Ordering number : EN4488A

Monolithic Linear IC

LA7471M

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 current limiter)
- Ripple filter
- Stereo/mono detection for external microphones

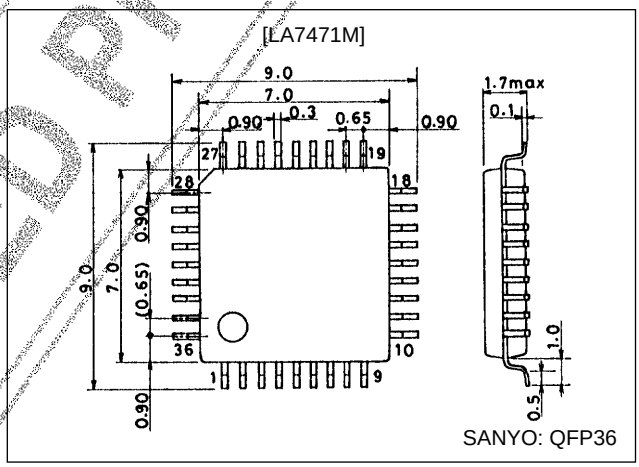
Features

- 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)

Package Dimensions

unit: mm

3162B-QFP36



SANYO: QFP36

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7.0	V
Allowable power dissipation	Pd max	Ta ≤ 65°C	300	mW
Operating temperature	Topr		–10 to +65	°C
Storage temperature	Tstg		–55 to +150	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		5.0	V
Operating supply voltage range	V_{CC} op		4.5 to 5.5	V

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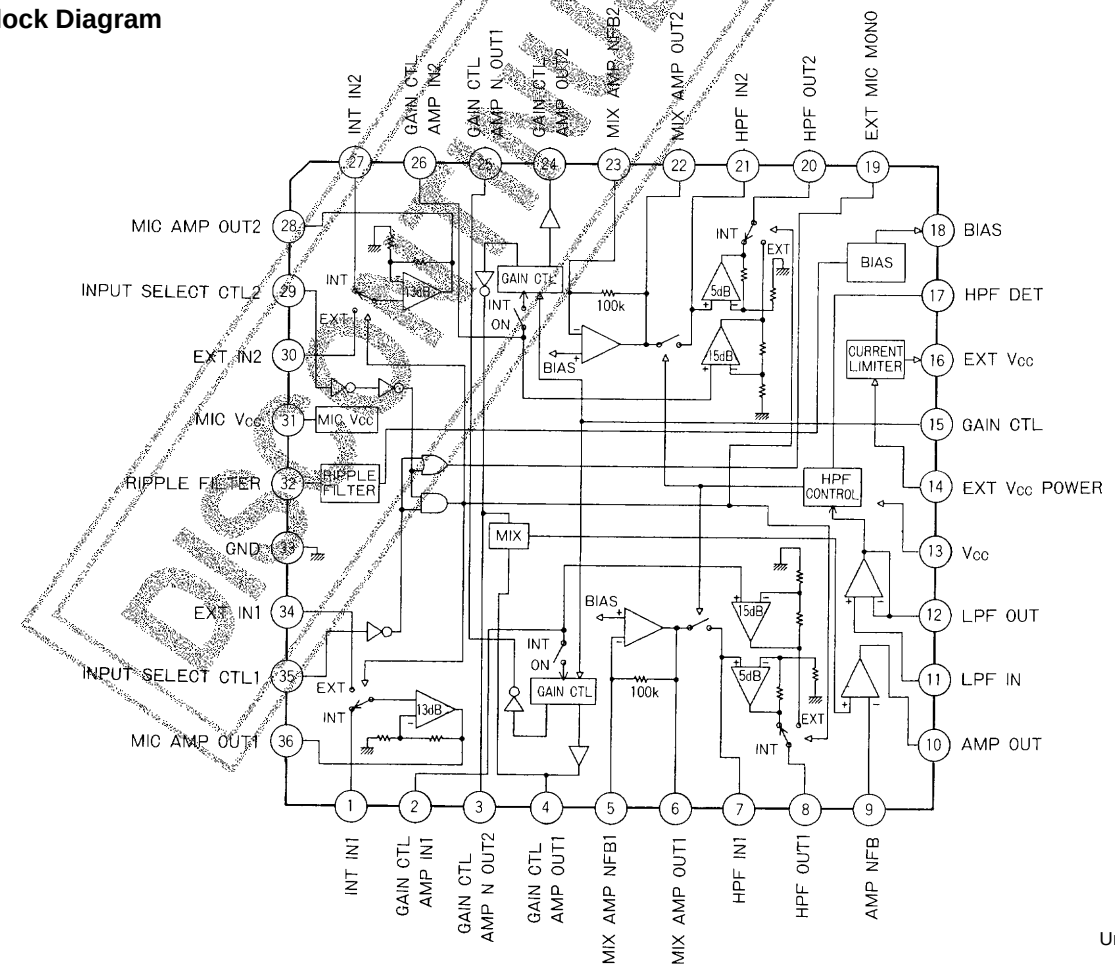
Operating Characteristics at Ta = 25°C, V_{CC} = 5.0 V, f = 1.0 kHz, R_L = 10 kΩ

