



LA7449, 7449M

Video Signal Processing IC for VHS VCR Systems

Overview

The LA7449 and 7449M are video signal processing single-chip ICs that handle the PAL-G, B and I, 4.43 NTSC, MESECAM and NAP-G, B and I formats. IC internal trimming is used to make the LA7449, 7449M completely adjustment free, and in combination with a special-purpose CCD (thd LC89970, 89970M) they provide a significant reduction in external components, including the glass delay line. Thus the LA7449, 7449M can significantly reduce the signal processing board manufacturing costs. Furthermore, the LA7449, 7449M support the NAP format (NTSC to PAL conversion) that is becoming widespread in Europe, China and other markets.

Features

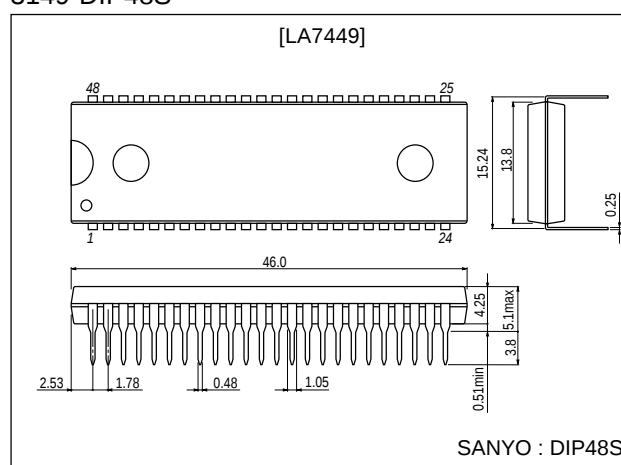
- Completely adjustment free.
The AGC, carrier, deviation, and PB-Y level are adjustment free.
The YC record current can also be made adjustment free by using the LA7411, 7416 as the head amplifier.
- Support for NAP and PAL color array correction.
Full modulation using a balanced modulator allows playback and conversion to PAL format of NTSC signals recorded on tape.
- Crosstalk exclusion in combination with a special-purpose CCD
Crosstalk can be excluded without using a glass delay line by combining the LA7449, 7449M with a special-purpose CCD (the LC89970, 89970M).
- Minimal number of external components.
New built-in components :
 - Detail enhancer CR.
 - C-trap in the Y low-pass filter.
 - Playback C low-pass filter.
- High performance and multiple functions.
Linear phase picture controller.
Double high-pass noise canceller, high-speed AFC, DCC.
New built-in functions.

- NAP circuit.
- AVNS (advanced vertical noise suppressor).
- Automatic QH insertion.
- FM AGC.
- Miniature package (48-pin QIP or DIP).

Package Dimensions

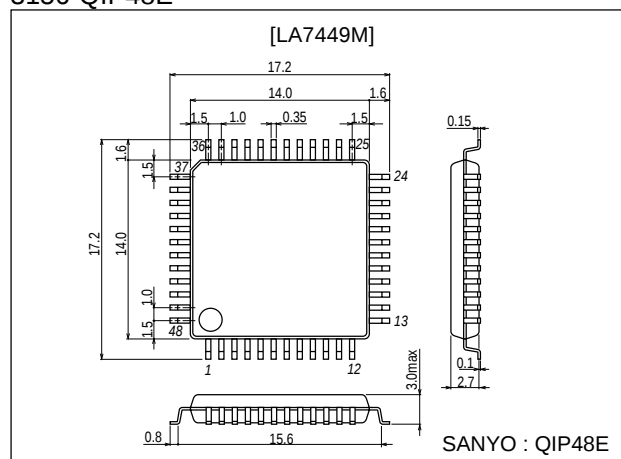
unit:mm

3149-DIP48S



unit:mm

3156-QIP48E



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SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

O2500TN (KT)/62095HA (OT) No.5119-1/10

Functions

All VHS format VCR signal processing functions.

