

**TruSurround™**  
with SRS (●)®

## TruSurround™ 3D AUDIO PROCESSOR

### ■ GENERAL DESCRIPTION

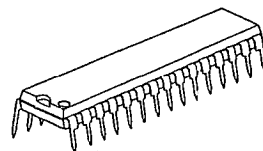
The NJM2180 is a TruSurround™ \*1) 3D audio processor. It regenerates full surround sound field from two speakers by the TruSurround Virtualizer when either 5.1 channels by Dolby Digital\*2) or 4 channels by Dolby Pro Logic\*2) signal is input.

The NJM2180 also performs the SRS 3D-STEREO. In this mode, NJM2180 regenerates a 3D sound field from normal L/R input.

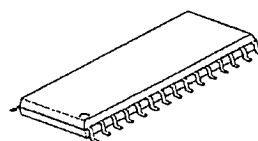
In addition, the NJM2180 includes 2-type BYPASS mode THROUGH and MIX DOWN. In THROUGH mode, the NJM2180 output 5.1 channels(max.) without any processing and in MIX DOWN mode, the NJM2180 output normal 2 channels stereo signal from 4 or 5.1 channels input

The NJM2180 is suitable for TV, mini component, CD radio cassette, multimedia speaker systems and others.

### ■ PACKAGE OUTLINE



NJM2180L



NJM2180M

For use in Virtual Dolby Surround(VDS) and/or Virtual Dolby Digital(VDD) products, please contact Dolby Laboratories for licensing information.

### ■ FEATURES

- Operating Voltage (4.7 to 13V)
- Maximum Input Voltage (2.1Vrms typ. at TRU\_4 mode,  $V^+ \geq 11V$ )
- Low Output Noise (35 $\mu$ Vrms typ. at TRU\_4 mode)
- SRS 3D-STEREO FUNCTION
- BYPASS FUNCTION (THROUGH/MIX DOWN)
- Bipolar Technology
- Package Outline SDIP30, SDMP30

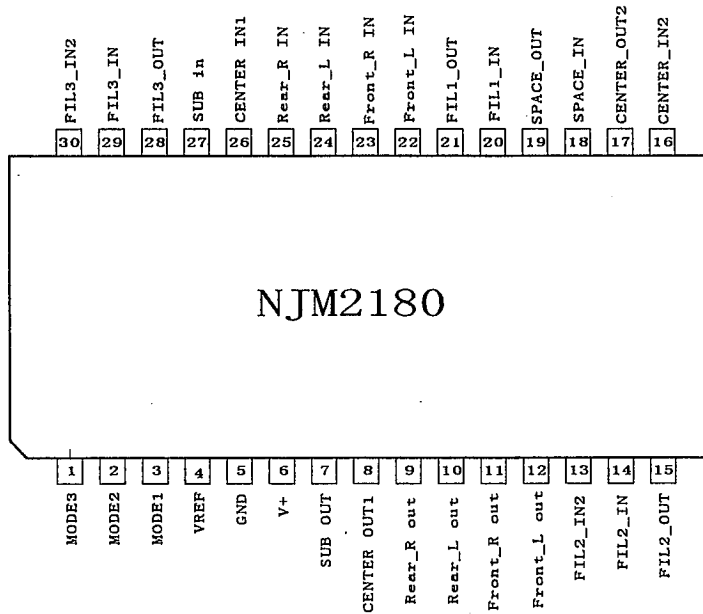
\*1) The TruSurround technology rights incorporated in the NJM2180 is owned by SRS Labs, a US Corporation and licensed to New Japan Radio Co., Ltd. The TruSurround technology is protected under United States Patent No. 4,748,689 with numerous additional pending domestic and foreign patents. TruSurround is a trademark of SRS Labs, Inc. SRS and the SRS symbol are registered trademarks of SRS Labs, Inc. in the United States and selected foreign countries. Neither the purchase of the NJM2180, nor the corresponding sale of audio enhancement equipment conveys the right to sell commercialized recordings made with the TruSurround technology. SRS Labs requires that all users of the NJM2180 must enter into a license agreement directly with SRS Labs and comply with all rules and regulations as outlined in the TruSurround Trademark Usage Manual of SRS Labs, Inc.

For further information, please contact:

• SRS Labs, Inc.  
2909 Daimler Street, Santa Ana, CA 92705 USA  
Tel:714-442-1070 Fax:714-852-1099 <http://www.srslabs.com>

\*2) Dolby and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation. Licensing and application information may be obtained from Dolby Lab.

