AN7090FHQ

Peripheral analog IC for audio signal processing

■ Overview

The AN7090FHQ is a one chip IC of audio signal processing analog circuit for use in various information systems including microcomputer.

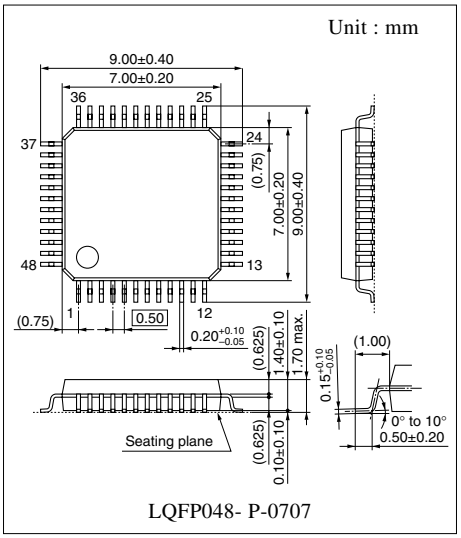
Small-sizing of system and low power dissipation are possible.

■ Features

- Built-in head phone amplifier
- Built-in external/internal microphone switching circuit
- Enables power save mode

■ Applications

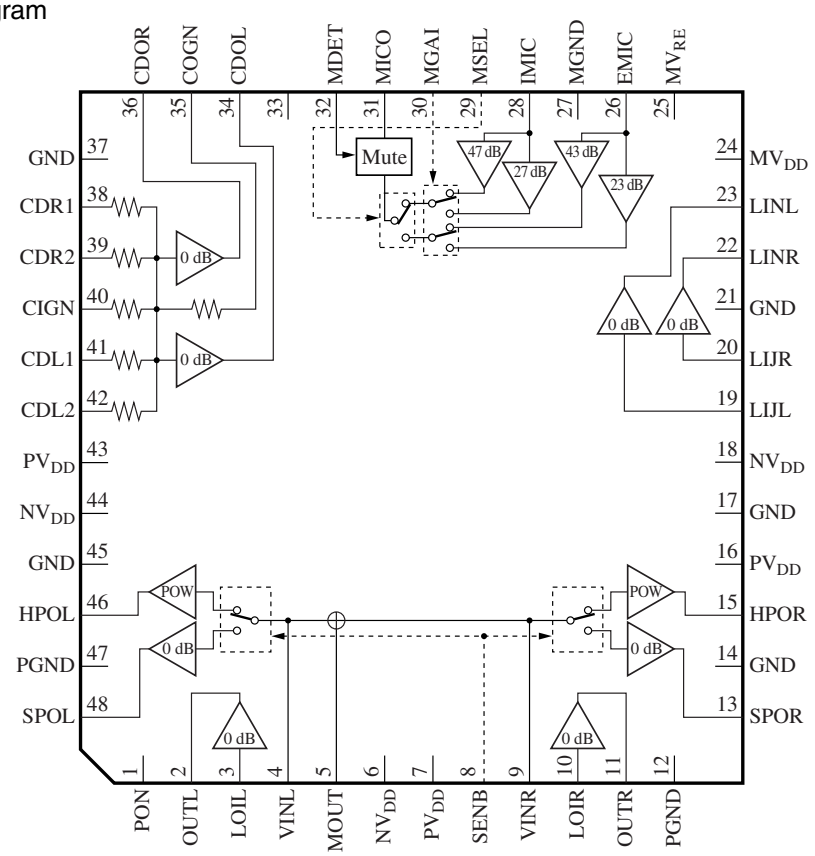
- Note-type personal computer, desk-top personal computer, portable information terminal and others



LQFP048- P-0707

Note) The package of this product will be changed to lead-free type (LQFP048-P-0707A). See the new package dimensions section later of this datasheet.

■ Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Power on control	25	Mic. V_{REF}
2	Line-out jack L-channel	26	External mic. input
3	Line-out input L-channel	27	Mic. GND
4	VR-input L-channel	28	Internal mic. input
5	Mono out	29	Mic. select (int./ext.)
6	$-5V_{DD}$ (power)	30	Mic. gain
7	$+5V_{DD}$ (power)	31	Mic. output
8	Speaker enable	32	Mic. mute
9	VR-input R-channel	33	Mic. NF
10	Line-out input R-channel	34	CD-out L-channel
11	Line-out jack R-channel	35	CD-out GND
12	Power GND	36	CD-out R-channel
13	Speaker-out R-channel	37	GND
14	GND (power)	38	CD-in R-channel 1
15	Headphone-out R-channel	39	CD-in R-channel 2
16	$+5V_{DD}$	40	CD-in GND
17	GND	41	CD-in L-channel 1
18	$-5V_{DD}$	42	CD-in L-channel 2
19	Line-in jack L-channel	43	$+5V_{DD}$
20	Line-in jack R-channel	44	$-5V_{DD}$
21	GND	45	GND
22	Line-in output R-channel	46	Headphone-out L-channel
23	Line-in output L-channel	47	Power GND
24	Mic. amp. V_{DD}	48	Speaker-out L-channel