	Luminance		Chrominance	
R/P	Video amplifier. Feedback clamp Main LPF YNR (AVNS) VCA Sync separator 4.2V regulator		4.43 BPF ACC amplifier. ACC det. Main converter 1.3M LPF VXO/XO Side lock det. 3rd lock protector	Half H killer BGP generator Killer det. VCO Phase shifter Sub converter 5.06 BPF
REC	Video AGC amplifier. Video AGC det. Pre LPF Detail enhancer 1/2 fH carrier shift	NL emphasis Main emphasis White/dark clip FM modulator	Preamplifier. Burst emphasis (NTSC) Killer APC det. AFC det.	Burst gate amplifier.
PB	FM AGC amplifier. FM AGC det. Double limiter FM demodulator Sub LPF Double highpass noise canceller QV/QH/character insert Main de-emphasis DOC	Drop out det. NL de-emphasis Picture control Y/C mix	Pre amplifier. Burst de-emphasis (NTSC) PB amplifier Killer NAP PAL burst sequence —Compensator Carrier balancer Burst gate amplifier.	APC det. ID det. DCC Trick det. DPLL

Specifications

Pin numbers are for the LA7449M

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 *	1350*	mW
Operating temperature	Topr		−10 to +65	°C
Storage temperature	Tstg		−40 to +150	°C

Note : * When mounted on a 70mm by 65mm, 1.5mm thickness Bakelite board. The value for the DIP package is 1150mW.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V _{CC}		5.0	V
Operating supply voltage	V _{CC} op		4.8 to 5.2	V

Operating Characteristics at Ta = 25°C, V_{CC}=5.0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Record mode Y system]						
Record mode current drain	I _{CCR}	Input : 1.0Vp-p video signal	100	130	160	mA
EE output level 1	V _{EE1}	Input : 50Hz system 1.0Vp-p video signal	1.95	2.05	2.15	Vp-p
AGC characteristics 1	AGC1	Input : 50Hz system 2.0Vp-p video signal	2.05	2.15	2.25	Vp-p
AGC characteristics 2	AGC2	Input : 50Hz system 0.5Vp-p video signal	1.90	2.00	2.10	Vp-p
AGC characteristics 3	AGC3	Input : 50Hz system with only SYNC increased 6dB	555	615	695	mVp-p
AGC characteristics 4	AGC4	Input : 50Hz system with only SYNC decreased 6dB	370	410	450	mVp-p
Sync separator output level	V _{SYR}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW _{SYR}	The SYNC-OUT output pulse width	4.0	4.3	4.6	μs
Sync separator output prerecord delay time	ΔT _{SYR}	The SYNC-OUT delay time	0.9	1.1	1.3	μs
Sync separator threshold level	TH _{SYR}			−20	−15	dB
Pseudo-H insertion level	ΔH _{DR}	With 2.7V applied to T14A	−400	−300	−200	mV
White insertion level	ΔW _{HR}	With 1.3V applied to T14A	100	250	400	mV
VCA detection voltage	V _{VCA}		3.00	3.20	3.40	V
Record YNR operation EP/LP	V _R -YNR1	Input : 50Hz system standard color bar signal	10	12	14	mVp-p

