



## SRS 3D SURROUND AUDIO PROCESSOR

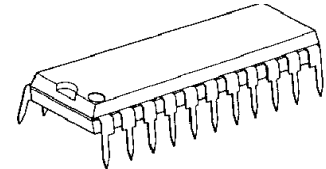
### ■GENERAL DESCRIPTION

The **NJM2198** is a SRS 3D surround audio processor regenerating the 3D surround sound with only two speakers.

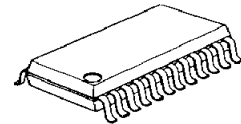
It regenerates 3D surround sound from both of monaural and stereo input.

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

### ■PACKAGE OUTLINE



**NJM2198L**



**NJM2198M**

### ■FEATURES

- Operating Voltage (4.7 to 13V)
- Low Supply Current (7.8mA 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 SDIP22,DMP24

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# NJM2198

## ■ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	15	V
Power Dissipation	P <sub>D</sub>	(SDIP22) 700 (SDMP24) 700	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<sub>+</sub>=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 VOLUME				
			L	R							
Operating Voltage	V <sub>+</sub>		-	-	-	-	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	3.9	7.8	11.7	
			-	-	-	3D Mono	-	3.5	7.0	10.5	
Reference Voltage	V <sub>REF</sub>	V <sub>+</sub> /2	-	-	-	-	5.8	6.0	6.2	V	
Maximum Input Voltage	V <sub>INMAX</sub>	f=1kHz T.H.D.=3%	V <sub>IN</sub> -	- V <sub>IN</sub>	L R	BYPASS	-	10.0 (2.51)	12.0 (3.98)	-	dBV (Vrms)
		f=125Hz T.H.D.=3%	V <sub>IN</sub> -	- V <sub>IN</sub>	L R	3D Stereo	MAX	-1.5 (0.84)	0.5 (1.06)	-	
		f=125Hz T.H.D.=3%	V <sub>IN</sub> -	- V <sub>IN</sub>	L R	3D Stereo	MIN	-	11.5 (3.76)	-	
		f=125Hz T.H.D.=3%	- V <sub>IN</sub>	V <sub>IN</sub> -	L R	3D Stereo	MAX	-	0.45 (1.05)	-	
		f=125Hz T.H.D.=3%	V <sub>IN</sub> V <sub>IN</sub>	V <sub>IN</sub> V <sub>IN</sub>	L R	3D Stereo	MAX	-	11.9 (3.94)	-	
		f=125Hz T.H.D.=3%	V <sub>IN</sub> V <sub>IN</sub>	-V <sub>IN</sub> -V <sub>IN</sub>	L R	3D Stereo	MAX	-7.5 (0.42)	-5.5 (0.53)	-	
		f=1kHz T.H.D.=3%	V <sub>IN</sub>	V <sub>IN</sub>	L R	3D Mono	-	-4.6 (0.59)	0.0 (1.0)	-	
Channel Balance	CH <sub>BAL</sub>	f=1kHz L-R Output	- V <sub>IN</sub>	V <sub>IN</sub> -	L R	3D Stereo	MAX	-1.0	0.0	1.0	dB

