



## SRS 3D SURROUND AUDIO PROCESSOR

### ■GENERAL DESCRIPTION

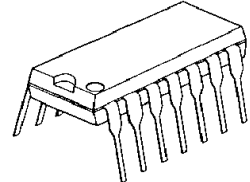
The **NJM2199** is a SRS 3D surround audio processor regenerating the 3D surround sound with two speakers. It regenerates 3D surround sound from stereo input only.

The features of wide operating voltage range, wide dynamic range, low output noise are suitable for any audio applications.

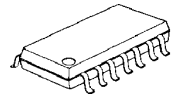
### ■FEATURES

- Operating Voltage (4.7 to 13V)
- Low Supply Current (5.7mA typ. at 3D Stereo mode)
- Low Output Noise (32 $\mu$ Vrms typ. at 3D Stereo mode)
- BYPASS Gain (0dB typ.)
- BYPASS FUNCTION (Through)
- WIDTH control
- Internal Mode Control Switch (2bit)
- Bipolar Technology
- Package Outline DIP14, DMP14, SSOP14

### ■PACKAGE OUTLINE




**NJM2199D**



**NJM2199M**



**NJM2199V**

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## ■ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER                   | SYMBOL           | RATINGS                                    | UNIT |
|-----------------------------|------------------|--|------|
| Supply Voltage              | V+               | 15   | V    |
| Power Dissipation           | P <sub>D</sub>   | (DIP14) 500<br>(DMP14) 350<br>(SSOP14) 300 | mW   |
| Operating Temperature Range | T <sub>opr</sub> | -40 to +85                                 | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -40 to +125                                | °C   |

## ■ELECTRICAL CHARACTERISTICS (V+=12V, Ta=25°C, V<sub>IN</sub>=-10dBV(316mVrms) unless otherwise noted)

| PARAMETER             | SYMBOL             |                      | TEST CONDITION  |                  |        |           |                 | MIN.            | TYP.            | MAX. | UNIT          |
|-----------------------|--------------------|----------------------|-----------------|------------------|--------|-----------|-----------------|-----------------|-----------------|------|---------------|
|                       |                    |                      | INPUT           |                  | OUTPUT | MODE      | WIDTH<br>VOLUME |                 |                 |      |               |
|                       |                    |                      | L               | R                |        |           |                 |                 |                 |      |               |
| Operating Voltage     | V+                 |                      | -               | -                | -      | -         | -               | 4.7             | 12.0            | 13.0 | V             |
| Operating Current     | I <sub>cc</sub>    | No Signal            | -               | -                | -      | BYPASS    | -               | 2.9             | 5.7             | 8.6  | mA            |
|                       |                    |                      | -               | -                | -      | 3D Stereo | MAX             | 2.9             | 5.7             | 8.6  |               |
| Reference Voltage     | V <sub>REF</sub>   | V+/2                 | -               | -                | -      | -         | -               | 5.8             | 6.0             | 6.2  | V             |
| Maximum Input Voltage | V <sub>INMAX</sub> | f=1kHz<br>T.H.D.=3%  | V <sub>IN</sub> | -                | L      | BYPASS    | -               | 10.0<br>(2.51)  | 12.0<br>(3.98)  | -    | dBV<br>(Vrms) |
|                       |                    | f=125Hz<br>T.H.D.=3% | V <sub>IN</sub> | -                | L      | 3D Stereo | MAX             | -1.5<br>(0.84)  | 0.50<br>(1.08)  | -    |               |
|                       |                    | f=125Hz<br>T.H.D.=3% | V <sub>IN</sub> | -                | L      | 3D Stereo | MIN             | -               | 11.5<br>(3.76)  | -    |               |
|                       |                    | f=125Hz<br>T.H.D.=3% | V <sub>IN</sub> | V <sub>IN</sub>  | L      | 3D Stereo | MAX             | -               | 0.45<br>(1.05)  | -    |               |
|                       |                    | f=125Hz<br>T.H.D.=3% | V <sub>IN</sub> | V <sub>IN</sub>  | R      | 3D Stereo | MAX             | -               | 11.9<br>(3.94)  | -    |               |
|                       |                    | f=125Hz<br>T.H.D.=3% | V <sub>IN</sub> | -V <sub>IN</sub> | L      | 3D Stereo | MAX             | -7.50<br>(0.42) | -5.50<br>(0.53) | -    |               |
| Channel Valance       | CH <sub>BAL</sub>  | f=1kHz<br>L-R Output | -               | V <sub>IN</sub>  | L      | 3D Stereo | MAX             | -1.0            | 0.0             | 1.0  | dB            |
|                       |                    |                      | V <sub>IN</sub> | -                | R      | 3D Stereo | MAX             | -1.0            | 0.0             | 1.0  |               |

