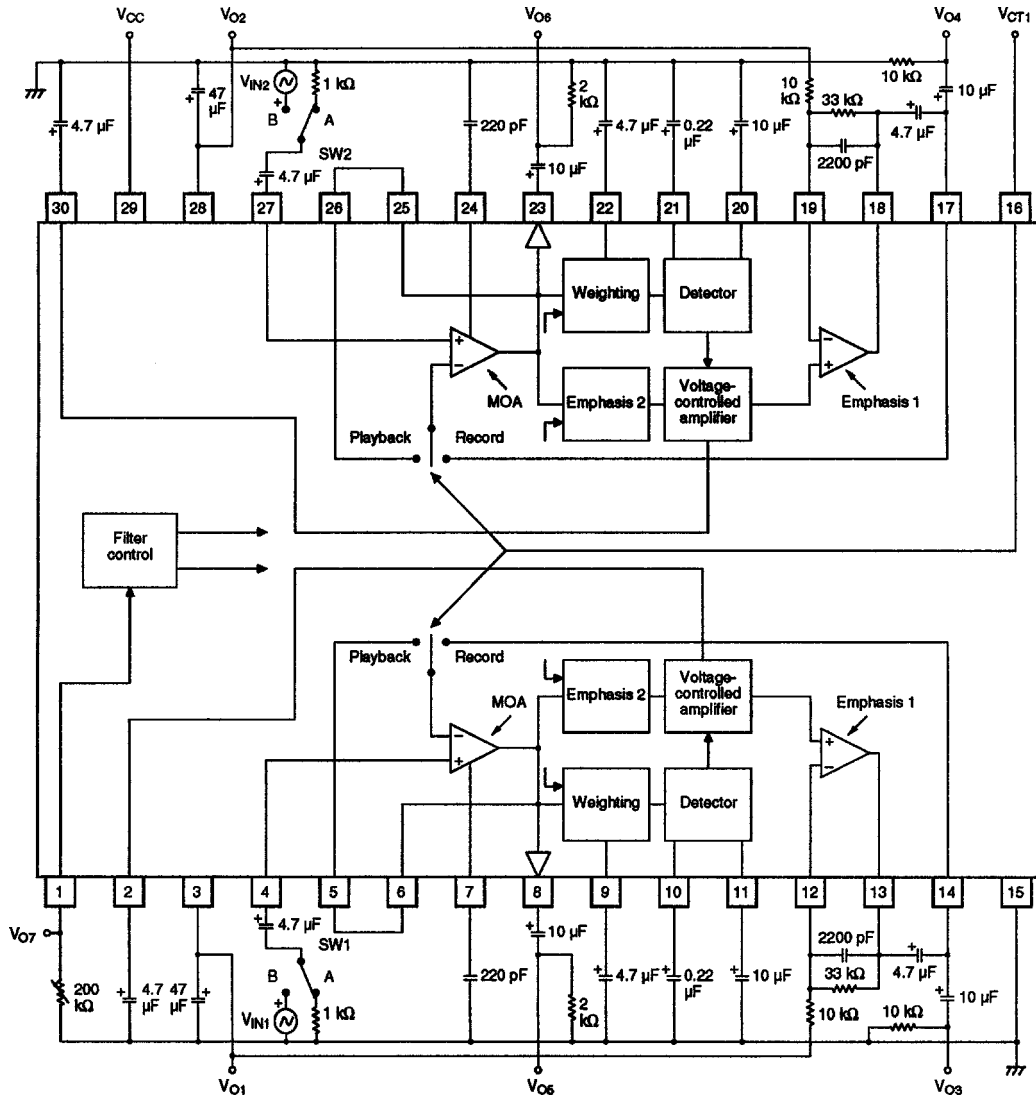
LA7451M

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Number	Name	Equivalent circuit	Function
25	MOA OUT2		Main operating amplifier output 2. Nominal voltage is 2.4V.
26	MOA PB NFB2		Main operating amplifier playback-mode negative feedback input 2. Used for aperture compensation. Nominal voltage is 2.4V.
27	NR IN2		Channel 2 input. Input impedance is 20kΩ and nominal voltage is 2.4V.
28	VREF2		Channel 2 reference voltage output. Output impedance is 90Ω and nominal voltage is 2.4V (0.5V _{CC}).
29	V _{CC}		5V supply
30	VCA BIAS2		VCA DC offset capacitor connection. Input impedance is 10kΩ and nominal voltage is 2.4V.

LA7451M

Test Circuit



Test Condition Switch Positions

Parameter	Symbol	SW1	SW2	V _{CT1}	Input	Test point
Recording-mode quiescent current	I _{CCR}	A	A	GND	–	A
Playback-mode quiescent current	I _{CCP}	A	A	V _{CC}	–	A
Reference voltage	V _{REF}	A	A	GND	–	V _{O1}
		A	A	GND	–	V _{O2}
Recording-mode select voltage	V _R	B	A	–	V _{CT1} , V _{IN1}	V _{CT1} , V _{O1}
Playback-mode select voltage	V _P	B	A	–	V _{CT1} , V _{IN1}	V _{CT1} , V _{O1}

Recording mode

Parameter	Symbol	SW1	SW2	V _{CT1}	Input	Test point
Output level	V _{OR}	B	A	GND	V _{IN1}	V _{O6}
		A	B	GND	V _{IN2}	V _{O6}
Total harmonic distortion	THD _R	B	A	GND	V _{IN1}	V _{O5}
		A	B	GND	V _{IN2}	V _{O6}
Maximum input level	V _{IMR}	B	A	GND	V _{IN1}	V _{O5} , V _{IN1}
		A	B	GND	V _{IN2}	V _{O6} , V _{IN2}
Output noise level	V _{ONR}	A	A	GND	–	V _{O5}
		A	A	GND	–	V _{O6}
Channel crosstalk rejection	CR	A	B	GND	V _{IN2}	V _{O5}
		B	A	GND	V _{IN1}	V _{O6}

