

DATA SHEET


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

SEMICONDUCTOR COMPANY
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

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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™.

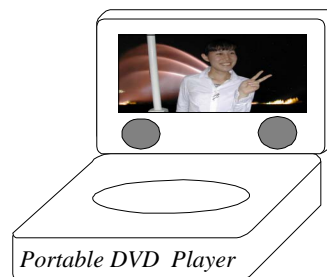
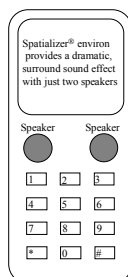
The Spatializer® environ™ is Desper Products, Inc.'s exclusive signal processing technology that is able to generate surround sound for low-power mobile applications. The technology is based on the company's commercial 3D audio production system, PRO-Spatializer® Audio Production System. The AN12974A 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.

■ 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 [®] 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 | μA | — |
| 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 | μA | — |
| 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 | — |

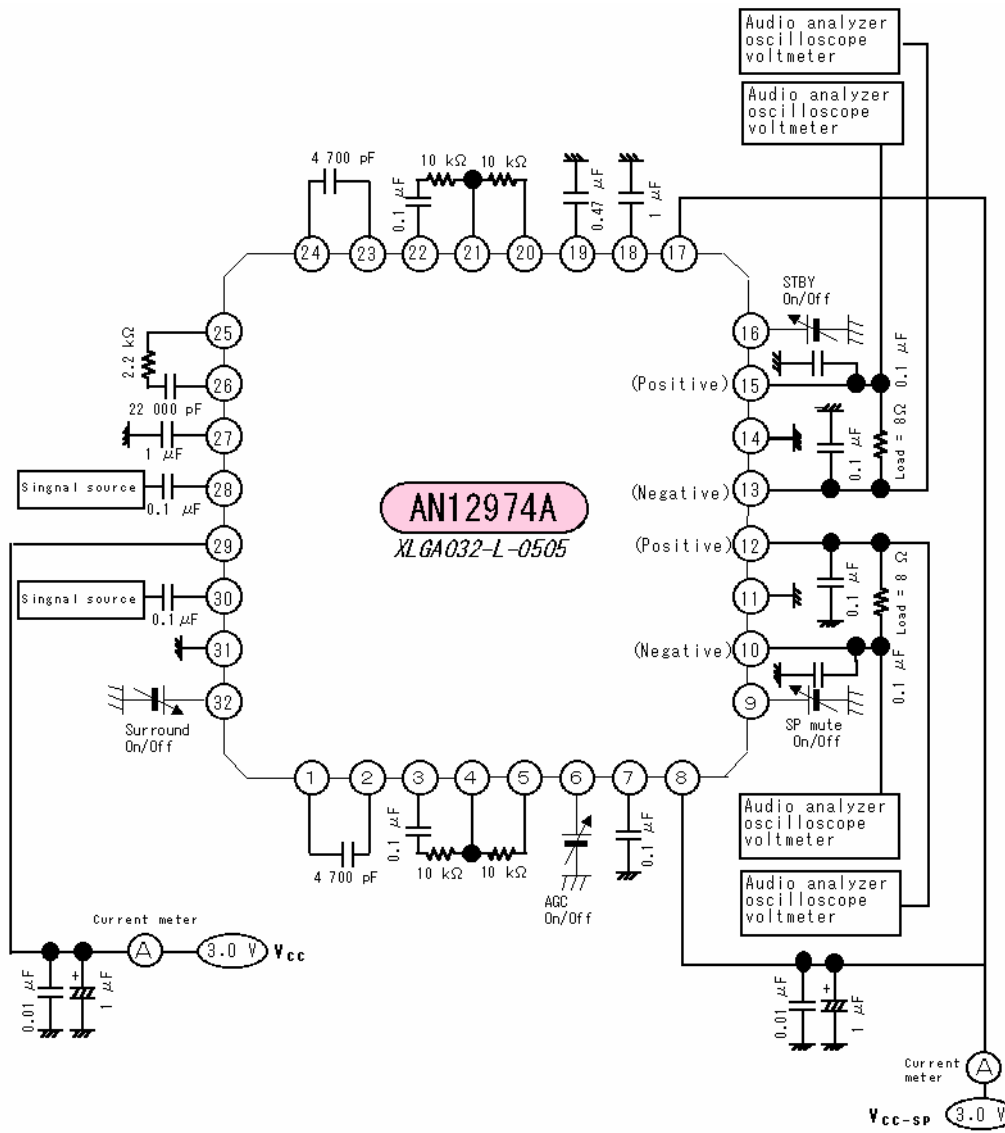
■ Electrical Characteristics (Design Reference Data) at $V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$

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

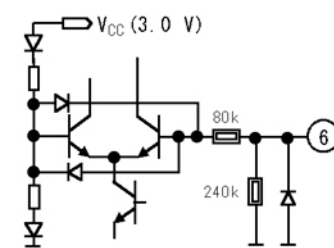

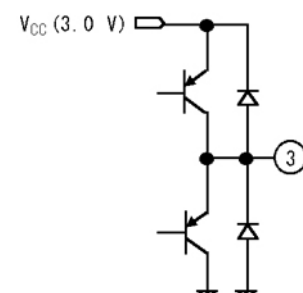
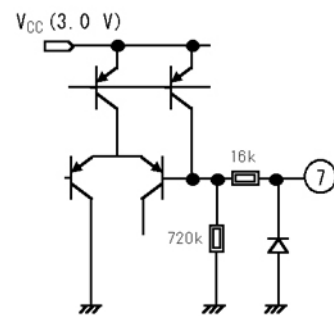
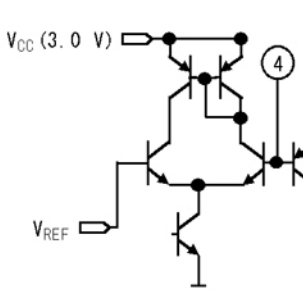

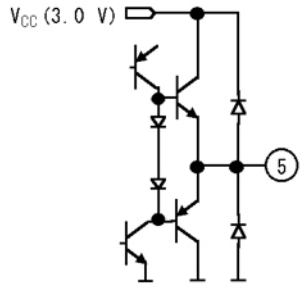
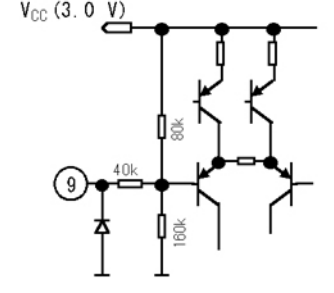


■ Measure Method of Electrical Characteristics

| 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 |
| Circuit current | | | | | | | | | |
| 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 |
| 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 | 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 |

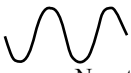

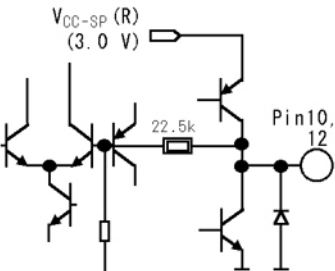
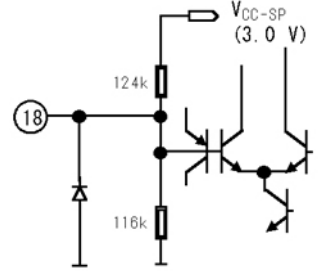
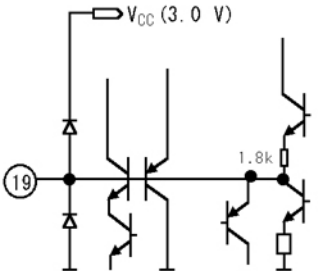

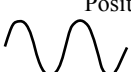
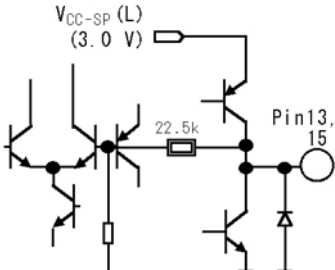

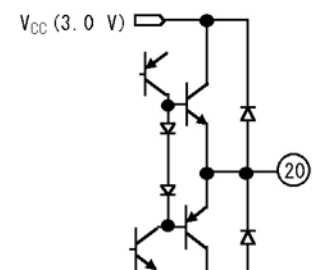
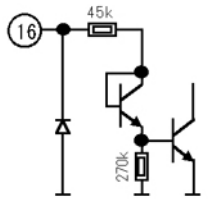
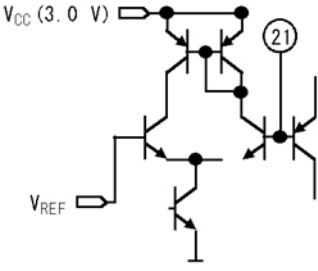
■ Technical Data

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 _{CC} DC: 3.0 V V _{CC-SR} (R) V _{CC-SP} (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> |


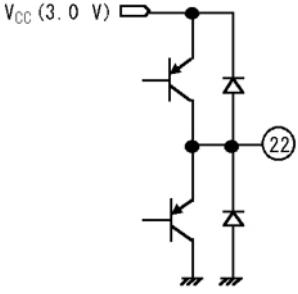

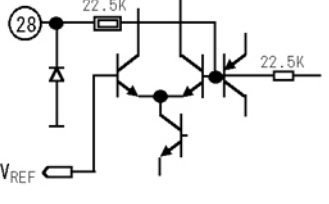

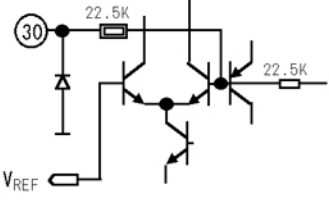
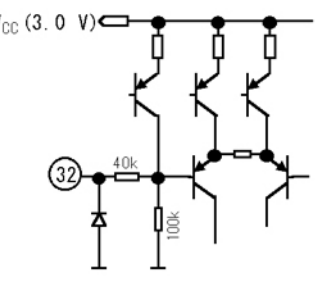
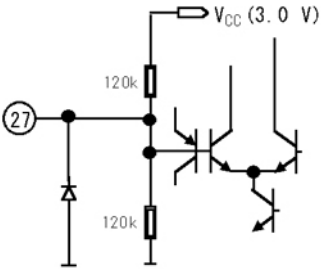
■ Technical Data (continued)

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>$1/2 V_{CC-SP}$ (V_{REF-SP})</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.

