

## Monaural Microphone Amplifier

### ■ GENERAL DESCRIPTION

The **NJM2781** is a monaural microphone amplifier IC with a standby function, and can vary a voltage gain by adjusting an external resistor.

Since the **NJM2781** operates with a low voltage range of +2.7V to +4.5V and is available in tiny packages of MSOP8(TVSP8)\* and SSOP8, it is ideally suited for portable and handheld components.

### ■ PACKAGE OUTLINE



**NJM2781RB1**  
MSOP8(TVSP8)



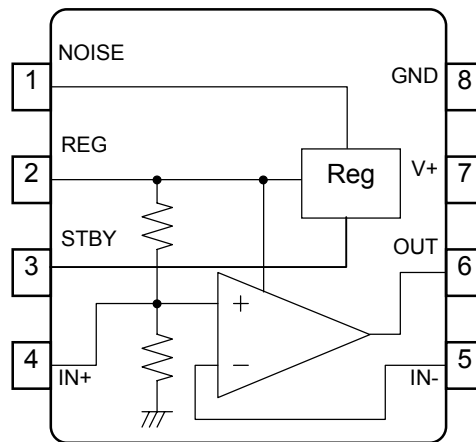
**NJM2781V**  
(SSOP8)

### ■ FEATURES

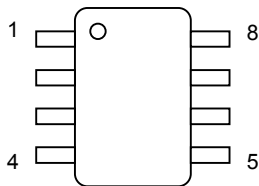
- Operating Voltage +2.7V to +4.5 V
- Operating Current 1.8mA typ.  
1μA max. (in Standby mode)
- Bipolar Technology
- Package Outline MSOP8(TVSP8) \*  
SSOP8

\*MEET JEDEC MO-187-DA / THIN TYPE

### ■ BLOCK DIAGRAM



### ■ PIN FUNCTION



| No. | SYMBOL | FUNCTION           | No. | SYMBOL | FUNCTION       |
|-----|--------|--------------------|-----|--------|----------------|
| 1   | NOISE  | Noise Bypass       | 5   | IN-    | Inverted Input |
| 2   | REG    | Regulator Output   | 6   | OUT    | Output         |
| 3   | STBY   | Standby On/Off     | 7   | V+     | Power Supply   |
| 4   | IN+    | Non-Inverted Input | 8   | GND    | Ground         |

## ■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER                   | SYMBOL         | RATING                      | UNIT |
|-----------------------------|----------------|-----------------------------|------|
| Supply Voltage              | V <sup>+</sup> | 5                           | V    |
| Power Dissipation           | P <sub>D</sub> | MSOP8(TVSP8):320, SSOP8:250 | mW   |
| Operating Temperature Range | Topr           | -40 to 85                   | °C   |
| Storage Temperature Range   | Tstg           | -40 to 125                  | °C   |

## ■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, V<sup>+</sup>=2.8V, Vin=-40dBV, f=1kHz, R<sub>L</sub>=9kΩ)

### ● Power Supply

| PARAMETER                | SYMBOL           | TEST CONDITION     | MIN. | TYP. | MAX. | UNIT |
|--------------------------|------------------|--------------------|------|------|------|------|
| Operating Voltage        | V <sup>+</sup>   |                    | 2.7  | 2.8  | 4.5  | V    |
| Operating Current 1      | I <sub>cc1</sub> | No signal, Standby |      | -    | 1    | μA   |
| Operating Current 2      | I <sub>cc2</sub> | No signal, Active  |      | 1.8  | 4    | mA   |
| Mic Power Supply Voltage | V <sub>o</sub>   | RL=6.8kΩ           | 2.3  | 2.42 | 2.54 | V    |

### ● Amplifier

| PARAMETER                            | SYMBOL          | TEST CONDITION             | MIN.           | TYP.           | MAX.          | UNIT                        |
|--------------------------------------|-----------------|----------------------------|----------------|----------------|---------------|-----------------------------|
| Output Voltage                       | V <sub>o</sub>  |                            | 1.28           | 1.35           | 1.42          | V                           |
| Voltage Gain                         | G <sub>v</sub>  | Test Circuit 1             | 24             | 25             | 26            | dB                          |
| Maximum Output Voltage               | V <sub>OM</sub> | THD=0.1%                   | -2.7<br>(0.73) | -1.5<br>(0.84) | -             | dBV<br>(V <sub>rms</sub> )  |
| Total Harmonic Distortion<br>(THD+N) | THD             |                            | -              | 0.025          | 0.1           | %                           |
| Output Noise                         | V <sub>NO</sub> | Rg=600Ω, A-Weighted        | -              | -98<br>(12.6)  | -90<br>(31.6) | dBV<br>(μV <sub>rms</sub> ) |
| Power Supply Ripple<br>Rejection     | PSRR            | Rg=600Ω,<br>Vripple=-20dBV | 65             | 80             | -             | dB                          |

