

Low Noise Low Supply Voltage Dual Operational Amplifier with Full Swing Input and Output

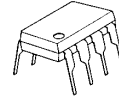
■ GENERAL DESCRIPTION

NJM2737 is a single supply dual operational amplifier with full swing input and output, operates from 1.8V.

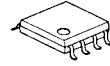
Noise characteristic is designed low as conventional low noise operational amplifiers, such as NJM5532 and NJM4580.

It is suitable for PC audio, portable audio and other low voltage single supplied audio applications.

■ PACKAGE OUTLINE



NJM2737D



NJM2737M



NJM2737V

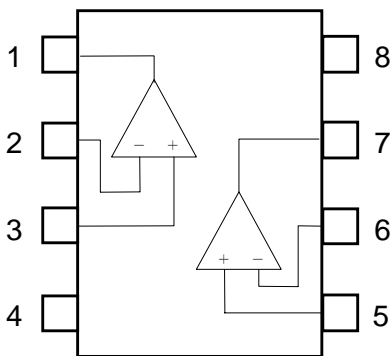


NJM2737RB1

■ FEATURES

- Operating Voltage 1.8 to 6.0V
- Low Input Voltage Noise 5nV/√Hz typ.
- Gain Band Width product 3.5MHz typ.
- Slew Rate 0.7V/μs typ.
- Offset Voltage 5mV max
- Input Full-Swing $V_{ICM} = 0$ to 5.0V at $V^+ = 5V$
- Output Full-Swing $V_{OH} \geq 4.9V / V_{OL} \leq 0.15V$ at $V^+ = 5V, R_L = 20k\Omega$
- Load Drivability $V_{OH} \geq 4.75V / V_{OL} \leq 0.25V$ at $V^+ = 5V, R_L = 2k\Omega$
- Bipolar Technology
- Package Outline DIP8, DMP8, SSOP8, TVSP8

■ PIN CONFIGURATION



PIN CONFIGURATION

- 1. OUTPUT1
- 2. -INPUT1
- 3. +INPUT1
- 4. V^-
- 5. +INPUT2
- 6. -INPUT2
- 7. OUTPUT2
- 8. V^+

NJM2737

■ ABSOLUTE MAXIMUM RATINGS

| (Ta=25°C) | | | |
|---------------------------------|------------------|--|------|
| PARAMETER | SYMBOL | RATINGS | UNIT |
| Supply Voltage | V ⁺ | 7.0 | V |
| Differential Input Voltage | V _{ID} | ±1.0 | V |
| Input Common Mode Voltage Range | V _{ICM} | 0 to 7.0 | V |
| Power Dissipation | P _D | 500(DIP8) 300(DMP8) 250(SSOP8) 320(TVSP8) | mW |
| Operating Temperature Range | Topr | -40 to +85 | °C |
| Storage Temperature Range | Tstg | -40 to +125 | °C |

(Note1)

If the supply voltage (V⁺) is less than 7V, the input voltage must not over the V⁺ level through 7V is limit specified.

■ RECOMMENDED OPERATING CONDITION

| (Ta=25°C) | | | |
|----------------|----------------|------------|------|
| PARAMETER | SYMBOL | RATING | UNIT |
| Supply Voltage | V ⁺ | 1.8 to 6.0 | V |

■ ELECTRICAL CHARACTERISTICS

● DC CHARACTERISTICS

| (V ⁺ =5V, Ta=25°C) | | | | | | |
|---------------------------------|------------------|--|------|------|------|------|
| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
| Operating Current | I _{CC} | No Signal | - | 1200 | 1600 | μA |
| Input Offset Voltage | V _{IO} | | - | 1 | 5 | mV |
| Input Bias Current | I _B | | - | 200 | 800 | nA |
| Input Offset Current | I _{IO} | | - | 5 | 100 | nA |
| Voltage Gain | A _V | R _L =2kΩ | 60 | 85 | - | dB |
| Common Mode Rejection Ratio | CMR | CMR+: 2.5V ≤ V _{CM} ≤ 5.0V, CMR-: 0 ≤ V _{CM} ≤ 2.5V (Note2) | 55 | 70 | - | dB |
| Supply Voltage Rejection Ratio | SVR | V ⁺ /GND = ±2.0 to ±3.0V | 70 | 85 | - | dB |
| Maximum Output Voltage 1 | V _{OH1} | R _L =20kΩ | 4.9 | 4.95 | - | V |
| | V _{OL1} | R _L =20kΩ | - | 0.05 | 0.1 | |
| Maximum Output Voltage 2 | V _{OH2} | R _L =2kΩ | 4.75 | 4.85 | - | V |
| | V _{OL2} | R _L =2kΩ | - | 0.15 | 0.25 | |
| Input Common Mode Voltage Range | V _{ICM} | CMR > 55dB | 0 | - | 5 | V |

(Note2) CMR is represented by either CMR+ or CMR- which has lower value.

CMR+ is measured with 2.5V ≤ V_{CM} ≤ 5V and CMR- is measured with 0V ≤ V_{CM} ≤ 2.5V .

