A7256



# High-Fidelity Audio Signal Record/Playback Processing Circuit for VCR Products

## Overview

The LA7256 provides the record and playback amplification functions required for high-fidelity audio signal processing in VCR systems. The record system supports S-VHS and over-recording, and also supports the provision of an adjustment-free record current by using a constant-current regulated output scheme incorporating an AGC circuit. The playback system consists of a high-gain preamplifier with a small DC offset, and includes a builtin EP gain increasing function.

# **Functions**

- Preamplifier (two channels)
- RF switching between CH1 and CH2
- Record AGC amplifier (for over-recording and S-VHS)
- Constant-current regulated output record amplifier
- Buffer amplifier that can be used in both record and playback

## **Features**

- Minimal number of required external components
- The playback amplifier output DC offset is small.
- Built-in EP mode gain emphasis
- Record AGC that handles three modes (for an adjustment-free record current)
- Built-in buffer amplifier that can be used to construct an active filter.

## **Specifications**

### Maximum Ratings at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		7.0	V
Allowable power dissipation	Pd max	Ta ≤ 65°C	700	mW
Operating temperature	Topr		-10 to +65	°C
Storage temperature	Tstg		-55 to +150	°C

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub>		5.0	V
Operating supply voltage range	V <sub>CC</sub> op		4.5 to 5.5	V

