Monolithic Linear IC

LA7391AN

SANYO

Global VHS-format VCR Video Signal Processor

[LA7391AN]

5.24

0.25

SANYO : DIP42S

Package Dimensions

37 9

• I/O pin for CNR insertion added.

• YNR/LNC switching possible.

unit: mm

3025B-DIP42S

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Overview

The LA7391AN is a multi-format, single-chip video signal processing IC that supports TV systems around the world.

Features

- Compatible with TV systems around the world (NTSC/ PAL/MESECAM/4.43 -NTSC/PAL-M/PAL-N).
- All filters on chip, except for PB-LPF for chroma (cutoff frequency requires no adjustment).
- No adjustment of YNR and DOC levels.
- Double high-pass noise canceller on chip.
- Linear phase-type picture control on chip.
- fsc output can be used as clock for OSD IC.
- DCC circuit on chip.
- Pilot burst erasure circuit on chip.
- High-speed AFC circuit on chip.
- Switching noise canceller on chip.
- Smallest package in the industry.
- Few components needed.
- 2fsc output.

Specifications

Maximum Ratings at Ta = 25 °C

Unit Parameter Symbol Conditions Ratings V_{CC}max Maximum supply voltage 7.0 V Allowable power dissipation Pdmax Ta ≦65 ∘C 1020 mW ۰C Operating temperature Topr -10 to +65 Storage temperature Tstg -40 to +150 ۰C

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

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

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Operating Characteristics at Ta = 25 $\,^{\circ}C,\,V_{\rm CC}$ = 5.0 V

Parameter	Symbol	Input	Output	Conditions	min	typ	max	Unit
[REC Mode Y]								
Current drain REC	ICCR			When $V_{CC} = 5 V$ (when there is no signal), measure sum of incoming current at pins 35 and 28	95	120	145	mA
AGC adjustment	C _{AGC}	T37A		V _{IN} = 1.0 Vp-p video signal, use VR39 to adjust T4 output to 0.5 Vp-p				
VCA control characteristics	VCA	T37A	T4	Measure T4 output level when S10 is set to 2	0.48	0.5	0.52	Vp-p
AGC adjustment voltage	VAGO	T37A	T39	Measure T39 DC voltage in above state	3.2	3.4	3.6	V
AGC detection voltage		T37A	T38	Measure T38 DC voltage in same manner	1.2	1.4	1.6	V
EE output level	VEE	T37A	T34A	Measure T34A output level in same manner	0.95	1.00	1.05	Vp-p
AGC Output 1	AGC 1	T37A	T4	$V_{IN} = 2.0 \text{ Vp-p video signal}$	500	540	560	mVp-p
AGC Output 2	AGC 2	T37A	T4	Measure T4 output level V _{IN} = 0.5 Vp-p video signal	470	490	500	mVp-p
AGC Output 3	AGC 3	T37A	T4	Measure T4 output level V _{IN} = 700 mVp-p LUMI, 600 mVp-p SYNC	135	150	165	mVp-p
AGC Output 4	AGC 4	T37A	T4	Measure 14 SYNC level V _{IN} = 700 mVp-p LUMI, 150 mVp-p SYNC	70	85	100	mVp-p
Sync separation output level	V _{SYR}	T37A	T32	V _{IN} = 1.0 Vp-p video signal,	4.0	4.2	4.4	Vp-p
Sync separation output	PW _{SYR}	T37A	T32	Measure 132 output pulse wave high value $V_{IN} = 1.0$ Vp-p video signal,	4.4	4.7	5.0	μs
Sync separation output	ΔT_{SYR}	T37A	T32	$V_{IN} = 1.0$ Vp-p video signal, measure delay	0.6	0.8	1.0	μs
leading edge delay time		7074	-	time of output SYNC versus input SYNC		40		
Sync separation threshold level	IH _{SYR}	137A	132	input level at point when output pulse width widens 1 µs or more beyond PWSYR		-18	-14	dB
Sync tip level,	L _{VOR}	T37A	T34	Measure electric potential for each of the T34				
white level measurement				peak, and assign the measured values to				
Pseudo V insertion level		T37A	T34	Measure T34 DC voltage when 5 V is applied	-80	0	80	m\/
(REC)				to T33, and assign the measured value to	00			1110
(L_{VDR} and calculate the difference with L_{SVN}				
				$\Delta VDR = L_{SYN} - L_{VDR}$				
Pseudo H insertion level	Δ HDR	T37A	T34	Measure T34 DC voltage when 2.7 V is	-200	-100	0	mV
(REC)				applied to T33, and assign the measured				
				value to L _{HDR} and calculate the difference				
White insertion level (REC)		T374	T3/	$\frac{\Delta HDR}{\Delta HDR} = \frac{L}{L} \frac{D}{P} \frac{D}{D} = \frac{L}{L} \frac{D}{HDR}$	150	250	350	m\/
		13/A	134	applied to T33, and assign the measured	150	230	330	
				value to L_{WHR} and calculate the difference				
				with L _{WHI}				
				$\Delta WHR = L_{WHI} - L_{WHR}$				
VCA detection voltage	V _{VCA}	T37A	Т9	Measure T9 DC voltage	3.1	3.4	3.7	V
REC YNR operation EP/LP	VR-YNR	T37A	Т3	V_{IN} = white 50% + CW (15.8 mVp-p) ratio between 32f _H component and 32 5f _H component	3.5	4.5	5.5	dB
Y-LPF frequency	YLPF 1	T37A	Т3	V _{IN} = standard multiburst signal 1 Vp-p, 2 MHz response to 500 kHz at T3	0.2	0.7	1.2	dB
	YLPF2	T37A	Т3	V _{IN} = standard multiburst signal 1 Vp-p, 4.8 MHz response to 500 kHz at T3	-4.5	-3.5	-2.5	dB
	YLPF3	T37A	Т3	V _{IN} = standard multiburst signal 1 Vp-p, 2 MHz response to 500 kHz at T3, T22A: 5 V	0.4	0.9	1.4	dB
	YLPF4	T37A	Т3	V _{IN} = standard multiburst signal 1 Vp-p, 4.8 MHz response to 500 kHz at T3, T22A: 5	-5.0	-4.0	-3.0	dB
FM modulator output level	V		T40	V No input use VR42 to adjust output	0.8	10	12	Vn-n
	* F M			frequency to 4 MHz, measure output level	0.0			44
FM modulator secondary distortion	H _{MOD}		T40	Ratio of 8 MHz component to 4 MHz in the above state		-40	-35	dB