● AC CHARACTERISTICS

| (V ⁺ =5V, Ta=25°C) | | | | | | |
|--------------------------------|----------------|---------------------|-----|-----|-----|------------|
| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
| Unity Gain Bandwidth | f _T | R _L =2kΩ | - | 3.5 | - | MHz |
| Phase Margin | Φ _M | R _L =2kΩ | - | 70 | - | Deg |
| Equivalent Input Noise Voltage | V _N | f=1kHz | - | 5 | - | nV/ √Hz |

● TRANSIENT CHARACTERISTICS

(V⁺=5V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-----------|--------|---------------------|-----|-----|-----|------|
| Slew Rate | SR | R _L =2kΩ | - | 0.7 | - | V/μs |

● DC CHARACTERISTICS

(V⁺=3V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------------------|------------------|---|------|------|------|------|
| Operating Current | I _{CC} | No Signal | - | 1000 | 1500 | μA |
| Input Offset Voltage | V _{IO} | | - | 1 | 5 | mV |
| Input Bias Current | I _B | | - | 200 | 800 | nA |
| Input Offset Current | I _{IO} | | - | 5 | 100 | nA |
| Voltage Gain | A _V | R _L =2kΩ | 60 | 85 | - | dB |
| Common Mode Rejection Ratio | CMR | CMR+: 1.5V ≤ V _{CM} ≤ 3.0V, CMR-: 0 ≤ V _{CM} ≤ 1.5V(Note3) | 48 | 63 | - | dB |
| Supply Voltage Rejection Ratio | SVR | V ⁺ /GND = ±1.2 to ±2.0V | 68 | 83 | - | dB |
| Maximum Output Voltage 1 | V _{OH1} | R _L =20kΩ | 2.9 | 2.95 | - | V |
| | V _{OL1} | R _L =20kΩ | - | 0.05 | 0.1 | |
| Maximum Output Voltage 2 | V _{OH2} | R _L =2kΩ | 2.75 | 2.85 | - | V |
| | V _{OL2} | R _L =2kΩ | - | 0.15 | 0.25 | |
| Input Common Mode Voltage Range | V _{ICM} | CMR > 48dB | 0 | - | 3 | V |

(Note3) CMR is represented by either CMR+ or CMR- which has lower value.

CMR+ is measured with 1.5V ≤ V_{CM} ≤ 3V and CMR- is measured with 0V ≤ V_{CM} ≤ 1.5V .

● AC CHARACTERISTICS

(V⁺=3V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--------------------------------|----------------|---------------------|-----|-----|-----|------------|
| Unity Gain Bandwidth | f _T | R _L =2kΩ | - | 3 | - | MHz |
| Phase Margin | Φ _M | R _L =2kΩ | - | 70 | - | Deg |
| Equivalent Input Noise Voltage | V _N | f=1kHz | - | 5 | - | nV/ √Hz |

● TRANSIENT CHARACTERISTICS

(V⁺=3V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-----------|--------|---------------------|-----|-----|-----|------|
| Slew Rate | SR | R _L =2kΩ | - | 0.7 | - | V/μs |

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● DC CHARACTERISTICS

(V⁺=1.8V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------------------|------------------|--|-----|------|------|------|
| Operating Current | I _{CC} | No Signal | - | 1000 | 1500 | μA |
| Input Offset Voltage | V _{IO} | | - | 1 | 5 | mV |
| Input Bias Current | I _B | | - | 200 | 800 | nA |
| Input Offset Current | I _{IO} | | - | 5 | 100 | nA |
| Voltage Gain | A _V | R _L =2kΩ | 60 | 85 | - | dB |
| Common Mode Rejection Ratio | CMR | CMR+: 0.9V ≤ V _{CM} ≤ 1.8V, CMR-: 0 ≤ V _{CM} ≤ 0.9V (Note4) | 40 | 55 | - | dB |
| Supply Voltage Rejection Ratio | SVR | V ⁺ /GND = ±0.9 to ±1.2V | 65 | 80 | - | dB |
| Maximum Output Voltage 1 | V _{OH1} | R _L =20kΩ | 1.7 | 1.75 | - | V |
| | V _{OL1} | R _L =20kΩ | - | 0.1 | 0.15 | |
| Maximum Output Voltage 2 | V _{OH2} | R _L =2kΩ | 1.6 | 1.65 | - | V |
| | V _{OL2} | R _L =2kΩ | - | 0.15 | 0.25 | |
| Input Common Mode Voltage Range | V _{ICM} | CMR > 40dB | 0 | - | 1.8 | V |

(Note4) CMR is represented by either CMR+ or CMR- which has lower value.

CMR+ is measured with 0.9V ≤ V_{CM} ≤ 1.8V and CMR- is measured with 0V ≤ V_{CM} ≤ 0.9V .

● AC CHARACTERISTICS

(V⁺=1.8V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--------------------------------|----------------|---------------------|-----|-----|-----|------------|
| Unity Gain Bandwidth | f _T | R _L =2kΩ | - | 3 | - | MHz |
| Phase Margin | Φ _M | R _L =2kΩ | - | 70 | - | Deg |
| Equivalent Input Noise Voltage | V _N | f=1kHz | - | 5 | - | nV/ √Hz |

● TRANSIENT CHARACTERISTICS

(V⁺=1.8V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-----------|--------|---------------------|-----|-----|-----|------|
| Slew Rate | SR | R _L =2kΩ | - | 0.6 | - | V/μs |

■ TERMINAL CHARACTERISTICS

| No. | Symbol | Equivalent Circuit | Typ.DC Voltage(V) | Function |
|-----|--------|--------------------|-------------------|---------------------|
| 3,5 | +INPUT | | | non-inverting input |
| 2,6 | -INPUT | | | inverting input |
| 1,7 | VOUT | | | output |

■ MEMO

[CAUTION]

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