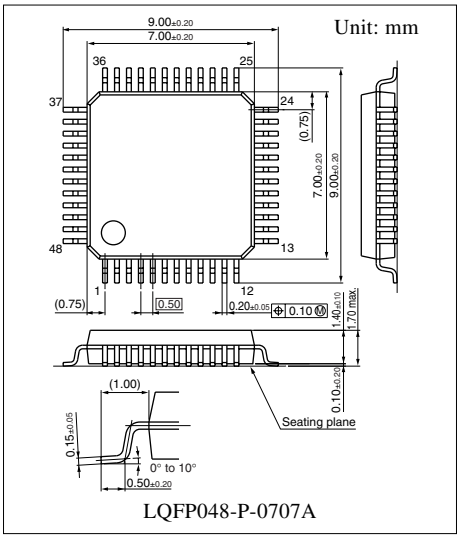
AN2905FHQ

Sound input/output interface IC for digital still camera

■ Overview

The AN2905FHQ is a sound input/output interface IC which is optimum for incorporation of sound functions in a digital still camera. The sound pre-processing prior to the digital processing and sound post-processing after DAC are integrated on a single chip. This IC is effective to make the equipment compact.



LQFP048-P-0707A

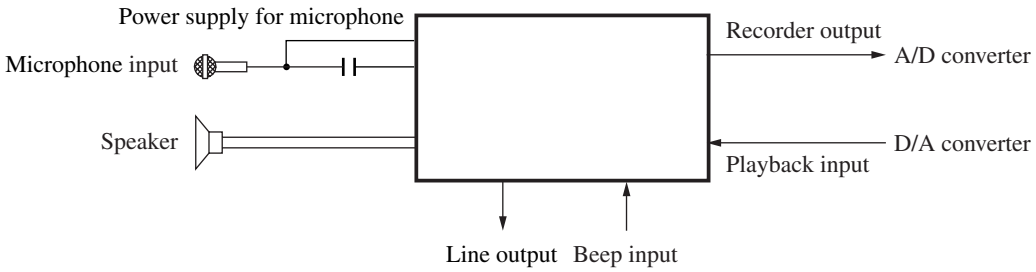
■ Features

- Functions required for the sound pre- and post-processings are integrated on a single chip
- The built-in microphone amp. and microphone power supply
- A built-in 0.5 W BTL amp.
- Built-in SP power save and electronic volume functions
- A beep circuit with electronic volume
- A built-in internal microphone amp. on/off function
- A built-in AGC switch
- A built-in AGC to a speaker amp.
  (Prevents the sound distortion, trembling sound and wire breakdown of the speaker at excessively high voltage signal input)