Parameter	Symbol	Input	Output	Conditions	min	tvp	max	Unit
FM modulator modulation	SMOD	T4	T40	Measure amplitude of change in output	1.6	2.0	2.4	MHz/V
sensitivity	CMOD			frequency when 2.6 V DC or 3.1 V DC is applied to T4, 2 x (f3.1 – f2.6)	1.0	2.0	2.1	
FM modulator linearity	LMOD	T4	T40	Measure output frequency when 2.85 V DC	-2	0	2	%
				applied to T4,				
				$L_{MOD} = \frac{f2.85 - (f3.1 + f2.6)/2}{2} \times 100$				
				S _{MOD}				
1/2 f _H carrier shift	CS1		T40	Measure amplitude of change in output	6.8	7.8	9.5	kHz
				frequency when SW41B is off and SW41A is				
			T 40	switched from on to off	0.0	7.0	0.5	
	0.52		140	Measure amplitude of change in output	6.8	7.8	9.5	KHZ
				switched from on to off				
Emphasis gain	Gемри	T4A	T5	V _{IN} = 0.5 Vp-p 10 kHz sine wave	-0.5	0	0.5	dB
1				Measure ratio of levels of input and output		-		-
	_			amplitude at T5				
Detail enhancer	G _{ENH1}	T4A	T5	V _{IN} = 158 mVp-p 2 MHz sine wave	0.9	1.4	1.9	dB
characteristics				difference with GEMDL				
	G _{ENH2}	T4A	T5	V _{IN} = 50 mVp-p 2 MHz sine wave	2.2	3.2	4.2	dB
	LINIZ			Measure ratio of levels of T5 and T4,				
				difference with G _{EMPH}				
	G _{ENH3}	I4A	15	V _{IN} = 15.8 mVp-p 2 MHz sine wave	4.0	5.0	6.0	dB
				difference with G _{EMPH}				
	G _{FNH4}	T4A	T5	V _{IN} = 15.8 mVp-p 2 MHz sine wave	1.8	2.8	3.8	dB
				Measure output amplitude at T5 in edit mode,				
				difference with G _{EMPH}				
Nonlinear emphasis	GNLEMP1	I4A	15	V _{IN} = 500 mVp-p 2 MHz Measure ratio of levels of T5 and T4	0.5	1.4	2.3	dB
				difference with G _{EMPH}				
	G _{NLEMP2}	T4A	T5	V _{IN} = 158 mVp-p 2 MHz	2.6	3.8	5.2	dB
				Measure ratio of levels of T5 and T4,				
				difference with G _{EMPH}	4.0	0.4	7.0	
	GNLEMP3	14A	15	V _{IN} = 50 mVp-p 2 MHz Measure ratio of levels of T5 and T4.	4.9	6.4	7.9	aв
				difference with G _{EMPH}				
Main linear emphasis	G _{ME1}	T4A	T5	V _{IN} = 50 mVp-p 200 kHz sine wave	4.9	5.2	5.5	dB
characteristics				Measure ratio of levels of T5 and T4,				
	Gue	TAA	ТБ	$\frac{\text{difference with G_{EMPH}}{\text{S}_{EMPH}}$	12.1	12.6	1/1	dB
	GME2	147	15	Measure ratio of levels of T5 and T4,	13.1	13.0	14.1	
				difference with G _{EMPH}				
White clipping level	L _{WC}	T4A	T5	$V_{IN} = 500 \text{ mVp-p}$ white 100% video signal	186	193	200	%
Dark alianian laval		TAA		Measure white clipping level at 15	<u> </u>		50	0/
Dark clipping level	LDC	I4A	15	Measure dark clipping level at T5	-60	-55	-50	%
[PB Mode Y]								1
Current drain PB	I _{CC} P			Incoming current at pins 35 and 28 when	125	155	185	mA
				$V_{CC} = 5.0 V$				
Dropout compensation	T _{DOC}	T39A	T34A	T39A: 4 MHz, 300 mVp-p sine wave	0.35	0.5	0.65	ms
period		T4A		T4A: 0.5Vp-p video signal				
				T34A: time from when input went to 0 until T34A output returned SW10 \rightarrow 1				
DOC loop gain	GDOC	T39A	T12	T39A: 4 MHz, 300 mVp-p sine wave	-1.0	0	1.0	dB
	0000	T4A		T4A: 0.5Vp-p video signal		Ũ	1.0	
				T39A: Input/output response when 5H have				
				elapsed after input went to 0, SW10 \rightarrow 3				
FM demodulation voltage	V _{DEM4}	T39A	T3	V_{IN} =300 mVp-p, f = 4 MHz, Output DC	1.5	2.0	2.5	V
FM demodulation consitivity	Spree	T304	T2	Village $V_{\rm IN} = 300 {\rm m}/{\rm n}$ -n f = 2 MHz $V_{\rm N}$ -r	0.36	0.45	0.54	V/MH-7
	ODEM	1 JaA		$V_{IN} = 300 \text{ mVp-p}, f = 6 \text{ MHz}, V_{DEM2}$	0.50	0.45	0.54	V/1V/11Z
				Calculate S _{DEM} = (V _{DEM6} - V _{DEM2})/4				