## PIN FUNCTION



| No. | SYMBOL         | FUNCTION                     | No. | SYMBOL      | FUNCTION                     |
|-----|----------------|------------------------------|-----|-------------|------------------------------|
| 1   | MODE3          | Mode Switch                  | 16  | CENTER_IN2  | CENTER gain adjustment       |
| 2   | MODE2          | Mode Switch                  | 17  | CENTER_OUT2 | CENTER gain adjustment       |
| 3   | MODE1          | Mode Switch                  | 18  | SPACE_IN    | SPACE gain adjustment        |
| 4   | VREF           | V <sup>+</sup> /2            | 19  | SPACE_OUT   | SPACE gain adjustment        |
| 5   | GND            | Ground                       | 20  | FIL1_IN     | Perspective Network_1 input  |
| 6   | V <sup>+</sup> | Supply Voltage 4.5 to 13V    | 21  | FIL1_OUT    | Perspective Network_1 output |
| 7   | SUB OUT        | SUB output                   | 22  | Front_L in  | Front Lch input              |
| 8   | CENTER OUT1    | CENTER output                | 23  | Front_R in  | Front Rch input              |
| 9   | Rear_R OUT     | Rear Rch output              | 24  | Rear_L in   | Rear Lch input               |
| 10  | Rear_L OUT     | Rear Lch output              | 25  | Rear_R in   | Rear Rch input               |
| 11  | Front_R OUT    | Front Rch output             | 26  | CENTER in1  | CENTER input                 |
| 12  | Front_L OUT    | Front Lch output             | 27  | SUB in      | SUB input                    |
| 13  | FIL2_IN2       | Perspective Network_2 input  | 28  | FIL3_OUT    | Perspective Network_3 output |
| 14  | FIL2_IN        | Perspective Network_2 input  | 29  | FIL3_IN     | Perspective Network_3 input  |
| 15  | FIL2_OUT       | Perspective Network_2 output | 30  | FIL3_IN2    | Perspective Network_3 input  |

■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER                   | SYMBOL           | RATING      | UNIT |
|-----------------------------|------------------|-------------|------|
| Supply Voltage              | V <sup>+</sup>   | 15          | V    |
| Power Dissipation           | P <sub>D</sub>   | 700         | mW   |
| Operating Temperature Range | T <sub>opr</sub> | -20 to +75  | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -40 to +125 | °C   |

■ ELECTRICAL CHARACTERISTICS (V<sup>+</sup>=12V, Ta=25°C, 0dBu=775mVrms)

| PARAMETER             | SYMBOL             | TEST CONDITION  | MIN.          | TYP.          | MAX.          | UNIT           |
|-----------------------|--------------------|---|---------------|---------------|---------------|----------------|
| Operating Voltage     | V <sup>+</sup>     |   | 4.7           | 12.0          | 13.0          | V              |
| Supply Current        | I <sub>cc</sub>    | No Signal<br>BYPASS1, 2 MODE  | 10.0          | 20.0          | 30.0          | mA             |
|                       |                    | No Signal<br>TRU_5.1 MODE   | 10.0          | 20.0          | 30.0          |                |
| Reference Voltage     | V <sub>REF</sub>   | V <sup>+</sup> /2   | 5.5           | 6.0           | 6.5           | V              |
| Maximum Input Voltage | V <sub>INMAX</sub> | V <sub>IN</sub> =front L, Rch f=1kHz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>BYPASS1 MODE    | 11.5<br>(2.9) | 13.5<br>(3.7) | 15.5<br>(4.6) | dBu<br>(Vrms)  |
|                       |                    | V <sub>IN</sub> =front L, Rch f=1kHz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>BYPASS2 MODE    | 11.5<br>(2.9) | 13.5<br>(3.7) | 15.5<br>(4.6) |                |
|                       |                    | V <sub>IN</sub> =front L, Rch f=125Hz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>3D-STEREO MODE | 9.3<br>(2.3)  | 11.3<br>(2.9) | 13.3<br>(3.6) |                |
|                       |                    | V <sub>IN</sub> =front L, Rch f=125Hz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>TRU_5.1 MODE   | 9.3<br>(2.3)  | 11.3<br>(2.9) | 13.3<br>(3.6) |                |
|                       |                    | V <sub>IN</sub> =Rear L, Rch f=125Hz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>TRU_5.1 MODE    | 9.0<br>(2.2)  | 11.0<br>(2.8) | 13.0<br>(3.5) |                |
|                       |                    | V <sub>IN</sub> =Center, Sub f=1kHz<br>V <sub>OUT</sub> =Lch at THD=3%<br>TRU_5.1 MODE        | 11.5<br>(2.9) | 13.5<br>(3.7) | 15.5<br>(4.6) |                |
|                       |                    | V <sub>IN</sub> =Rear Lch f=125Hz<br>V <sub>OUT</sub> =L, Rch at THD=3%<br>TRU_4 MODE         | 6.5<br>(1.6)  | 8.5<br>(2.1)  | 10.5<br>(2.6) |                |
| Output Noise          | V <sub>NOISE</sub> | CCIR-ARM<br>V <sub>IN</sub> =GND V <sub>OUT</sub> =L, Rch<br>BYPASS1 MODE                     | —             | -95.0<br>(17) | -84.0<br>(63) | dBV<br>(uVrms) |
|                       |                    | CCIR-ARM<br>V <sub>IN</sub> =GND V <sub>OUT</sub> =L, Rch<br>BYPASS2 MODE                     | —             | -98.0<br>(13) | -84.0<br>(63) |                |
|                       |                    | CCIR-ARM<br>V <sub>IN</sub> =GND V <sub>OUT</sub> =L, Rch<br>3D-STEREO MODE                   | —             | -89.0<br>(35) | -84.0<br>(63) |                |
|                       |                    | CCIR-ARM<br>V <sub>IN</sub> =GND V <sub>OUT</sub> =L, Rch<br>TRU_5.1 MODE                     | —             | -89.0<br>(35) | -84.0<br>(63) |                |
|                       |                    | CCIR-ARM<br>V <sub>IN</sub> =GND V <sub>OUT</sub> =L, Rch<br>TRU_4 MODE                       | —             | -89.0<br>(35) | -84.0<br>(63) |                |