**■ELECTRICAL CHARACTERISTICS** ( $V_+=12V, T_a=25, ^\circ C$  unless otherwise noted)

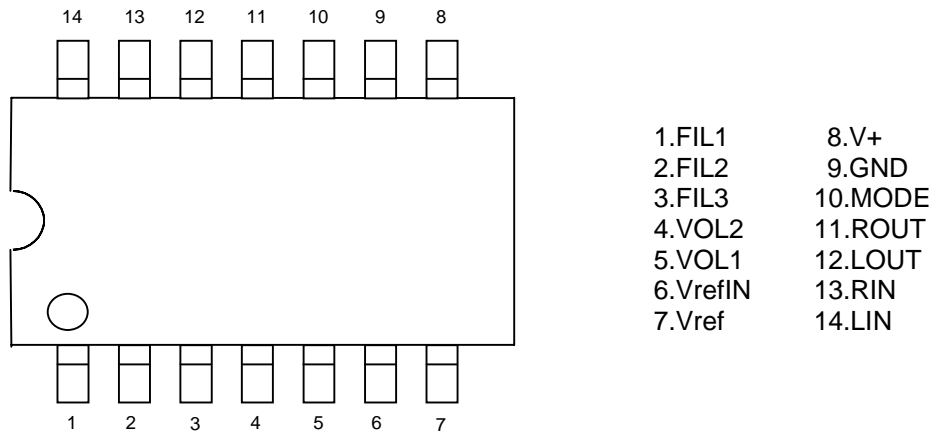
| PARAMETER                   | SYMBOL       | TEST CONDITION           |               |               |        |              | MIN. | TYP. | MAX.           | UNIT          |                         |
|-----------------------------|--------------|--------------------------|---------------|---------------|--------|--------------|------|------|----------------|---------------|-------------------------|
|                             |              | INPUT                    |               | OUTPUT        | MODE   | WIDTH VOLUME |      |      |                |               |                         |
|                             |              | L                        | R             |               |        |              |      |      |                |               |                         |
| Output Noise                | $V_{NOISE}$  | Rg=0Ω<br>A-Weighte       | 0             | 0             | L<br>R | BYPASS       | -    | -    | -110<br>(3.16) | -95<br>(17.8) | dB<br>( $\mu V_{rms}$ ) |
|                             |              | Rg=0Ω<br>A-Weighte       | 0             | 0             | L<br>R | 3D<br>Stereo | MAX  | -    | -90<br>(31.6)  | -85<br>(56.2) |                         |
| Total Harmonic Distortion   | T.H.D        | f=1kHz                   | $V_{IN}$<br>- | -<br>$V_{IN}$ | L<br>R | BYPASS       | -    | -    | 0.005          | 0.01          | %                       |
|                             |              | f=1kHz                   | $V_{IN}$<br>- | -<br>$V_{IN}$ | L<br>R | 3D<br>Stereo | MAX  | -    | 0.1            | 1.0           |                         |
| Bypass Gain                 | $G_{Bypass}$ | f=1kHz                   | $V_{IN}$<br>- | -<br>$V_{IN}$ | L<br>R | BYPASS       | -    | -1.0 | 0.0            | 1.0           | dB                      |
| SRS Gain                    | $G_{SRS}$    | f=125Hz                  | $V_{IN}$<br>- | -<br>$V_{IN}$ | L<br>R | 3D<br>Stereo | MAX  | 9.4  | 11.4           | 13.4          | dB                      |
|                             |              | f=125Hz                  | $V_{IN}$<br>- | -<br>$V_{IN}$ | L<br>R | 3D<br>Stereo | MIN  | -1.5 | 0.5            | 2.5           |                         |
|                             |              | f=125Hz                  | -<br>$V_{IN}$ | $V_{IN}$<br>- | L<br>R | 3D<br>Stereo | MAX  | 6.8  | 8.8            | 10.8          |                         |
| Mode Select Control Voltage | $V_{MODE}$   | $V_{IN} =$<br>High Level | -             | -             | -      | -            | -    | 2.0  | -              | $V_+$         | V                       |
|                             |              | $V_{IN} =$<br>Low Level  | -             | -             | -      | -            | -    | 0.0  | -              | 0.7           |                         |

