Ordering number : EN5842

Monolithic Linear IC

LA71521M

Video/audio signal processor for VHS VCRs (single chip for Y/C/A)

Overview

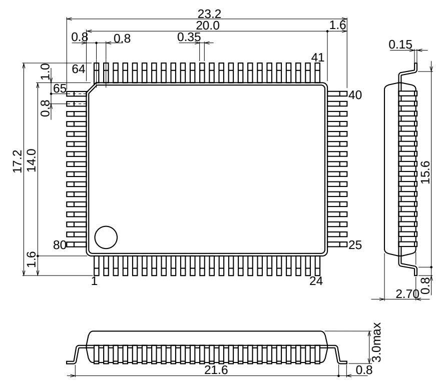
The LA71521M is a video/audio signal processor IC for VHS VCRs. It handles recording and playback of PAL/GBI, MESECAM, and 4.43 NTSC signals. NTSC software tapes can be converted to PAL for monitoring. The IC requires no adjustments and minimizes the peripheral component count, making it possible to implement efficient signal handling at low cost.

Package Dimensions

unit: mm

3174-QFP80E

[LA71521M]



SANYO : QFP80E (QIP80E)

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7	V
Allowable power dissipation	Pd max	Ta ≤ 65°C 114.3 x 76.1 mm^2 x 1.6 mm^3 with paper phenol substrate	1400	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	V
Recommended operating supply voltage range	V_{CC} opg		4.8 to 5.2	V

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Operating Characteristics at Ta = 25°C, V_{CC} = 5V

Parameter	Symbol	Input	Output	Conditions	Ratings			Unit
					min	typ	max	
[REC mode Y]								
Current drain (POWER SAVE MODE)	I_{CCS}			Influx current measured at pin 41 in power save mode	20	22	24	mA
Current drain (REC)	I_{CCR}			Sum of influx current at pins 36, 41, 47, 76 measured; 5V: pins 36, 41, 47; 7V: pin 76	130	145	160	mA
EE output level 1	$V_{EE}1$	T28A	T38	T38 output level measured with V_{IN} = 1.0 Vp-p video signal (PAL)	2.0	2.1	2.2	Vp-p
EE output level 2	$V_{EE}2$	T28A	T38	T38 output level measured with V_{IN} = 1.0 Vp-p video signal (NTSC)	2.0	2.1	2.2	Vp-p
AGC characteristics 1	AGC1	T28A	T38	Ratio of V_{EE} and T38 output level with V_{IN} = 2.0 Vp-p video signal	0	0.6	1.2	dB
AGC characteristics 2	AGC2	T28A	T38	Ratio of V_{EE} and T38 output level with V_{IN} = 0.5 Vp-p video signal	–1.2	–0.2	0	dB
AGC characteristics 3	AGC3	T28A	T38	T38 SYNC level measured with V_{IN} = 700 mVp-pLUMI, 600 mVp-p SYNC	550	650	750	mVp-p
AGC characteristics 4	AGC4	T28A	T38	T38 SYNC level measured with V_{IN} = 700 mVp-pLUMI, 150 mVp-p SYNC	370	420	470	mVp-p
Sync separation output level	V_{SYR}	T28A	T37	T37 output pulse crest value measured with V_{IN} = 1.0 Vp-p video signal	4.0	4.2	4.4	Vp-p
Sync separation output pulse width	PW_{SYR}	T28A	T37	T37 output pulse width measured with V_{IN} = 1.0 Vp-p video signal	4.2	4.5	4.8	µs
Sync separation output Pre-delay time	ΔT_{SYR}	T28A	T37	Delay of output SYNC vs. input SYNC measured with V_{IN} = 1.0 Vp-p video signal	0.6	0.8	1.0	µs
Sync separation Threshold level	TH_{SYR}	T28A	T37	Input level gradually attenuated and measured when output pulse width becomes larger than PW_{SYR} by 1 µs		–20	–15	dB
Sync tip level Pedestal level White level measurement	L_{VOR}	T28A	T38	Potential measured with V_{IN} = 1.0 Vp-p video signal, under following conditions. T38 sync tip level: L_{SYN} Pedestal level: L_{PED} White peak level: L_{WHT}	700	800	900	mV
Simulated H insertion level	ΔHDR	T28A	T38	T38 DC level measured with 2.7V DC applied to T33. Using this as L_{HDR}, differential to L_{PED} (see above) is calculated.	–150	0	+150	mV
White insertion level	ΔWHR	T28A	T38	T38 DC level measured with 1.3V DC applied to T33. Using this as L_{WHR}, differential to L_{WHT} (see above) is calculated.	–150	0	+150	mV
REC YNR operation	R_{YNR}	T28A	T25	T25 YNR characteristics measured with V_{IP} = 1 Vp-p standard color bar signal input Serial 00 OFF 10 (weak) 01 (medium) 11 (strong)	 0 1.7 4.2 /	 0 2.7 5.7 /	 0 3.7 7.2 /	dB
Y_{LPF} frequency response characteristics 1	$Y_{LPF}1$	T28A	T25	1 MHz response of T25 vs. 500 kHz with V_{IN} = 1 Vp-p standard multiburst signal	–0.3	+0.2	+0.7	dB
Y_{LPF} frequency response characteristics 2	$Y_{LPF}2$	T28A	T25	2 MHz response of T25 vs. 500 kHz with V_{IN} = 1 Vp-p standard multiburst signal	–1.4	–0.4	+0.6	dB
Y_{LPF} frequency response characteristics 3	$Y_{LPF}3$	T28A	T25	3 MHz response of T25 vs. 500 kHz with V_{IN} = 1 Vp-p standard multiburst signal	–4	–2	0	dB
Y_{LPF} frequency response characteristics 4	$Y_{LPF}4$	T28A	T25	4.43 MHz response of T25 vs. 500 kHz with V_{IN} = 1 Vp-p standard multiburst signal			–25	dB
REC-FM output level	V_{FM}		T18	T18 output level measured in no-signal input condition	304	320	336	mVp-p
Carrier frequency 1 (PAL)	$F_{FM}1$		T18	T18 output frequency measured in no-signal input condition	3.725	3.8	3.875	MHz
Carrier frequency 2 (NTSC)	$F_{FM}2$				3.325	3.4	3.475	MHz

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Parameter	Symbol	Input	Output	Conditions	Ratings min	Ratings typ	Ratings max	Unit
REC-FM output level Secondary distortion	H_{MOD}		T18	Secondary distortion measured in no-signal input condition		–40	–35	dB
Deviation 1 (PAL)	DEV1	T28A	T18	T18 deviation measured with V_{IN} = white 100% 1 Vp-p	0.95	1.00	1.05	MHz
Deviation 2 (NTSC)	DEV2	T28A	T18	T18 deviation measured with V_{IN} = white 100% 1 Vp-p	0.95	1.00	1.05	MHz
FM modulator linearity	L_{MOD}	T26	T18	Output frequency set to f2.85 with 2.85V DC applied to T26	–2	0	+2	%
1/2f_H carrier shift	CS		T18	Output frequency shift	6.5	7.8	9.1	kHz
Emphasis gain	$G_{EMP}24$ $G_{EMP}37$	T26A	T24 T37	Level difference of T26A and T37 measured with V_{IN} = 500 mVp-p, 10 kHz sine wave input	–0.75	–0.25	+0.25	dB
Detail enhancer characteristics 1	$G_{ENH}1$	T26A	T24	Level difference of T26A and T37 measured with V_{IN} = 158 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$	0.1	0.6	1.1	dB
Detail enhancer characteristics 2	$G_{ENH}2$	T26A	T24	Level difference of T26A and T24 measured with V_{IN} = 50 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$	1.3	2.3	3.3	dB
Detail enhancer characteristics 3	$G_{ENH}3$	T26A	T24	Level difference of T26A and T24 measured with V_{IN} = 15.8 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$	1.8	3.3	4.8	dB
Nonlinear emphasis characteristics 1	$G_{NLEMP}1$	T26A	T24	Level difference of T26A and T24 measured with V_{IN} = 500 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$	0.3	1.2	2.1	dB
Nonlinear emphasis characteristics 2	$G_{NLEMP}2$	T26A	T24	Level difference of T26A and T24 measured with V_{IN} = 158 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$	2.5	3.8	5.0	dB
Nonlinear emphasis characteristics 3	$G_{NLEMP}3$	T26A	T24	Level difference of T26A and T24 measured with V_{IN} = 50 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}24$ Serial 1 2 3 4	6.5 4.5 2.5 0	8.0 6.0 4.0 0	9.5 7.5 5.5 0	dB
Main linear emphasis characteristics 1	$G_{ME}1$	T26A	T37	Level difference of T26A and T37 measured with V_{IN} = 50 mVp-p, 500 kHz sine wave input Differential with $G_{EMP}37$	10.5	11.0	11.5	dB
Main linear emphasis characteristics 2	$G_{ME}2$	T26A	T37	Level difference of T26A and T37 measured with V_{IN} = 50 mVp-p, 2 MHz sine wave input Differential with $G_{EMP}37$	12.5	13.0	13.5	dB
White clip level	L_{WC}	T28A	T37	White clip level at T37 measured with V_{IN} = white 100% 1.0 Vp-p CTL 1 2	185 176	195 185	205 194	%
Dark clip level	L_{DC}	T28A	T37	Dark clip level at T37 measured with V_{IN} = white 100% 1.0 Vp-p CTL 1 2	–57.5 –52.0	–52.5 –47.0	–47.5 –42.0	%
Video output linearity	LINY	T28A	T38	T38 stair levels measured with video signal 1.0Vp-p (linearity unit, 5 stairs) input. Stair linearity determined by arithmetic processing.	–0.5	0	+0.5	dB
[PB mode Y]								
Current drain PB	I_{CCP}			5V: pins 36, 41, 47; 7V: pin 76 Sum of influx current at pins 36, 41, 47, 76 measured	153	170	187	mA
Dropout compensation time	T_{DOC}	T15 T26A	T38	T20: 4 MHz, 300 mVp-p sine wave T26A: revert time for T38 output from when 0.5 Vp-p video signal T15 input is set to 0	10.5	12.5	14.5	H
DOC characteristics	G_{DOC}	T15 T26A	T38	T15: 4 MHz, 300 mVp-p sine wave T26A: 0.5Vp-p video signal Input/output response 5H after setting T15 input to 0	–1.5	0	+1.5	dB
PB Y level	V-Y_{OUT}	T15	T38	Playback Y level with DEV = 1.0 MHz FM signal input	2.00	2.10	2.20	Vp-p
Self-recording/playback Y level	R/P_{OUT}		T38	Playback Y level for self-recording/playback	1.93	2.10	2.27	Vp-p

