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.

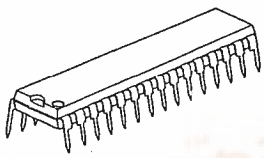
The NJM2180 also performs the SRS 3D-STEREO. In this mode, NJM2180 regenerates a 3D sound field from normal L/R input.

In addition, the NJM2180 includes 2-type BYPASS mode THROUGH and MIX DOWN. In THRUOGH 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

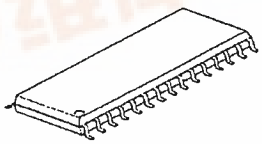
The NJM2180 is suitable for TV, mini component, CD radio cassette, multimedia speaker systems and others.

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

■ PACKAGE OUTLINE



NJM2180L



NJM2180M

■ FEATURES

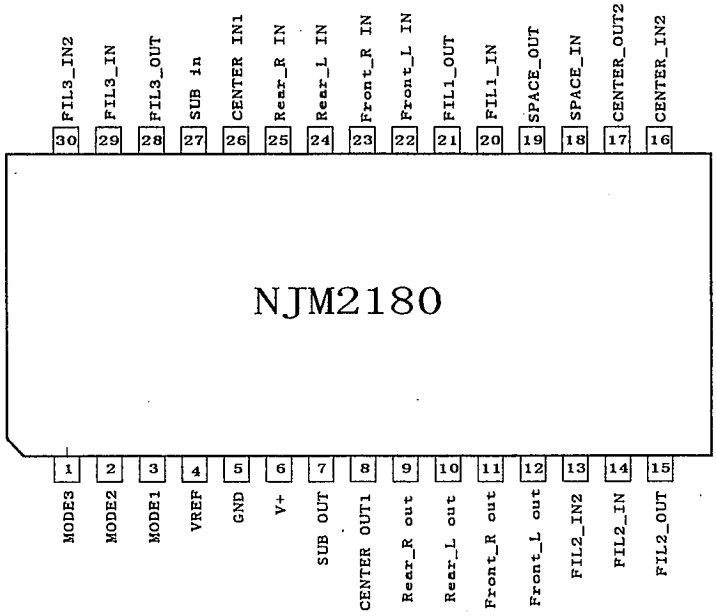
- ●Operating Voltage (4.7 to 13V)
- ●Maximum Input Voltage (2.1Vrms typ. at TRU_4 mode, $V^+ \geqq 11V$)
- ●Low Output Noise (35μVrms typ. at TRU_4 mode)
- ●SRS 3D-STEREO FUNCTION
- ●BYPASS FUNCTION (THROUGH/MIX DOWN)
- ●Bipolar Technology
- ●Package Outline SDIP30, SDMP30

*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. 4,748,669 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	$V^+/2$	19	SPACE_OUT	SPACE gain adjustment
5	GND	Ground	20	FIL1_IN	Perspective Network_1 input
6	V^+	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^+	15	V
Power Dissipation	P_D	700	mW
Operating Temperature Range	T_{opr}	-20 to +75	°C
Storage Temperature Range	T_{stg}	-40 to +125	°C

■ ELECTRICAL CHARACTERISTICS (V^+=12V, Ta=25°C, 0dBu=775mVrms)