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	±6	V
Supply current	I_{CC}	15	mA
Power dissipation *2	P_D	180	mW
Operating ambient temperature *1	T_{opr}	−20 to +70	°C
Storage temperature *1	T_{stg}	−55 to +125	°C

Note) ∗1 : T_a = 25°C except operating ambient temperature and storage temperature.
∗2 : T_a = 75°C

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	±4.5 to ±5.0 typ. to ±5.5	V

■ Electrical Characteristics at V_{CC} = ±5 V, f = 1 kHz, T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line-out jack block						
Line-out gain *1	VLO_{LR}	V_{IN} = 1 V[rms], f = 1 kHz	−1	0	1	dB
Line-out total harmonic distortion *1	VLOTH	V_{IN} = 1 V[rms], f = 1 kHz	—	0.01	0.02	%
Line-out output residual noise *2	VLOSN	V_{IN} = 0 V[rms], R_g = 4.7 kΩ	—	−90	−80	dB
Cross talk 1 *1	CT1	V_{IN} = 1 V[rms], f = 1 kHz	—	−70	−60	dB
Speaker-out block						
Sp-out gain *1	VSP_{LR}	V_{IN} = 1 V[rms], f = 1 kHz	−1	0	1	dB
Sp-out total harmonic distortion 2 *1	VSPTH	V_{IN} = 1 V[rms], f = 1 kHz	—	0.01	0.02	%
Sp-out residual noise *2	VSPSN	V_{IN} = 0 V[rms], R_g = 4.7 kΩ	—	−85	−80	dB
Sp-out mute attenuation 1 *1	VMU1	V_{IN} = 1 V[rms], f = 1 kHz	—	−85	−80	dB
Cross talk 2 *1	CT2	V_{IN} = 1 V[rms], f = 1 kHz	—	−70	−60	dB
Headphone amplifier block						
Rated output *1	HP_{THD4}	f = 1 kHz, distortion : 1%, load : 32 Ω	80	100	120	mW
HP-out total harmonic distortion 3 *1	THD3	V_{IN} = 1 V[rms], f = 1 kHz, load : 32 Ω	—	0.01	0.02	%
HP-out residual noise *2	HS/N	V_{IN} = 0 V[rms], f = 1 kHz, R_g = 4.7 kΩ, load : 32 Ω	—	−85	−80	dB
HP-out mute attenuation 2 *1	VMU2	V_{IN} = 1 V[rms], f = 1 kHz, load : 32 Ω	—	−85	−80	dB
Cross talk 3 *1	CT3	V_{IN} = 1 V[rms], f = 1 kHz, load : 32 Ω	—	−70	−60	dB
Line-in jack block						
L-jack gain *1	VLJ	V_{IN} = 1 V[rms], f = 1 kHz	−1	0	1	dB
L-jack total harmonic distortion 4 *1	THDJ	V_{IN} = 1 V[rms], f = 1 kHz	—	0.01	0.02	%
L-jack output residual noise *2	LJSN	V_{IN} = 0 V[rms], R_g = 4.7 kΩ	—	−90	−80	dB
Cross talk 4 *1	CT4	V_{IN} = 1 V[rms], f = 1 kHz	—	−70	−60	dB
CD-ROM block						
CD in gain *1	VCDIN	V_{IN} = 1 V[rms], f = 1 kHz	−1	0	1	dB
CD in total harmonic distortion 5 *1	CDTHD5	V_{IN} = 1 V[rms], f = 1 kHz	—	0.01	0.02	%
CD in output residual noise *2	CDSN	V_{IN} = 0 V[rms], R_g = 4.7 kΩ	—	−85	−80	dB
Cross talk 5 *1	CT5IN	V_{IN} = 1 V[rms], f = 1 kHz	—	−70	−60	dB