Parameter	Symbol	Innut	Output	Conditions	min	typ	max	Unit
	U	mput	V		2.5		25	0/
	LDEM	$L_{\text{DEM}} = \frac{1}{V_{\text{DEM6}} - V_{\text{DEM6}} - V_{\text{DEM2}}} x \ 100 \qquad \qquad$						
Carrier leak	CL	T39A	Т3	V _{IN} = 300 mVp-p, f = 4 MHz Ratio between 4 MHz component of T3 and S _{DEM}		-40	-35	dB
PB YNR characteristics LP/EP	GP-YNR	T4A	T28A	V_{IN} = white 50% + CW (15.8 mVp-p) Ratio between 32f _H component and 32.5f _H component	-11	-9	-7	dB
PB LNC characteristics SP	GP-LNC	T4A	T28A	V _{IN} = white 50% + CW (15.8 mVp-p) Ratio between 32f _H component and 32.5f _H component	-7.0	-5.5	-4.0	dB
Playback through gain	G _{PB}	T4A	T34A	Apply $V_{IN} = 0.5$ Vp-p video signal to pin 4, and determine ratio between T34A output level and input level	4.0	5.5	7.0	dB
Nonlinear de-emphasis characteristics	GNL _{DEEM1}	T4A	T34A	V_{IN} = white 50% + CW (f = 1 MHz, 158 mVp-p) measure input/output response, difference with GPB	-2.8	-1.8	-0.8	dB
	GNL _{DEEM2}	T4A	T34A	f = 1 MHz, 50 mVp-p	-5.0	-4.0	-3.0	dB
Noise canceller	G _{WNC1}	T4A	T34A	f = 1.5 MHz, 158 mVp-p	-1.3	-0.8	-0.3	dB
characteristics	G _{WNC2}	T4A	T34A	f = 1.5 MHz, 50 mVp-p	-4.5	-3.5	-2.5	dB
	GWNC2	T4A	T34A	f = 1.5 MHz. 15.8 mVp-p	-10.5	-9.0	-7.5	dB
PIC-CTL center response characteristics	G _{PC}	T4A	T34A	f = 2 MHz, 158 mVp-p	1.2	1.7	2.2	dB
PIC-CTL hard response characteristics	G _{PH}	T4A	T34A	f = 2 MHz, 158 mVp-p	7.0	8.0	10.0	dB
PIC-CTL soft response characteristics	G _{PS}	T4A	T34A	f = 2 MHz, 158 mVp-p	-10.0	-8.0	-7.0	dB
Sync tip level, pedestal level, white level measurement (PB)	L _{VOR}	T4A	T34	With V_{IN} = white 100% and T34A at 1.0 Vp-p, measure electric potential for each of the pin 34 video output sync tip, pedestal, and white peak, and assign the measured values to L _{SYN} , L _{PED} , and L _{WHI} , respectively				
Pseudo V insertion level (PB)	Δ VDP	T4A	T34	Measure pin 34 DC voltage when 5 V is applied to pin 33, and assign the measured value to L_{VDP} , and calculate the difference with L_{SYN} Δ VDP = $L_{SYN} - L_{VDP}$	-80	0	80	mV
Pseudo H insertion level (PB)	Δ HDP	T4A	T34	Measure pin 34 DC voltage when 2.7 V is applied to pin 33, and assign the measured value to L_{HDP} , and calculate the difference with L_{PED} $\Delta HDP = L_{PED} - L_{HDP}$	-300	-200	-100	mV
White insertion level (PB)	∆WHP	T4A	T34	Measure pin 34 DC voltage when 1.3 V is applied to pin 33, and assign the measured value to L_{WHP} , and calculate the difference with L_{WHI} $\Delta WHP = L_{WHI} - L_{WHP}$	20	120	220	mV
Sync separation output level	V _{SYP}	T4A	T32	V _{IN} = 0.5 Vp-p video signal, pin 32 output pulse wave high value	4.0	4.2	4.4	Vp-p
Sync separation output pulse width	PW _{SYP}	T4A	T32	V_{IN} = 0.5 Vp-p video signal, T32 output pulse width	4.4	4.7	5.0	μs
Sync separation output leading edge delay time	ΔT_{SYP}	T4A	T32	V _{IN} = 0.5 Vp-p video signal, measure delay time of output SYNC versus input SYNC	0.9	1.1	1.3	μs
4.2 V regulator operation check	V _{REG}		T30	Measure DC level of T30 in REC mode	3.95	4.15	4.35	VDC
[REC Mode Chroma]								
REC chroma low-band conversion output level	V _{OR-15}	T37A	T15A	V _{IN} = standard color bar signal (1 Vp-p), measure burst level at T15A	120	160	200	mVp-p
Burst emphasis amount (NTSC mode)	GBE	T37A	T15A	V_{IN} = standard color bar signal (1 Vp-p) Ratio of burst level at T15A when S41A is off (SP/EP) and on (LP)	5.5	6.0	6.5	dB