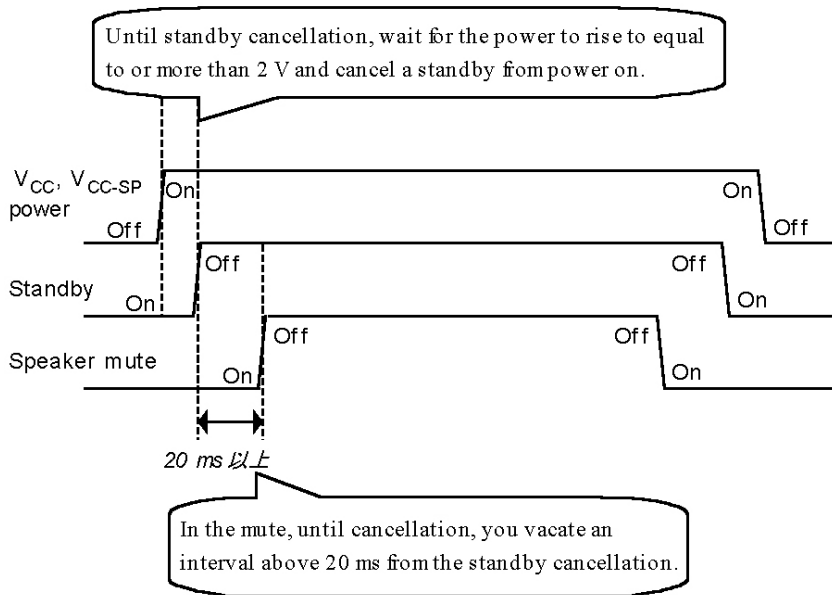
| Pin No. | Waveform and voltage | Inner circuit | Pin No. | Waveform and voltage | Inner circuit |
|---------|--|--|---------|--|---|
| 22 | Surround output 1-channel  DC: 1.5 V AC: -34 dBV |  | 28 | Audio input terminal L-channel  DC: 1.5 V AC: -34 dBV |  Input impedance = 22.5 kΩ |
| 23, 24 | Surround 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

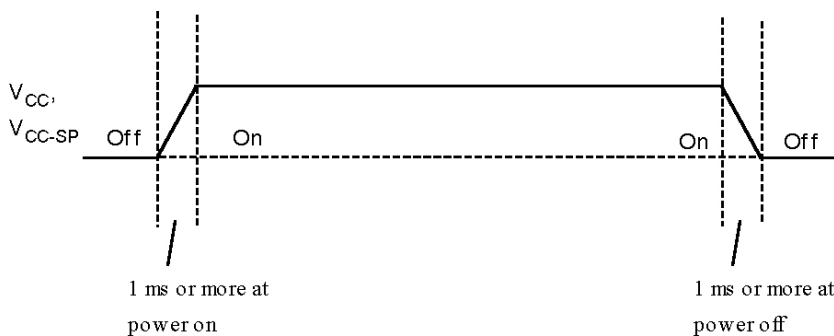
1. The power off condition
Both the standby and the mute are in the on condition.
2. Power on
3. The standby cancellation
4. The mute cancellation

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

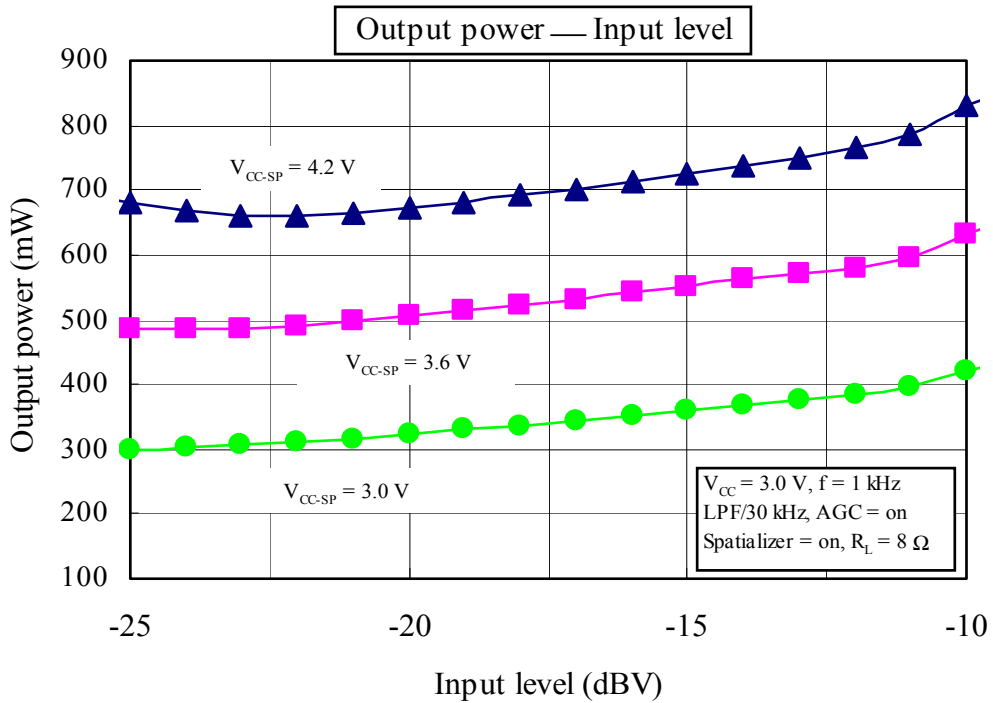
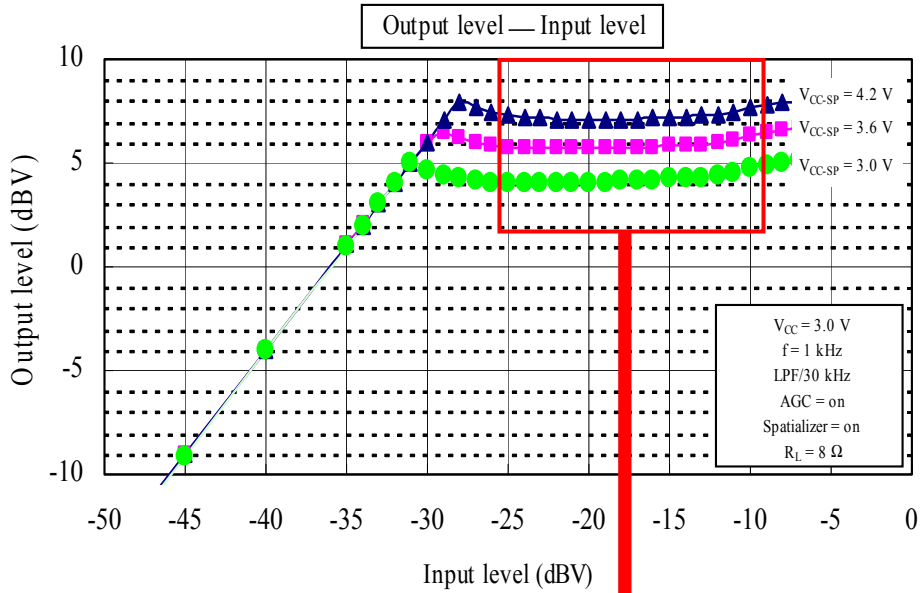
In order to reduce current consumption during SP-save or standby, when SP-save switch is on (when pin 9 is low-level), also set pin 6 to low-level.

(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.

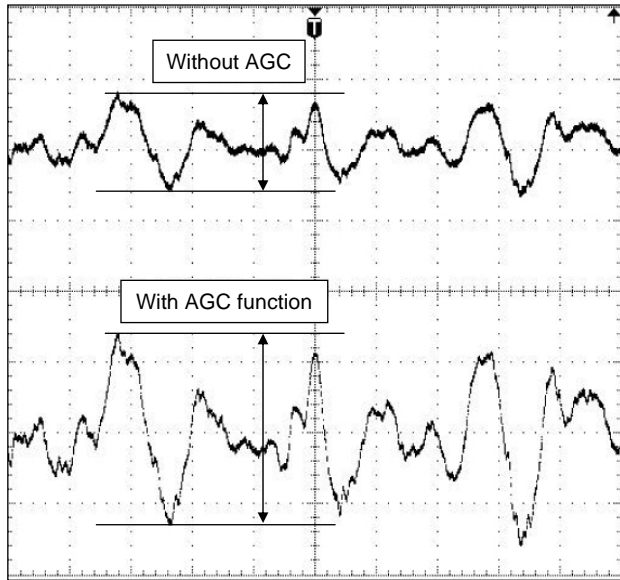
- Technical Data (continued)
- Output power when AGC is on



■ Technical Data (continued)