### ● Control

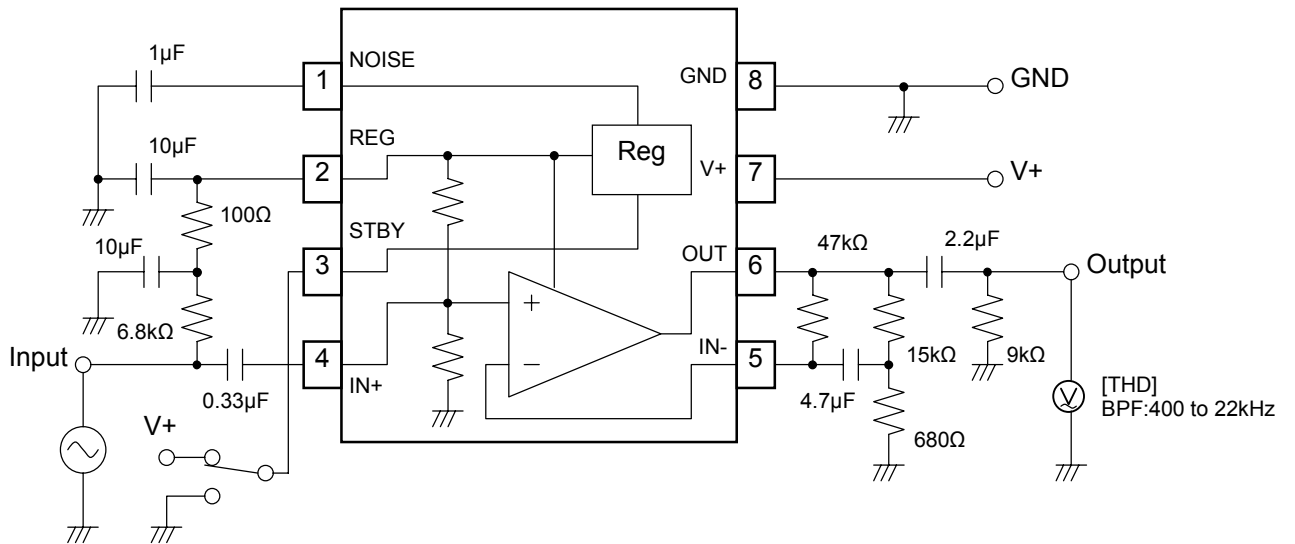
| PARAMETER                | SYMBOL          | TEST CONDITION | MIN. | TYP. | MAX.           | UNIT |
|--------------------------|-----------------|----------------|------|------|----------------|------|
| High Level Input Voltage | V <sub>IH</sub> | STBY terminal  | 2    | -    | V <sup>+</sup> | V    |
| Low Level Input Voltage  | V <sub>IL</sub> | STBY terminal  | 0    | -    | 0.5            | V    |

### ■ Standby Mode Operation

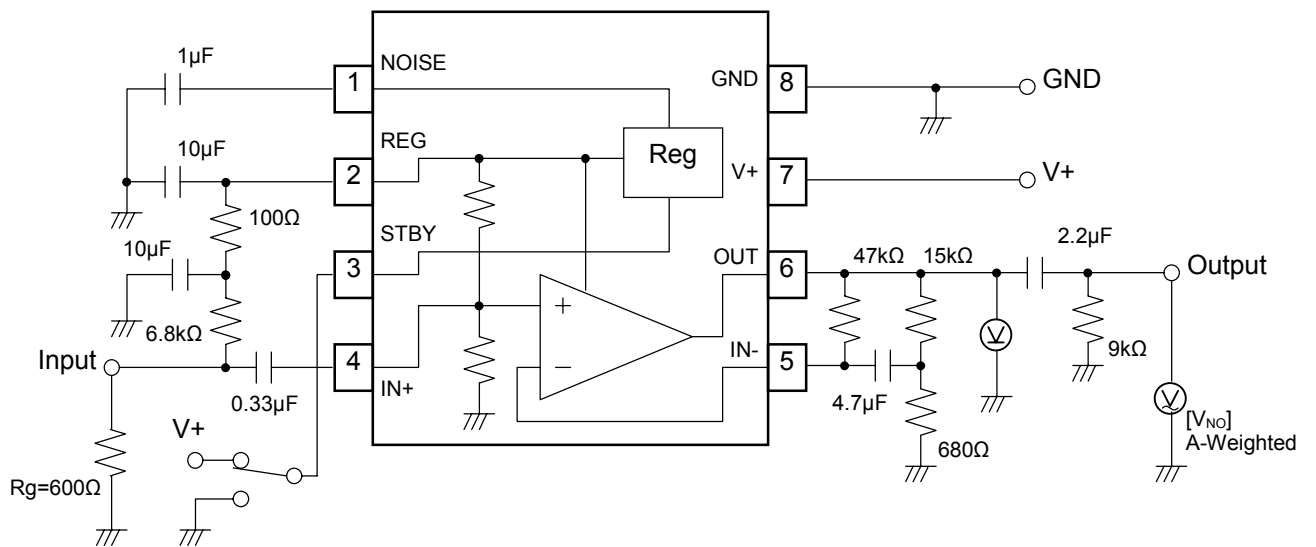
| Status  | Control Terminal | IC Condition |
|---------|------------------|--------------|
|         | STBY             |              |
| Active  | H                | IC active    |
| Standby | L, OPEN          | IC standby   |