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# **Package Dimensions**

unit: mm **3067-DIP24S** 



# Operating Characteristics at Ta = 25°C, $V_{CC}$ = 5 V, in the specified test circuit

Parameter	Symbol	Conditions	min	typ	max	Unit	
Playback Model						Onic	
Circuit current	laan	No input: the pin 14 influx current	13	18	23	mA	
Voltage gain, CH1	G <sub>VP1</sub>	Pin 20 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = low: measure the pin 3 output.	72.5	75.5	78.5	dB	
Voltage gain, CH2	G <sub>VP2</sub>	Pin 17 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = high: measure the pin 3 output.	72.5	75.5	78.5	dB	
Voltage gain difference	ΔG <sub>VP</sub>	G <sub>VP1</sub> – G <sub>VP2</sub>	-2	0	2	dB	
EP gain emphasis	ΔG <sub>EP</sub>	Pin 20 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = low: the ratio of the pin 3 outputs when pin 2 is high/low	1.7	2.4	3.1	dB	
Frequency characteristics, CH1	f <sub>P1</sub>	Pin 20 input = 100 $\mu$ Vp-p, pin 1 = low: the difference in the levels on pin 3 when f = 2.2 MHz and 1.0 MHz	-3.0	-1.0	0	dB	
Frequency characteristics, CH2	f <sub>P2</sub>	Pin 17 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = high: the difference in the levels on pin 3 when f = 2.2 MHz and 1.0 MHz	-3.0	-1.0	0	dB	
Crosstalk CH1 to CH2	$CT_{1 \rightarrow 2}$	Pin 17 input = 0, pin 20 input = $100 \mu$ Vp-p, f = 1.5 MHz: the difference in the pin 3 output levels when pin 1 goes from low to high		-40	-35	dB	
Crosstalk CH2 to CH1	$\text{CT}_{2 \rightarrow 1}$	Pin 20 input = 0, pin 17 output = 100 $\mu$ Vp-p, f = 1.5 MHz: the difference in the pin 3 output levels when pin 1 goes from high to low		-40	-35	dB	
Equivalent input noise voltage CH1	V <sub>NP1</sub>	With pin 20 grounded through 0.01 $\mu$ F and 1 $\Omega$ , pin 1 = low: the pin 3 noise in input equivalent <sup>*1</sup>		0.8	1.0	μVrms	
Equivalent input noise voltage CH2	V <sub>NP2</sub>	With pin 17 grounded through 0.01 $\mu$ F and 1 $\Omega$ , pin 1 = high: the pin 3 noise in input equivalent <sup>*1</sup>		0.8	1.0	μVrms	
Second harmonic distortion CH1	2THD <sub>1</sub>	Pin 20 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = low: the second harmonic in the pin 3 output		-50	-40	dB	
Second harmonic distortion CH2	2THD <sub>2</sub>	Pin 17 input = 100 $\mu$ Vp-p, f = 1.5 MHz, pin 1 = high: the second harmonic in the pin 3 output		-50	-40	dB	
Maximum output voltage CH1	V <sub>OMP1</sub>	With the pin 20 input varying, f = 1.5 MHz, pin 1 = low: when the pin 3 third harmonic distortion is $-30 \text{ dB}$	2.0			Vp-p	
Maximum output voltage CH2	V <sub>OMP2</sub>	With the pin 17 input varying, f = 1.5 MHz, pin 1 = high: when the pin 3 third harmonic distortion is $-30 \text{ dB}$	2.0			Vp-p	
Output DC offset 1	ΔV <sub>ODC1</sub>	Pin 17 and 20 inputs = 0, pin 1 = low, pin 2 = low (SP): the difference in the pin 3 DC level when pin 1 goes from low to high	-30	0	+30	mV	
Output DC offset 2	ΔV <sub>ODC2</sub>	Pin 17 and 20 inputs = 0, pin 1 = low, pin 2 = high (EP): the difference in the pin 3 DC level when pin 1 goes from low to high	-50	0	+50	mV	
Head switching: CH1 hold voltage	V <sub>HS1</sub>	The pin 1 DC voltage required to operate CH1	0		1.0	V	
Head switching: CH2 hold voltage	V <sub>HS2</sub>	The pin 1 DC voltage required to operate CH2	3.0		V <sub>CC</sub>	V	
Playback mode switch on resistance	R <sub>SW</sub>	Calculate from the voltage difference on pin 16 when the pin 16 influx current is 1 mA and 2 mA.		4.0	6.0	Ω	
SP hold voltage	V <sub>2</sub> SP	The pin 2 voltage required to hold SP mode	0		1.0	V	
EP hold voltage	V <sub>2</sub> EP	The pin 2 voltage required to hold EP mode	3.0		V <sub>CC</sub>	V	
PB hold voltage	V <sub>5L</sub>	The pin 5 voltage required to hold PB mode	0		1.0	V	
[Record Mode]							
Circuit current	I <sub>CCR</sub>	No signal, the pin 14 influx current	45	63	81	mA	
Output current	I <sub>OR</sub>	Pin 9 input = 180 mVp-p, f = 1.5 MHz: measure the pin 16 output	48	53	58	mAp-p	
AGC control characteristics 1	$\Delta V_{AGC1}$	Pin 9 input = 90 and 180 mVp-p, f = 1.5 MHz: the ratio of the pin 16 output levels	-0.5	-0.2		dB	
AGC control characteristics 2	ΔV <sub>AGC2</sub>	Pin 9 input = 360 and 180 mVp-p, f = 1.5 MHz: the ratio of the pin 16 output levels		0.2	0.5	dB	
Cross modulation distortion 0.4 MHz component	CMD <sub>04</sub>	For a pin 9 input <sup>*2</sup> , the 0.4 MHz spurious signal in the pin 16 output current			-40	dB	
Cross modulation distortion 0.9 MHz component	CMD <sub>09</sub>	For a pin 9 input <sup>*2</sup> , the 0.9 MHz spurious signal in the pin 16 output current			-40	dB	

 Note:
 1. Measure the input noise voltage after passing the pin 3 output (playback FM output) through a 1.1 MHz low-pass filter.

 2.
 1.3 MHz (70 mVp-p) + 1.7 MHz (180 mVp-p)

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Parameter	Symbol	Conditions	min	typ	max	Unit
Over-record hold voltage	V <sub>11M</sub>	The pin 11 DC voltage for over-record mode	1.5		3.0	V
Over-record current ratio	I <sub>O-OV</sub>	Pin 9 input = 180 mVp-p, f = 1.5 MHz, pin 11 = middle level: measure the pin 16 output current	1.7	2.2	2.7	dB
S-VHS hold voltage	V <sub>11H</sub>	The pin 11 DC voltage for S-VHS mode	3.5		V <sub>CC</sub>	V
S-VHS current ratio	I <sub>O-SV</sub>	Pin 9 input = 180 mVp-p, f = 1.5 MHz, pin 11 = high: measure the pin 16 output current	-2.0	-2.6	-3.2	dB
Record mute hold voltage 1	V <sub>4L</sub>	The pin 4 DC voltage when record muting is off	0		1.0	V
Record mute hold voltage 2	V <sub>4H</sub>	The pin 4 DC voltage when record muting is on	3.0		V <sub>CC</sub>	V
Mute attenuation	I <sub>OR</sub> , M <sub>U</sub>	Pin 9 input = 180 mVp-p, f = 1.5 MHz, pin 4 = high: measure the pin 16 output current			-40	dB
Record hold voltage	V <sub>5H</sub>	The pin 5 voltage required to hold record mode	3.0		V <sub>CC</sub>	V
[Built-in Buffer]						
Buffer I/O DC offset	$\Delta V_{BUF}$		-10		10	mV
Buffer frequency characteristics	f <sub>BUF</sub>	Pin 9 input = 180 mVp-p, f = 1/10 MHz	-1		1	dB

