

# DATA SHEET

Part No.	AN12974A
Package Code No.	XLGA032-L-0505


SEMICONDUCTOR COMPANY  
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

---

## Contents

■ Overview .....	3
■ Features .....	3
■ Applications .....	3
■ Package .....	3
■ Type .....	3
■ Application Circuit Example .....	4
■ Pin Descriptions .....	5
■ The Mode Table .....	5
■ Absolute Maximum Ratings .....	6
■ Operating Supply Voltage Range .....	6
■ Electrical Characteristics .....	7
■ Electrical Characteristics (Design Reference Data) .....	8
■ Test Circuit Diagram .....	9
■ Measure Method of Electrical Characteristics .....	10
■ Technical Data .....	11
• The power and logic timing .....	14
• The power timing of $V_{CC}$ and $V_{CC-SP}$ .....	14
• Pin 6: AGC on/off switch terminal .....	14
• Pin 32: 3D surround spatializer® on/off switch .....	14
• Output power when AGC is on .....	15
• Amplifier output wave pattern .....	16
• Power dissipation of package XLGA032-L-0505 .....	17
• Main characteristics .....	17
■ Usage Notes .....	30
■ Licensing Agreement .....	30
■ Package Outline .....	31

# AN12974A

Stereo power amplifier with built-in AGC circuitry and SPATIALIZER® 

## ■ Overview

The AN12974A audio power amplifier features built-in AGC circuitry and Spatializer® environ™.

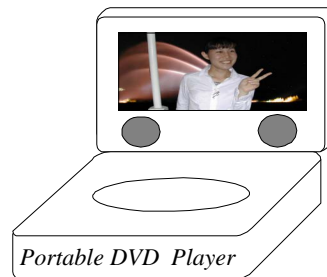
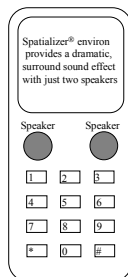
The Spatializer® environ™ is Desper Products, Inc.'s exclusive signal processing technology that is able to generate surround sound for low-power mobile applications. The technology is based on the company's commercial 3D audio production system, PRO-Spatializer® Audio Production System. The AN12974A IC employs the same innovative technology of the PRO-Spatializer® Audio Production System to enhance sound for products with close proximity speakers such as those on headphones and cellular phones to expand the soundfield for a much more spacious sound.

## ■ Features

- Delivers spacious 3D sound for a stereo system with such as cellular phones' speakers in close proximity.
- The AGC circuitry can activate to minimize distortion, raising the average volume level and it can prevent speaker from breaking when an input level is too high.
- High output BTL power amplifier, when AGC is on, speaker output: 700mW  
( $V_{CC-SP} = 4.2\text{ V}$ ,  $RL = 8\ \Omega$ , when AGC is on, the rate of the output wave pattern's distortion would be approximately 1%)
- Operating supply voltage:  $V_{CC} = 2.55\text{ V to }3.5\text{ V}$ ,  $V_{CC-SP} = 2.55\text{ V to }4.5\text{ V}$

## ■ Applications

- Cellular phones, PDAs and portable DVD players



## ■ Package

- 32-pin fine pitch land grid array package (XLGA type)

## ■ Type

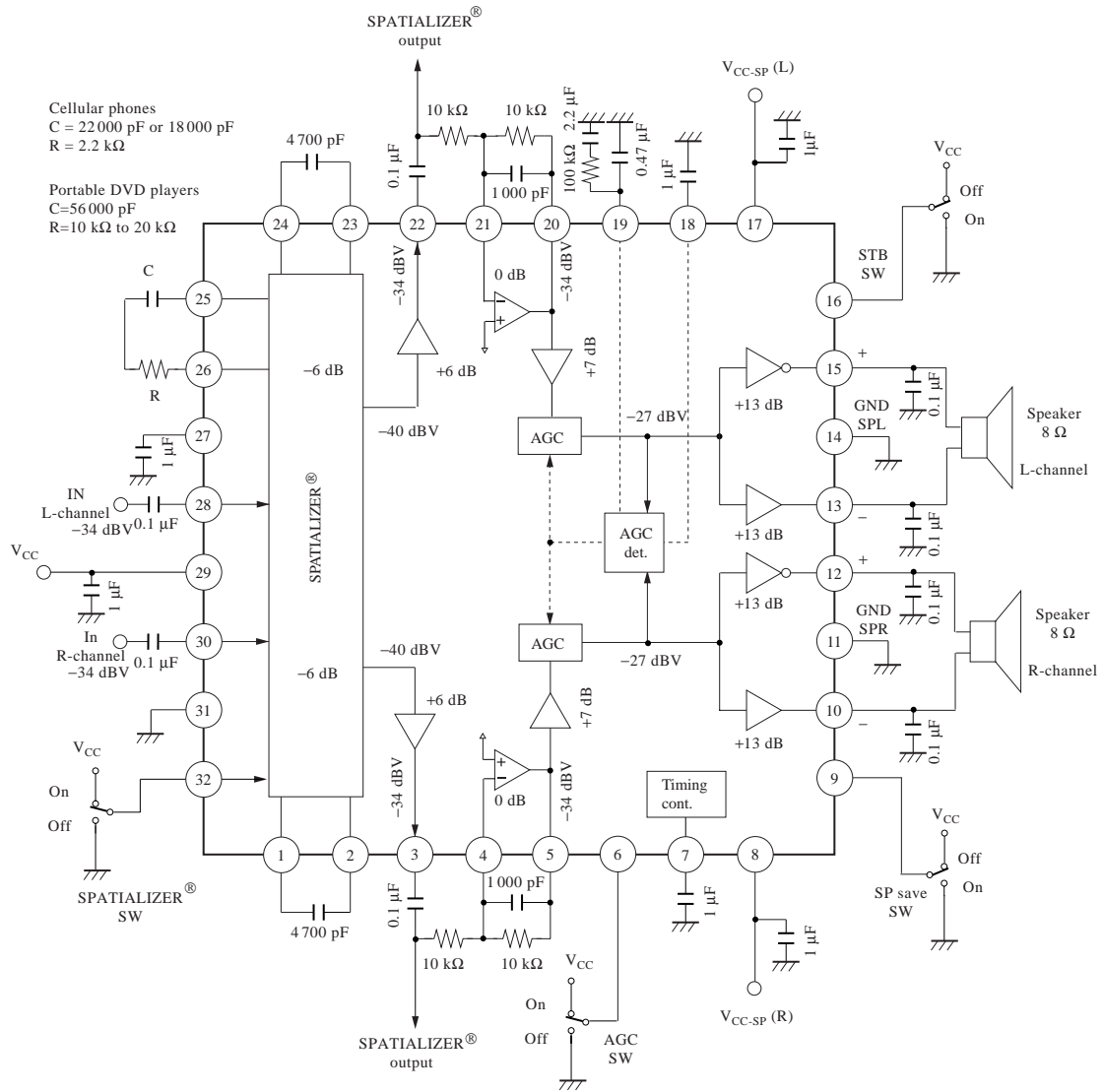
- Silicon monolithic bipolar IC

Note) Spatializer® and the circle-in-square device trademark are owned by Desper Products, Inc.

Products and specifications are subject to change without notice.

Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

Application Circuit Example



### ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Surround filter terminal r-channel 1	17	$V_{CC-SP}$ (L-channel)
2	Surround filter terminal r-channel 2	18	$1/2 V_{CC-SP}$ ( $V_{REF-SP}$ )
3	Surround output r-channel	19	AGC detecting terminal
4	Gain adjustment reflection amplifier output r-channel	20	Gain adjustment reflection amplifier output l-channel
5	Gain adjustment reflection amplifier output r-channel	21	Gain adjustment reflection amplifier output l-channel
6	AGC on/off switch	22	Surround output l-channel
7	Pre-charge timing condenser terminal	23	Surround filter terminal l-channel 2
8	$V_{CC-SP}$ r-channel	24	Surround filter terminal l-channel 1
9	Speaker power save on/off switch	25	Surround effect adjustment 1
10	Speaker output r-channel (-)	26	Surround effect adjustment 2
11	GND (Speaker r-channel)	27	$1/2 V_{CC}$ ( $V_{REF}$ )
12	Speaker output r-channel (+)	28	Audio input terminal l-channel
13	Speaker output l-channel (-)	29	$V_{CC}$
14	GND (Speaker l-channel)	30	Audio input terminal r-channel
15	Speaker output l-channel (+)	31	GND
16	All standby on/off switch	32	Surround on/off switch

### ■ The mode table

Pin No.	Function	Mode		Explanation of operation
		Low	High	
32	Surround on/off switch	Off	On	On/off of spatializer <sup>®</sup> function is controlled.
6	AGC on/off switch	Off	On	On/off of AGC function for speaker is controlled.
9	Speaker power save on/off switch	On	Off	On/off of power amplifier for speaker is controlled.
16	All standby on/off switch	On	Off	On/off of all functions of IC is controlled.

### ■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Supply voltage	$V_{CC}$	3.6	V	*1
		$V_{CC-SP}$	5.0		
2	Supply current	$I_{CC}$	—	A	—
3	Power dissipation	$P_D$	—	mW	*2
4	Operating ambient temperature	$T_{opr}$	-20 to +70	°C	*3
5	Storage temperature	$T_{stg}$	-55 to +150	°C	*3

Note) \*1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

\*2: Power dissipation shows the value of independent IC without a heat sink at  $T_a = 70^\circ\text{C}$ .

(Reference to ■ Technical Data, • Power dissipation of package XLGA032-L-0505)

\*3: Except for the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

### ■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Note
Operating supply voltage range	$V_{CC}$	2.55 to 3.50	V	—
	$V_{CC-SP}$	2.55 to 4.50		*

Note) \*: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Electrical Characteristics at  $V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$

Note)  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$  unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Note
					Min	Typ	Max		
Circuit current									
1	Circuit current 1A at no signal ( $V_{CC}$ )	$I_{VCCA}$	1	$V_{CC} = 3.0\text{ V}$ , at no signal, surround = on, STB = off, SP = on	1.6	3.0	8.3	mA	—
2	Circuit current 2SA at no signal ( $V_{CC-SP}$ )	$I_{VCCSA}$	1	$V_{CC-SP} = 3.0\text{ V}$ , at no signal, surround = on, STB = off, SP = on	2.0	20.0	40.0	mA	—
3	Circuit current 1B at standby mode ( $V_{CC}$ )	$I_{VCCB}$	1	$V_{CC} = 3.0\text{ V}$ , at no signal, surround = off, STB = on, SP = mute	—	0.1	1.0	$\mu\text{A}$	—
4	Circuit current 2B at standby mode ( $V_{CC-SP}$ )	$I_{VCCSB}$	1	$V_{CC-SP} = 3.0\text{ V}$ , at no signal, surround = off, STB = on, SP = mute	—	0.01	1.0	$\mu\text{A}$	—
5	Circuit current 1C at speaker mute ( $V_{CC}$ )	$I_{VCCC}$	1	$V_{CC} = 3.0\text{ V}$ , at no signal, surround = on, STB = off, SP = mute	—	2.8	8.1	mA	—
6	Circuit current 2C at speaker mute ( $V_{CC-SP}$ )	$I_{VCCSC}$	1	$V_{CC-SP} = 3.0\text{ V}$ , at no signal, surround = on, STB = off, SP = mute	—	0.3	1.0	mA	—
Input/output characteristic: Pin 28 to pin 13, pin 15 BTL output, pin 30 to pin 10, pin 12 BTL output									
11	Speaker reference output level L-channel / r-channel	VSPOL VSPOR	1	$V_{IN} = -34.0\text{ dBV}$ , 1 kHz, surround = off, $R_{OUT} = 8\ \Omega$	-9.5	-8.0	-6.5	dBV	—
12	Speaker reference output distortion 1, spatializer® on L-channel / r-channel	THSPO2L THSPO2R	1	$V_{IN} = -34.0\text{ dBV}$ , 1 kHz, surround = on, $R_{OUT} = 8\ \Omega$ , to THD fifth	—	0.3	0.5	%	—
13	Speaker reference output distortion 2, spatializer® off L-channel / r-channel	THSPO2L THSPO2R	1	$V_{IN} = -34.0\text{ dBV}$ , 1 kHz, surround = off, $R_{OUT} = 8\ \Omega$ , to THD fifth	—	0.3	0.5	%	—
14	Speaker reference output noise voltage 1, spatializer® on L-channel / r-channel	VNSPOL1 VNSPOR1	1	No signal, A curve filter, surround = on, $R_{OUT} = 8\ \Omega$	—	-71	-66	dBV	—
15	Speaker reference output noise voltage 2, spatializer® off L-channel / r-channel	VNSPOL2 VNSPOR2	1	No signal, A curve filter, surround = off, $R_{OUT} = 8\ \Omega$	—	-76	-71	dBV	—
16	Speaker maximum rating output L-channel / r-channel	VMSPOL VMSPOR	1	Consumptive power of load, AGC = off, THD = 10%, $f = 1\text{ kHz}$ , $R_{OUT} = 8\ \Omega$	300	470	—	mW	—
17	Speaker output level at mute = on L-channel / r-channel	VSPOMTL VSPOMTR	1	$V_{IN} = -34.0\text{ dBV}$ , 1 kHz, A curve filter, surround = off, $R_{OUT} = 8\ \Omega$	—	-110	-90	dBV	—

■ Electrical Characteristics at  $V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$  (continued)

