# Ground Noise Isolation Amplifier

## ■ GENERAL DESCRIPTION

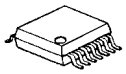
The **NJM2794** is a ground noise isolation amplifier designed for car audio system. It contains dual channel differential amplifier.

It is developed for those car audio applications where long connections between head unit and other components are necessary and ground noise has to be eliminated.

## ■ PACKAGE OUTLINE



NJM2794RB2

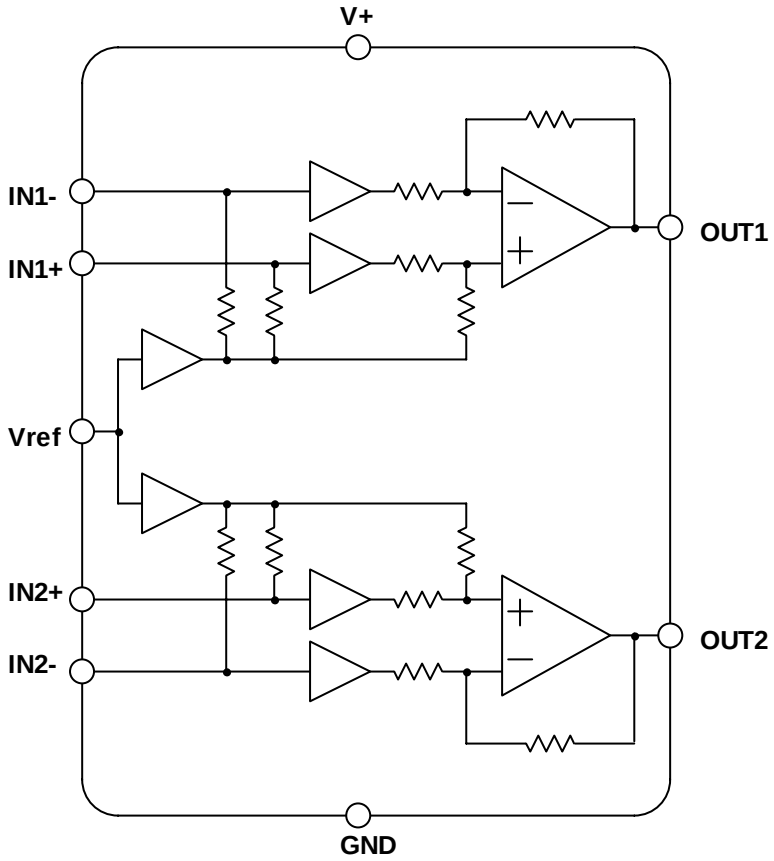


NJM2794V

## ■ FEATURES

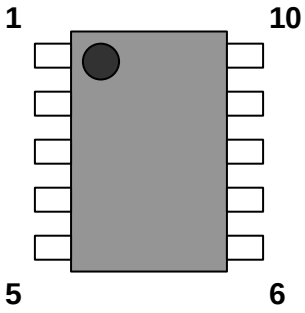
- Dual Channel Differential Amplifier
- Operating Voltage 4.3 to 13V
- Operating Current 14mA typ.
- Common mode rejection ratio CMRR=60dB typ.
- Maximum Output Voltage 2Vrms min., @ THD=0.1%
- Supply Voltage Rejection Ratio 60dB typ.
- Total Harmonic Distortion 0.002% typ.
- Noise Output Voltage 1.3μVrms typ.
- Bipolar Technology
- Package Outline TVSP10, SSOP14

## ■ BLOCK DIAGRAM



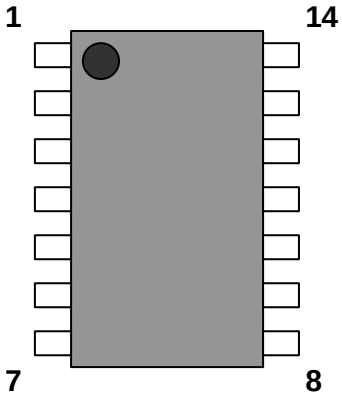
## ■ PIN CONFIGURATION

**TVSP10**




| No. | Symbol | Function |
|---|---|---|
| 1 | OUT1 | Output1 |
| 2 | GND | Ground |
| 3 | Vref | Reference Voltage |
| 4 | V+ | Power Supply |
| 5 | OUT2 | Output2 |
| 6 | IN2+ | +Input2 |
| 7 | IN2- | -Input2 |
| 8 | NC | No Connect |
| 9 | IN1- | -Input1 |
| 10 | IN1+ | +Input1 |

**SSOP14**




| No. | Symbol | Function |
|---|---|---|
| 1 | OUT1 | Output1 |
| 2 | NC | No Connect |
| 3 | GND | Ground |
| 4 | Vref | Reference Voltage |
| 5 | V+ | Power Supply |
| 6 | NC | No Connect |
| 7 | OUT2 | Output2 |
| 8 | IN2+ | +Input2 |
| 9 | NC | No Connect |
| 10 | IN2- | -Input2 |
| 11 | NC | No Connect |
| 12 | IN1- | -Input1 |
| 13 | NC | No Connect |
| 14 | IN1+ | +Input1 |

■ **ABSOLUTE MAXIMUM RANGES** (Ta=25°C)

