



SRS 3D SURROUND AUDIO PROCESSOR

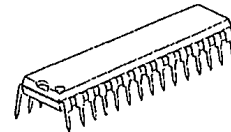
GENERAL DESCRIPTION

The NJM2178 is a SRS 3D surround audio processor regenerating the 3D surround sound by two speakers.

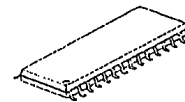
It regenerates 3D surround sound from both of monaural and stereo input.

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

PACKAGE OUTLINE



NJM2178L



NJM2178M

FEATURES

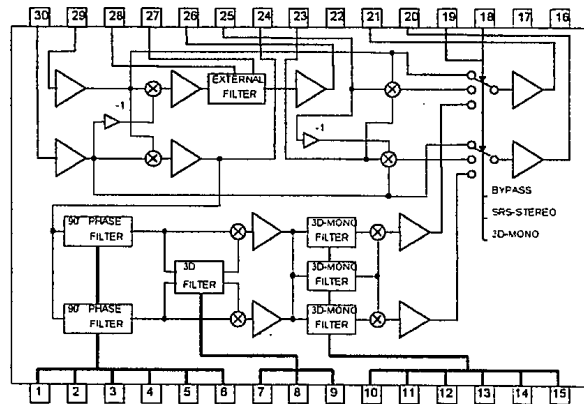
- Operating Voltage (4.7 to 13V)
- Low Supply Current (11mA typ. at 3D-STEREO mode)
- Wide Dynamic Range (>110dB)
- Low Output Noise (22  $\mu$ Vrms typ. at 3D-STEREO mode)
- BYPASS Gain (-3dB typ.)
- BYPASS FUNCTION(Through)
- SPACE and CENTER control
- Internal Mode Control Switch(2bit)
- Bipolar Technology
- Package Outline SDIP30, SDMP30

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PIN CONFIGURATION

90° Phase Filter	1	C1	Rin	30	Rch Input
90° Phase Filter	2	C2	Lin	29	Lch Input
90° Phase Filter	3	C3	PNout	28	External Filter Output
90° Phase Filter	4	C4	PNin	27	External Filter Input
90° Phase Filter	5	C5	Sout	26	SPACE Control Output
90° Phase Filter	6	C6	Sin	25	SPACE Control Input
3D Filter	7	CF1	Cout	24	CENTER Control Output
3D Filter	8	CF2	Cin	23	CENTER Control Input
3D Filter	9	CF3	Vref	22	V <sup>1/2</sup>
3D-MONO Filter	10	MOC5	Lout	21	Lch Output
3D-MONO Filter	11	MOC6	Rout	20	Rch Output
3D-MONO Filter	12	MOC3	MODE1	19	SRS/3D-MONO Mode Select
3D-MONO Filter	13	MOC4	MODE2	18	ON/PASS Mode Select
3D-MONO Filter	14	MOC1	GND	17	Ground
3D-MONO Filter	15	MOC2	V+	16	4.7 TO 13.0V Supply

BLOCK DIAGRAM



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

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	7	V
Power Dissipation	P <sub>D</sub>	(SD1P30) 700 (SDMP30) 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, Vin=0dBu(775mVrms), unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT	
Operating Voltage	V <sup>+</sup>		4.7	12.0	13.0	V	
Operating Current	I <sub>CC</sub>	No Signal	BYPASS	-	9.0	14.0	mA
			3D-STEREO	-	11.0	17.0	
			3D-MONAUURAL	-	14.0	21.0	
Reference Voltage	V <sub>REF</sub>	V <sup>+</sup> /2	5.5	V <sup>+</sup> /2	6.5	V	
Maximum Input Voltage	V <sub>INMAX</sub>	Vin=Lch f=1kHz Vout=Lch at THD=3%	BYPASS	8.0 (1.95)	10.0 (2.45)	-	dBu (Vrms)
		Vin=Lch f=125Hz Vout=Rch at THD=3% SPACE VR Max CENTER VR Min	3D-STEREO	2.8 (1.07)	4.8 (1.35)	-	
		Vin=L, Rch f=300Hz Vout=Lch at THD=3%	3D-MONAUURAL	5.0 (1.38)	7.0 (1.74)	-	
Channel Balance	CH <sub>BAL</sub>	f=1kHz SPACE VR Min CENTER VR Min Lch→Rch Rch→Lch	3D-STEREO	-1.0	0.0	1.0	dB
Output Noise	V <sub>NOISE</sub>	Vin=GND DIN-AUDIO	3D-STEREO	-	22.0	60.0	μVrms
		Vin=GND DIN-AUDIO	3D-MONAUURAL	-	35.0	60.0	
Total Harmonic Distortion	THD	Vin=-10dBu Lch f=1kHz SPACE VR Max CENTER VR Min	3D-STEREO	-	0.10	-	%
		Vin=-10dBu L, Rch f=1kHz	3D-MONAUURAL	-	0.05	-	
Bypass Gain	G <sub>BYPASS</sub>	f=1kHz	BYPASS	-5.0	-3.0	-1.0	dB
Feed Through Gain	G <sub>THROUGH</sub>	f=1kHz SPACE VR Min CENTER VR Min L, Rch→L or Rch	3D-STEREO	-15.3	-13.3	-11.3	dB