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LA7449, 7449M

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Record mode Y system]						
Y-LPF frequency characteristics 1	YLPF1	The 1MHz attenuation with respect to 500kHz	−0.5	0.0	+0.5	dB
Y-LPF frequency characteristics 2	YLPF2	The 2MHz attenuation with respect to 500kHz	−1.0	0.0	+1.0	dB
Y-LPF frequency characteristics 3	YLPF3	The 3MHz attenuation with respect to 500kHz	−2.5	−0.5	+1.0	dB
Y-LPF frequency characteristics 4	YLPF4	The 4.43MHz attenuation with respect to 500kHz			−25	dB
FM modulator output level	V _{FM}	No input	1.0	1.2	1.4	Vp-p
Carrier frequency 1	F _{FM1}	50Hz system	3.7	3.8	3.9	MHz
FM modulator output 2nd harmonic distortion	H _{MOD}			−40	−35	dB
Deviation 1	DEV1	50Hz system	0.95	1.00	1.05	MHz
FM modulator linearity	L _{MOD}		−2	0	+2	%
1/2 f _H carrier shift	CS		6.5	7.8	9.1	kHz
Emphasis gain	G _{EMP}	Input 0.5Vp-p, 10kHz sine wave	−0.5	0.0	+0.5	dB
Detail enhancer characteristics 1	G _{DET1}	Input : 316mVp-p, 2MHz sine wave	1.6	1.9	2.6	dB
Detail enhancer characteristics 2	G _{DET2}	Input : 100mVp-p, 2MHz sine wave	3.1	4.1	5.1	dB
Detail enhancer characteristics 3	G _{DET3}	Input : 31.6mVp-p, 2MHz sine wave	5.3	6.3	7.3	dB
NL emphasis characteristics 1	G _{NLEMP1}	Input : 500mVp-p, 2MHz sine wave	0.5	1.4	2.3	dB
NL emphasis characteristics 2	G _{NLEMP2}	Input : 158mVp-p, 2MHz sine wave	2.6	3.8	5.2	dB
NL emphasis characteristics 3	G _{NLEMP3}	Input : 50mVp-p, 2MHz sine wave	4.9	6.4	7.9	dB
Main empasis characteristics 1	G _{ME1}	Input : 100mVp-p, 500kHz sine wave	4.9	5.2	5.5	dB
Main empasis characteristics 2	G _{ME2}	Input : 100mVp-p, 2MHz sine wave	13.1	13.6	14.1	dB
White clipping level	L _{WC}	Input : 1.0Vp-p, white 100% video signal	186	195	204	%
Dark clipping level	L _{DC}	Input : 1.0Vp-p, white 100% video signal	−55	−50	−45	%
[Playback mode Y system]						
Playback mode current drain	I _{CCP}		135	160	185	mA
Dropout compensation time	T _{DOC}		0.72	0.85	0.95	ms
DOC loop gain	G _{DOC}	5H later	−1.0	0.0	+1.0	dB
Playback Y level	V _{VOU}	For playback of an FM signal with a 1.0MHz deviation	1.95	2.05	2.15	Vp-p
FM demodulator linearity	L _{DEM}	2, 4, 6 MHz	−3.5	0.0	+3.5	%
Demodulation sensitivity	S _{DEM}		0.47	0.52	0.57	V/MHz
Carrier leakage	CL	Input : 4MHz, 600mVp-p		−40	−35	dB
Playback YNR characteristics LP/EP	G _{p-YNR1}	Input : 50% white + CW	−2.5			dB
NL de-emphasis characteristics 1	G _{NLDE1}	Input : 158mVp-p, 2MHz sine wave	−6.0	−5.0	−4.0	dB
NL de-emphasis characteristics 2	G _{NLDE2}	Input : 50mVp-p, 2MHz sine wave	−10.5	−9.0	−7.5	dB
Double noise canceller characteristics 1	G _{WNC1}	Input 158mVp-p, 2MHz sine wave	−1.8	−1.3	−0.8	dB
Double noise canceller characteristics 2	G _{WNC2}	Input 50mVp-p, 2MHz sine wave	−6.2	−5.2	−4.2	dB
Double noise canceller characteristics 3	G _{WNC3}	Input 15.8mVp-p, 2MHz sine wave	−11.7	−10.7	−8.7	dB
PIC-CTL hard response characteristics 1	G _{PH1}	Input : 50% video + sine wave f=1MHz, 158mVp-p	4.5	5.5	6.5	dB
PIC-CTL hard response characteristics 2	G _{PH2}	Input : 50% video + sine wave f=2MHz, 158mVp-p	8.0	9.0	10.0	dB
PIC-CTL soft response characteristics 1	G _{PS1}	Input : 50% video + sine wave f=1MHz, 158mVp-p	−4.5	−3.5	−2.5	dB
PIC-CTL soft response characteristics 2	G _{PS2}	Input : 50% video + sine wave f=2MHz, 158mVp-p	−9.0	−7.0	−5.0	dB
Pseudo-V insertion level (playback)	ΔV _{Dp}	With 5V applied to T14A	−150	−50	+50	mV
Pseudo-H insertion level (playback)	ΔH _{Dp}	With 2.7V applied to T14A	−400	−300	−200	mV
[Record mode Y system]						
White insertion level (playback)	ΔW _{Hp}	With 1.3V applied to T14A	100	250	400	mV
Sync separator output level	V _{SYP}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW _{SYP}	The SYNC-OUT output pulse width	4.2	4.5	4.8	μs
Sync separator output pre-record delay time	ΔT _{SYP}		1.4	1.6	1.8	μs
4.2V regulator voltage	V _{REG}		4.0	4.2	4.4	V
[Record mode chrominance system]						
Chrominance low band conversion output burst level	V _{OR-38}	Input : PAL/GBI standard color bar signal, 1Vp-p	150	190	230	mVp-p
VXO oscillator level 1	V _{VXO-R1}	Input : PAL/GBI standard color bar signal, 1Vp-p	300	500	700	mVp-p
Record ACC characteristics 1	ACC-R1	With only the chrominance signal level increased 6dB		+0.2	+0.6	dB
Record ACC characteristics 2	ACC-R2	With only the chrominance signal level decreased 6dB	−0.5	−0.1		dB
ACC killer on input level	V _{ACCK-ON}			−26		dB
ACC killer on output level	V _{O-ACCK}			−60	−50	dB
ACC killer recovery input level	V _{ACCK-OFF}			−20		dB
VXO control sensitivity	S _{VXO}		1.3	3.2	5.1	Hz/m