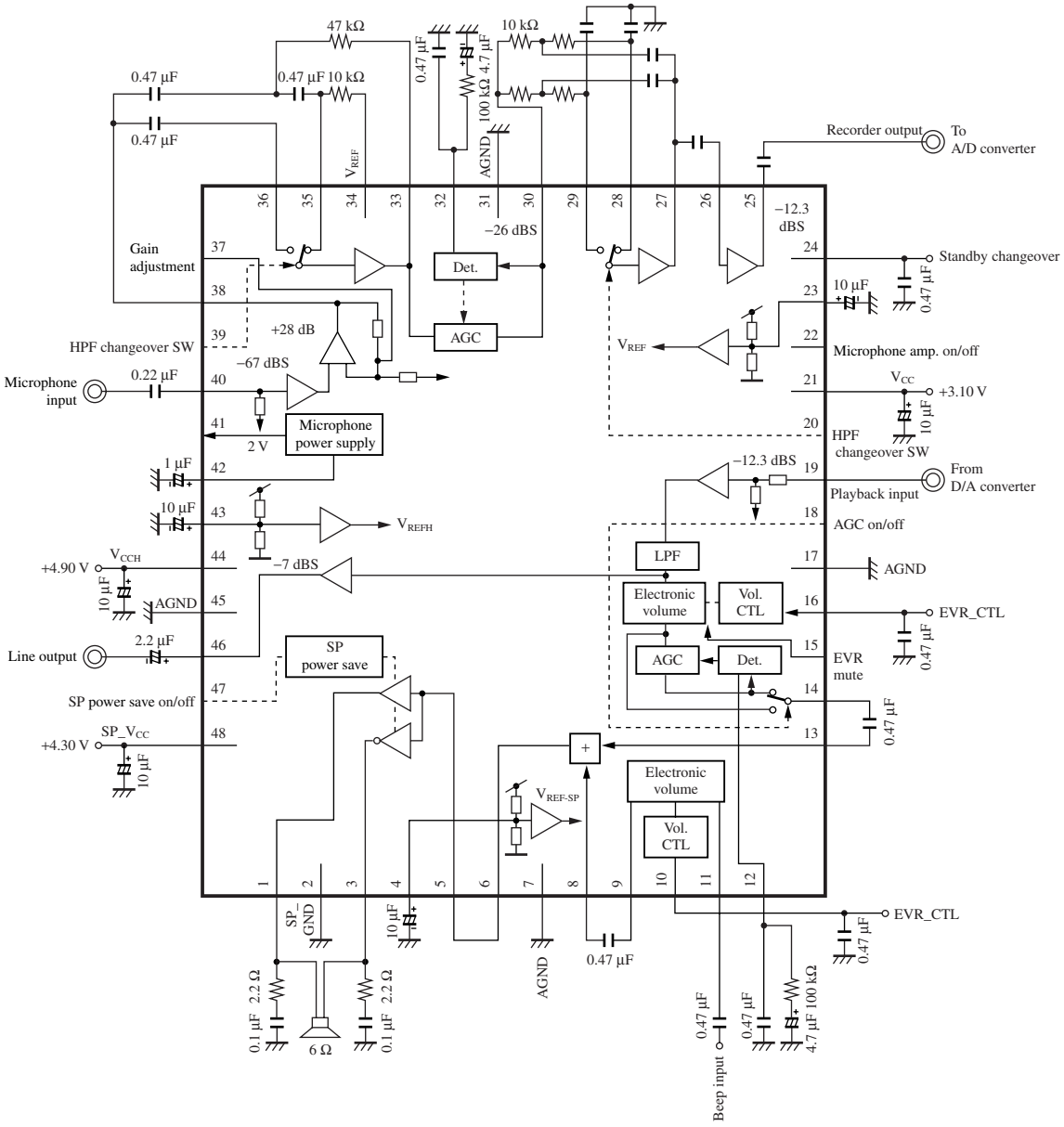
■ Applications

- Digital still camera (DSC)

■ Application Circuit



■ Application Circuit Example



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Speaker output (+)	25	Recorder output
2	GND (for SP)	26	HPF operational amp. input
3	Speaker output (–)	27	Operational amp. output
4	$1/2V_{CC\text{-}SP}$	28	Operational amp. input
5	Speaker amp. input	29	Operational amp. input
6	Mix. amp. output	30	AGC output
7	GND	31	GND
8	Beep mix. amp. input	32	AGC detection pin
9	Beep electronic volume output	33	Wind noise HPF output
10	Beep electronic volume controll	34	Wind noise HPF bias output
11	Beep input	35	Wind noise HPF operational amp. input
12	Playback-system AGC detection pin	36	Wind noise not through HPF input
13	Mix. amp. input	37	Microphone amp. negative feedback pin
14	Electronic volume output	38	Microphone amp. output
15	EVR mute	39	SW against wind noise
16	Electronic volume control	40	Microphone amp. input
17	GND	41	Microphone power supply
18	AGC changeover SW	42	Microphone power supply smoothing pin
19	Playback input	43	$1/2V_{CCH}$ (V_{REFH})
20	HPF changeover SW	44	V_{CCH}
21	V_{CC}	45	GND
22	Microphone amp. power save SW	46	Line output
23	$1/2V_{CC}$ (V_{REF})	47	Speaker power save SW
24	Standby changeover	48	$V_{CC\text{-}SP}$ (for speaker drive)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage *2	V_{CC}	3.5	V
	V_{CCH} /$V_{CC\text{-}SP}$	5.2	
Supply current	I_{CC}	—	A
Power dissipation *3	P_D	361	mW
Operating ambient temperature *1	T_{opr}	–20 to +70	°C
Storage temperature *1	T_{stg}	–55 to +150	°C

Note) ∗1: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.

∗2: When used within the range not exceeding the absolute maximum ratings and the power dissipation.

