

# **Two-Channel Microphone Amplifier** for Video Camera

#### Overview

The LA7471M is a stereo microphone amplifier for use in video camera products. It includes an automatic wind noise detection and removal circuit, an equalization circuit to compensate for microphone frequency characteristics and an L/R mixing circuit to provide a good stereo image. The LA7471M provides high quality audio for video camera applications.

## **Functions**

- Microphone amplifier (two channels)
- Internal/external microphone switching
- · Automatic wind noise detection/prevention circuit
- High-pass filter and disable switch
- Internal microphone power supply
- External microphone power supply (with carrent limiter)
- Ripple filter
- Stereo/mono detection for external microphones

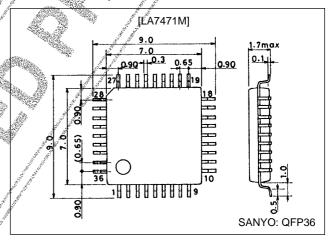
#### **Features**

- Automatic wind noise detection and exclusion circuit (The high-pass filter provides a first-order to third-order linear conversion.)
- High-quality audio (low noise, microphone frequency characteristic compensation, and stereo enhancement)

# Package Dimensions

unit; mm

3162B-QFP36



# **Specifications**

Maximum Ratings at  $Ta \neq 25^{\circ}C$ 

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Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max	AND SOME SOME SOME SOME SOME SOME SOME SOME	7.0	٧
Allowable power dissipation	Pd max	T <sub>e</sub> ≤ 65°C	300	mW
Operating temperature	Topr	7 /	-10 to +65	°C
Storage temperature	Tstg	<i>)</i> "	-55 to +150	ô

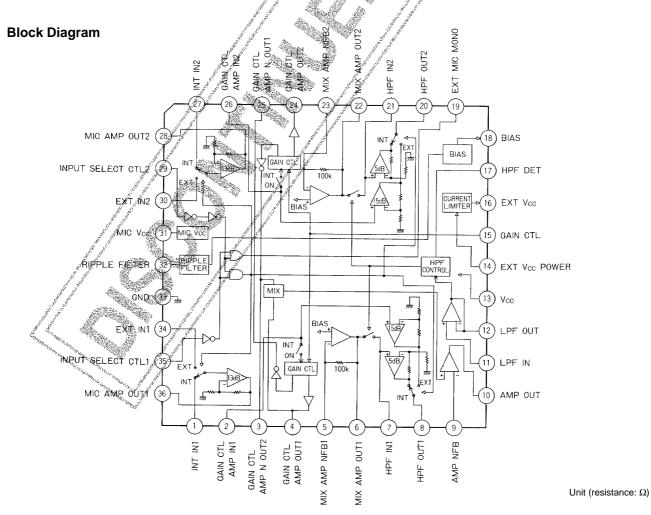
# Operating Conditions at Ta = 25%

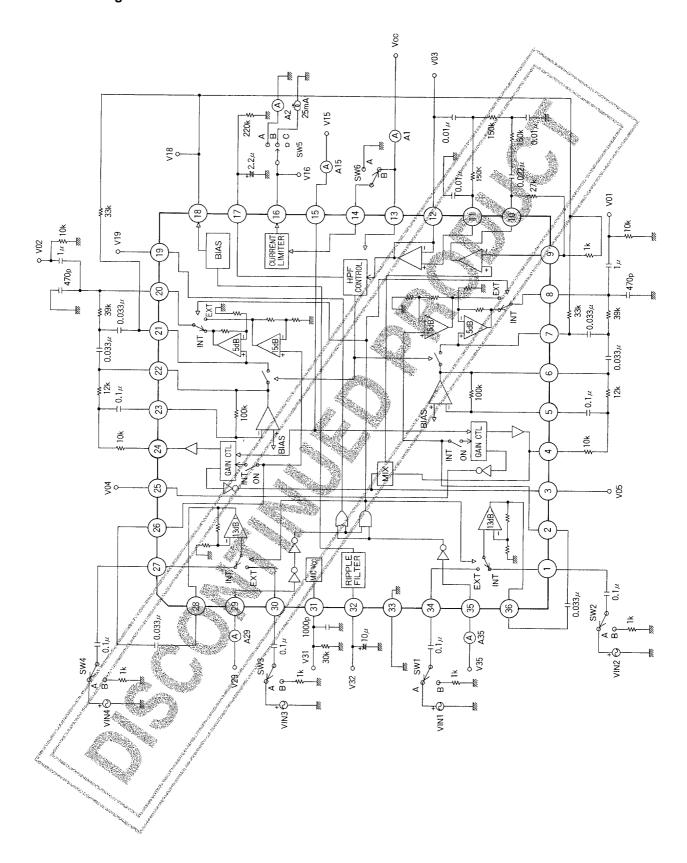
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>C</sub> C		5.0	V
Operating supply voltage range	V <sub>CC</sub> op		4.5 to 5.5	V