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

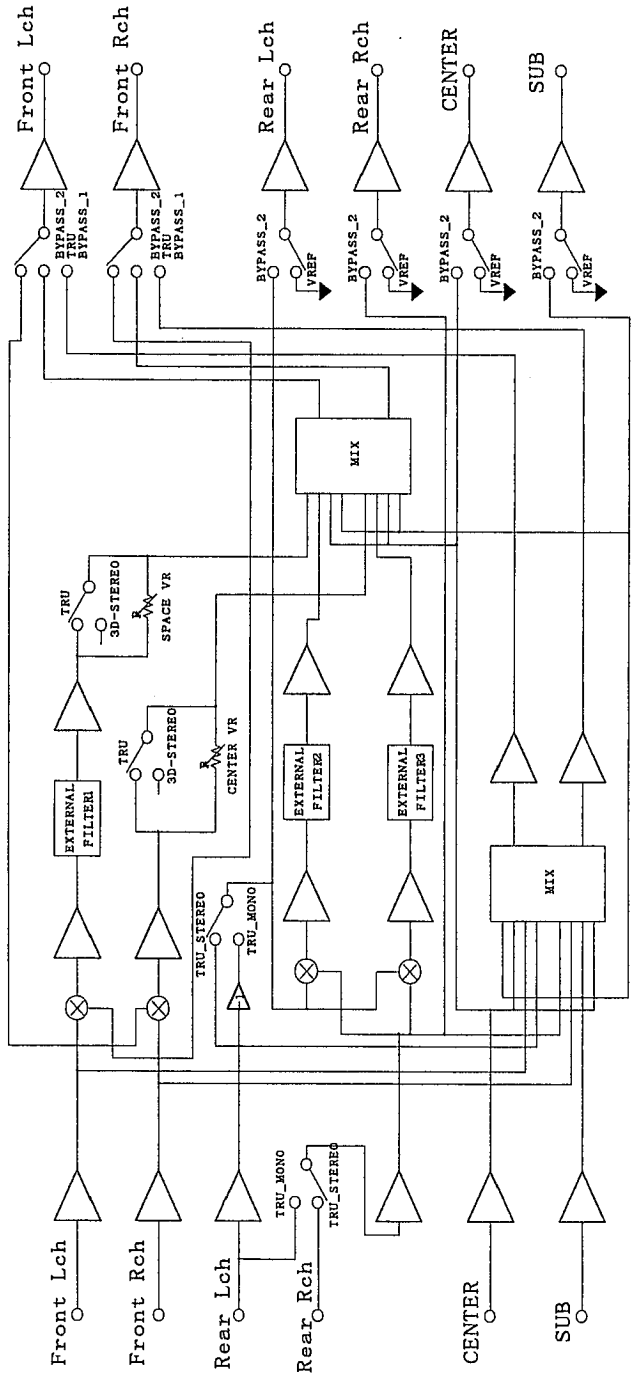
■ ELECTRICAL CHARACTERISTICS (V^+=12V, Ta=25°C, 0dBu=775mVrms)

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Total Harmonic Distortion	THD	V_{IN}=−10dBu Front Lch f=1kHz, V_{OUT}=Lch	BYPASS1 MODE	0.001	0.1	0.5	%
		V_{IN}=−10dBu Front Lch f=1kHz, V_{OUT}=Lch	BYPASS2 MODE	0.001	0.01	0.5	
		V_{IN}=−10dBu Front Lch f=1kHz, V_{OUT}=L, Rch	3D-STEREO MODE	0.01	0.1	0.5	
		V_{IN}=−10dBu Front Lch f=1kHz, V_{OUT}=L, Rch	TRU_5.1 MODE	0.01	0.1	0.5	
		V_{IN}=−10dBu Rear Lch f=1kHz, V_{OUT}=L, Rch	TRU_5.1 MODE	0.01	0.1	0.5	
		V_{IN}=−10dBu Front Lch f=1kHz, V_{OUT}=L, Rch	TRU_4 MODE	0.01	0.1	0.5	
		V_{IN}=−10dBu Rear Lch f=1kHz, V_{OUT}=L, Rch	TRU_4 MODE	0.01	0.1	0.5	
BYPASS1 Gain	$G_{Bypass1}$	V_{IN}=0dBu Front Lch f=1kHz, V_{OUT}=L, Rch	BYPASS1 MODE	−4.9	−2.9	−0.9	dB
BYPASS2 Gain	$G_{Bypass2}$	V_{IN}=0dBu Front Lch 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 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 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 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 f=1kHz, V_{OUT}=L, Rch	TRU_4 MODE	−4.9	−2.9	−0.9	dB
SUB Gain	G_{SUB}	V I N=0dBu Sub ch 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 f=1kHz, V_{OUT}=Lch SPACE VR Min CENTER VR Min	3D-STEREO MODE	−20.2	−18.2	−16.2	dB
L+R Gain	G_{L+R}	V_{IN}=0dBu Front Lch f=1kHz, V_{OUT}=Rch SPACE VR Min CENTER VR Max	3D-STEREO MODE	−15.0	−13.0	−11.0	dB
L−R Gain	G_{L-R}	V_{IN}=0dBu Front Lch f=125Hz, V_{OUT}=Rch SPACE VR Max 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