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LA7449, 7449M

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Record mode chrominance system]						
APC pull-in range 1	Δf_{APC1}		350			Hz
APC pull-in range 2	Δf_{APC2}				−350	Hz
BGP delay time	t_D	Input : PAL/GBI standard color bar signal, 1Vp-p	3.1	3.4	3.7	μ s
BGP pulse width	t_W		4.7	4.9	5.1	μ s
AFC pull-in range 1	Δf_{AFC1}		+1.0	+7.0		kHz
AFC pull-in range 2	Δf_{AFC2}			−3.7	−1.0	kHz
[Playback mode chrominance system]						
Video output burst level	V_{OP-11}	SP mode, input : burst 30mVp-p	255	300	345	mVp-p
Pin 25 output burst level	V_{OP-25}	SP mode, input : burst 30mVp-p	195	230	265	mVp-p
Playback ACC characteristics 1	ACC_{P1}	With the chrominance level increased 6dB		+0.5	+0.8	dB
Playback ACC characteristics 2	ACC_{P2}	With the chrominance level decreased 6dB	−0.8	−0.5		dB
Playback killer on input level	V_{ACK-P}		−40	−32	−25	dB
Playback killer on chrominance output level	V_{OACK-P}			−44	−40	dB
Main converter carrier leakage	C_{LP}	The 5.06MHz carrier leakage component		−40	−33	dB
Burst de-emphasis level NT	G_{BD}	NTSC mode	−5.25	−5.0	−4.75	dB
Playback XO output level 1	V_{XO-P1}		300	450	600	mVp-p
Playback XO oscillator frequency deviation	Δf_{XO}	$\Delta f_{XO}=f-4.433619$ (MHz)	−9	0	+9	Hz
SLD detector current 1	I_{SLD1}			170		μ A
SLD detector current 2	I_{SLD2}			170		μ A
NTSC playback burst output level	V_{BNT}	NTSC mode	255	300	345	mVp-p
NTSC to PAL conversion-V axis burst level	$VB-NAP$		−1.0	0.0	+1.0	dB
NTSC to PAL conversion burst level ratio	$\Delta B-NAP$		−2.0	0.0	+2.0	dB