## ■ TEST CIRCUIT

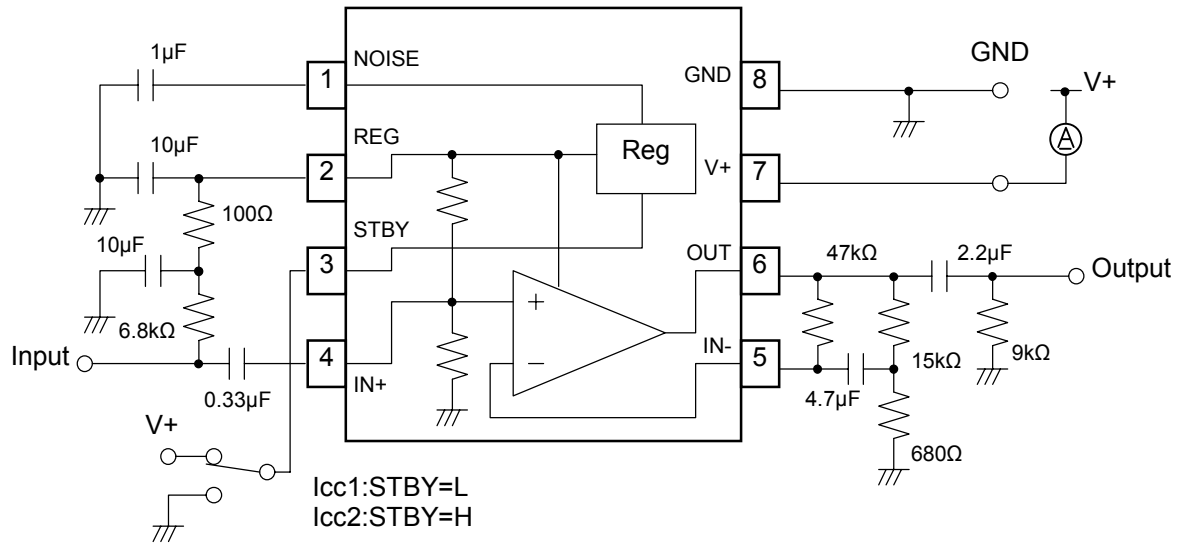
Test Circuit 1 (Voltage Gain  $G_V$ , Maximum Output Voltage  $V_{OM}$ , Total Harmonic Distortion THD)



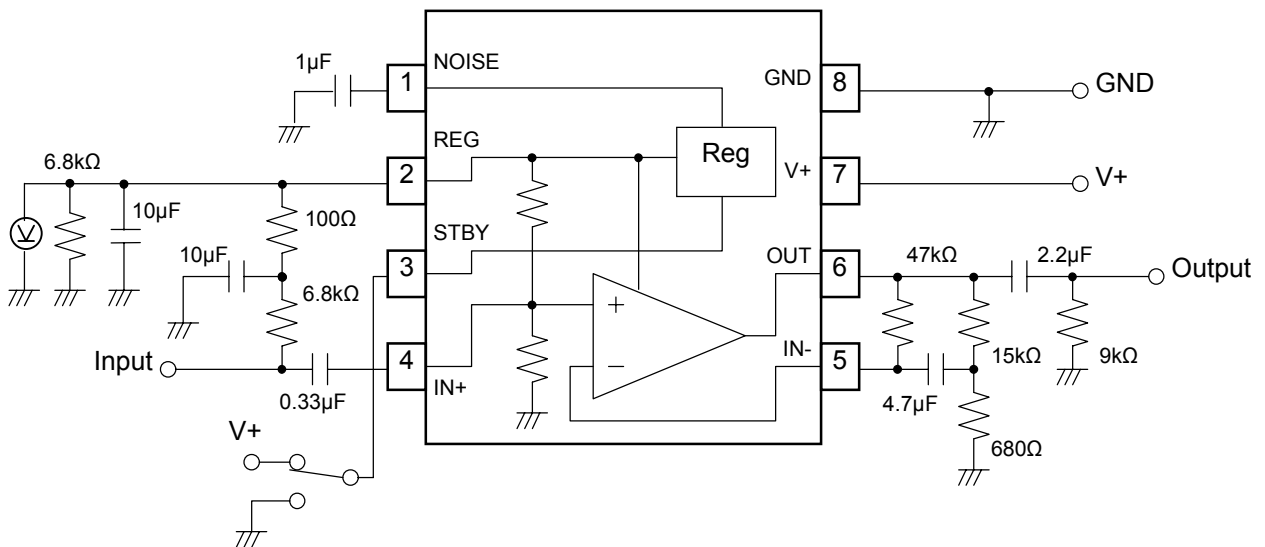
Test Circuit 2 (DC Output Voltage  $V_O$ , Output Noise  $V_{NO}$ )



