

**SANYO**

No.2899

**LA7321, 7321M**

Monolithic Linear IC

**VHS VTR Playback Head Amp,  
Recording Amp****Functions and Features**

(Functions) · 4-channel playback head amp

· 2-channel recording amp

· 13 head select switches (PB, REC)

· 1 recording amp gain select switch

· Envelope detector for special playback (for GT-4)

(Features) · Designed for 4 heads (for GT-4)

· On-chip head select switches, recording amp gain select switch, envelope detector for GT-4 making it possible to perform signal processing for the head section on a single chip.

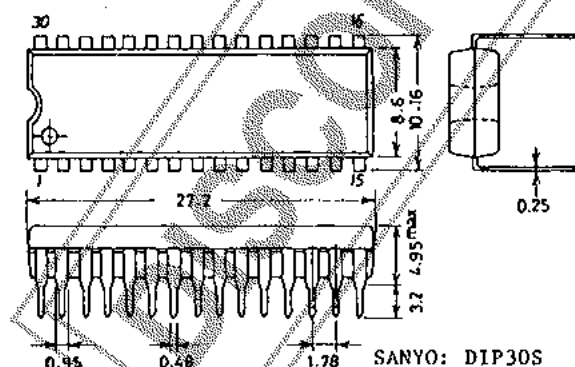
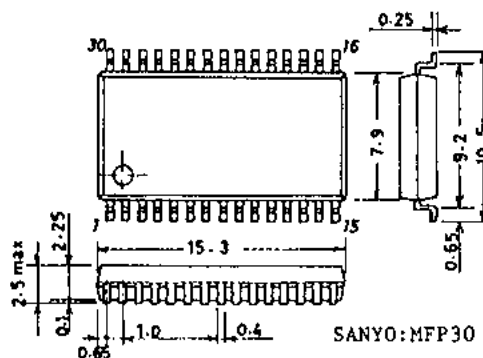
· Load variations cause less recording current variations because of recording amp of constant-current type.

(Maximum recording current : 40mA<sub>pp</sub>)**Maximum Ratings at Ta = 25°C**

Maximum Supply Voltage	V <sub>CC</sub> max	(PB)	7.0	unit
		(REC)	14.0	V
Allowable Power Dissipation	P <sub>d</sub> max	(65°C)	LA7321	920
			LA7321M	850
				mW
Operating Temperature	T <sub>opg</sub>		-10 to +65	°C
Storage Temperature	T <sub>stg</sub>		-40 to +125	°C

**Operating Conditions at Ta = 25°C**

Supply Voltage	V <sub>CC</sub>	(PB)	5.0	unit
		(REC)	12.0	V
Operating Voltage Range	V <sub>CC</sub> opg	(PB)	4.75 to 5.5	V
		(REC)	10 to 13	V