L7449M Control Pin Table

Pin No.	Control function		L		M	H
3	R/P	Edit				3.8 VDC or more
5	R/P	YNR (AVNS)-CTL	1.0 VDC to less YNR-off		1.5 to 2.5 VDC YNR-CTL	3.5 VDC or more YNR (strong)
6	R	*****				3.9 VDC or more
	P	N, C, CTL	1.5 VDC or less N, C-off		2.0 to 3.0 VDC N, C-CTL	
12	R/P	C-rotary	0 to 1.9 VDC Low CH		2.3 VDC or more High CH	
14	P	QV/QH CHARA. INS	0.8 VDC or less Through	1.2 to 2.2 VDC CHARA insert	2.6 to 3.3 VDC Pedestal insert	3.7 VDC or more QV insert
15	P	Auto QH INS on	Pull down by 3.9kΩ			
18	R/P	N. L.-on (weak)	0.6 VDC or less N. L.-off	1.0 to 3.0 VDC N. L.-on	3.9 VDC or more N. L.-off	
	R	Detail-ENHA	Normal		Weak and f_C down	
22	R/P	EP/LP/SP	1.2 VDC or less SP	2.0 to 2.7 VDC LP	3.9 VDC or more EP	
23	R	SP carrier shift stop			3.0 VDC or more SP carrier shift stop	
24	P	NAP	1.2 VDC or less Through	2.0 to 2.7 VDC Balanced-mod output	3.3 VDC or more NAP-on	
26	R/P	NT/MESEC/PAL	1.2 VDC or less PAL	2.0 to 2.7 VDC MESEC	3.9 VDC or more NTSC	
29	P	Trick			3.9 VDC or more	
44	P	DOC-off			4.1 VDC or more	
48	R/P	PB-H			4.0 VDC or more	

Note : Do not allow pin 3 to fall under 1.5V. (The chip will enter test mode.)

