

HEADPHONE™

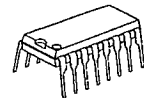
SRS Headphone 3D SURROUND PROCESSOR

GENERAL DESCRIPTION

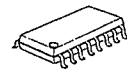
The NJM2190 is a headphone surround processor based on SRS technology. It provides a realistic and spacious listening experience through standard headphones.

The features of low operating voltage, low output noise, and low operating current are very suitable for portable audio applications.

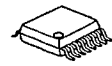
PACKAGE OUTLINE



NJM2190D



NJM2190M

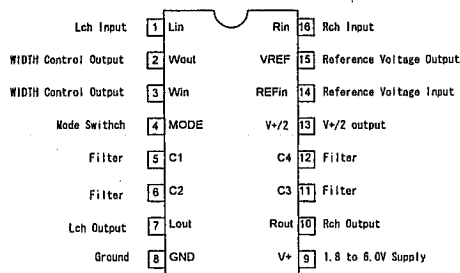


NJM2190V

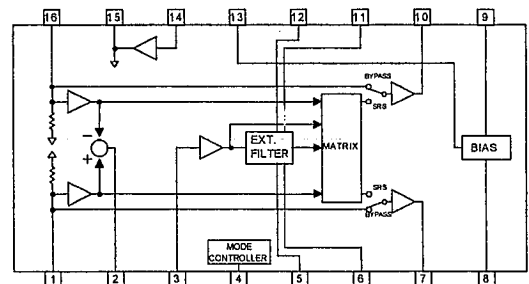
FEATURES

- Operating Voltage (1.8 to 6.0V)
- Low Operating Current (1.3mA typ. at SRS mode)
- Low Output Noise (12.0μVrms typ. at SRS mode)
- WIDTH Control
- Bipolar Technology
- Package Outline DIP16, DMP16, SSOP16

PIN CONFIGURATION



BLOCK DIAGRAM



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■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺	7	V
Power Dissipation	P _D	(DIP16) 500 (DMP16) 300 (SSOP16) 300	mW
Operating Temperature Range	T _{OPR}	-20 to +75	°C
Storage Temperature Range	T _{STG}	-40 to +125	°C

■ ELECTRICAL CHARACTERISTICS (V⁺=3V, V_{IN}=-26dBV (50mVrms), Ta=25°C, unless otherwise specified.)

PARAMETER	SYMBOL		CONDITION					MIN	TYP	MAX	UNIT
			INPUT		OUTPUT	MODE	WIDTH VR ^(*)				
			L	R							
Operating Voltage	V ⁺		-	-	-	-	-	1.8	3.0	6.0	V
Operating Current	I _{CC}	No Signal	0	0	-	BYPASS	-	-	0.7	1.0	mA
			0	0	-	SRS	MIN	-	1.3	1.8	
			0	0	-	SRS	MAX	-	1.3	1.8	
Reference Voltage	V _{REF}	V ⁺ /2	-	-	-	-	-	1.3	1.5	1.7	V
Maximum Input Voltage	V _{IM}	f=1kHz THD=1%	V _{IN}	0	L	BYPASS	-	-	0.1 (1012)	-	dBV (mVrms)
			0	V _{IN}	R						
		f=100Hz THD=1%	V _{IN}	0	L	SRS	MIN	-	-11.8 (257)	-	
			0	V _{IN}	R						
		f=100Hz THD=1%	V _{IN}	0	L	SRS	MAX	-	-15.8 (162)	-	
			0	V _{IN}	R						
		V ⁺ =1.8V f=1kHz THD=1%	V _{IN}	0	L	BYPASS	-	-6.7 (462)	-4.7 (582)	-	
			0	V _{IN}	R						
		V ⁺ =1.8V f=100Hz THD=1%	V _{IN}	0	L	SRS	MIN	-	-16.7 (146)	-	
			0	V _{IN}	R						
		V ⁺ =1.8V f=100Hz THD=1%	V _{IN}	0	L	SRS	MAX	-22.5 (75)	-20.5 (94)	-	
			0	V _{IN}	R						

■ ELECTRICAL CHARACTERISTICS ($V^+=3V, V_{IN}=-26dBV(50mV_{rms}), T_a=25^\circ C$, unless otherwise specified.)