**■MODE SWITCH**

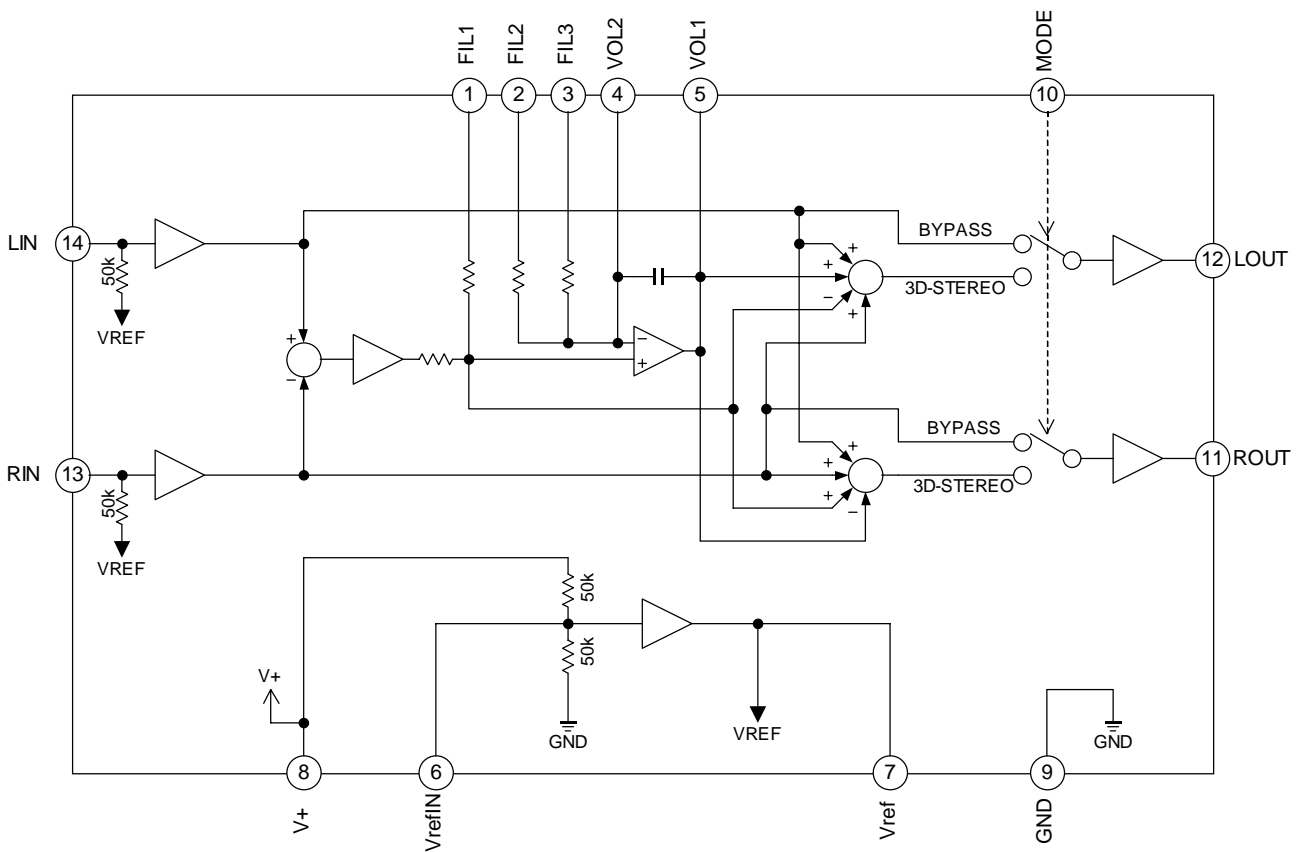
| MODE      | MODE |
|-----------|------|
| BYPASS    | L    |
| 3D Stereo | H    |