LA7449, 7449M

Function Control in each of the LA7449M Operating Modes

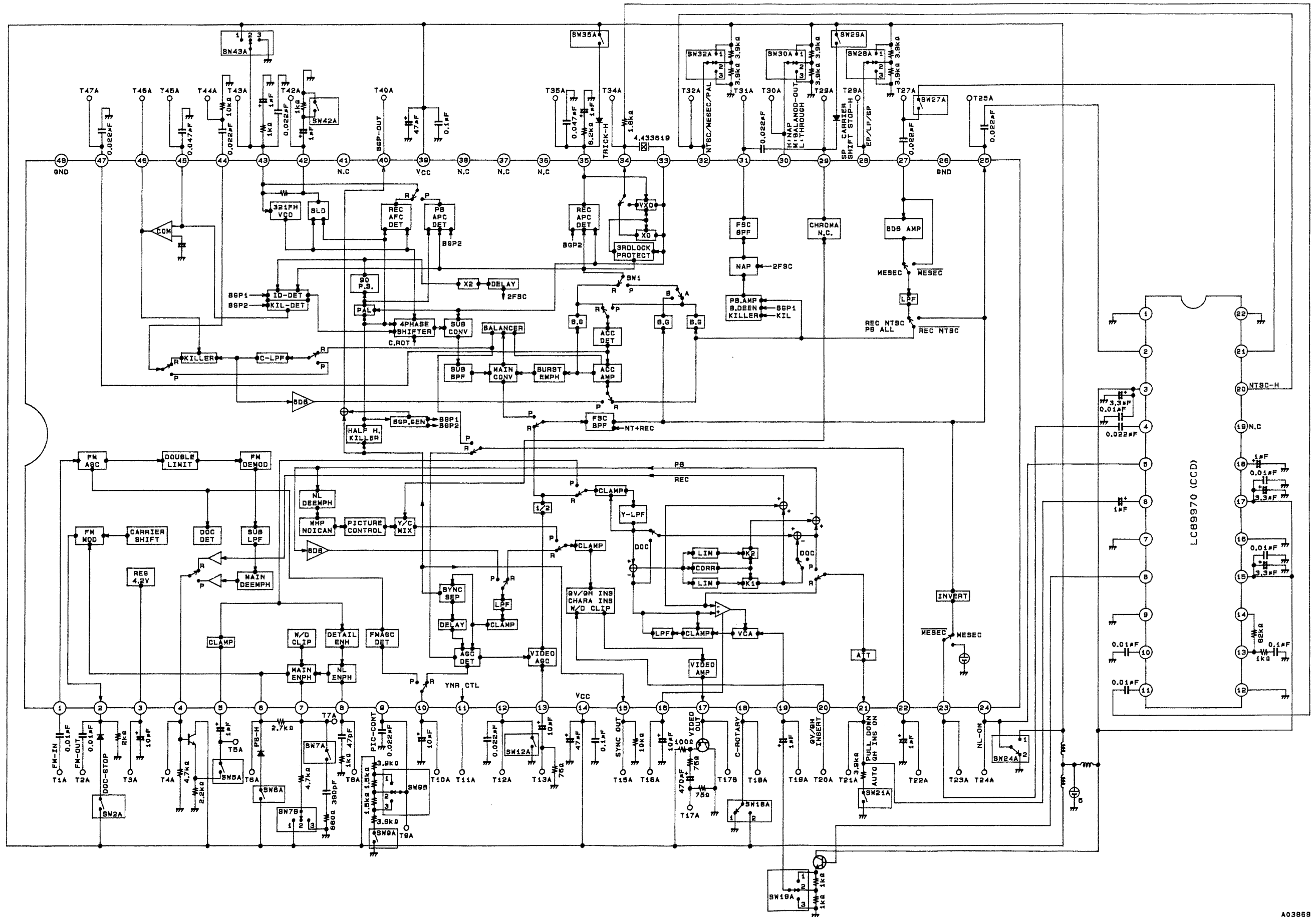
		Edit	YNR			NL		Detail enhancer			NC			PIC-CTL	1/2 f _H carrier shift
			Pin 5 control			Pin 18 control		Pin 6 control (with pin 18 control L/H)			Pin 6 control				
			L	M	H	L/H	M	L	M	H	L	M	H		
REC	SP	On	Off	Off	Off	Off	On	Off	Variable	Center	–	–	–	–	○ (×)
		Off	Off	Off	Off	Off	On	Off	Variable	Center	–	–	–	–	○ (×)
	LP EP	On	Off	K1=0.2 K2=0.0	K1=0.2 K2=0.0	On	On	Off	Variable	Center	–	–	–	–	○
		Off	Off	K1=0.5 K2=0.0	K1=0.5 K2=0.0	On	On	Off	Variable	Center	–	–	–	–	○
PB	SP	On	K1=0.0 K2=0.0	K1=0.0 K2=0.0	K1=0.5 K2=0.0	Off	On	–	–	–	Off	Variable	Center	Center	–
		Off	K1=0.0 K2=0.0	K1=0.2 K2=0.0	K1=0.5 K2=0.0	Off	On	–	–	–	Off	Variable	Center	○	–
	LP EP	On	K1=0.0 K2=0.5	K1=0.2 K2=0.5	K1=0.5 K2=0.5	On	On	–	–	–	Off	Variable	Center	Center	–
		Off	K1=0.0 K2=0.5	K1=0.2 K2=0.5	K1=0.5 K2=0.5	On	On	–	–	–	Off	Variable	Center	○	–

Note : 1. K1 is the YNR coefficient, K2 is the LNC coefficient.