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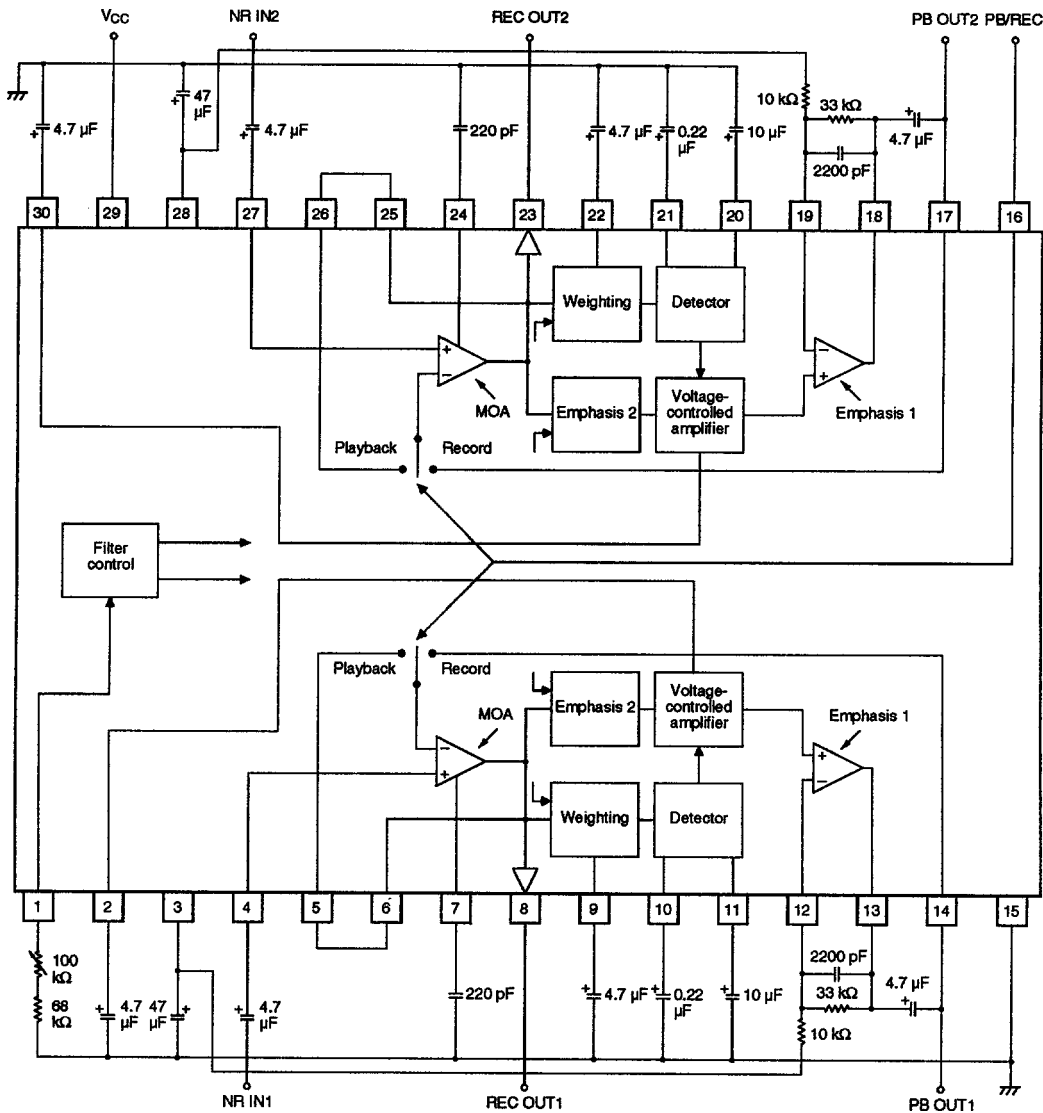
Playback mode

Parameter	Symbol	SW1	SW2	V _{CT1}	Input	Test point
Output level	V _{OP}	B	A	V _{CC}	V _{IN1}	V _{O3}
		A	B	V _{CC}	V _{IN2}	V _{O4}
Output level differential	V _{OCH}	B/A	A/B	V _{CC}	V _{IN1} /V _{IN2}	V _{O3} /V _{O4}
Total harmonic distortion	THD _P	B	A	V _{CC}	V _{IN1}	V _{O3}
		A	B	V _{CC}	V _{IN2}	V _{O4}
Maximum input level	V _{OMP}	B	A	V _{CC}	V _{IN1}	V _{O3}
		A	B	V _{CC}	V _{IN2}	V _{O4}
Output noise level	V _{ONP}	A	A	V _{CC}	–	V _{O3}
		A	A	V _{CC}	–	V _{O4}

Test Setup Procedure

1. Select playback mode.
2. Apply a 400Hz, –16dBs input signal, V_{IN1}, and measure the AC voltage across the 4.7μF capacitor connected to VCA BIAS1, V₁.
3. Apply a 7kHz, –16dBs input signal, V_{IN1}, and measure the AC voltage, V₂ again as in step 2.
4. Adjust the volume control variable resistor so that V₁ – V₂ becomes –6.8dB.

Sample Application Circuit



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