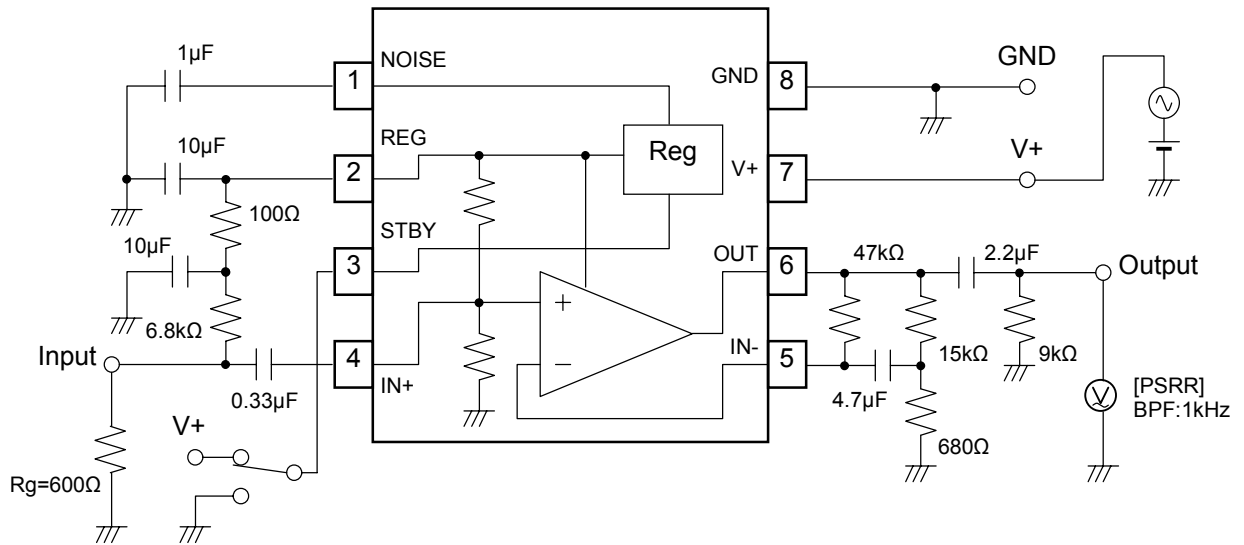
Test Circuit 3 (Operating Current  $I_{cc1}, I_{cc2}$ )



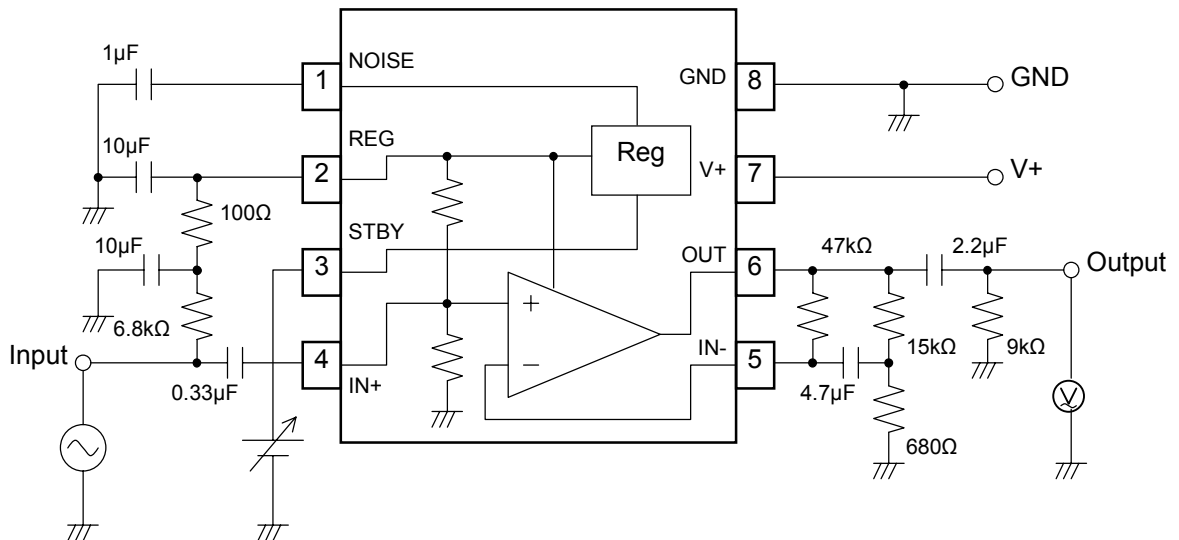
Test Circuit 4 (Mic Power Supply Voltage  $V_O$ )