### **Test Circuit Diagram**



Unit (resistance: Ω, capacitance: F) \*: Organic Semiconductor

# Application Circuit Block Diagram



Unit (resistance:  $\Omega$ , capacitance: F)

### **Pin Functions**

Pin No.	Symbol	Pin internal equivalent circuit	Function
1	A-HEAD PULSE	1 30K 2 30K 2 55K 2 ↓ 1 402656	Low: 0 to 1.0 V $\rightarrow$ CH1 High: 3.0 to V <sub>CC</sub> $\rightarrow$ CH2
2	ES/SP	2 30K Q 30K Q 55K Q 55K Q 402657	Low: 0 to 1.0 V $\rightarrow$ SP High: 3.0 to V <sub>CC</sub> $\rightarrow$ EP
3	PB-FM OUT	3 1000 3 W 400 # A 777 A02658	
4	REC MUTE	(4) 30k 0 ₹ ₹5k 0 777 402559	Low: 0 to 1.0 V $\rightarrow$ Mute off High: 3.0 to V <sub>CC</sub> $\rightarrow$ Mute on
5	REC	5 5 30 K Q 30 K Q 777 402560	Low: 0 to 1.0 V $\rightarrow$ PB High: 3.0 to V <sub>CC</sub> $\rightarrow$ REC
6	GND		Ground for the playback output stage and record circuits

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Pin No.	Symbol	Pin internal equivalent circuit	Function
7	BUFF IN	7 1000 50k0 W 200#A 1/2VCC A02561	
8	BUFF OUT	B 200 # A 777 A02662	DC voltage = 1/2 V <sub>CC</sub>
9	REC FM IN	9 5ka 100a 9 	Record amplifier input
10	AGC FILT	10 10 10kΩ 15kΩ ₹300Ω 777 777 402664	Detects the record amplifier AGC detector output
11	REC MODE	11 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$15k0 \$100μA \$10μA \$100μ	Low: 0 to 1.0 V $\rightarrow$ Normal Middle: 1.5 to 3.0 V $\rightarrow$ Over-record High: 3.5 V to V <sub>CC</sub> $\rightarrow$ S-VHS
12	REC OUT GND		Ground for the record output circuits

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Pin No.	Symbol	Pin internal equivalent circuit	Function		
13	REC-CURR-ADJ	REC DUT 3000 13 W AGC DET A02655	Converts the record output current output to a voltage.		
14	V <sub>CC</sub>				
15	REC BIAS	ВОО # А О 1.5 m А ВЕС ОUT АGC Амр 15 W 1.6 m А 600 # А 1.6 m А 600 # А 402667	Input block for the record current amplifier		
16	REC OUT	(16) PB ON V M A02668	Switch for record current output and playback mode on On in PB mode		
17	CH2-IN	10KQ 10KQ 10KQ M A02559	Playback amplifier CH2 input		
18	PSW2	1B 40K 0 50K 0 40K 0	CH2 head current supply		

Pin No.	Symbol	Pin internal equivalent circuit	Function
19	FILT2	1000 1000 1000 1000 1.5k0 1.5k0 0 0 0 0 0 0 0 0 0 0 0 0 0	Generates the playback amplifier CH2 DC bias.
20	CH1-IN	20 REC ON 777 777 777 777 777 777 777	Playback amplifier CH1 input
21	PB GND		Ground for the playback amplifier
22	FILT1	100 Ω 22 1.5 k Ω 1.5 k Ω 00 μA 10 k Ω 10 k Ω 1	Generates the playback amplifier CH1 DC bias.
23	NC		
24	PSW1	24 40 k 0 ₹ 777 777 777 777 777 777 777 777 777 402674	Record amplifier CH2 head current supply

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