2. Use the 1/2f_H carrier shift entries in parentheses when pin 23 is high.

3. The detail enhancer is off when pin 18 is at the middle level.

LA7449 Test Circuit (DIP)



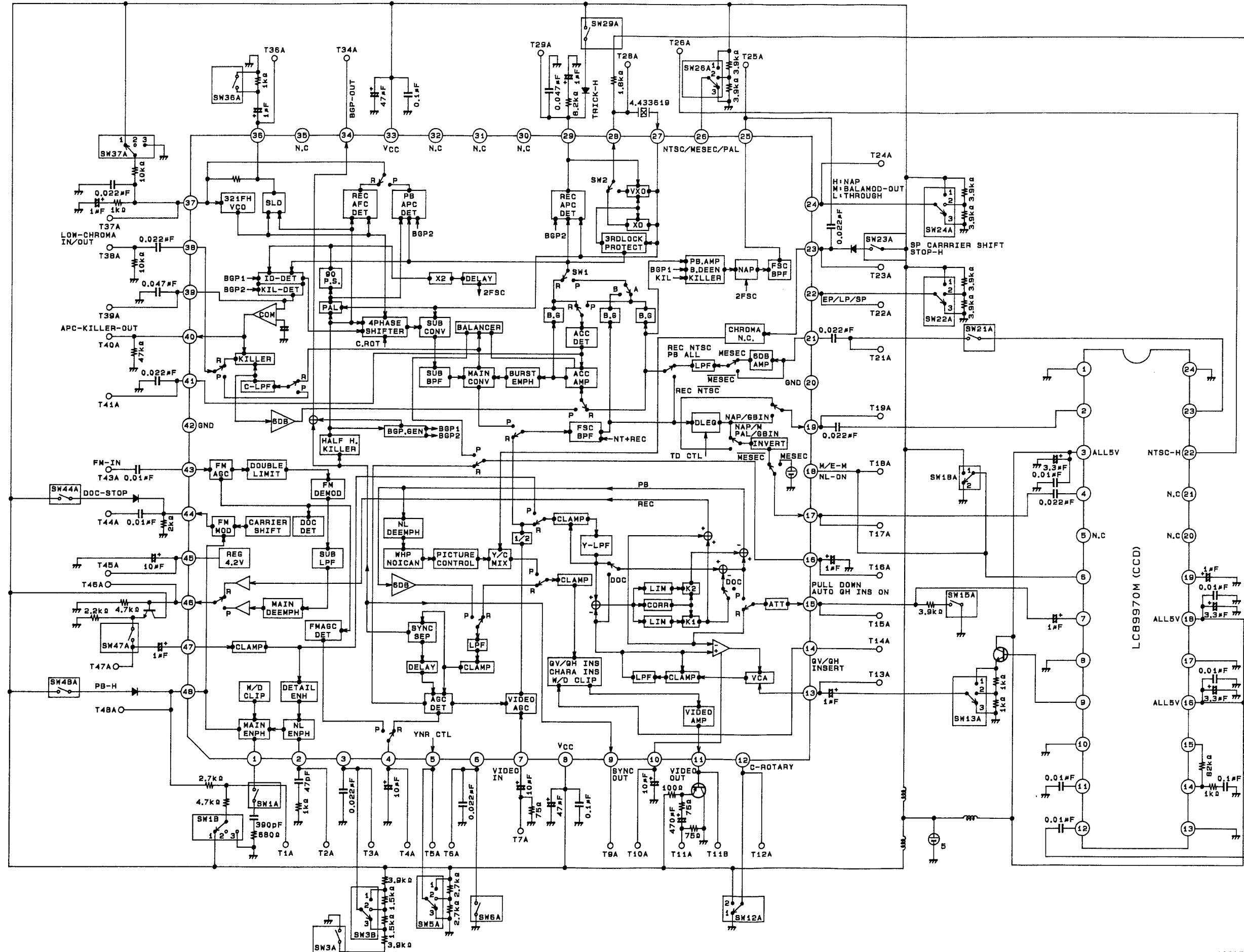
LA7449 Block Diagram (DIP)

▼ We recommend using a $\pm 1\%$ tolerance resistor here since this resistor determines the PBY level.