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Parameter	Symbol	Input	Output	Conditions	Ratings min	typ	max	Unit
FM demodulator linearity	L_{DEM}	T15	T25	$L_{DEM} = \frac{V_{DEM}^{4} - (V_{DEM}^{2} + V_{DEM}^{6})/2}{V_{DEM}^{6} - V_{DEM}^{2}} \times 100$	–3.5	0	+3.5	%
Carrier leak	CL	T15	T25	V_{IN} = 300 mVp-p f = 4 MHz Ratio of T25 4 MHz component and SDEM			–35	dB
Playback YNR characteristics	P_{YNR}	T26A	T38	Ratio of 3 fH component and 32.5 fH component with V_{IN} = white 50% + CW (15.8 mVp-p) Serial 00 OFF 10 (weak) 01 (medium) 11 (strong)	0 –3.7 –9.2 –13.3	0 –3.2 –8.2 –11.8	0 –2.7 –7.2 –10.3	dB
Nonlinear deemphasis characteristics 1	$G_{NLDE}1$	T26A	T38	Input/output response measured with V_{IN} = white 50% video + sine wave f = 2 MHz 158 mVp-p	–3.5	–2.5	–1.5	dB
Nonlinear deemphasis characteristics 2	$G_{NLDE}2$	T26A	T38	f = 2 MHz, 50 mVp-p CTL 1 2 3 4	4.5 2.5 0.5 0	6.0 4.0 2.0 0	7.5 5.5 3.5 0	dB
Double noise canceler characteristics 1	$G_{WNC}1$	T26A	T38	f = 1.2 MHz, 158 mVp-p, pin 69 open Gr2 bit 8/7 = "10", Gr5 bit 1 = "0"	–3	–2	–1	dB
Double noise canceler characteristics 2	$G_{WNC}2$	T26A	T38	f = 1.2 MHz, 50 mVp-p, pin 69 open Gr2 bit 8/7 = "10", Gr5 bit 1 = "0"	–7.5	–6.0	–4.5	dB
Double noise canceler characteristics 3	$G_{WNC}3$	T26A	T38	f = 1.2 MHz, 15.8 mVp-p, pin 69 open Gr2 bit 8/7 = "10", Gr5 bit 1 = "0"	–14	–12	–10	dB
Double noise canceler characteristics 4	$G_{WNC}4$	T26A	T38	f = 2.5 MHz, 15.8 mVp-p, pin 69 open Gr2 bit 8/7 = "10", Gr5 bit 1 = "0"	–6	–5	–4	dB
Double noise canceler characteristics 5	$G_{WNC}5$	T26A	T38	f = 2.5 MHz, 15.8 mVp-p, pin 69 open Gr2 bit 8/7 = "10", Gr5 bit 1 = "0"	–9.5	–8.0	–6.5	dB
PIC-CTL hard response characteristics 1	$G_{PH}1$	T26A	T38	f = 1 MHz, 158 mVp-p, Gr5 bit 6/5/4 = "1/0/0"	2.5	3.5	4.5	dB
PIC-CTL hard response characteristics 2	$G_{PH}2$	T26A	T38	f = 2 MHz, 158 mVp-p, Gr5 bit 6/5/4 = "1/0/0"	6	7	8	dB
PIC-CTL soft response characteristics 1	$G_{PH}3$	T26A	T38	f = 1 MHz, 158 mVp-p, Gr5 bit 6/5/4 = "0/0/0"	–4.5	–3.5	–2.5	dB
PIC-CTL soft response characteristics 2	$G_{PH}4$	T26A	T38	f = 2 MHz, 158 mVp-p, Gr5 bit 6/5/4 = "0/0/0"	–8	–7	–6	dB
Sync tip level Pedestal level White level measurement	L_{VOR}	T26A	T38	T38 video output sync tip (L_{SYN}), pedestal (L_{PED}), white level (L_{WHT}) potential measured with V_{IN} = white 100% 0.5 Vp-p	700	800	900	mV
Simulated V insertion level	ΔVDP	T26A	T38	DC voltage at T38 is measured when 5V is applied to T33. Taking this as L_{VDP}, differential with L_{SYN} above is calculated.	–50	0	+50	mV
Simulated H insertion level	ΔHDP	T26A	T38	DC voltage at T38 is measured when 2.7V is applied to T33. Taking this as L_{HDP}, differential with L_{PED} above is calculated.	–100	0	+100	mV
White insertion level	ΔWHP	T26A	T38	DC voltage at T38 is measured when 1.3V is applied to T33. Taking this as L_{WHP}, differential with L_{WHT} above is calculated.	–100	0	+100	mV
Sync separation output level	V_{SYP}	T26A	T37	Pin 37 output pulse crest value measured with V_{IN} = 0.5 Vp-p video signal	4.0	4.2	4.4	Vp-p
Sync separation output pulse width	P_{WSYP}	T26A	T37	Pin 37 output pulse width measured with V_{IN} = 0.5 Vp-p video signal	4.35	4.65	4.95	µs
Sync separation output Pre-delay time	ΔT_{SYP}	T26A	T37	Delay of output SYNC vs. input SYNC measured with V_{IN} = 0.5 Vp-p video signal	0.7	0.9	1.10	µs
4V regulator	V_{REG}		T31	T31 DC level measured	3.8	4.0	4.2	V
FMAGC output level	VF_{AGC}	T15	T17	Pin 17 signal amplitude measured with V_{IN} = 150, 300, 600 mVp-p 4 MHz CW	325	350	375	mVp-p