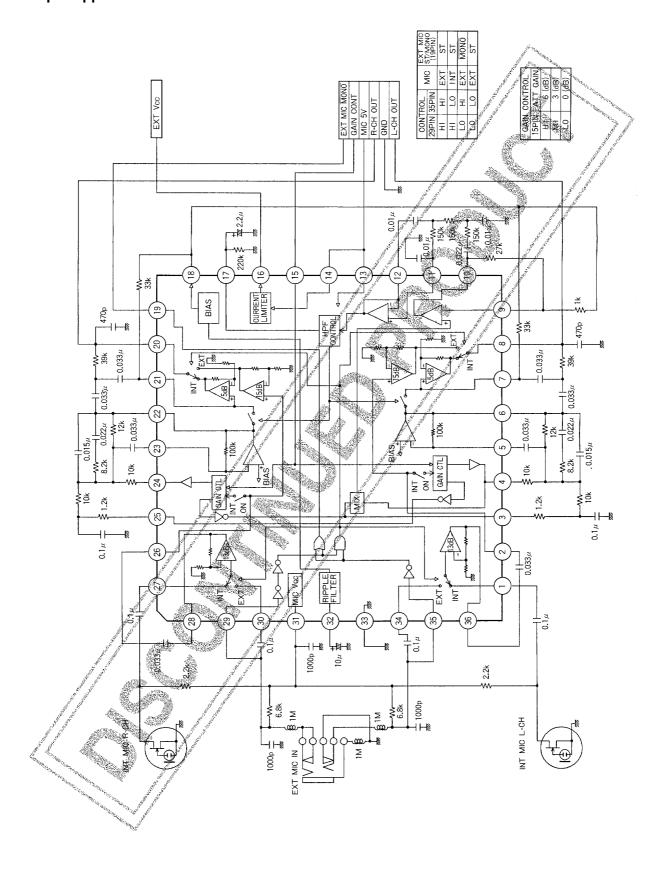
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# Operating Characteristics at $Ta=25^{\circ}C,\,V_{CC}$ = 5.0 V, f = 1.0 kHz, $R_{L}$ = 10 k $\Omega$

		9 1111		Ratings			
Parameter	Symbol	Conditions	min	typ	max	Unit	
Current dissipation	I <sub>CC1</sub>	INT MIC in, EXT V <sub>CC</sub> off, L/Rch	5.5	8/ \_	10.5	mA	
Current dissipation	I <sub>CC2</sub>	INT MIC in, EXT V <sub>CC</sub> on, L/Rch	6	9.	12	mA	
	VG <sub>1</sub>	EXT MIC in, L/Rch	27.3	27.8	28:3	dB	
Voltage gain	VG <sub>2</sub>	INT MIC in, Gain CTL Hi, L/Rch	23.8	24.3	24.8	dB	
Voltage gain	VG <sub>3</sub>	INT MIC in, Gain CTL Mi, L/Rch	20.8	21.3	21.8	dB	
	VG <sub>4</sub>	INT MIC in, Gain CTL Lo, L/Rch	17.8 🔏 🌶	18.3	18.8	₹ødB	
Total harmonic distortion	THD	INT MIC in, EXT MIC in V <sub>O</sub> = 300 mVrms, L/Rch	aft de	0.05	0.2	%	
Maximum output	V <sub>OM</sub>	INT MIC in, EXT MIC in THD = 1%, L/Rch	1.0	1.4		Vrms	
	V <sub>NO1</sub>	EXT MIC in, L/Rch, Rg = 1 kΩ, JIS-A		22	32	μVrms	
Output noise voltage	V <sub>NO2</sub>	INT MIC in, L/Rch, Rg = 1 k $\Omega$ , JIS-A Gain CTL Hi, Mi, Lo		16	24	μVrms	
Input switch crosstalk	SW <sub>CR</sub>	INT MIC in $\rightarrow$ EXT MIC in (Rg = 1 k $\Omega$ ) f = 10 kHz, L/Rch		80	70	dB	
Inter-channel crosstalk	CH <sub>CR</sub>	INT/EXT MIC, Lch $\rightarrow$ Rch, Rch $\rightarrow$ Lch, f = 10 kHz		51	45	dB	
Internal microphone power supply output voltage	V <sub>INM</sub>	When pin 31 is DC, with 30 kΩ load	2,65	2.8	2.95	٧	
External power supply output voltage	V <sub>EXM</sub>	When connected to pin 16 (output current)	4.0	4.5		V	
External power supply limiter current	I <sub>LIM</sub>	When connected to pin 16 (output current)			30	mA	
Input switching control voltage	CTL <sub>H</sub>	High level, pin 29/pin 35 DC	<b>1</b> .3		V <sub>CC</sub>	V	
input switching control voltage	CTLL	Low level, pin 29/pin 35 DC	/ / 0		0.7	V	
Input impedance	Z <sub>IN</sub>	INT/EXT MfC, fn, L/Rch	<i>f</i> 7 60	75	90	kΩ	
Output impedance	Z <sub>O</sub>	Pins 8 and 20	1	1	5	Ω	