Note)  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$  unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Note
					Min	Typ	Max		
Input/output characteristic (continued): Pin 28 to pin 13, pin 15 BTL output, pin 30 to pin 10, pin 12 BTL output									
18	Speaker AGC1 output level L-channel / r-channel	VSPOA1L VSPOA1R	1	$V_{IN} = -20.0\text{ dBV}$ , 1 kHz, surround = off, $R_{OUT} = 8\ \Omega$	+2.0	+4.0	+6.0	dBV	—
19	Speaker AGC2 output level L-channel / r-channel	VSPOA2L VSPOA2R	1	$V_{IN} = -4\text{ dBV}$ , 1 kHz, surround = off, $R_{OUT} = 8\ \Omega$	+2.5	+4.5	+6.5	dBV	—
Voltage holding mode									
21	Standby on/off switch voltage range holding off	V16H	1		2.0	—	3.0	V	—
22	Standby on/off switch voltage range holding on	V16L	1		0.0	—	0.5	V	—
23	AGC on/off switch voltage range holding on	V6H	1		2.0	—	3.0	V	—
24	AGC on/off switch voltage range holding off	V6L	1		0.0	—	0.5	V	—
25	Speaker mute on/off switch voltage range holding off	V9H	1		2.0	—	3.0	V	—
26	Speaker mute on/off switch voltage range holding on	V9L	1		0.0	—	0.5	V	—
27	Spatializer® on/off switch voltage range holding on	V32H	1		2.0	—	3.0	V	—
28	Spatializer® on/off switch voltage range holding off	V32L	1		0.0	—	0.5	V	—

■ Electrical Characteristics (Design Reference Data) at  $V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$

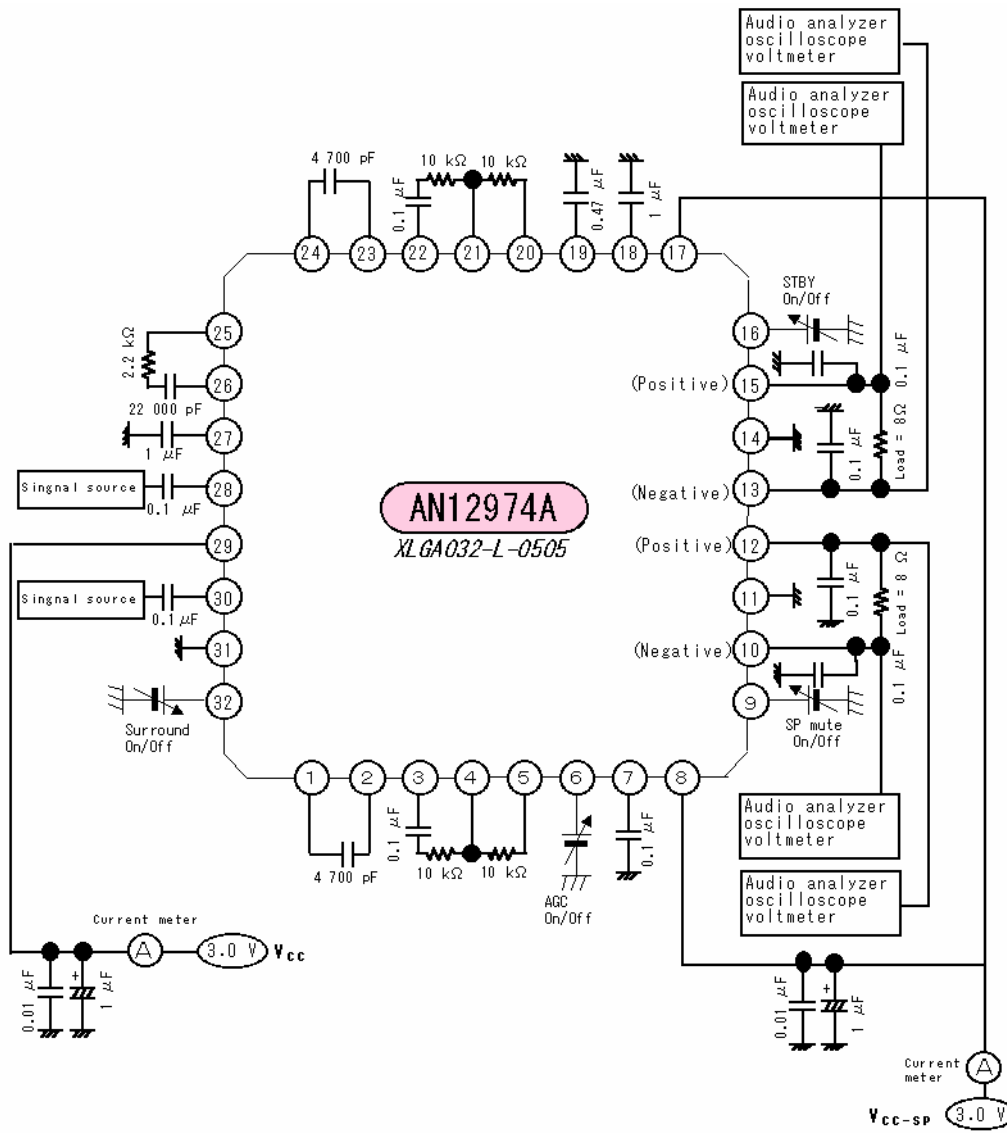
Note)  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$  unless otherwise specified.

The characteristics listed below are reference values based on the IC design and are not guaranteed.

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Note
					Min	Typ	Max		
Distortion measurement (No. 19 speaker AGC2 output level)									
1	Speaker AGC2 output distortion	THSPOA2L THSPOA2R	1	$V_{IN} = -4\text{ dBV}$ , 1 kHz, surround = off, $R_{OUT} = 8\ \Omega$ , to THD fifth	—	1.0	—	%	—



■ Test Circuit Diagram

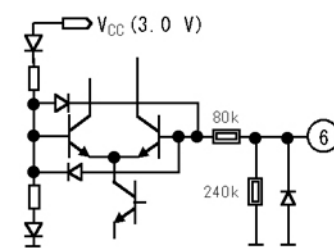

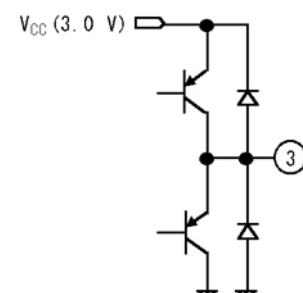
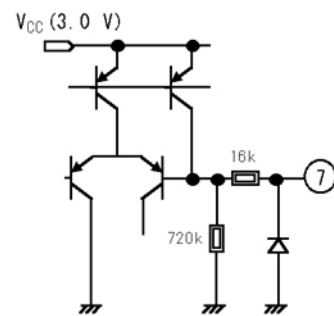
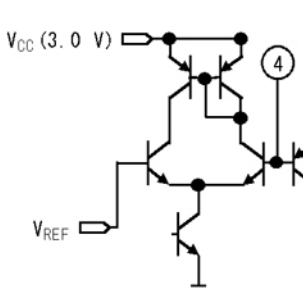

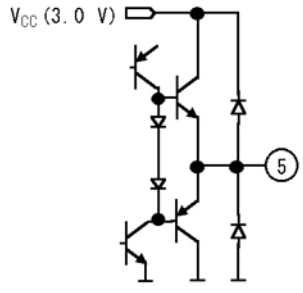
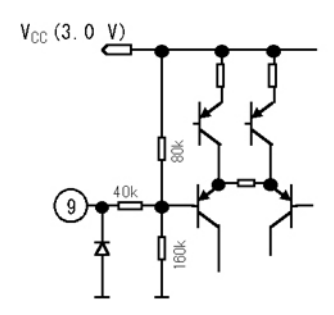


### ■ Measure Method of Electrical Characteristics

C No.	Parameter	Input		Output		Each pin conditions			
		Pin No.	Conditions	Pin No.	Conditions	Pin 6 AGC High: on Low: off	Pin 9 SP save High: off Low: on	Pin 32 surround High: on Low: off	Pin 16 STB High: off Low: on
<b>Circuit current</b>									
1	Circuit current 1A at no signal ( $V_{CC}$ )	29	$V_{CC} = 3.0 \text{ V}$ , at no signal	29	Current measurement	3 V	3 V	3 V	3 V
2	Circuit current 2SA at no signal ( $V_{CC-SP}$ )	8, 17	$V_{CC-SP} = 3.0 \text{ V}$ , at no signal	8, 17		3 V	3 V	3 V	3 V
3	Circuit current 1B at standby mode ( $V_{CC}$ )	29	$V_{CC} = 3.0 \text{ V}$ , at no signal, at STB mode	29		0 V	0 V	0 V	0 V
4	Circuit current 2B at standby mode ( $V_{CC-SP}$ )	8, 17	$V_{CC-SP} = 3.0 \text{ V}$ , at no signal, at STB mode	8, 17		0 V	0 V	0 V	0 V
5	Circuit current 1C at speaker mute ( $V_{CC}$ )	29	$V_{CC} = 3.0 \text{ V}$ , at no signal, at SP power save	29		3 V	0 V	3 V	3 V
6	Circuit current 2C at speaker mute ( $V_{CC-SP}$ )	8, 17	$V_{CC-SP} = 3.0 \text{ V}$ , at no signal, at SP power save	8, 17		3 V	0 V	3 V	3 V
<b>Input/output characteristic: Pin 28 to pin 13, pin 15 BTL output, pin 30 to pin 10, pin 12 BTL output</b>									
11	Speaker reference output level L-channel / r-channel	28, 30	$V_{IN} = -34.0 \text{ dBV}$ , 1 kHz	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$	3 V	3 V	0 V	3 V
12	Speaker reference output distortion 1 Spatializer® on, L-channel / r-channel	28, 30	$V_{IN} = -34.0 \text{ dBV}$ , 1 kHz	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , to THD fifth	3 V	3 V	3 V	3 V
13	Speaker reference output distortion 2 Spatializer® off, L-channel / r-channel	28, 30	$V_{IN} = -34.0 \text{ dBV}$ , 1 kHz	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , to THD fifth	3 V	3 V	0 V	3 V
14	Speaker reference output noise voltage 1 Spatializer® on, L-channel / r-channel	28, 30	No input, at no signal	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , A curve filter	3 V	3 V	3 V	3 V
15	Speaker reference output noise voltage 2 Spatializer® off, L-channel / r-channel	28, 30	No input, at no signal	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , A curve filter	3 V	3 V	0 V	3 V
16	Speaker maximum rating output L-channel / r-channel	28, 30	AGC = off ( $V_8 = 0 \text{ V}$ )	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , to THD fifth, THD = 10%	0 V	3 V	0 V	3 V
17	Speaker output level at mute = on L-channel / r-channel	28, 30	$V_{IN} = -34.0 \text{ dBV}$ 1 kHz, ( $V_{16} = 0 \text{ V}$ )	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$ , A curve filter	3 V	0 V	0 V	3 V
18	Speaker AGC1 output level L-channel / r-channel	28, 30	$V_{IN} = -20.0 \text{ dBV}$ , 1 kHz	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$	3 V	3 V	0 V	3 V
19	Speaker AGC2 output level L-channel / r-channel	28, 30	$V_{IN} = -4 \text{ dBV}$ , 1 kHz	15 to 13, 12 to 10	$R_{OUT} = 8 \Omega$	3 V	3 V	0 V	3 V

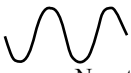

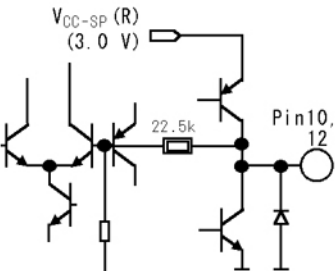
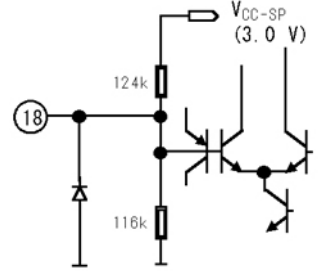
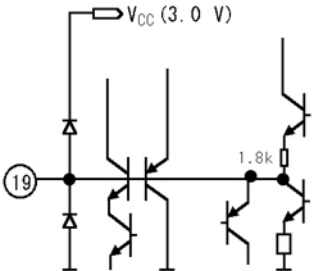

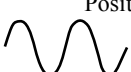
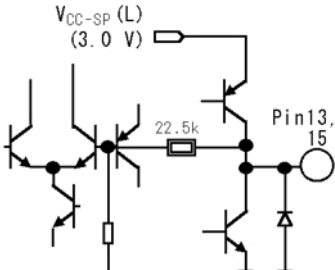