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■ ELECTRICAL CHARACTERISTICS ( $V^+=12V$ ,  $T_a=25^\circ C$ ,  $V_{in}=0dBu(775mV_{rms})$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION		MIN	TYP	MAX	UNIT
L+R Gain	$G_{L+R}$	f=1kHz SPACE VR Min CENTER VR Max Lch→Rch	3D-STEREO	-10.5	-8.5	-6.5	dB
L-R Gain	$G_{L-R}$	f=125Hz SPACE VR Max CENTER VR Min Lch→Rch	3D-STEREO	7.0	9.0	11.0	dB
3D-MONO Gain at Lch out	$G_{MONOEL}$	f=125Hz L, Rch→Lch	3D-MONAUURAL	2.4	4.4	6.4	dB
3D-MONO Gain at Rch out	$G_{MONOER}$	f=125Hz L, Rch→Rch	3D-MONAUURAL	2.2	4.2	6.2	dB
MODE Select Control Voltage	$V_{MODE}$	Vin=HIGH LEVEL		2.0	-	$V^+$	V
		Vin=LOW LEVEL		0.0	-	0.7	

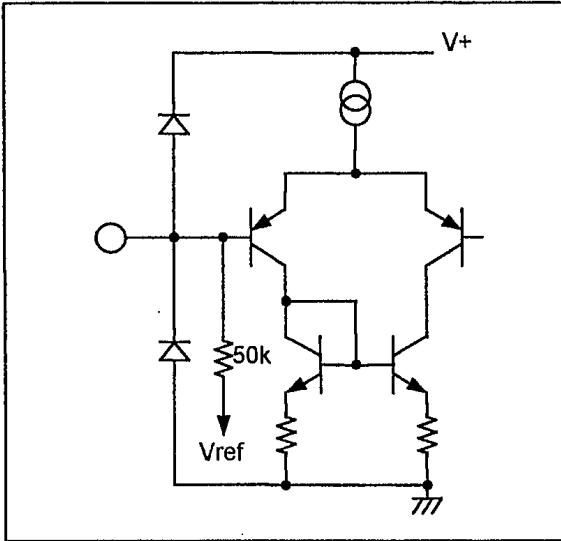
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■ MODE Switch