■ **ELECTRICAL CHARACTERISTICS** ( $V_{+}=12V, T_a=25^{\circ}C, V_{IN}=-10dBV(316mVrms)$  unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION						MIN.	TYP.	MAX.	UNIT
		INPUT		OUTPUT	MODE	WIDTH VOLUME					
		L	R								
Output Noise	$V_{NOISE}$	Rg=0 $\Omega$ A-Weight	0	0	L R	BYPASS	-	-	-110 (3.16)	-95 (17.8)	dB ( $\mu Vrms$ )
		Rg=0 $\Omega$ A-Weight	0	0	L R	3D Stereo	MAX	-	-90 (31.6)	-85 (56.2)	
		Rg=0 $\Omega$ A-Weight	0	0	L R	3D Mono	-	-	-90 (31.6)	-85 (56.2)	
Total Harmonic Distortion	T.H.D	f=1kHz	$V_{IN}$ -	- $V_{IN}$	L R	BYPASS	-	-	0.005	0.01	%
		f=1kHz	$V_{IN}$ -	- $V_{IN}$	L R	3D Stereo	MAX	-	0.1	1.0	
		f=1kHz	$V_{IN}$ -	- $V_{IN}$	L R	3D Mono	-	-	0.1	1.0	
Bypass Gain	$G_{Bypass}$	f=1kHz	$V_{IN}$ -	- $V_{IN}$	L R	BYPASS	-	-1.0	0.0	1.0	dB
SRS Gain	$G_{SRS}$	f=125Hz	$V_{IN}$ -	- $V_{IN}$	L R	3D Stereo	MAX	9.4	11.4	13.4	dB
		f=125Hz	$V_{IN}$ -	- $V_{IN}$	L R	3D Stereo	MIN	-1.5	0.5	2.5	
		f=125Hz	- $V_{IN}$	$V_{IN}$ -	L R	3D Stereo	MAX	6.8	8.8	10.8	
		f=1kHz	$V_{IN}$	$V_{IN}$	L	3D Mono	-	1.3	3.3	5.3	
		f=1kHz	$V_{IN}$	$V_{IN}$	R	3D Mono	-	-6.9	-4.9	-2.9	
Mode Select Control Voltage	$V_{MODE}$	$V_{IN}$ = High Level	-	-	-	-	-	2.0	-	$V_{+}$	V
		$V_{IN}$ = Low Level	-	-	-	-	-	0.0	-	0.7	

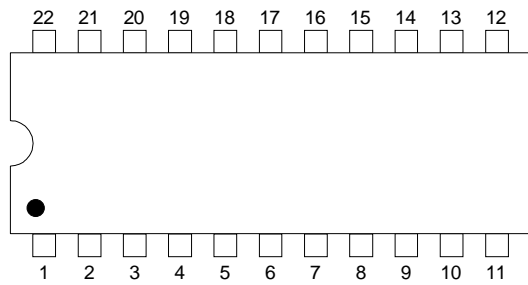
■ **MODE SWITCH**

MODE	MODE1
BYPASS	L
3D-Sound	H

MODE	MODE2
3D Stereo	L
3D Mono	H

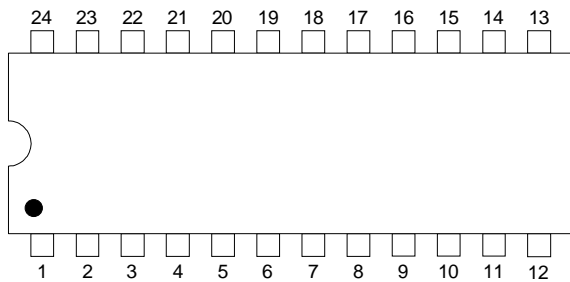
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## ■PIN CONFIGURATION