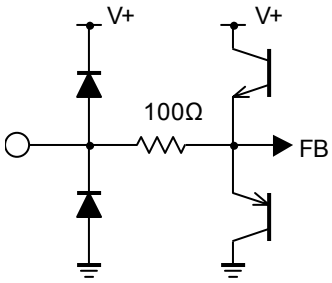
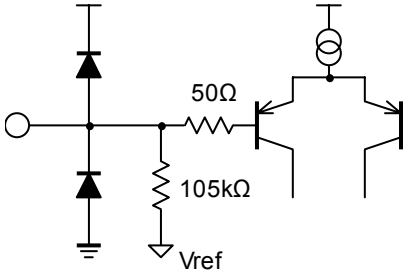
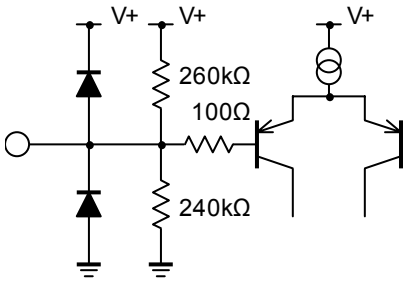
| PARAMETER | SYMBOL | RANGE | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+$ | +15 | V |
| Maximum Input Voltage | $V_{IM}$ | 0 to $V^{+(*)}$ | V |
| Power Dissipation | $P_D$ | TVSP10 : 530*<br>SSOP14 : 550*<br>NOTE: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting | mW |
| Operating Temperature | Topr | -40 to +85 | °C |
| Storage Temperature | Tstg | -40 to +150 | °C |

(∗) For the maximum input voltage less than 0 to$V^+$

■ **ELECTRICAL CHARACTERRISTIC** ($V^+$=9V,Ta=25°C)

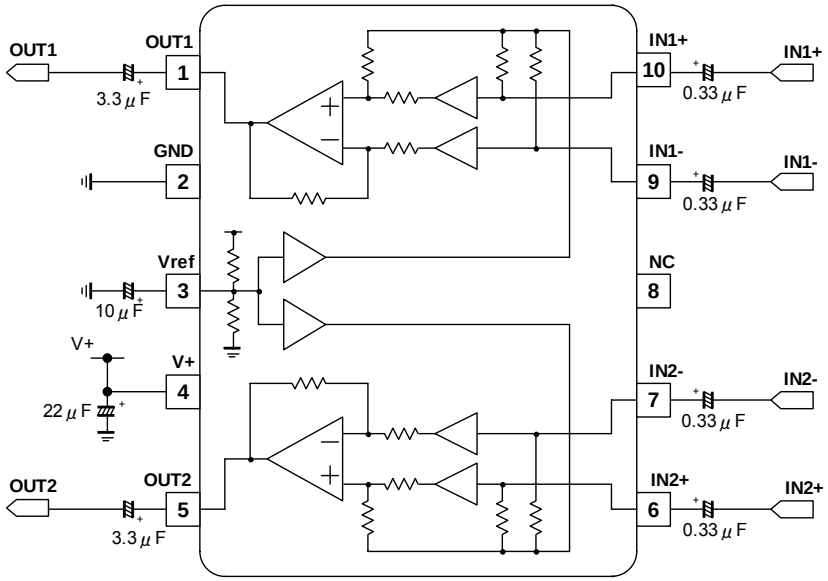
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **DC CHARACTERRISTIC** | | | | | | |
| Operating Voltage | $V^+$ | | 4.3 | 9 | 13 | V |
| Operating Current | $I_{CC}$ | No Signal | - | 14 | 20 | mA |
| Reference Voltage | $V_{REF}$ | | 3.8 | 4.3 | 4.8 | V |
| **AC CHARACTERRISTIC** (Non-inverting circuit, f=1kHz, Vin=1Vrms, $R_g$=0Ω, $R_L$=10kΩ unless otherwise specified) | | | | | | |
| Voltage Gain | Gv | | -1.0 | 0.0 | +1.0 | dB |
| Channel Separation | CS | f=1kHz | 90 | 110 | - | dB |
| Channel Balance | BAL | | - | - | 0.5 | dB |
| Roll-off High Frequency | $f_{RH}$ | -1dB | 100 | - | - | kHz |
| Input Resistance | $R_{IN}$ | | 85 | 105 | 125 | kΩ |
| Output Resistance | $R_{OUT}$ | | - | 90 | - | Ω |
| Maximum Output Voltage 1 | $V_{OM1}$ | THD=0.1%, f = 1kHz | 2 | 2.5 | - | Vrms |
| Maximum Output Voltage 2 | $V_{OM2}$ | THD=0.1%, f = 1kHz, $V^+$=8V | 1.7 | 2.1 | - | Vrms |
| Maximum Output Voltage 3 | $V_{OM3}$ | Inverting,<br>THD=0.1%, f = 1kHz | - | 2.5 | - | Vrms |
| Maximum Output Voltage 4 | $V_{OM4}$ | Inverting,<br>THD=0.1%, f = 1kHz, $V^+$=8V | - | 2.1 | - | Vrms |
| Noise Output Voltage | $V_{NO}$ | Rg=600Ω, A-weighted | - | 1.3 | 2.5 | μVrms |
| Total Harmonic Distortion | THD | f=1kHz , $V_O$=1Vrms,<br>BW=400Hz to 30kHz | - | 0.002 | 0.01 | % |
| Common Mode Rejection Ratio | CMRR | | 50 | 60 | - | dB |
| Common Mode Input Voltage | Vicm | CMRR=50dB | - | 2 | - | Vrms |
| Supply Voltage Rejection Ratio | SVR | f=100Hz , $V_{ripple}$=100mVrms | 55 | 65 | - | dB |