### Test Circuit 5 (Power Supply Ripple Rejection PSRR)

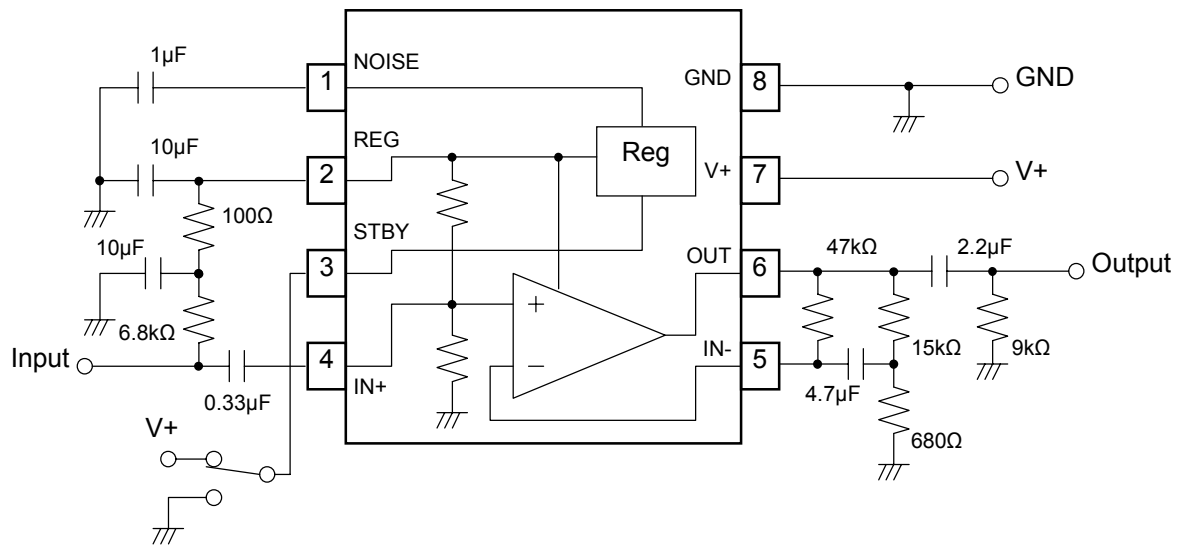


### Test Circuit 6 (Stand-By Control Voltage $V_{IH}$ , $V_{IL}$ )



# NJM2781

## ■ APPLICATION CIRCUIT



## ■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION           | EQUIVALENT CIRCUIT | TERMINAL VOLTAGE |
|---------|--------|--------------------|--------------------|------------------|
| 1       | NOISE  | Noise Bypass       |                    | 0.54V            |
| 2       | REG    | Regulator Output   |                    | 2.42V            |
| 3       | STBY   | Standby On/Off     |                    | 0V               |
| 4       | IN+    | Non-Inverted Input |                    | 1.35V            |

# NJM2781

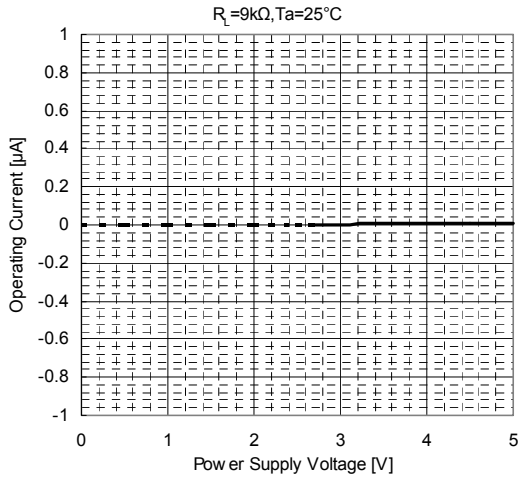
## ■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION       | EQUIVALENT CIRCUIT | TERMINAL VOLTAGE |
|---------|--------|----------------|--------------------|------------------|
| 5       | IN-    | Inverted Input |                    | 1.35V            |
| 6       | OUT    | Output         |                    | 1.35V            |