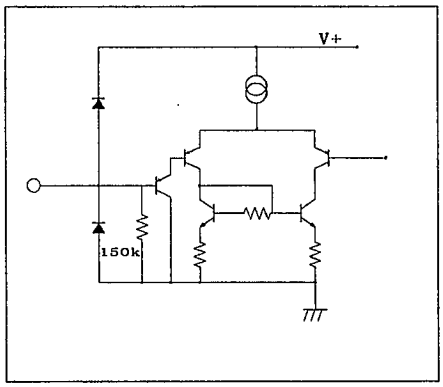
MODE	MODE1	MODE2	MODE3	NOTE
BYPASS_1	L	L	L	MIX DOWN MODE (2-Channel Output)
BYPASS_2	L	L	H	INPUT THROUGH MODE (Multi-Channel Output)
TSV_5.1	L	H	L	TruSurround MODE (Dolby Digital Decoded Source) Variable effects by SPACE and CENTER VR
TSV_4	L	H	H	TruSurround MODE (Dolby Pro Logic Decoded Source) Variable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

■ BLOCK DIAGRAM

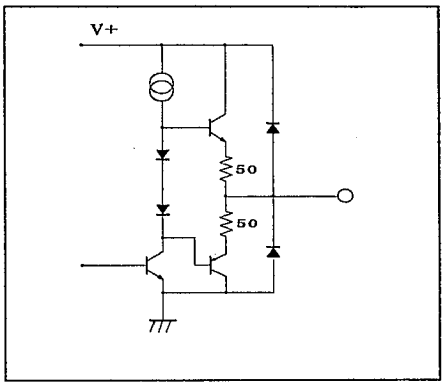


■PIN DESCRIPTION

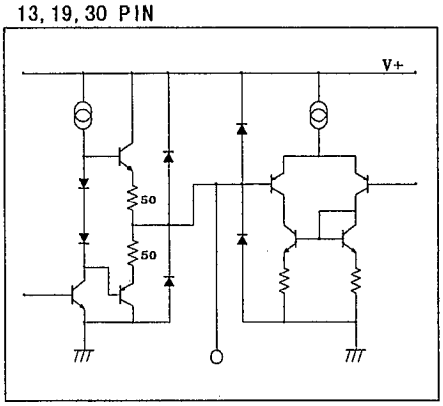
1, 2, 3 PIN



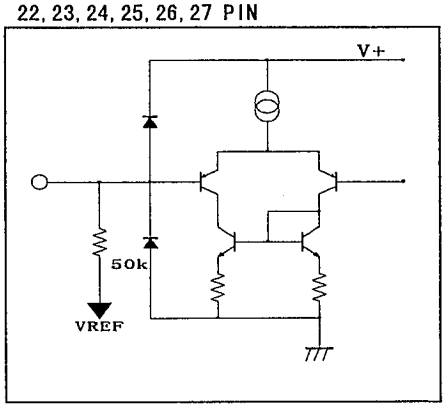
4, 7, 8, 9, 10, 11, 12, 15, 17, 21, 28 PIN