# NJM2199

## ■PIN CONFIGURATION



## ■BLOCK DIAGRAM



## ■ TERMINAL DESCRIPTION


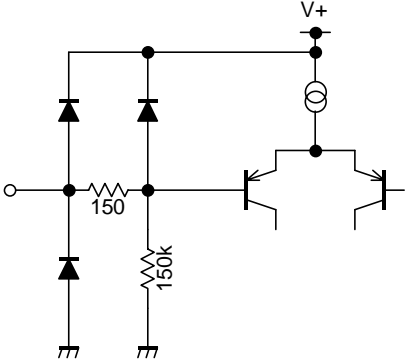
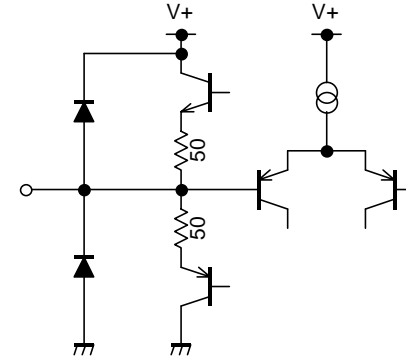
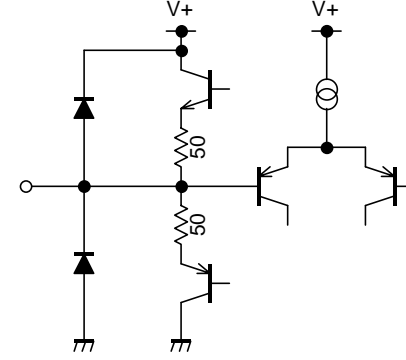
| PIN No. | SYMBOL | FUNCTION       | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|--------|----------------|--------------------|---------|
| 1       | FIL1   | Filter Input   |                    | $V+/2$  |
| 2       | FIL2   | Filte Input    |                    | $V+/2$  |
| 3       | FIL3   | Filter Input   |                    | $V+/2$  |
| 4       | VOL2   | WIDTH VR Input |                    | $V+/2$  |

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## ■TERMINAL DESCRIPTION

| PIN No. | SYMBOL | FUNCTION                | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|--------|-------------------------|--------------------|---------|
| 5       | VOL1   | WIDTH VR Output         |                    | $V+/2$  |
| 6       | VREFIN | Reference Voltage Input |                    | $V+/2$  |
| 7       | VREF   | Reference Voltage       |                    | $V+/2$  |
| 8       | V+     | Power Supply            |                    | $V+$    |

## ■TERMINAL DESCRIPTION

| PIN No. | SYMBOL | FUNCTION     | EQUIVALENT CIRCUIT   | VOLTAGE |
|---------|--------|--------------|--|---------|
| 9       | GND    | GND          |    | 0V      |
| 10      | MODE1  | Mode Control |   | 0V      |
| 11      | ROUT   | Rch Output   |  | V+/2    |
| 12      | LOUT   | Lch Output   |  | V+/2    |