Parameter	Symbol	Input	Output	Conditions	min	typ	max	Unit
VXO oscillation level	V _{VXO-R}	T37A	T19	V _{IN} = standard color bar signal (1 Vp-p), measure T19 output amplitude (with a FET	450	560	670	mVp-p
REC ACC characteristics	ACC _{R1}	T37A	T15A	probe) V_{IN} = standard color bar signal (1 Vp-p), input +6 dB chroma signal level only, measure T15A burst level, and calculate ratio with V _{OR} -15		0.2	0.5	dB
	ACC _{R2}	T37A	T15A	V_{IN} = standard color bar signal (1 Vp-p), input –6 dB chroma signal level only, measure T15A burst level, and calculate ratio with V _{OR} -15	-0.5	-0.1		dB
REC ACC killer input level	VACC _{K-ON}	T37A	T15A	V_{IN} = standard color bar signal (1 Vp-p), lower the chroma signal, and measure the input burst level at the point where output at T15A ceases, and calculate the ratio with the standard input level		-26		dB
REC ACC killer output level	VO _{ACCK}	T37A	T15A	Use a spectrum analyzer to measure the output level at T15A in the killer state described previously; ratio with V _{OR-15}		-60	-50	dB
Input level for REC ACC killer return	VACCK-OFF	T4A	T34A	Starting from the killer state described previously, gradually raise the input chroma level and measure the input burst level when output is generated at T15A and calculate the ratio with the standard input level		-20		dB
VXO control sensitivity	S _{VXO}	T37A	T17 T19A	Measure the pin 17 DC voltage when a standard color bar signal is input (1 Vp-p)V ₀ Measure the frequency at T19A when V ₀ is applied to pin 17 from the external power supplyf ₁ Measure the frequency at T19A when V ₀ + 10 mV is applied to pin 17f ₂ $S_{VXO} = \frac{f_2 - f_1}{10}$ Hz/mV	3.8	5.7	7.6	Hz/mV
REC APC pull-in range	∆ f _{APC1}	T37A	T15A	Input a 50% white signal overlapped with a 4.4336 MHz, 300 mVp-p continuous wave. After confirming that there is output at T15A, increase the frequency of the CW until the output at T15A stops, and then gradually reduce the frequency until output appears again at T15A; that CW frequency is f1. $\Delta f_{APC1} = f1 - 4433619$ (Hz)	350	440		Hz
	Δ f _{APC2}	T37A	T15A	In the same manner, reduce the frequency of the CW until the output at T15A stops, and then gradually increase the frequency until output appears again at T15A; that CW frequency is f2. $\Delta f_{APC2} = f2 - 4433619$ (Hz)		-900	-350	Hz
BGP delay time	t _D	T37A	T32 T36	Measure waveforms at T32 and T36 when a standard color bar signal (1 Vp-p) is input.		4.3		μs
BGP pulse width	t _W	T37A	T32 T36	T36		4.8		μs