∗3: The power dissipation shown is for the independent IC without a heat sink at T_a = 70°C.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CCH}	4.50 to 5.00	V
	V_{CC}	2.70 to 3.30	
	$V_{CC\text{-}SP}$	2.70 to 5.00	

■ Electrical Characteristics at V_{CCH} = 4.9 V, $V_{CC\text{-}SP}$ = 4.3 V, V_{CC} = 3.1 V, T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit current						
Circuit current without signal (1A) (V_{CC}-system)	I_{VCCA}	Without signal	2.2	3.2	4.2	mA
Circuit current without signal (2A) (V_{CCH}-system)	I_{VCCHA}	Without signal	2.8	3.8	4.8	mA
Circuit current without signal (3A) ($V_{CC\text{-}SP}$-system)	I_{VCCSA}	Without signal	1.0	3.0	6.0	mA
Circuit current without signal (1B) (V_{CC}-system)	I_{VCCB}	I/O power save	—	0.5	1.5	mA
Circuit current without signal (2B) (V_{CCH}-system)	I_{VCCHB}	I/O power save	—	1.8	2.8	mA
Circuit current without signal (3B) ($V_{CC\text{-}SP}$-system)	I_{VCCSB}	SP power save	—	0.7	1.7	mA
Circuit current without signal (3C) (V_{CCH}-system)	I_{VCCHC}	SP power save	—	3.0	4.0	mA
Circuit current without signal (3D) (V_{CCH}-system)	I_{VCCHD}	SP, I/O power save	—	1.8	2.8	mA
Circuit current without signal (1C) (V_{CC}-system)	I_{VCCC}	Microphone amp. off	—	1.8	2.8	mA
Power supply for microphone						
Microphone supply voltage	V_{MIC}	Output current = −5 mA	1.8	2.0	2.2	V
Microphone amp. characteristics: Microphone amp. input → Microphone amp. output						
Output level	V_{ROM}	V_{IN} = −37 dBS, 1 kHz	−9	−8	−7	dBS
Output THD 1	TH_{ROM1}	V_{IN} = −37 dBS, 1 kHz, up to 5th harmonic	—	0.02	0.10	%
Output noise	N_{ROM}	Without input, using A-curve filter	—	−89	−84	dBS
Output THD 2	TH_{ROM2}	V_{IN} = −33 dBS, 1 kHz, up to 5th harmonic	—	0.02	1.0	%
Rec. AGC characteristics: AGC input → Rec. input						
Rec. reference output level A	V_{ROA}	V_{IN} = −38 dBS, 1 kHz	−13.3	−12.3	−11.3	dBS
Rec. reference output THD 1A	TH_{ROA}	V_{IN} = −38 dBS, 1 kHz, up to 5th harmonic	—	0.01	0.10	%
Rec. output noise voltage A	VN_{ROA}	Without input, using A-curve filter	—	−81	−75	dBS

■ Electrical Characteristics at V_{CCH} = 4.9 V, $V_{CC\text{-}SP}$ = 4.3 V, V_{CC} = 3.1 V, T_a = 25°C (continued)

