Panasonic

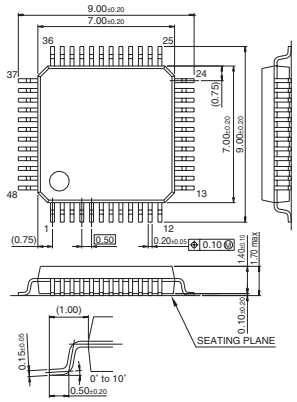
For Digital Still Cameras

Audio Input/Output Interface IC AN2905FHQ

■ Overview

The AN2905FHQ is an audio input/output interface IC for digital still cameras that have built-in audio capability. This IC integrates in single chip configuration all audio processing functions that precede digital processing and follow D/A conversion, thus contributing to more compact equipment design.

Unit:mm



LQFP048-P-0707A

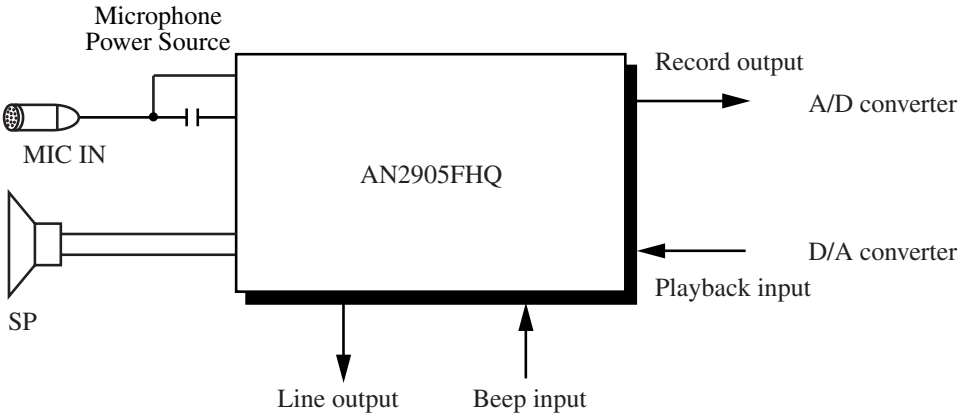
■ Features

- Incorporates in a single chip all necessary functions for pre- and post audio processing.
- Built-in microphone amplifier and microphone power supply.
- Built-in 0.5W BTL amplifier.
- Built-in SP power-save and electronic volume control functions.
- Built-in internal microphone amplifier-off function.
- Built-in AGC SW function.
- Built-in playback AGC function.

■ Applications

- DSC

■ Sample Applications



¶ The products and specifications are subject to change without any notice. Please ask for the latest product standards to guarantee the satisfaction of your product requirements.