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 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, Rg = 1 kΩ, JIS-A		22	32	μVrms
	V_{NO2}	INT MIC in, L/Rch, Rg = 1 kΩ, JIS-A Gain CTL Hi, Mi, Lo		16	24	μVrms
Input switch crosstalk	SW_{CR}	INT MIC in → EXT MIC in (Rg = 1 kΩ), f = 10 kHz, L/Rch		80	70	dB
Inter-channel crosstalk	CH_{CR}	INT/EXT MIC, Lch → Rch, Rch → Lch, f = 10 kHz		51	45	dB
Internal microphone power supply output voltage	V_{INM}	When pin 31 is DC, with 30 kΩ 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	kΩ
Output impedance	Z_O	Pins 8 and 20		1	5	Ω

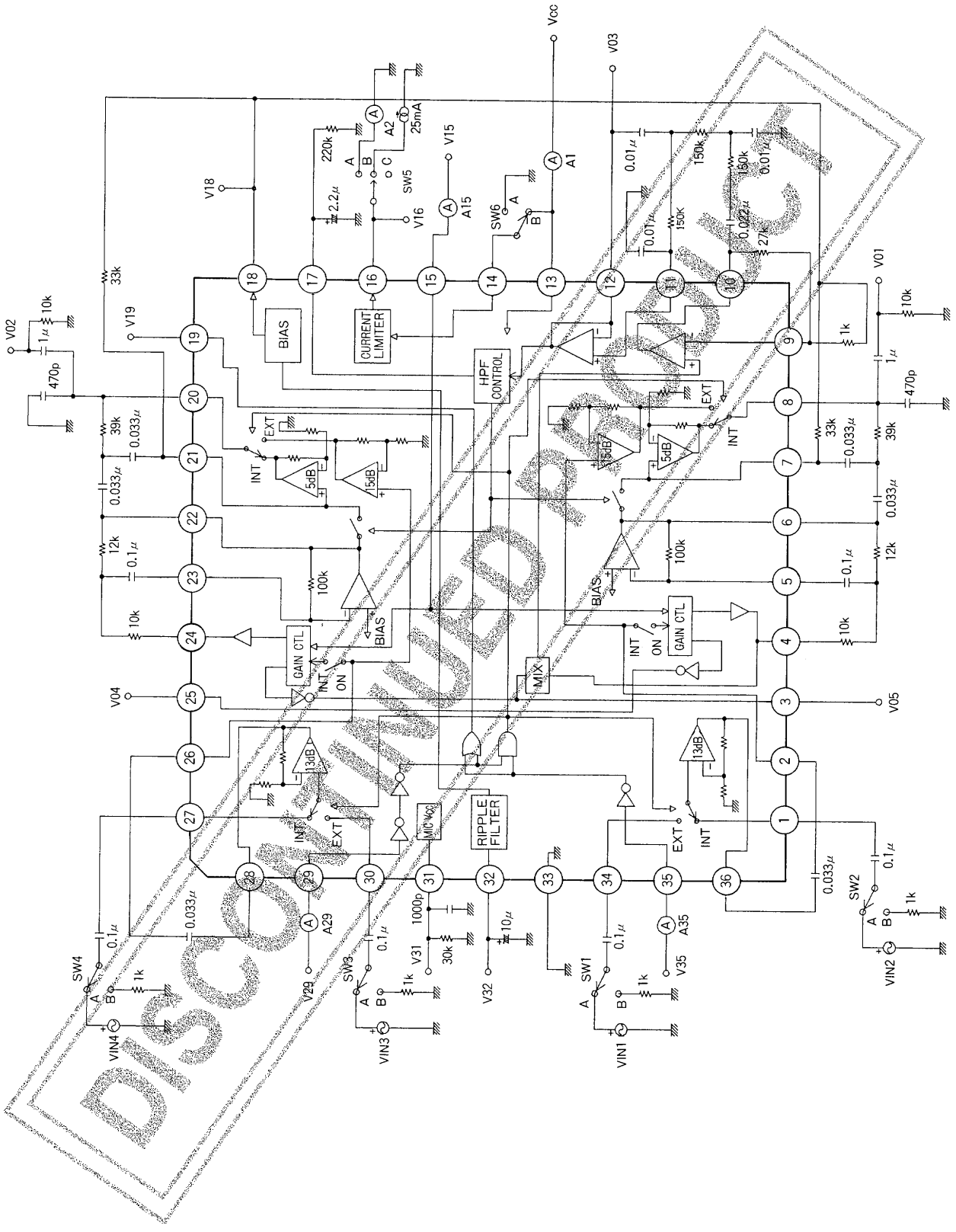
Block Diagram



Unit (resistance: Ω)