PARAMETER	SYMBOL		CONDITION					MIN	TYP	MAX	UNIT
			INPUT		OUTPUT	MODE	WIDTH VR ^(*)				
			L	R							
Maximum Input Voltage (*2)	V_{IM}	$V^+=1.8V$ $f=1kHz$ $THD=1\%$	V_{IN}	V_{IN}	L	SRS	MIN	-	-16.7 (146)	-	dBV (μV_{rms})
					R						
			V_{IN}	V_{IN}	L	SRS	MAX	-	-16.7 (146)	-	
					R						
V_{IN}	$-V_{IN}$	L	SRS	MIN	-	-22.9 (72)	-				
		R									
V_{IN}	$-V_{IN}$	L	SRS	MAX	-28.5 (38)	-26.5 (47)	-				
		R									
Output Noise	V_{NO}	$R_g=0\Omega$ A-Weighted	0	0	L	BYPASS	-	-	-110 (3.0)	-104 (6.0)	dBV (μV_{rms})
					R						
			0	0	L	SRS	MIN	-	-98 (12.0)	-	
					R						
			0	0	L	SRS	MAX	-	-98 (12.0)	-92 (24.0)	
					R						
Total Harmonic Distortion	THD	$V^+=1.8V$ $f=1kHz$	V_{IN}	0	L	BYPASS	-	-	0.02	-	%
					R						
			V_{IN}	0	L	SRS	MIN	-	0.10	-	
					R						
			V_{IN}	0	L	SRS	MAX	-	0.25	0.5	
					R						
V_{IN}	0	L	BYPASS	-	-1.0	0.0	1.0				
		R									
L + R Gain	G_{L+R}	$f=1kHz$	V_{IN}	V_{IN}	L	SRS	MIN	-	0.0	-	dB
					R						
			V_{IN}	V_{IN}	L	SRS	MAX	-1.0	0.0	1.0	
					R						

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■ ELECTRICAL CHARACTERISTICS ($V^+=3V$, $V_{IN}=-26dBV$ (50mVrms), $T_a=25^\circ C$, unless otherwise specified.)

PARAMETER	SYMBOL		CONDITION					MIN	TYP	MAX	UNIT			
			INPUT		OUTPUT	MODE	WIDTH VR ^(*)							
			L	R										
L-R Gain (*2)	G_{L-R}	$f=100Hz$	V_{IN}	$-V_{IN}$	L	SRS	MIN	3.7	5.7	7.7	dB			
					R									
			V_{IN}	$-V_{IN}$	L	SRS	MAX					19.3	21.3	23.3
					R									
Channel Separation	CS	$f=1kHz$	0	V_{IN}	L	BYPASS	-	60.0	80.0	-	dB			
			V_{IN}	0	R									
MODE Select Control Voltage	V_{IH}	High Level	-	-	-	-	-	1.3	-	V^+	V			
	V_{IL}	Low Level	-	-	-	-	-	0.0	-	0.5				

(*1) Refer to application circuit 1.

(*2) The word ' $-V_{IN}$ ' signifies opposite phase of ' V_{IN} '.

■ MODE Switch

	MODE
BYPASS MODE	L
SRS MODE	H

■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1 16	Lin Rin	Audio Input		$V^+/2$
2	Wout	WIDTH Control Output		$V^+/2$
3	Win	WIDTH Control Input		$V^+/2$
4	MODE	Mode Switch		-

■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
5	C1	Capacitor Terminal 1 for Filter		$V^+/2$
6	C2	Capacitor Terminal 2 for Filter		$V^+/2$
7 10	Lout Rout	Audio Output		$V^+/2$
8	GND	Ground		0V

■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
9	V ⁺	Power Supply		V ⁺
11	C3	Capacitor Terminal 3 for Filter		V ⁺ /2
12	C4	Capacitor Terminal 4 for Filter		V ⁺ /2
13	V ⁺ /2	V ⁺ /2 Output		V ⁺ /2