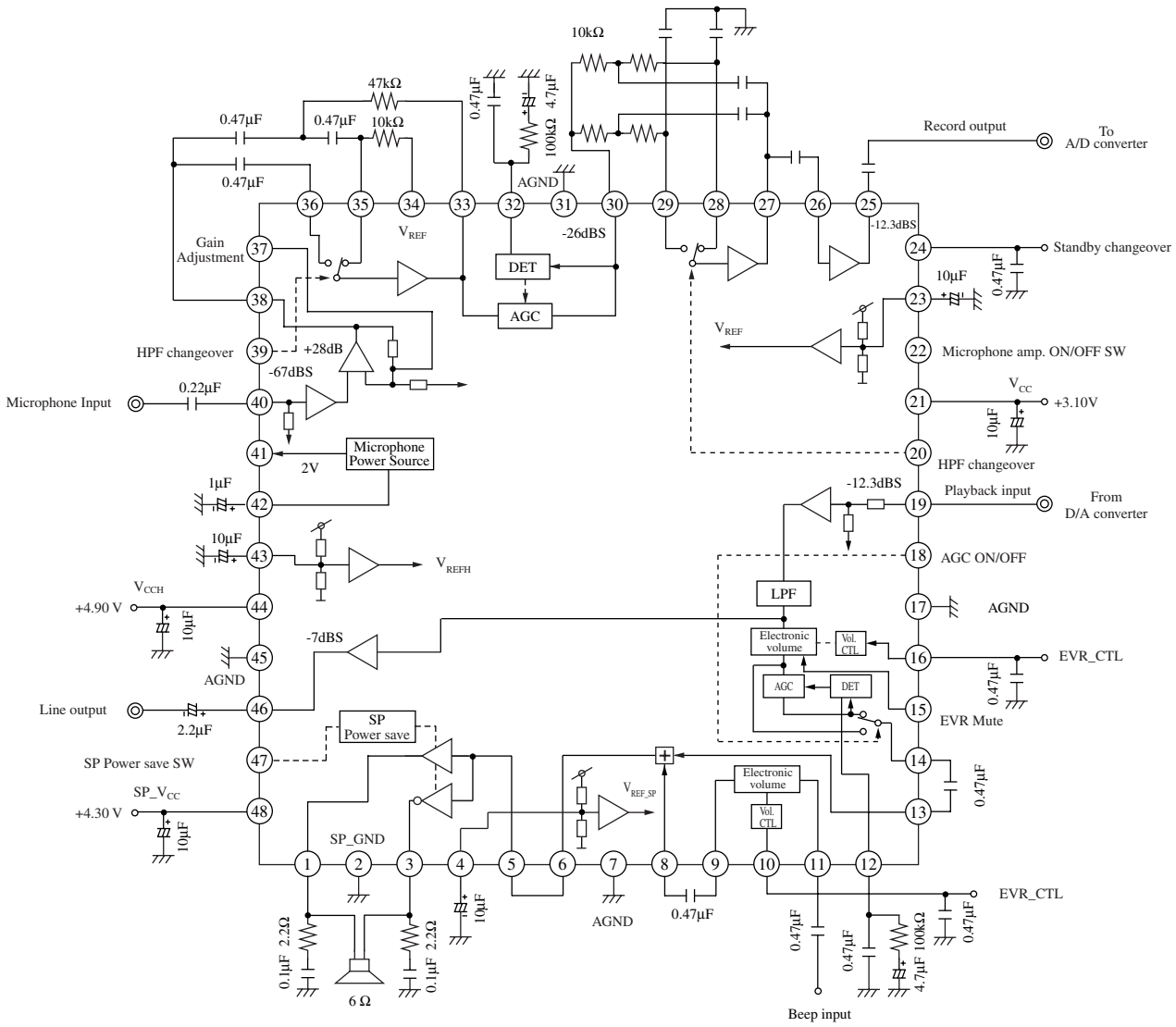
Semiconductor Company, Matsushita Electric Industrial Co., Ltd.

1 Kotari Yakemachi, Nagaokakyo, Kyoto, 617-8520 Japan Tel. (075) 951-8151 http://www.panasonic.co.jp/semicon/

D00090AE

New publication, effective from May. 25. 2001.

■ Block Diagram



■ Pin Descriptions

Pin No.	Function	Pin No.	Function
1	SP Output(+)	25	REC output
2	GND (for SP)	26	HPF OP Amp. input
3	SP Output(-)	27	OP Amp. output
4	$1/2V_{CC\_SP}$	28	OP Amp. input
5	SP Amp. Input	29	OP Amp. input
6	MIX Amp. Output	30	AGC output
7	GND	31	GND
8	MIX Amp. input for Beep	32	AGC Det. pin
9	Electronic Volume Output for Bee	33	Noise for wind HPF output
10	Electronic Volume Control for Beep	34	Noise for wind HPF bias output
11	Beep input	35	Noise for wind HPF OP Amp. input
12	AGC Det. pin for playback	36	Noise for wind HPF through input
13	MIX Amp. input	37	MIC Amp. negative feedback pin
14	Electronic Volume Output	38	MIC Amp. Output
15	EVR mute	39	Noise for wind SW
16	Electronic Volume Control	40	MIC Amp. Input
17	GND	41	MIC Power supply
18	AGC changeover SW	42	MIC Power supply filter
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	SP Power save SW
24	Standby changeover	48	V_{CC_SP} (for SP drive)

■ Absolute Maximum Ratings

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

Note 1) Ta=25°C except storage temperature and operating ambient temperature.

