Ordering number : EN5709

Monolithic Linear IC

LA70001, 70001M

Record/Playback Amplifiers for VHS Format VCRs

Overview

The LA70001 and LA70001M ICs provide record and playback amplifiers for VHS format VCRs. A system with an adjustment-free Y/C record current can be achieved by combining the LA70001/M with an LA71000M or LA71500M video signal processing IC.

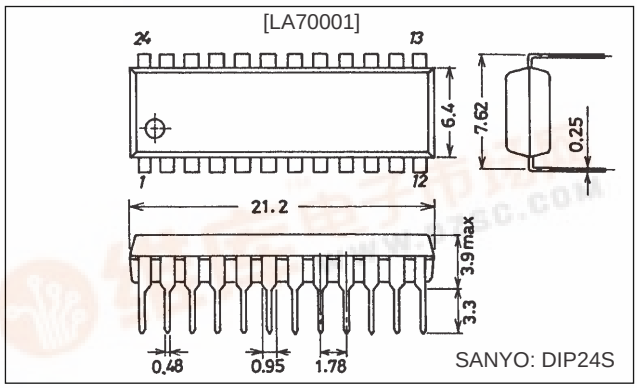
Features

- Direct connection of the head to the playback amplifier input allows the number of external devices to be reduced.
- A fixed-current drive technique that is strongly resistant to load fluctuations is adopted in the record amplifier for stable recording characteristics. The record amplifier includes a built-in AGC circuit.
- These products have the same package dimensions as the LA70011 and LA70011M to allow a common PCB to be used. These products can also share the same PCB with the LA70020 by mounting the IC at the right end of the LA70020 socket.

Package Dimensions

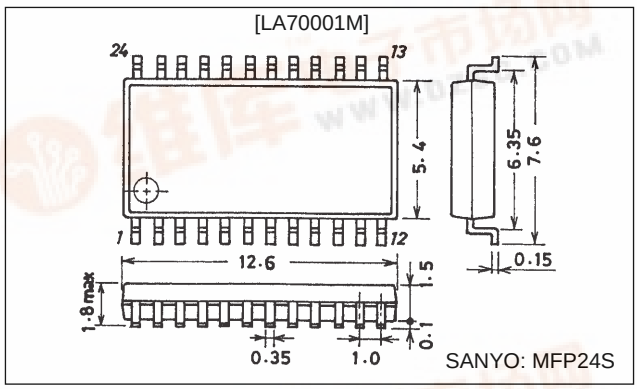
unit: mm

3067-DIP24S



unit: mm

3112-MFP24S



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7.0	V
Allowable power dissipation	Pd max	Ta ≤ 65°C [LA70001]	600	mW
		Ta ≤ 65°C [LA70001M] (Using a 114.3 × 76.1 × 1.6 mm glass epoxy PCB)	500	mW
Operating temperature	Topr		–10 to +65	°C
Storage temperature	Tstg		–40 to +150	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		5.0	V
Operating supply voltage range	V_{CC} op		4.8 to 5.5	V