**Case Outline 3061-D30S1C [LA7321]**  
(unit : mm)**Case Outline 3073A-M301C [LA7321M]**  
(unit : mm)

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N078TA, TS No.2899-1/9

## Operating Characteristics at Ta = 25°C

Characteristic		Symbol	Test Conditions		SW				min	typ	max	unit
			Input	Output		1	2	3				
PB (Preamp Section)			T1		PB + 5V	SW 30	HA	EP /SP	Special MU			
Current Dissipation		I <sub>ccp</sub>			Pin 1 flow-in current	1	1	1	1	15	24	30 mA
Voltage Gain	CH1	VG (1)	T28	T7	Vi: 38mV <sub>pp</sub> f: 1MHz	2	2	2	2	50.0	59.5	62.5 dB
	CH2	VG (2)	T27	T7		1	2	2	2			
	CH3	VG (3)	T23	T7		2	1	1	2			
	CH4	VG (4)	T21	T7		1	1	1	2			
Voltage Gain Difference 1		ΔVG (1)			VG (1) - VG (2)					-1.0	0	1.0 dB
Voltage Gain Difference 2		ΔVG (2)			VG (3) - VG (4)					-1.0	0	1.0 dB
Intermode Gain Difference		ΔVG SP-EP			VG (1) - VG (3)					-1.0	0	1.0 dB
Equivalent Input Noise Voltage	CH1	V <sub>NIN</sub> (1)		T7	* $\frac{V_{out}}{VG(1),(2),(3),(4)}$ after 1.1MHz L.P.F.	2	2	2	2	1.1	1.5	μV <sub>rms</sub>
	CH2	V <sub>NIN</sub> (2)		T7		1	2	2	2			
	CH3	V <sub>NIN</sub> (3)		T7		2	1	1	2			
	CH4	V <sub>NIN</sub> (4)		T7		1	1	1	2			
Frequency Characteristic	CH1	ΔV <sub>fp</sub> (1)	T28	T7	Vi: 38mV <sub>pp</sub> f: 100kHz, 7MHz 7MHz 100kHz output ratio	2	2	2	2	-2.5	0	dB
	CH2	ΔV <sub>fp</sub> (2)	T27	T7		1	2	2	2			
	CH3	ΔV <sub>fp</sub> (3)	T23	T7		2	1	1	2			
	CH4	ΔV <sub>fp</sub> (4)	T21	T7		1	1	1	2			
2nd Harmonic Distortion	CH1	V <sub>NIN</sub> (1)	T28	T7	Vi: 38mV <sub>pp</sub> f: 4MHz 8M component 4M component output ratio	2	2	2	2	-40	-35	dB
	CH2	V <sub>NIN</sub> (2)	T27	T7		1	2	2	2			
	CH3	V <sub>NIN</sub> (3)	T23	T7		2	1	1	2			
	CH4	V <sub>NIN</sub> (4)	T21	T7		1	1	1	2			
Max. Output Level	CH1	V <sub>OMP</sub> (1)	T28	T7	f: 1MHz Output level when 3rd distortion is -30dB.	2	2	2	2	0.8	1.0	V <sub>p-p</sub>
	CH2	V <sub>OMP</sub> (2)	T27	T7		1	2	2	2			
	CH3	V <sub>OMP</sub> (3)	T23	T7		2	1	1	2			
	CH4	V <sub>OMP</sub> (4)	T21	T7		1	1	1	2			

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Characteristic			Symbol	Test Conditions		SW				min	typ	max	unit	
				Input	Output	1	2	3	4					
PB (Preamp Section)				T1		PB + 5V	SW 30	HA	EP /SP	Special MU				
Cross-talk 1 (SP)	CH1	V <sub>CR1</sub> (1)	T27 T23 T21	T7	V <sub>i</sub> : 38mVpp f: 4MHz V <sub>out</sub>	2	2	2	1					
	CH2	V <sub>CR1</sub> (2)	T28 T23 T21	T7	V <sub>G</sub> (1),(2) output ratio	1	2	2	1		-40	-35	dB	
Cross-talk 2 (EP)	CH3	V <sub>CR2</sub> (3)	T21 T28 T27	T7	V <sub>i</sub> : 38mVpp f: 4MHz V <sub>out</sub>	2	1	1	1					
	CH4	V <sub>CR2</sub> (4)	T23 T28 T27	T7	V <sub>G</sub> (3),(4) output ratio	1	1	1	1		-40	-35	dB	
Output DC Offset		ΔV <sub>ODC1</sub>		Pin 7	CH1 – CH2	2→1	2		1					
		ΔV <sub>ODC2</sub>		Pin 7	CH3 – CH4	2→1	1		1					
		ΔV <sub>ODC3</sub>		Pin 7	CH1 – CH3	2	2→1		1		-100	0	100	mV
		ΔV <sub>ODC4</sub>		Pin 7	CH2 – CH4	1	2→1		1					
		ΔV <sub>ODC5</sub>		Pin 7	CH1 – CH4	2→1	2→1		1					
		ΔV <sub>ODC6</sub>		Pin 7	CH2 – CH3	1→2	2→1		1					
PB (Envelope Detector)				T1		PB + 5V								
Detection Pin DC Offset		ΔV <sub>5,6</sub>		T5 T6	T5(DC) – T6(DC)				1	-50	0	50	mV	
Detection Characteristic 1 (SP)		V <sub>5DC</sub>	T28	T5	After setting T7 output to f: 4MHz, V <sub>i</sub> : 200mVpp, measure the difference between T5 output DC and T6 output DC at no input mode.	2	2		1	800	900	1000	mV	
Detection Characteristic 2 (EP)		V <sub>6DC</sub>	T23	T6	After setting T7 output to f: 4MHz, V <sub>i</sub> : 200mVpp, measure the difference between T5 output DC and T6 output DC at no input mode.	2	1		1	800	900	1000	mV	
Comparator Output Waveform 1		V <sub>9DC1</sub>	T28	T9	V <sub>i</sub> : 38mVpp f: 4MHz, T9 output DC	2	2		1	0	0.1	0.2	V	
Comparator Output Waveform 2		V <sub>9DC2</sub>	T23	T9	V <sub>i</sub> : 38mVpp f: 4MHz, T9 output DC	2	1		1	3.8	4.0	4.2	V	
REC				T14		REC + 12V								
Current Dissipation		I <sub>CCR</sub>		T14		Pin 14 flow-in current			2	38	51	64	mA	