SDIP-22

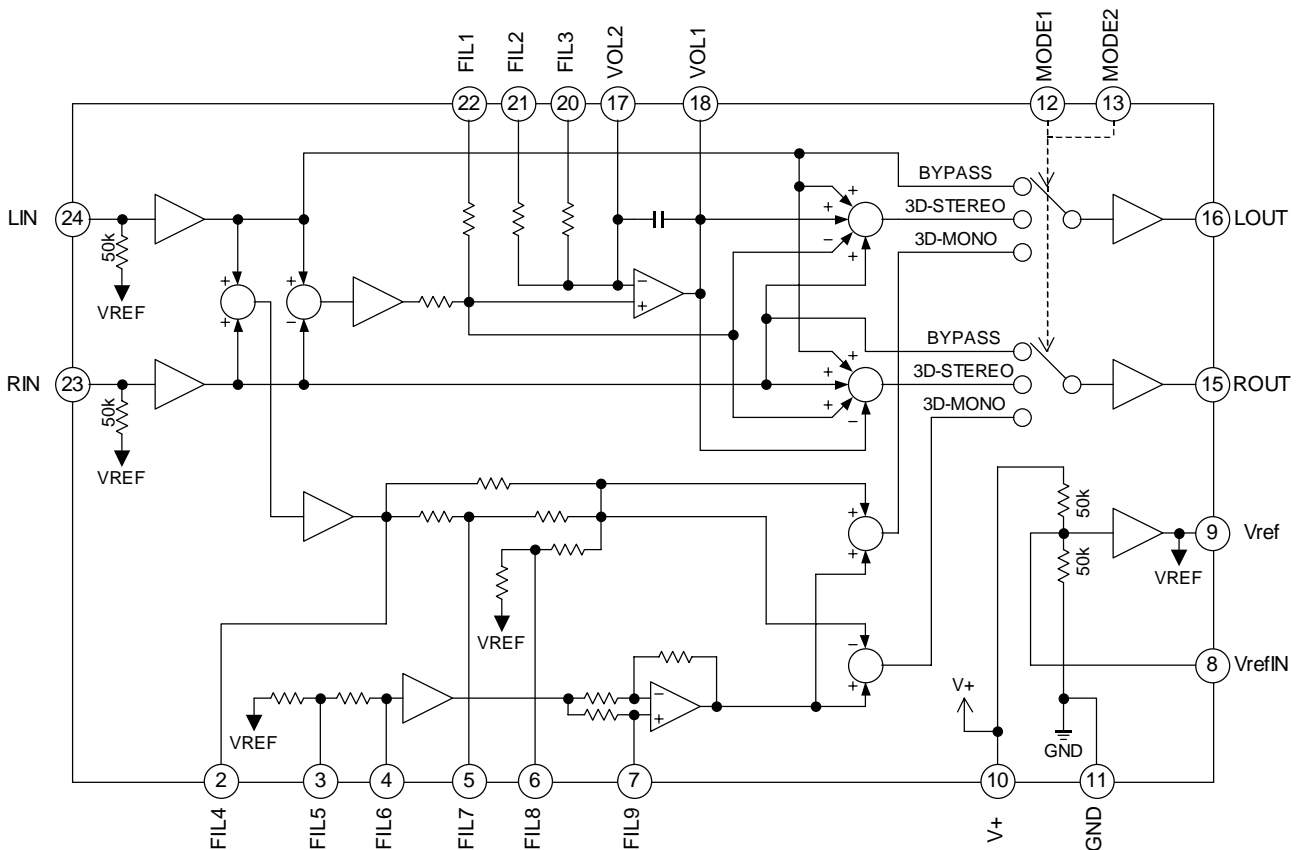
- |          |          |
|----------|----------|
| 1.FIL4   | 12.MODE2 |
| 2.FIL5   | 13.ROUT  |
| 3.FIL6   | 14.LOUT  |
| 4.FIL7   | 15.VOL2  |
| 5.FIL8   | 16.VOL1  |
| 6.FIL9   | 17.TP    |
| 7.VrefIN | 18.FIL3  |
| 8.Vref   | 19.FIL2  |
| 9.V+     | 20.FIL1  |
| 10.GND   | 21.RIN   |
| 11.MODE1 | 22.LIN   |