Electrical Characteristics at Ta = 25°C

Parameter		Symbol	Conditions	Ratings			Unit
				min	typ	max	
[Playback Mode]							
Current drain		I_{CCP}	The pin 13 inflow current.	23	29	35	mA
Voltage gain	CH1	$G_{VP}1$	V_{IN} = 38 m Vp-p, f = 1 MHz	56	59	62	dB
	CH2	$G_{VP}2$		56	59	62	dB
Voltage gain difference 1		$\Delta G_{VP}1$	$G_{VP}1$—$G_{VP}2$	–1	0	+1	dB
Equivalent input noise voltage	CH1 CH2	$V_{NIN}1$ $V_{NIN}2$	With the same conditions as for the voltage gain, the ratio of the output passed through a 1.1-MHz low-pass filter and the output with no input signal.		1.0	1.5	µVrms
Frequency characteristics	CH1	$\Delta V_{fp}1$	The ratio of the output for V_{IN} = 38 mVp-p,				
	CH2	$\Delta V_{fp}2$	f = 7 MHz and G_{VP}1, 2, 3, and 4.	–2.5	0		dB
Second harmonic distortion	CH1 CH2	$V_{HDP}1$ $V_{HDP}2$	With V_{IN} = 38 mVp-p, f = 4 MHz, the ratio of the 8-MHz output component (second harmonic) and the 4-MHz component (the fundamental).		–40	–35	dB
Maximum output level	CH1 CH2	$V_{OMP}1$ $V_{OMP}2$	At f = 1 MHz, the output level when the ratio of the 3-MHz output (third harmonic) and the 1-MHz output (fundamental) is –30 dB.	1.0	1.2		Vp-p
Crosstalk SP		$V_{CR}1$	The ratio of the V_{IN} = 38 mVp-p, f = 4 MHz output and G_{VP}1.		–40	–35	dB
Output DC offset		$\Delta V_{ODC}1$	CH1 – CH2	–100	0	+100	mV
Envelope detector output pin voltage		V_{ENV}	The T6 DC level when there is no input signal.	0	0.8	1.3	V
Envelope detector output pin voltage SP1		$V_{ENVSP}1$	With a f = 4 MHz input, the T6 DC level when the T7A output level becomes 175 mVp-p.	2.0	2.5	3.0	V
		$V_{ENVSP}2$	With a f = 4 MHz input, the T6 DC level when the T7A output level becomes 400 mVp-p.	3.5	4.0	4.5	V
Envelope detector output pin voltage EP		$V_{ENVEP}1$	With a f = 4 MHz input, the T6 DC level when the T7A output level becomes 125 mVp-p.	2.0	2.5	3.0	V
		$V_{ENVEP}2$	With a f = 4 MHz input, the T6 DC level when the T7A output level becomes 300 mVp-p.	4.0	4.5	5.0	V
Switch transistor on resistance in playback mode		$R_{PON}18$	Measure the difference in the DC levels with a 1-mA and a 2-mA inflow current.		4	6	Ω
SW30 threshold level		SW30-1	Lch → Hch *1	1.2		5.0	V
		SW30-2	Hch → Lch	0.0		0.8	V
[Record Mode]							
Current drain		I_{CCR}	The pin 13 inflow current.	43	50	57	mA
Record AGC amplifier output level		V_{RSP}	The output level when V_{IN} = 400 mVp-p, f = 4 MHz.	105	112	119	mVp-p
Record AGC amplifier control characteristics		$\Delta V_{AGC}1$-SP	At f = 4 MHz, when V_{IN} = 700 mVp-p: the output level /VRSP, EP		0.5	1.0	dB
		$\Delta V_{AGC}2$-SP	At f = 4 MHz, when V_{IN} = 100 mVp-p: the output level /VRSP, EP	–1.0	–0.5		dB
Record AGC amplifier frequency characteristics		ΔV_{FRS}	At V_{IN} = 400 mVp-p, the ratio of the outputs when f is 1 MHz and 7 MHz, i.e. the ratio of the 7-MHz value to the 1-MHz value.*2.	–1	0	+1	dB
Record AGC amplifier second harmonic distortion		ΔV_{HDRS}	With V_{IN} = 400 mVp-p, f = 4 MHz, the ratio of the 8-MHz output component (second harmonic) and the 4-MHz component (the fundamental).		–45	–40	dB
Record AGC amplifier maximum output level		ΔV_{MOSP}	At f = 4 MHz, the output level at which the second harmonic goes to –35 dB. *3	20	22		mAp-p
Record AGC amplifier muting attenuation		ΔV_{MRS}	When V_{IN} = 400 mVp-p and f = 4 MHz, the output level/VRSP, EP		–45	–40	dB
Record AGC amplifier cross modulation relative level		ΔV_{CYS}	T9A: V_{IN} = 400 mVp-p, f = 4 MHz T10A: V_{IN} = 2.4 Vp-p, f = 629 kHz The ratio of the (4 MHz ± 629 kHz) and the 4-MHz outputs.		–45	–40	dB
Record muting threshold level		MUTE-1	MUTE OFF → MUTE ON *1	1.2		2.8	V
		MUTE-2	MUTE ON → MUTE OFF	3.2		5.0	V
Record mode to playback mode threshold level		PB-REC	PB → REC *1	1.2		5.0	V
		REC-PB	REC → PB	0.0		0.8	V

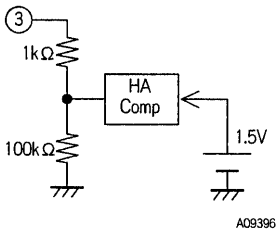
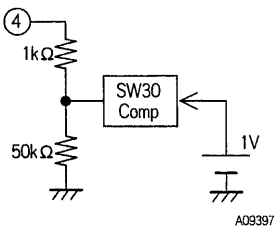
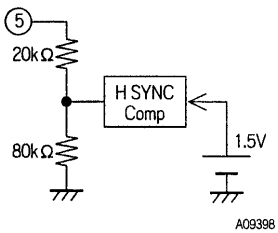
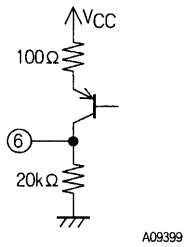
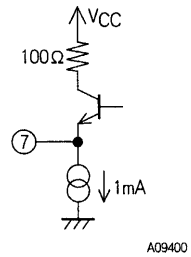
Notes: Use a resistor with an accuracy of 1.0% for the resistor between pins 13 and 14.