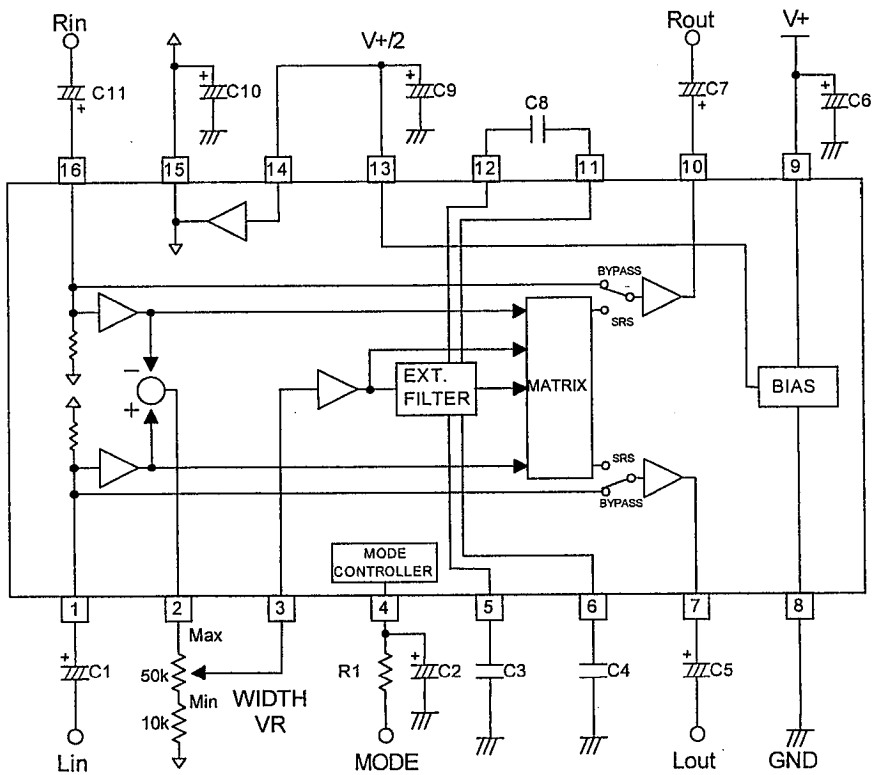
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■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
14	REFin	Reference Voltage Input		$V^+/2$
15	VREF	Reference Voltage Output		$V^+/2$

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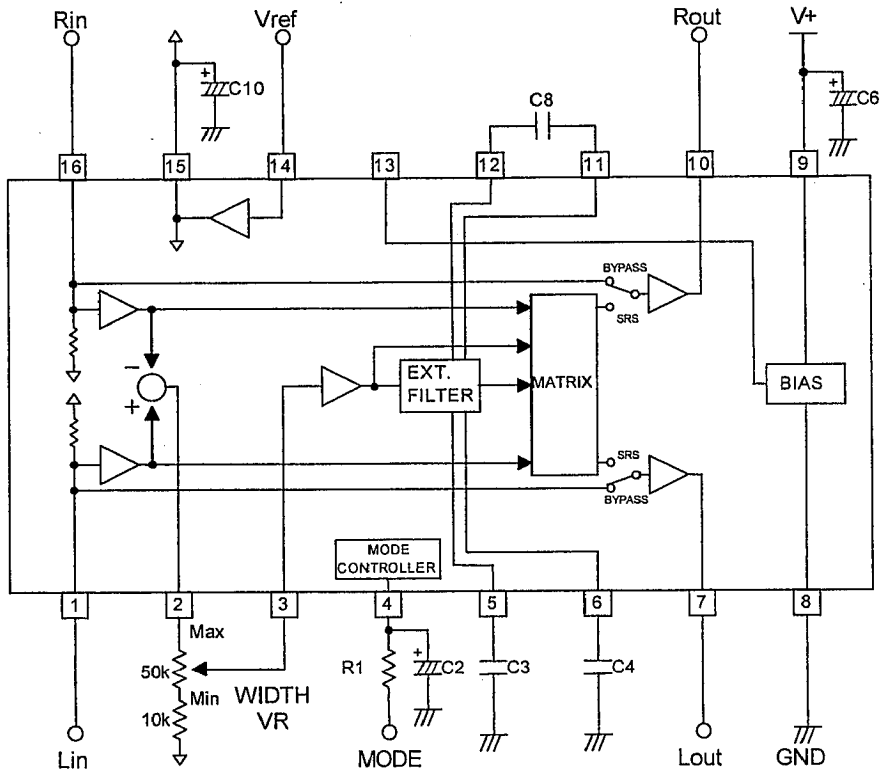
APPLICATION CIRCUIT 1



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Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1	22k Ω	±5%	C6	22 to 100 µF	-
C1	10 µF	-	C7	10 µF	-
C2	10 µF	-	C8	4.7nF	±5%
C3	3.3nF	±5%	C9	1 to 10 µF	-
C4	0.1 µF	±5%	C10	10 to 7 µF	-
C5	10 µF	-	C11	10 µF	-

APPLICATION CIRCUIT 2 (Without using internal $V+/2$.)