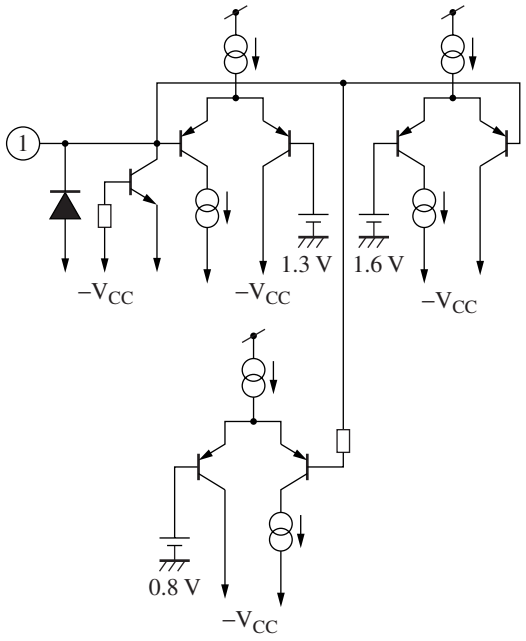
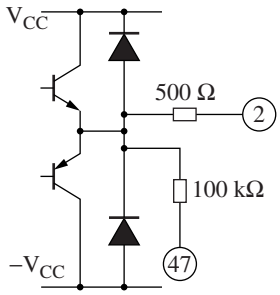
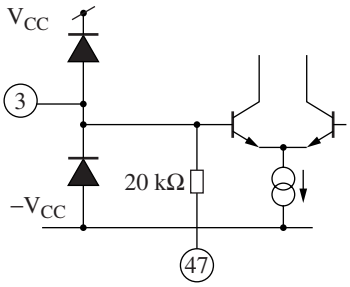
Note) *1 : Using the DIN audio filter.
*2 : Using the A curve filter.

■ Electrical Characteristics at V_{CC} = ±5 V, f = 1 kHz, T_a = 25°C (continued)

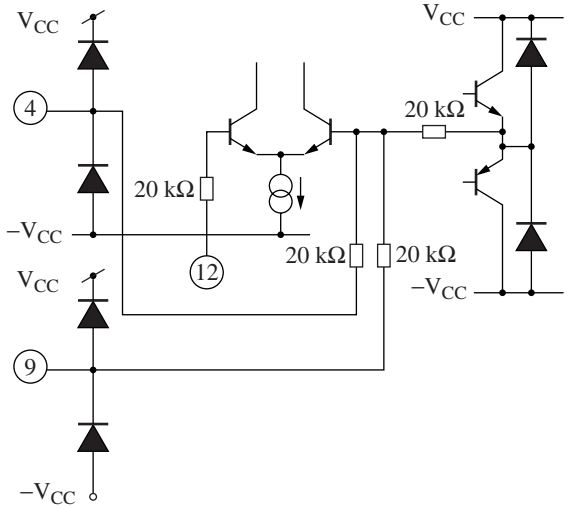
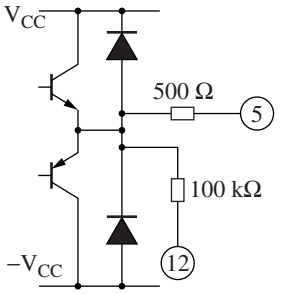
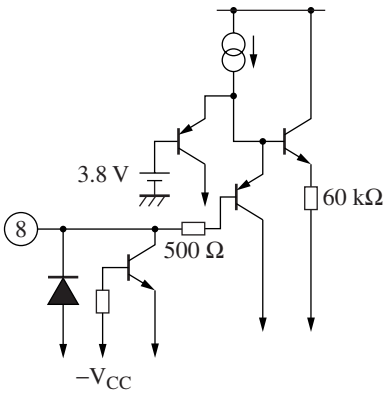
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Internal-mic. block						
Mic.-out voltage 1 *1	V_{INT0}	V_{IN} = 3 mV[rms], f = 1 kHz	0.3	0.7	1	V[rms]
Mic.-out voltage 2 *1	V_{INT1}	V_{IN} = 3 mV[rms], f = 1 kHz	0.03	0.07	0.1	V[rms]
Mic.-out output residual noise *2	MICSN1	V_{IN} = 0 V[rms], R_g = 2.2 kΩ	—	−80	−75	dB
Mic.-out total harmonic distortion 6 *1	THDM6	V_{IN} = 25 mV[rms], f = 1 kHz	—	0.02	0.1	%
Mic.-out mute attenuation 3 *1	VMIMU1	V_{IN} = 3 mV[rms], f = 1 kHz	—	−75	−70	dB
External-mic. block						
Mic.-out voltage 1 *1	V_{EXT0}	V_{IN} = 5 mV[rms], f = 1 kHz	0.3	0.7	1	V[rms]
Mic.-out voltage 2 *1	V_{EXT1}	V_{IN} = 5 mV[rms], f = 1 kHz	0.03	0.07	0.1	V[rms]
Mic.-out output residual noise *2	MICSN2	V_{IN} = 0 V[rms], R_g = 2.2 kΩ	—	−80	−75	dB
Mic.-out total harmonic distortion 7 *1	THDM7	V_{IN} = 25 mV[rms], f = 1 kHz	—	0.02	0.1	%
Mic.-out mute attenuation 4 *1	VMIMU2	V_{IN} = 5 mV[rms], f = 1 kHz	—	−75	−70	dB
Mic. use V_{REF} voltage						
Mic. use V_{REF} DC voltage *1	$MICV_{REFDC}$	Flow out current at pin 25 : 3.3 mA	2.3	2.5	2.7	V
Mic. use V_{REF} voltage ripple noise *1	$MICV_{REFRI}$	Flow out current at pin 25 : 3.3 mA	—	—	0.01	V[p-p]
Circuit current						
Circuit current at no load 1	I_{TOTA1}	No input signal (+V_{CC} side)	5	7	10	mA
Circuit current at no load 2	I_{TOTA2}	No input signal (−V_{CC} side)	5	7	10	mA
Circuit current at power save 1	I_{PWON1}	No input signal (+V_{CC} side)	0.3	1	5	mA
Circuit current at power save 2	I_{PWON2}	No input signal (−V_{CC} side)	0.3	1	5	mA
Low-level mic. balance	MICBL	$V_{EXT1} - V_{INT1}$	—	0	30	mV[rms]
High-level mic. balance	MICBH	$V_{EXT0} - V_{INT0}$	—	0	200	mV[rms]