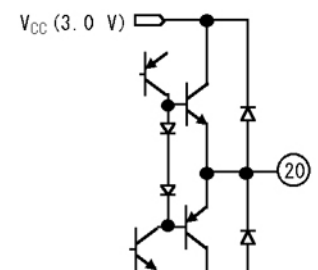
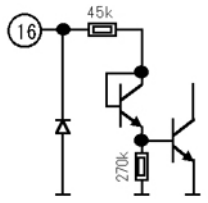
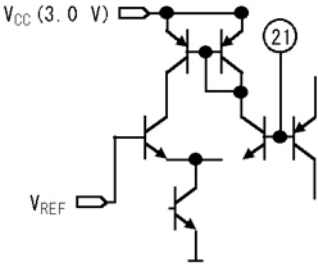
■ Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Waveform and voltage	Inner circuit	Pin No.	Waveform and voltage	Inner circuit
1, 2	Surround filter terminal R-channel 1 R-channel 2  DC: 1.5 V	—	6	AGC on/off switch  Logic High = AGC on Low = AGC off  Open DC: —	 <p>Input impedance = 240 kΩ</p>
3	Surround output R-channel  DC: 1.5 V AC: -34 dBV		7	Pre-charge timing condenser terminal  Open DC: 2.9 V	 <p>Input impedance = 736 kΩ</p>
4	Gain adjustment reflection amplifier output r-channel  DC: 1.5 V AC: —		29  8, 17	V <sub>CC</sub> DC: 3.0 V  V <sub>CC-SR</sub> (R) V <sub>CC-SP</sub> (L)  DC: 3.0 V	—
5	Gain adjustment reflection amplifier output r-channel  DC: 1.5 V AC: -34 dBV	 <p>Output impedance = 10 Ω or less</p>	9	Speaker mute switch  Logic High = mute off Low = mute on  Open DC: 2.0 V	 <p>Output impedance = 93 kΩ</p>


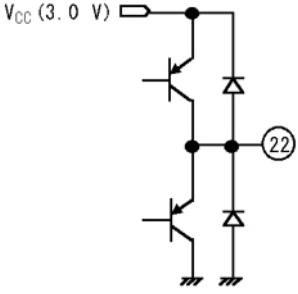

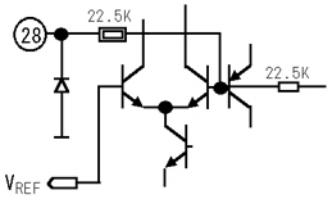

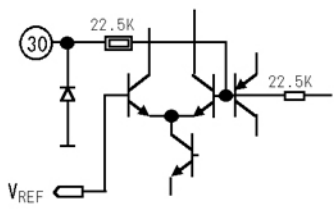
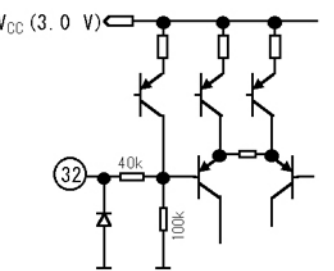
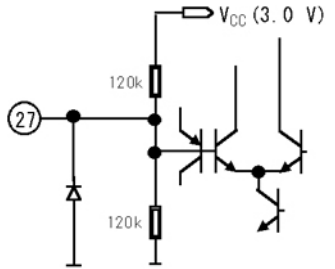
■ Technical Data (continued)

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Waveform and voltage	Inner circuit	Pin No.	Waveform and voltage	Inner circuit
10, 12	<p>Speaker output</p> <p>Pin 10</p>  <p>Negative</p>  <p>Positive</p> <p>Pin 12</p> <p>DC: 1.45 V AC: -8 dBV</p>	 <p>Output impedance = 10 Ω or less</p>	18	<p><math>1/2 V_{CC-SP}</math> (<math>V_{REF-SP}</math>)</p> <p>DC: 1.45 V</p>	 <p>Input impedance = 60 kΩ</p>
11, 14, 31	<p>GND</p> <p>DC: 0 V</p>	—	19	<p>AGC detecting terminal</p> <p>DC: 0 V to 1 V</p>	
13, 15	<p>Speaker output</p> <p>Pin 13</p>  <p>Negative</p>  <p>Positive</p> <p>Pin 15</p> <p>DC: 1.45 V AC: -8 dBV</p>	 <p>Output impedance = 10 Ω or less</p>	20	<p>Gain adjustment reflection amplifier output l-channel</p>  <p>DC: 1.5 V AC: -34 dBV</p>	 <p>Output impedance = 10 Ω or less</p>
16	<p>All standby on/off switch</p> <p>Logic High = STBY off Low = STBY on</p> <p>Open DC: 0 V</p>	 <p>Input impedance = 50 kΩ or less</p>	21	<p>Gain adjustment reflection amplifier output l-channel</p> <p>DC: 1.5 V AC: —</p>	

■ Technical Data (continued)

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

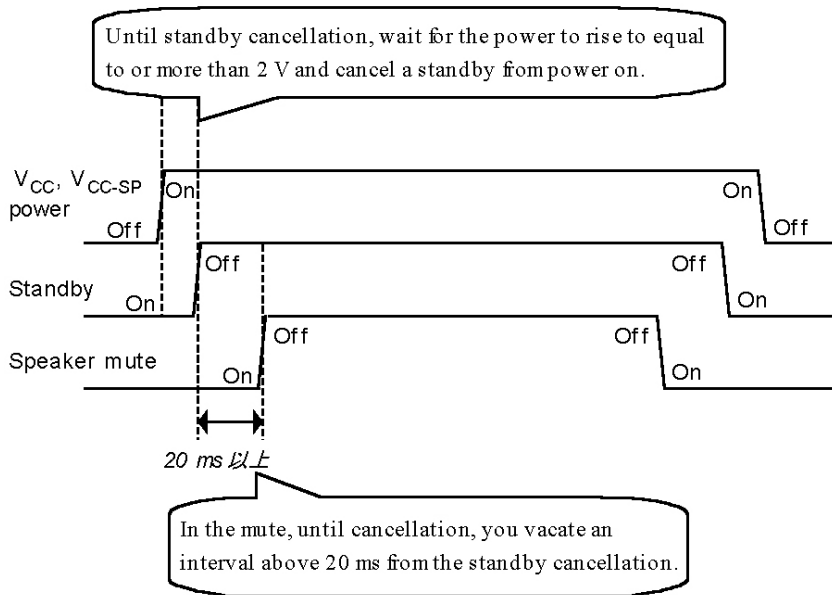
Pin No.	Waveform and voltage	Inner circuit	Pin No.	Waveform and voltage	Inner circuit
22	Surround output 1-channel  DC: 1.5 V AC: -34 dBV		28	Audio input terminal L-channel  DC: 1.5 V AC: -34 dBV	 Input impedance = 22.5 kΩ
23, 24	Surround filter terminal L-channel 1 L-channel 2 DC: 1.5 V	—	30	Audio input terminal R-channel  DC: 1.5 V AC: -34 dBV	 Input impedance = 22.5 kΩ
25, 26	Surround effect adjustment 1, 2 DC: 1.5 V	—	32	Surround on/off switch Logic High = Surround on Low = Surround off Open DC: 1.25 V	 Input impedance = 140 kΩ
27	$1/2 V_{CC} (V_{REF})$ DC: 1.5 V	 Input impedance = 60 kΩ			

■ Technical Data (continued)

• The power and logic timing

As for the timing of power on/off and each control pin, it much more recommends a procedure below the purpose of the rejection sound measure in changing.

The speaker output system



The basic procedure at the time of power on

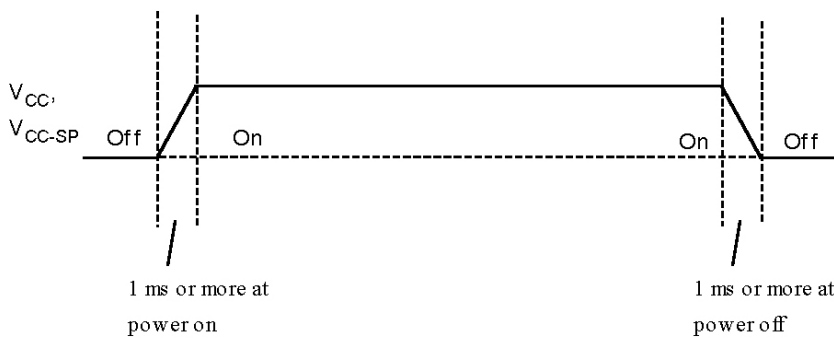
1. The power off condition  
Both the standby and the mute are in the on condition.
2. Power on
3. The standby cancellation
4. The mute cancellation

The basic procedure at the time of power off.

1. The power on condition  
Both the standby and the mute are in the off condition.
2. Mute on
3. Standby on
4. Power off

• The power timing of  $V_{CC}$  and  $V_{CC-SP}$

This IC have not a standup and falling order in  $V_{CC}$  and  $V_{CC-SP}$ .



• Pin 6: AGC on/off switch terminal

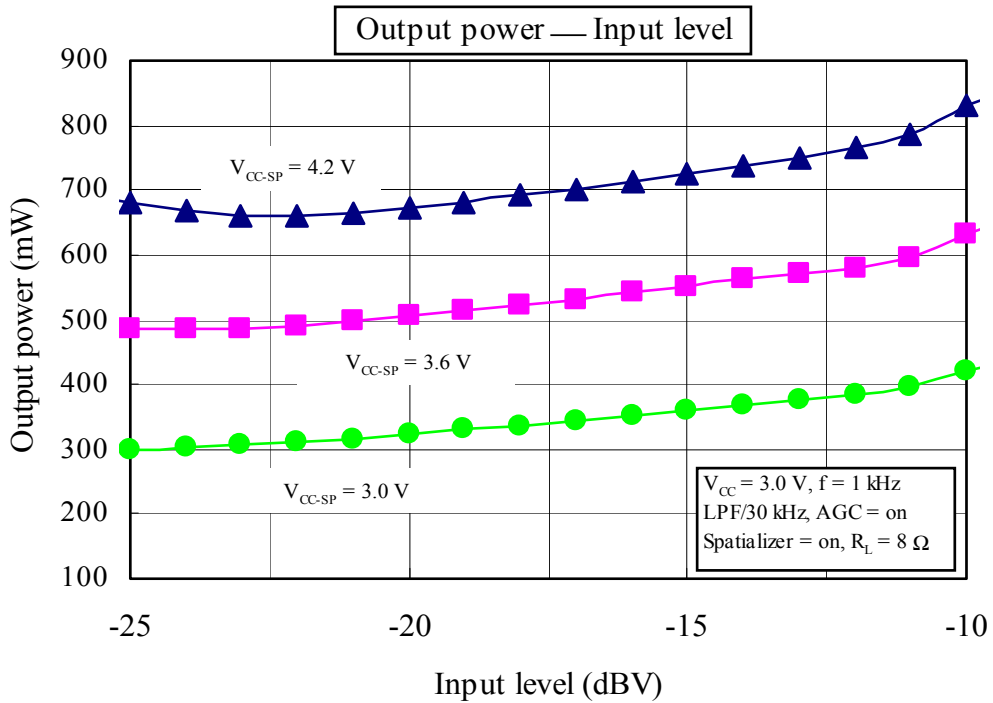
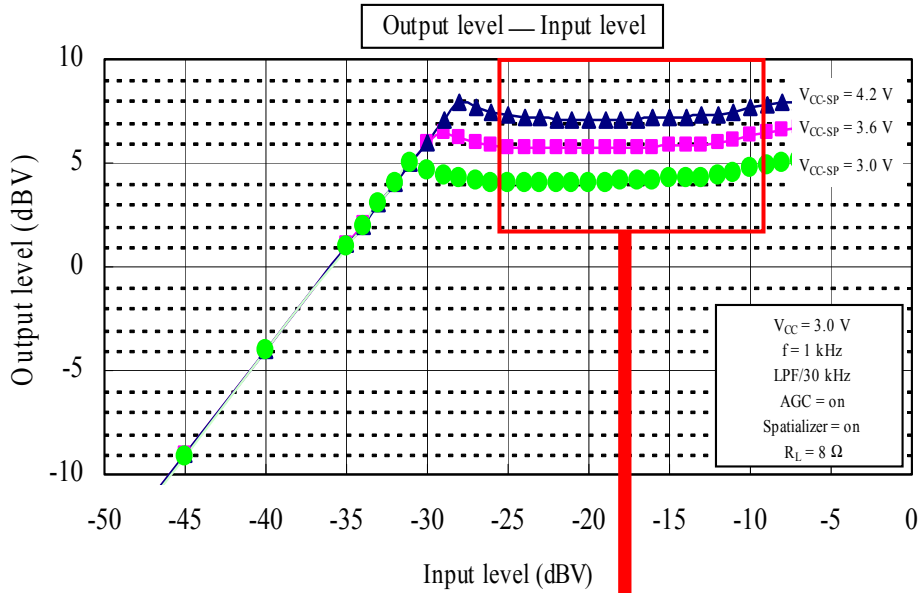
In order to reduce current consumption during SP-save or standby, when SP-save switch is on (when pin 9 is low-level), also set pin 6 to low-level.

(When standby switch is on (pin 16 is low-level), SP-save switch will be on.)

• Pin 32: 3D surround spatializer® on/off switch

In order to reduce current consumption during standby, when standby switch is on (pin 16 is low-level), also set pin 32 to low-level.