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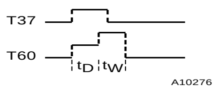
Parameter	Symbol	Input	Output	Conditions	Ratings min	Ratings typ	Ratings max	Unit
[REC mode chroma]								
REC chroma low-range converter output level	V_{OR}-14	T28A	T14A	T14A burst level measured with V_{IN} = 1 Vp-p standard color bar signal CTL 0	215	225	235	mVp-p
				CTL 1	180	190	200	
REC chroma/FM ratio	C/FM	T28A	T14A T18	Down-converted chroma level/FM level ratio with 100% chroma input (R_L: 5.1 kΩ)	–3.7	–3.0	–2.3	dB
Burst emphasis amount (NTSC mode)	G_{BE}	T28A	T14A	SP/EP and LP T14A burst level ratio with V_{IN} = 1Vp-p standard color bar signal	5.5	6.0	6.5	dB
VXO oscillation level (PAL mode)	V_{VXO-RP}	T28A	T56	T56 output amplitude measured with FET probe at V_{IN} = 1 Vp-p standard color bar signal	300	500	700	mVp-p
VXO oscillation level (NTSC mode)	V_{VXO-RN}	T28A	T56	T56 output amplitude measured with FET probe at V_{IN} = 1 Vp-p standard color bar signal	300	500	700	mVp-p
REC ACC characteristics 1	ACC_R1	T28A	T14A	T14A burst level measured and compared to VOR-14 with V_{IN} = 1 Vp-p standard color bar signal and chroma signal only boosted by +6 dB		+0.2	+0.5	dB
REC ACC characteristics 2	ACC_R2	T28A	T14A	T14A burst level measured and compared to VOR-14 with V_{IN} = 1 Vp-p standard color bar signal and chroma signal only boosted by –6 dB	–0.5	–0.1		dB
REC ACC Killer input level	$V_{ACCK-ON}$	T28A	T14A	T14A input burst level measured when output goes off and compared to standard input level, with V_{IN} = 1 Vp-p standard color bar signal and chroma signal being gradually attenuated.		–26		dB
REC ACC Killer output level	V_{OACCK}	T28A	T14A	T14A output level measured with spectrum analyzer and compared to VOR-14, in killer condition as described above.		–60	–50	dB
REC ACC Demodulator input level	$V_{ACCK-OFF}$	T28A	T14A	From killer condition as described above, T14A input burst level is measured when output goes on with input chroma level being gradually increased. This is compared to standard input level.		–20		dB
REC APC Pull-in range 1	$\Delta f_{APC}1$	T28A	T14A	Input signal: 50% white signal superimposed with 4.4336 MHz 300 mVp-p CW. After checking that T14A output is on, CW frequency is raised until T14A output goes off. Frequency then is gradually reduced. CW frequency when T14A output goes on: f1	350			Hz
REC APC Pull-in range 2	$\Delta f_{APC}2$	T28A	T14A	Same as above, CW frequency is lowered until T14A output goes off. Then frequency is gradually raised. CW frequency when T14A output goes on: f2			–350	Hz
REC AFC Pull-in range 1	$\Delta f_{AFC}1$	T28A	T51	300 mVp-p, 15.6 kHz pulse train with 5 µs pulse width is input. Pulse train frequency is raised until T51 output waveform is impaired. Then frequency is lowered. Pulse train frequency when T51 waveform becomes normal: f1	+1			kHz
REC AFC Pull-in range 2	$\Delta f_{AFC}2$	T28A	T51	Same as above, pulse train frequency is lowered until T51 output waveform is impaired. Then frequency is raised. Pulse train frequency when T51 waveform becomes normal: f2			–1	kHz
BGP delay time	t_D	T28	T37 T60	T37 and T60 waveforms are observed with standard color bar input to T28A 	3.1	3.4	3.7	µs
BGP width	t_W				4.7	4.9	5.1	µs

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Parameter	Symbol	Input	Output	Conditions	Ratings min	Ratings typ	Ratings max	Unit
2 fsc output level	$V2_{fsc}$	T28A	T58	T58 level measured in no-signal input condition	360	400	440	mVp-p
2 fsc duty	$D2_{fsc}$	T28A	T58	T58 duty measured in no-signal input condition	40	50	60	%
[PB mode chroma chroma]								
PB chroma video Output level (PAL mode)	P_{Vop-38}	T15A T26A	T38	From T15A in PB and SP mode, a chroma signal down-converted from the PAL chroma noise test signal (SP mode, burst 80 mVp-p) and mixed with a 4 MHz 300 mVp-p sine wave is input. From T26A, a 50% white signal is input. Burst level is measured at T38.	490	580	670	mVp-p
PB chroma video Output level (NTSC mode)	N_{Vop-38}	T15A T26A	T38	From T15A in PB and SP mode, a chroma signal down-converted from the NTSC chroma noise test signal (SP mode, burst 160 mVp-p) and mixed with a 4 MHz 300 mVp-p sine wave is input. From T26A, a 50% white signal is input. Burst level is measured at T38.	490	580	670	mVp-p
PB chroma Pin 46 output level	Vop-46	T15A T26A	T46	Under same conditions as for P_{Vop-38}, T46 burst level is measured.	170	200	230	mVp-p
PB ACC characteristics 1	ACC_P1	T15A T26A	T46	Under same conditions as for P_{Vop-38}, input chroma level is raised by +6 dB. T46 burst level is measured and compared to P_{Vop-38}.		0.5	0.8	dB
PB ACC characteristics 2	ACC_P2	T15A T26A	T46	Under same conditions as for P_{Vop-38}, input chroma level is raised by –6 dB. T46 burst level is measured and compared to P_{Vop-38}.	–0.5	–0.2		dB
PB killer input level	V_{ACK-P}	T15A T26A	T46	Under same conditions as for P_{Vop-38}, input chroma level is attenuated and input burst level is measured when chroma output at T46 goes off (compared to standard input 80 mVp-p)			–25	dB
Chroma output level in PPB killer condition	V_{OACK-P}	T15A T26A	T38	T38 measured with spectrum analyzer and compared to P_{Vop-38} in killer condition as described above.		–44	–40	dB
PB main converter carrier leak	C_{LP}	T15A T26A	T38	Under same conditions as for P_{Vop-38}, T38 is measured with spectrum analyzer and 4.43 MHz component is compared to 5.06 MHz component.		–40	–33	dB %
Burst deemphasis (PAL mode)	G_{BD}	T15A T26A	T46	629 kHz, 160 mVp-p CW is mixed with 4 MHz, 300 mVp-p CW and input to T15A. 50% white signal is input from T26A. Output level during T46 burst interval and during other times is compared.	–5.75	–5.50	–5.25	dB
PB XO output level (NTSC mode)	V_{XO-PP}		T59	T59 output level measured with FET probe in PB mode	300	500	700	mVp-p
PB XO oscillator frequency deviation (PAL mode)	Δf_{XOP}		T59	T59 frequency measured in PB mode: f	–9	0	+9	Hz
NTSC -> PAL conversion V axis burst level	V_{BNAP}	T15A T26A	T38	From T15A, down-converted chroma noise test signal mixed with 4 MHz, 300 mVp-p CW is input. From T26A, 50% white signal is input. –45° burst level at T38 is measured and compared to P_{Vop-38}	–1	0	+1	dB
NTSC -> PAL conversion Burst level ratio	ΔB-NAP	T15A T26A	T38	Under same conditions as above, +45° burst level is measured and compared to V_{BNAP}	–2	0	+2	dB