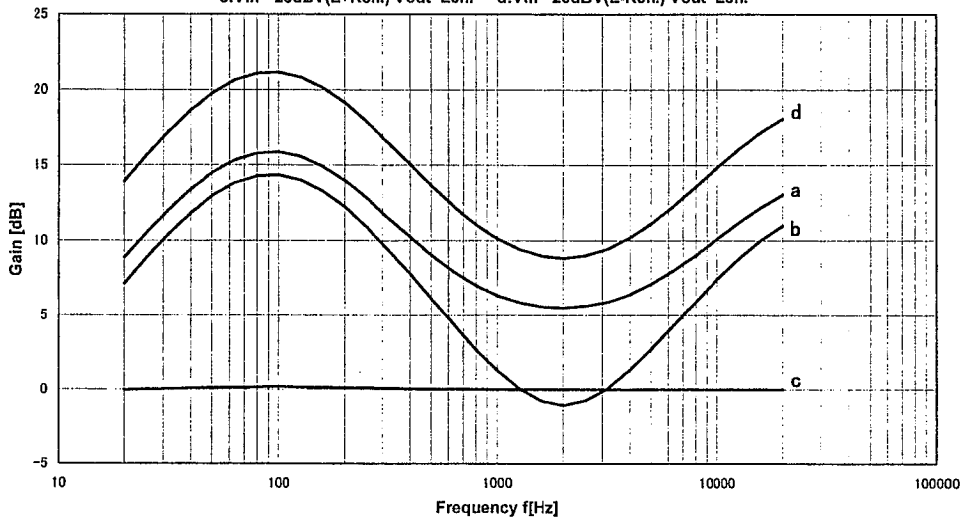


Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1	22k Ω	$\pm 5\%$	C6	22 to 100 μF	-
C2	10 μF	-	C8	4.7nF	$\pm 5\%$
C3	3.3nF	$\pm 5\%$	C10	10 to 47 μF	-
C4	0.1 μF	$\pm 5\%$			

■ TYPICAL CHARACTERISTICS

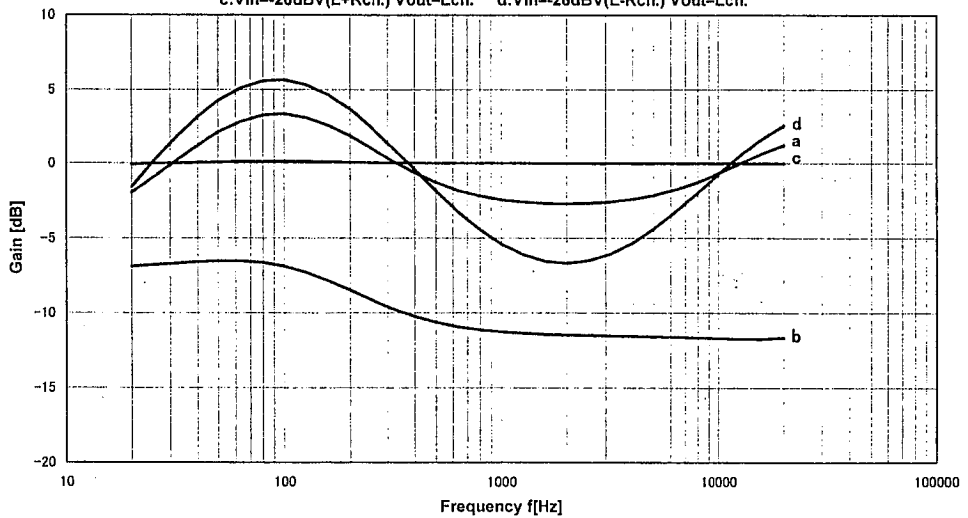
GAIN STRUCTURE (WIDTH VR:MAX)

Conditions : SRS MODE , WIDTH VR=MAX , V+=3V
 a:Vin=-26dBV(Lch.) Vout=Lch. b:Vin=-26dBV(Rch.) Vout=Lch.
 c:Vin=-26dBV(L+Rch.) Vout=Lch. d:Vin=-26dBV(L-Rch.) Vout=Lch.