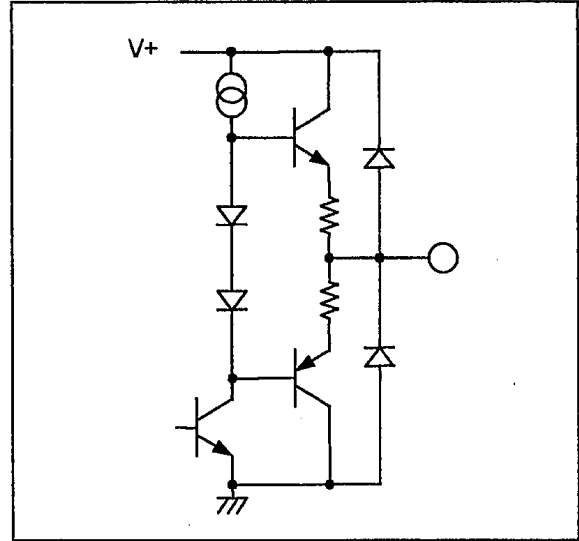
	MODE1	MODE2
BYPASS MODE	—	L
3D-STEREO	H	H
3D-MONAUURAL	L	H

## PIN FUNCTION

29,30 PIN:INPUT

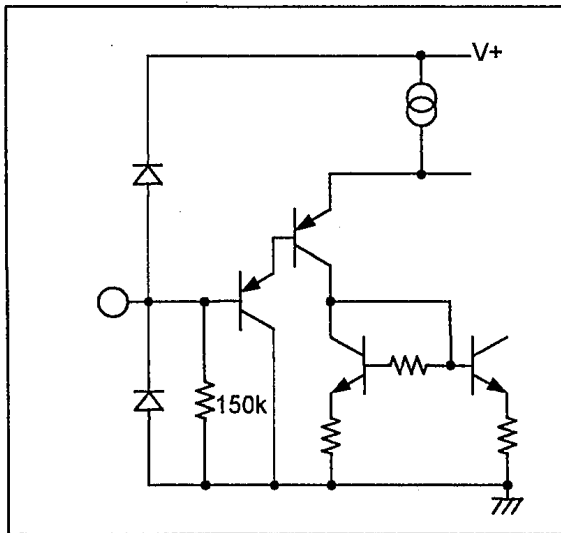


20,21,22,24,26 PIN:OUTPUT

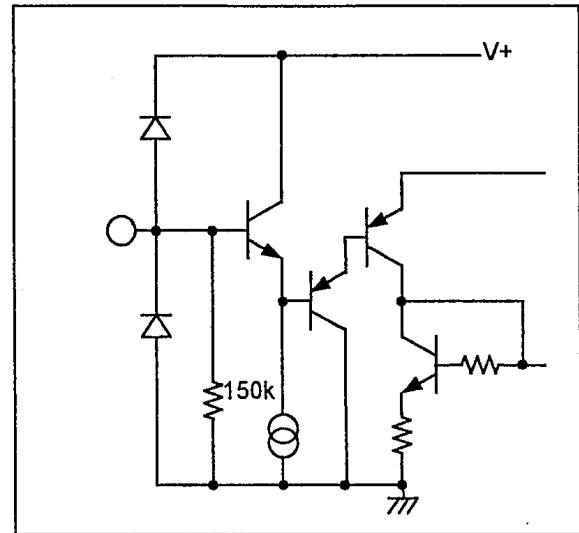


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18 PIN:MODE SW

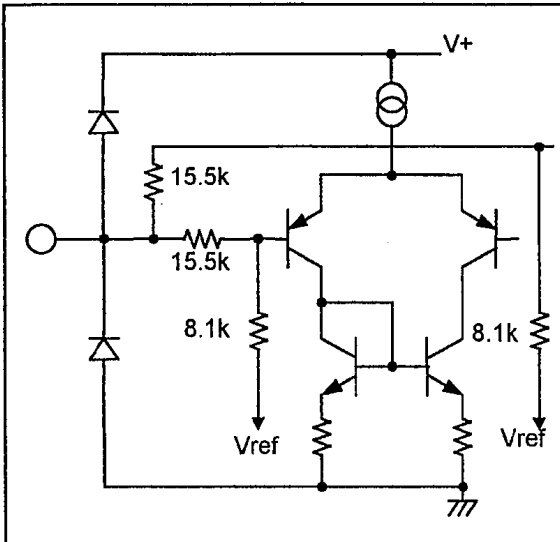


19 PIN:MODE SW

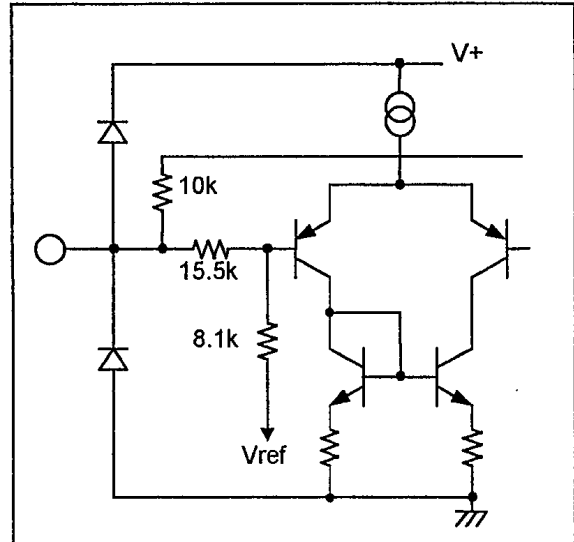


■ PIN FUNCTION

23 PIN:INPUT