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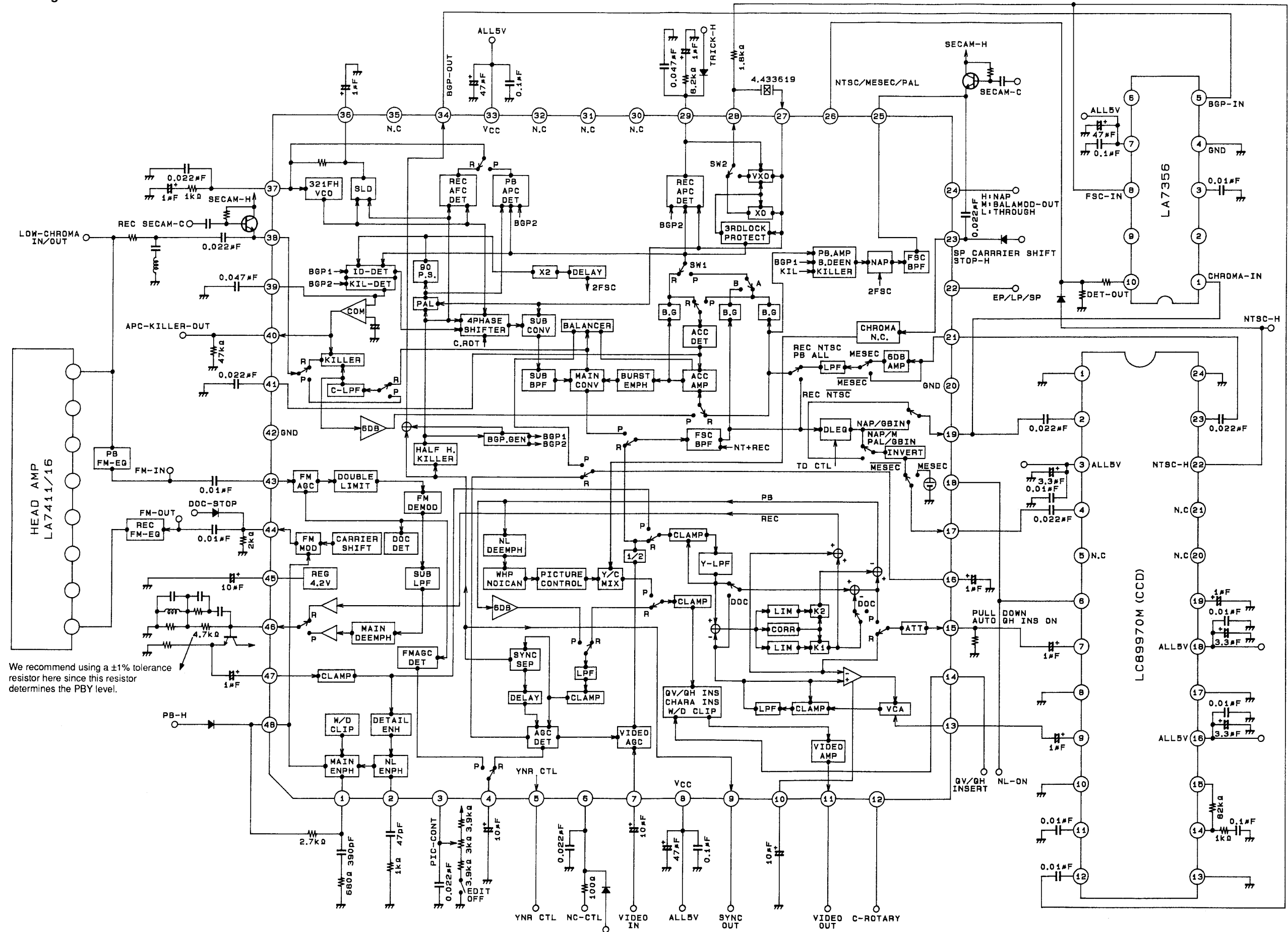
LA7449, 7449M

LA7449M Test Circuit



LA7449, 7449M

LA7449M Block Diagram



We recommend using a $\pm 1\%$ tolerance resistor here since this resistor determines the PBY level.

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