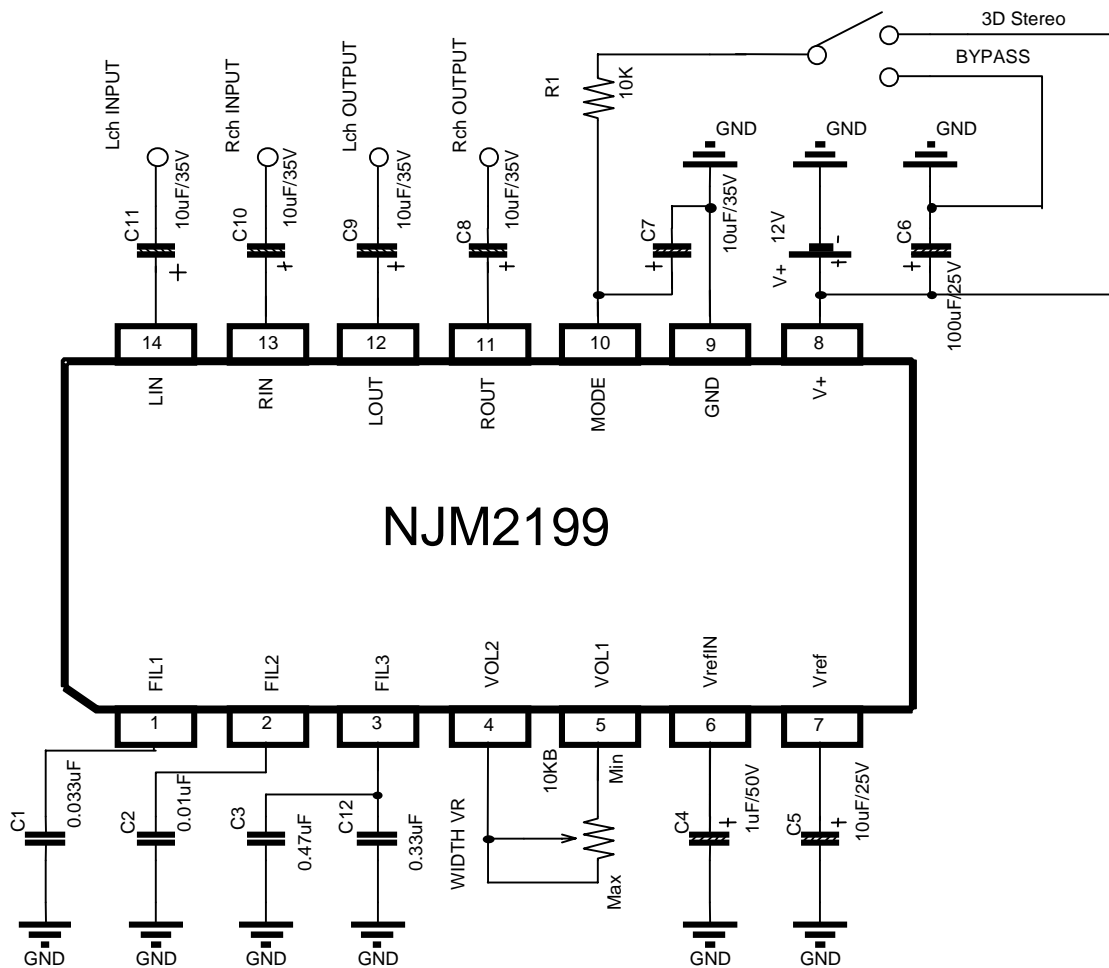
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## ■ TERMINAL DESCRIPTION

| PIN No. | SYMBOL | FUNCTION  | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|--------|-----------|--------------------|---------|
| 13      | RIN    | Rch Input |                    | $V+/2$  |
| 14      | LIN    | Lch Input |                    | $V+/2$  |