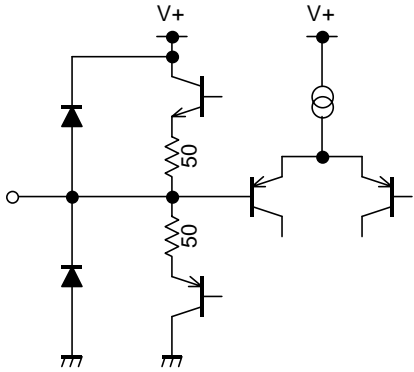
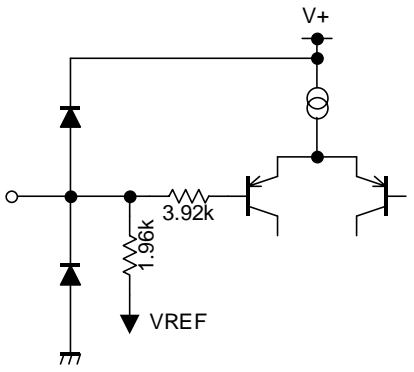
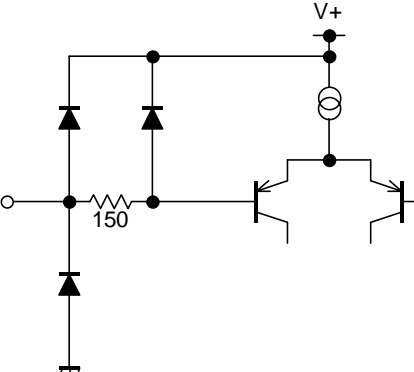
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- |           |           |
|-----------|-----------|
| 1.TP1     | 13. MODE2 |
| 2.FIL4    | 14. TP2   |
| 3.FIL5    | 15.ROUT   |
| 4.FIL6    | 16.LOUT   |
| 5.FIL7    | 17.VOL2   |
| 6.FIL8    | 18.VOL1   |
| 7.FIL9    | 19.TP3    |
| 8. VrefIN | 20.FIL3   |
| 9. Vref   | 21.FIL2   |
| 10. V+    | 22.FIL1   |
| 11. GND   | 23.RIN    |
| 12. MODE1 | 24.LIN    |

## ■BLOCK DIAGRAM (DMP-24)



## ■TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1	TP1	Test Pin		0V
2	FIL4	Filter Input		$V+/2$
3	FIL5	Filter Input		$V+/2$
4	FIL6	Filter Input		$V+/2$

## ■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
5	FIL7	Filter Input		$V+/2$
6	FIL8	Filter Input		$V+/2$
7	FIL9	Filter Input		$V+/2$
8	VREFIN	Reference Voltage Input		$V+/2$

## ■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
9	VREF	Reference Voltage		$V+/2$
10	VCC	Power Supply		$V+$
11	GND	GND		0V
12	MODE1	Mode Control		0V

## ■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
13	MODE2	Mode Control		$V+/2$
14	TP2	Test Pin		0V
15	ROUT	Rch Output		$V+/2$
16	LOUT	Lch Output		$V+/2$