## ■ TERMINAL DESCRIPTION

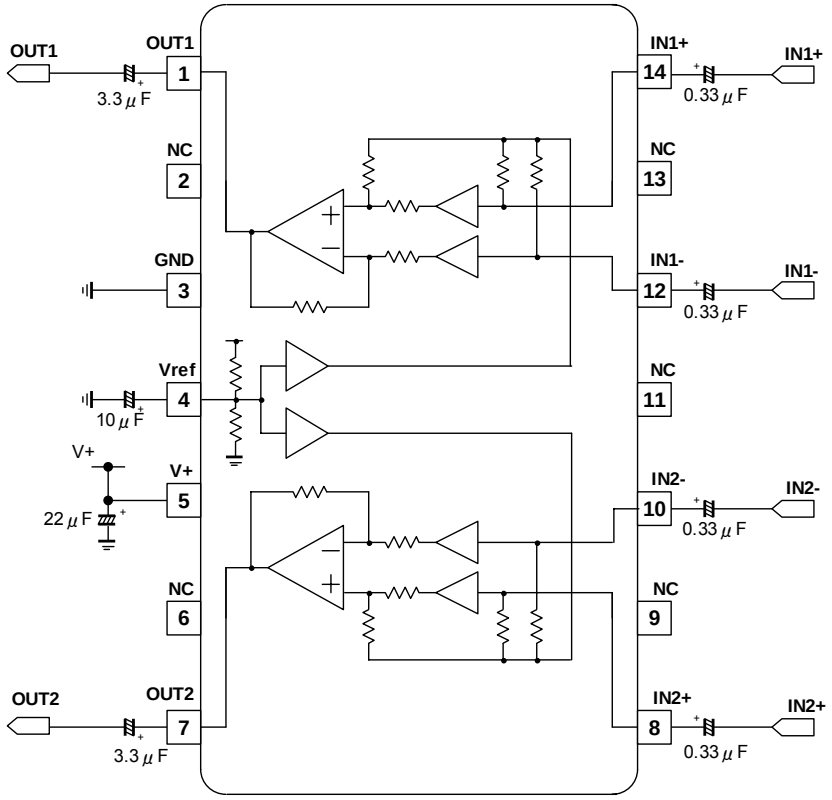
| PIN NO. TVSP 10 | PIN NO. SSOP 14 | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL DC VOLTAGE |
|---|---|---|---|---|---|
| 1<br>5 | 1<br>7 | OUT1<br>OUT2 | Output1<br>Output2 |  | $V^+$x0.48 [V] |
| 6<br>7<br>9<br>10 | 8<br>10<br>12<br>14 | IN2+<br>IN2-<br>IN1-<br>IN1+ | +Input2<br>-Input2<br>-Input1<br>+Input1 |  | $V^+$x0.48 [V] |
| 3 | 4 | Vref | Reference Voltage |  | $V^+$x0.48 [V] |

## ■ APPLICATION CIRCUIT

● TVSP10 (NJM2794RB2)

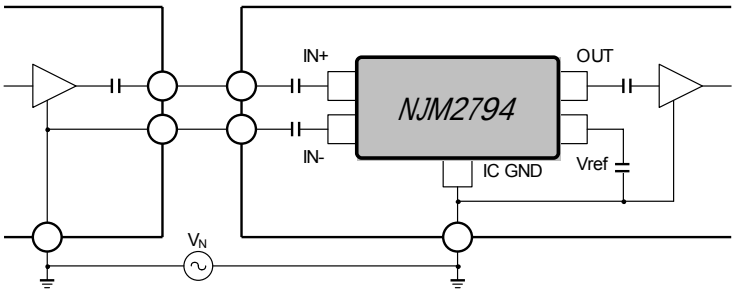



● SSOP14 (NJM2794V)