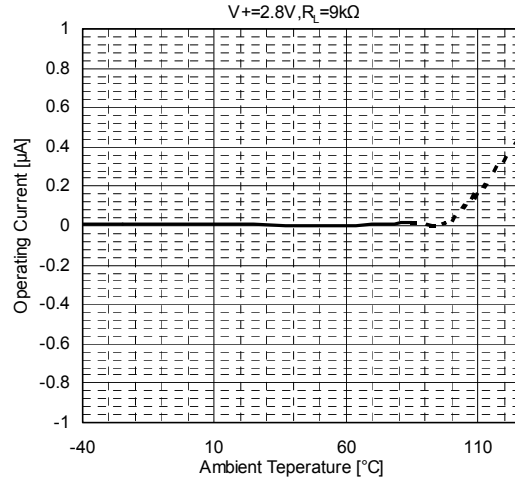


## ■ TYPICAL CHARACTERISTICS

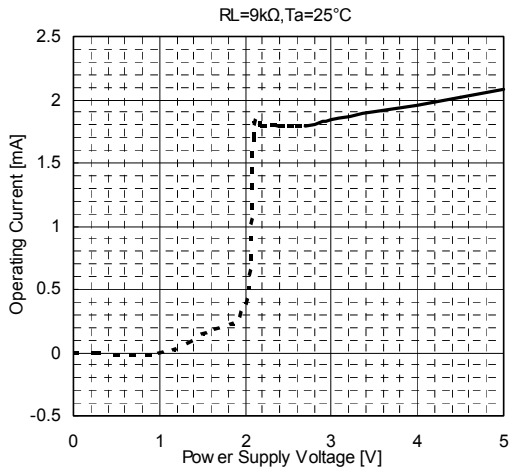
Operating Current vs. Power Supply Voltage (Standby)



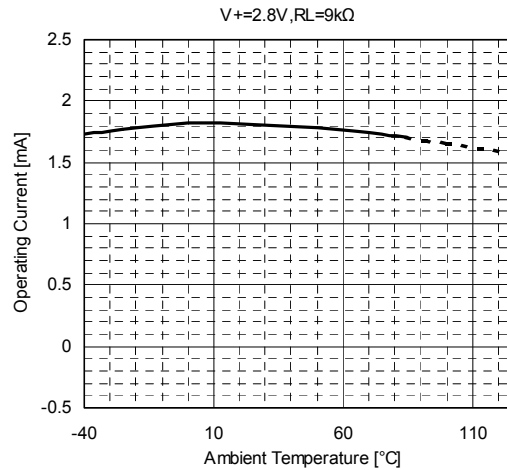
Operating Current vs. Ambient Temperature (Standby)



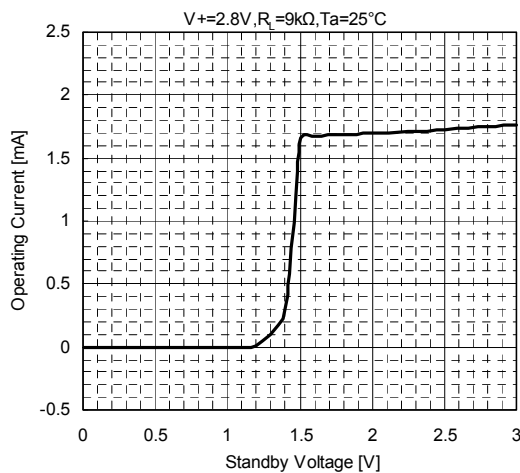
Operating Current vs. Power Supply Voltage (Active)



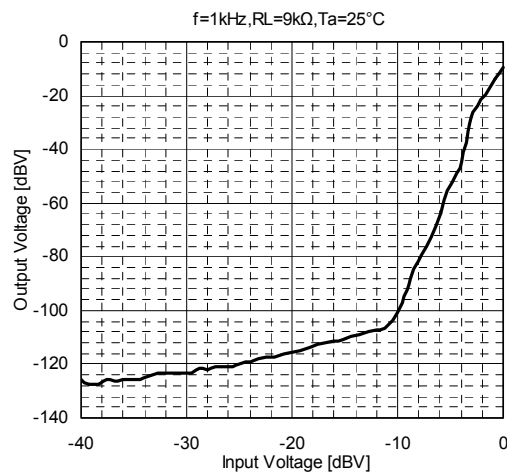
Operating Current vs. Ambient Temperature (Active)