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Parameter	Symbol	Input	Output	Conditions	min	typ	max	Unit
REC AFC pull-in range	^Ơ AFC1	137A	124	Input a string of pulses (negative polarity) at	1.0	7.0		kHz
				300 mV, 15.6 kHz with a width of 5 µs. After				
				until the waveform at his 24 is disrupted				
				then reduce the frequency until the waveform				
				at pin 24 is pormal again: that pulse string				
				frequency is f_1 .				
				T24				
				$\Delta f_{AFC1} = f_1 - 15.625 (kHz)$				
	Δ faec2	T37A	T24	In the same manner, after reducing the		-3.7	-1.0	kHz
	74 02			frequency of the pulse string until the				
				waveform at pin 24 is disrupted, then				
				increase the frequency until the waveform at				
				pin 24 is normal again; that pulse string				
				frequency is f ₂ .				
				$\Delta f_{AFC2} = f_2 - 15.625 (kHz)$				
[PB Mode Chroma]		-						
PB chroma video output	Vop-34	139A	134A	In PB, SP mode, input a 4 MHz: 300 mVp-p	240	300	360	mVp-p
level				continuous wave at 139A, and nom 115A				
		14A		mVp-p) that underwent low-band conversion				
				from a chroma noise test signal				
				Input a 50% white signal from T4A and				
				measure the T34A burst level				
PB chroma pin 31 output	Vop-31	T39A	T31	Measure the T31 burst level under the same	220	270	320	mVp-p
level		T15A		conditions as for Vop-34.	_	-		
		T4A						
PB ACC characteristics	ACC _{P1}	T39A	T31	Input the input chroma level at +6 dB under		0.5	0.8	dB
		T15A		the same conditions as for Vop-34 and				
		T4A		measure the T31 burst level, and calculate				
				the ratio with Vop-31.				
	ACC _{P2}	T39A	T31	Input the input chroma level at -6 dB under	-0.5	-0.2		dB
		T15A		the same conditions as for Vop-34 and				
		I4A		measure the 131 burst level, and calculate				
DD killer innut level		T20 A	T04	the fallo with vop-31.	40	22	25	aD
	VACK-P	T159A	131	conditions as for Von 34 and measure the	-40	-32	-25	uв
				input burst level at the point where T31				
				chroma output ceases (Calculate ratio with				
				standard input of 50 mVp-p)				
PB killer chroma output		T39A	T34A	Use a spectrum analyzer to measure the T34		-44	-40	dB
level	UACK-F	T15A		chroma output level in the killer state			_	-
		T4A		described previously. Calculate ratio with				
				V _{OP-34} .				
PB main converter carrier	C _{LP}	T39A	T34A	Monitor T34A with a spectrum analyzer under		-40	-33	dB
leak		T14A		the same conditions as for Vop-34 and				
		T4A		calculate the ratio between the 4.43 MHz				
				component and the 5.06 MHz carrier leak				
				component.				
Burst de-emphasis amount	GBD	T39A	T31	From T39A, input a 4 MHz 300 mVp-p	-4.40	-4.65	-4.90	dB
(NTSC mode)		T4A		continuous wave; from T4A, input a 50%				
		127A		white signal, and calculate the ratio between				
				the output level during the 131 burst interval				
			T 10	and the output level during other intervals.	400	040	750	
	VXO-P		119	ineasure the PB mode 119 output level with	480	010	/ 50	invp-p
	A f		T10A	Mossure the frequency of T10A during DD	0	0	10	L⊔
variation			IISA	modef	-9	0	79	
				$\Delta f_{XO} = f - 4433619 (Hz)$				