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Characteristic			Symbol	Test Conditions		SW				min	typ	max	unit	
				Input	Output	1	2	3	4					
REC				T14		REC+12V	SW 30	HA	EP /SP	Special MU				
Voltage Gain	EPC	VG(EC)	T10	T18	$V_i: 300\text{mVpp}$ $f: 1\text{MHz}$				1	2				
	EP Y	VG(EY)	T11	T18	$V_i: 300\text{mVpp}$ $f: 4\text{MHz}$				1	2				
	SP C	VG(SC)	T10	T16	$V_i: 300\text{mVpp}$ $f: 1\text{MHz}$				2	2	-8.0	-6.0	-4.0 dB	
	SP Y	VG(SY)	T11	T16	$V_i: 300\text{mVpp}$ $f: 4\text{MHz}$				2	2				
Voltage Gain Difference 1		$\Delta V_G$ (EP)			VG(EC) - VG(EY)						-1.0	0	1.0 dB	
Voltage Gain Difference 2		$\Delta V_G$ (SP)			VG(SC) - VG(SY)						-1.0	0	1.0 dB	
Intermode Gain Difference		$\Delta V_G$ EP-SP			VG(EC) - VG(SC)						-1.0	0	1.0 dB	
Frequency Characteristic	EPC	$\Delta V_R$ (EC)	T10	T18	$V_i: 300\text{mVpp}$ $f: 1\text{MHz}, 7\text{MHz}$ 7M component 1M component output ratio				1	2				
	EP Y	$\Delta V_R$ (EY)	T11	T18					1	2				
	SP C	$\Delta V_R$ (SC)	T10	T16					2	2	-2.0	-0.5	-1.0 dB	
	SP Y	$\Delta V_R$ (SY)	T11	T16					2	2				
2nd Harmonic Distortion	EPC	$\Delta V_{HDR}$ (EC)	T10	T18	$V_{out}: 30\text{mApp}$ (150mVpp) $f: 4\text{MHz}$ 8M component 4M component output ratio				1	2				
	EP Y	$\Delta V_{HDR}$ (EY)	T11	T18					1	2				
	SP C	$\Delta V_{HDR}$ (SC)	T10	T16					2	2	-45	-40	dB	
	SP Y	$\Delta V_{HDR}$ (SY)	T11	T16					2	2				
Max. Output Level	EPC	$V_{OMR}$ (EC)	T10	T18	$f: 4\text{MHz}$ Output level when 2nd harmonic distortion is -40dB.				1	2	30	40		mVpp
	EP Y	$V_{OMR}$ (EY)	T11	T18					1	2				
	SP C	$V_{OMR}$ (SC)	T10	T16					2	2				
	SP Y	$V_{OMR}$ (SY)	T11	T16					2	2				
Muting Attenuation	EPC	$V_{MR}$ (EC)	T10	T18	$V_i: 300\text{mVpp}$ $f: 1\text{M(C)}, 4\text{M(Y)}$ $\frac{V_{out}}{VG(EC), (EY), (SC), (SY)}$ output ratio				1	1				
	EP Y	$V_{MR}$ (EY)	T11	T18					1	1				
	SP C	$V_{MR}$ (SC)	T10	T16					2	1	-50	-45	dB	
	SP Y	$V_{MR}$ (SY)	T11	T16					2	1				