Note) ∗1 : Using the DIN audio filter.
∗2 : Using the A curve filter.

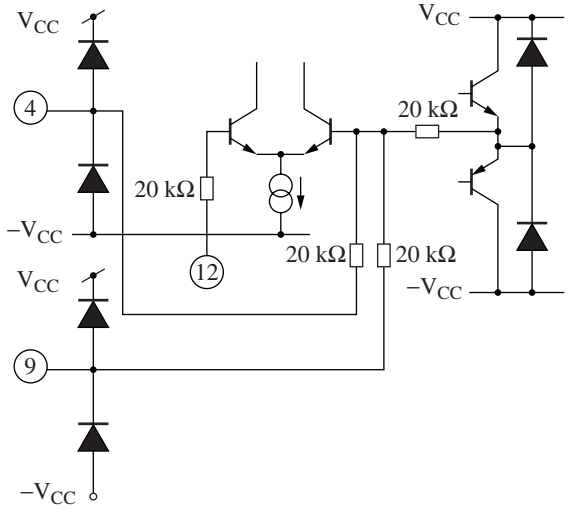
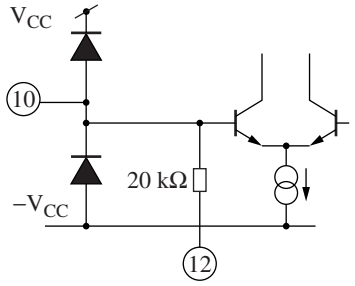
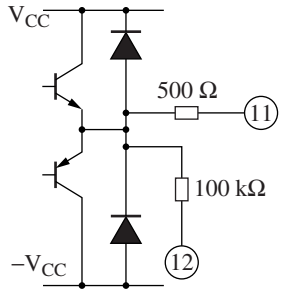
■ Terminal Equivalent Circuits

Pin No.	Equivalent circuit	Description	Pin voltage (V)
1		PON : Switching control pin of power save mode	—
2		OUTL : Output pin of L-channel line-out jack	0
3		LOIL : Input pin of L-channel line-out jack	0