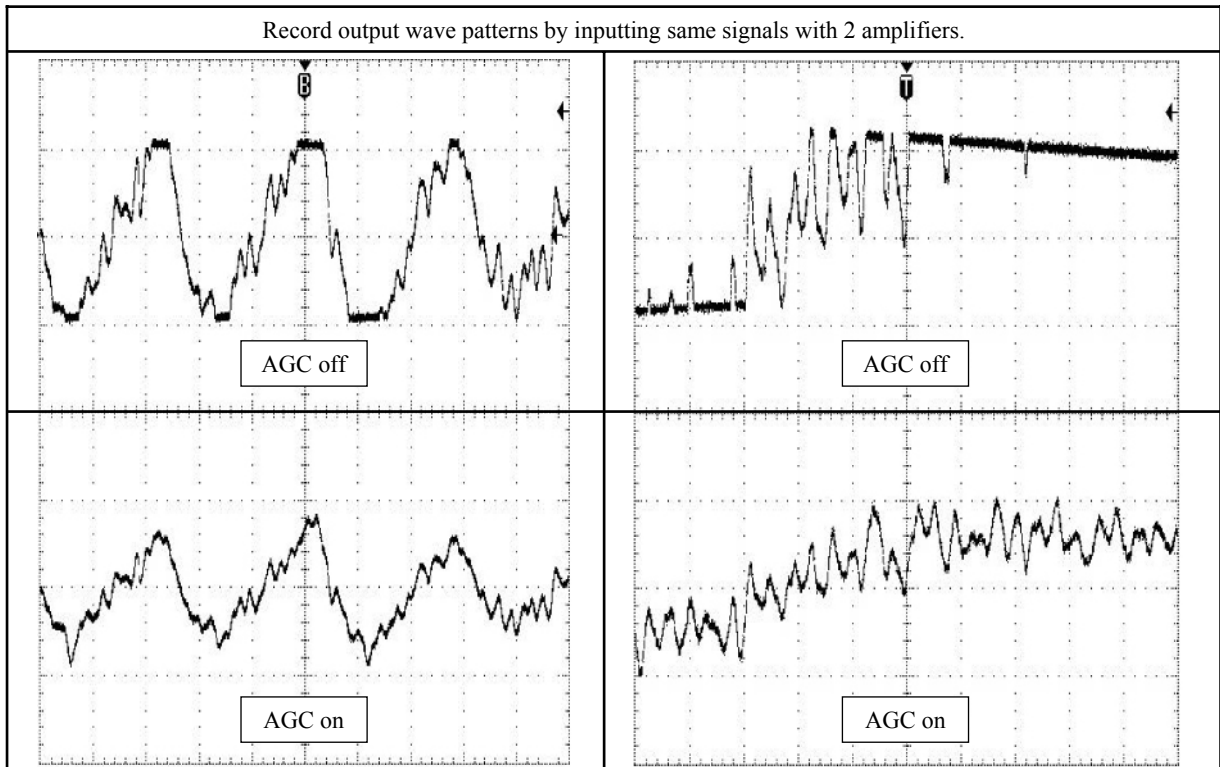
• Amplifier output wave pattern

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



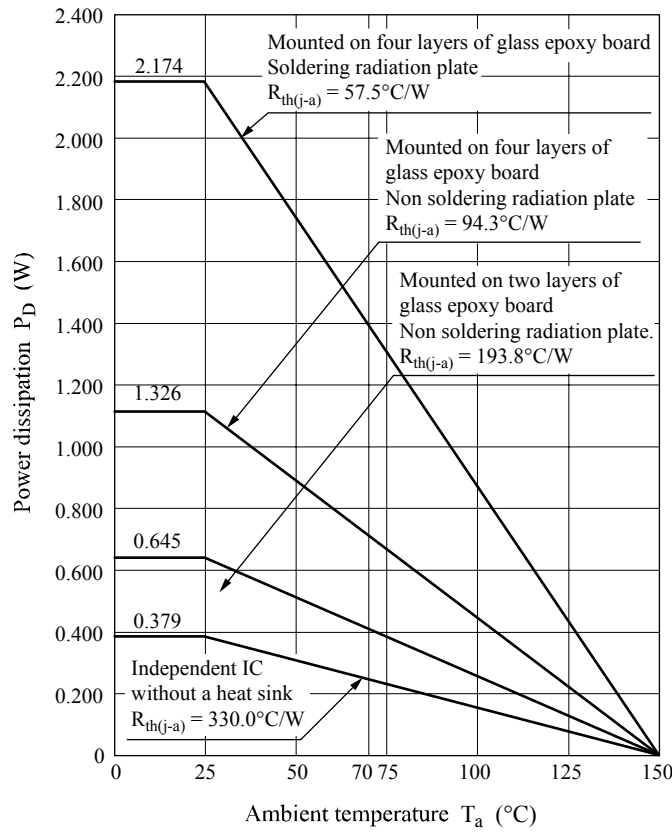
← Average sound volume cannot be big without AGC (wave patters clips when input signal is big and sound distortion occurs)

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



■ Technical Data (continued)

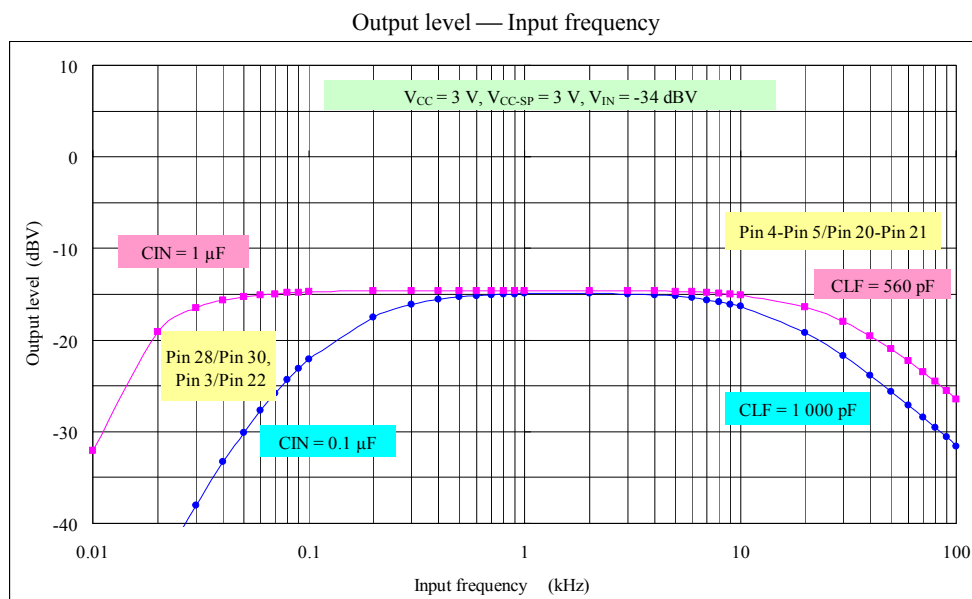
- Power dissipation of package XLGA032-L-0505



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

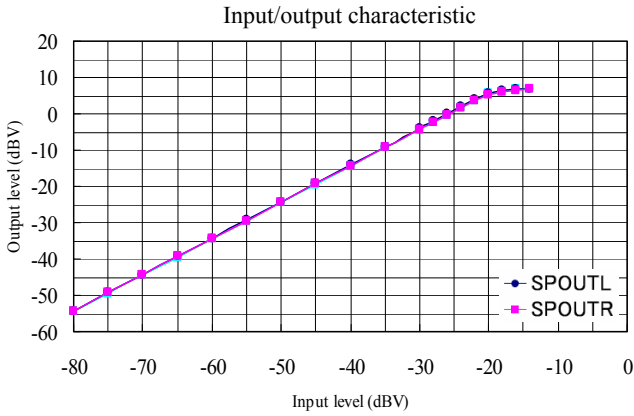
• Main characteristics

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

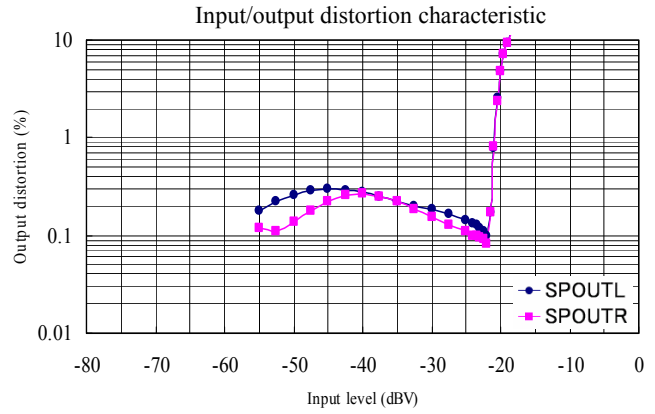


■ Technical Data (continued)

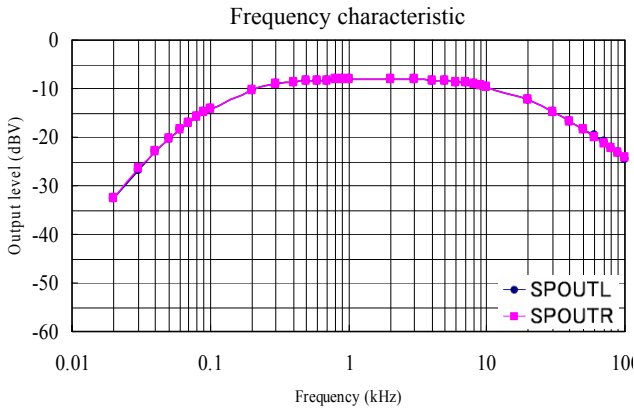
- Main Characteristics (continued) AGC = off, surround = off



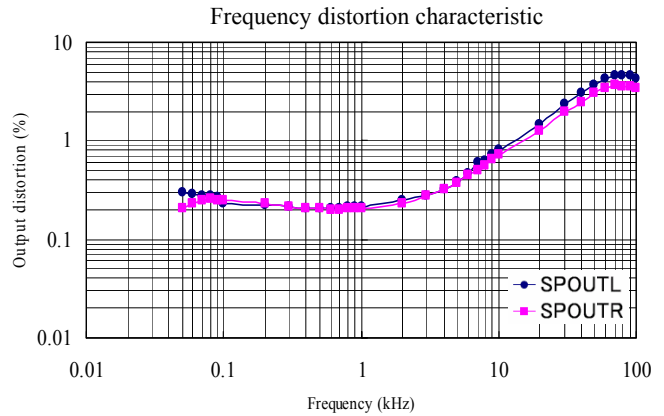
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = off, surround = off
 Load = $8\ \Omega$