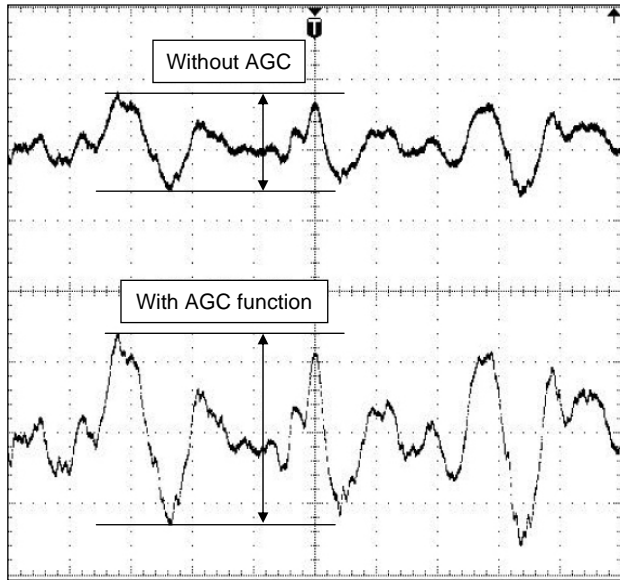
- Technical Data (continued)
- Output power when AGC is on



■ Technical Data (continued)

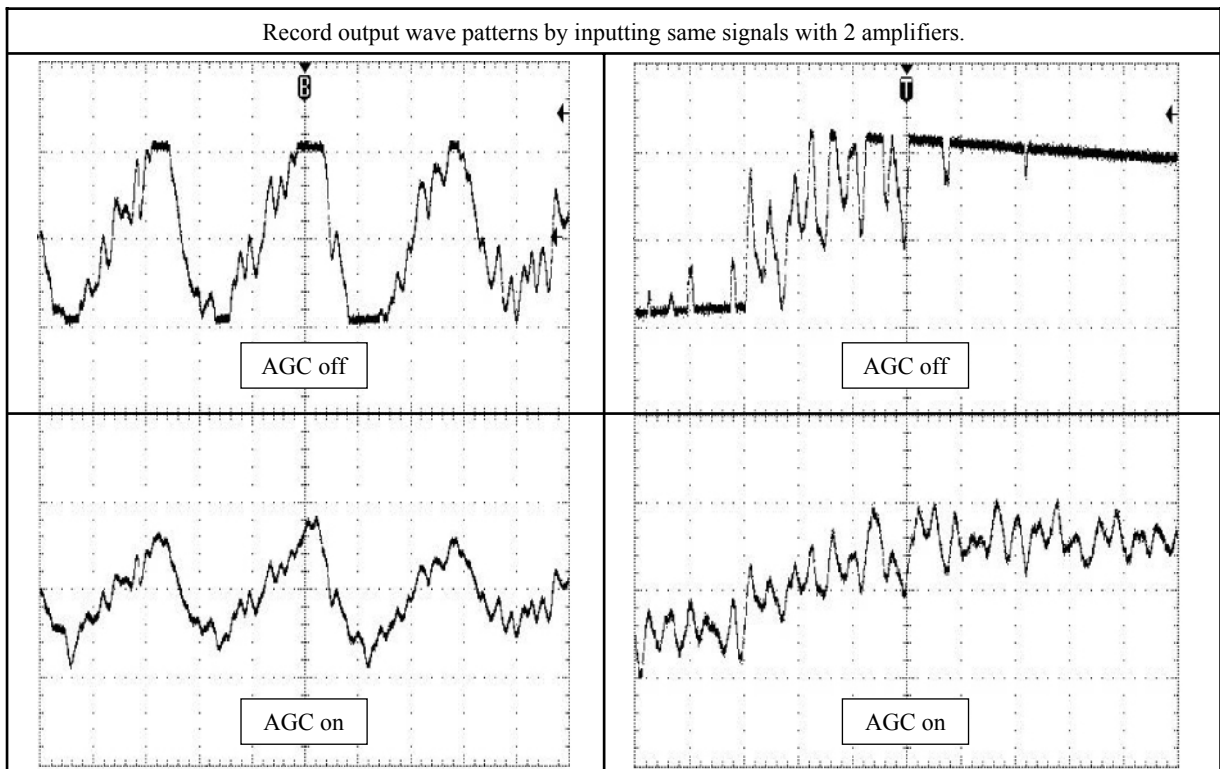
• Amplifier output wave pattern

Achieving a big sound volume without clipping distortion by small speakers.



← Average sound volume cannot be big without AGC (wave patters clips when input signal is big and sound distortion occurs)

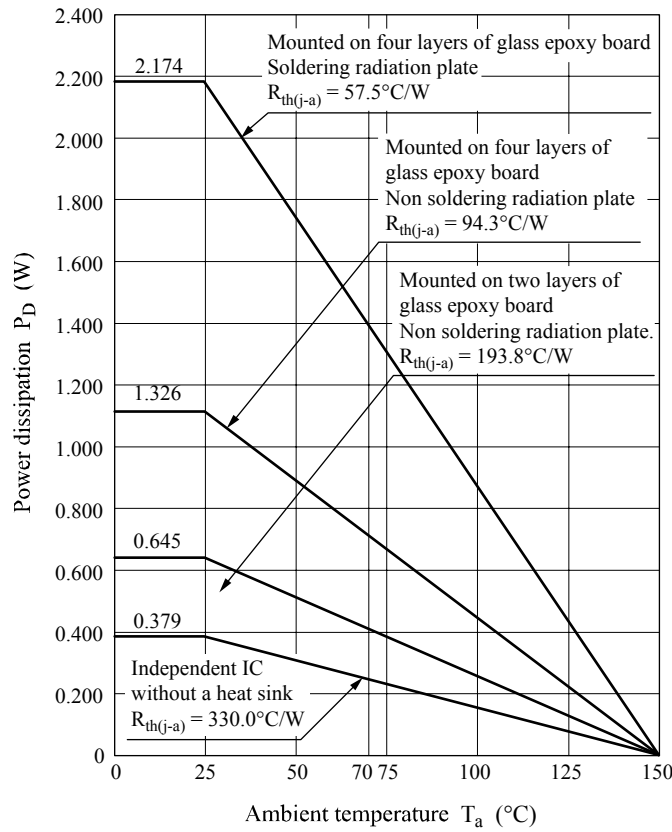
← Average sound volume can be big with AGC (AGC prevents sound distortion when input signal is big)





■ Technical Data (continued)

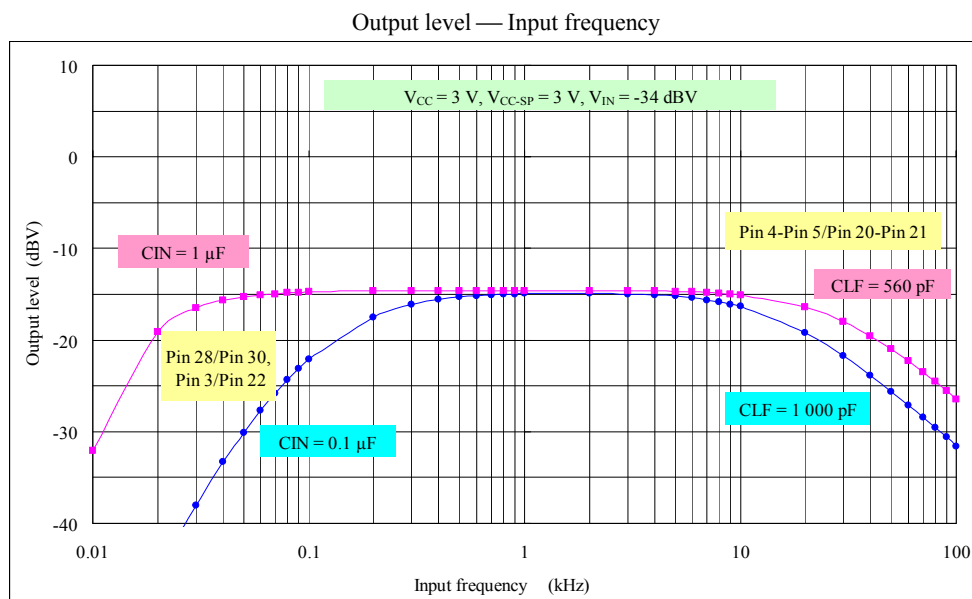
- Power dissipation of package XLGA032-L-0505



Note) The characteristics listed above are reference values based on the IC design and are not guaranteed.

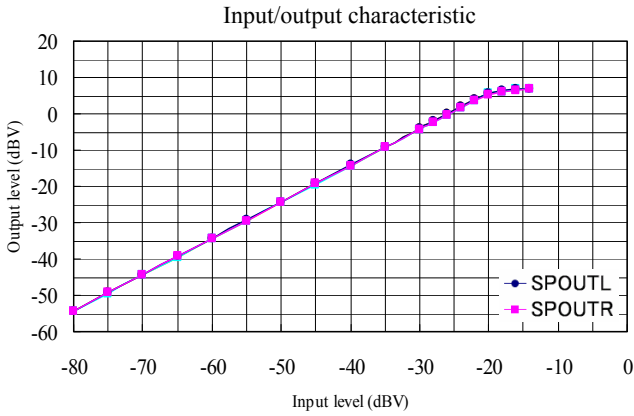
• Main characteristics

Please adopt the condenser's capacity suitable for speakers or stereo systems that you use.

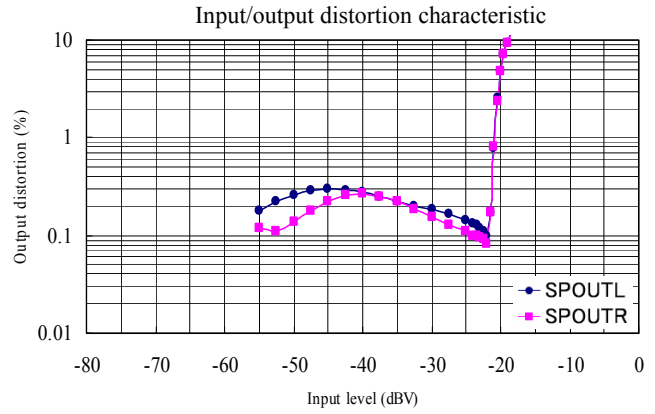


■ Technical Data (continued)

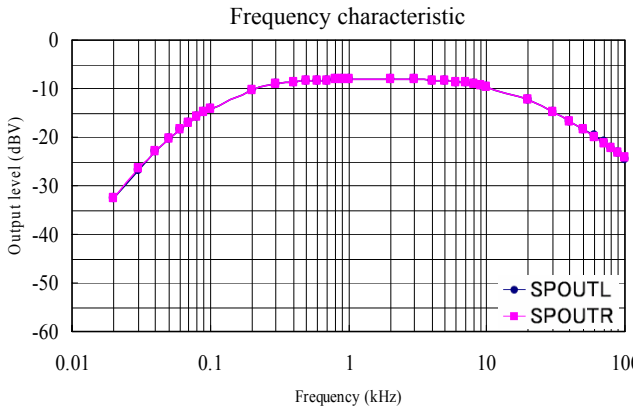
- Main Characteristics (continued) AGC = off, surround = off



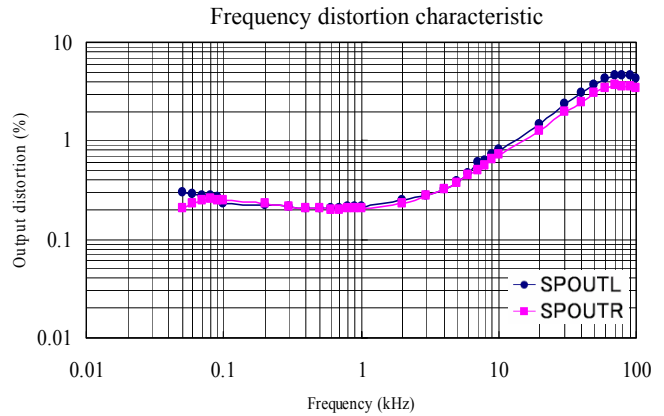
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = off  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = off  
 Load =  $8\ \Omega$



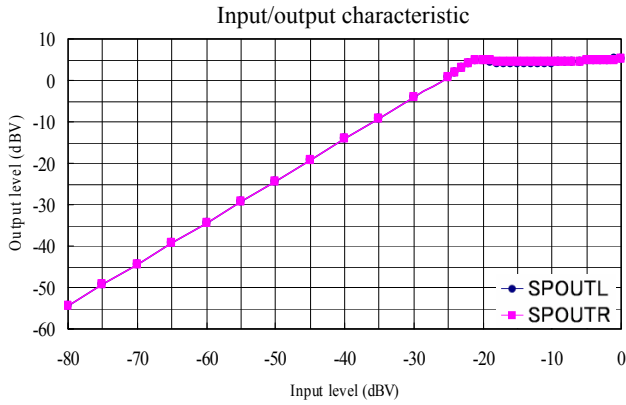
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -34\text{ dBV}$   
 AGC = off, surround = off  
 Load =  $8\ \Omega$



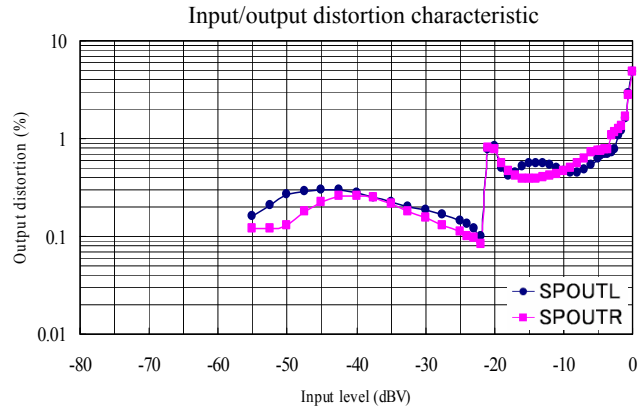
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -34\text{ dBV}$   
 AGC = off, surround = off  
 Load =  $8\ \Omega$

■ Technical Data (continued)