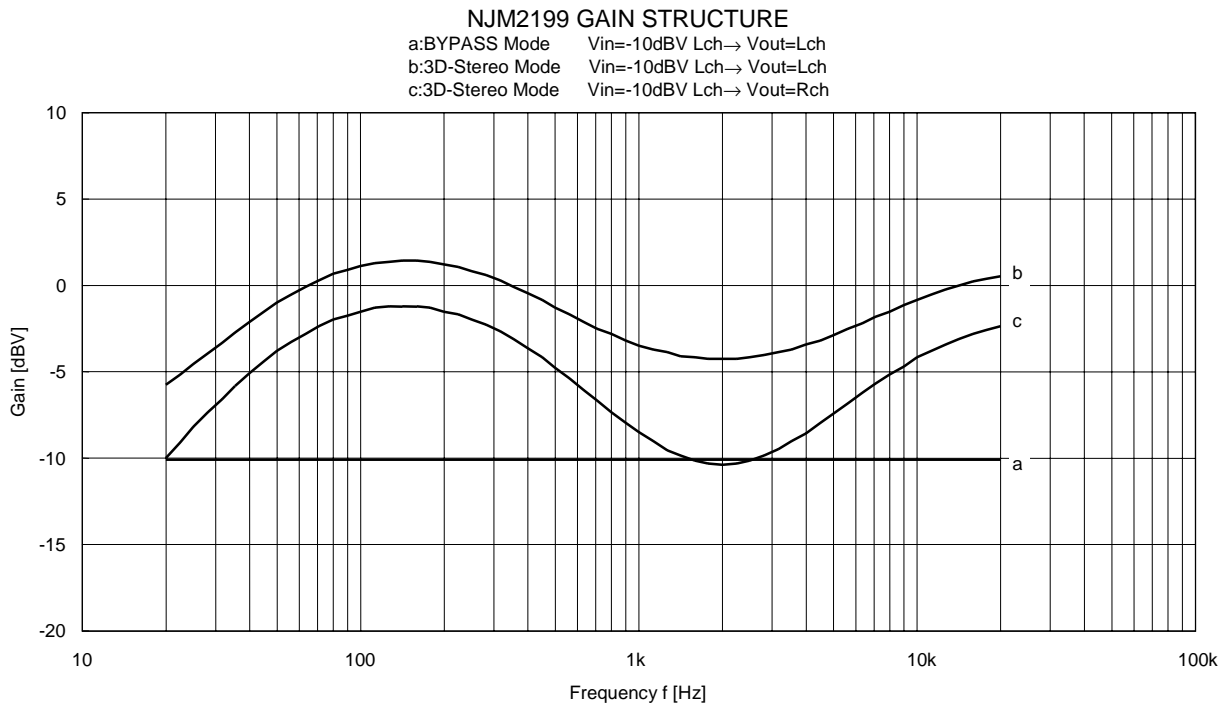


## APPLICATION CIRCUIT



| Parts No. | Value         | Tolerance | Parts No.        | Value        | Tolerance |
|-----------|---------------|-----------|------------------|--------------|-----------|
| C1        | 0.033 $\mu$ F | $\pm$ 5%  | C5,C6            | 100 $\mu$ F  | $\pm$ 20% |
| C2        | 0.01 $\mu$ F  | $\pm$ 5%  | C7,C8,C9,C10,C11 | 10 $\mu$ F   | $\pm$ 20% |
| C3        | 0.47 $\mu$ F  | $\pm$ 5%  | C12              | 0.33 $\mu$ F | $\pm$ 5%  |
| C4        | 1 $\mu$ F     | $\pm$ 20% | R1               | 10k          | $\pm$ 5%  |

## ■ TYPICAL CHARACTERISTICS



**[CAUTION]**  
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