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



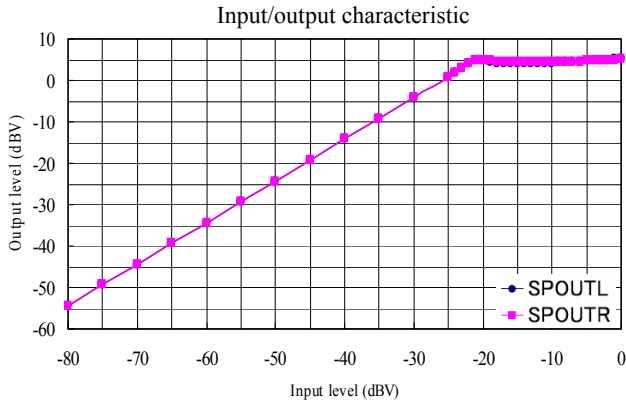
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -34\text{ dBV}$
 AGC = off, surround = off
 Load = $8\ \Omega$



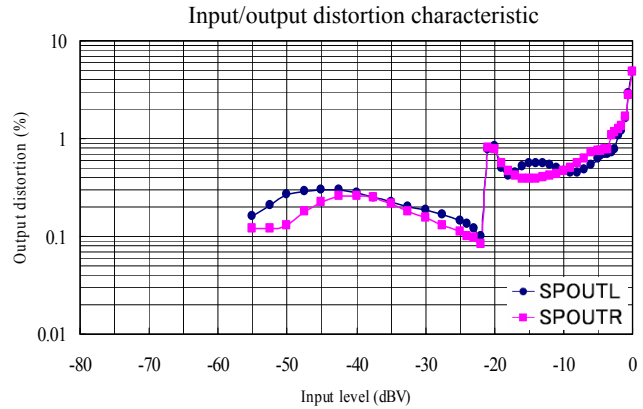
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -34\text{ dBV}$
 AGC = off, surround = off
 Load = $8\ \Omega$

■ Technical Data (continued)

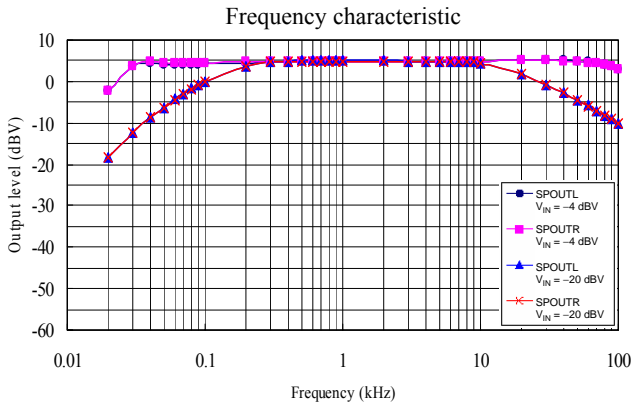
- Main Characteristics (continued) AGC = on, surround = off



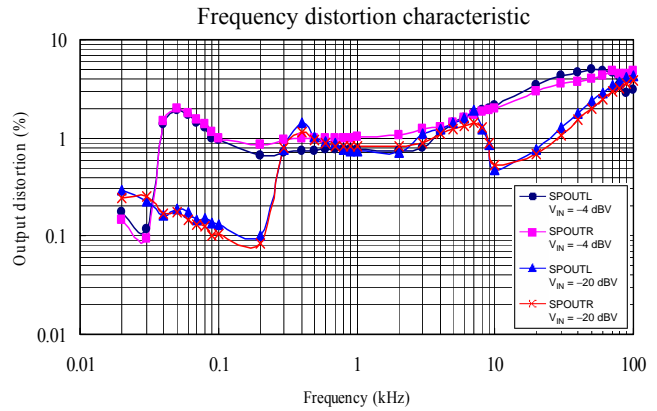
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = on, surround = off
 Load = $8\ \Omega$



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



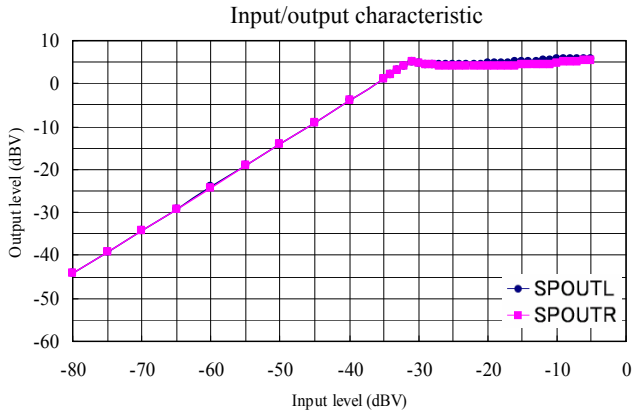
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -4\text{ dBV}$, $V_{IN} = -20\text{ dBV}$
 AGC = on, surround = off
 Load = $8\ \Omega$



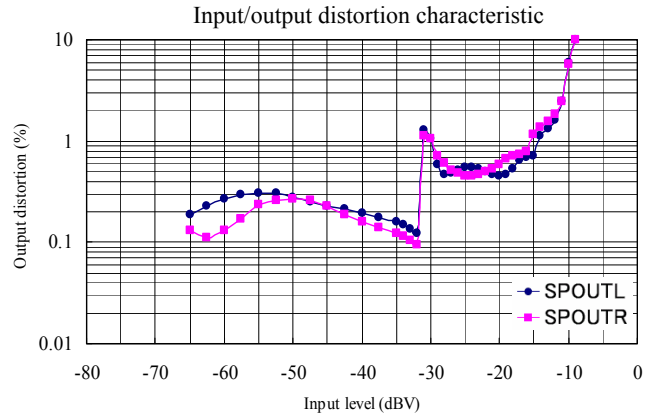
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -4\text{ dBV}$, $V_{IN} = -20\text{ dBV}$
 AGC = on, surround = off
 Load = $8\ \Omega$

■ Technical Data (continued)

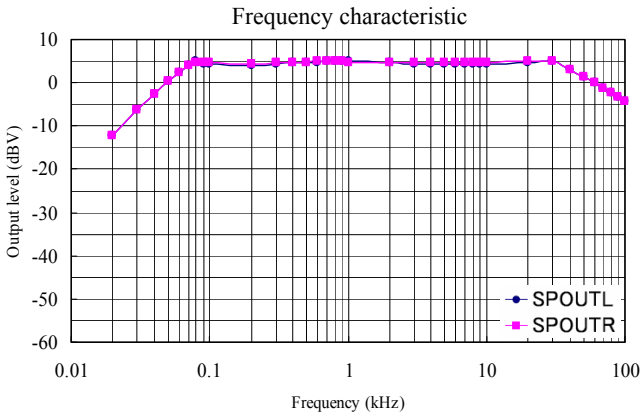
- Main Characteristics (continued) AGC = on, surround = on



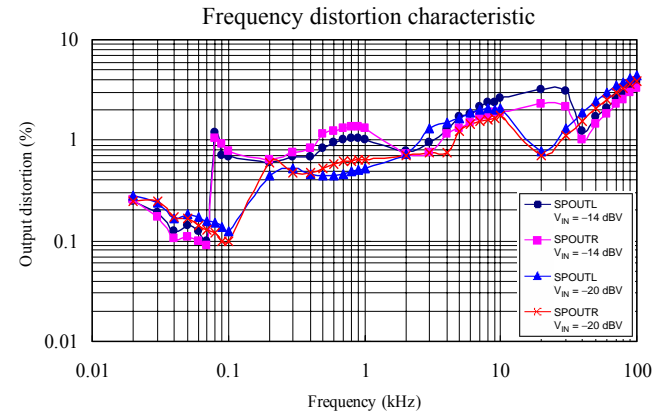
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = on, surround = on
 Load = $8\ \Omega$



$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, 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 = $8\ \Omega$

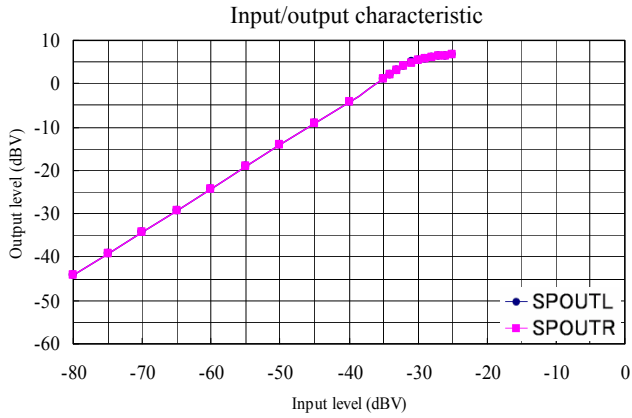


$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -14\text{ dBV}$, $V_{IN} = -20\text{ dBV}$
 AGC = on, surround = on
 Load = $8\ \Omega$

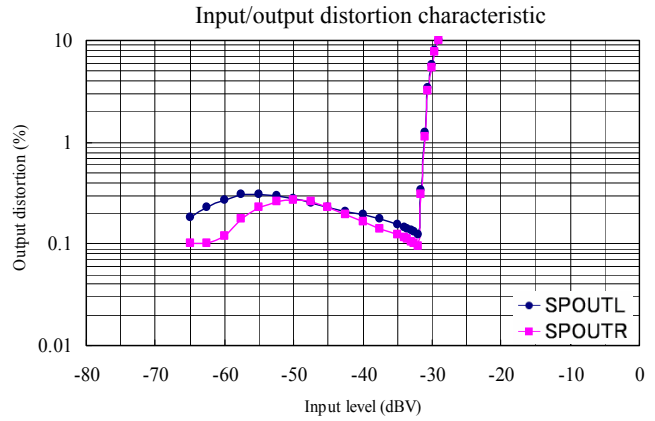
Due to Input/output distortion characteristic, the maximum input level (in the case of "AGC = on, surround = on") would be approximately -14 dBV.