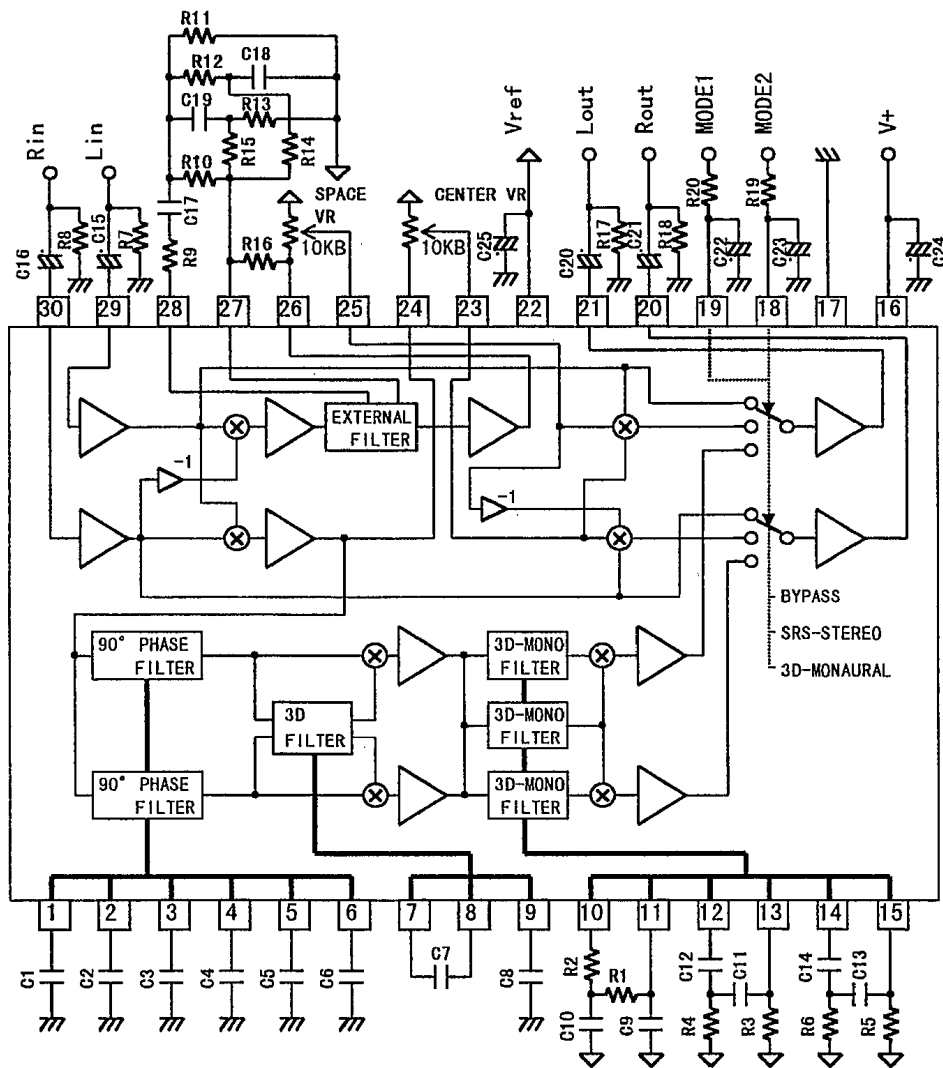


25 PIN:INPUT



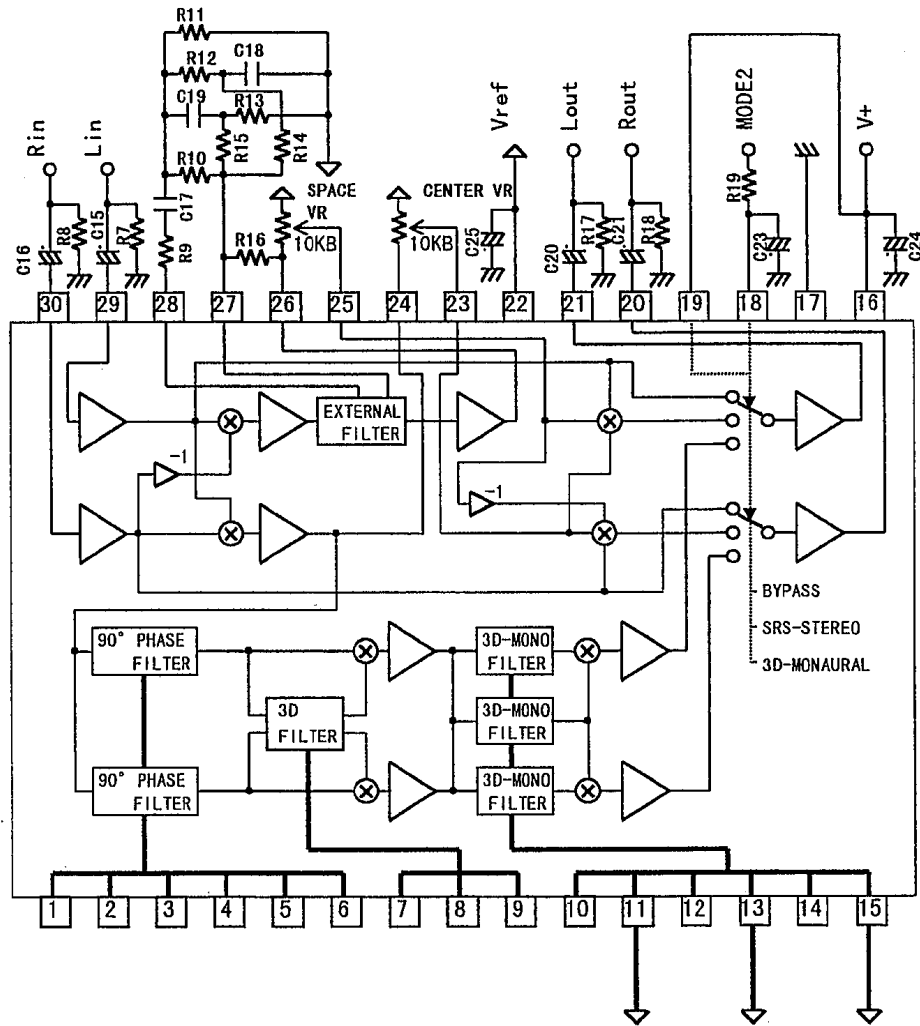
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## APPLICATION CIRCUIT



Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
C1	0.027 $\mu$ F		C24	100 $\mu$ F	
C2, C7	4700pF		R1, R3, R5	100k $\Omega$	$\pm 5\%$
C3	470pF		R2, R4, R6, R17	10k $\Omega$	$\pm 5\%$
C4, C10, C12, C14	0.1 $\mu$ F		R18, R19, R20	10k $\Omega$	$\pm 5\%$
C5	0.015 $\mu$ F		R9	1k $\Omega$	$\pm 5\%$
C6	2200pF		R10	110k $\Omega$	$\pm 5\%$
C8	0.47 $\mu$ F		R11	4.3k $\Omega$	$\pm 5\%$
C9, C11, C13	0.01 $\mu$ F		R12	1.5k $\Omega$	$\pm 5\%$
C17, C18	0.47 $\mu$ F	$\pm 5\%$	R13	3.9k $\Omega$	$\pm 5\%$
C19	4700pF	$\pm 5\%$	R14	33k $\Omega$	$\pm 5\%$
C15, C16, C20, C21	10 $\mu$ F		R7, R8, R15	47k $\Omega$	$\pm 5\%$
C22, C23, C25	10 $\mu$ F		R16	62k $\Omega$	$\pm 5\%$

APPLICATION CIRCUIT (only SRS 3D-STEREO mode)