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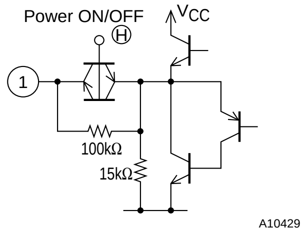
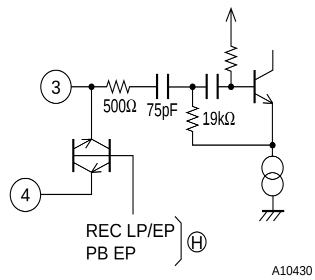
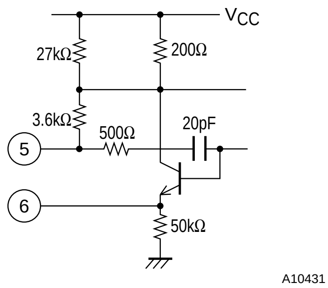
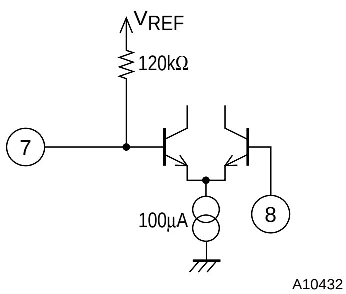
Parameter	Symbol	Input	Output	Conditions	Ratings min	Ratings typ	Ratings max	Unit
NTSC -> PAL conversion chroma phase	P-NAP	T15A T26A	T38	4 MHz, 300 mVp-p CW and 100% chroma signal phase shifted by –90° from burst are mixed and input to T15A. 50% white signal is input to T26A. Chroma phase when pin 67 is 0V is measured and taken as θ1. Chroma phase when pin 67 is 5V is measured and taken as θ2. P-NAP = θ1 – θ2	160	180	200	deg
[REC mode/EQ]								
REC EQ characteristics 1	G_{REQ1}	T23	T18	Input/output response measured with V_{IN} = 500 mVp-p, f = 4 MHz	–3	–2	–1	dB
REC EQ secondary distortion	H_{REQ}	T23	T18	Under same conditions as above, secondary harmonics are measured.		–40	–35	dB
REC EQ characteristics 2	G_{REQ2}	T23	T18	Input/output response measured with V_{IN} = 500 mVp-p, f = 627 kHz			–20	dB
REC EQ characteristics 3	G_{REQ3}	T23	T18	Input/output response measured with V_{IN} = 500 mVp-p, f = 1.07 MHz			–20	dB
REC EQ characteristics 4	G_{REQ4}	T23	T18	Input/output response measured with V_{IN} = 500 mVp-p, f = 4.5 MHz	–3.3	–2.3	–1.3	dB
REC EQ characteristics 5	G_{REQ5}	T23	T18	Input/output response measured with V_{IN} = 500 mVp-p, f = 2.0 MHz	–1	0	+1	dB
[PB mode/EQ]								
PB EQ characteristics 1	G_{PEQ1}	T15A	T17	Input/output response measured with V_{IN} = 400 mVp-p, f = 4 MHz	–2.5	–1.1	0.0	dB
PB EQ secondary distortion	H_{PEQ}	T15A	T17	Under same conditions as above, secondary harmonics are measured.		–40	–30	dB
PB EQ characteristics 2	G_{PEQ2}	T15A	T17	Input/output response measured with V_{IN} = 400 mVp-p, f = 627 kHz			–30	dB
PB EQ characteristics 3	G_{PEQ3}	T15A	T17	High-range trap frequency and gain measured with V_{IN} = 400 mVp-p		7.8		MHz
							–25	dB
PB EQ characteristics 4	G_{PEQ4}	T15A	T17	Input/output response measured with V_{IN} = 400 mVp-p, f = 1.07 MHz			–30	dB
PB EQ characteristics 5	G_{PEQ5}	T15A	T17	Input/output response measured with V_{IN} = 400 mVp-p, f = 4.5 MHz	–1	0	+1	dB
PB EQ characteristics 6	G_{PEQ6}	T15A	T17	Input/output response measured with V_{IN} = 400 mVp-p, f = 2.0 MHz	–11	–10	–9	dB

Continued on next page

Parameter	Symbol	Input	Output	Conditions	Ratings			Unit
					min	typ	max	
[REC/PB mode]								
LINE AMP voltage gain (PB)	V_{GLP}	T11	T77	V_{IN} = –30 dBV	23.0	23.5	24.0	dB
LINE AMP voltage gain (A1, A2, A3)	V_{GLR}	T71 T73 T75	T77	V_{IN} = –30 dBV	23.0	23.5	24.0	dB
LINE AMP distortion (PB)	THD_L	T11	T77	V_{IN} = –30 dBV		0.1	0.4	%
LINE AMP Output noise voltage (PB)	V_{NOL}	—	T77	Rg = 1 kΩ, DIN audio filter		–74.0	–70.5	dBV
LINE AMP Maximum output voltage (PB)	V_{OML}	T11	T77	Output voltage for 1% THD	1.0	1.2		Vrms
Output voltage with LINE AMP ALC	V_{OA}	T73	T77	–28 dBV input to T73	–7	–6	–5	dBV
LINE AMP ALC effect	ALC	T73	T77	T73 input level reduced from –28 dBV to –8 dBV	0	1	3	dB
LINE AMP ALC distortion	THD_A	T73	T77	–28 dBV input to T73		0.1	0.5	%
MUTE attenuation	M_{PB} M_A1 M_A2 M_A3	T11 T71 T73 T75	T77		80	90		dB
EQ AMP open circuit voltage gain	VG_{OE}	T7	T10	V_{IN} = –66 dBV	58	64		dB
EQ AMP input converted noise voltage	V_{NIE}	—	T10	Rg = 620Ω, DIN audio filter		1.0	1.8	µVrms
REC AMP voltage gain	VG_R	T79	T1	V_{IN} = –20 dBV	14.0	14.5	15.0	dB
REC AMP distortion	THD_R	T79	T1	V_{IN} = –20 dBV		0.1	0.4	%
REC AMP Maximum output voltage	V_{OMR}	T79	T1	Output voltage for 1% THD	1.0	1.2		Vrms
REC BIAS voltage	V_{BIAS}	—	T3	Head impedances must be in the middle of the range.	297	330	363	mVrms
REC BIAS control voltage	V_{CTL}	—	T5	No-signal condition.	1.66	1.85	2.03	V

Pin Function

<table>
<tr><th>Pin number</th><th>Pin name</th><th>Standard DC voltage</th><th>Signal waveform</th><th>Equivalent circuit</th></tr>
<tr><td>1</td><td>A-REC-OUT</td><td>2.3V</td><td>CW, 1.4 Vp-p</td><td>
</td></tr>
<tr><td>2</td><td>A-GND</td><td>0V</td><td></td><td></td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">A-AUTO-BIAS-IN</td><td rowspan="2">2.3V</td><td>REC MODE
CW 1.4 Vp-p
70 kHz, 1.0 Vp-p</td><td rowspan="4">
</td></tr>
<tr><td>PB MODE
DC 2.3V</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">A-EQ-SW2</td><td rowspan="2">2.3V</td><td>REC MODE
CW, 1.4 Vp-p
70 kHz, 1.1 Vp-p</td></tr>
<tr><td>PB, EP MODE DC 2.3V
PB, EP MODE CW 1.4 mVp-p</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">A-AUTO-BIAS-IN</td><td>REC
ADAPTIVE</td><td>DC (1.7 to 2.0V)</td><td rowspan="4">
</td></tr>
<tr><td>PB
VCC</td><td>DC 5V</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">A-AUTO-BIAS-B</td><td>REC 0.7V</td><td>DC 0.7V</td></tr>
<tr><td>PB 0V</td><td>DC 0V</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">A-EQ-IN</td><td rowspan="2">2.3V</td><td>REC
DC 2.3V</td><td rowspan="4">
</td></tr>
<tr><td>PB
CW, 1.4 mVp-p</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">A-EQ-NFB</td><td rowspan="2">2.3V</td><td>REC
DC 2.3V</td></tr>
<tr><td>PB
CW, 1 mVp-p</td></tr>
</table>

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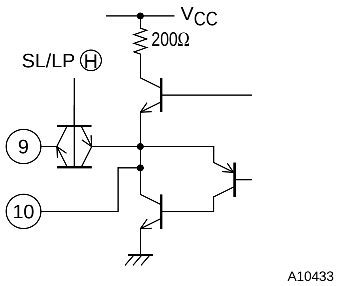
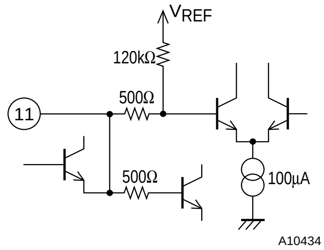
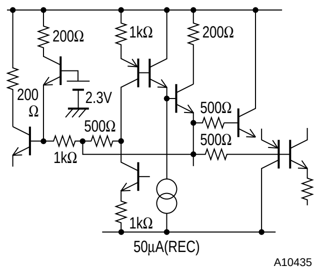
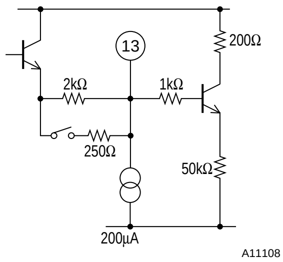
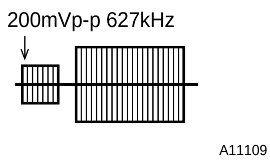
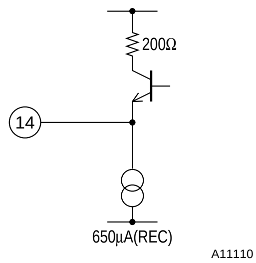
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
9	A-EQ-SW1	2.3V	REC DC 2.3V PB CW, 2.2 Vp-p	
10	A-EQ-OUT	2.3V	REC DC 2.3V PB CW, 2.2 Vp-p	
11	A-LINE-PB-IN	2.3V	REC HALF RECTIFICATION 70 kHz PB CW 95 mVp-p	
12	AGC-TC1	REC 2.3V	DC	
	Carrier Leak Balancer	PB 2.3V	DC	
13	ACC-FILT	REC 1.8V PB 1.8V	DC	
14	REC-C-OUT	REC 2.8V PB 0V	200 mVp-p 627 kHz 	