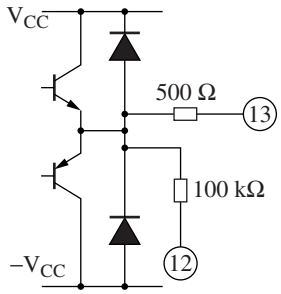
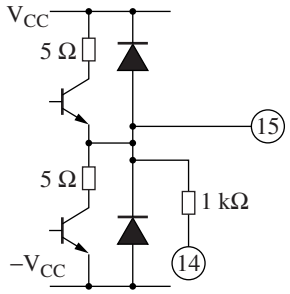
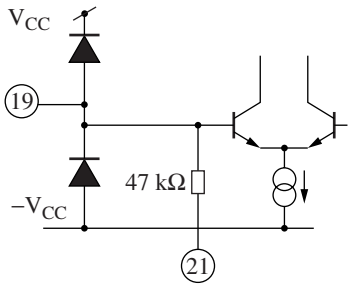
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
4		VINL : Input pin of L-channel VR	0
5		MOUT : Mono output pin of L-channel and R-channel VR	0
6	—	NV_{DD} : $-V_{DD}$ for power stage	−5
7	—	PV_{DD} : $+V_{DD}$ for power stage	+5
8		SENB : Speaker enable	—

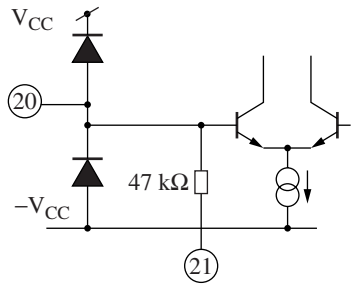
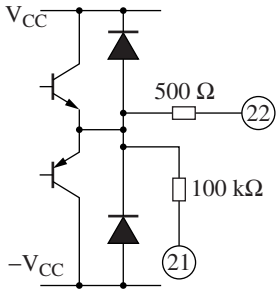
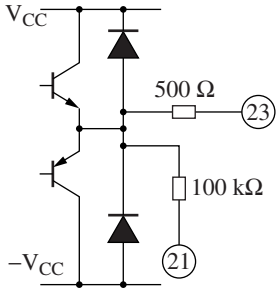
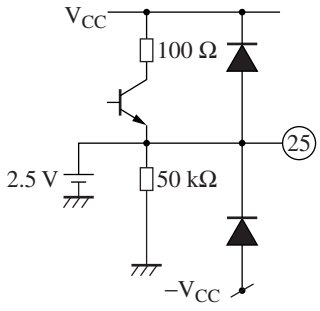
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
9		VINR : Input pin of R-channel VR	0
10		LOIR : Input pin of R-channel line-out jack	0
11		OUTR : Output pin of R-channel line-out jack	0
12	—	PGND : Ground pin	0

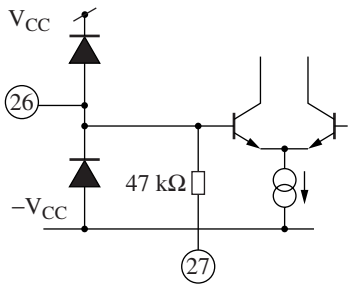
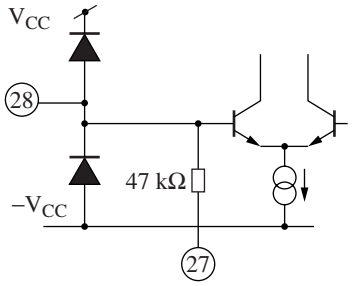
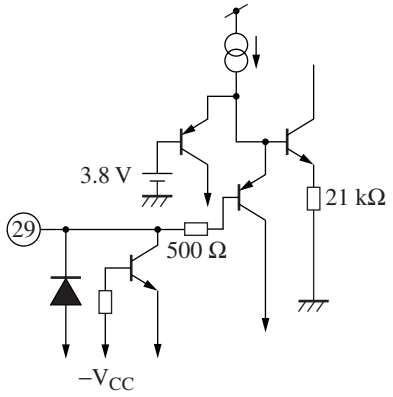
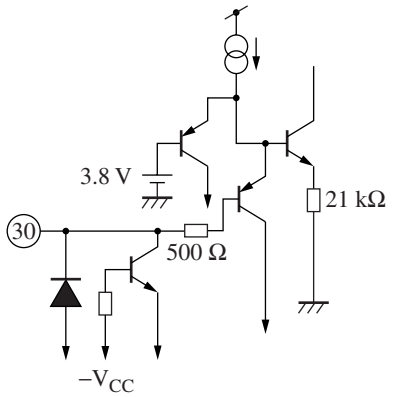
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
13		SPOR : Output pin of R-channel speaker	0
14	—	GND : Ground pin	0
15		HPOR : Output pin of R-channel headphone	0
16	—	PV_{DD} : V_{DD}	+5
17	—	GND : Ground pin	0
18	—	NV_{DD} : $-V_{DD}$	−5
19		LIJL : Input pin of L-channel line-in jack	0