Note 2) When used within the range not exceeding the absolute maximum ratings and the power dissipation.

Note 3) Power dissipation shows the value of only package at Ta=70°C.

■ Recommended Operating Range

Operating supply voltage range	V_{CCH}	4.50 to 5.00 V
	V_{CC}	2.70 to 3.30 V
	V_{CC_SP}	2.70 to 5.00 V

■ Electrical Characteristics (Ta=25°C±2°C, V_{CCH}=4.9V, V_{CC_SP}=4.1V, V_{CC}=3.1V)

Parameter	Symbol	Condition	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) ($V_{CC\text{-}H}$-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) ($V_{CC\text{-}H}$-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) ($V_{CC\text{-}H}$-system)	I_{VCCHC}	SP power save	-	3.0	4.0	mA
Circuit current without signal (3D) ($V_{CC\text{-}H}$-system)	I_{VCCHD}	SP,I/O power save	-	1.8	2.8	mA
Circuit current without signal (1C) (V_{CC} -system)	I_{VCCC}	MIC amp. OFF	-	1.8	2.8	mA
Power supply for microphone						
Microphone supply voltage	V_{MIC}	I_O= -5 mA	1.8	2.0	2.2	V

■ Electrical Characteristics (Ta=25°C±2°C,V_{CCH}=4.9V,V_{CC_SP}=4.1V,V_{CC}=3.1V)

Parameter	Symbol	Condition	min	typ	max	Unit
Microphone amp. Characteristics		Microphone amp. input → Microphone amp. output				
Output level	V_{ROM}	Vin = -37 dBS,1 kHz	-9	-8	-7	dBS
Output distortion factor 1	TH_{ROM1}	Vin = -37 dBS,1 kHz,up to 5th THD	-	0.02	0.10	%
Output noise	N_{ROM}	Without signal, using A-curve filter	-	-89	-84	dBS
Output distortion factor 2	TH_{ROM2}	Vin = -33 dBS,1 kHz,up to 5th THD	-	0.02	1.0	%
Rec. AGC characteristic		AGC input→Rec. input				
Rec. reference output level A	V_{ROA}	Vin = -38 dBS,1 kHz	-13.3	-12.3	-11.3	dBS
Rec. reference output distortion factor 1A	TH_{ROA}	Vin = -38 dBS,1 kHz,up to 5th THD	-	0.01	0.10	%
Rec.reference output noise A	VN_{ROA}	Without signal, using A-curve filter	-	-81	-75	dBS
MIC AGC characteristics 1	V_{AGCML1}	Vin = -33 dBS,1 kHz	-9.3	-7.3	-5.3	dBS
MIC AGC characteristics 2	V_{AGCML2}	Vin = -28 dBS,1 kHz	-9.0	-6.0	-3.0	dBS
MIC AGC characteristics 3	V_{AGCML3}	Vin = -22 dBS,1 kHz	-8.8	-5.8	-2.8	dBS
MIC AGC characteristics 3 distortion factor	TH_{AGCM3}	Vin = -22 dBS,1 kHz up to 5th THD,load = 22 kΩ	-	0.10	0.40	%
MIC AGC characteristics 4	V_{AGCM4}	Vin = -4 dBS,1 kHz	-8.0	-5.0	-2.0	dBV
MIC AGC characteristics 4 distortion factor	TH_{AGCM4}	Vin = -4 dBS,1 kHz up to 5th THD,load = 22 kΩ	-	0.15	1.0	%
AGC DC offset voltage	VD_{ROM}	Without signal, difference from V_{REF}	-30	0	30	mV
PB line output characteristics		PB input → LINE output				
Line reference output level at playback	V_{LOPS}	Vin = -12.3 dBS,1 kHz	-8.0	-7.0	-6.0	dBS
Line reference output distortion factor at playback	TH_{LOPS}	Vin = -12.3 dBV,1 kHz up to 5th THD	-	0.02	0.10	%
Line reference output noise at playback	VN_{OPS}	Without signal, 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 closstalk Mic.-in →Line out	V_{SOPS1}	Vin = -61 dBV,f = 1 kHz using A-curve filter,at playback	-	-83	-78	dBS
REC closstalk 1 PB-in → Rec.-out	V_{SOPS1}	Vin = -7.3 dBV,f = 1 kHz using A-curve filter	-	-81	-73	dBS