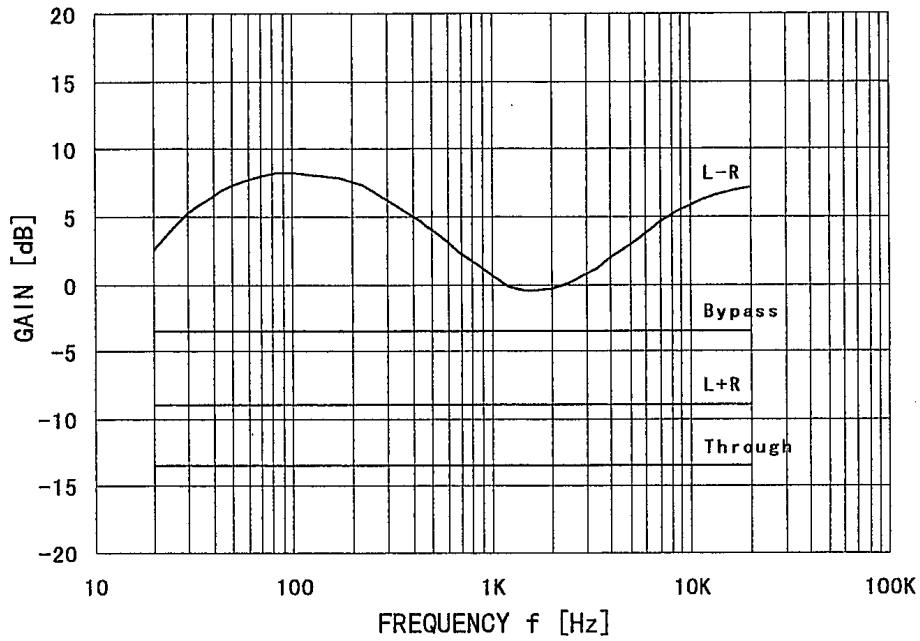


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Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
C17, C18	0.47 $\mu$ F	$\pm$ 5%	R10	110k $\Omega$	$\pm$ 5%
C19	4700pF	$\pm$ 5%	R11	4.3k $\Omega$	$\pm$ 5%
C15, C16, C20, C21	10 $\mu$ F		R12	1.5k $\Omega$	$\pm$ 5%
C23, C25	10 $\mu$ F		R13	3.9k $\Omega$	$\pm$ 5%
C24	100 $\mu$ F		R14	33k $\Omega$	$\pm$ 5%
R17, R18, R19	10k $\Omega$	$\pm$ 5%	R7, R8, R15	47k $\Omega$	$\pm$ 5%
R9	1k $\Omega$	$\pm$ 5%	R16	62k $\Omega$	$\pm$ 5%

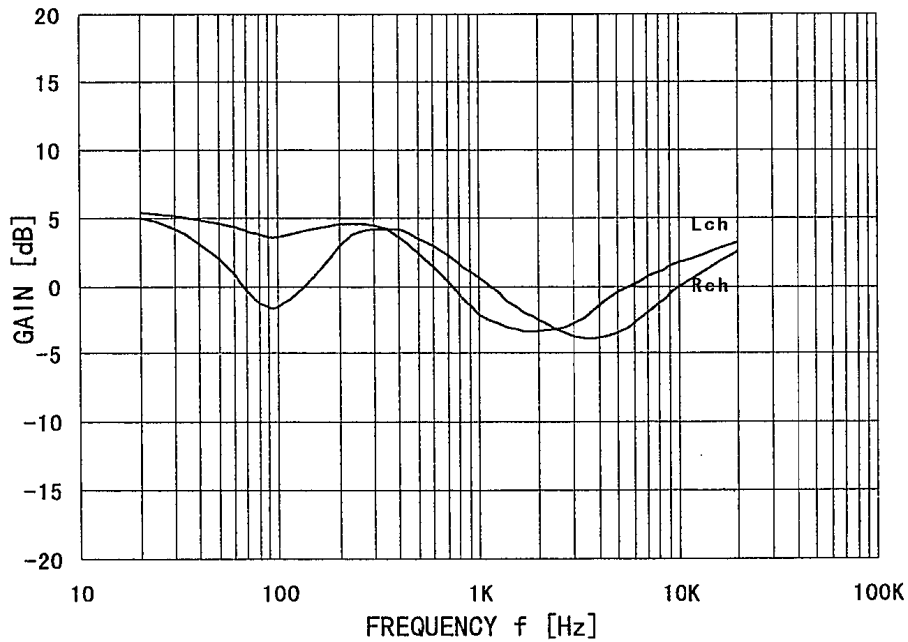
■ TYPICAL CHARACTERISTICS

3D-STEREO GAIN STRUCTURE



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3D-MONO GAIN STRUCTURE





## ■NOTE

The Sound Retrieval System (SRS) technology incorporated in the NJM2178 is owned by SRS Labs, a US Corporation. The SRS technology is protected under U.S. Patent No. 4,866,774; 4,748,669; and 4,841,572 with numerous additional issued and pending foreign patents. The trademarks "SRS", "the SRS symbol" and "Sound Retrieval System" are registered in the U.S. and selected foreign countries.

In order to purchase and implement the NJM2178, all customers must enter into a license agreement directly with SRS Labs for the payment of royalties and to ensure proper trademark usage. Neither the purchase of the NJM2178, nor the corresponding sale of audio enhancement equipment conveys the right to commercialized recordings made with the Sound Retrieval System.

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# NJM2178

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## MEMO

**[CAUTION]**

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