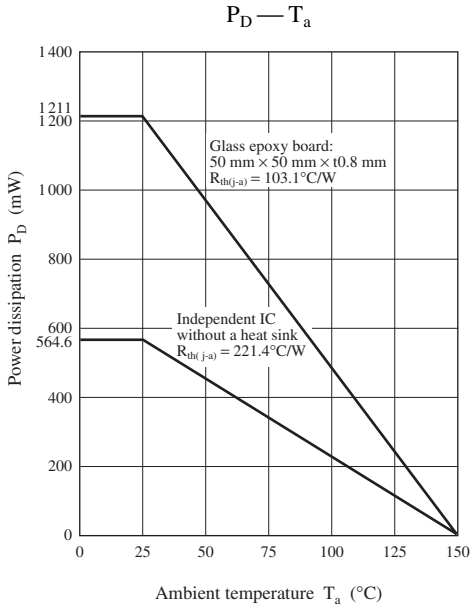
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rec. AGC characteristics (continued): AGC input → Rec. input						
Microphone AGC characteristics 1	V_{AGCML1}	V_{IN} = −33 dBS, 1 kHz	−9.3	−7.3	−5.3	dBS
Microphone AGC characteristics 2	V_{AGCML2}	V_{IN} = −28 dBS, 1 kHz	−9.0	−6.0	−3.0	dBS
Microphone AGC characteristics 3	V_{AGCML3}	V_{IN} = −22 dBS, 1 kHz	−8.8	−5.8	−2.8	dBS
Microphone AGC characteristics 3 THD	TH_{AGCM3}	V_{IN} = −22 dBS, 1 kHz, up to 5th harmonic, load = 22 kΩ	—	0.10	0.40	%
Microphone AGC characteristics 4	V_{AGCM4}	V_{IN} = −4 dBS, 1 kHz	−8.0	−5.0	−2.0	dBV
Microphone AGC characteristics 4 THD	TH_{AGCM4}	V_{IN} = −4 dBS, 1 kHz, up to 5th harmonic, load = 22 kΩ	—	0.15	1.0	%
AGC-DC offset voltage	VD_{ROM}	Without input, difference from V_{REF} voltage	−30	0	30	mV
PB line output characteristics: PB input → Line output						
Line reference output level at playback	V_{LOPS}	V_{IN} = −12.3 dBS, 1 kHz	−8.0	−7.0	−6.0	dBS
Line reference output THD at playback	TH_{LOPS}	V_{IN} = −12.3 dBS, 1 kHz, up to 5th harmonic	—	0.02	0.10	%
Line reference output noise voltage at playback	VN_{OPS}	Without input, using A-curve filter	—	−84	−78	dBS
Line maximum output level at playback	V_{LMAPOS}	f = 1 kHz, load = 22 kΩ, THD = 1% (up to 5th)	2.8	6.3	—	dBS
Line crosstalk Mic. input → Line output	V_{SOPS1}	V_{IN} = −61 dBV, f = 1 kHz, using A-curve filter at PB	—	−83	−78	dBS
Rec. crosstalk 1 PB input → Rec. output	V_{NOM}	V_{IN} = −7.3 dBV, f = 1 kHz, using A-curve filter	—	−81	−73	dBS
Electronic volume characteristics: PB input → EVR output (AGC = off)						
Electronic volume maximum (+10 dB) gain	VE_{VMA}	V_{IN} = −12.3 dBS, 1 kHz, vol. = max. (V_{16} = 3.1 V)	−12.0	−11.0	−10.0	dBS
Electronic volume typical (0 dB) gain	VE_{VTP}	V_{IN} = −12.3 dBS, 1 kHz, vol. = center (V_{16} = 1.55 V)	−24.0	−21.0	−18.0	dBS
Electronic volume minimum (maximum attenuation) gain	VE_{VMI}	V_{IN} = −12.3 dBS, 1 kHz, vol. = min. (V_{16} = 0 V), using A-curve filter	—	−90	−80	dBS
Playback-system characteristics (at AGC on)						
Playback AGC characteristics 1	VPB_{AGC1}	V_{IN} = −22.3 dBS, 1 kHz, vol. = max.	−20	−18	−16	dBS
Playback AGC characteristics 2 (reference +10 dB)	VPB_{AGC2}	V_{IN} = −12.3 dBS, 1 kHz, vol. = max.	−12.5	−9.5	−6.5	dBS
Playback AGC characteristics 3 (reference +22.3 dB)	VPB_{AGC3}	V_{IN} = 0 dBS, 1 kHz, vol. = max.	−11.5	−8.5	−5.5	dBS
Playback AGC characteristics 3 (reference +22.3 dB) THD	$THPB_{AGC3}$	V_{IN} = 0 dBS, 1 kHz, vol. = max., 5th harmonic	—	0.85	1.0	%