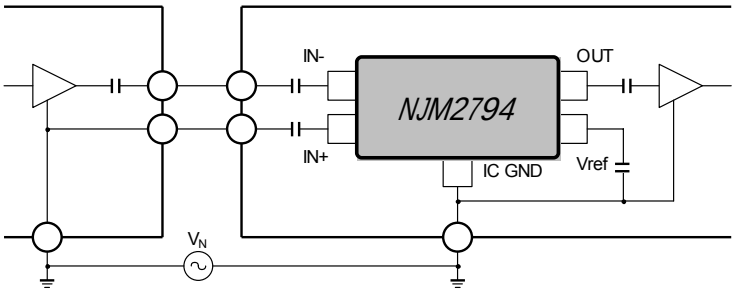


## ■ APPLICATION BLOCK DIAGRAM

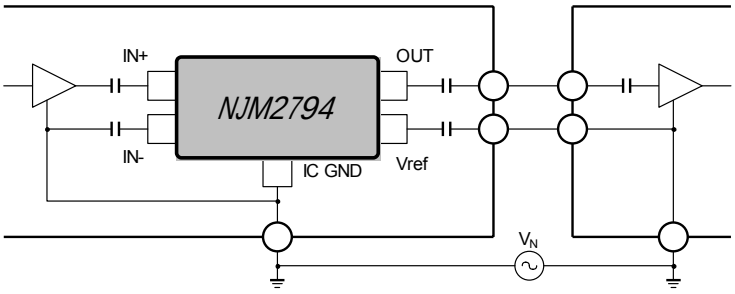
(1) Non-inverting line input



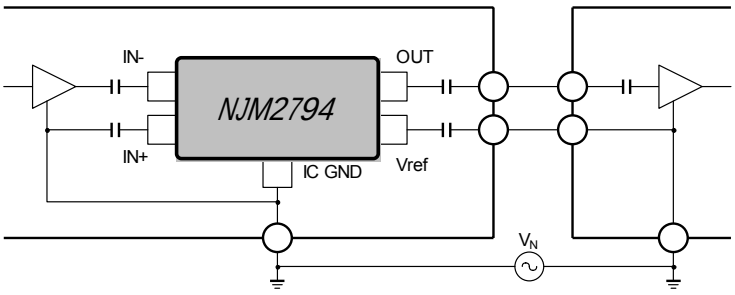

(2) Inverting line input




(3) Non-inverting line output

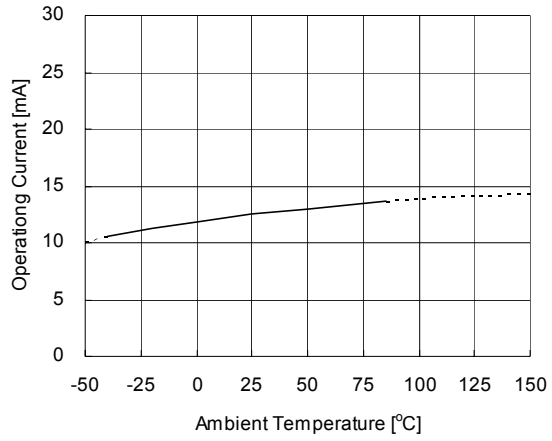



(4) Inverting line output

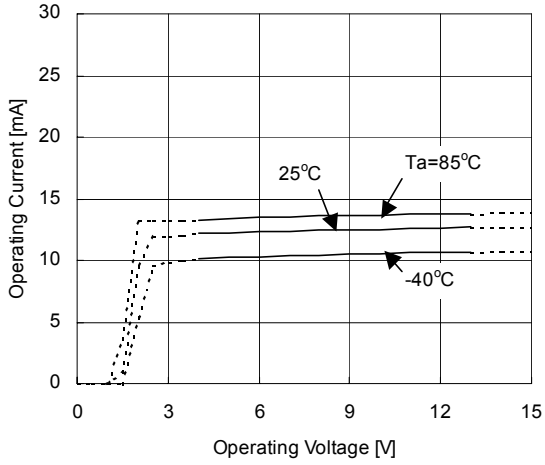


## ■ TYPICAL CHARACTERISTICS

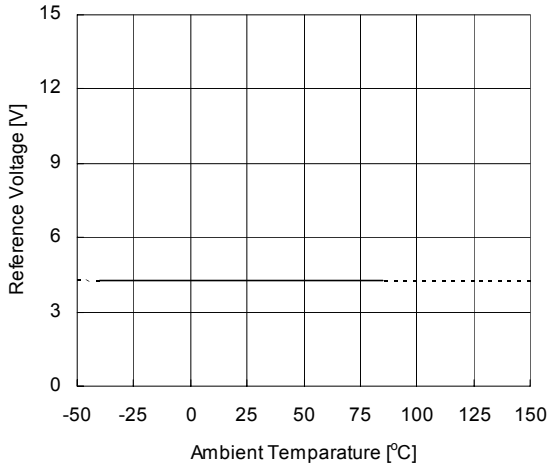
Operating Current vs. Ambient Temperature
V+=9V