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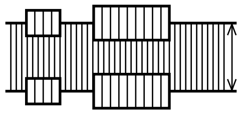
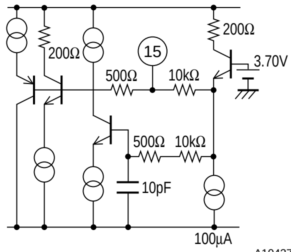
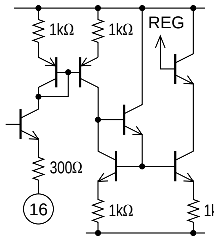
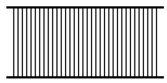
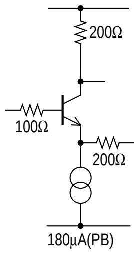
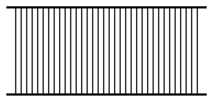
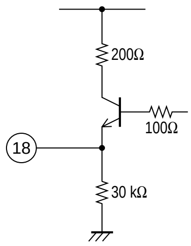
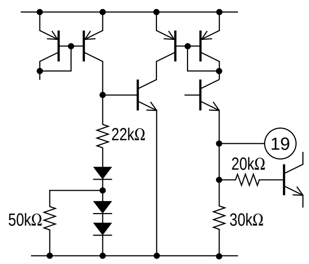
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
15	PB Y-FM/C-IN C-IN (FROM Pre)	REC 4.2V PB 3.2V	PB Y-FM 400 mVp-p  A10436	 A10437
16	PM (R03)	REC 1.6V PB 1.6V	DC	 A10438
17	PB-EQ-OUT	REC 2.6V PB 2.6V	FM 730 mVp-p PB Y-FM 340 mVp-p  A10439	 A10440
18	REC-Y FM-OUT	REC 1.9V PB 1.9V	PEC Y-FM 730 mVp-p  A10441	 A10442
19	REC-H-OUT	REC 4.2V REC PAUSE 2.5V EE or PB 0V	DC	 A10443

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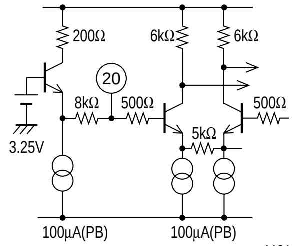
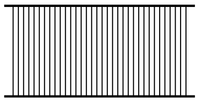
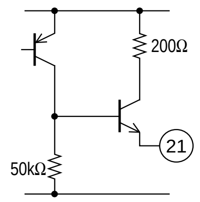
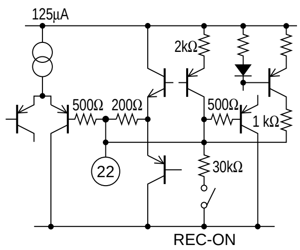
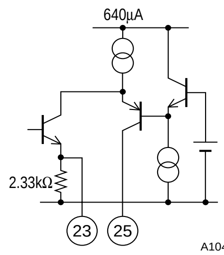
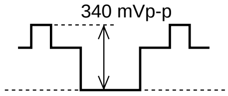
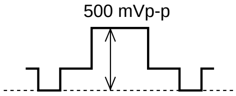
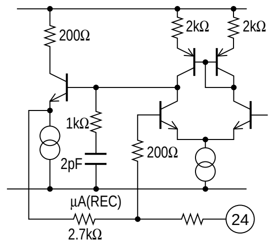
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
20	PB Y-FM-IN (FROM EQ)	REC 4.7V	FM 700 mVp-p	 A10445
		PB 2.5V	PB-Y•FM 320 mVp-p  A10444	
21	TRICK-HOUT	TRICK MODE WITHOUT TRICK MODE	DC 4.5V 0V	 A10446
22	AGC-TC2	REC 1.6V	DC	 A10447
		PB 1.7V		
23	PB-EMITTER -PEAKING	REC 0V	DC	 A10449
		PB 2.6V	340 mVp-p  A10448	
24	MAIN-EMPH FILTER	REC 2.2V	500 mVp-p  A10450	 A10451
		PB 0V	DC	

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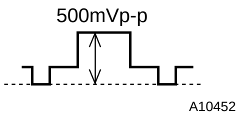
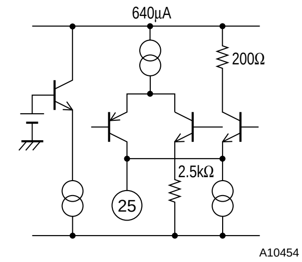
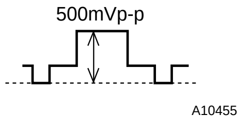
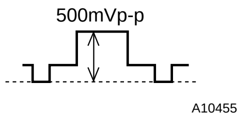
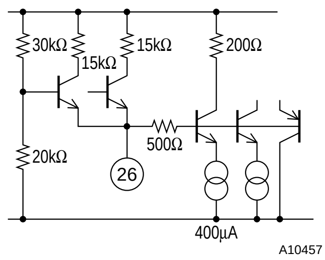
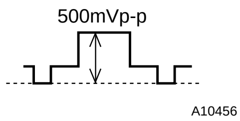
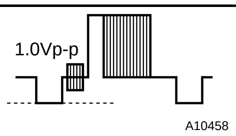
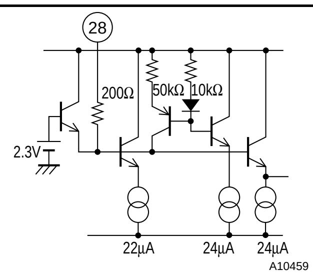
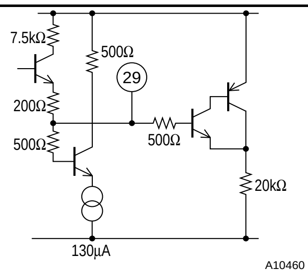
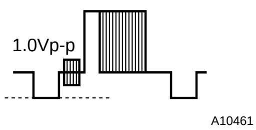
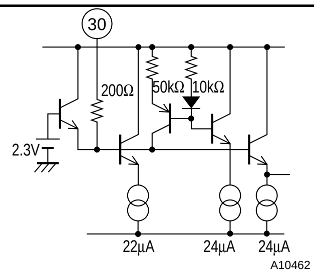
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
25	REC-Y	REC 1.6V		
	MAIN-DE-EMPH. OUT	PB 1.2V		
26	CLAMP-IN	REC 2.9V		
		PB 2.8V		
27	Y-GND	0V		
28	VIDEO-IN1	REC VSYNC 1.7V		
		PB 0V	DC	
29	FBC-FILT (Feed Back Clamp)	REC 2.6V	DC	
		PB 2.6V		
30	VIDEO-IN2	REC VSYNC 1.7V		
		PB 0V		

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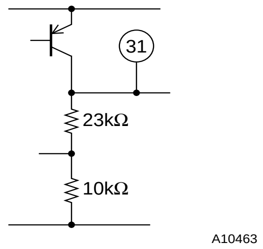
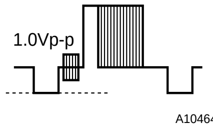
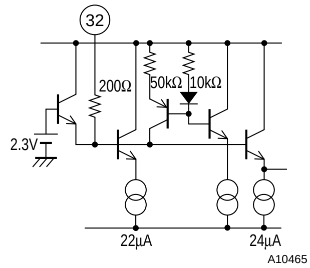
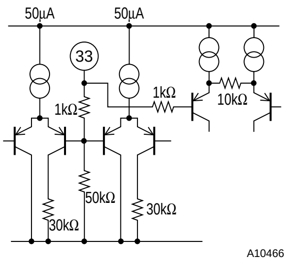
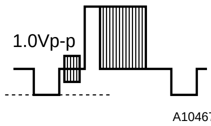
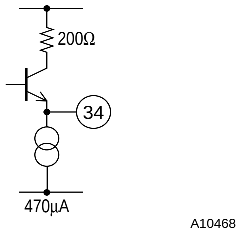
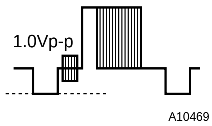
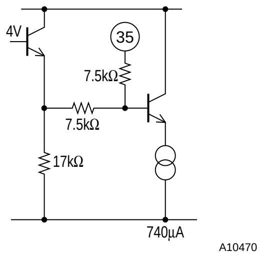
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
31	REG	REC 4.1V REC 4.1V	DC	
32	VIDEO-IN3	REC VSYNC 1.7V		
		PB 0V		
33	QV/QH-INS CHARA-INS		0 to 0.8V : Through 1.0 to 2.2V : Character Ins. 2.5 to 3.2V : QV Ins. 3.8 to V_{CC}V : QV Ins.	
34	VPS-OUT	REC VSYNC 1.7V		
		PB 0V		
35	VIDEO-AGC-IN	REC 2.3V		
		PB 3.1V		
36	Y-V_{CC}	5V	DC	