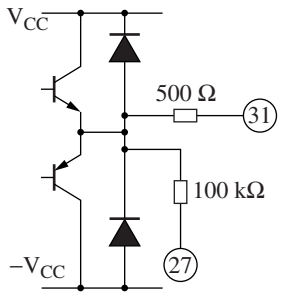
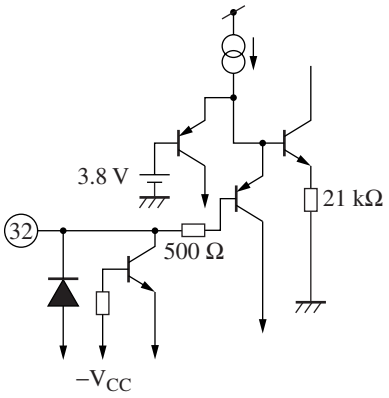
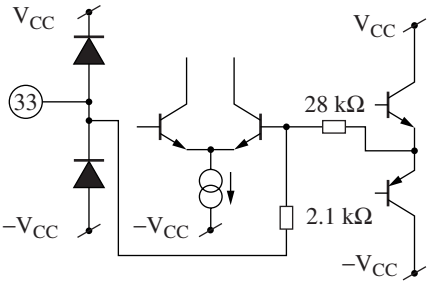
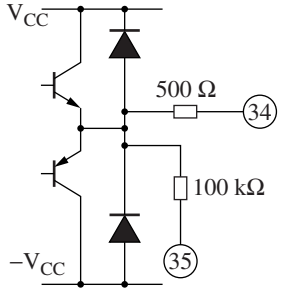
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
20		LIJR : Input pin of R-channel line-in jack	0
21	—	GND : Ground pin	0
22		LINR : Output pin of R-channel line-in jack	0
23		LINL : Output pin of L-channel line-in jack	0
24	—	MV_{DD} : Power supply for mic. amp.	+5
25		MV_{RE} : Power supply for mic.	2.5

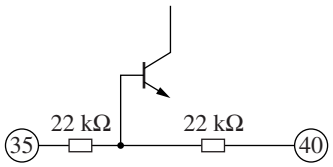
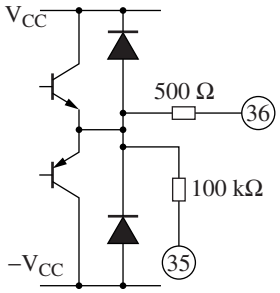
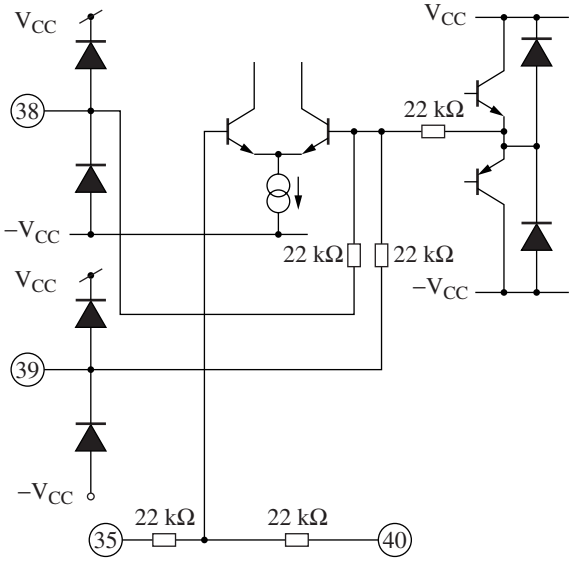
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
26		EMIC : Input pin of external mic. amp.	0
27	—	MGND : Ground pin for mic.	0
28		IMIC : Input pin of internal mic. amp.	0
29		MSEL : Mic. selector (int./ext.)	—
30		MGAI : Mic. gain control	—