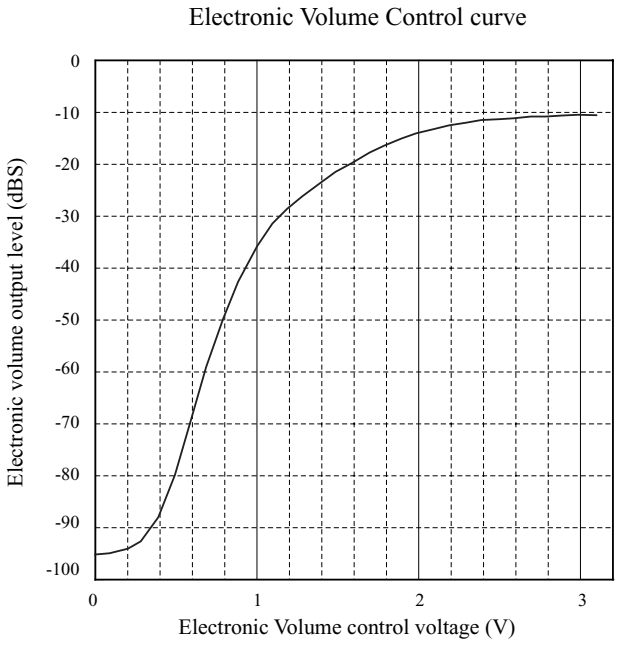
■ Electrical Characteristics (Ta=25°C±2°C,V_{CCH}=4.9V,V_{CC_SP}=4.1V,V_{CC}=3.1V)

Parameter	Symbol	Condition	min	typ	max	Unit
Electronic Volume Characteristic	PB input→ EVR output (AGC=OFF)					
Electronic Volume MAX (+10dB)gain	VE_{VMA}	Vin = -12.3 dBS,1 kHz Vol.= MAX(V_{16}=3.1 V)	-12.0	-11.0	-10.0	dBS
Electronic Volume TYP (0dB)gain	VE_{VTP}	Vin = -12.3 dBS,1 kHz Vol.= CENTER(V_{16}=1.55 V)	-24.0	-21.0	-18.0	dBS
Electronic Volume MIN ((maximum attenuation)gain	VE_{VMI}	Vin = -12.3 dBS,1 kHz Vol.= MIN(V_{16}=0 V),using A-curve filter	-	-90	-80	dBS
Playback system AGC ON characteristics						
AGC characteristics 1	VPB_{AGC1}	Vin = -22.3 dBS,1 kHz Vol.=MAX	-20	-18	-16	dBS
AGC characteristics 2 Reference +10dB	VPB_{AGC2}	Vin = -12.3 dBS,1 kHz Vol.=MAX	-12.5	-9.5	-6.5	dBS
AGC characteristics 3 Reference +22.3dB	VPB_{AGC3}	Vin = 0 dBS,1 kHz Vol.=MAX	-11.5	-8.5	-5.5	dBS
AGC characteristics 3 Reference +22.3dB distortion factor	$THPB_{AGC3}$	Vin = 0 dBS,1 kHz Vol.=MAX,up to 5th THD	-	0.85	1.0	%
Speaker output-system characteristics 1 (AGC OFF)						
Reference output level at playback	V_{SPPS}	Vin = -14.3 dBS,1 kHz,Vol=MAX Beep EVR = MIN,R_L = 6 Ω	0.0	1.5	3.0	dBS
Reference output distortion factor at playback	TH_{SPPS}	Vin = -14.3 dBS,1 kHz,Vol=MAX Beep EVR = MIN,R_L = 6 Ω	-	0.2	0.9	%
Reference output noise voltage at playback	VN_{SPPS}	without signal, using A-curve filter Vol=TYP,Beep EVR = MIN,R_L= 6 Ω	-	-78	-74	dBS
maximum rating output at playback	V_{MSPPS}	f = 1 kHz,Vol = MAX Beep EVR = MIN,R_L = 6 Ω,THD = 10 %	300	500	-	mW
Power save output at playback	V_{PSPPS}	Vin = -14.3 dBS,1 kHz,Vol=MAX using A-curve filter, R_L = 6 Ω	-	-110	-90	dBS
Beep EVR characteristics 1 (EVR = MAX)	V_{BMA}	Vin = -15 dBS,1 kHz Vol = MIN,R_L = 6 Ω	0.0	1.5	3.0	dBS
Beep EVR characteristics 2 (EVR = MIN)	V_{BMI}	Vin = -15 dBS,1 kHz,Vol = MIN using A-curve filter,R_L = 6 Ω	-	-72	-67	dBS
Speaker output-system characteristics 2 (AGC ON)						
Reference output level at playback	V_{SPPS}	Vin = -12.3 dBS,1 kHz,Vol=MAX Beep EVR = MIN,R_L = 6 Ω	2.0	5.0	6.5	dBS
Reference output distortion factor at playback	TH_{SPPS}	Vin = -12.3 dBS,1 kHz,Vol=MAX Beep EVR = MIN,R_L = 6 Ω	-	0.2	0.9	%
Reference output noise voltage at playback	VN_{SPPS}	without signal,Ausing A-curve filter Vol=TYP,Beep EVR = MIN,R_L= 6Ω	-	-72	-68	dBS