■ Technical Data (continued)

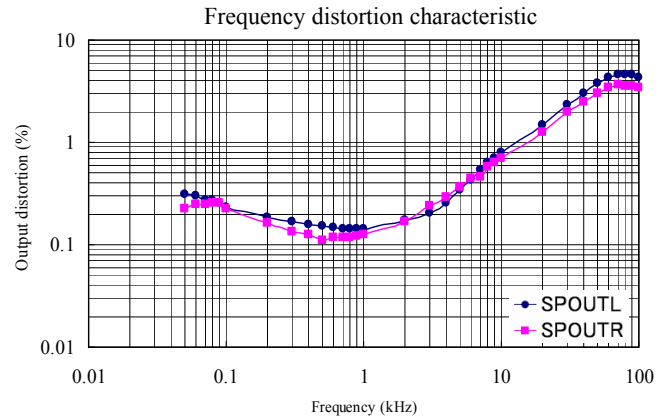
- Main Characteristics (continued) AGC = off, surround = on



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



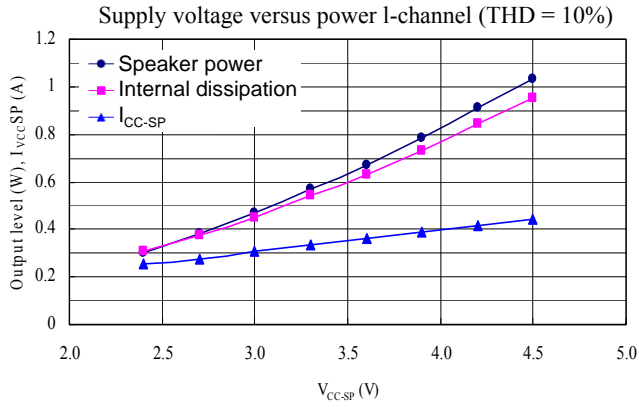
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = off, surround = on
 Load = $8\ \Omega$



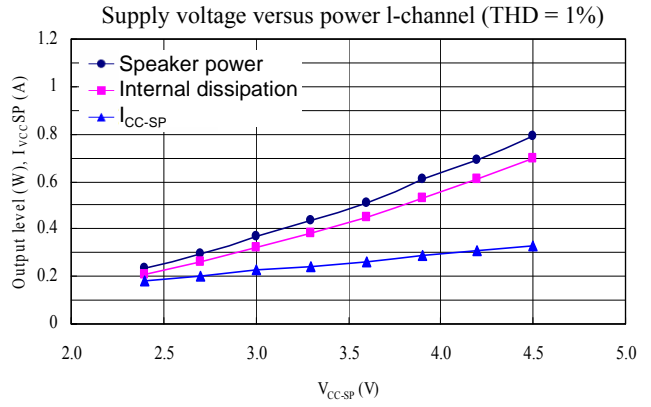
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 No filter, $V_{IN} = -34\text{ dBV}$
 AGC = off, surround = on
 Load = $8\ \Omega$

■ Technical Data (continued)

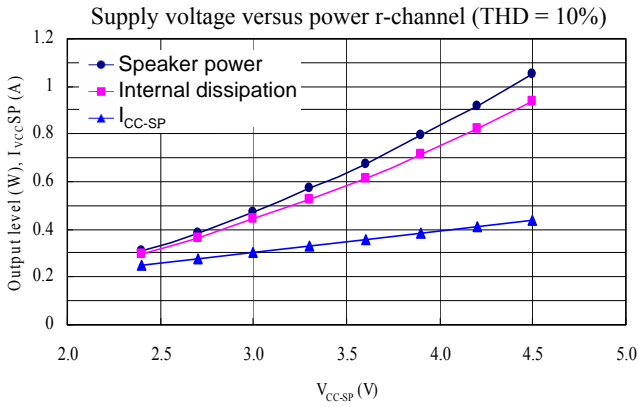
- Main Characteristics (continued) Speaker power



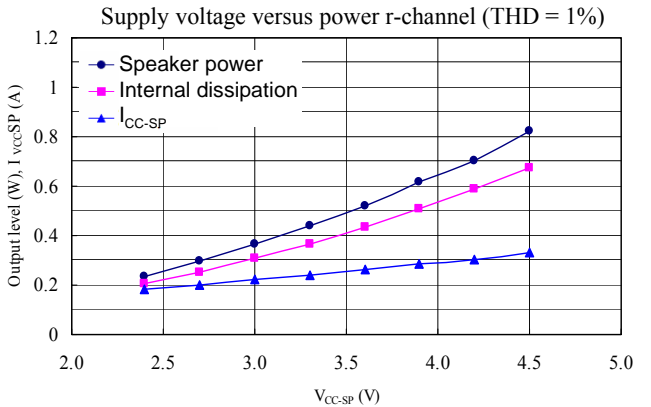
V_{CC} = 3.0 V, V_{CC-SP} = sweep
 f = 1 kHz, LPF/30 kHz
 AGC = off, surround = off
 Load = 8 Ω



V_{CC} = 3.0 V, V_{CC-SP} = sweep
 f = 1 kHz, LPF/30 kHz
 AGC = off, surround = off
 Load = 8 Ω



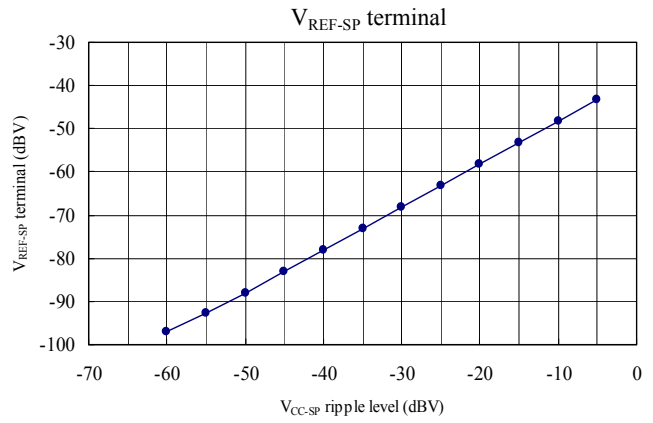
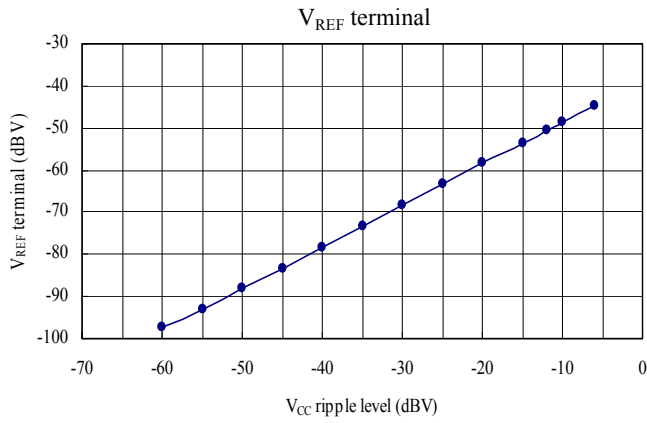
V_{CC} = 3.0 V, V_{CC-SP} = sweep
 f = 1 kHz, LPF/30 kHz
 AGC = off, surround = off
 Load = 8 Ω



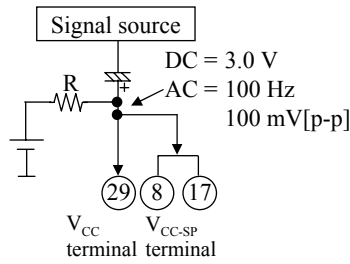
V_{CC} = 3.0 V, V_{CC-SP} = sweep
 f = 1 kHz, LPF/30 kHz
 AGC = off, surround = off
 Load = 8 Ω

■ Technical Data (continued)

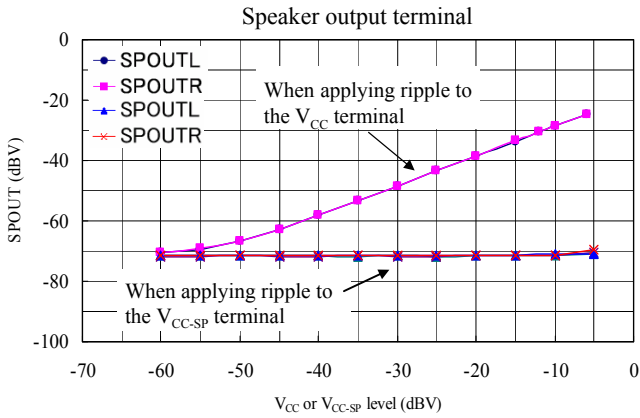
- Main Characteristics (continued) Power supply ripple rejection



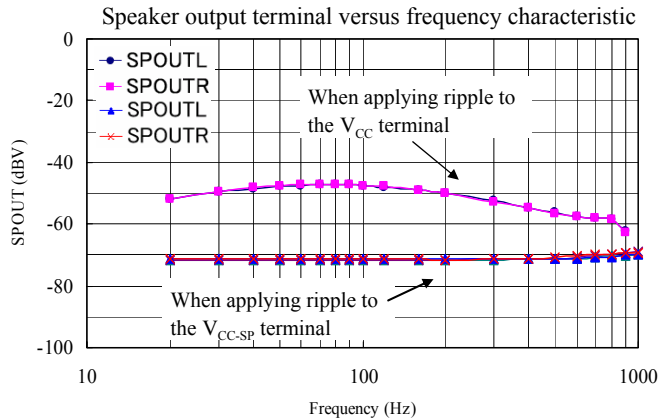
V_{CC} = 3.0 V, V_{CC-SP} = 3.0 V
 f = 100 Hz, LPF/30 kHz
 AGC = on, surround = on
 Load = 8 Ω



V_{CC} = 3.0 V, V_{CC-SP} = 3.0 V
 f = 100 Hz, LPF/30 kHz
 AGC = on, surround = on
 Load = sweep