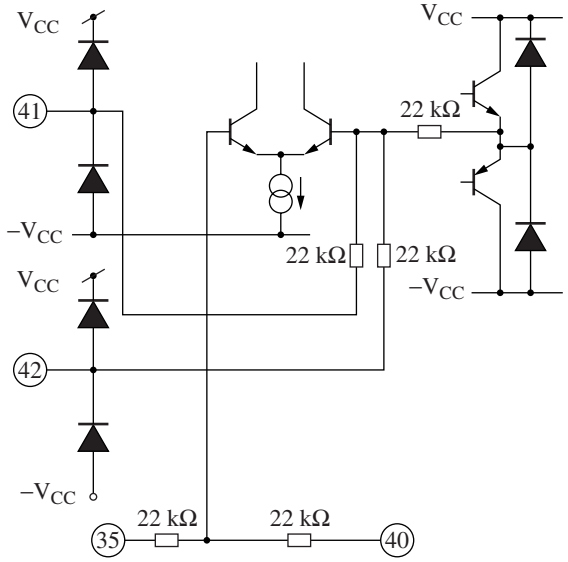
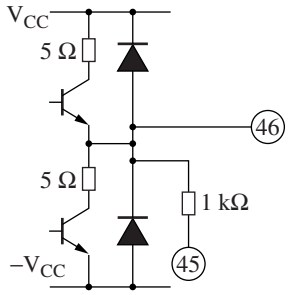
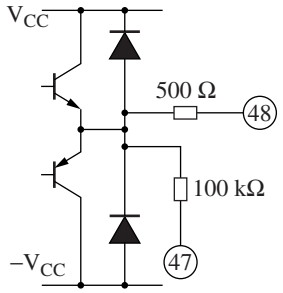
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
31		MICO : Output pin of mic. amp.	0
32		MDET : Mic. mute control	—
33		Mic. NF : Negative feedback pin of mic. amp.	0
34		CDOL : Output pin of L-channel CD-ROM	0

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Pin voltage (V)
35		COGN : Ground pin	0
36		CDOR : Output pin of R-channel CD-ROM	0
37	—	GND : Ground pin	0
38		CDR1 : Input pin of R-channel CD-ROM1	0
39		CDR2 : Input pin of R-channel CD-ROM2	0
40	Refer to pin 35.	CIGN : Ground pin	0

■ Terminal Equivalent Circuits (continued)

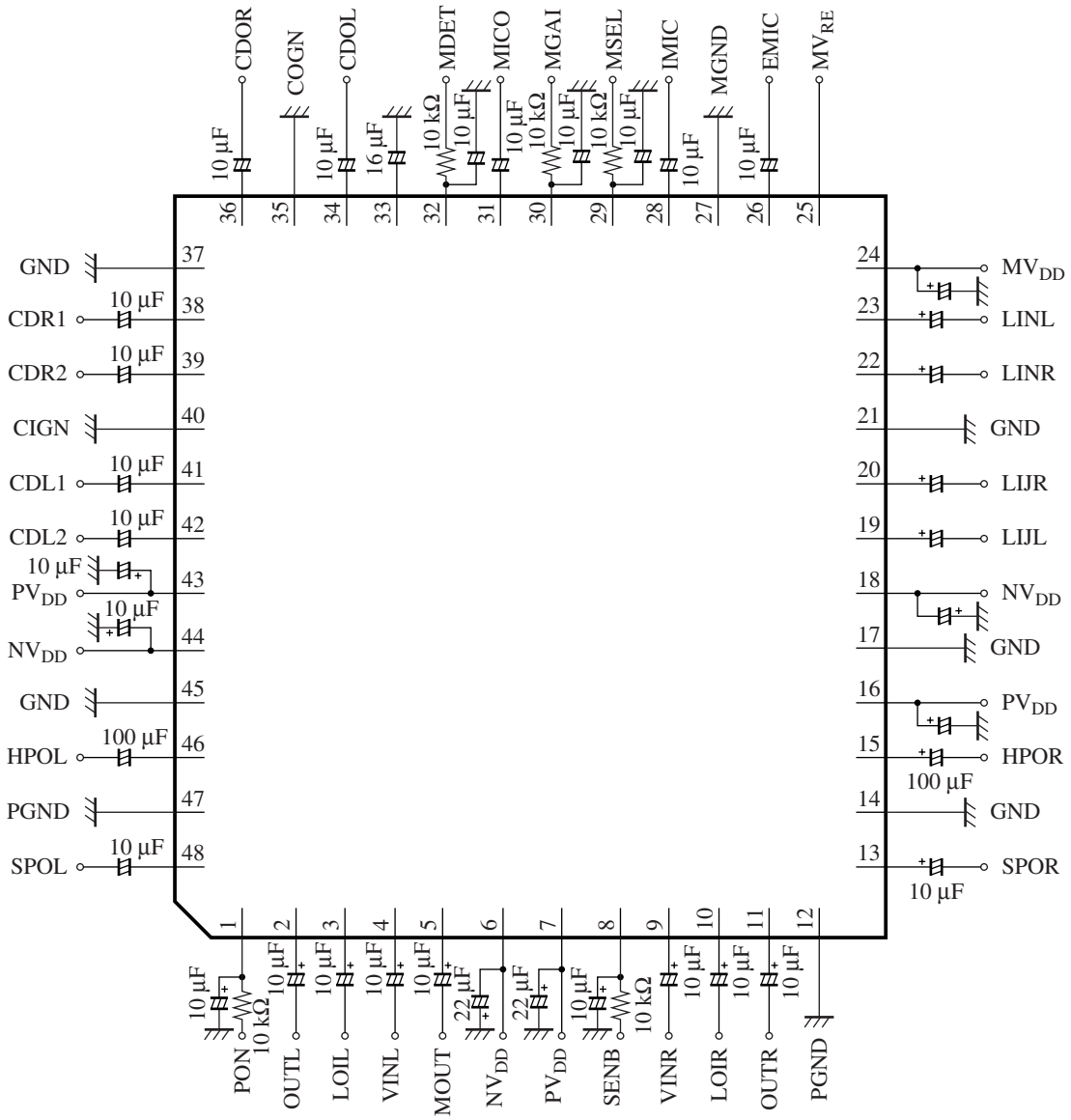
Pin No.	Equivalent circuit	Description	Pin voltage (V)
41		CDL1 : Input pin of L-channel CD-ROM1	0
42		CDL2 : Input pin of L-channel CD-ROM2	0
43	—	PV_{DD} : +power supply	+5
44	—	NV_{DD} : −power supply	−5
45	—	GND : Ground pin	0
46		HPOL : Output pin of L-channel headphone	0
47	—	PGND : Ground pin	0
48		SPOL : Output pin of L-channel speaker	0