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■ ELECTRICAL CHARACTERISTICS ( $V^+=12V$ ,  $T_a=25^\circ C$ ,  $0dBu=775mVrms$ )

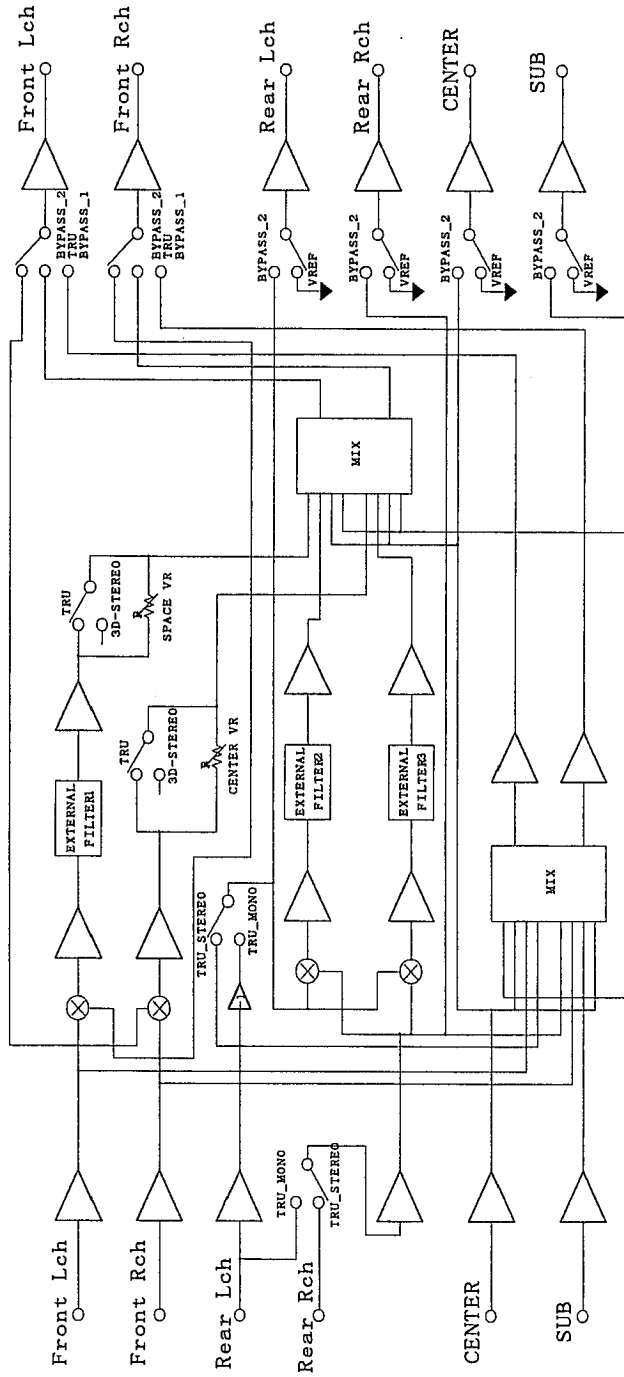
| PARAMETER                   | SYMBOL        | TEST CONDITION   |                | MIN.  | TYP.  | MAX.  | UNIT |
|-----------------------------|---------------|--|----------------|-------|-------|-------|------|
| Total Harmonic Distortion   | THD           | $V_{IN}=-10dBu$ Front Lch<br>$f=1kHz, V_{OUT}=Lch$                                 | BYPASS1 MODE   | 0.001 | 0.1   | 0.5   | %    |
|                             |               | $V_{IN}=-10dBu$ Front Lch<br>$f=1kHz, V_{OUT}=Lch$                                 | BYPASS2 MODE   | 0.001 | 0.01  | 0.5   |      |
|                             |               | $V_{IN}=-10dBu$ Front Lch<br>$f=1kHz, V_{OUT}=L, Rch$                              | 3D-STEREO MODE | 0.01  | 0.1   | 0.5   |      |
|                             |               | $V_{IN}=-10dBu$ Front Lch<br>$f=1kHz, V_{OUT}=L, Rch$                              | TRU_5.1 MODE   | 0.01  | 0.1   | 0.5   |      |
|                             |               | $V_{IN}=-10dBu$ Rear Lch<br>$f=1kHz, V_{OUT}=L, Rch$                               | TRU_5.1 MODE   | 0.01  | 0.1   | 0.5   |      |
|                             |               | $V_{IN}=-10dBu$ Front Lch<br>$f=1kHz, V_{OUT}=L, Rch$                              | TRU_4 MODE     | 0.01  | 0.1   | 0.5   |      |
|                             |               | $V_{IN}=-10dBu$ Rear Lch<br>$f=1kHz, V_{OUT}=L, Rch$                               | TRU_4 MODE     | 0.01  | 0.1   | 0.5   |      |
| BYPASS1 Gain                | $G_{BYPASS1}$ | $V_{IN}=0dBu$ Front Lch<br>$f=1kHz, V_{OUT}=L, Rch$                                | BYPASS1 MODE   | -4.9  | -2.9  | -0.9  | dB   |
| BYPASS2 Gain                | $G_{BYPASS2}$ | $V_{IN}=0dBu$ Front Lch<br>$f=1kHz, V_{OUT}=L, Rch$                                | BYPASS2 MODE   | -2.0  | 0.0   | 2.0   | dB   |
| TRU Front Gain              | $G_{TRU-F}$   | $V_{IN}=0dBu$ Front Lch<br>$f=125Hz, V_{OUT}=Lch$                                  | TRU_5.1 MODE   | -0.2  | 1.8   | 3.8   | dB   |
| TRU Rear Gain               | $G_{TRU-R}$   | $V_{IN}=0dBu$ Rear Lch<br>$f=125Hz, V_{OUT}=Lch$                                   | TRU_5.1 MODE   | 0.8   | 2.8   | 4.8   | dB   |