GAIN STRUCTURE (WIDTH VR:MIN)

Conditions : SRS MODE , WIDTH VR=MIN , V+=3V
 a:Vin=-26dBV(Lch.) Vout=Lch. b:Vin=-26dBV(Rch.) Vout=Lch.
 c:Vin=-26dBV(L+Rch.) Vout=Lch. d:Vin=-26dBV(L-Rch.) Vout=Lch.

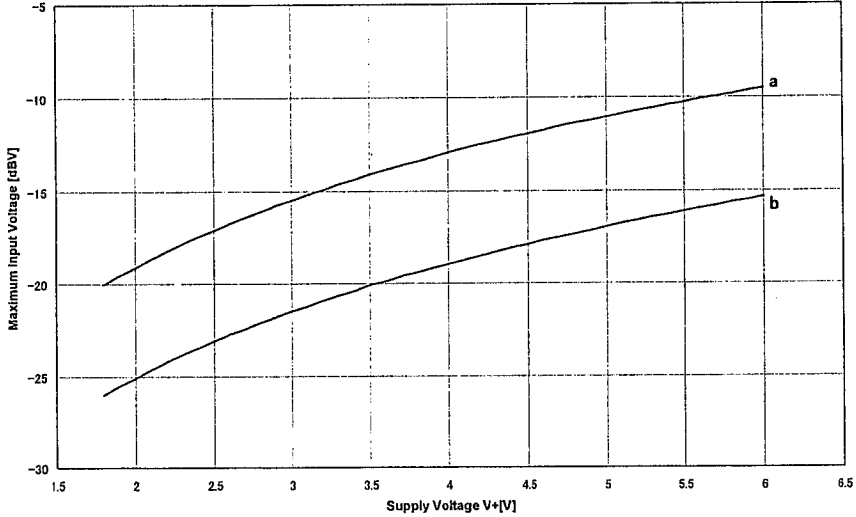


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TYPICAL CHARACTERISTICS

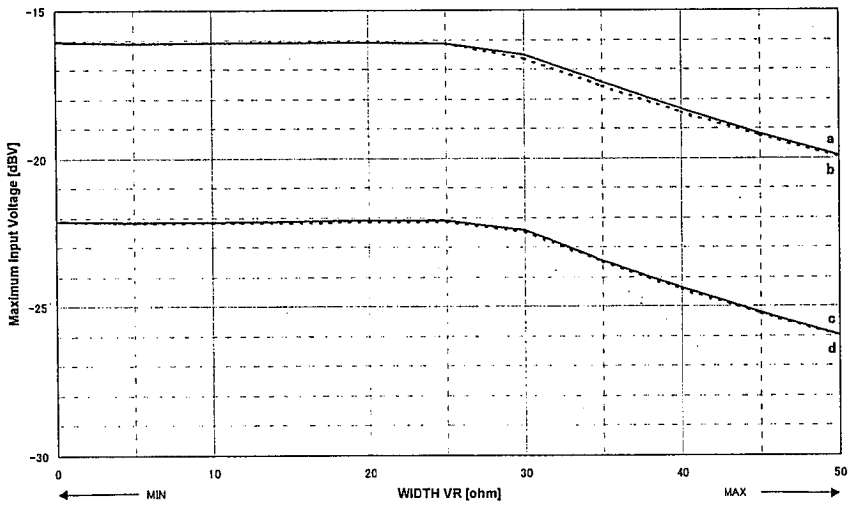
Maximum Input Voltage vs. Supply Voltage

Maximum Input Voltage vs. Supply Voltage
 conditions : SRS MODE, WIDTH VR=MAX, f=100Hz
 a. Vin=Lch. Vout=Lch.(at THD=1%)
 b. Vin=L-Rch. Vout=Lch.(at THD=1%)



Maximum Input Voltage vs. WIDTH VR

Conditions : SRS MODE, V+=1.8V, f=100Hz
 a: Vin=Lch. Vout=Lch.(at THD=1%) b: Vin=Lch. Vout=Rch.(at THD=1%)
 c: Vin=L-Rch. Vout=Lch.(at THD=1%) d: Vin=L-Rch. Vout=Rch.(at THD=1%)



MEMO

[CAUTION]

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