# **Switch Operation Table**

Current dissipation 1	Item	Symbol	SW1	SW2	SW3	SW4	SW5	SW6	V15	V29	V35	Test point
Current dissipation 2	Current dissipation 1	I <sub>CC1</sub>	В	В	В	В	С	Α	L .	Н	L	A <sub>1</sub>
Voltage gain 1	Current dissipation 2		В	В	В	В	С	В	L d	H	L	
Voltage gain 1 VG12 VG21 VG21 B A A B C A VI VI L VC2 VC32 VG22 B B B B B A B C A VI VI L VC2 VC32 VC32 B B B B B A B C A VI VI L VC2 VC32 VC32 B B B B B A B C A VI VI VC32 VC32 B B B B B A C A VI VI VC32 VC32 B B B B B A C A VI VC32 B VC32 B B B B A B C A VI VC32 B VC32 B B B B A B C A VC3 VC32 B VC32 B C C C A VI VC4			Α	В	В	В	С	Α	المراجع المراجع	Target Land Barrell	. L	
VG22	Voltage gain 1		В	В	Α	В	С	Α	مرا الراز المراز الراز	L	- Angel	
Voltage gain 2         VG22         B         B         B         B         A         C         A         H         L         Voltage gain 3           Voltage gain 3         VG31         B         A         B         B         B         B         C         N         M         H         L         VO1         VO1         VO1         VO1         N         H         L         VO2         VO1         VO1         N         H         L         VO2         VO1         VO1         N         H         L         VO1         VO1         N         H         L         VO1         VO1         VO1         N         H         L         VO1         N         N         N         L         L         L         VO1         N         H         L         VO1         N         L         L         L         VO1         N         L         L         L         VO1			В	Α	В	В	С	Α	/ /H	Ян	T.	V <sub>O1</sub>
Votage gain 3   Votage gain 4   Votage gain 5   Votage gain 6   Votage gain 6   Votage gain 7   Votage gain 8   B   B   B   B   B   C   A   M   H   L   Votage gain 9   Vota	Voltage gain 2	VG <sub>2-2</sub>	В	В	В	А	С	Α 🧷	5 S	th.	100	
Voltage gain 3         VG <sub>32</sub> B         B         B         B         A         C         A         B         H         L         Vol2 Voltage gain 4           Voltage gain 4         VG4,1         B         A         B         B         B         B         B         C         A         H         L         Voltage V			В	Α	В	В	С	A.	M	H W	L A 3	200
Voltage gain 4  VG41  VG42  B  B  B  C  A  C  C	Voltage gain 3		В	В	В	А	С	3 3	35.35	-⊗H	1/	
Voltage gain 4		VG <sub>4-1</sub>	В	Α	В	В	С	A	1000			
THD1+1	Voltage gain 4		В	В	В	А	- 4	<i>A</i>	175 x 2 x 6 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	H A	N .E	