| TRU Rear Gain               | $G_{TRU-R}$   | $V_{IN}=0dBu$ Rear Lch<br>$f=125Hz, V_{OUT}=L, Rch$                                | TRU_4 MODE     | 1.5   | 3.5   | 5.5   | dB   |
| CENTER Gain                 | $G_{CENTER}$  | $V_{IN}=0dBu$ Center ch<br>$f=1kHz, V_{OUT}=L, Rch$                                | TRU_4 MODE     | -4.9  | -2.9  | -0.9  | dB   |
| SUB Gain                    | $G_{SUB}$     | $V_{IN}=0dBu$ Sub ch<br>$f=1kHz, V_{OUT}=L, Rch$                                   | TRU_4 MODE     | -2.0  | 0.0   | -2.0  | dB   |
| Feed Through Gain           | $G_{THROUGH}$ | $V_{IN}=0dBu$ Front Lch<br>$f=1kHz, V_{OUT}=Lch$<br>SPACE VR Min<br>CENTER VR Min  | 3D-STEREO MODE | -20.2 | -18.2 | -16.2 | dB   |
| L + R Gain                  | $G_{L+R}$     | $V_{IN}=0dBu$ Front Lch<br>$f=1kHz, V_{OUT}=Rch$<br>SPACE VR Min<br>CENTER VR Max  | 3D-STEREO MODE | -15.0 | -13.0 | -11.0 | dB   |
| L - R Gain                  | $G_{L-R}$     | $V_{IN}=0dBu$ Front Lch<br>$f=125Hz, V_{OUT}=Rch$<br>SPACE VR Max<br>CENTER VR Min | 3D-STEREO MODE | -2.0  | 0.0   | 2.0   | dB   |
| MODE Select Control Voltage | $V_{MODE}$    | $V_{IN}=High Level$  |                | 2.0   | —     | $V^+$ | V    |
|                             |               | $V_{IN}=Low Level$   |                | 0.0   | —     | 0.7   |      |

■ MODE SELECT FUNCTION

| MODE      | MODE1 | MODE2 | MODE3 | NOTE   |
|-----------|-------|-------|-------|--|
| BYPASS_1  | L     | L     | L     | MIX DOWN MODE (2-Channel Output)   |
| BYPASS_2  | L     | L     | H     | INPUT THROUGH MODE (Multi-Channel Output)  |
| TSV_5.1   | L     | H     | L     | TruSurround MODE (Dolby Digital Decoded Source)<br>Variable effects by SPACE and CENTER VR   |
| TSV_4     | L     | H     | H     | TruSurround MODE (Dolby Pro Logic Decoded Source)<br>Variable effects by SPACE and CENTER VR |
| 3D-STEREO | H     | L     | —     | SRS 3D-STEREO MODE (Normal STEREO Source)<br>Variable effects by SPACE and CENTER VR         |
| TRU_5.1   | H     | H     | L     | TruSurround MODE (Dolby Digital Decoded Source)<br>Standard effects                          |
| TRU_4     | H     | H     | H     | TruSurround MODE (Dolby Pro Logic Decoded Source)<br>Standard effects                        |