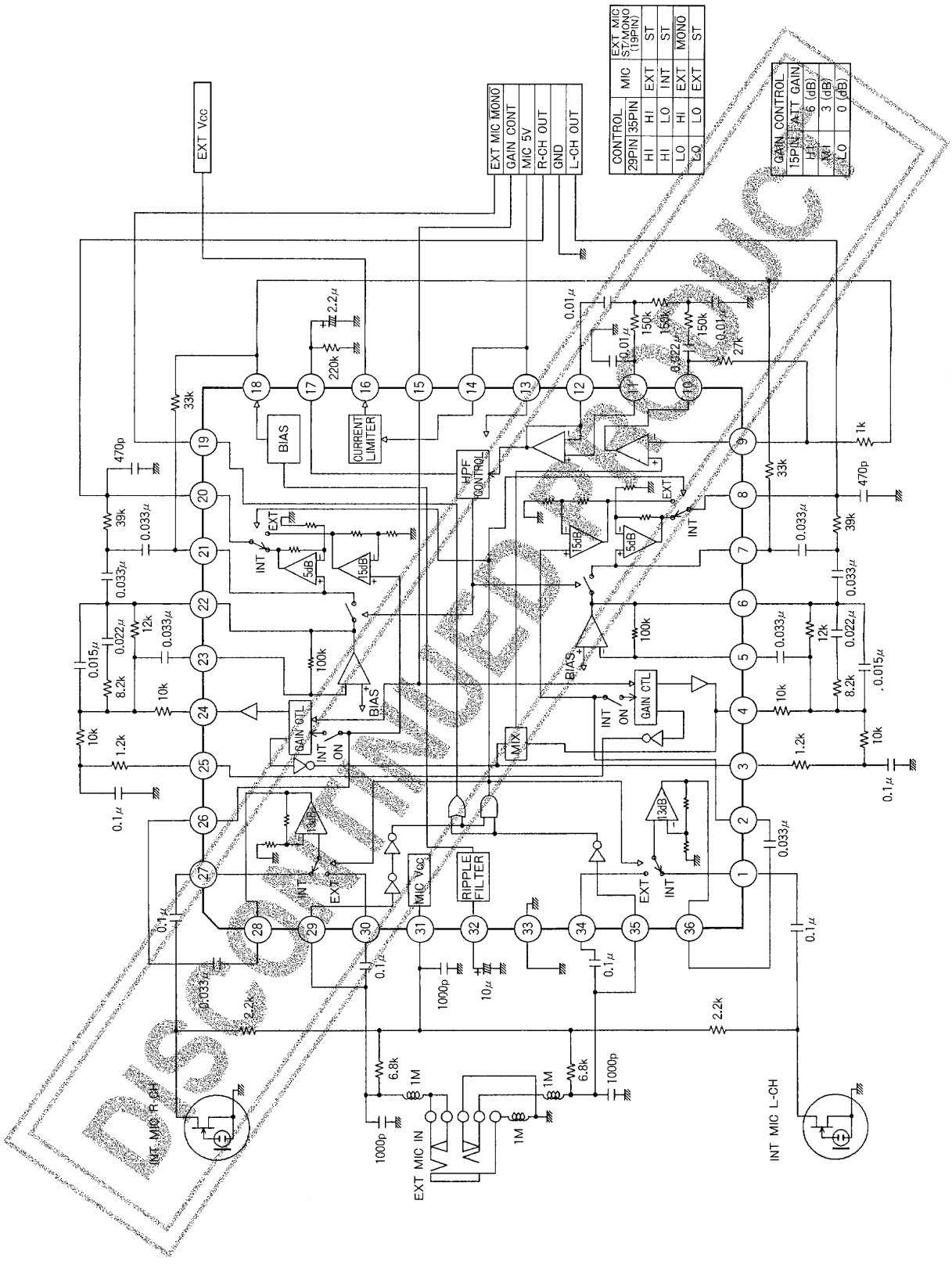
Test Circuit Diagram

Unit (resistance: Ω, capacitance: F)



Sample Application Circuit

Unit (resistance: Ω, capacitance: F)

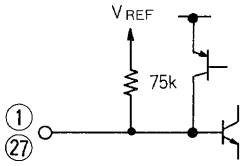
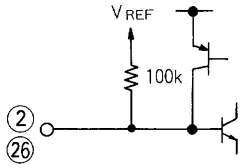
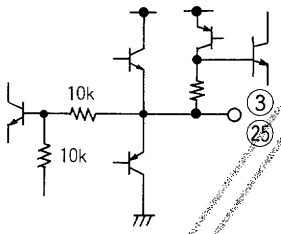
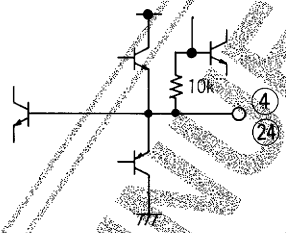
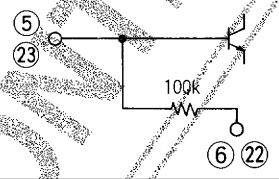
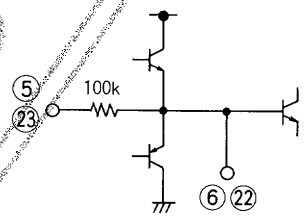
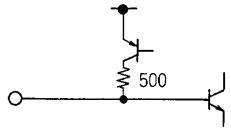