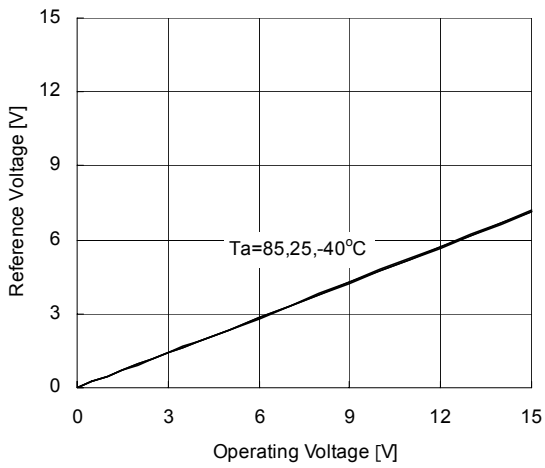

Operating Current vs. Operating Voltage



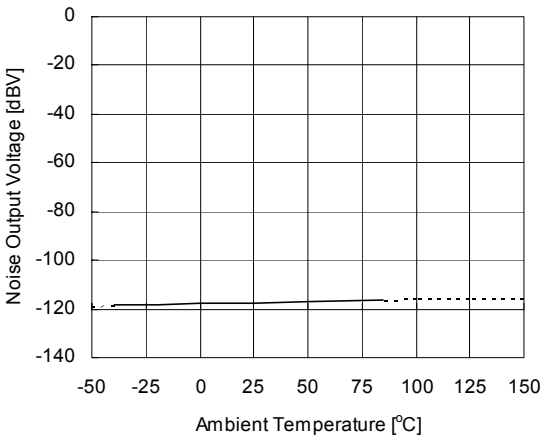

Reference Voltage vs. Ambient Temperature
V+=9V



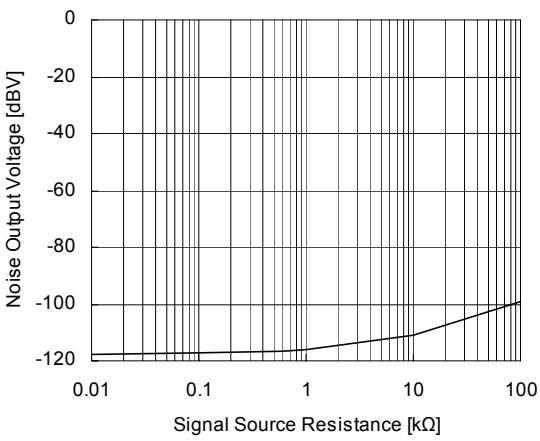

Reference Voltage vs. Operating Voltage




Noise Output Voltage vs. Ambient Temperature
V+=9V, Rg=600Ω, A-Weighted

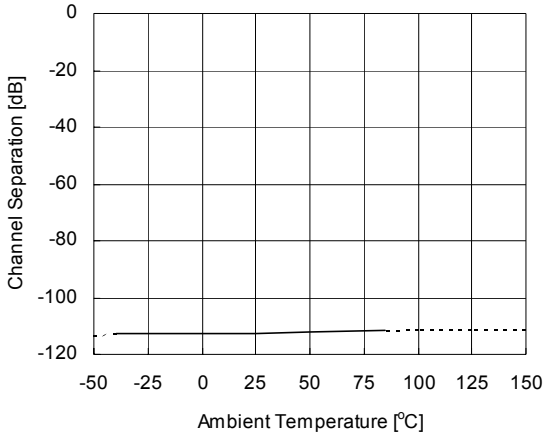



Noise Output Voltage vs. Signal Source Resistance
V+=9V, Ta=25°C, A-Weighted

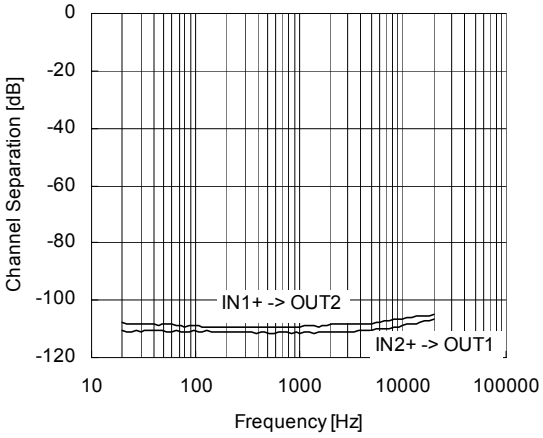


## ■ TYPICAL CHARACTERISTICS

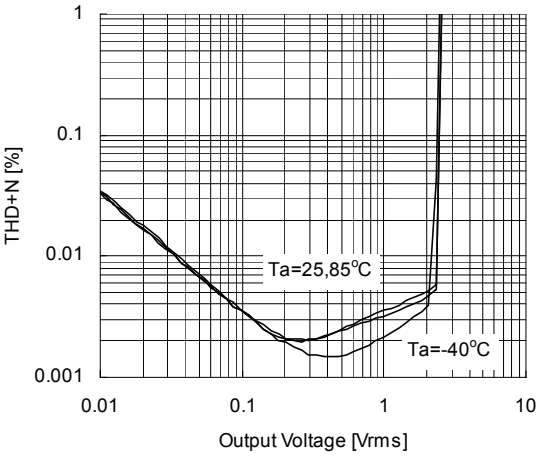
Channel Separation vs. Ambient Temperature
V+=9V, Rg=600Ω, Vin=1Vrms, BW=400Hz-30kHz
IN1+ -> OUT2



