



## 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 current 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)

## Specifications

### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		7.0	V
Allowable power dissipation	P <sub>d</sub> max	Ta ≤ 65°C	300	mW
Operating temperature	T <sub>opr</sub>		-10 to +65	°C
Storage temperature	T <sub>stg</sub>		-55 to +150	°C

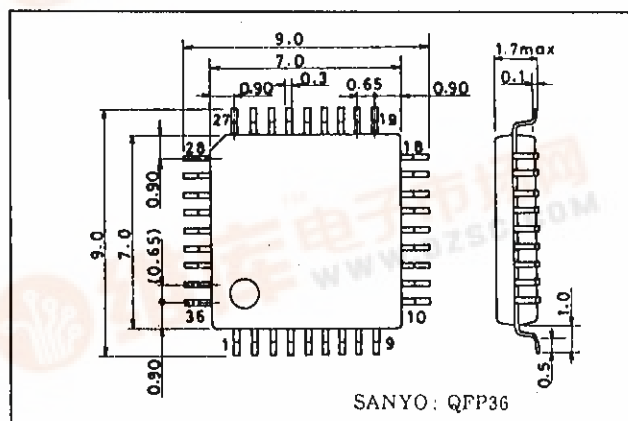
### Operating Conditions at Ta = 25°C

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

## Package Dimensions

unit: mm

### 3162B-QFP36

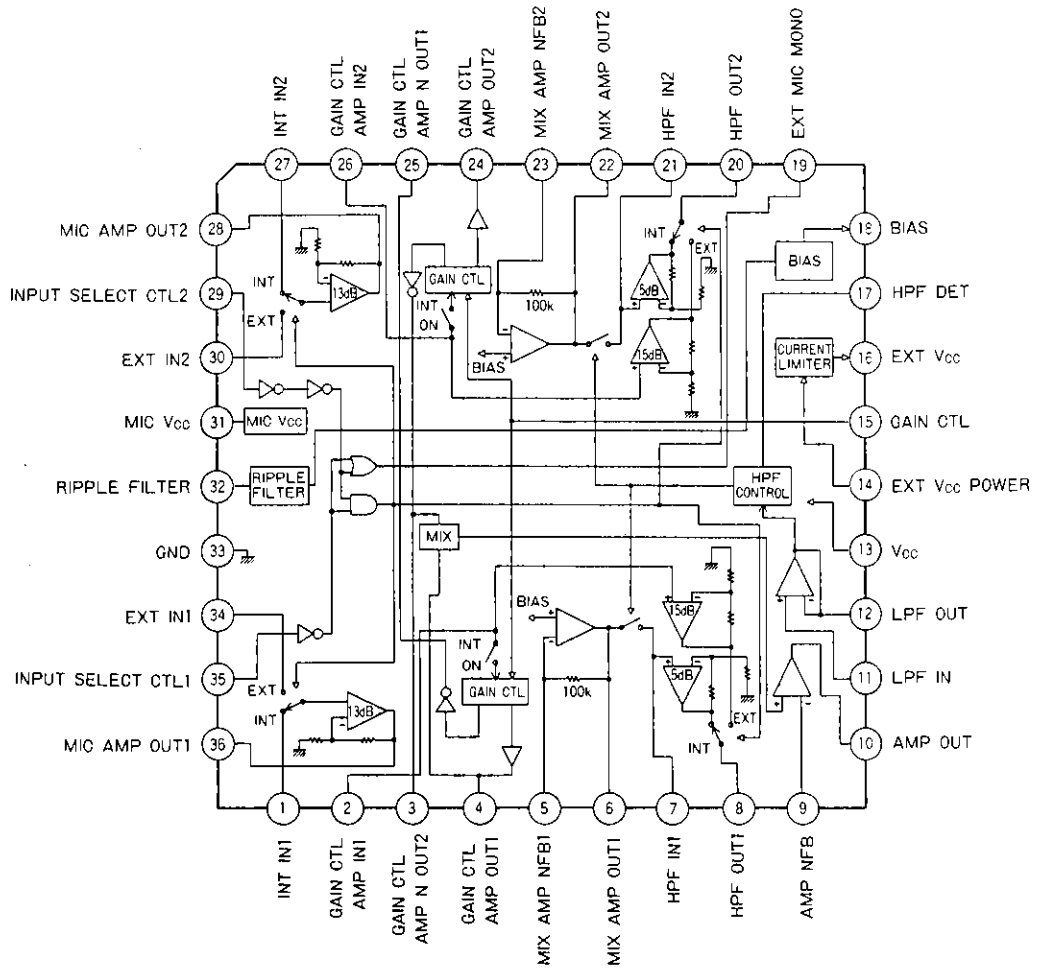


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**Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{ V}$ ,  $f = 1.0\text{ kHz}$ ,  $R_L = 10\text{ k}\Omega$**

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current dissipation	$I_{CC1}$	INT MIC in, EXT $V_{CC}$ off, L/Rch	5.5	8	10.5	mA
	$I_{CC2}$	INT MIC in, EXT $V_{CC}$ on, L/Rch	6	9	12	mA
Voltage gain	$VG_1$	EXT MIC in, L/Rch	27.3	27.8	28.3	dB
	$VG_2$	INT MIC in, Gain CTL Hi, L/Rch	23.8	24.3	24.8	dB
	$VG_3$	INT MIC in, Gain CTL Mi, L/Rch	20.8	21.3	21.8	dB
	$VG_4$	INT MIC in, Gain CTL Lo, L/Rch	17.8	18.3	18.8	dB