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Characteristic			Symbol		Test Conditions	SW				min	typ	max	unit
						1	2	3	4				
REC				T14	REC+12V	SW 30	HA	EP /SP	Special MU				
Cross Modulation Relative Level	SP C	$V_{CY}$ (EP)	T10 T11	T18	Input T10, $V_{out} = 40mV_{pp}$ , $f = 629kHz$ Input T11, $V_{out} = 150mV_{pp}$ , $f = 4MHz$ $4M \pm 629kHz$ 4MHz output ratio			1	2		45	-40	dB
	SP Y	$V_{CY}$ (SP)	T10 T11	T16				2	2				
Switch Tr ON Resistance													
ON Resistance of SW Tr Turned ON at PB	SP	$R_{PON 30}$		T30	PB mode Difference between DC voltage at 1mA flow-in and DC voltage at 2mA flow-in $\times 1$						5	8	$\Omega$
	EP	$R_{PON 19}$		T19									
ON Resistance of Mode Select SW Tr at PB	CH1	$R_{PON 28}$		T28	PB mode Difference between DC voltage at 1mA flow-in and DC voltage at 2mA flow-in $\times 1$			1	2		9	12	$\Omega$
	CH2	$R_{PON 27}$		T27				1	2				
	CH3	$R_{PON 23}$		T23				2	2				
	CH4	$R_{PON 21}$		T21				2	2				
ON Resistance of SW Tr Turned ON at REC	SP	$R_{PON 30}$		T30	REC mode Difference between DC voltage at 1mA flow-in and DC voltage at 2mA flow-in			1			6	10	$\Omega$
	EP	$R_{PON 19}$		T19				2					
Leak Current of Mode Select SW Tr at REC	SP	$I_L 30$		T30	REC mode Flow-in current when $\pm 5V$ is applied			2			-4	0	$\mu A$
	EP	$I_L 19$		T19				1					
ON Resistance of SW Tr Turned ON at REC	CH1	$R_{PON 28}$		T28	REC mode Difference between DC voltage at 1mA flow-in and DC voltage at 2mA flow-in $\times 1$						6	10	$\Omega$
	CH2	$R_{PON 27}$		T27									
	CH3	$R_{PON 23}$		T23									
	CH4	$R_{PON 21}$		T21									
ON Resistance of Gain Select SW Tr at REC (SP)				T19	REC mode Difference between DC voltage at 1mA flow-in and DC voltage at 2mA flow-in $\times 1$			2			7	10	$\Omega$

Note)  $\times 1$  Let the ON resistance to be obtained be  $x (\Omega)$ ,  
 $2x (mV)$  at 2mA flow-in  
 $1x (mV)$  at 1mA flow-in  
Therefore, difference  $2x - 1x = x$  is the ON resistance.