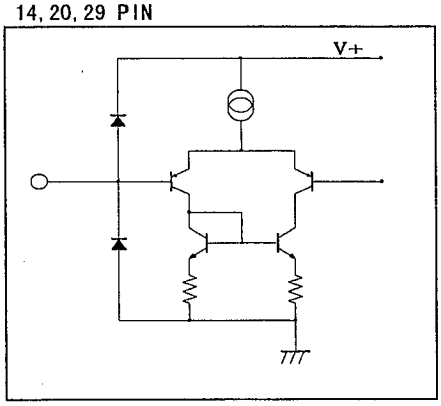
13, 19, 30 PIN



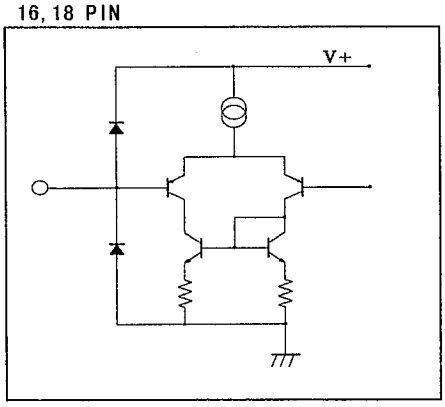
22, 23, 24, 25, 26, 27 PIN



14, 20, 29 PIN



16, 18 PIN



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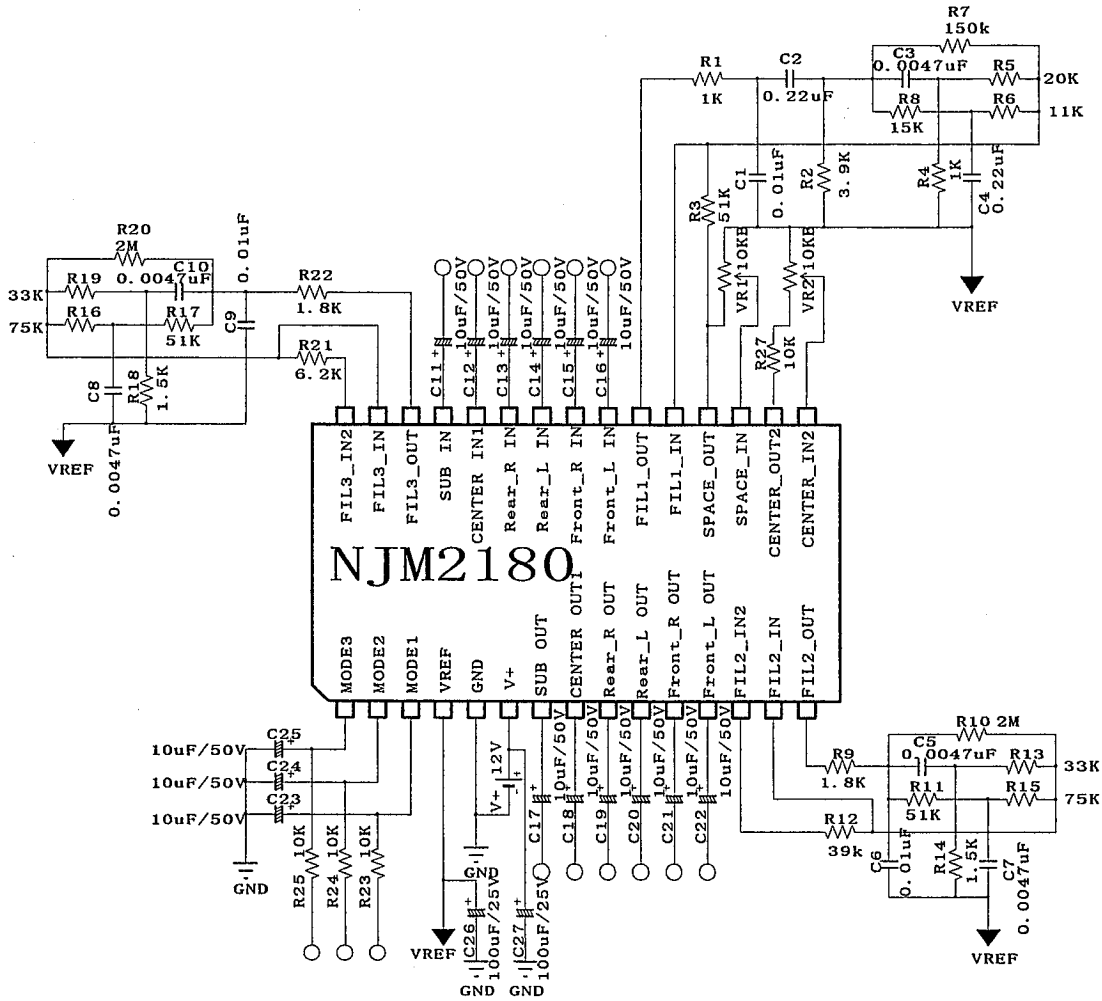
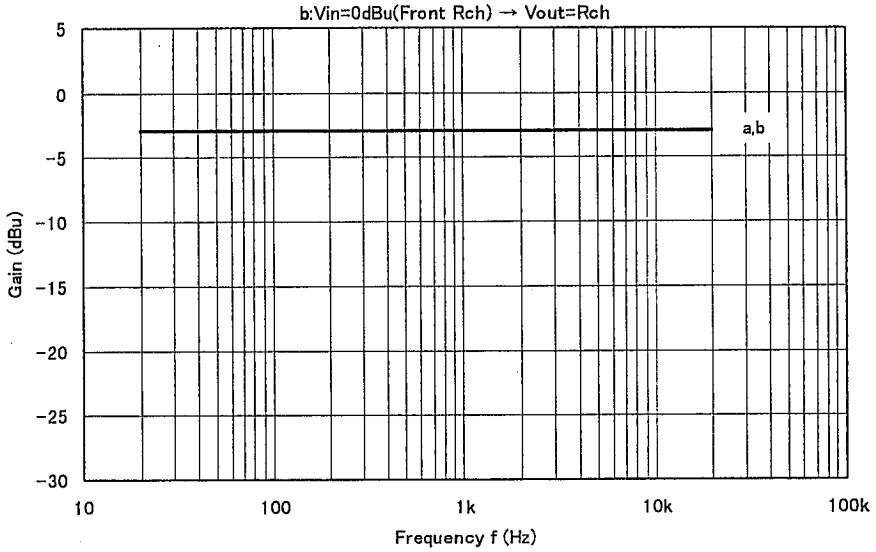
■APPLICATION CIRCUIT