Operating Current vs. Standby Voltage

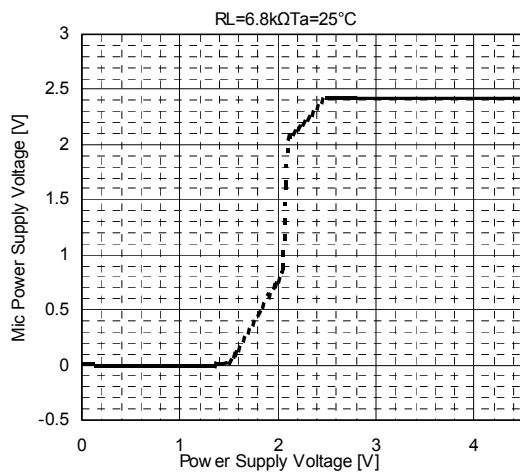


Output Voltage vs. Input Voltage (Standby)

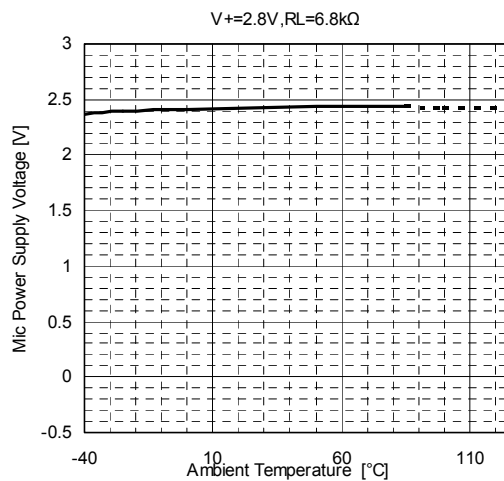


## TYPICAL CHARACTERISTICS

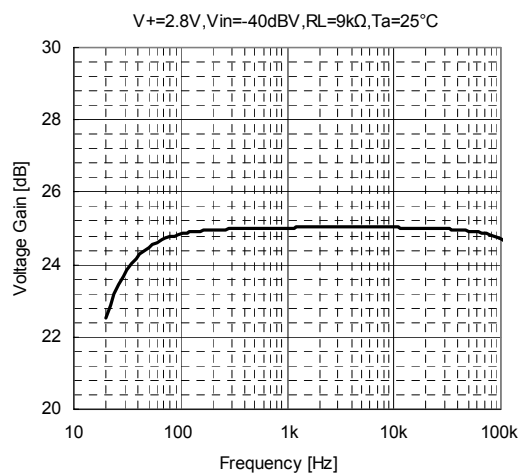
Mic Power Supply Voltage vs. Power Supply Voltage



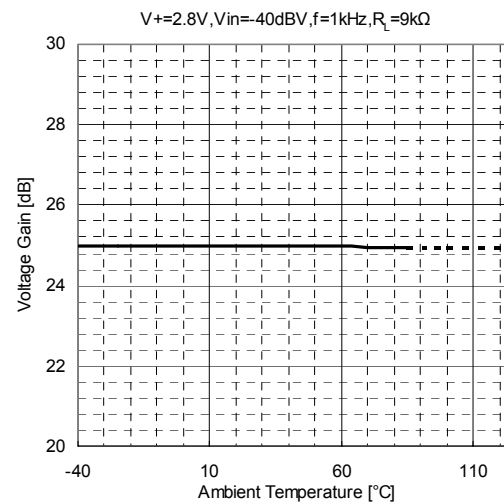
Mic Power Supply Voltage vs. Ambient Temperature