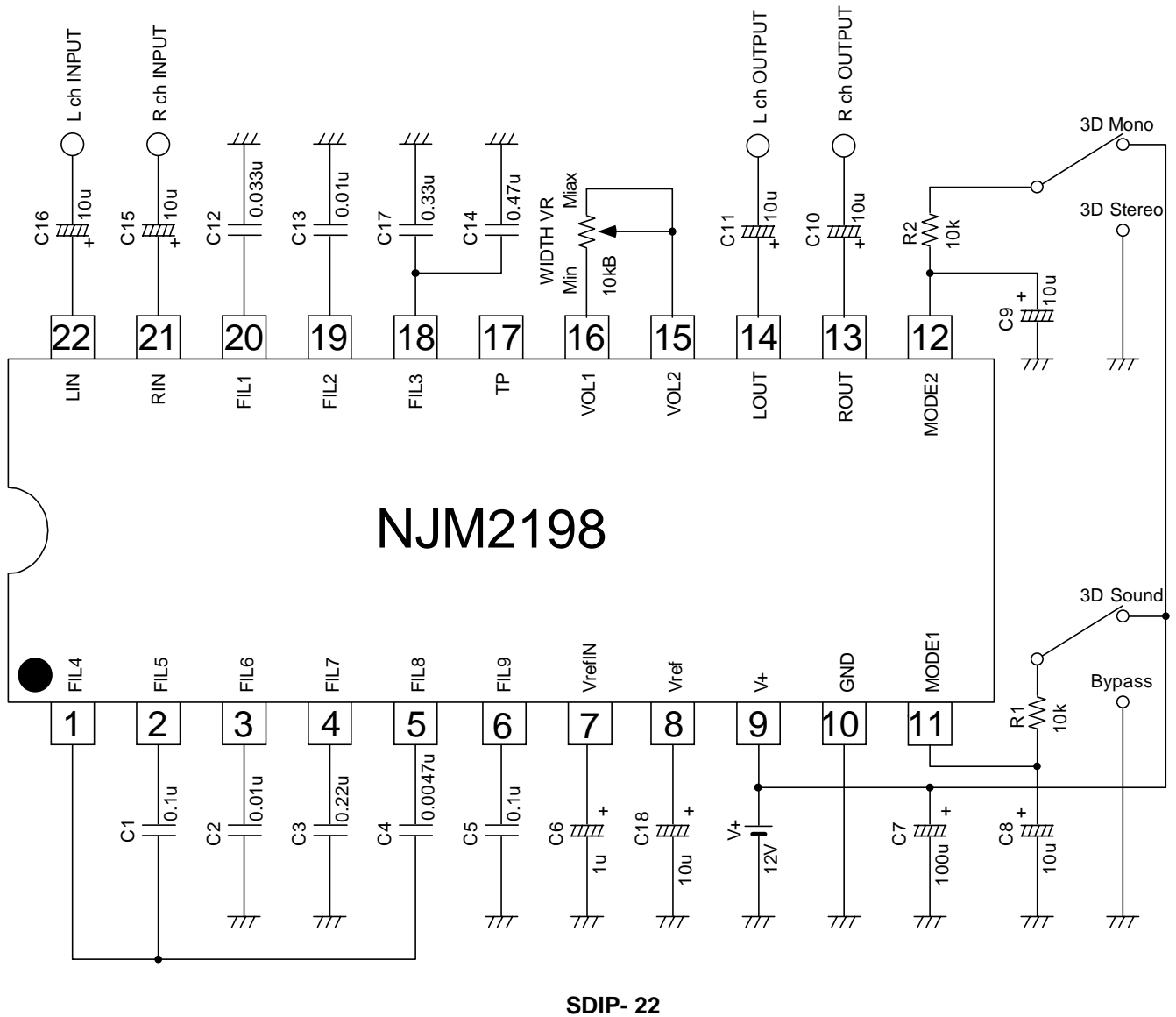
## ■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
17	VOL2	WIDTH VR Input		V+/2
18	VOL1	WIDTH VR Input		V+/2
19	TP3	Test Pin		0V
20	FIL3	Filter Input		V+/2

## ■TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
21	FIL2	Filter Input		V+/2
22	FIL1	Filter Input		V+/2
23	RIN	Rch Input		V+/2
24	LIN	Lch Input		V+/2