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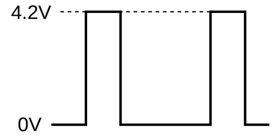
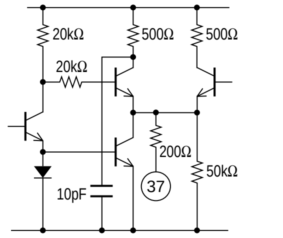
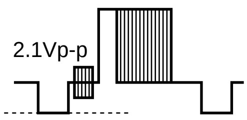
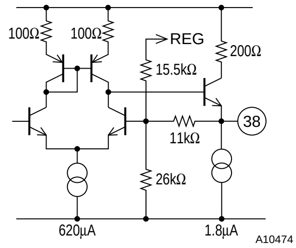
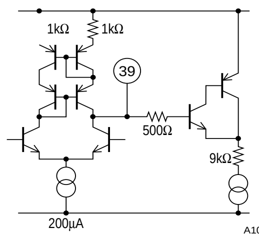
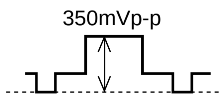
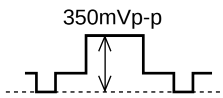
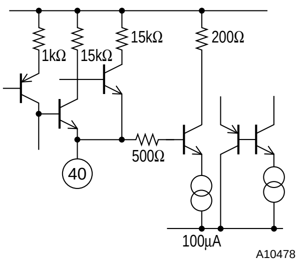
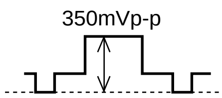
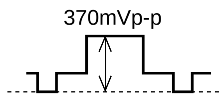
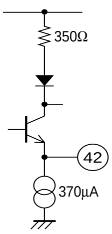
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
37	SYNC-OUT		 A10471	 A10472
38	VIDEO-OUT	VSYNC 0.8V	 A10473	 A10474
39	VCA-FILT	REC 3.1V PB 3.1V	DC	 A10475
40	VCA-IN (CLAMP)	REC 2.8V PB 2.8V	 A10476  A10477	 A10478
41	VCC2	5V	DC	
42	Y-CCD-DRIVE	REC 1.8V PB 1.8V	 A10479  A10480	 A10481

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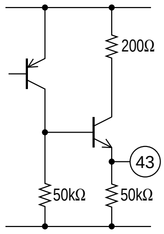
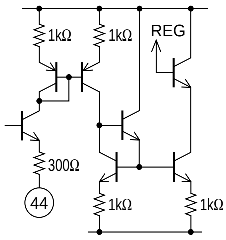
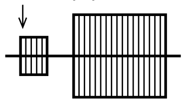
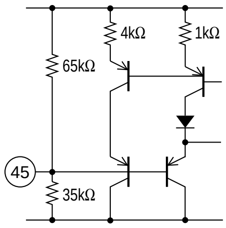
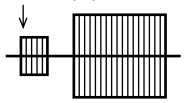
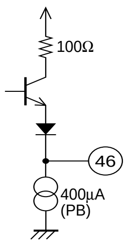
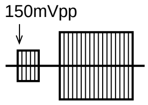
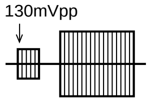
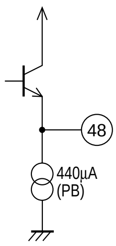
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
43	NTSC-H OUT	NTSC MODE 4.2V WITHOUT NTSC MODE 0V	DC	 A10482
44	PQ 2 (RO2)	REC 1.7V PB 1.8V	DC	 A10483
45	PB CHROMA IN	REC 1.8V PB 1.9V	210mVp-p  A10484	 A10485
46	PB CHROMA OUT	REC 0V PB 2.0V	210mVp-p  A10486	 A10487
47	C-V_{CC}	5V	DC	
48	C-CCD-DRIVE2	REC 2.8V PB 2.8V	150mVpp  A10488 130mVpp  A10489	 A10490

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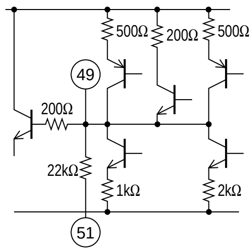
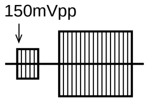
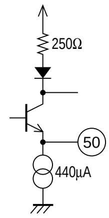
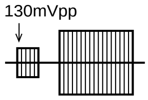
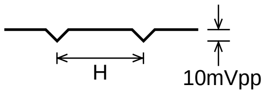
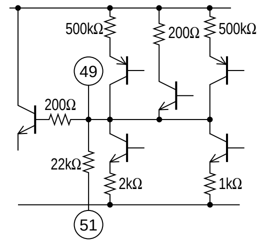
<table>
<tr><th>Pin number</th><th>Pin name</th><th>Standard DC voltage</th><th>Signal waveform</th><th>Equivalent circuit</th></tr>
<tr><td rowspan="2">49</td><td rowspan="2">SLD-FILT</td><td>REC 4.0V</td><td rowspan="2">DC</td><td rowspan="2">

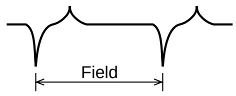
A10491</td></tr>
<tr><td>PB 4.1V</td></tr>
<tr><td rowspan="2">50</td><td rowspan="2">C-CCD-DRIVE 1</td><td>REC 2.9V</td><td>

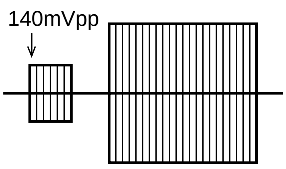
A10492</td><td rowspan="2">

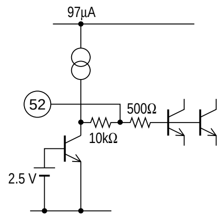
A10494</td></tr>
<tr><td>PB 2.9V</td><td>

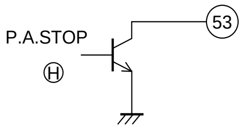
A10493</td></tr>
<tr><td rowspan="2">51</td><td rowspan="2">AFC/APC-FILT</td><td>REC 4.0V</td><td>