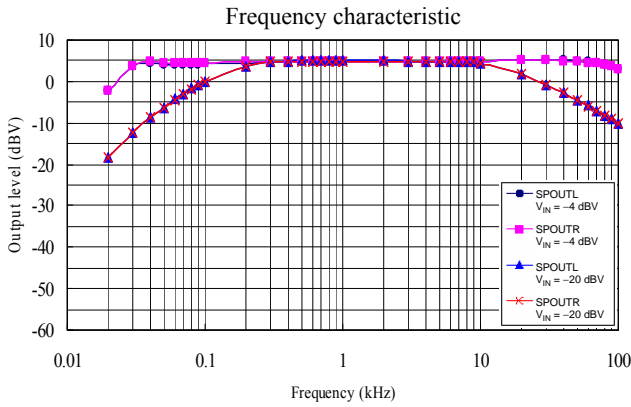
- Main Characteristics (continued) AGC = on, surround = off



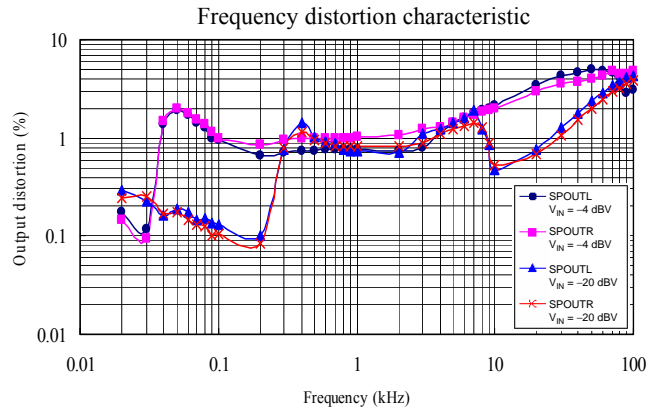
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = off  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = off  
 Load =  $8\ \Omega$



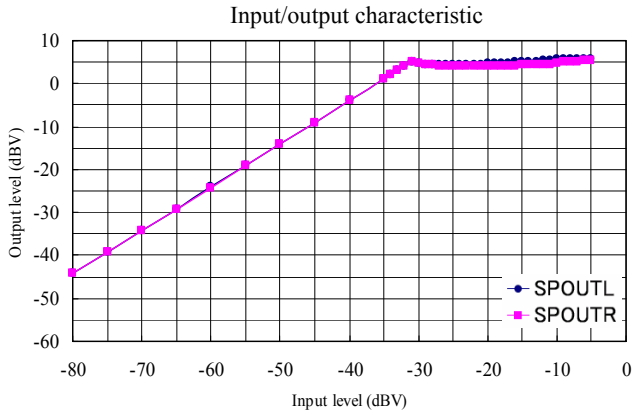
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -4\text{ dBV}$ ,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = off  
 Load =  $8\ \Omega$



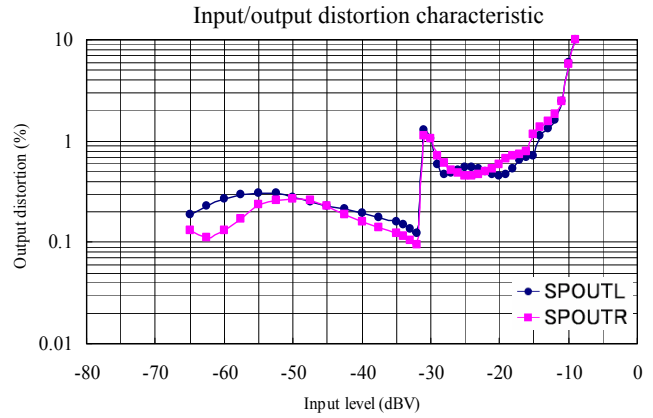
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -4\text{ dBV}$ ,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = off  
 Load =  $8\ \Omega$

■ Technical Data (continued)

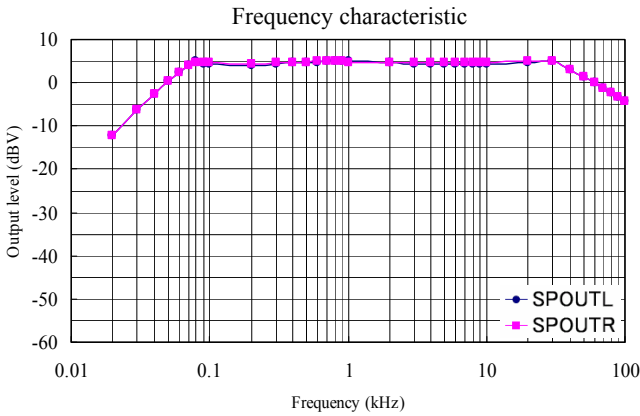
- Main Characteristics (continued) AGC = on, surround = on



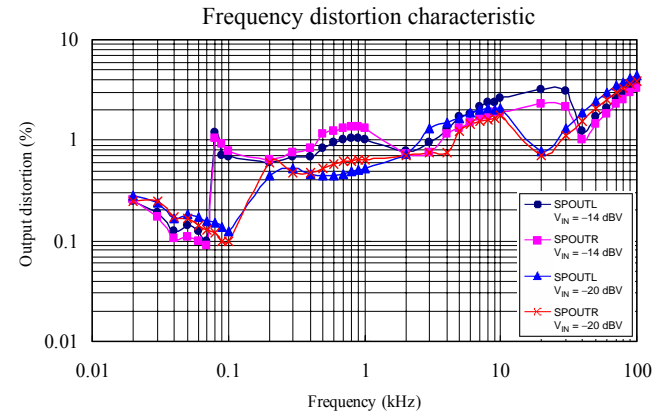
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = on  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = on  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -14\text{ dBV}$   
 AGC = on, surround = on  
 Load =  $8\ \Omega$

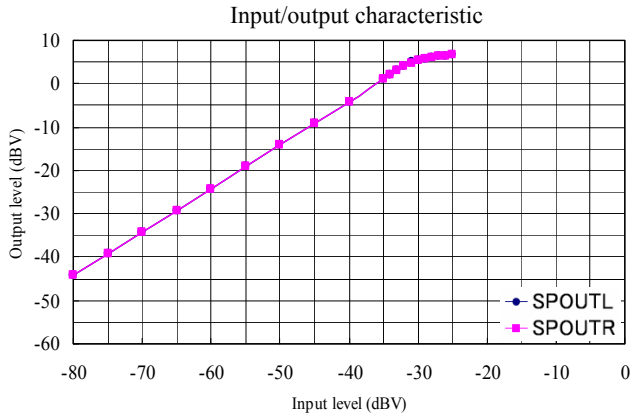


$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -14\text{ dBV}$ ,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = on  
 Load =  $8\ \Omega$

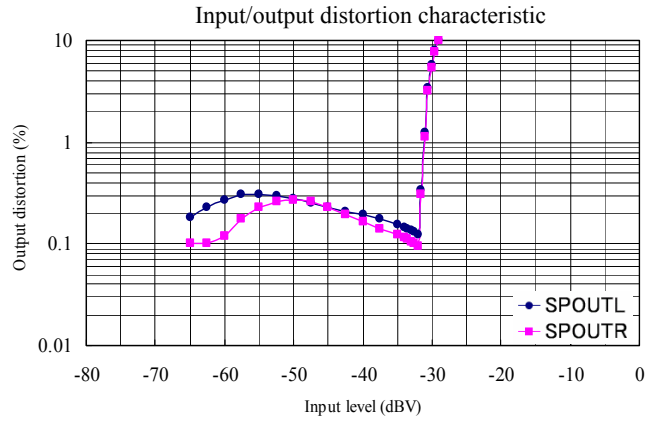
Due to Input/output distortion characteristic, the maximum input level (in the case of "AGC = on, surround = on") would be approximately  $-14\text{ dBV}$ .

■ Technical Data (continued)

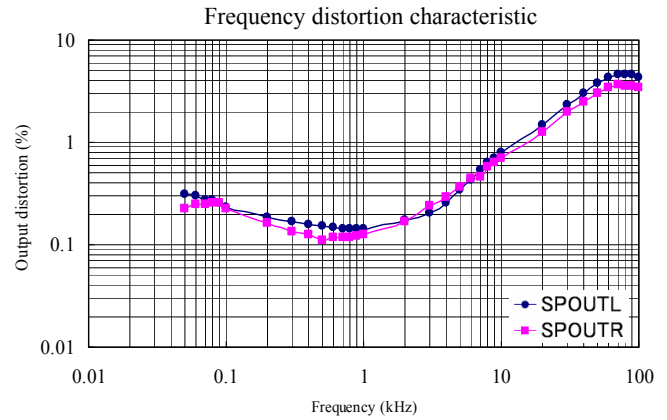
- Main Characteristics (continued) AGC = off, surround = on



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = on  
 Load =  $8\ \Omega$



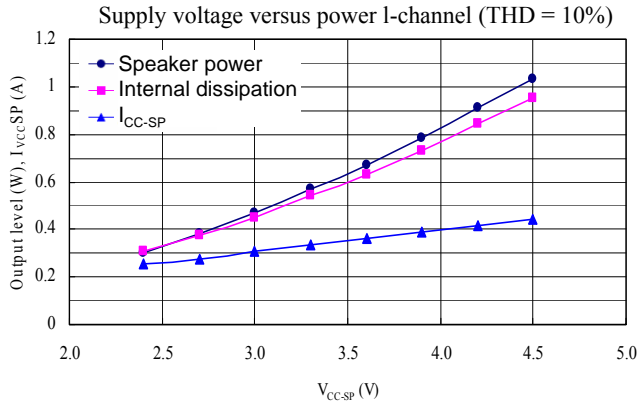
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = on  
 Load =  $8\ \Omega$



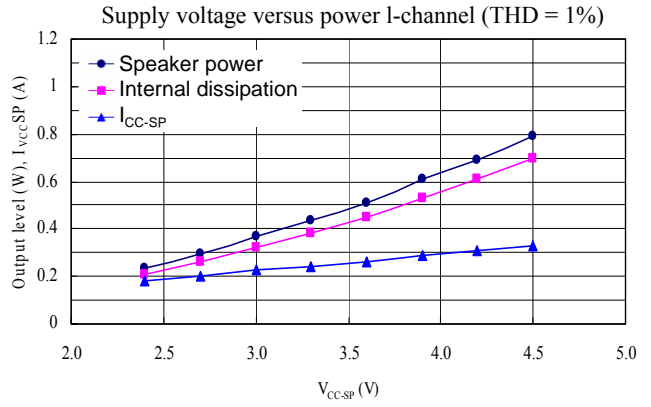
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 No filter,  $V_{IN} = -34\text{ dBV}$   
 AGC = off, surround = on  
 Load =  $8\ \Omega$

■ Technical Data (continued)

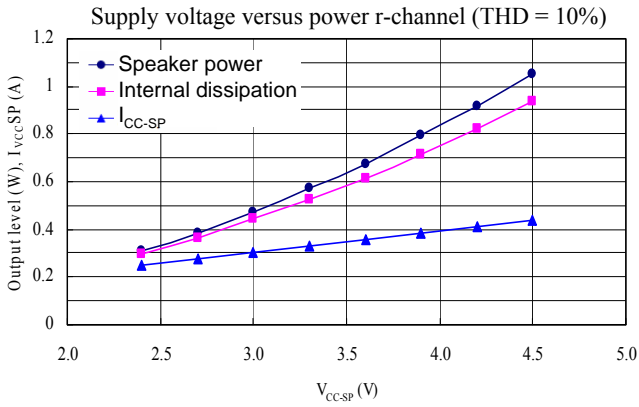
- Main Characteristics (continued) Speaker power



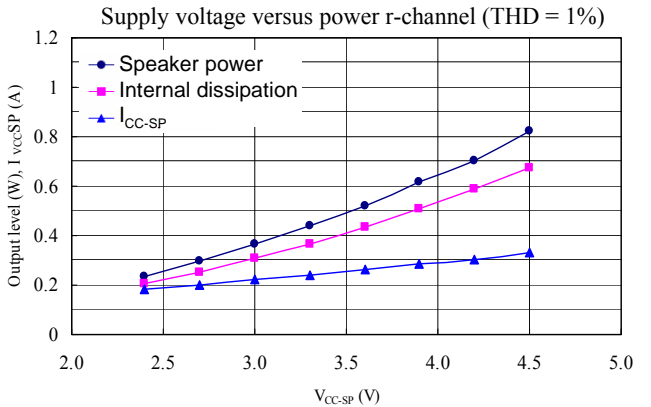
V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = sweep  
 f = 1 kHz, LPF/30 kHz  
 AGC = off, surround = off  
 Load = 8 Ω



V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = sweep  
 f = 1 kHz, LPF/30 kHz  
 AGC = off, surround = off  
 Load = 8 Ω