Switch Operation Table

Item	Symbol	SW1	SW2	SW3	SW4	SW5	SW6	V15	V29	V35	Test point
Current dissipation 1	I_{CC1}	B	B	B	B	C	A	L	H	L	A_1
Current dissipation 2	I_{CC2}	B	B	B	B	C	B	L	H	L	A_1
Voltage gain 1	VG_{1-1}	A	B	B	B	C	A	L	L	L	V_{O1}
	VG_{1-2}	B	B	A	B	C	A	L	L	L	V_{O2}
Voltage gain 2	VG_{2-1}	B	A	B	B	C	A	H	H	L	V_{O1}
	VG_{2-2}	B	B	B	A	C	A	H	H	L	V_{O2}
Voltage gain 3	VG_{3-1}	B	A	B	B	C	A	M	H	L	V_{O1}
	VG_{3-2}	B	B	B	A	C	A	M	H	L	V_{O2}
Voltage gain 4	VG_{4-1}	B	A	B	B	C	A	L	H	L	V_{O1}
	VG_{4-2}	B	B	B	A	C	A	L	H	L	V_{O2}
Total harmonic distortion	THD_{1-1}	A	B	B	B	C	A	L	L	L	V_{O1}
	THD_{1-2}	B	B	A	B	C	A	L	L	L	V_{O2}
	THD_{2-1}	B	A	B	B	C	A	H	H	L	V_{O1}
	THD_{2-2}	B	B	B	A	C	A	H	H	L	V_{O2}
	THD_{3-1}	B	A	B	B	C	A	M	H	L	V_{O1}
	THD_{3-2}	B	B	B	A	C	A	M	H	L	V_{O2}
	THD_{4-1}	B	A	B	B	C	A	L	H	L	V_{O1}
	THD_{4-2}	B	B	B	A	C	A	L	H	L	V_{O2}
Maximum output	V_{OM1-1}	A	B	B	B	C	A	L	L	L	V_{O1}
	V_{OM1-2}	B	B	A	B	C	A	L	L	L	V_{O2}
	V_{OM2-1}	B	A	B	B	C	A	H	H	L	V_{O1}
	V_{OM2-2}	B	B	B	A	C	A	H	H	L	V_{O2}
	V_{OM3-1}	B	A	B	B	C	A	M	H	L	V_{O1}
	V_{OM3-2}	B	B	B	A	C	A	M	H	L	V_{O2}
	V_{OM4-1}	B	A	B	B	C	A	L	H	L	V_{O1}
	V_{OM4-2}	B	B	B	A	C	A	L	H	L	V_{O2}
Output noise voltage 1	V_{NO1-1}	B	B	B	B	C	A	L	L	L	V_{O1}
	V_{NO1-2}	B	B	B	B	C	A	L	L	L	V_{O2}
Output noise voltage 2	V_{NO2-1}	B	B	B	B	C	A	H	H	L	V_{O1}
	V_{NO2-2}	B	B	B	B	C	A	H	H	L	V_{O2}
	V_{NO2-3}	B	B	B	B	C	A	M	H	L	V_{O1}
	V_{NO2-4}	B	B	B	B	C	A	M	H	L	V_{O2}
	V_{NO2-5}	B	B	B	B	C	A	L	H	L	V_{O1}
	V_{NO2-6}	B	B	B	B	C	A	L	H	L	V_{O2}
Input switch crosstalk	S_{CR1}	B	A	B	B	C	A	L	L	L	V_{O1}
	S_{CR2}	B	B	B	A	C	A	L	L	L	V_{O2}
Inter-channel crosstalk	C_{cn1-1}	A	B	B	B	C	A	L	L	L	V_{O2}
	C_{cn1-2}	B	B	A	B	C	A	L	L	L	V_{O1}
	C_{cn2-1}	B	A	B	B	C	A	H	H	L	V_{O2}
	C_{cn2-2}	B	B	B	A	C	A	H	H	L	V_{O1}
Internal microphone power supply output voltage	V_{INM}	B	B	B	B	C	A	L	L	L	V_{31}
External power supply output voltage	V_{EXM}	B	B	B	B	B	B	L	L	L	V_{16}
External power supply limiter current	I_{LIM}	B	B	B	B	A	B	L	L	L	A_2

Pin Functions

Unit (resistance: Ω)