*1. This is the voltage application point

*2. Here, fix the AGC amplifier gain by applying a 1.8-V DC level to the AGC detector filter pin (pin 15).

*3. Here, adjust the output level by applying a DC voltage to the REC-CUR-Adj pin (pin 12).

Pin Functions

Pin No.	Pin name	Standard DC voltage (V)		Equivalent circuit	Notes
1	N.C				
2	N.C				
3	HA (EP/SP)				EP SP 1.5 V
4	SW30				Hch Lch 1.0 V
5	H-SYNC				SYNC H L 1.5 V
6	ENVDET-OUT	PB	Provided in a separate document.		
		REC	0		
7	PB-OUT	PB	1.7		
		REC	2.1		
8 20	GND				

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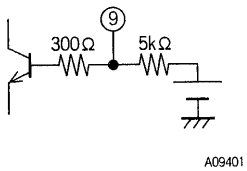
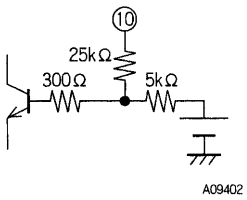
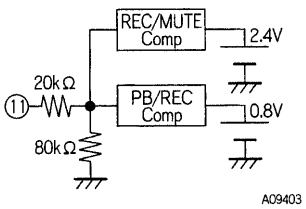
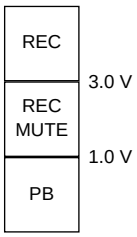
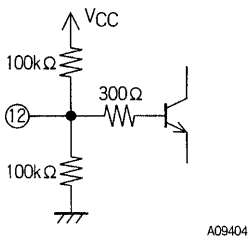
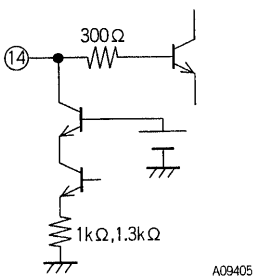
Pin No.	Pin name	Standard DC voltage (V)		Equivalent circuit	Notes
9	REC-Y-IN	PB	4.0		
		REC	3.7		
10	REC-C-IN	PB	4.0		
		REC	3.7		
11	REC/MUTE/PB				
12	REC-CURRENT-ADJ2	PB	2.5 V		
		REC	2.5 V		
13	V_{CC}				
14	REC-CURRENT-ADJ1	PB	5.0		
		REC	4.5		

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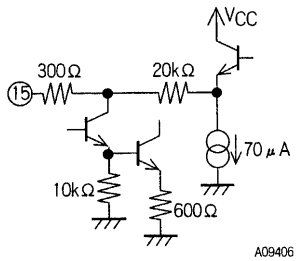
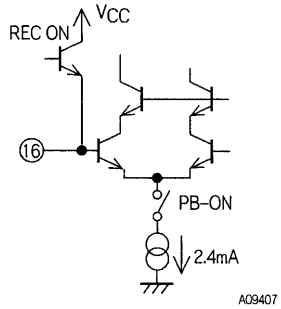
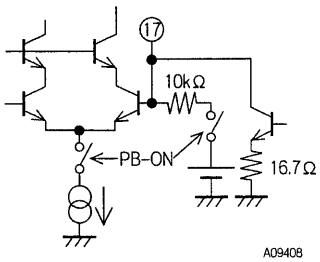
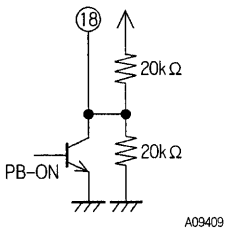
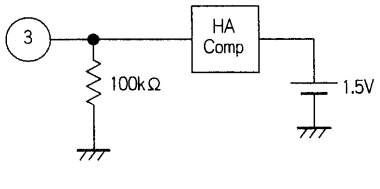
Pin No.	Pin name	Standard DC voltage (V)		Equivalent circuit	Notes
15	REC-AGC-FILT	PB	0		
		REC	1.6		
16 19	L IN H IN	PB	2.1		
		REC	4.1		
17	REC_SP_OUT	PB	2.1 V		
		REC	4.1 V		
18	PB FILT	PB	0		
		REC	2.5		
21 22 23 24	N.C				

Usage Notes

Control Pin Logic

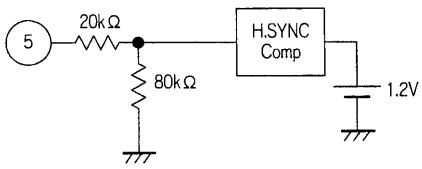
• HA-SW (EP/SP mode switching): pin 3



GND < the pin 3 DC level < 1.5 V: SP mode

1.5 V < the pin 3 DC level < 5 V: EP mode

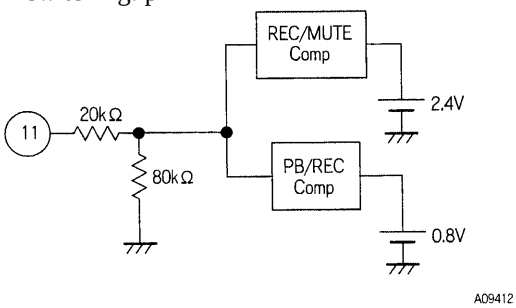
• H.SYNC input: pin 5



The pin 5 DC level > 1.5 V: The horizontal synchronization period

In record mode: Used as the REC-AGC-AMP synchronization block gate pulse.