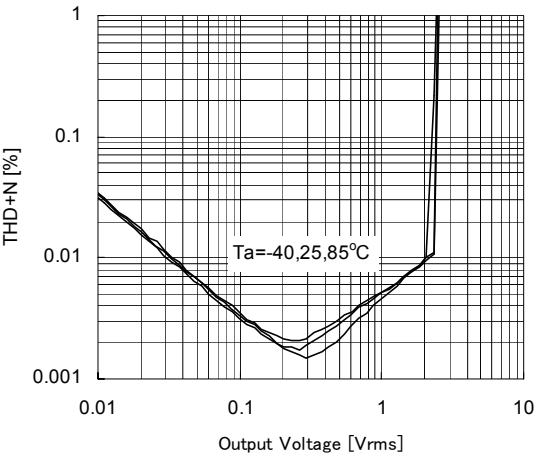

Channel Separation vs. Frequency
V+=9V, Rg=600Ω, Vin=1Vrms, BW=10Hz-30kHz



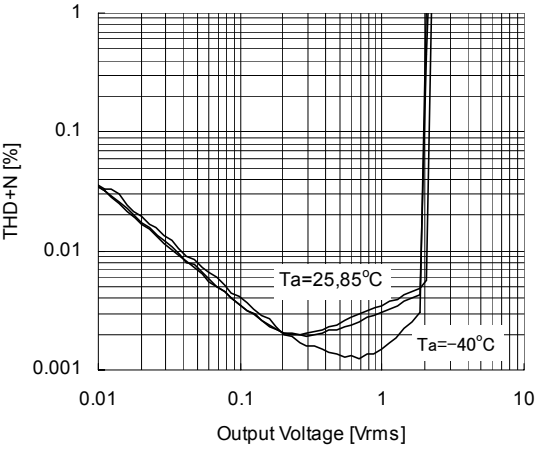

THD+N vs. Output Voltage
V+=9V, f=1kHz, Non-Inverting Circuit



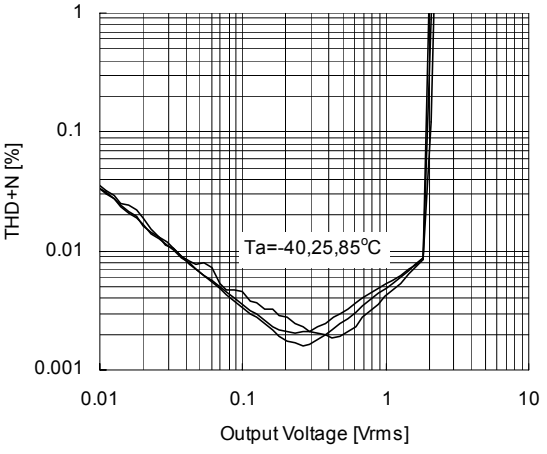

THD+N vs. Output Voltage
V+=9V, f=1kHz, Inverting Circuit




THD+N vs. Output Voltage
V+=8V, f=1kHz, Non-Inverting Circuit

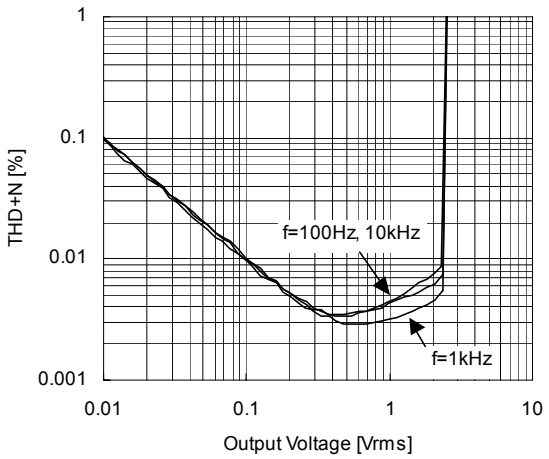



THD+N vs. Output Voltage
V+=8V, f=1kHz, Inverting Circuit

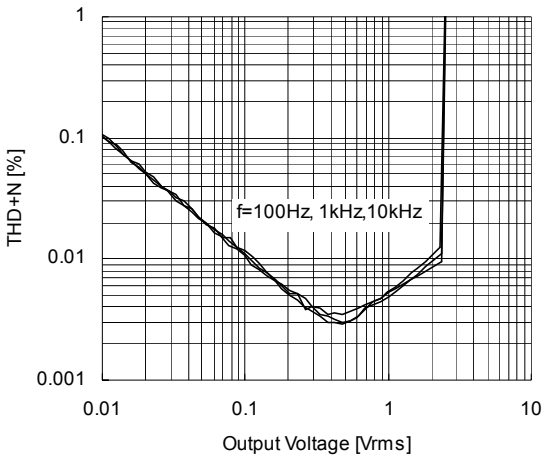


## ■ TYPICAL CHARACTERISTICS

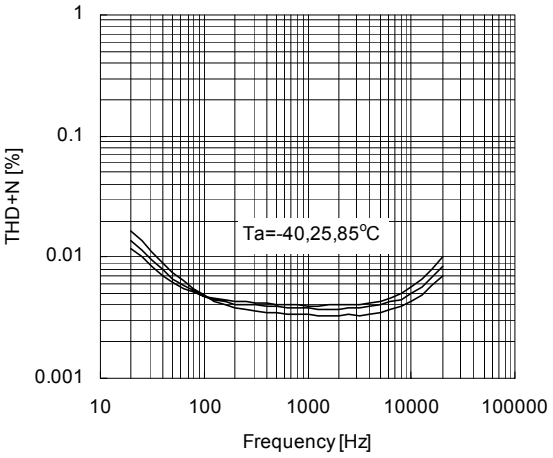
THD+N vs. Output Voltage
V+=9V, Ta=25°C, Non-Inverting Circuit