A10495</td><td rowspan="2">

A10497</td></tr>
<tr><td>PB = 4.0V</td><td>

A10496</td></tr>
<tr><td>52</td><td>C-CCD-IN</td><td>3.2V</td><td>

A10498</td><td>

A10499</td></tr>
<tr><td>53</td><td>PA STOP-TR-SW</td><td>0V</td><td>DC</td><td>

A10500</td></tr>
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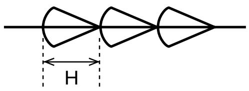
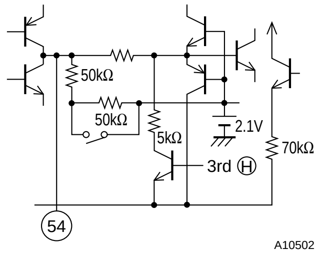
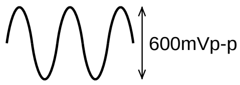
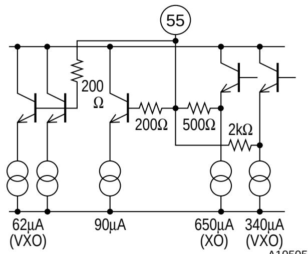
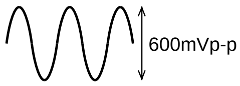
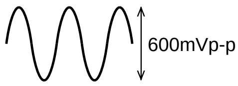
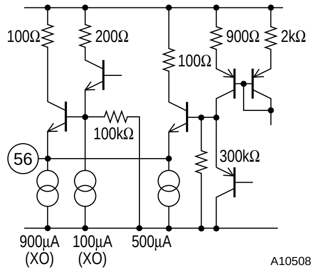
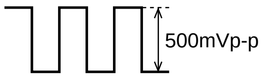
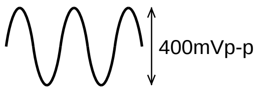
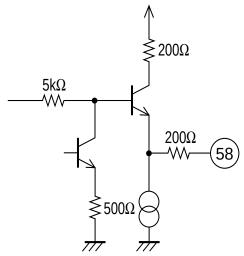
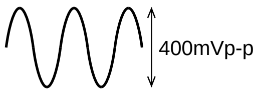
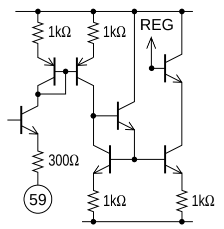
<table>
<tr><th>Pin number</th><th>Pin name</th><th>Standard DC voltage</th><th>Signal waveform</th><th>Equivalent circuit</th></tr>
<tr><td>54</td><td>REC-APC-FILTER</td><td>2.1V</td><td>A10501</td><td>A10502</td></tr>
<tr><td rowspan="2">55</td><td rowspan="2">VXO/XO-IN</td><td>REC 4.0</td><td>A10503</td><td rowspan="2">A10505</td></tr>
<tr><td>PB 3.9V</td><td>A10504</td></tr>
<tr><td rowspan="2">56</td><td rowspan="2">VXO/XO-OUT</td><td>REC 2.5V</td><td>A10506</td><td rowspan="2">A10508</td></tr>
<tr><td>PB 2.5V</td><td>A10507</td></tr>
<tr><td>57</td><td>C-GND</td><td>0V</td><td>DC</td><td></td></tr>
<tr><td rowspan="2">58</td><td rowspan="2">2Fsc/PB-H OUT</td><td>REC 1.5V</td><td>A10509</td><td rowspan="2">A10511</td></tr>
<tr><td>PB 2.8V</td><td>A10510</td></tr>
<tr><td rowspan="2">59</td><td rowspan="2">RL (RO4)</td><td>REC 1.5V</td><td>DC</td><td rowspan="2">A10512</td></tr>
<tr><td>PB 1.5V</td><td>DC</td></tr>
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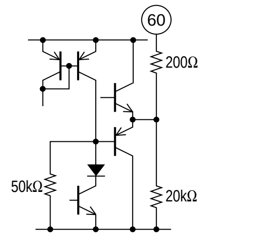
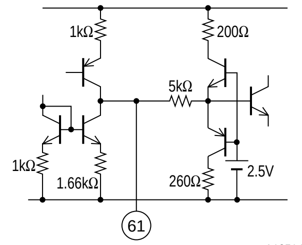
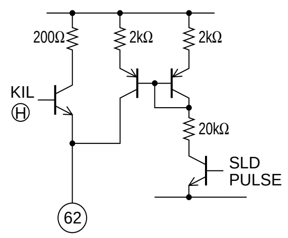
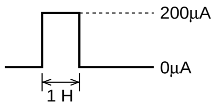
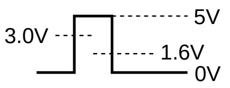
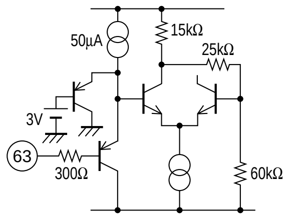
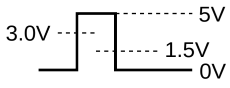
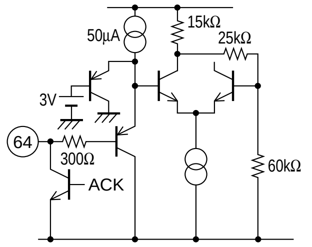
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
60	BGP-OUT		SYNC+BGP SYNC 1.4V (TYP) BGP 4.0V or MORE	 A10513
61	KILL-FILT	Color 2.0V	DC	 A10514
		killer 3.0V		
62	ACK/SLD OUT	ACK-OUT MODE	KILLER MODE 4V or MORE COLOR MODE 0V	 A10516
		SLD-OUT MODE	 A10515	
63	SERIAL-CLOCK-IN		 A10517	 A10518
64	SERIAL-DATA-IN		 A10519	 A10520

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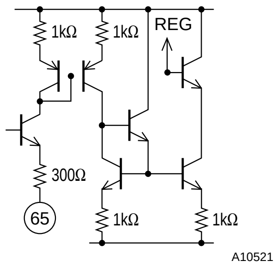
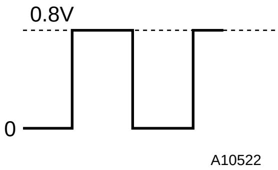
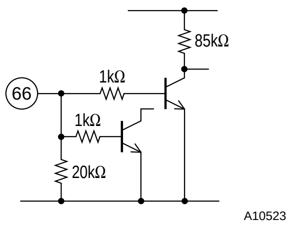
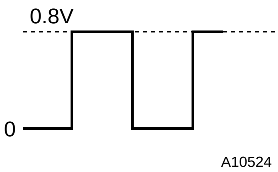
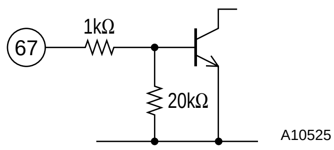
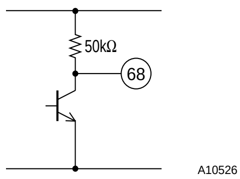
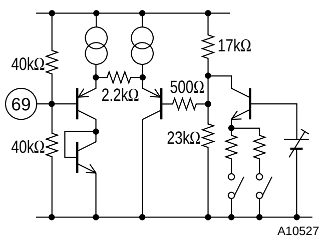
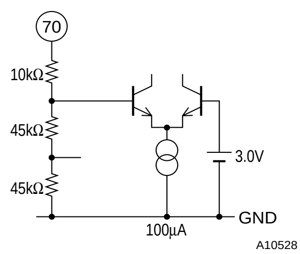
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
65	PQ1 (RO1)	REC 1.6V PB 1.6V	DC	
66	C-ROTARY -PULSE-IN			
67	CSC-PULSE-IN			
68	PAL-PULSE	+45° 1V or MORE +45° 1V or LESS		
69	NC-CTL	REC 2.1V PB 2.1V	DC	
70	A. MUTE-ON/OFF	0V	DC MUTE OFF : under 2.7V MUTE ON : over 3.3V	

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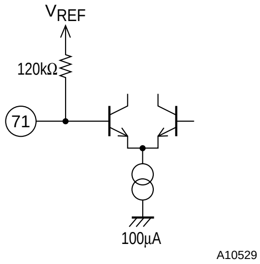
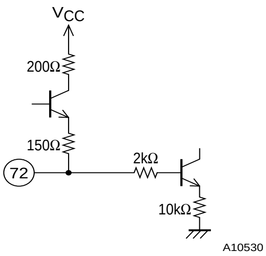
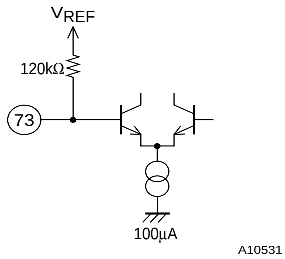
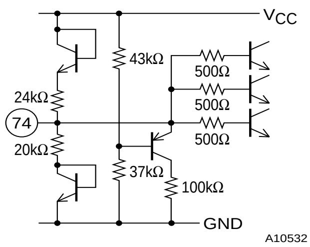
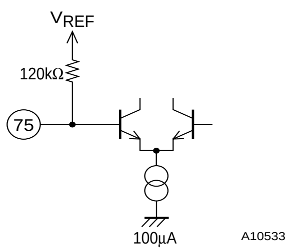
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
71	A. LINE-IN1	2.3V	REC CW, 95 mVp-p PB DC 2.3V	
72	A-ALC-DET	0V	REC: ADAPTIVE PB DC 0V	
73	A-LINE-IN2	2.3V	REC CW, 95 mVp-p PB DC 2.3V	
74	A-VREF-FILTER	2.3V	DC	
75	A. LINE-IN3	2.3V	REC CW, 95 mVp-p PB DC 2.3V	
76	A-V_{CC}	5V	DC	