• REC/REC-MUTE/PB switching: pin 11



GND < the pin 11 DC level < 1.0 V: Playback mode

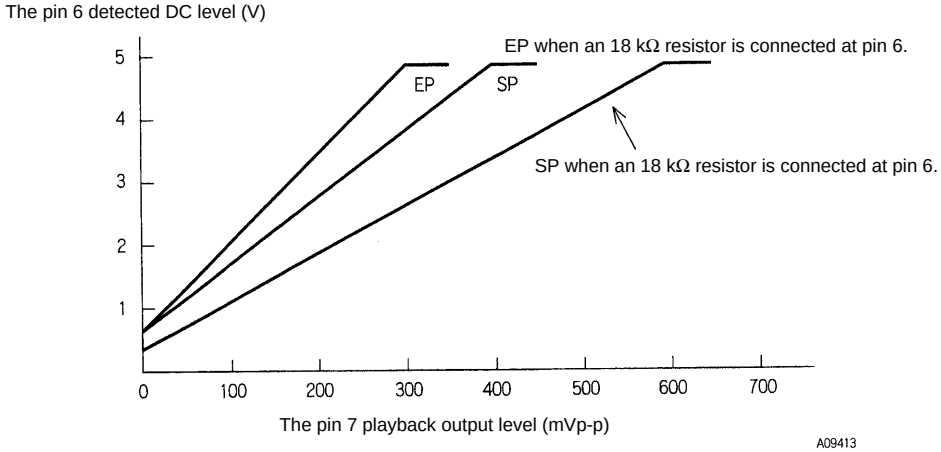
1.0 V < the pin 11 DC level < 3.0 V: Record mode with recording muted.

3.0 V < the pin 11 DC level < 5.0 V: Record mode

Envelope detection characteristics: pin 6

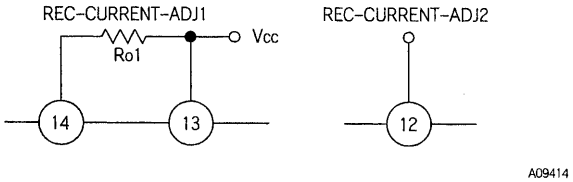
The LA70001 provides a built-in playback signal envelope detection circuit so that the tracking adjustment can be made automatic.

Envelope Detection Voltage Characteristics



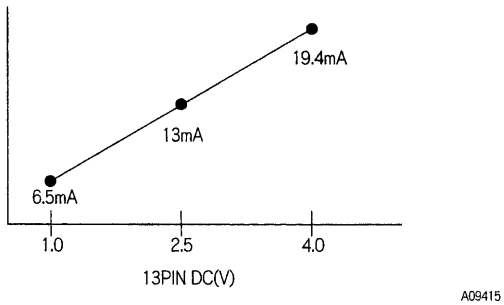
Record Amplifier Gain Control

The LA70001 achieves an adjustment-free record current by adding an AGC circuit in the record amplifier block. The record current can be modified using the following method.

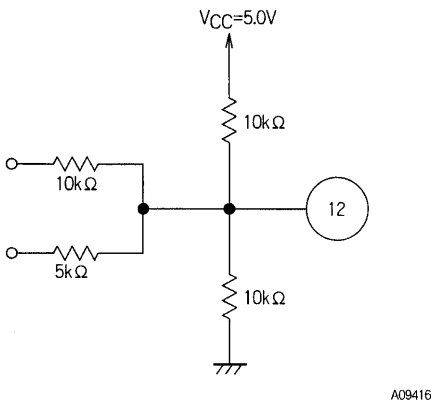


- Record current adjustment 2: When left open.
  Pin 12 DC level is set to 1/2 V_{CC} (approximately 2.5 V) by an internal bias, and the record current is determined by Ro1.
  Design value: When Ro1 is 1.5 kΩ, the record current will be 12.7 mA per channel.
- Record current adjustment 2: When used.
  The gain can be varied by –6.0 dB to +3.5 dB relative to the value set by Ro1 by applying a control DC voltage of between 1 and 4 V to pin 12.

Record current (mAp-p) design value



Note: The technique shown in the figure below can be used to apply a DC level to pin 12. This allows a control voltage of between 1 and 4 V to be applied.



Block Diagram