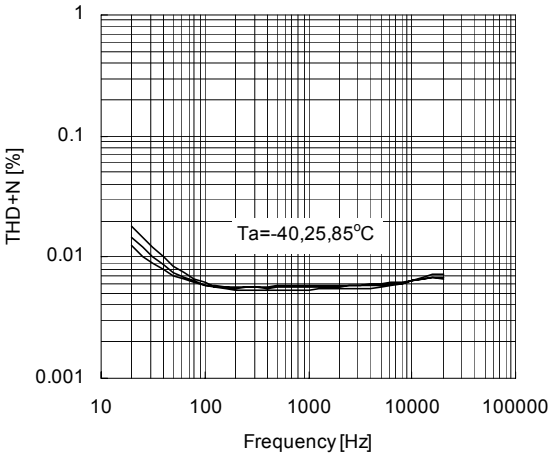

THD+N vs. Output Voltage
V+=9V, Ta=25°C, Inverting Circuit



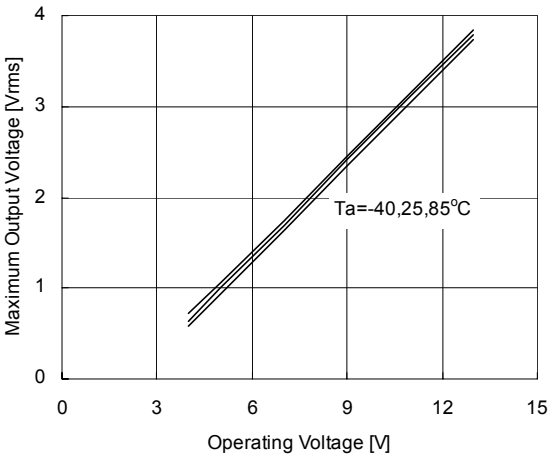

THD+N vs. Output Voltage
V+=9V, Vin=1Vrms, BW=22Hz-80kHz,
Non-Inverting Circuit



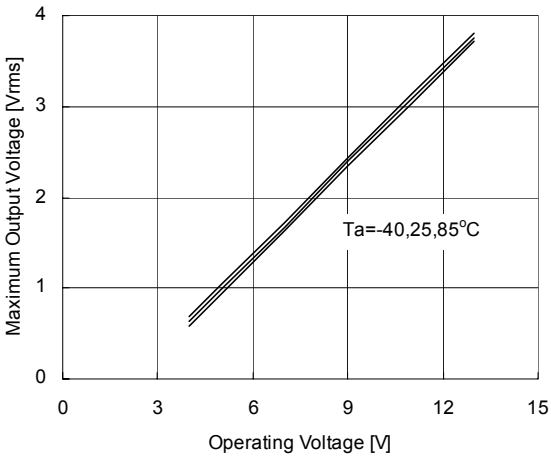

THD+N vs. Output Voltage
V+=9V, Vin=1Vrms, BW=22Hz-80kHz,
Inverting Circuit




Maximum Output Voltage vs. Operating Voltage
f=1kHz, THD=0.1%, Non-Inverting Circuit

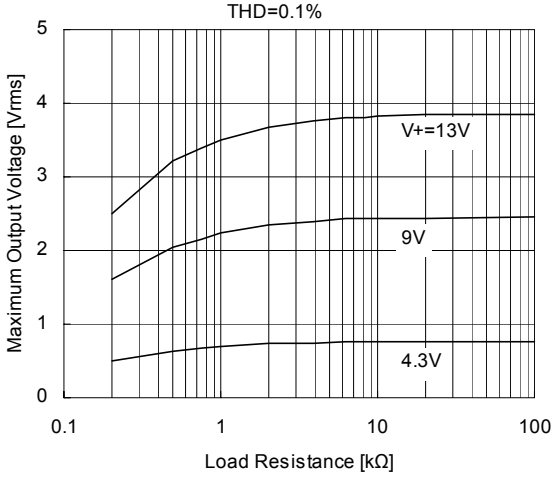



Maximum Output Voltage vs. Operating Voltage
f=1kHz, THD=0.1%, Inverting Circuit

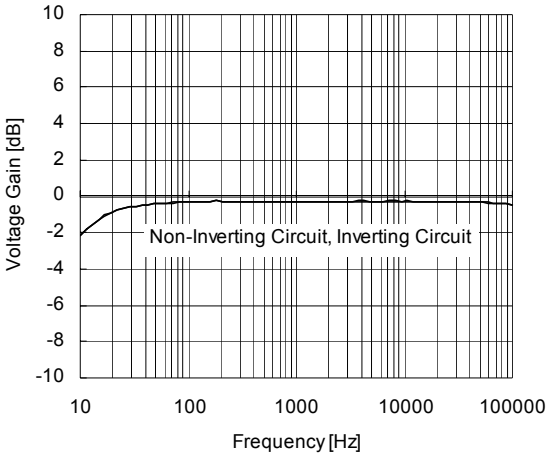


## ■ TYPICAL CHARACTERISTICS

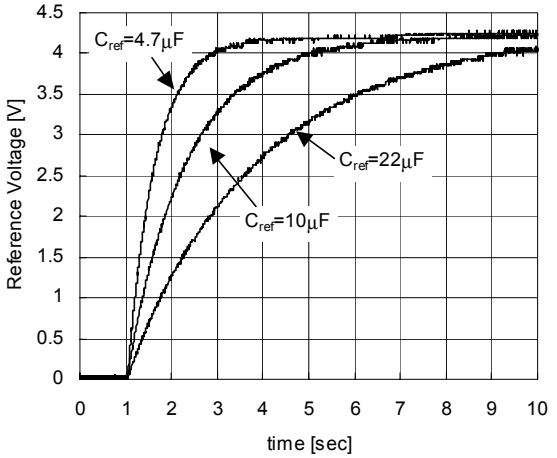
Maximum Output Voltage vs. Load Resistance
V+=9V, f=1kHz, Ta=25°C, BW=400 - 30kHz
THD=0.1%