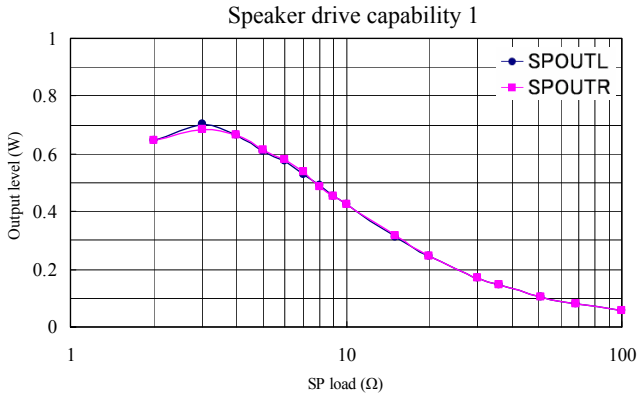
V_{CC} = 3.0 V, V_{CC-SP} = 3.0 V
 f = 100 Hz, LPF/30 kHz
 AGC = on, surround = on
 Load = 8 Ω



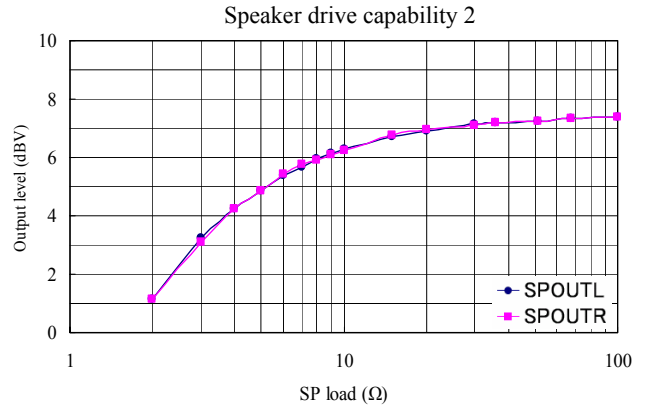
V_{CC} = 3.0 V, V_{CC-SP} = 3.0 V
 V_{IN} = 100 mV[p-p] (= -29 dBV), LPF = 30 kHz
 AGC = on, surround = on
 Load = 8 Ω

■ Technical Data (continued)

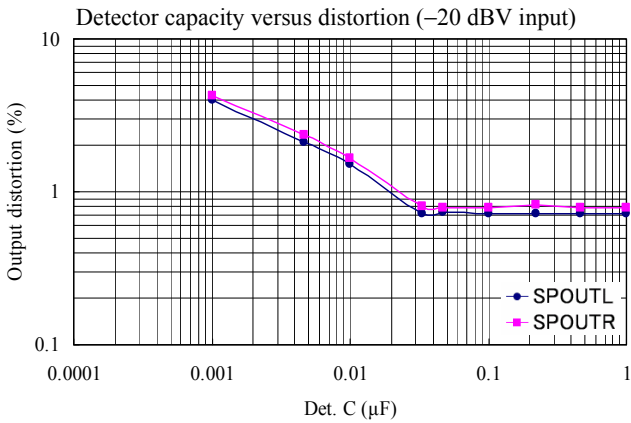
- Main Characteristics (continued) Speaker drive capability, detector capacity versus distortion



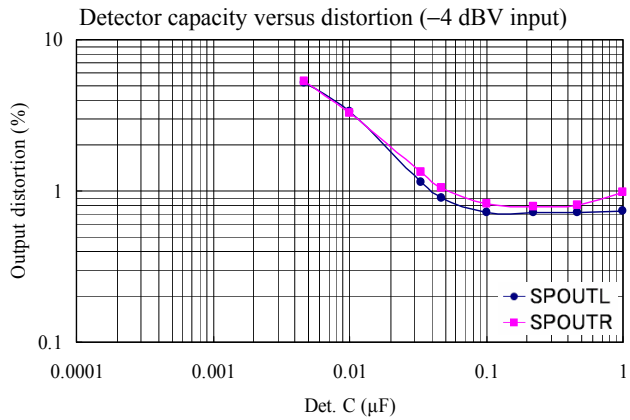
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = off, surround = off
 THD = output level measurement at 10%, load = sweep



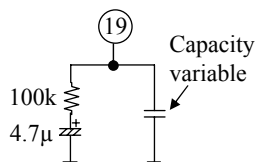
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = off, surround = off
 THD = output level measurement at 10%, load = sweep



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

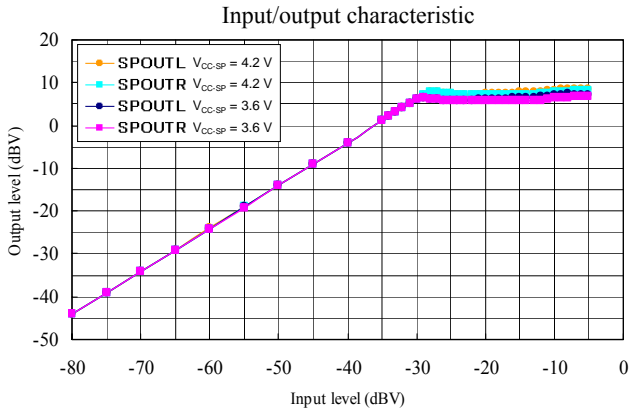


$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, LPF/30 kHz, $V_{IN} = -4\text{ dBV}$
 AGC = on, surround = off
 Load = 8 Ω

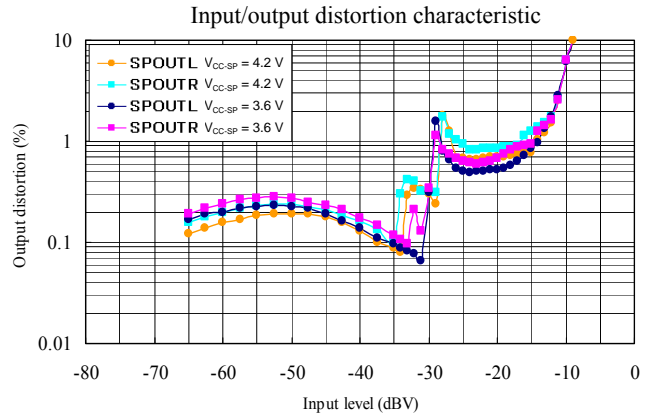


■ Technical Data (continued)

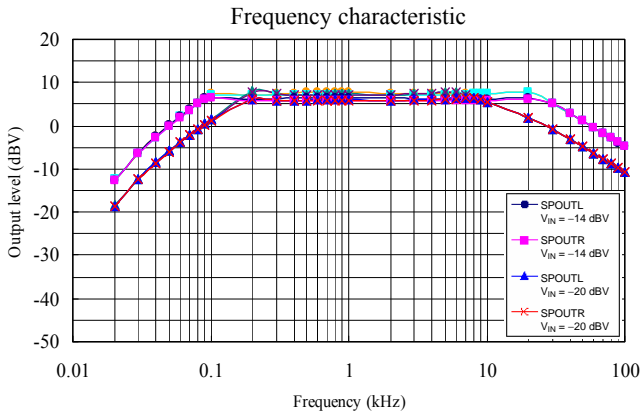
- Main Characteristics (continued) AGC = on, surround = on



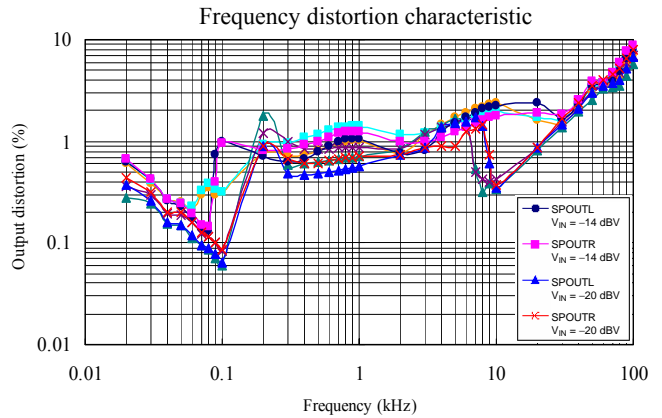
$V_{CC} = 3.0V$
 $f = 1\text{ kHz}$, LPF/30 kHz
 AGC = on, surround = on
 Load = $8\ \Omega$