THD_2_1   B   B   A   B   C   A   H   H   L   Vo2   THD_2_1   B   A   B   B   C   A   H   H   L   Vo2   THD_3_1   B   A   B   B   C   A   H   H   L   Vo2   THD_3_1   B   A   B   B   C   A   M   H   L   Vo2   THD_3_1   B   A   B   B   C   A   M   H   L   Vo2   THD_3_1   B   A   B   B   C   A   M   H   L   Vo2   THD_3_1   B   A   B   B   C   A   M   H   L   Vo2   THD_3_1   B   A   B   B   C   A   M   H   L   Vo3   THD_3_2   B   B   B   A   C   A   M   H   L   Vo3   THD_3_2   B   B   B   A   C   A   L   H   L   Vo3   THD_3_2   B   B   B   A   C   A   L   L   L   L   Vo3   THD_3_2   B   B   B   A   B   B   C   A   L   L   L   Vo3   THD_3_2   B   B   B   A   B   B   C   A   L   L   L   Vo3   THD_3_2   B   B   B   A   B   B   C   A   H   H   L   Vo3   THD_3_2   B   B   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   A   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   C   A   A   B   B   B   C   A   A   B   B   C   A   A   B   B   B   B   C   A   A   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   B   B   C   A   B   B   B   B   B   C   A   B   B   B   B   C   A   B   B   B   B   C   C   A   B   B   B   B   B   C   A   B   B   B   B   C   C   A   B   B   C   C   A   B   B   B   B   B   C			Α	В	В	В	C./ //	£7.5°5	*****	L and the	L	
Total harmonic distortion  ThD21 B A B B C A H H H L Vo2  ThD31 B A B B A C A H H L Vo2  ThD31 B A B B A C A M H L Vo2  ThD31 B A B B A C A M H L Vo2  ThD31 B A B B A C A M H L Vo2  ThD41 B A B B A C A M H L Vo2  ThD41 B A B B B A C A M H L Vo2  ThD41 B A B B B A C A L L VO2  VoM11 A B B B B A C A L L L VO2  VoM12 B B B B A C A H H L Vo2  VoM21 B A B B B C A H H L Vo2  VoM22 B B B B A C A H H L Vo2  VoM32 B B B B A C A H H L Vo3  VoM32 B B B B C A L L L VO1  VoM42 B B B B C A L L L VO1  VoM42 B B B B C A L L L VO1  VoM42 B B B B C A L L L VO2  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM42 B B B B C A L L L VO3  VoM44 B B B B B C A L L L VO3  VoM45 B B B B C A L L L VO3  VoM46 B B B B C A L L L VO3  VoM47 B B B B B C A H H L VO3  Vox B B B B B C A H H L VO3  Vox B B B B B C A L L L VO3  Vox B B B B B C A L L L VO3  Vox B B B B B C A L L L VO3  Vox B B B B B C A L L L VO3  Vox B B B B B B C A L L L VO3  Vox B B B B B B C A L L L VO3  Vox B B B B B B C A L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B C A L L L L VO3  Vox B B B B B B B B B B B L L L L VO3  Vox B B B B B B B B B B B L L L L V V3  Vox B B B B B B B B B B B L L L L L V3  Vox B B B B B B B B B B B B B L L L L L V3  Vox B B B B B B B B B B B L L L L L V3  Vox B B B B B B B B B B B B L L L L L L V3  Vox B B B B B B B B B B B L L L L L L V3  Vox B B B B B B B B B B L L L L L L V3  Vox B B B B B B B B B B B L L L L L L V3  Vox B B B B B B B B B B B B L L L L L L V3  Vox B B B B B B B B B B B B B L L L L L L			В	В	Α	В		A	200 ALL PARK OR A	Le get	L	V <sub>O2</sub>
Tht   Tht			В	Α	В	В	Ĉ	37.75	H	<i>P</i> H	L	V <sub>01</sub>
THD3-1							v ,\$E	27.363	7547	3 3		Vo
THD32	Total harmonic distortion	THD <sub>3_1</sub>				- 20	7 BY 25	42-CASAGE 420	2 9	ğ.		V <sub>O1</sub>
THD4-1						13 12	77.72	9966	2 3			V <sub>O2</sub>