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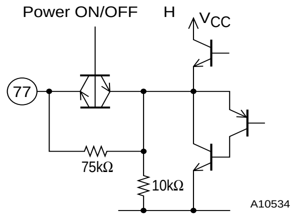
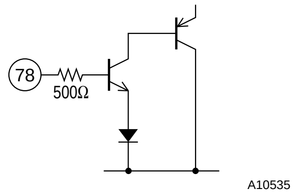
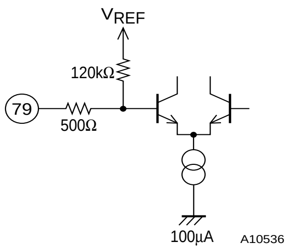
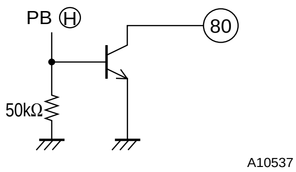
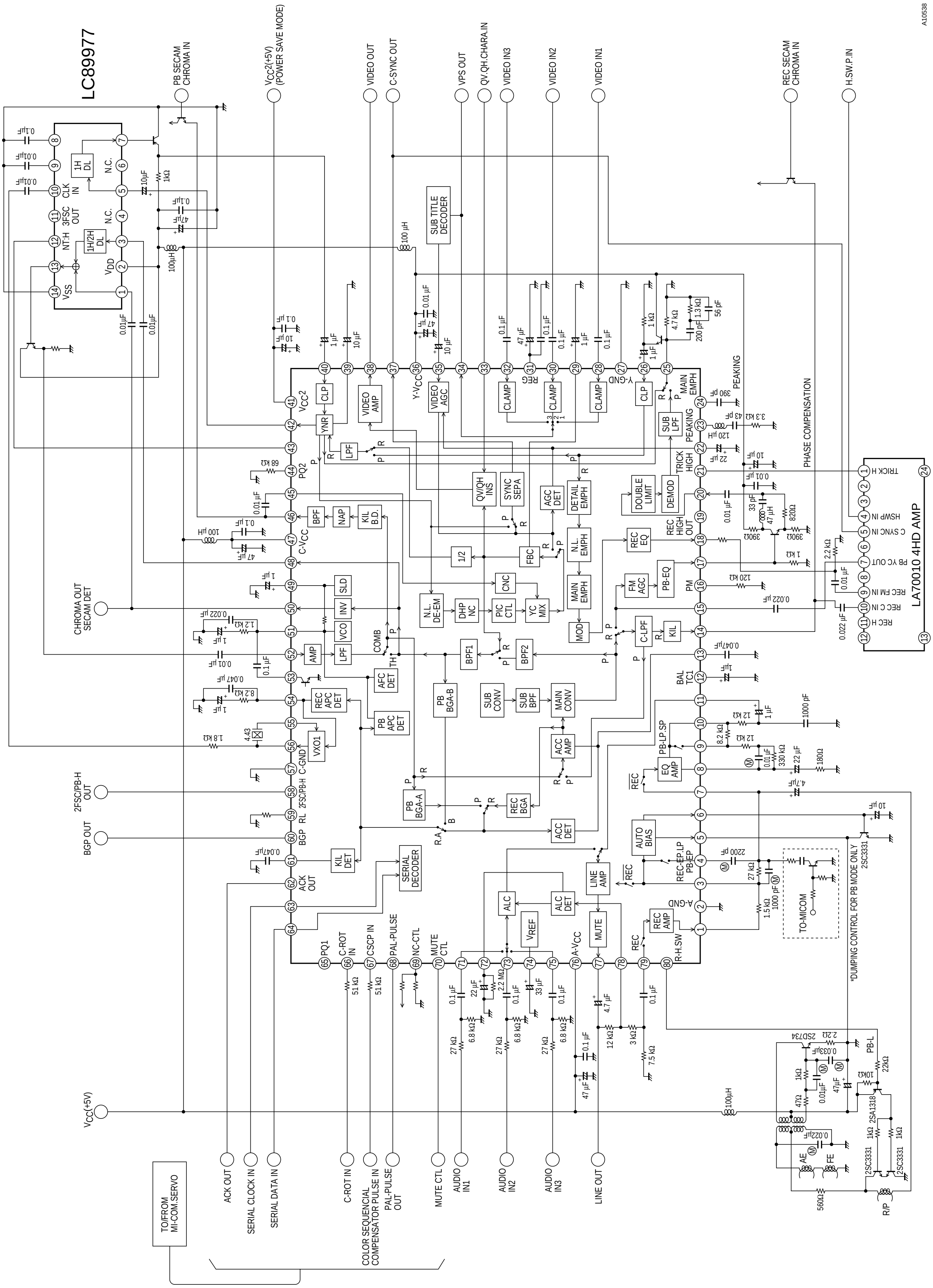
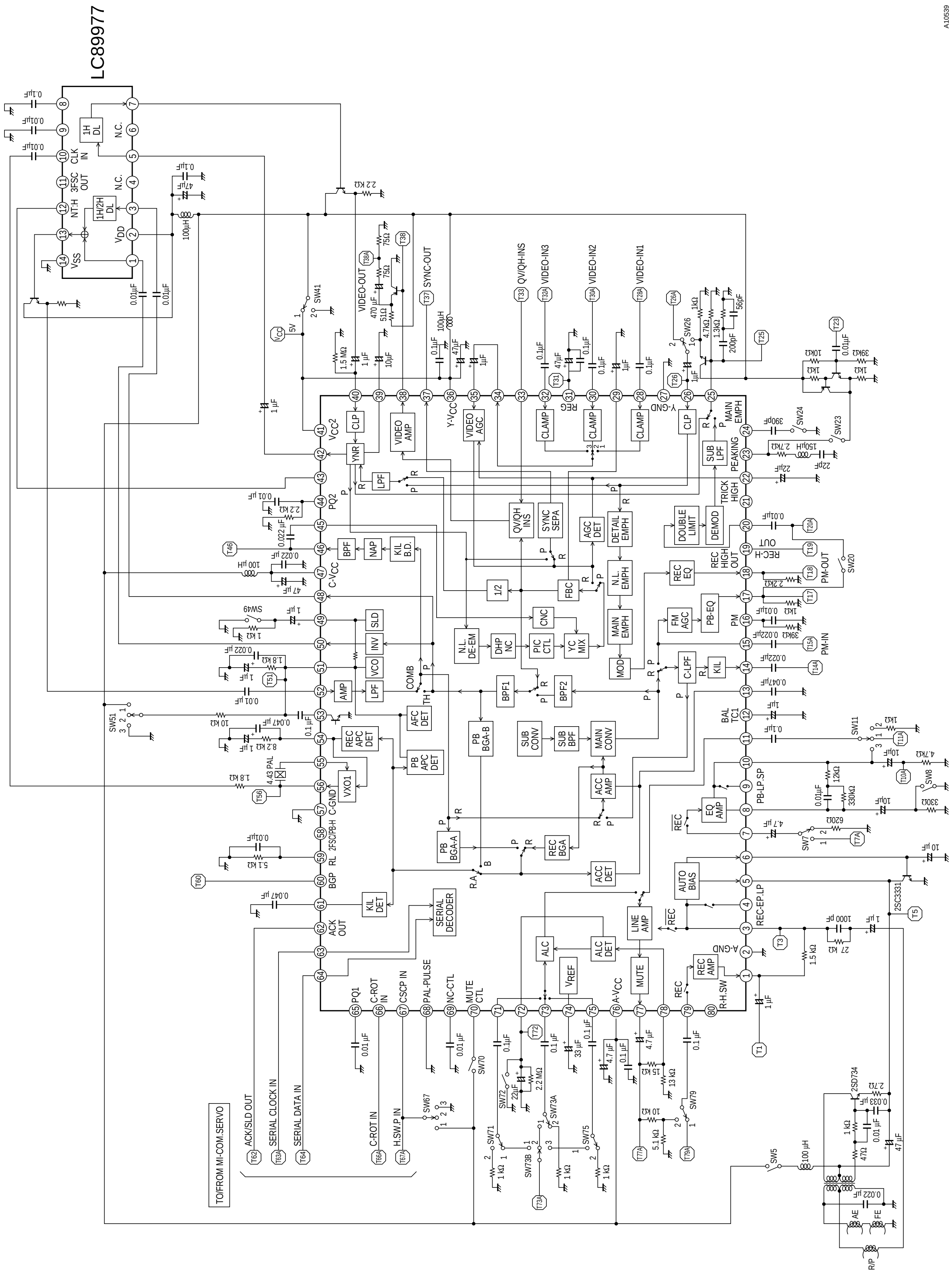
Pin number	Pin name	Standard DC voltage	Signal waveform	Equivalent circuit
77	A-LINE-OUT	2.3V	CW, 1.4 Vp-p	
78	A-ALC-DET-IN	0V	CW, 0.6 Vp-p	
79	A-REC-IN	2.3V	REC CW, 283 mVp-p	
			PB DC 2.3V	
80	A-AUDIO-HEAD-SW-OUT	REC 5V	REC DC 5V (SW/OFF)	
		PB 0V	PB DC 0V (SW/ON)	

Block Diagram and Sample Application Circuit



Test Circuit Diagram



This catalog provides information as of January, 1999. Specifications and information herein are subject to change without notice.