Pin No.	Function	Internal Circuit	DC Voltage	Description
1 27	INT in		2.1 V	Internal microphone input The input impedance is 75 kΩ.
2 26	Gain CTL AMP in		2.1 V	Gain control amplifier input The input impedance is 100 kΩ.
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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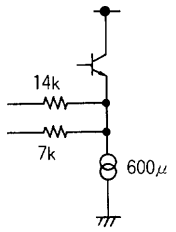
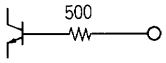
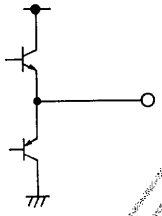
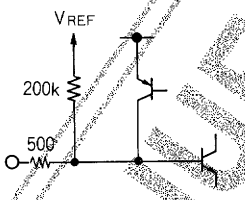
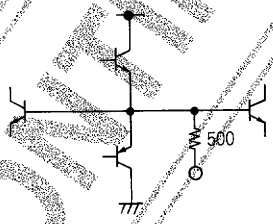
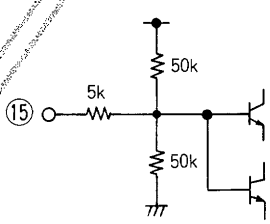
Unit (resistance: Ω)

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 kΩ.
12	LPF out		2.1 V	Buffer output for forming a low-pass filter. This is a low impedance output.
13	V_{CC}		V_{CC}	Power supply for circuits other than the external V_{CC} circuit
14	EXT V_{CC} power			External V_{CC} 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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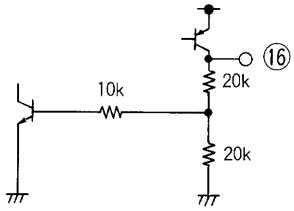
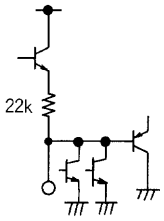
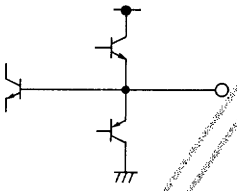
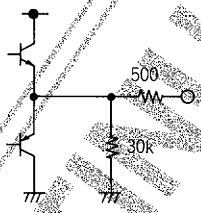
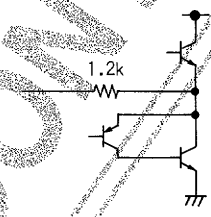
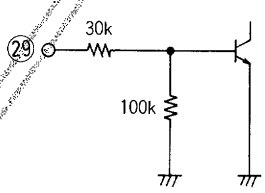
Unit (resistance: Ω)

Pin No.	Function	Internal Circuit	DC Voltage	Description
16	EXT V_{CC}			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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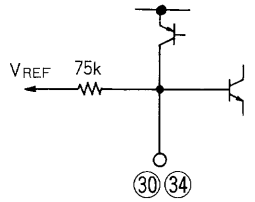
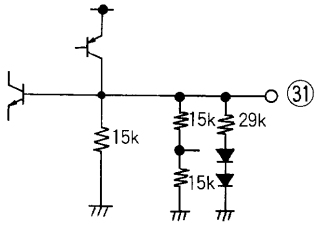
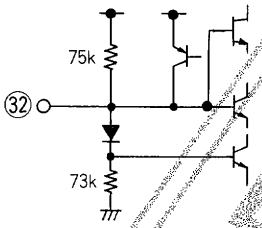
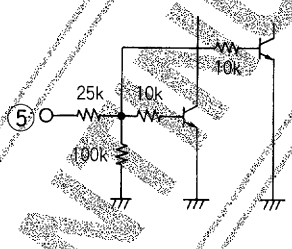
Unit (resistance: Ω)

Pin No.	Function	Internal Circuit	DC Voltage	Description
30 34	EXT in		2.1 V	External microphone input The input impedance is 75 kΩ.
31	Mic V_{CC}		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 kΩ 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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