■ Electrical Characteristics at V_{CCH} = 4.9 V, V_{CC-SP} = 4.3 V, V_{CC} = 3.1 V, T_a = 25°C (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Speaker output-system characteristics 1 (at AGC off)						
SP reference output level at playback	V_{SPPS}	V_{IN} = −14.3 dBS, 1 kHz, vol. = max., beep EVR = min., R_L = 6 Ω	0.0	1.5	3.0	dBS
SP reference output THD at playback	TH_{SPPS}	V_{IN} = −14.3 dBS, 1 kHz, vol. = max., beep EVR = min., R_L = 6 Ω	—	0.2	0.9	%
SP reference output noise voltage at playback	VN_{SPPS}	Without input, using A-curve filter, vol. = typ., beep EVR = min., R_L = 6 Ω	—	−78	−74	dBS
SP maximum rating output at playback	V_{MSPPS}	f = 1 kHz, vol. = max., beep EVR = min., R_L = 6 Ω, THD = 10%	300	500	—	mW
SP output at power save and playback	V_{PSPPS}	V_{IN} = −14.3 dBS, 1 kHz, vol. = max., using A-curve filter, R_L = 6 Ω	—	−110	−90	dBS
Beep EVR characteristics 1 (at EVR = max.)	V_{BMA}	V_{IN} = −15 dBS, 1 kHz, vol. = min., R_L = 6 Ω	0.0	1.5	3.0	dBS
Beep EVR characteristics 2 (at EVR = min.)	V_{BMI}	V_{IN} = −15 dBS, 1 kHz, vol. = min., using A-curve filter, R_L = 6 Ω	—	−72	−67	dBS
Speaker output-system characteristics 2 (at AGC on)						
SP reference output level at playback	V_{SPPS}	V_{IN} = −12.3 dBS, 1 kHz, vol. = max., beep EVR = min., R_L = 6 Ω	2.0	5.0	6.5	dBS
SP reference output THD at playback	TH_{SPPS}	V_{IN} = −12.3 dBS, 1 kHz, vol. = max., beep EVR = min., R_L = 6 Ω	—	0.2	0.9	%
SP reference output noise voltage at playback	VN_{SPPS}	Without input, using A-curve filter, vol. = typ., beep EVR = min., R_L = 6 Ω	—	−72	−68	dBS
Mode selection hold voltage						
HPF off hold voltage	V_{39L}		0.0	—	0.5	V
HPF on hold voltage	V_{39H}		2.5	—	3.1	V
SP output on hold voltage	V_{47L}		0.0	—	0.5	V
SP output off hold voltage	V_{47H}		2.6	—	4.3	V
Standby on hold time	V_{24L}		0.0	—	0.5	V
Standby off hold time	V_{24H}		2.6	—	3.1	V
Microphone amp. on hold time	V_{22H}		0.0	—	0.5	V
Microphone amp. off hold time	V_{22L}		2.6	—	3.1	V
HPF on hold voltage	V_{20L}		0.0	—	0.5	V
HPF off hold voltage	V_{20H}		2.6	—	3.1	V
AGC on hold voltage	V_{18L}		0.0	—	0.5	V
AGC off hold voltage	V_{18H}		2.6	—	3.1	V
EVR mute on hold voltage	V_{15L}		0.0	—	0.5	V
EVR mute off hold voltage	V_{15H}		2.6	—	3.1	V

■ Technical Data

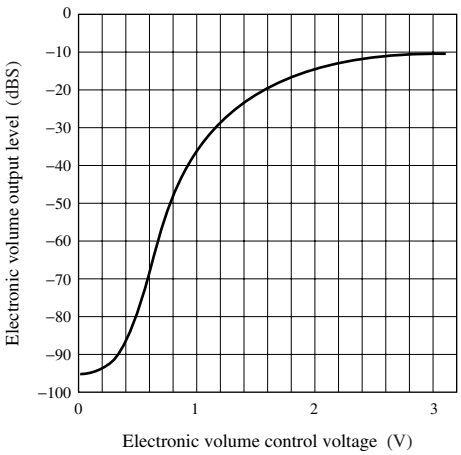
1. P_D — T_a curves of LQFP048-P-0707A



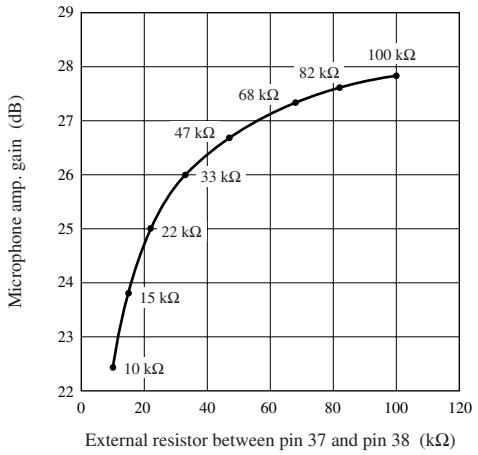
■ Technical Data (continued)

2. Main Characteristics

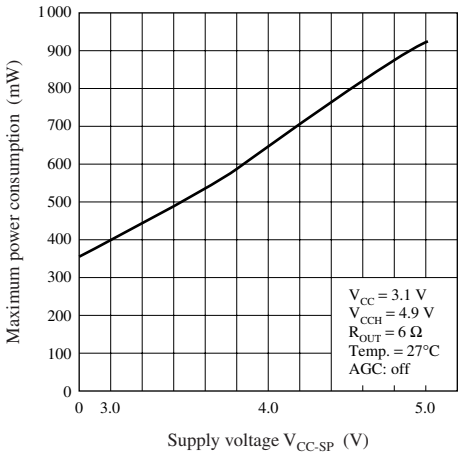
Electronic volume control curve



Microphone amp. gain — External resistor between pin 37 and pin 38



Maximum power consumption — Supply voltage $V_{CC\text{-}SP}$



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