Total harmonic distortion	THD	INT MIC in, EXT MIC in $V_O = 300\text{ mVrms}$ , L/Rch		0.05	0.2	%
Maximum output	$V_{OM}$	INT MIC in, EXT MIC in THD = 1%, L/Rch	1.0	1.4		Vrms
Output noise voltage	$V_{NO1}$	EXT MIC in, L/Rch, $R_g = 1\text{ k}\Omega$ , JIS-A		22	32	$\mu\text{Vrms}$
	$V_{NO2}$	INT MIC in, L/Rch, $R_g = 1\text{ k}\Omega$ , JIS-A Gain CTL Hi, Mi, Lo		16	24	$\mu\text{Vrms}$
Input switch crosstalk	$SW_{CR}$	INT MIC in $\rightarrow$ EXT MIC in ( $R_g = 1\text{ k}\Omega$ ) $f = 10\text{ kHz}$ , L/Rch		80	70	dB
Inter-channel crosstalk	$CH_{CR}$	INT/EXT MIC, Lch $\rightarrow$ Rch, Rch $\rightarrow$ Lch, $f = 10\text{ kHz}$		51	45	dB
Internal microphone power supply output voltage	$V_{INM}$	When pin 31 is DC, with $30\text{ k}\Omega$ load	2.65	2.8	2.95	V
External power supply output voltage	$V_{EXM}$	When connected to pin 16 (output current)	4.0	4.5		V
External power supply limiter current	$I_{LIM}$	When connected to pin 16 (output current)			30	mA
Input switching control voltage	$CTL_H$	High level, pin 29/pin 35 DC	1.3		$V_{CC}$	V
	$CTL_L$	Low level, pin 29/pin 35 DC	0		0.7	V
Input impedance	$Z_{IN}$	INT/EXT MIC in, L/Rch	60	75	90	$\text{k}\Omega$
Output impedance	$Z_O$	Pins 8 and 20		1	5	$\Omega$