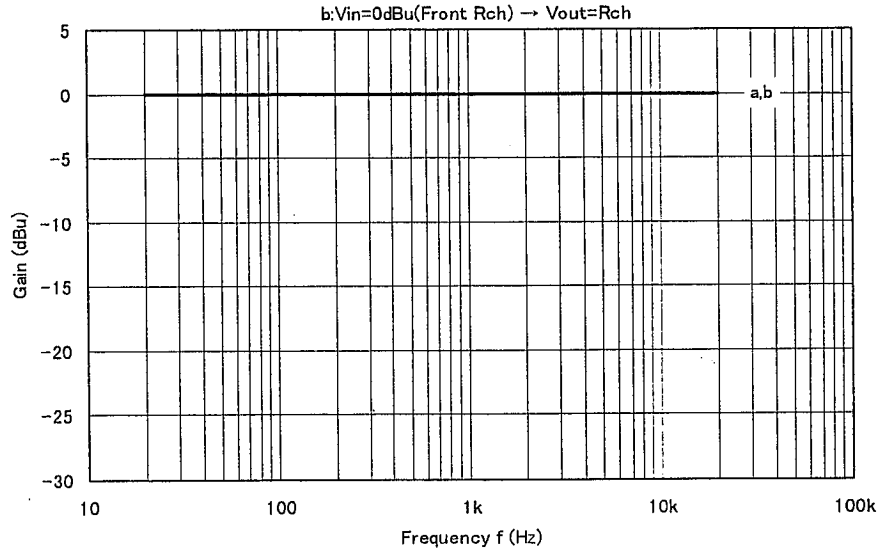
Note: In case of TRU_4 or TSV_4 MODE, input the mono signal of surround channel from Dolby Logic decoder into Rear_L IN terminal or both of Rear_L IN and Rear_R IN terminals.

■TYPICAL CHARACTERISTICS

TruSurround GAIN STRUCTURE
BYPASS1 Mode (V^+=12V)
a:Vin=0dBu(Front Lch) → Vout=Lch
b:Vin=0dBu(Front Rch) → Vout=Rch

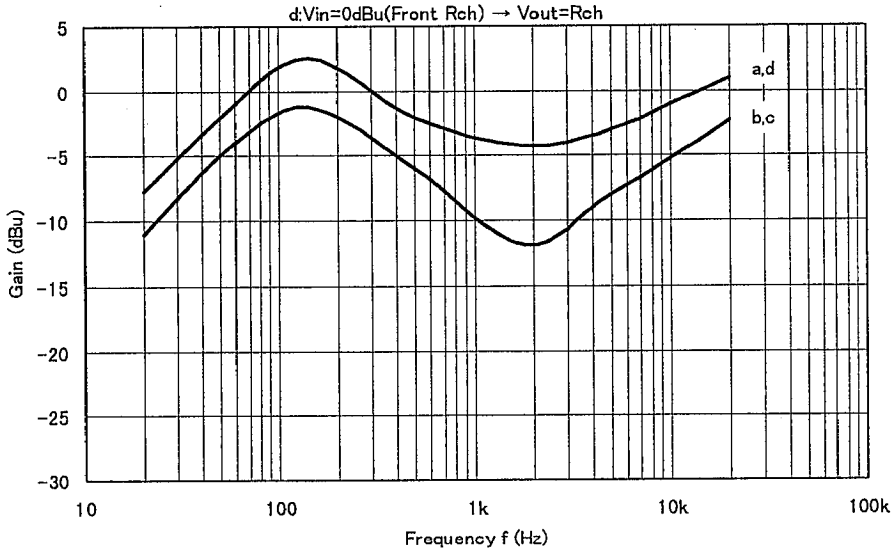


TruSurround GAIN STRUCTURE
BYPASS2 Mode (V^+=12V)
a:Vin=0dBu(Front Lch) → Vout=Lch
b:Vin=0dBu(Front Rch) → Vout=Rch