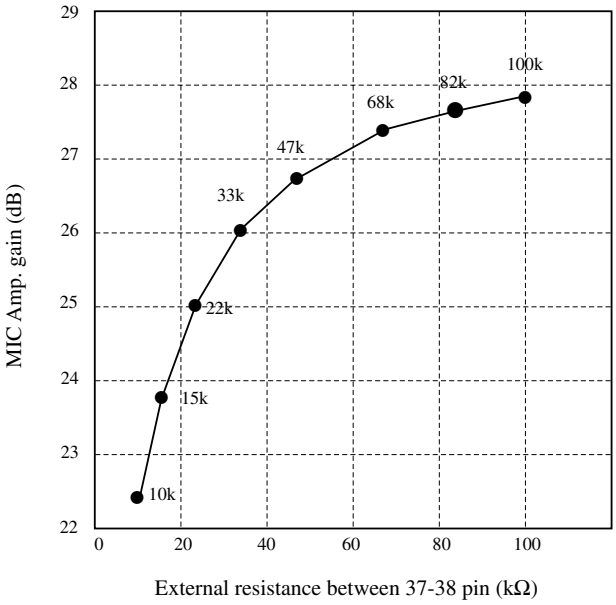
■ Electrical Characteristics (Ta=25°C±2°C,V_{CCH}=4.9V,V_{CC_SP}=4.1V,V_{CC}=3.1V)

Parameter	Symbol	Condition	min	typ	max	Unit
Mode selection hold voltage						
HPF OFF hold voltage range	V_{39L}	-	0.0	-	0.5	V
HPF ON hold voltage range	V_{39H}	-	2.5	-	3.1	V
SP output ON hold voltage range	V_{47L}	-	0.0	-	0.5	V
SP output OFF hold voltage range	V_{47H}	-	2.6	-	4.3	V
Standby ON hold voltage range	V_{24L}	-	0.0	-	0.5	V
Standby OFF hold voltage range	V_{24H}	-	2.6	-	3.1	V
MIC Amp. ON hold voltage range	V_{22H}	-	0.0	-	0.5	V
MIC Amp. OF F hold voltage range	V_{22L}	-	2.6	-	3.1	V
HPF ON hold voltage range	V_{20L}	-	0.0	-	0.5	V
HPF OFF hold voltage range	V_{20H}	-	2.6	-	3.1	V
AGC ON hold voltage range	V_{18L}	-	0.0	-	0.5	V
AGC OFF hold voltage range	V_{18H}	-	2.6	-	3.1	V
EVR mute ON hold voltage range	V_{15L}	-	0.0	-	0.5	V
EVR mute OFF hold voltage range	V_{15H}	-	2.6	-	3.1	V