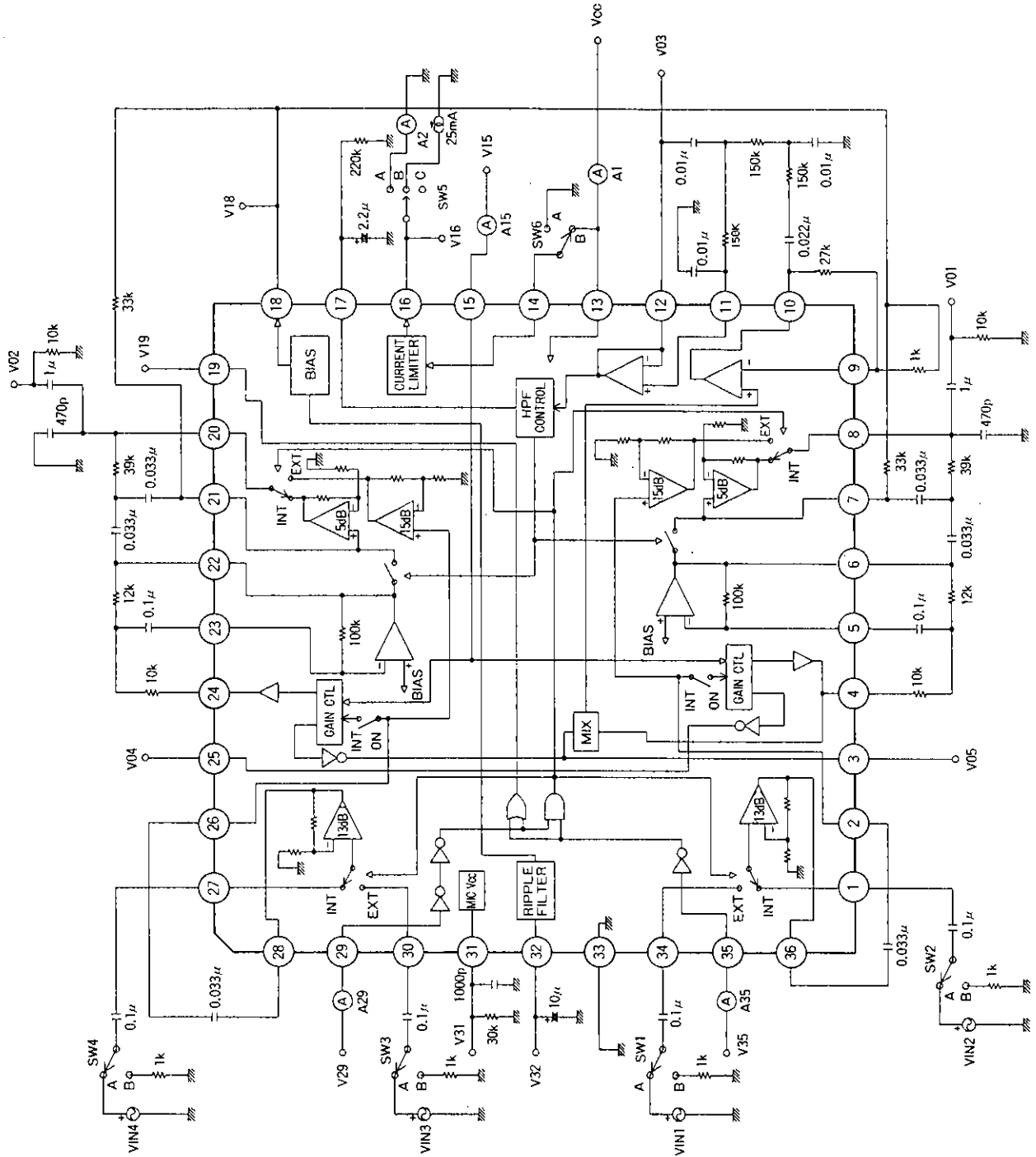
### Block Diagram



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Test Circuit Diagram

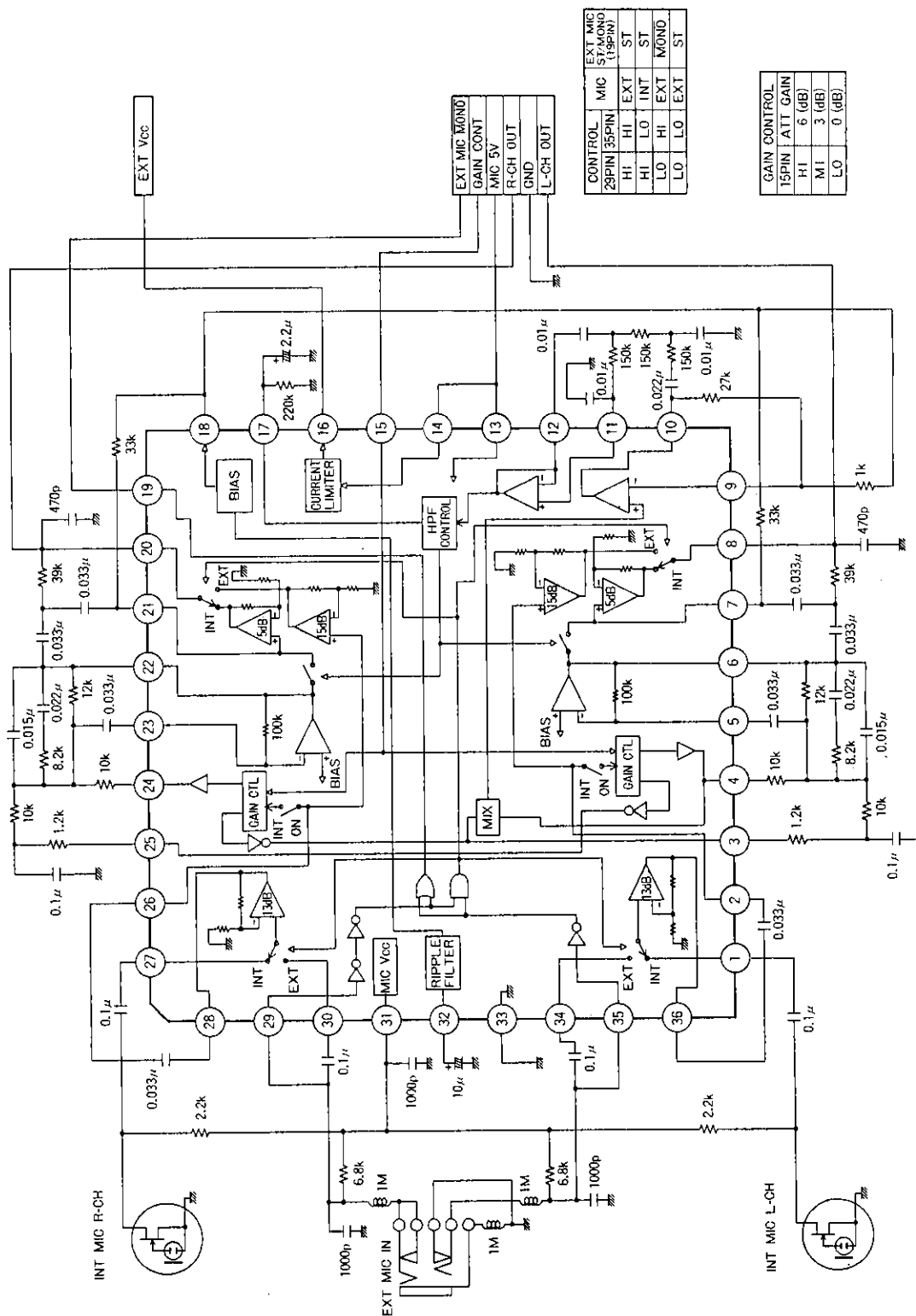
Unit (Resistance: Ω, Capacitance: F)



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## Application Circuit Diagram

Unit (Resistance:  $\Omega$ , Capacitance: F)



CONTROL	29PIN	MIC	EXT	MONO	EXT	MONO	ST
HI	HI	EXT	ST				
LO	LO	INT	ST				
LO	LO	EXT	MONO				
		LO	EXT	ST			

GAIN CONTROL	15PIN	ATT	GAIN
HI		6	(dB)
MI		3	(dB)
LO		0	(dB)