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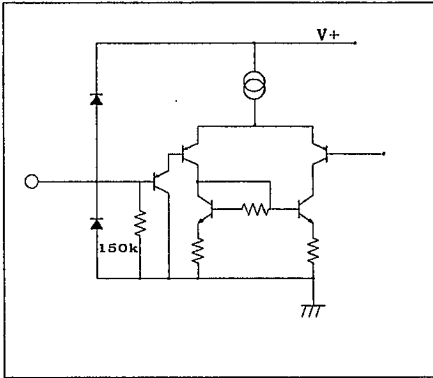
## ■ BLOCK DIAGRAM



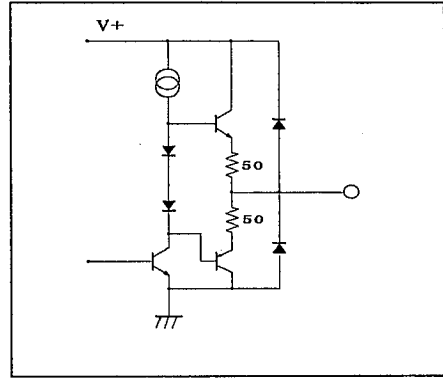
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■ PIN DESCRIPTION

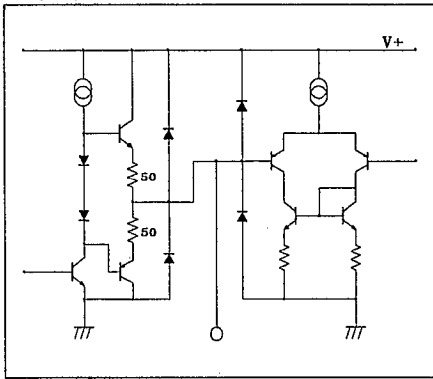
1, 2, 3 PIN



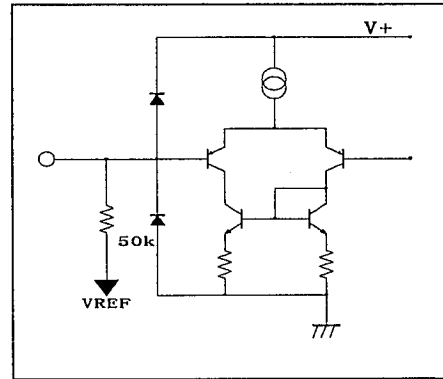
4, 7, 8, 9, 10, 11, 12, 15, 17, 21, 28 PIN