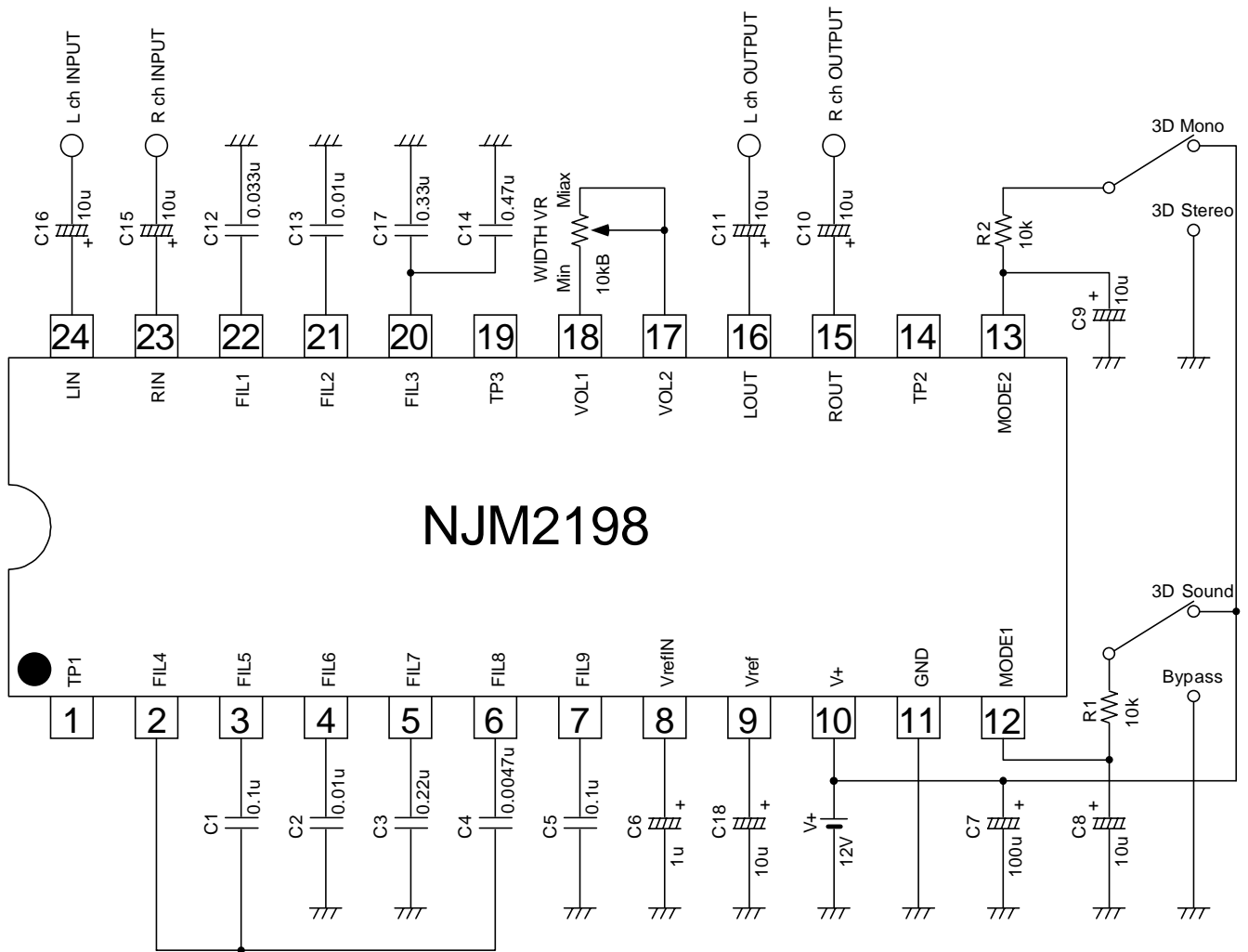
## APPLICATION CIRCUIT



Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
C1,C5	0.1 $\mu$ F	$\pm$ 5%	C8,C9,C10,C11,C15,C16,C18	10 $\mu$ F	$\pm$ 20%
C2,C13	0.01 $\mu$ F	$\pm$ 5%	C12	0.033 $\mu$ F	$\pm$ 5%
C3	0.22 $\mu$ F	$\pm$ 5%	C14	0.47 $\mu$ F	$\pm$ 5%
C4	0.047 $\mu$ F	$\pm$ 5%	C17	0.33 $\mu$ F	$\pm$ 5%
C6	1 $\mu$ F	$\pm$ 20%	R1,R2	10k	$\pm$ 5%
C7	100 $\mu$ F	—			