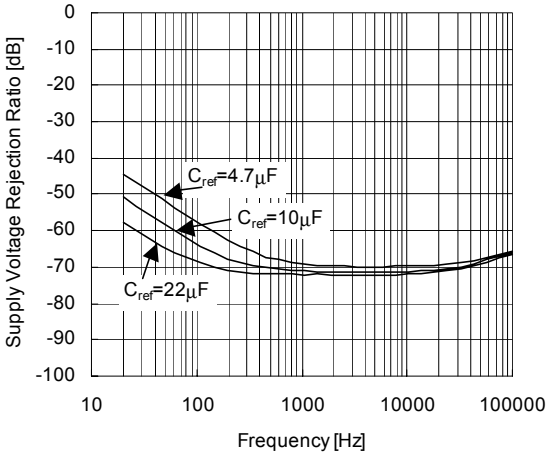

Voltage Gain vs. Frequency
V+=9V, Vin=1Vrms, Ta=25°C



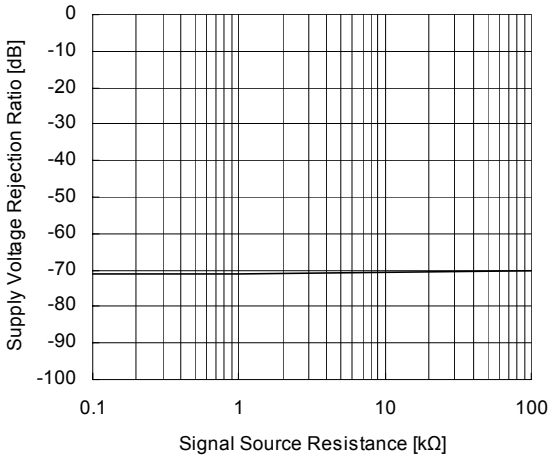

Reference Voltage Turn-on behaviour
V+=9V, Ta=25°C



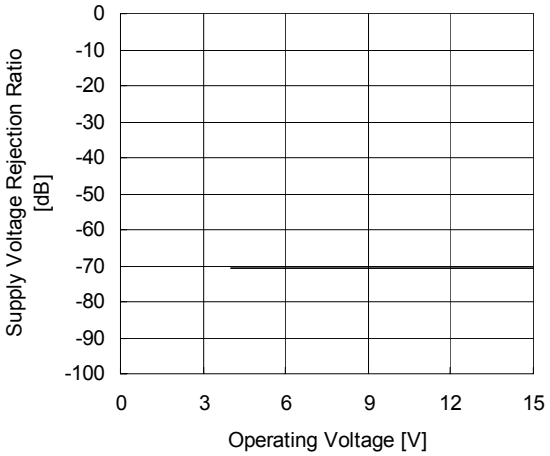

Supply Voltage Rejection Ratio
vs. Frequency
V+=9V, Vripple=100mV, Rg=600Ω, Ta=25°C




Supply Voltage Rejection Ratio
vs. Signal Source Resistance
V+=9V, Vrippple=100mV, f=100Hz, Ta=25°C

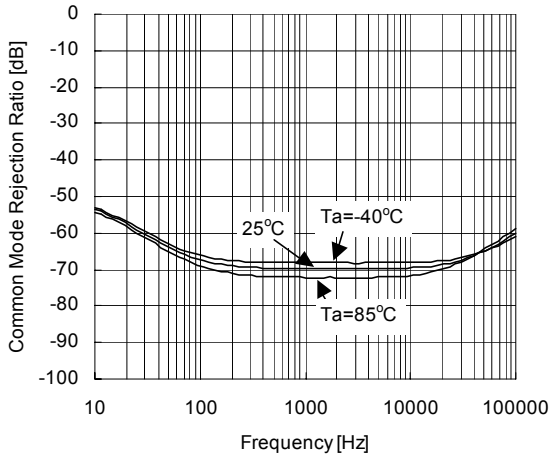



Supply Voltage Rejection Ratio
vs. Operating Voltage
Vripple=100mV, f=100Hz, Rg=600Ω, Ta=25°C

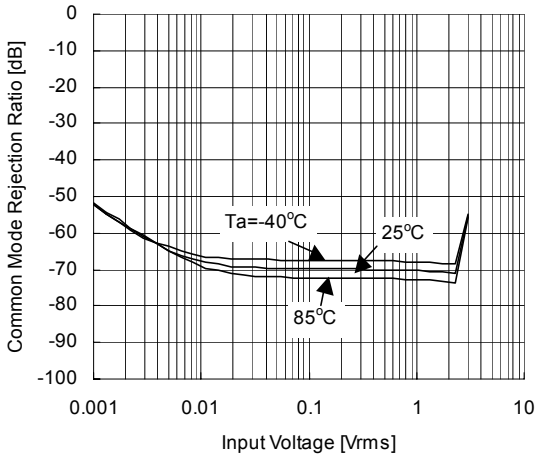


## ■ TYPICAL CHARACTERISTICS

Common Mode Rejection Ratio vs. Frequency
V+=9V, Vin=1Vrms




Common Mode Rejection Ratio vs. Input Voltage
V+=9V, f=1kHz, Ta=25°C, BW=400 - 30kHz




[CAUTION]
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