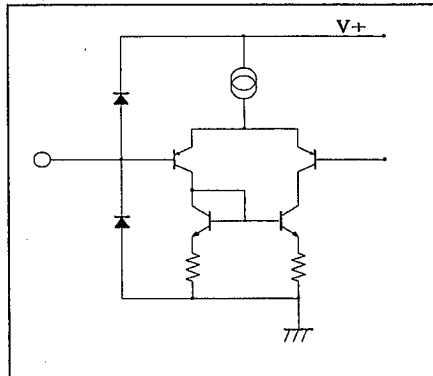
13, 19, 30 PIN



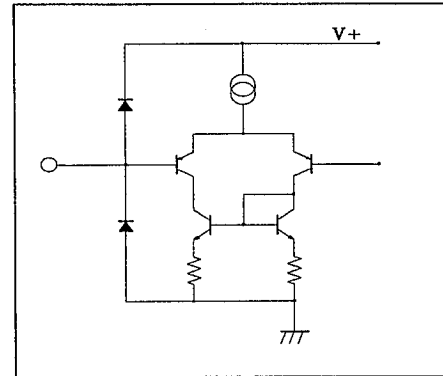
22, 23, 24, 25, 26, 27 PIN



14, 20, 29 PIN



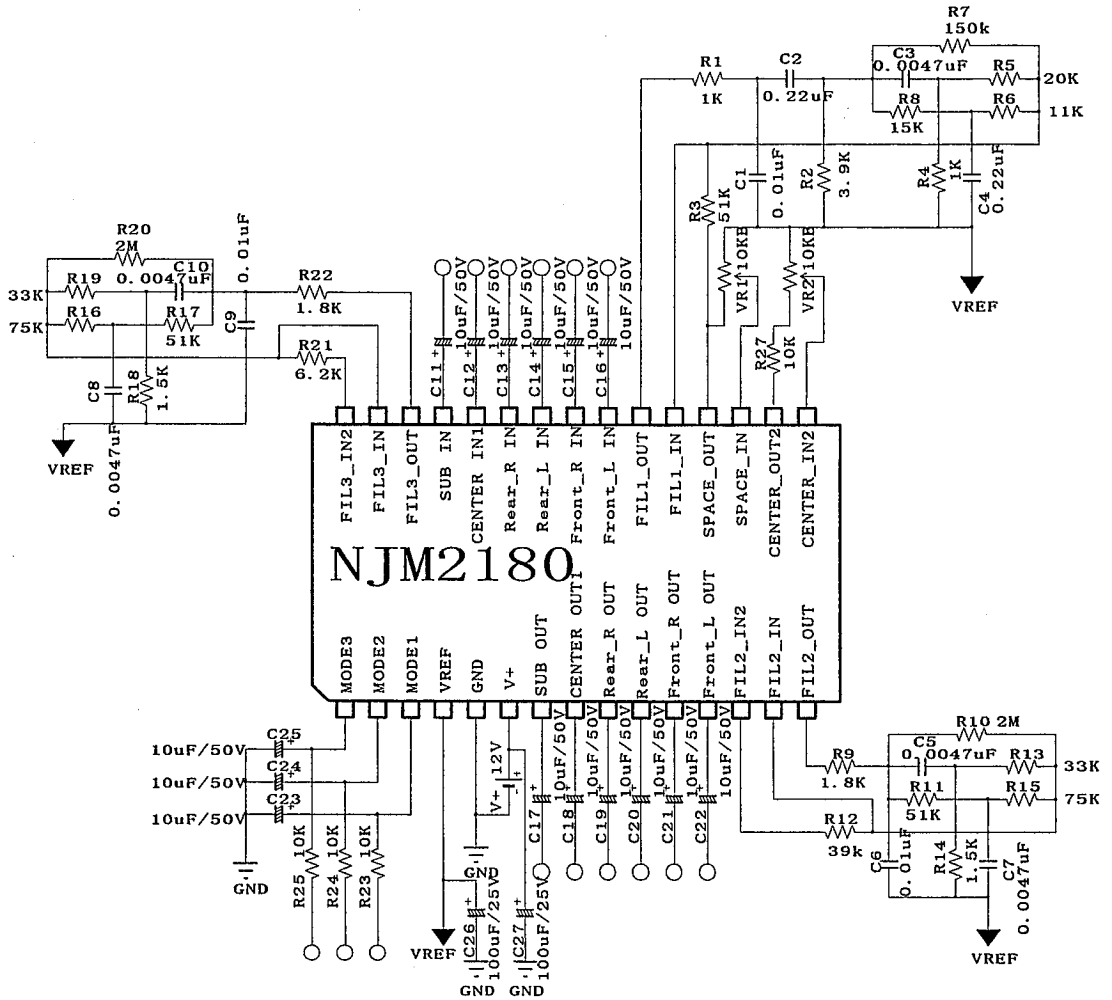
16, 18 PIN



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## APPLICATION CIRCUIT

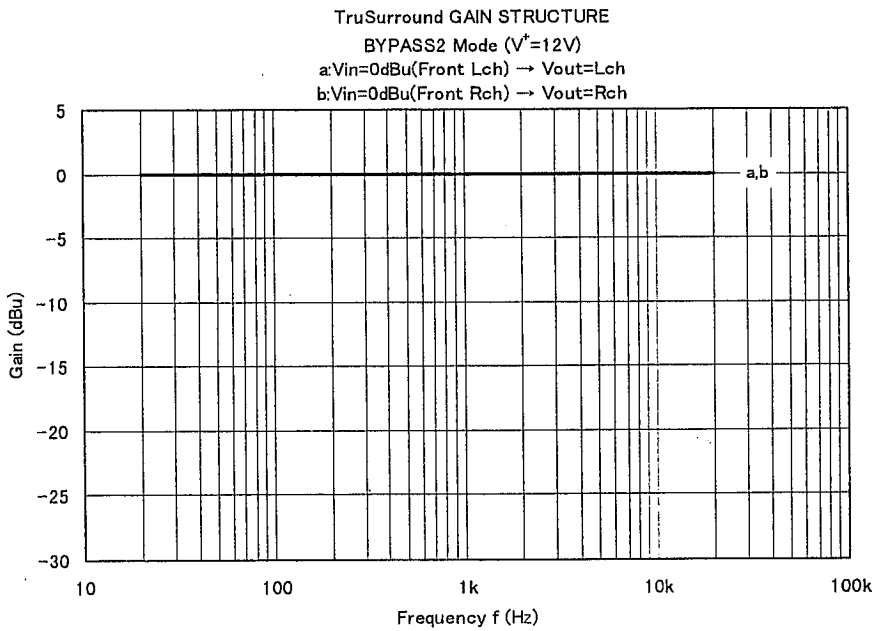
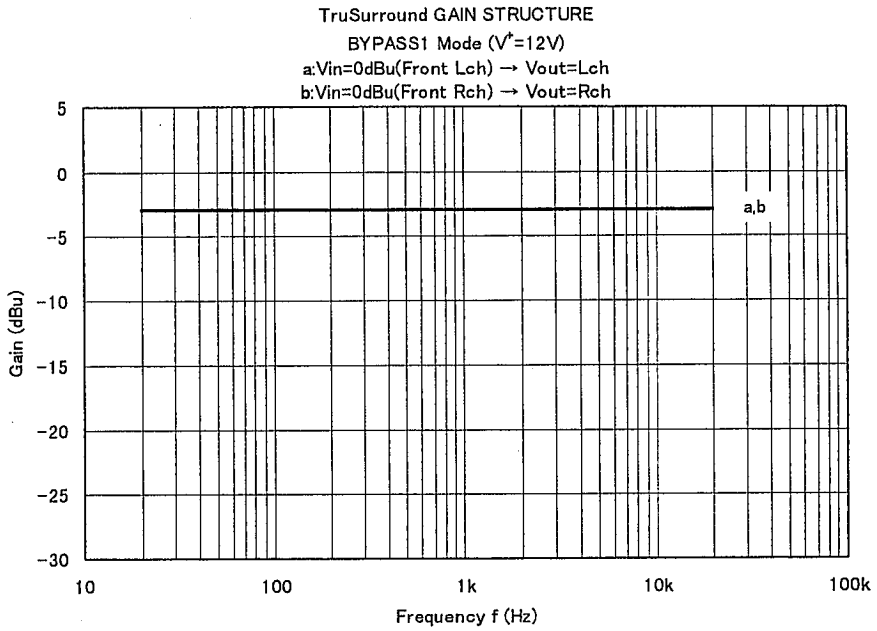
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Note: In case of TRU\_4 or TSV\_4 MODE, input the mono signal of surround channel from Dolby Logic decoder into Rear\_L IN terminal or both of Rear\_L IN and Rear\_R IN terminals.