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## APPLICATION CIRCUIT



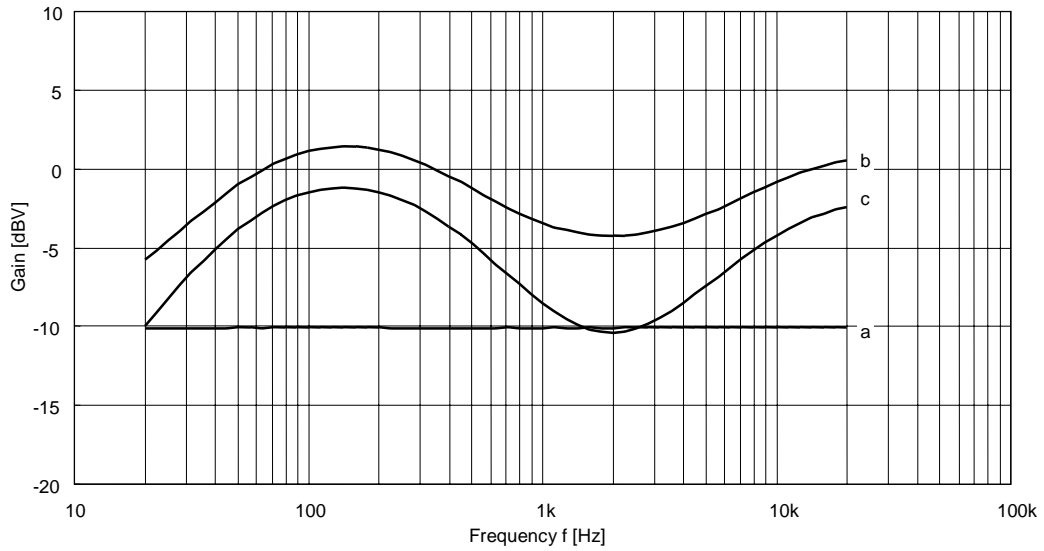
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Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
C1,C5	0.1 $\mu$ F	$\pm$ 5%	C8,C9,C10,C11,C15,C16,C18	10 $\mu$ F	$\pm$ 20%
C2,C13	0.01 $\mu$ F	$\pm$ 5%	C12	0.033 $\mu$ F	$\pm$ 5%
C3	0.22 $\mu$ F	$\pm$ 5%	C14	0.47 $\mu$ F	$\pm$ 5%
C4	0.047 $\mu$ F	$\pm$ 5%	C17	0.33 $\mu$ F	$\pm$ 5%
C6	1 $\mu$ F	$\pm$ 20%	R1,R2	10k	$\pm$ 5%
C7	100 $\mu$ F	—			

## TYPICAL CHARACTERISTICS

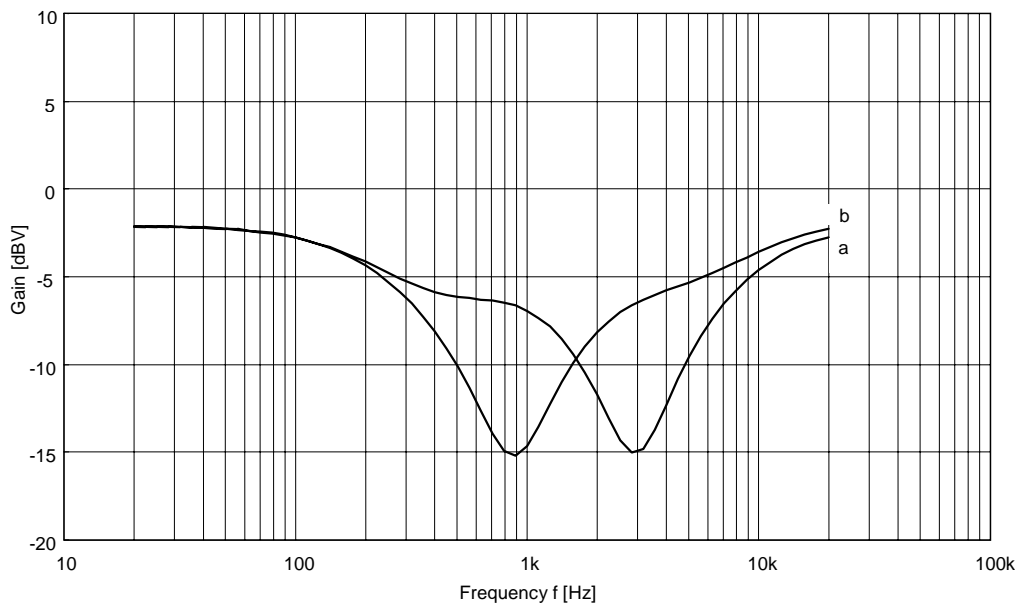
NJM2198 GAIN STRUCTURE

a: BYPASS Mode Vin=-10dBV Lch → Vout=Lch  
 b: 3D-Stereo Mode Vin=-10dBV Lch → Vout=Lch  
 c: 3D-Stereo Mode Vin=-10dBV Lch → Vout=Rch



NJM2198 GAIN STRUCTURE

3D-MONO Mode  
 a: Vin=-10dBV L+Rch → Vout=Lch  
 b: Vin=-10dBV L+Rch → Vout=Rch



**[CAUTION]**

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