■ Technical Information

• Description of each control pin

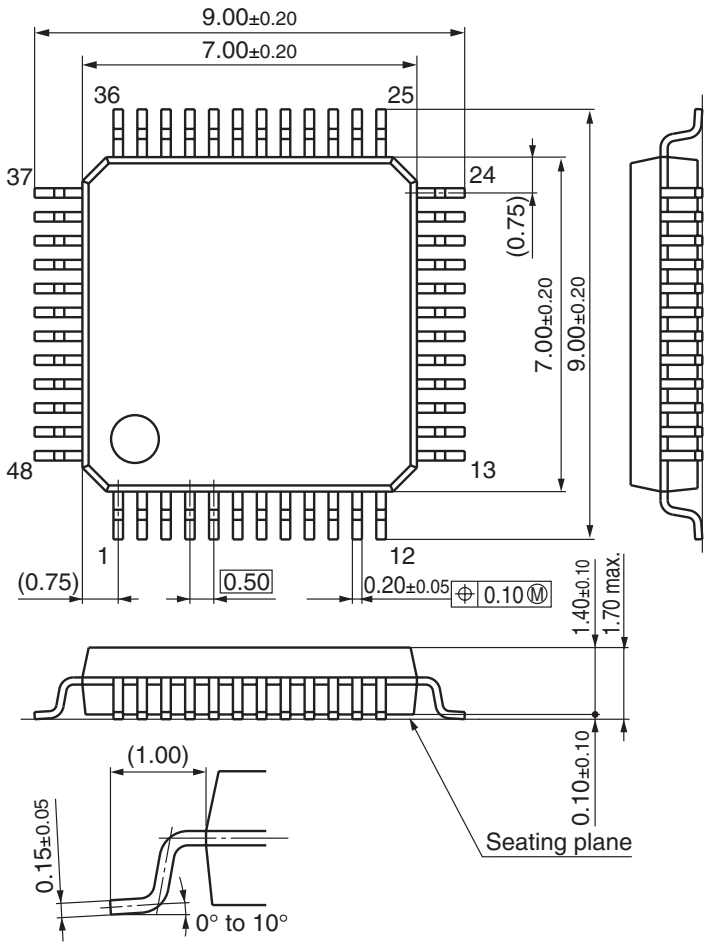
Parameter	Pin No.	Low	High
POWERON	1	Power save mode on	Power save mode off
SPKENB	8	Headphone output mute	Speaker output mute
MICGAIN	30	Mic. amp. gain low	Mic. amp. gain high
MICSEL	29	External mic. selection	Internal mic. selection
MICDET	32	Mic. amp. output mute on	Mic. amp. output mute off

■ Application Circuit Example



■ New Package Dimensions (Unit: mm)

• LQFP048-P-0707A (Lead-free package)



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