■ TYPICAL CHARACTERISTICS



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## TYPICAL CHARACTERISTICS

### TruSurround GAIN STRUCTURE

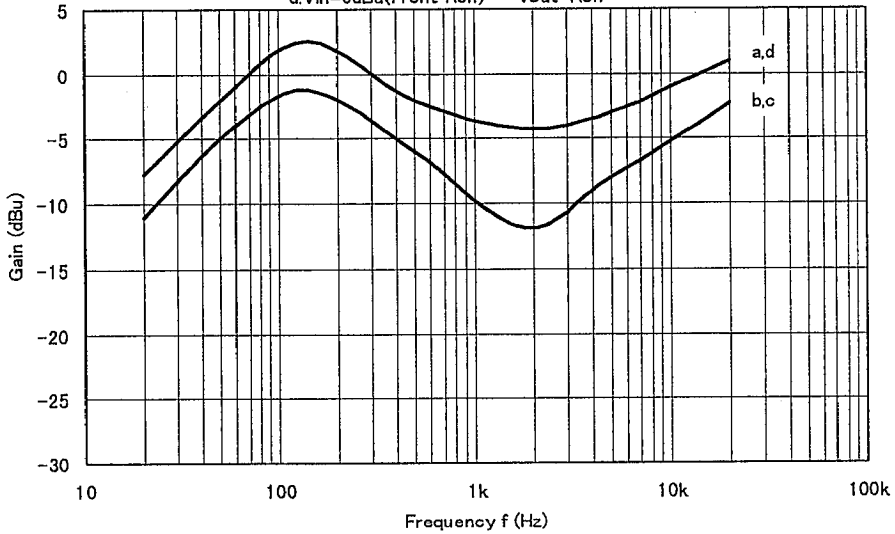
Tru5.1 Mode ( $V^+ = 12V$ )

a: Vin=0dBu(Front Lch) → Vout=Lch

b: Vin=0dBu(Front Lch) → Vout=Rch

c: Vin=0dBu(Front Rch) → Vout=Lch

d: Vin=0dBu(Front Rch) → Vout=Rch



### TruSurround GAIN STRUCTURE

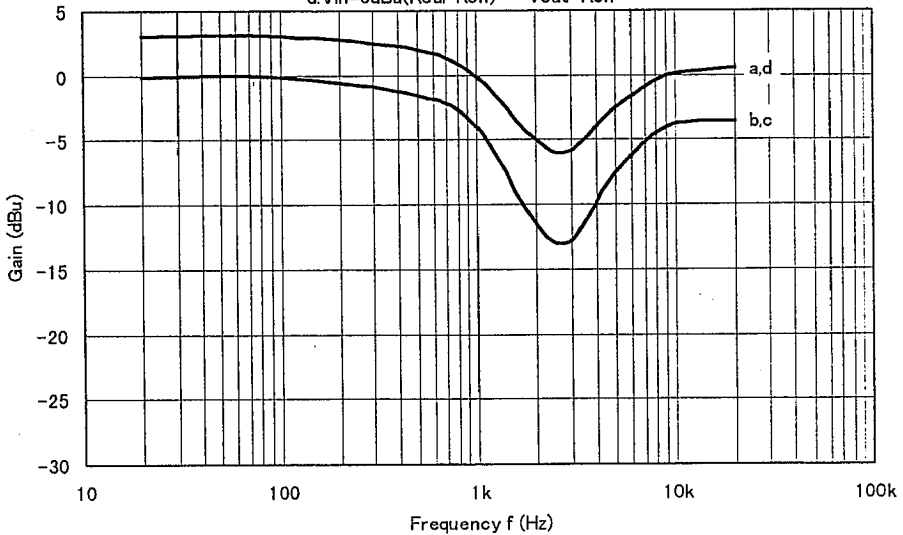
Tru5.1 Mode ( $V^+ = 12V$ )