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Switch Operation Table

Item	Symbol	SW1	SW2	SW3	SW4	SW5	SW6	V15	V29	V35	Test point
Current dissipation 1	I <sub>CC1</sub>	B	B	B	B	C	A	L	H	L	A <sub>1</sub>
Current dissipation 2	I <sub>CC2</sub>	B	B	B	B	C	B	L	H	L	A <sub>1</sub>
Voltage gain 1	VG <sub>1-1</sub>	A	B	B	B	C	A	L	L	L	V <sub>O1</sub>
	VG <sub>1-2</sub>	B	B	A	B	C	A	L	L	L	V <sub>O2</sub>
Voltage gain 2	VG <sub>2-1</sub>	B	A	B	B	C	A	H	H	L	V <sub>O1</sub>
	VG <sub>2-2</sub>	B	B	B	A	C	A	H	H	L	V <sub>O2</sub>
Voltage gain 3	VG <sub>3-1</sub>	B	A	B	B	C	A	M	H	L	V <sub>O1</sub>
	VG <sub>3-2</sub>	B	B	B	A	C	A	M	H	L	V <sub>O2</sub>
Voltage gain 4	VG <sub>4-1</sub>	B	A	B	B	C	A	L	H	L	V <sub>O1</sub>
	VG <sub>4-2</sub>	B	B	B	A	C	A	L	H	L	V <sub>O2</sub>
Total harmonic distortion	THD <sub>1-1</sub>	A	B	B	B	C	A	L	L	L	V <sub>O1</sub>
	THD <sub>1-2</sub>	B	B	A	B	C	A	L	L	L	V <sub>O2</sub>
	THD <sub>2-1</sub>	B	A	B	B	C	A	H	H	L	V <sub>O1</sub>
	THD <sub>2-2</sub>	B	B	B	A	C	A	H	H	L	V <sub>O2</sub>
	THD <sub>3-1</sub>	B	A	B	B	C	A	M	H	L	V <sub>O1</sub>
	THD <sub>3-2</sub>	B	B	B	A	C	A	M	H	L	V <sub>O2</sub>
	THD <sub>4-1</sub>	B	A	B	B	C	A	L	H	L	V <sub>O1</sub>
	THD <sub>4-2</sub>	B	B	B	A	C	A	L	H	L	V <sub>O2</sub>
Maximum output	V <sub>OM1-1</sub>	A	B	B	B	C	A	L	L	L	V <sub>O1</sub>
	V <sub>OM1-2</sub>	B	B	A	B	C	A	L	L	L	V <sub>O2</sub>
	V <sub>OM2-1</sub>	B	A	B	B	C	A	H	H	L	V <sub>O1</sub>
	V <sub>OM2-2</sub>	B	B	B	A	C	A	H	H	L	V <sub>O2</sub>
	V <sub>OM3-1</sub>	B	A	B	B	C	A	M	H	L	V <sub>O1</sub>
	V <sub>OM3-2</sub>	B	B	B	A	C	A	M	H	L	V <sub>O2</sub>
	V <sub>OM4-1</sub>	B	A	B	B	C	A	L	H	L	V <sub>O1</sub>
	V <sub>OM4-2</sub>	B	B	B	A	C	A	L	H	L	V <sub>O2</sub>
Output noise voltage 1	V <sub>NO1-1</sub>	B	B	B	B	C	A	L	L	L	V <sub>O1</sub>
	V <sub>NO1-2</sub>	B	B	B	B	C	A	L	L	L	V <sub>O2</sub>
Output noise voltage 2	V <sub>NO2-1</sub>	B	B	B	B	C	A	H	H	L	V <sub>O1</sub>
	V <sub>NO2-2</sub>	B	B	B	B	C	A	H	H	L	V <sub>O2</sub>
	V <sub>NO2-3</sub>	B	B	B	B	C	A	M	H	L	V <sub>O1</sub>
	V <sub>NO2-4</sub>	B	B	B	B	C	A	M	H	L	V <sub>O2</sub>
	V <sub>NO2-5</sub>	B	B	B	B	C	A	L	H	L	V <sub>O1</sub>
	V <sub>NO2-6</sub>	B	B	B	B	C	A	L	H	L	V <sub>O2</sub>
Input switch crosstalk	S <sub>CR1</sub>	B	A	B	B	C	A	L	L	L	V <sub>O1</sub>
	S <sub>CR2</sub>	B	B	B	A	C	A	L	L	L	V <sub>O2</sub>
Inter-channel crosstalk	C <sub>en1-1</sub>	A	B	B	B	C	A	L	L	L	V <sub>O2</sub>
	C <sub>en1-2</sub>	B	B	A	B	C	A	L	L	L	V <sub>O1</sub>
	C <sub>en2-1</sub>	B	A	B	B	C	A	H	H	L	V <sub>O2</sub>
	C <sub>en2-2</sub>	B	B	B	A	C	A	H	H	L	V <sub>O1</sub>
Internal microphone power supply output voltage	V <sub>INM</sub>	B	B	B	B	C	A	L	L	L	V <sub>31</sub>
External power supply output voltage	V <sub>EXM</sub>	B	B	B	B	B	B	L	L	L	V <sub>16</sub>
External power supply limiter current	I <sub>LIM</sub>	B	B	B	B	A	B	L	L	L	A <sub>2</sub>