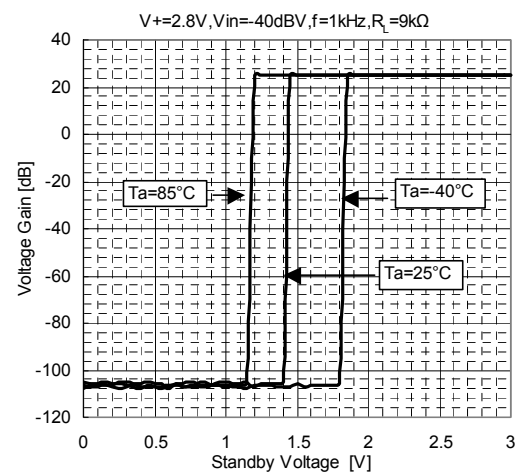
Voltage Gain vs. Frequency



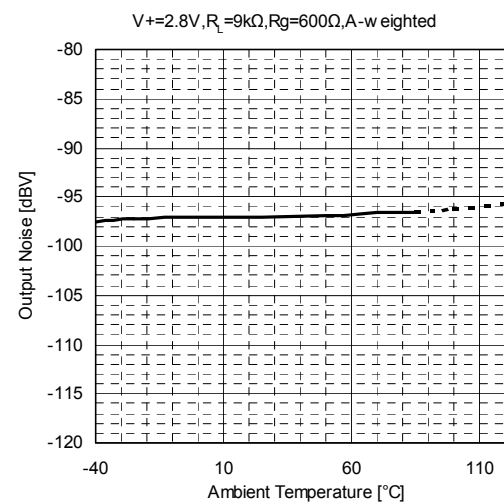
Voltage Gain vs. Ambient Temperature



Voltage Gain vs. Standby Voltage (Ta)

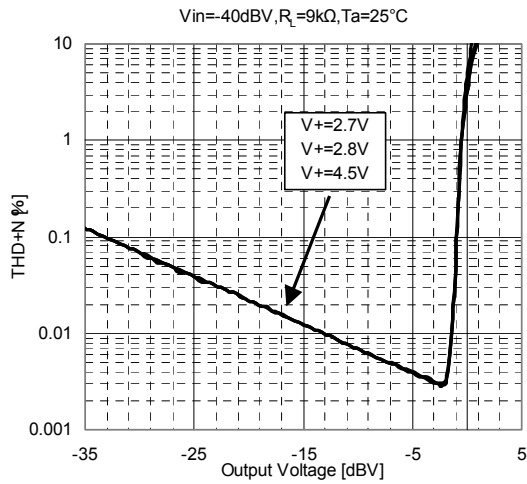


Output Noise vs. Ambient Temperature

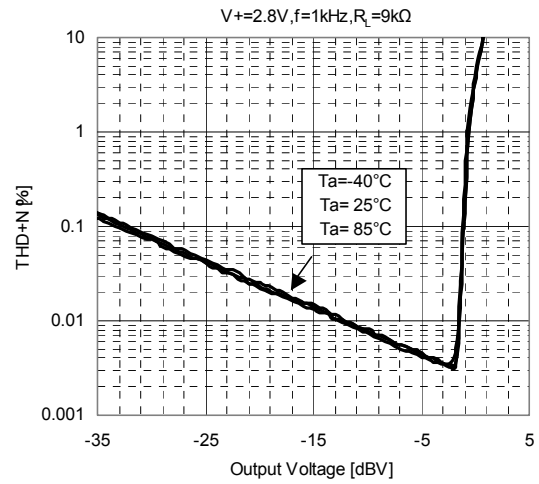


## ■ TYPICAL CHARACTERISTICS

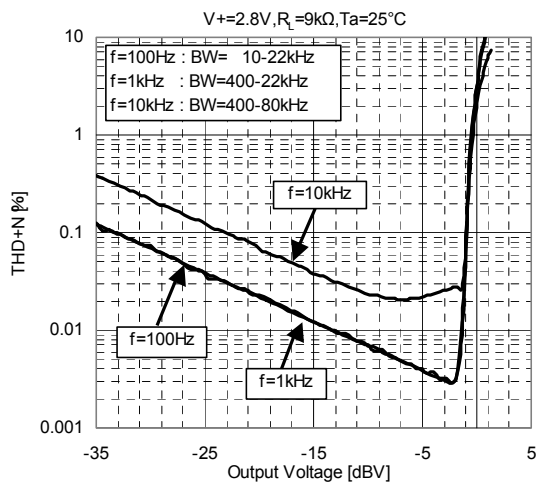
Total Harmonic Distortion vs. Output Voltage (V+)



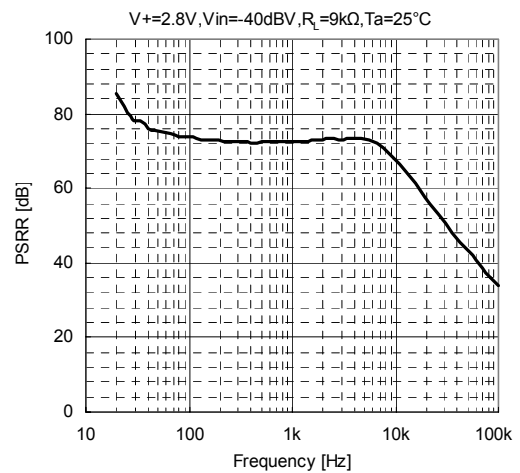
Total Harmonic Distortion vs. Output Voltage (Ta)



Total Harmonic Distortion vs. Output Voltage (f)



Power Supply Ripple Rejection vs. Frequency



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