a: Vin=0dBu(Rear Lch) → Vout=Lch

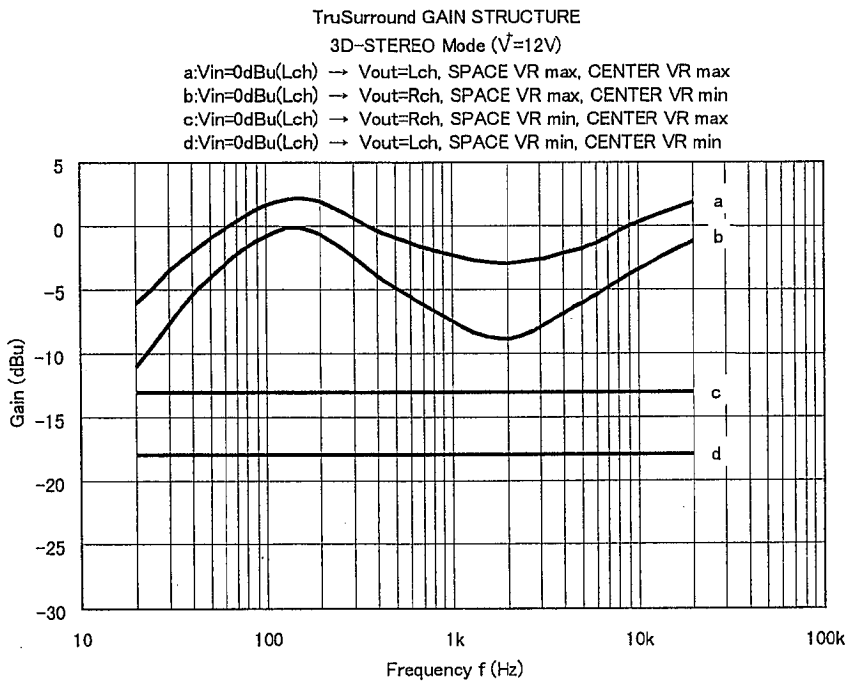
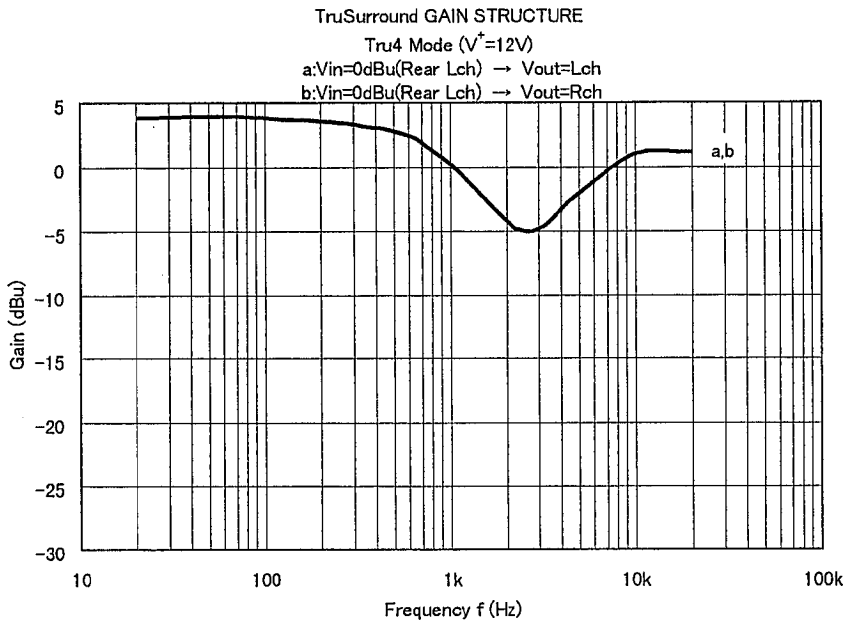
b: Vin=0dBu(Rear Lch) → Vout=Rch

c: Vin=0dBu(Rear Rch) → Vout=Lch

d: Vin=0dBu(Rear Rch) → Vout=Rch



■ TYPICAL CHARACTERISTICS



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## MEMO

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.