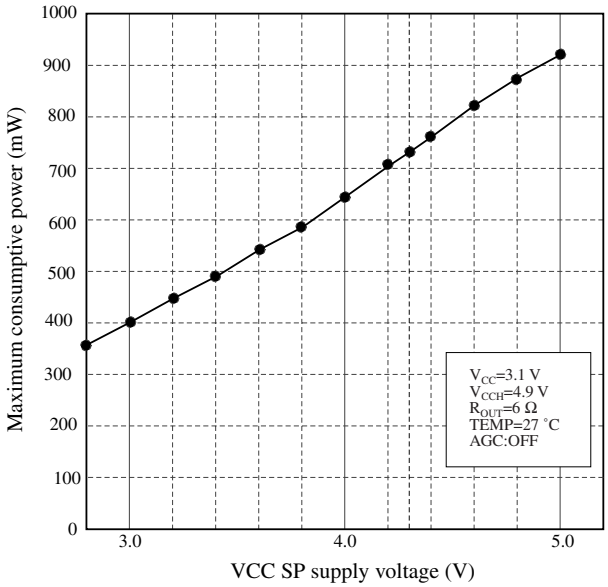
■ Characteristics Curve



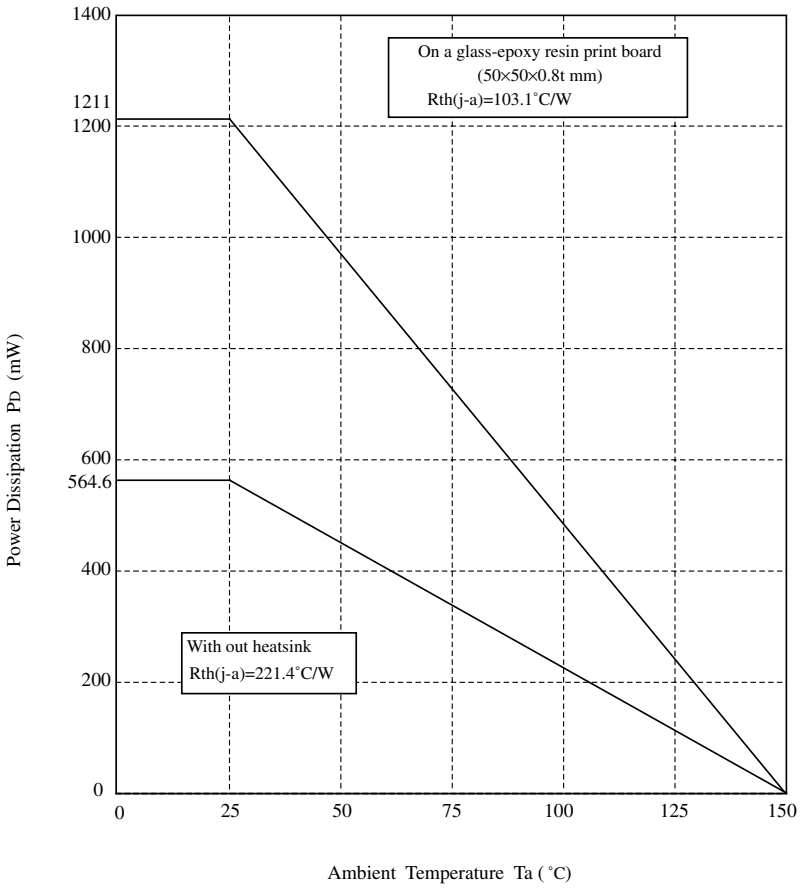
External resistance vs MIC Amp.gain



VCC SP vs maximum consumptive power



■ Package Power Dissipation



Request for your special attention and precautions in using the technical information and semiconductors described in this material

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.

(3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.

(6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.

Please read the following notes before using the datasheets

A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.

B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.

C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.

2001 MAR