THD4_2		7+Z THD₄_1				AC A1		A 100 100 100 100 100 100 100 100 100 10	300 150			
Nomina			В	В	В			A	//L	Н	L	
Naximum output			Α	В	3"	В	C	Α 🦨	L	L	L	
Maximum output				В	A	8.3.	1000	.5. 3	L	L	L	
Maximum output    VoM2-2			В	Α	₽B	В	C C	3/ 37	Н	Н	L	
Maximum output			В	В	/ B 4	A	С	A A	Н	Н	L	
Vom3-2   B   B   B   A   C   A   M   H   L   Vo2	Maximum output		В	A	В	1000000	С /	A	М	Н	L	
Vomulation   Vom			В	./B./	.B	A	G /	Α	М	Н	L	
VoM4-2			В	A	. Care 9174	23/42/201	70	Α	L	Н	L	
Output noise voltage 1  VNO1-1  VNO1-2  B  B  B  B  C  A  L  L  L  VO1  VNO2-1  VNO2-1  B  B  B  B  B  C  A  L  L  L  VO2  A  L  L  L  VO2  A  L  L  L  VO2  VNO2-1  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-2  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-3  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-4  B  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-5  B  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-5  B  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-5  B  B  B  B  B  C  A  H  H  L  VO2  VNO2-6  B  B  B  B  B  C  A  L  H  L  VO2  VNO2-6  B  B  B  B  B  B  C  A  L  H  L  VO2  VNO2-6  B  B  B  B  B  B  C  A  L  H  L  VO2  VNO2-6  B  B  B  B  B  B  C  A  L  L  L  VO3  VNO2-6  B  B  B  B  B  B  C  A  L  L  L  VO3  VNO2-6  B  B  B  B  B  C  A  L  L  L  VO3  VNO2-6  C  C  C  C  C  C  C  C  C  C  C  C  C			В ,/	/ B /	В	A	C	Α	L	Н	L	
VNO1-2			B.//	B.	В	В	/ C	Α	L	L	L	
Output noise voltage 2    V_{NO2-1}	Output noise voltage 1		B	В	В	B /	С	Α	L	L	L	
Output noise voltage 2    VNO2-2			/ B	.5336	В	2.5	С	А	Н	Н	L	
Output noise voltage 2    VN02's   B			P 45	1000000	В	//B	С	А	Н	Н	L	
VNO2-4			5 55	7.686777	В /	В	С	Α	М	Н	L	
No2-5	Output noise voltage 2		,00°, 7		B/	В	С	Α	М	Н	L	
No2-6   B   B   B   B   C   A   L   H   L   V <sub>02</sub>		55 .50	M1.50-50-5		3/ 3/	В	С	Α	L	Н	L	
SCR1	يُ			В	B	В	С	Α	L	Н	L	
Scheme   S			2233	, A	∦ B	В	С	Α	L	L	L	
Cont.   A	Input switch crosstalk		200	3 4	В	А	С	Α	L	L	L	
Inter-channel crosstalk		C <sub>cn1-1</sub>	1967/17625	a B <sub>s</sub>	В	В	С	Α	L	L	L	
Inter-channel crosstalk	( )		15,249.6									V <sub>O1</sub>
Internal microphone power supply output voltage    Cong. 2   B	Inter-channel crosstalk	C <sub>cn2-1</sub>	A 100 A	* **								
Internal microphone power supply output voltage  External power supply output voltage  VEXM B B B B B B L L L V16  External power supply output voltage	// 🕷	Conso	E :	-								
External power supply output voltage VEXM B B B B B L L L V <sub>16</sub> External power supply B B B B B B B B B B B B B B B B B B B	supply output voltage	Same of the same	, B									
External power supply  Linux B B B B A B L L L A2	External power supply	V <sub>EXM</sub>		В	В	В	В	В	L	L	L	V <sub>16</sub>
	External power supply	JĽIM	В	В	В	В	Α	В	L	L	L	A <sub>2</sub>