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



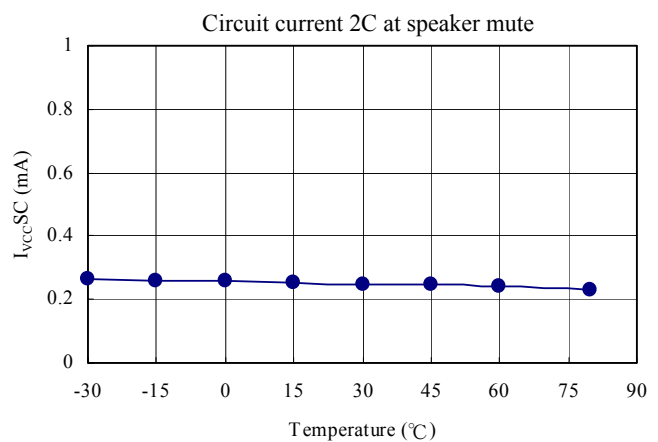
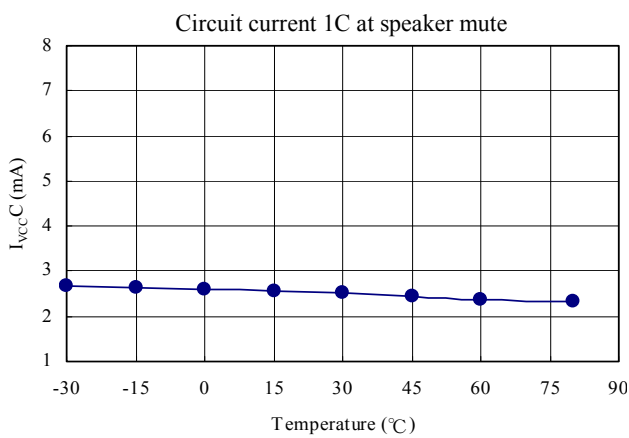
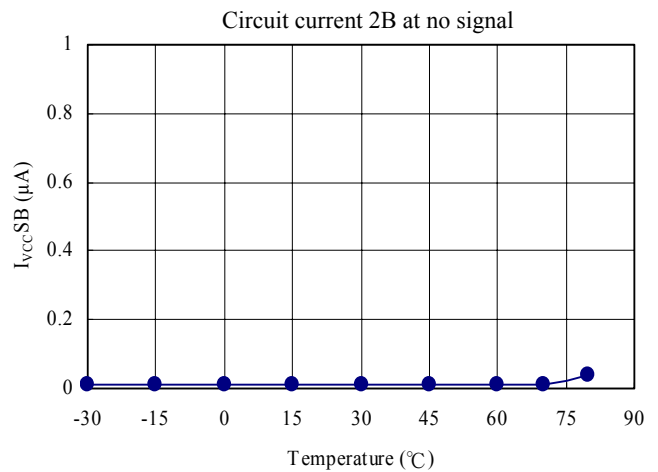
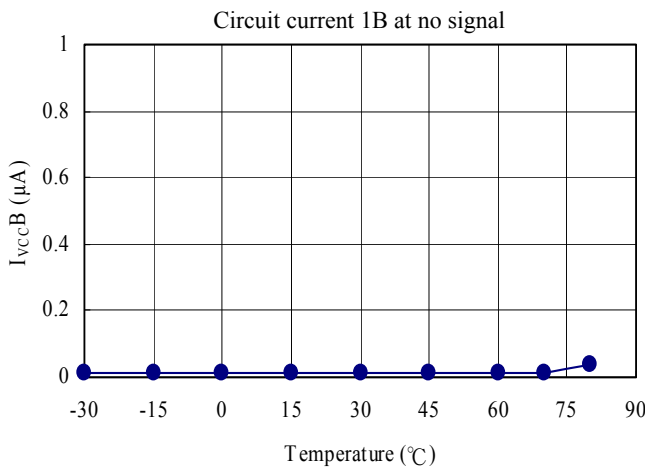
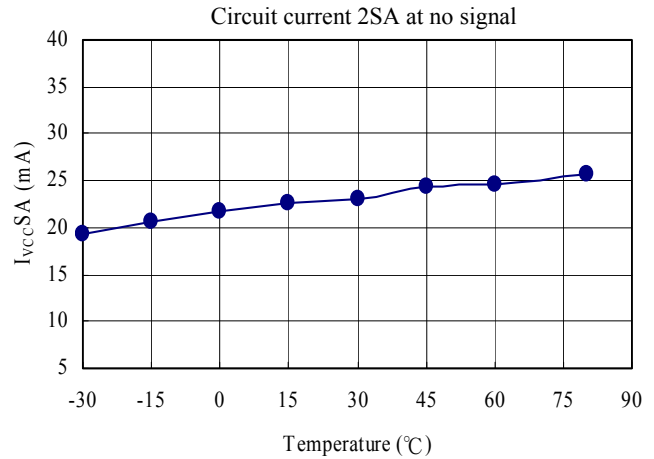
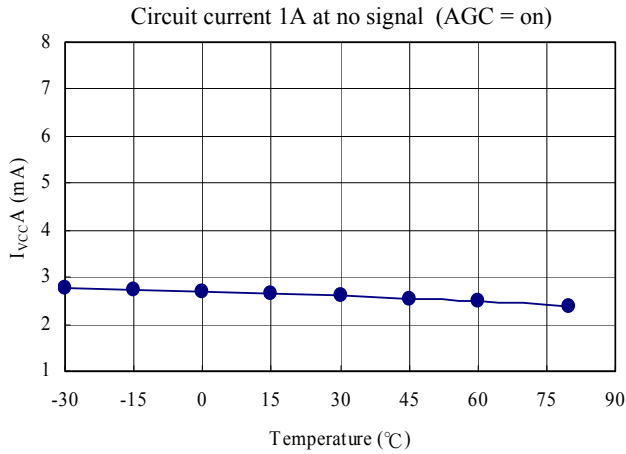
$V_{CC} = 3.0V$
 No filter, $V_{IN} = -14\text{ dBV}$, $V_{IN} = -20\text{ dBV}$
 AGC = on, surround = on
 Load = $8\ \Omega$



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

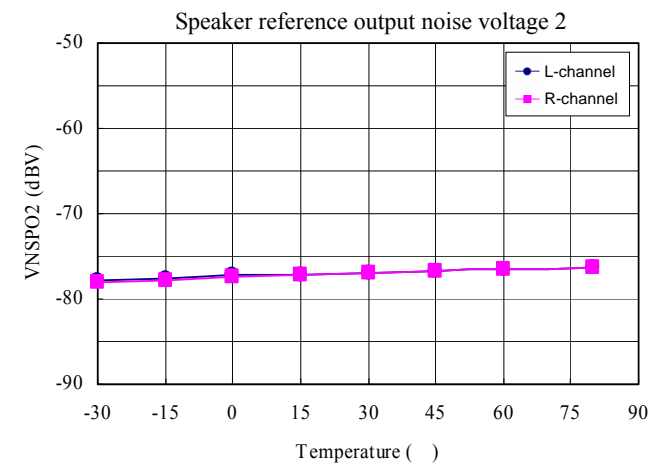
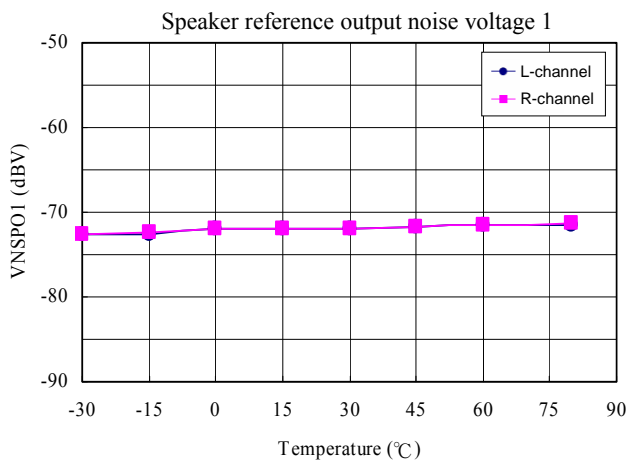
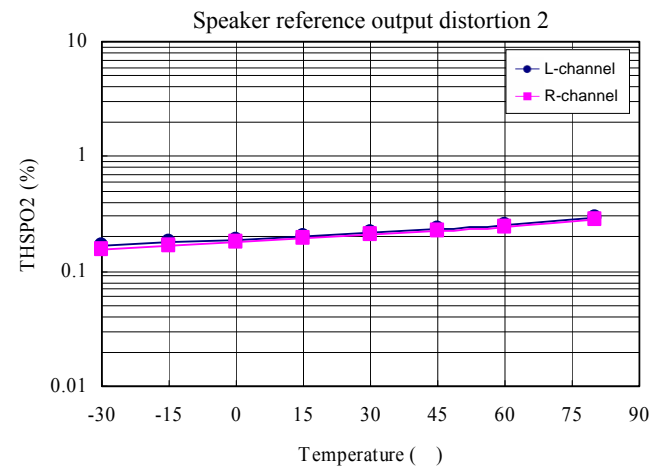
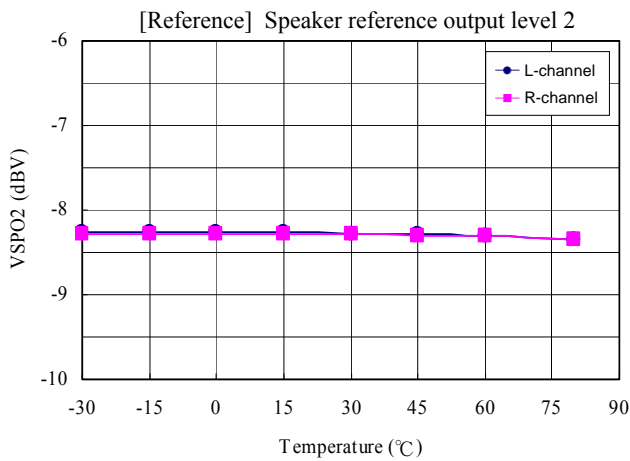
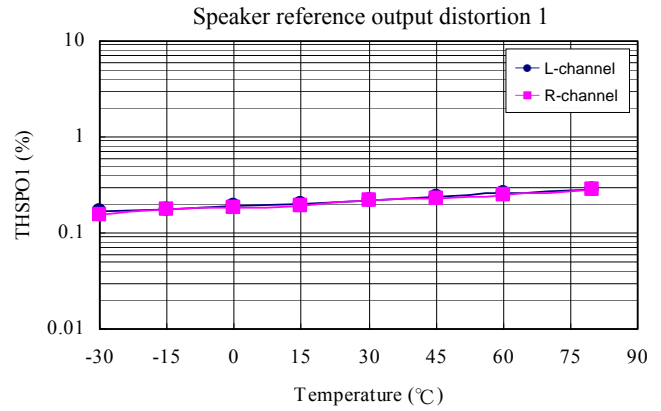
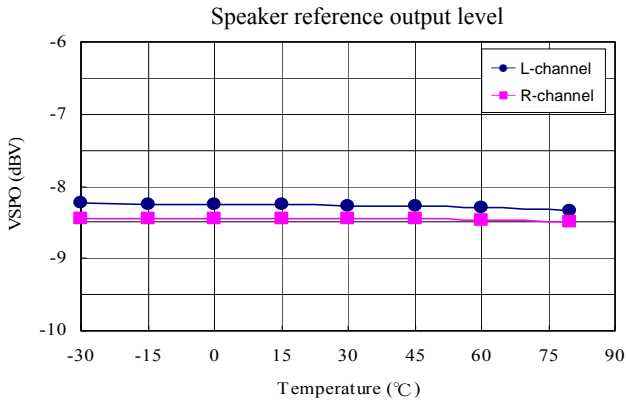
■ Technical Data (continued)