Parameter	Symbol	Input	Output	Conditions	min	typ	max	Unit
SLD detection current	I _{SLD1}	T39A	T23A	In PB mode, with S24: 3 and S23: off, input a		135		μA
		T4A		4 MHz 300 mVp-p continuous wave from				
				139A, input a 50% white signal from 14A,				
				and measure the wave peak at 123A				
				Vos1				
				$I_{SLD1} = VOS1/1 k\Omega$				
	I _{SLD2}	T39A	T23A	Same as above (however, S24 = 1)		135		μA
		T4A		Vosz				
				$I_{SLD2} = VOS2/1 \ k\Omega$				
2fsc output level	V2fsc		T21	In PB mode, measure the T21 output level with an FET probe	480	640	800	mVp-p

Note) A trap (4.84 MHz for NTSC systems and 5.69 MHz for PAL systems) is required in the chroma playback system (between pins 25 and 27 or between pins 31 and 29) in order to suppress unnecessary components in converter output.



Equivalent Circuit Block Diagram and Sample Application Circuit

Unit (resistance: Ω , capacitance: F)

LA7391AN Control Pins

Pin No.	Function	Control	Contents
20	N.C control	Linear	When \rightarrow high, N.C \rightarrow Strong
22	Filter switching	Н	3.58 MHz system
		L or OPEN	4.43 MHz system
42	YNR/LNC selection	OPEN	YNR
		L	LNC (line noise canceller)

Test Circuit Diagram



Unit (resistance: Ω , capacitance: F)

Contro	Pin	Function	Chart
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Pin No.	L	М	Н		
Pin 5 R/P switching	Open REC mode		Over 3.8V PB mode		
Pin 7 SP/EP switching	Open EP mode		Over 3.9 V SP mode		
Pin13 EDIT2 PIC-CTL	2 V to 2.5 V PIC-CTL SOFT	2.5 V to 3 V PIC-CTL HARD	Over 3.6 V EDIT ON		
Pin 14 SECAM CTL			Over 4.0 V SECAM mode		
Pin 17 Special playback switching		Open Before comb in SP	Over 3.5 V (over 200 μΑ) After comb in SP		
Pin 27 MESECAM CTL		Open	Over 3.0 V MESECAM mode		
Pin 33 QV, QH, CHAR		Refer to Pin 33, QV, QH, CHAR, insertion diagram			
Pin 36 NTSC-CTL			NTSC mode if current is 150 μA or more		
Pin 40 DOC STOP control	Open Normal mode		Over 3.9 V DOC STOP		
Pin 41 ROTARY pulse LP switch	OV 0.45V ROTARY L PULSE Tape speed SP	0.75V 1.55V 1.85V 2.15V H L or EP modeLP	$\begin{array}{c c} 2.45V \\ H \\ \end{array}$		
Pin 42 YNR/LNC switch	Line NC when under 1 V in PB	Open SP: LNC, LP/EP: YNR			

Pin 33 QV, QH, CHAR, insertion



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