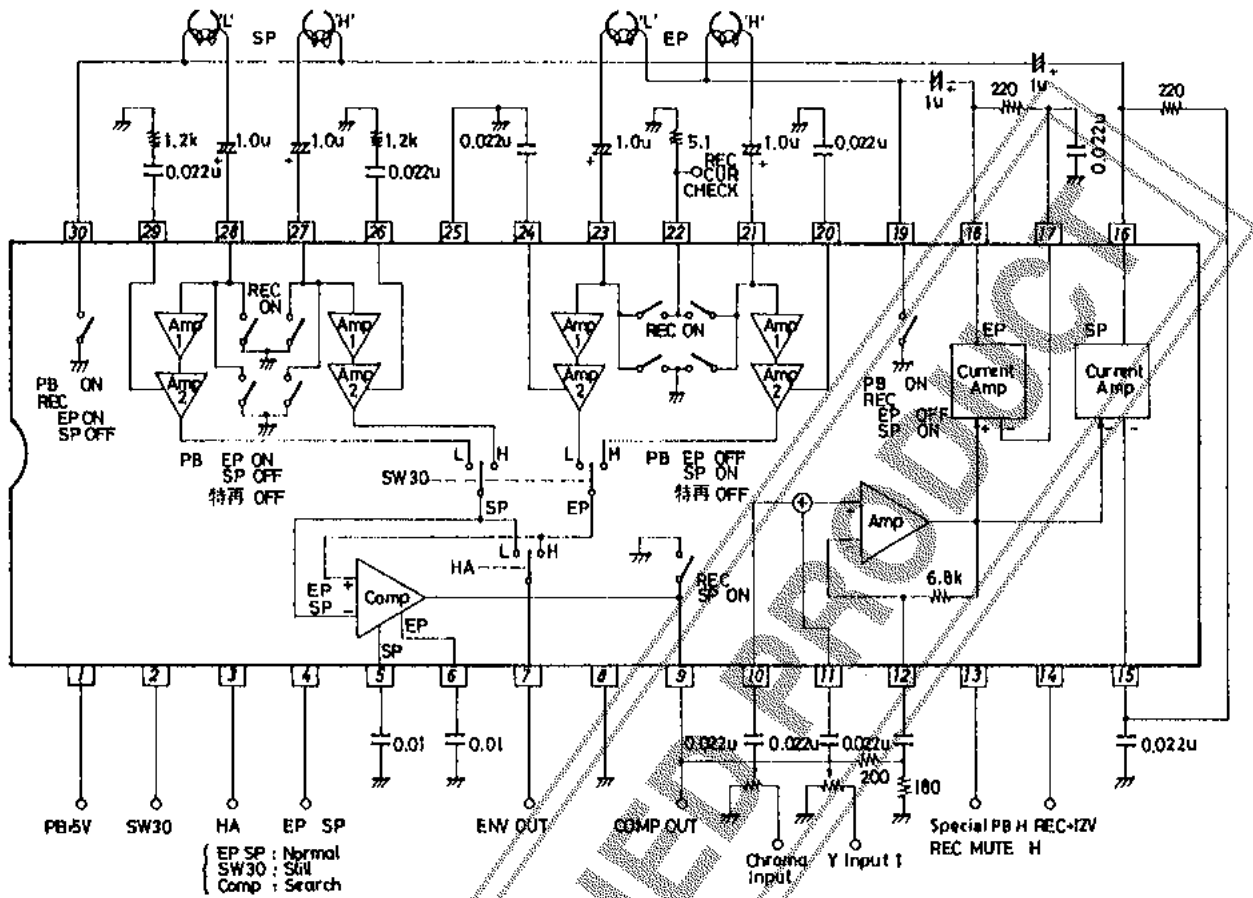
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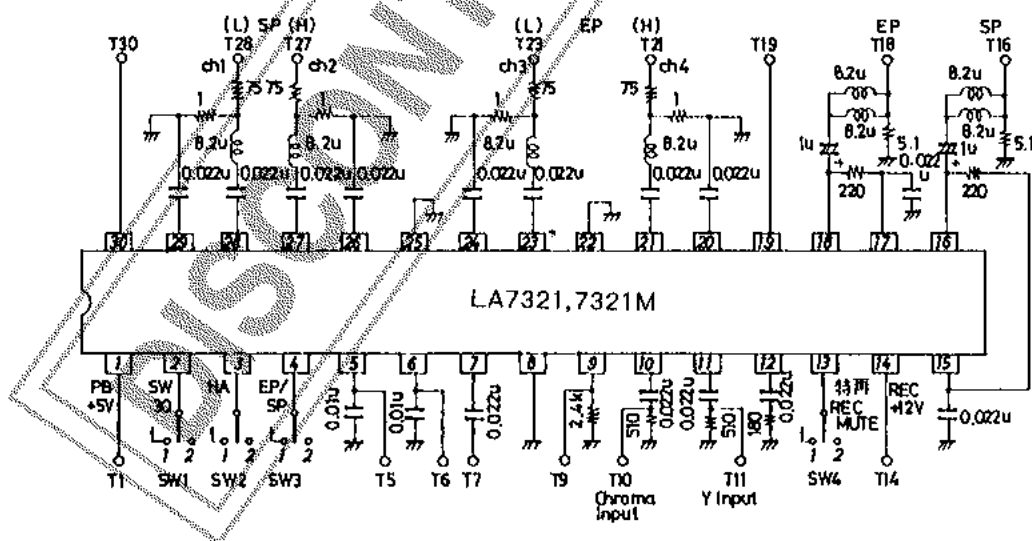
Characteristic	Symbol	Test Conditions			SW				min	typ	max	unit
		Input	Output		1	2	3	4				
Control Pin Threshold Level at PB					SW 30	HA	EP /SP	Special MU				
SW 30 Threshold Level	SW 30 (1)	T28 T27	T2	CH1 → CH2 changeover voltage	※	2	2	2	2.5		5.0	V
	SW 30 (2)	T28 T27	T2	CH2 → CH1 changeover voltage					0		1.5	
HA Threshold Level	HA (1)	T28 T27	T3	CH1 → CH2 changeover voltage	2	※		1	2.5		5.0	V
	HA (2)	T28 T27	T3	CH1 → CH3 changeover voltage					0		1.5	
EP/SP Threshold Level	P <sub>MODE</sub> (1)	T28	T4	T4 DC voltage when T7 output waveform disappears	2	2	※	2	2.5		5.0	V
	P <sub>MODE</sub> (2)	T28	T4	T4 DC voltage when T7 output waveform appears					0		1.5	
Special PB "H" Threshold Level	Special (1)	T28 T27	T13	T13 DC voltage when T7 output waveform appears	2	2	1	※	3.0		5.0	V
	Special (2)	T28 T27	T13	T13 DC voltage when T7 output waveform disappears					0		1.5	
Control Pin Threshold Level at REC												
EP/SP Threshold Level	P <sub>MODE</sub> (1)	T10	T4	T4 DC voltage when output changes from T16 to T18			※	2	2.5		5.0	V
	P <sub>MODE</sub> (2)	T10	T4	T4 DC voltage when output changes from T18 to T16					0		1.5	
Threshold Level at REC MUTE	MUTE (1)	T10	T13	T13 DC voltage when T18 output waveform disappears			1	※	3.0		5.0	V
	MUTE (2)	T10	T13	T13 DC voltage when T18 output waveform appears					0		1.5	