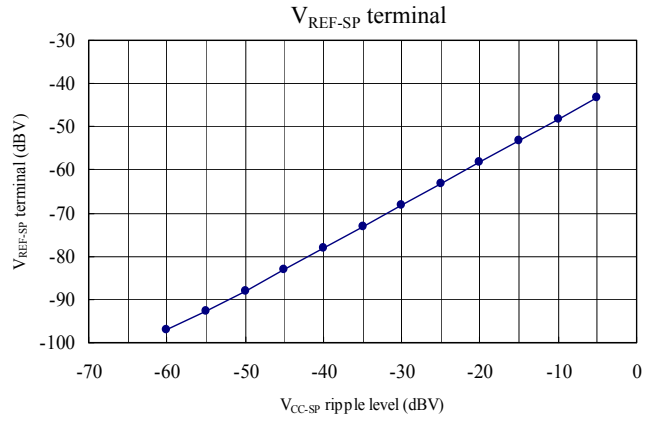
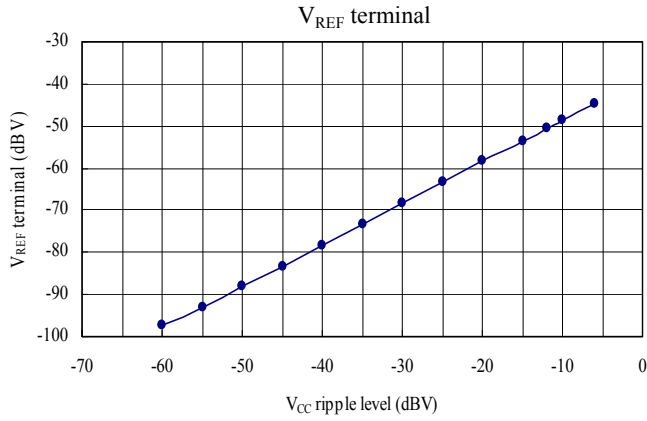
V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = sweep  
 f = 1 kHz, LPF/30 kHz  
 AGC = off, surround = off  
 Load = 8 Ω



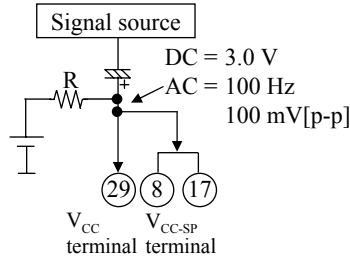
V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = sweep  
 f = 1 kHz, LPF/30 kHz  
 AGC = off, surround = off  
 Load = 8 Ω

■ Technical Data (continued)

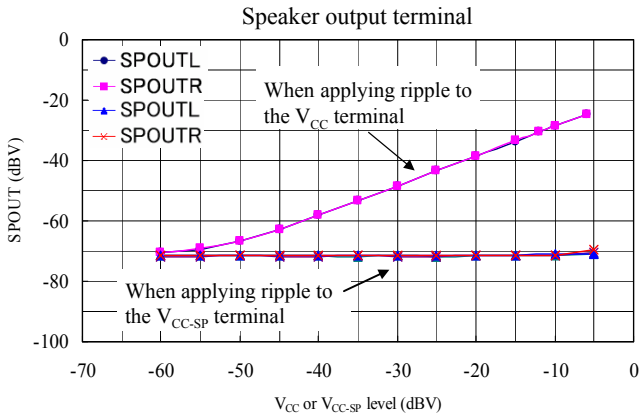
- Main Characteristics (continued) Power supply ripple rejection



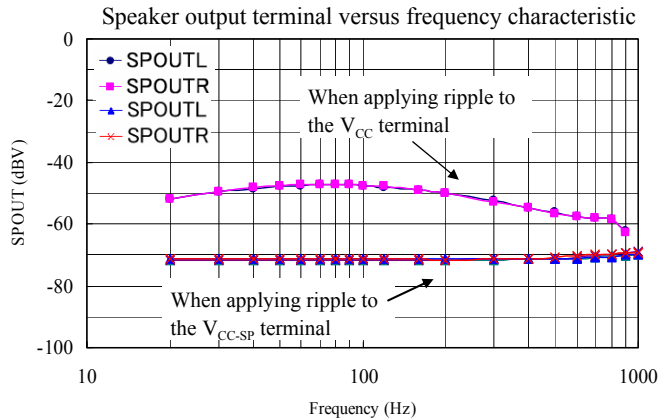
V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = 3.0 V  
 f = 100 Hz, LPF/30 kHz  
 AGC = on, surround = on  
 Load = 8 Ω



V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = 3.0 V  
 f = 100 Hz, LPF/30 kHz  
 AGC = on, surround = on  
 Load = sweep



V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = 3.0 V  
 f = 100 Hz, LPF/30 kHz  
 AGC = on, surround = on  
 Load = 8 Ω

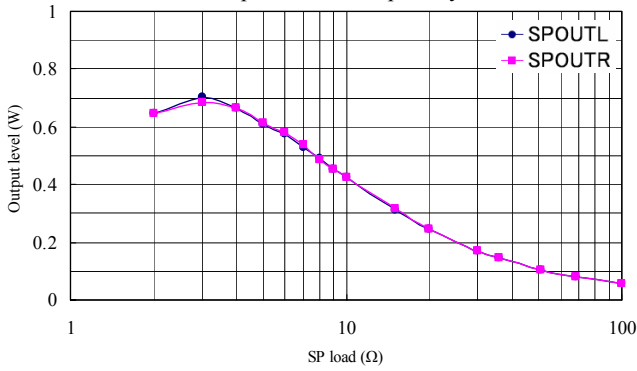


V<sub>CC</sub> = 3.0 V, V<sub>CC-SP</sub> = 3.0 V  
 V<sub>IN</sub> = 100 mV[p-p] (= -29 dBV), LPF = 30 kHz  
 AGC = on, surround = on  
 Load = 8 Ω

■ Technical Data (continued)

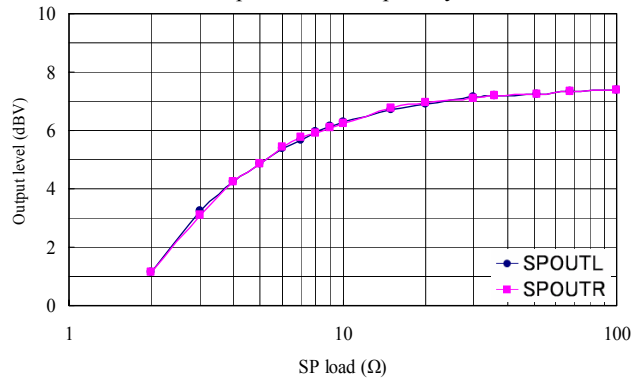
- Main Characteristics (continued) Speaker drive capability, detector capacity versus distortion

Speaker drive capability 1



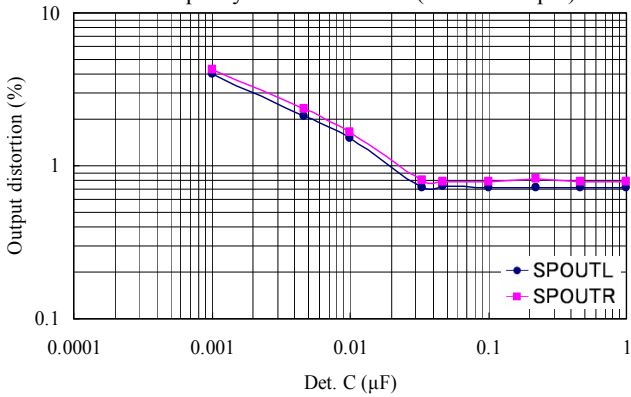
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = off  
 THD = output level measurement at 10%, load = sweep

Speaker drive capability 2



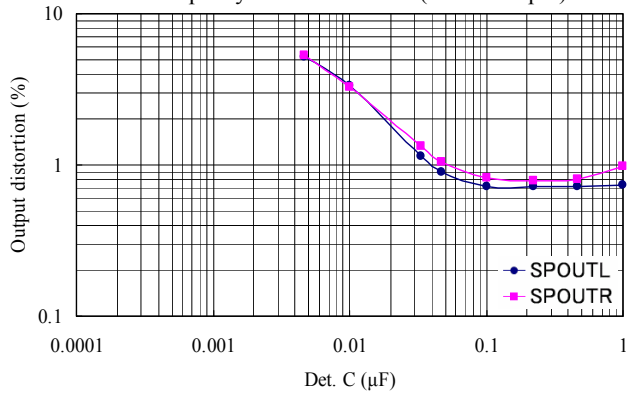
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = off, surround = off  
 THD = output level measurement at 10%, load = sweep

Detector capacity versus distortion (-20 dBV input)

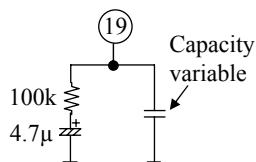


$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = off  
 Load = 8 Ω

Detector capacity versus distortion (-4 dBV input)



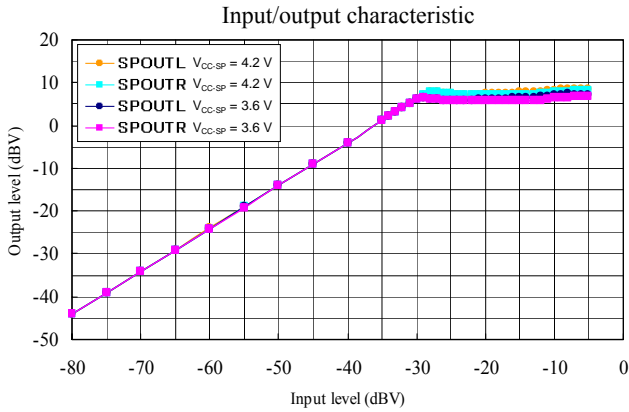
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ , LPF/30 kHz,  $V_{IN} = -4\text{ dBV}$   
 AGC = on, surround = off  
 Load = 8 Ω



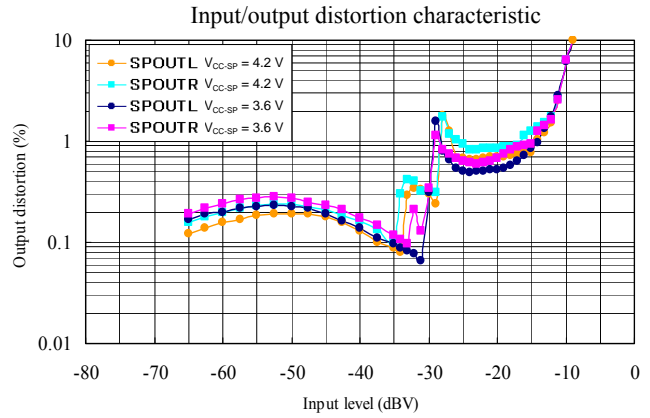


■ Technical Data (continued)

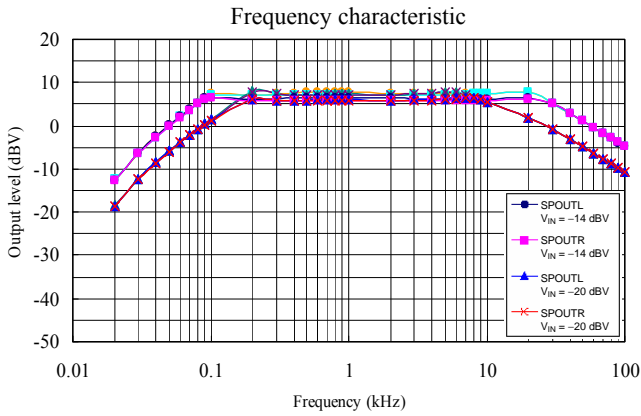
- Main Characteristics (continued) AGC = on, surround = on



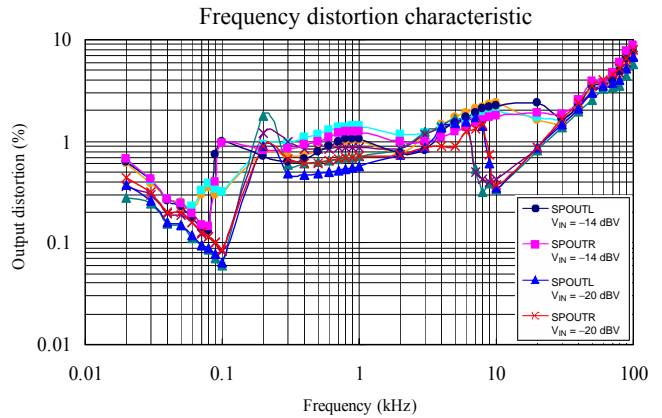
$V_{CC} = 3.0V$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = on  
 Load =  $8\ \Omega$



$V_{CC} = 3.0V$   
 $f = 1\text{ kHz}$ , LPF/30 kHz  
 AGC = on, surround = on  
 Load =  $8\ \Omega$