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### Pin Functions

		Unit (resistance : $\Omega$ )			
Pin No.	Function	Internal Circuit	DC Voltage	Description	
1 27	INT in		2.1 V	Internal microphone input The input impedance is 75 k $\Omega$ .	
2 26	Gain CTL AMP in		2.1 V	Gain control amplifier input The input impedance is 100 k $\Omega$ .	
3 25	Gain CTL AMP N out		2.1 V	Gain control amplifier inverted output	
4 24	Gain CTL AMP out		2.1 V	Gain control amplifier output	
5 23	Mix AMP NFB		2.1 V	Mixer amplifier NFB pin	
6 22	Mix AMP out		2.1 V	Mixer amplifier output	
7 21	HPF in		2.1 V	High-pass filter amplifier input This is a high impedance input.	

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Unit (resistance :  $\Omega$ )

Pin No.	Function	Internal Circuit	DC Voltage	Description
8 20	HPF out		2.1 V	Output for the high-pass filter 5 dB amplifier and the EXT mode 15 dB amplifier
9	AMP NFB		2.1 V	NFB for the amplifier that adjusts the wind noise exclusion high-pass filter on/off level
10	AMP out		2.1 V	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		2.1 V	Buffer input for forming a low-pass filter. The input impedance is 200 k $\Omega$ .
12	LPF out		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 CTL			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 :  $\Omega$ )

Pin No.	Function	Internal Circuit	DC Voltage	Description
16	EXT V <sub>CC</sub>			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			Detects the level used to turn the high-pass filter on and off.
18	BIAS		2.1 V	Reference voltage
19	EXT MIC mono			Outputs a low level only when the external microphone is monophonic.
28 36	Mic AMP out		2.1 V	Microphone amplifier output This is a low-impedance output.
29	Input select CTL2			Internal/external switch Control pin used to determine stereo or monophonic operation

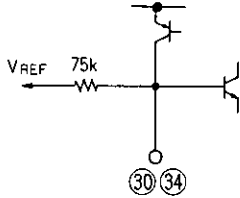
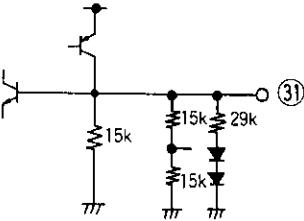
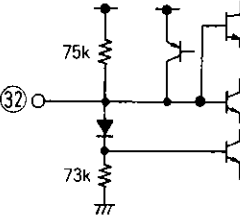
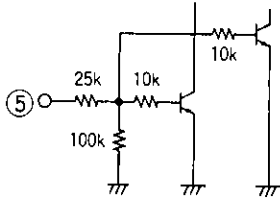
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Unit (resistance :  $\Omega$ )

Pin No.	Function	Internal Circuit	DC Voltage	Description
30 34	EXT in		2.1 V	External microphone input The input impedance is 75 k $\Omega$ .
31	Mic V <sub>CC</sub>		2.8 V	Power supply for the internal microphone
32	Ripple filter		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		0	
35	Input select CTL1			Internal/external switch Control pin used to determine stereo or monophonic operation

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