# LA7321,7321M

## LA7321,7321M Block Diagram



## LA7321,7321M Test Circuit



## LA7321,7321M

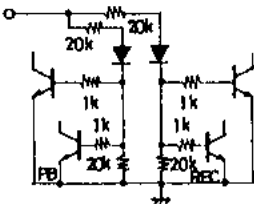
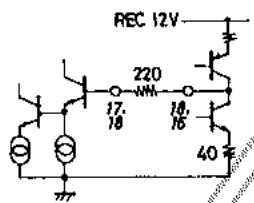
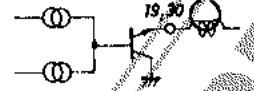
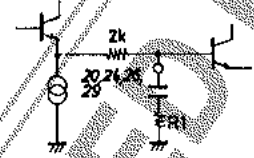

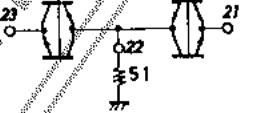
LA7321,7321M Pin Description

Pin No.	Function	Standard DC Voltage	Input/Output Configuration	Remarks
1	PB + 5V			24mA typ.
2	SW30 control pin			L : 0 to 1.5V H : 2.5 to 5.0V
3	H · A control pin			L : 0 to 1.5V H : 2.5 to 5.0V
4	control pin			L : 0 to 1.5V H : 2.5 to 5.0V
5 6	Envelope detection pin	2.4 (V)		
7	Preamplifier output	2.3 (V)		· Connect R = 2kΩ externally when the output line is routed around.
8	GND			
9	(PB) Comparator output (REC) SW pin for gain change			※ SW Tr ON resistance 7 to 10Ω ※ For gain change, refer to pin 12.
10 11	REC amp input chroma. Y	6.7 (V)		Rin = 10kΩ
12	REC Y/CMIX amp feedback pin	5.9 (V)		※ The gain depends on R1. R1 : 180 = 10.5dB ※ R2 can be used to change the gain. R2 : 500 = +2.0 : 200 = +3.7dB (R : 1.2kΩ)

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Pin No.	Function	Standard DC Voltage	Input/Output Configuration	Remarks
13	(PB) Special PB control pin (REC) REC MUTE control pin			L : 0 to 1.5V H : 3.0 to 5.0V
14	REC +12V			
15 16 17 18	REC Amp output Amp feedback pin	5.9 (V)		· Maximum REC current 40mA <sub>pp</sub>
19 30	PB ON SW Tr REC mode select SW Tr			On resistance 6 to 10Ω
20 24 26 29	Preamplifier bypass capacitor pin	1.9 (V)		· The gain depends on R1. R1 : 0 = 0dB : 820 = -3dB : 1.2k = -4dB
21 23 27 28	Preamplifier input	0.7 (V)		· Rin ≒ 400Ω · Cin ≒ 40 to 50p
22	REC circuit check pin			ON resistance 6 to 10Ω
25	Pre GND			