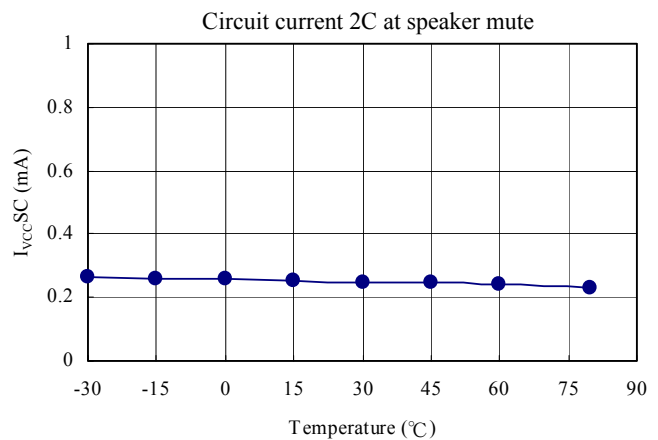
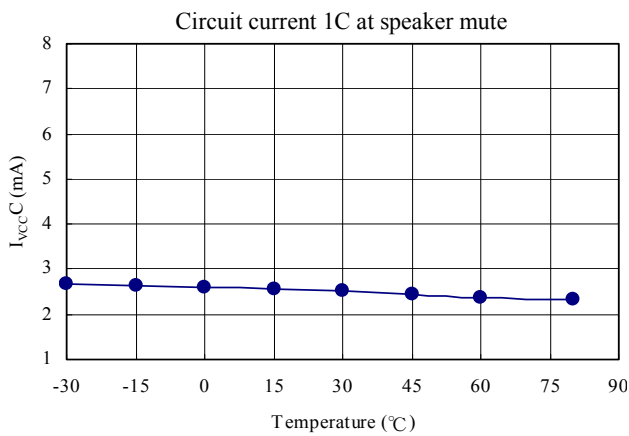
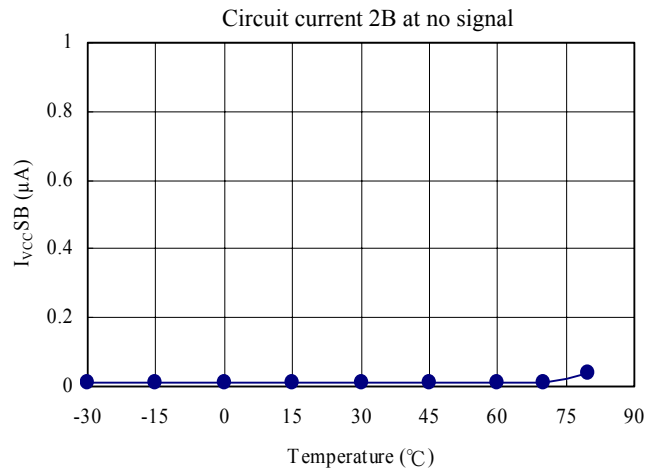
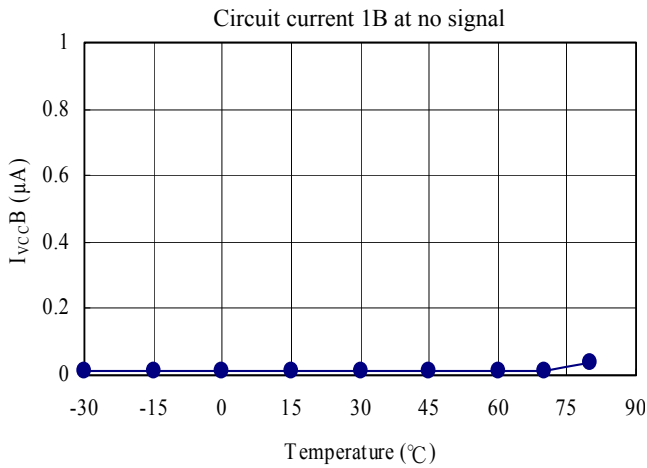
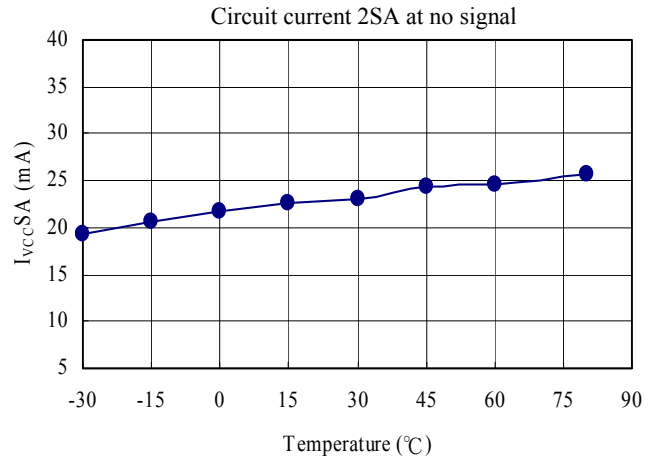
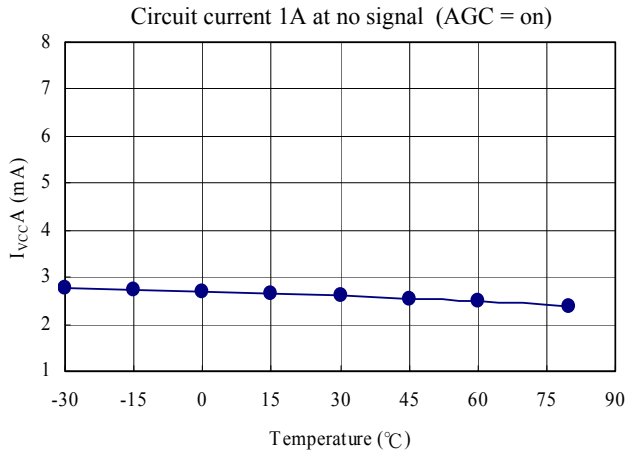
$V_{CC} = 3.0V$   
 No filter,  $V_{IN} = -14\text{ dBV}$ ,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = on  
 Load =  $8\ \Omega$



$V_{CC} = 3.0V$   
 No filter,  $V_{IN} = -14\text{ dBV}$ ,  $V_{IN} = -20\text{ dBV}$   
 AGC = on, surround = on  
 Load =  $8\ \Omega$

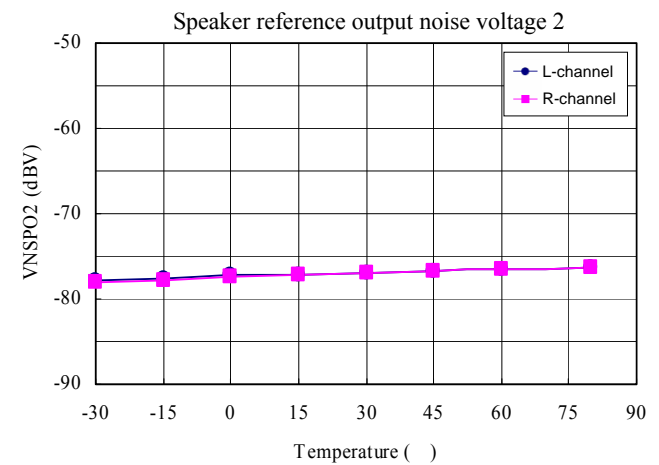
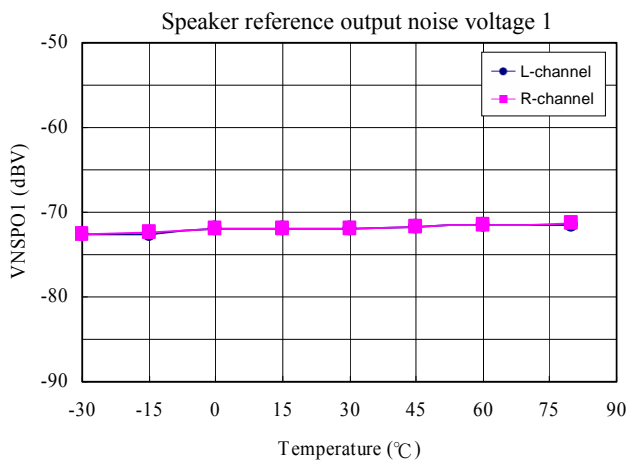
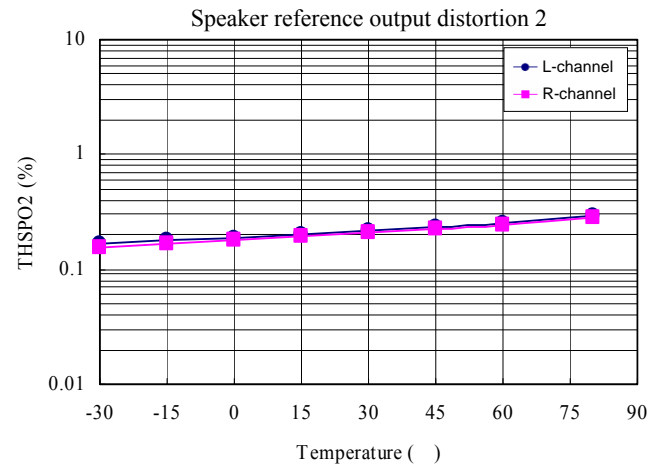
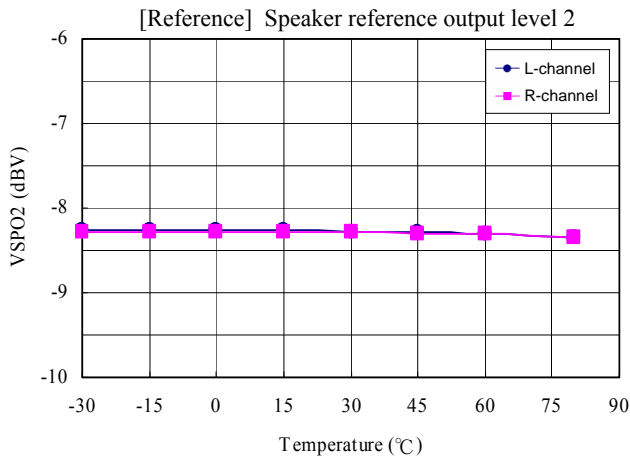
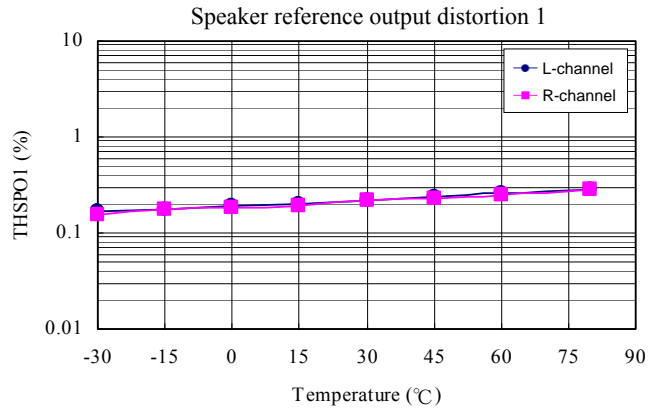
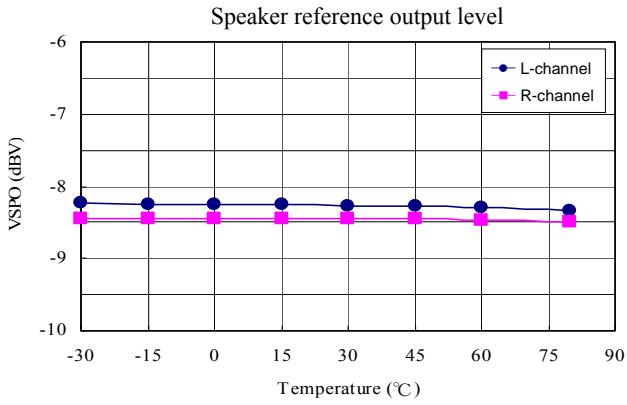
■ Technical Data (continued)

- Main Characteristics (continued) Temperature fluctuation characteristic at  $V_{CC} = V_{CC-SP} = 3.0\text{ V}$