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



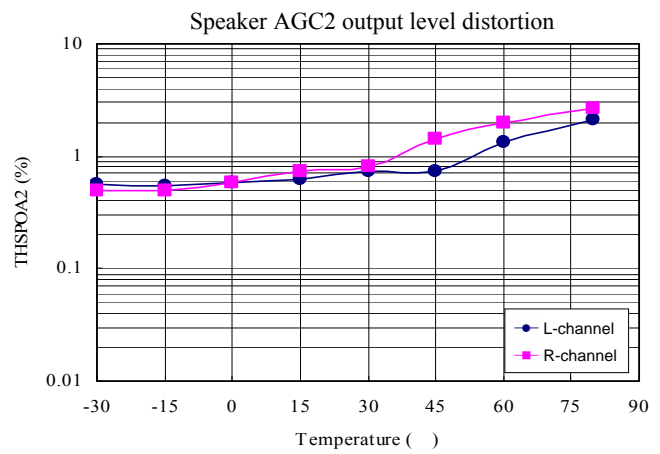
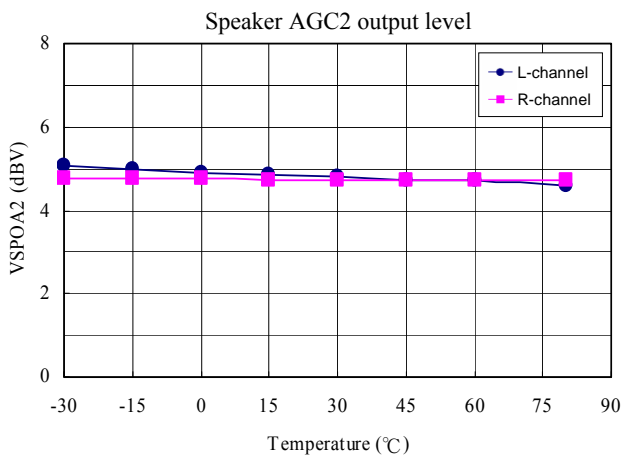
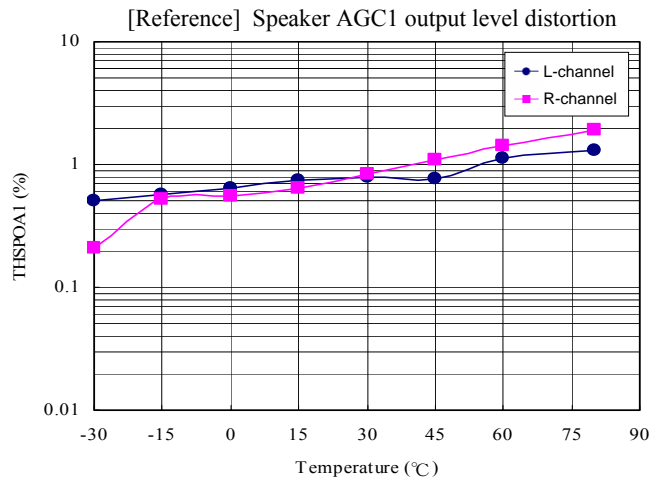
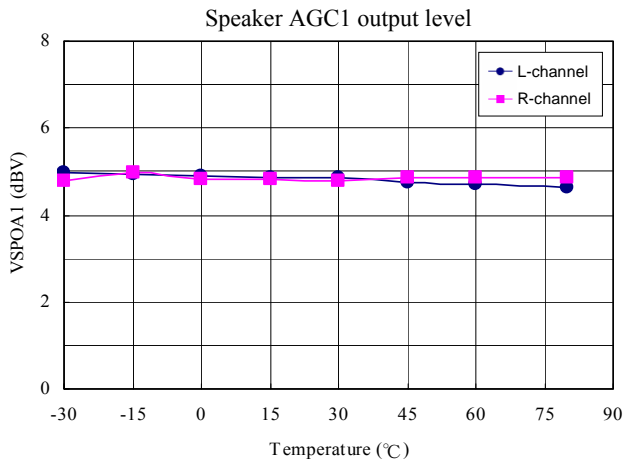
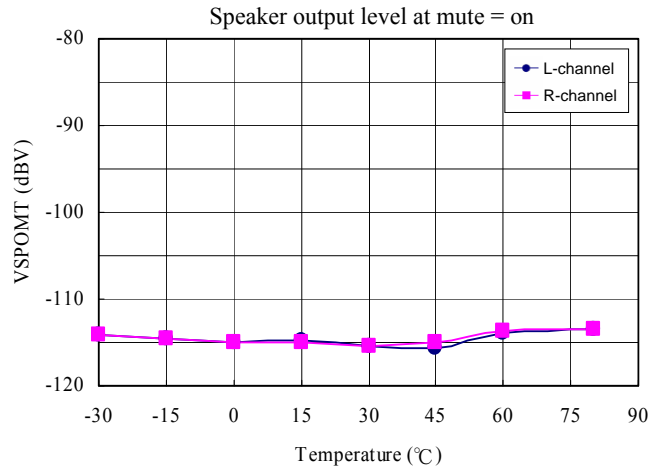
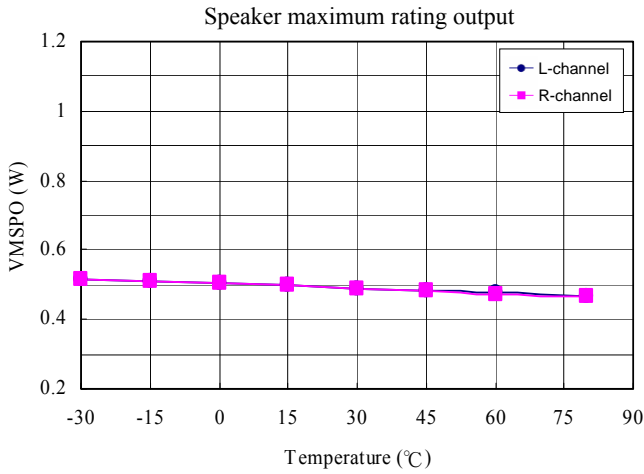
■ Technical Data (continued)

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



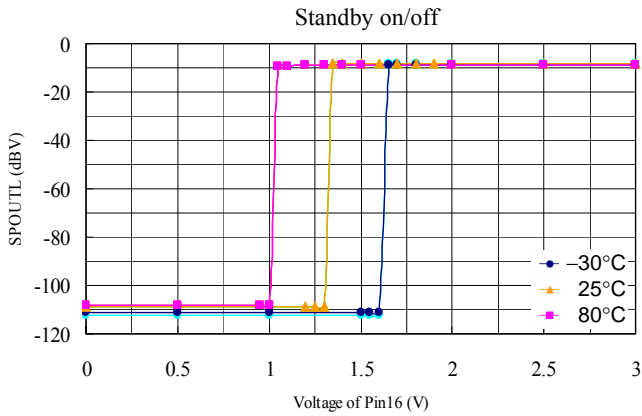
■ Technical Data (continued)

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

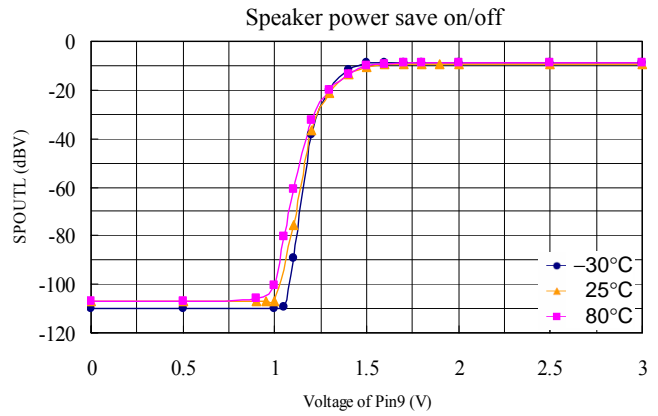


■ Technical Data (continued)

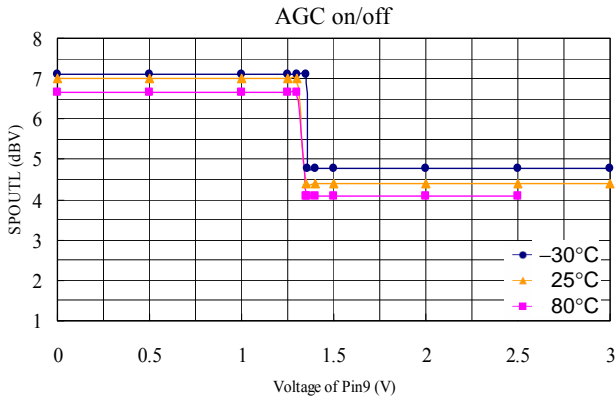
- Main Characteristics (continued) Switch voltage of a control terminal



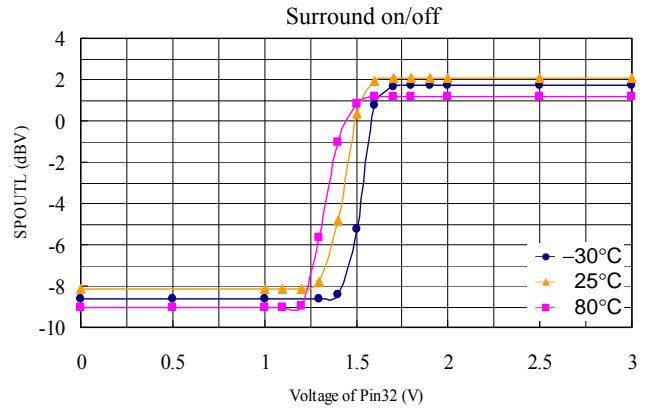
$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, $LPF = 30\text{ kHz}$, $V_{INL} = -34\text{ dBV}$
 AGC = off, surround = off,
 pin 28 to SPOUTL measurement
 Load = $8\ \Omega$



$V_{CC} = 3.0\text{ V}$, $V_{CC-SP} = 3.0\text{ V}$
 $f = 1\text{ kHz}$, $LPF = 30\text{ kHz}$, $V_{INL} = -34\text{ dBV}$
 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.

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