## **Pin Functions**

Unit (resistance:  $\Omega$ )

Pin No.	Function	Internal Circuit	DC Voltage	Description
1 27	INT in	V <sub>REF</sub> 75k	2.1 V	Internal microphone input The input impedance is 75 k $\Omega$ .
2 26	Gain CTL AMP in	2 26	2.1 V , , , , , , , , , , , , , , , , , ,	Gain control amplitier input The input impedance is 100 kΩ.
3 25	Gain CTL AMP N out	10k 33,000 310k 310k 310k 310k 310k 310k 310k 3	2:130	Gain control amplifier inverted output
4 24	Gain CTL AMP out	10k (4)	2.1 V	Gain control amplifier output
5 23	Mix AMP NFB	(5) (23) 100K (6) (22)	2.1 V	Mixer amplifier NFB pin
6 22	Mix AMP out	(5) 100k (3) (3) (6) (2)	2.1 V	Mixer amplifier output
7 21	HPF in	\$ 500 K	2.1 V	High-pass filter amplifier input This is a high impedance input.

## Continued from preceding page.

Unit (resistance: Ω)

				Unit (resistance: Ω)
Pin No.	Function	Internal Circuit	DC Voltage	Description
8 20	HPF out	14k — W 600µ	2.1 V	Output for the high-pass filter 5 dB amplifier and the EXT mode 15 dB amplifier
9	AMP NFB	500 W	2.1 V	NFB for the amplifier that adjusts the wind noise exclusion high pass filter on off level
10	AMP out		21.9	Output for the amplifier that adjusts the wind noise exclusion high-pass filter on/off level This is a low impedance output.
11	LPF in	200k \$ 500 0-W	2.10	Buffer input for forming a low-pass filter. The input impedance is 200 k $\Omega$ .
12	LPF out	¥ 500 ×	2.1 V	Buffer output for forming a low-pass filter. This is a low impedance output.
13	V <sub>CC</sub>		V <sub>CC</sub>	Power supply for circuits other than the external V <sub>CC</sub> circuit
14	EXT.V <sub>CC</sub> power			External V <sub>CC</sub> circuit power supply
15.	Gain CTE	\$50k ₩ 50k		Gain control pin High level (4 V or higher): 6 dB Mid level (2 to 3 V): 3 dB Low level (1 V or lower): 0 dB

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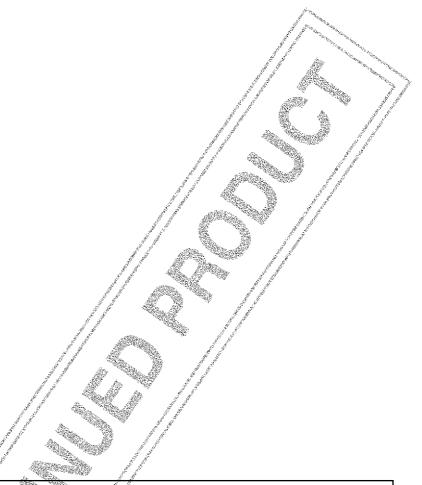
Unit (resistance:  $\Omega$ )

			I	Unit (resistance: Ω)
Pin No.	Function	Internal Circuit	DC Voltage	Description
16	EXT V <sub>CC</sub>	10k 20k 16		External power supply with current limiter Capable of providing at least 4-V when an output current is 25 mA: When the output voltage is 0 V, the output current is less than 25 mA.
17	HPF DET	22k ***********************************		Detegris the level used to turn, the high-pass filter on and off.
18	BIAS		2.1 V	Reference voltage
19	EXT MIC mono	500 30R		Outputs a low level only when the external microphone is monophonic.
28 36	Mic AMP out	1.2k	2.1 V	Microphone amplifier output This is a low-impedance output.
29	Input seject CTL2	23 S W 100k ≸		Internal/external switch Control pin used to determine stereo or monophonic operation

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Unit (resistance:  $\Omega$ )

Pin No.	Function	Internal Circuit	DC Voltage	Description Description
30 34	EXT in	V <sub>REF</sub> 75k 30 34	2.1 V	External microphone input The input impedance is ₹5 kΩ.
31	Mic V <sub>CC</sub>	\$15k \$29k \$15k ₹15k ₹29k	2.8 \$	Power supply for the internal microphone
32	Ripple filter	75k 💸 73k 🕷	2.1 V	This pin is used to exclude ripple from internal circuits. Connect a capacitor and a resistor of 75 k $\Omega$ externally to exclude ripple.
33	GND	// * ***	,00 j	
35	Input select CTL1	25k 10k 10k 10k 10k 10k 10k 10k 10k 10k 10		Internal/external switch Control pin used to determine stereo or monophonic operation



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