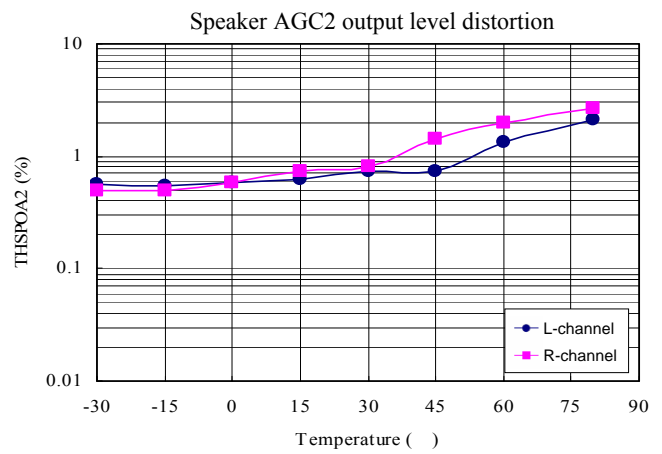
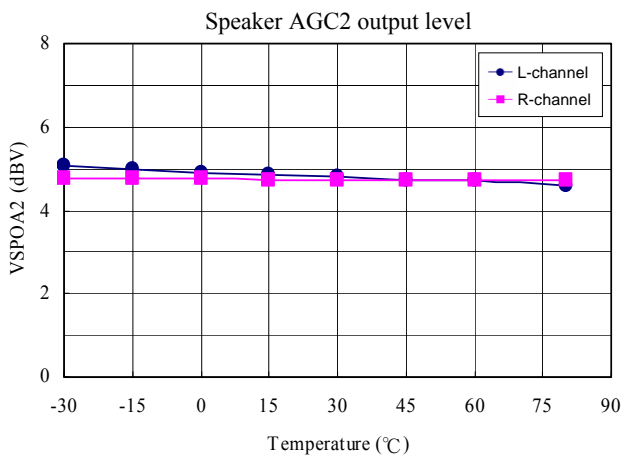
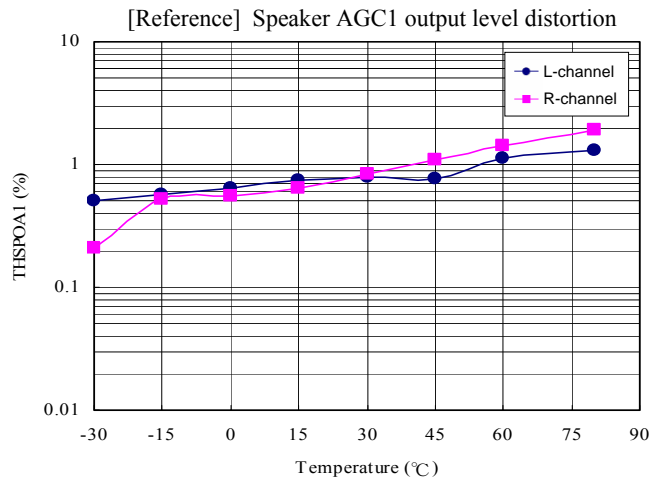
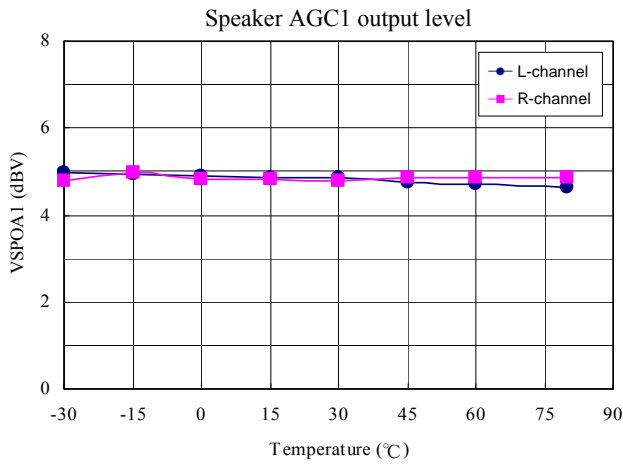
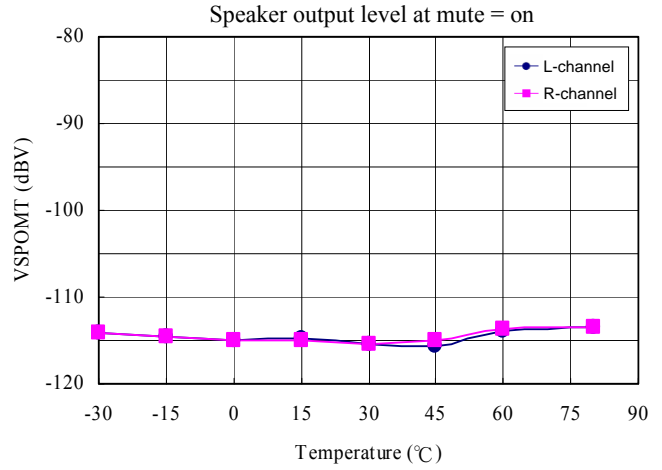
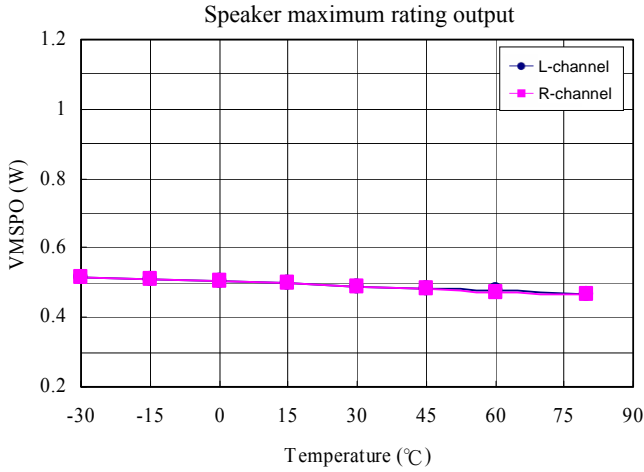
■ Technical Data (continued)

- Main Characteristics (continued) Temperature fluctuation characteristic at  $V_{CC} = V_{CC-SP} = 3.0\text{ V}$



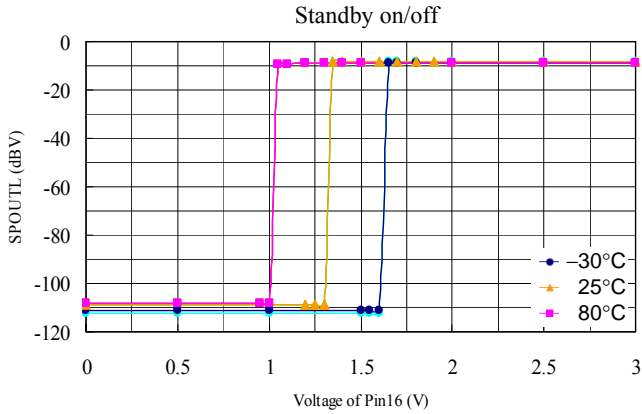
■ Technical Data (continued)

- Main Characteristics (continued) Temperature fluctuation characteristic at  $V_{CC} = V_{CC-SP} = 3.0\text{ V}$

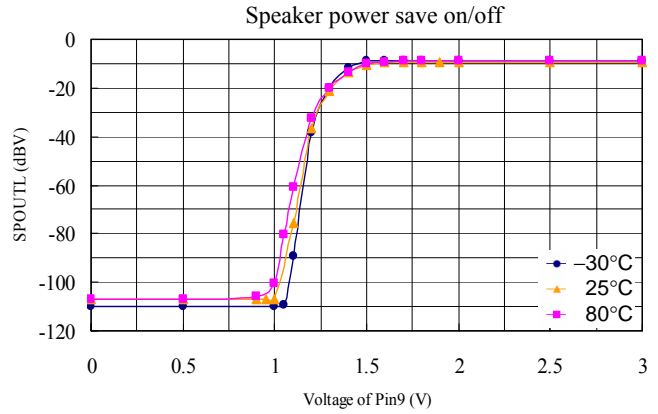


■ Technical Data (continued)

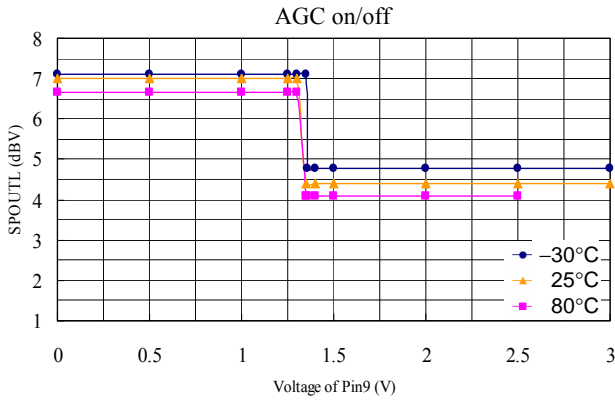
- Main Characteristics (continued) Switch voltage of a control terminal



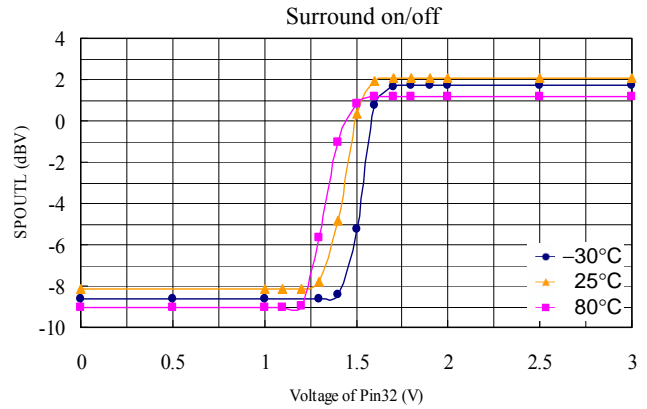
$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ ,  $LPF = 30\text{ kHz}$ ,  $V_{INL} = -34\text{ dBV}$   
 AGC = off, surround = off,  
 pin 28 to SPOUTL measurement  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ ,  $LPF = 30\text{ kHz}$ ,  $V_{INL} = -34\text{ dBV}$   
 AGC = off, surround = off,  
 pin 28 to SPOUTL measurement  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ ,  $LPF = 30\text{ kHz}$ ,  $V_{INL} = -14\text{ dBV}$   
 Surround = off, pin 28 to SPOUTL measurement  
 Load =  $8\ \Omega$



$V_{CC} = 3.0\text{ V}$ ,  $V_{CC-SP} = 3.0\text{ V}$   
 $f = 1\text{ kHz}$ ,  $LPF = 30\text{ kHz}$ ,  $V_{INL} = -34\text{ dBV}$   
 AGC = off, pin 28 to SPOUTL measurement  
 Load =  $8\ \Omega$

**■ Usage Notes**

- Avoid the power line short and the ground short of the terminals.
- Especially positive phase speaker output pins (pin 12, pin 15) and negative phase speaker output pins (pin 10, pin 13) have the possibility of break-down caused by the power line short and the ground short.  
Be sure to avoid power line short, ground short and load short.

**■ Licensing Agreement**

License agreement is required between Customer and Desper Products, Inc.

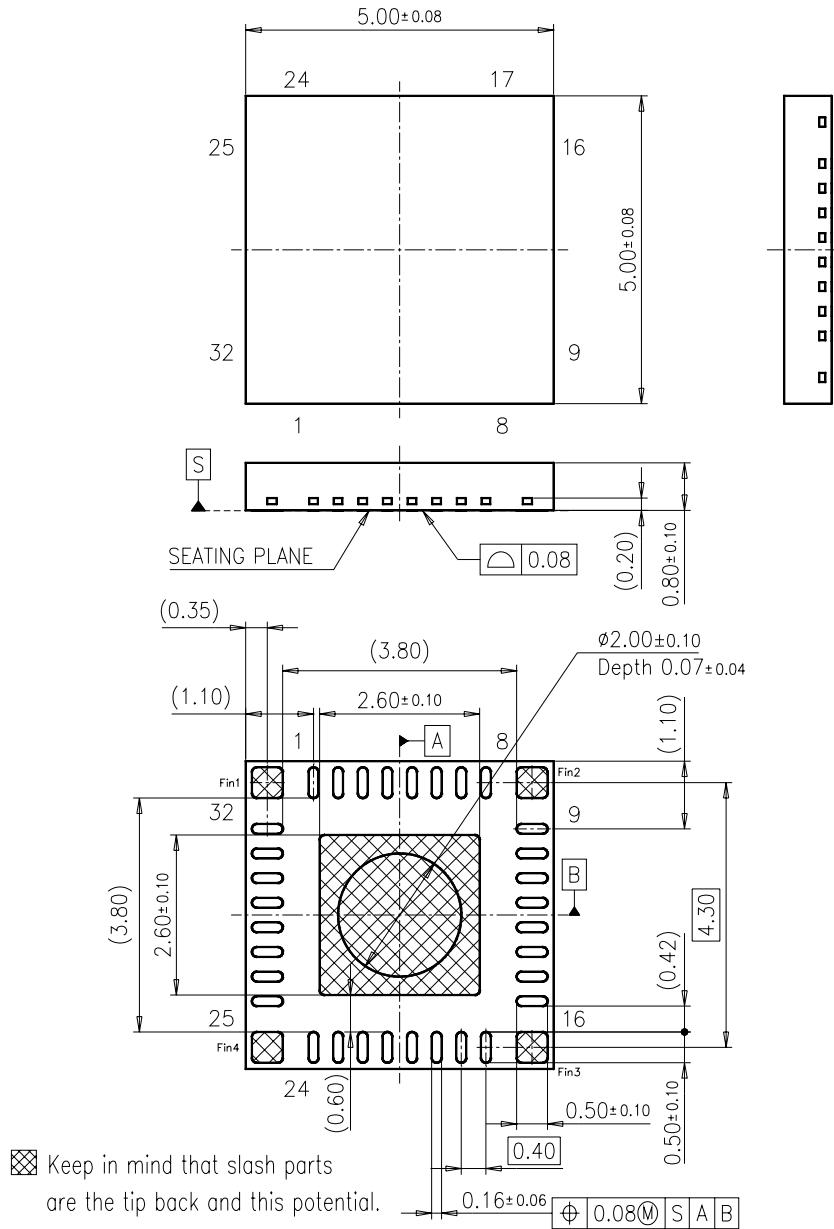
**(Japan Office)**

Spatializer® Audio Laboratories, Inc.  
Desper Products, Inc.  
Mr. Masaya Ishikawa  
E-mail: masaya@ishi-kawa.com  
Tokyo Office  
1-15-4-201 Sasazuka  
Shibuya-Ku, Tokyo  
151-0073 Japan  
Tel: +81-3-5454-1140  
Fax: +81-3-5790-5394

**(Headquarters)**

Spatializer® Audio Laboratories, Inc.  
Desper Products, Inc.  
Mr. Henry R. Mandell  
E-mail: henrym@spatializer.com  
1754 Technology Drive, Suite 125  
San Jose, California 95110  
Tel: 408-453-4180 ext. 201  
Fax: 408-437-5787

- Package Outline (Unit: mm)
- XLGA032-L-0505



## 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 technical information 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 circuits examples of the products. It neither warrants non-infringement of intellectual property right or any other rights owned by our company or a third party, nor grants any license.
- (3) We are not liable for the infringement of rights owned by a third party arising out of the use of the technical information as described in this material.
- (4) 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.
- (5) The products and product specifications described in this material are subject to change without notice for 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.
- (6) 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, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (7) When using products for which damp-proof packing is required, observe the conditions (including shelf life and amount of time let standing of unsealed items) agreed upon when specification sheets are individually exchanged.
- (8) This material may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.