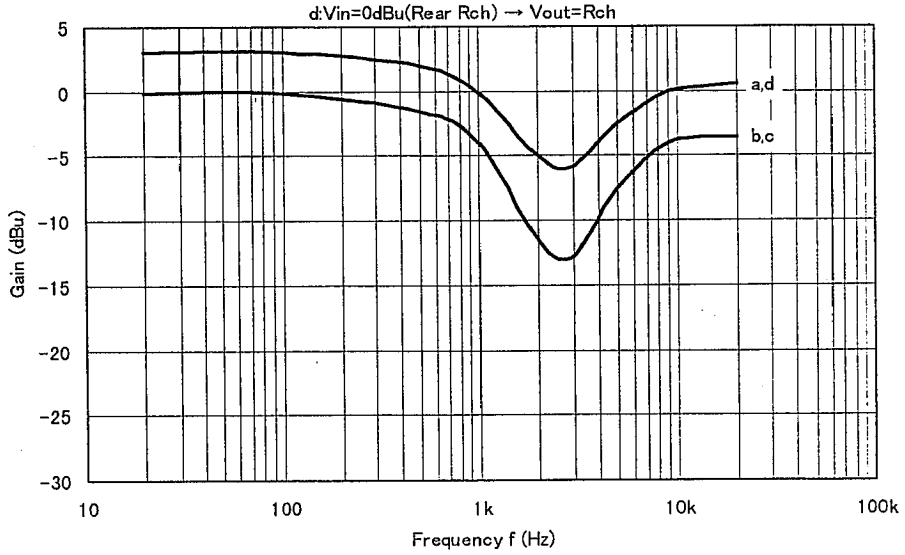


■TYPICAL CHARACTERISTICS

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

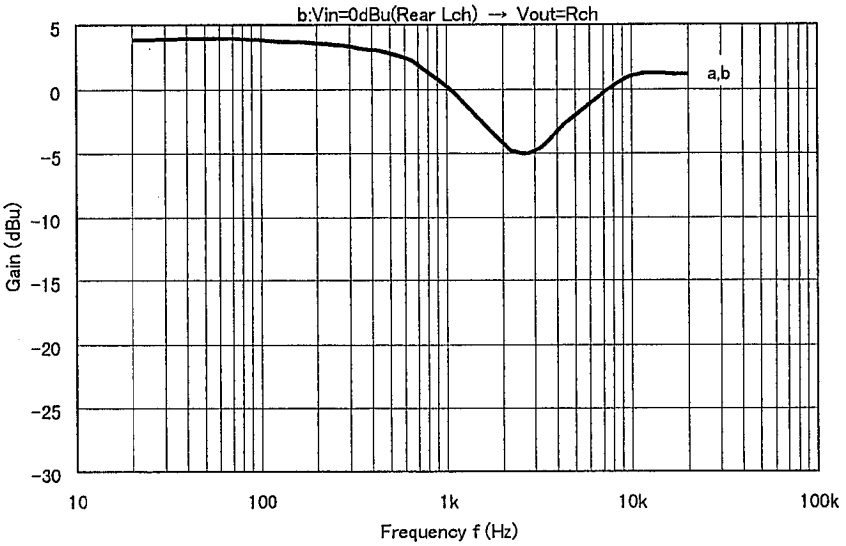


TruSurround GAIN STRUCTURE
Tru5.1 Mode (V^+=12V)
a:Vin=0dBu(Rear Lch) → Vout=Lch
b:Vin=0dBu(Rear Lch) → Vout=Rch
c:Vin=0dBu(Rear Rch) → Vout=Lch
d:Vin=0dBu(Rear Rch) → Vout=Rch

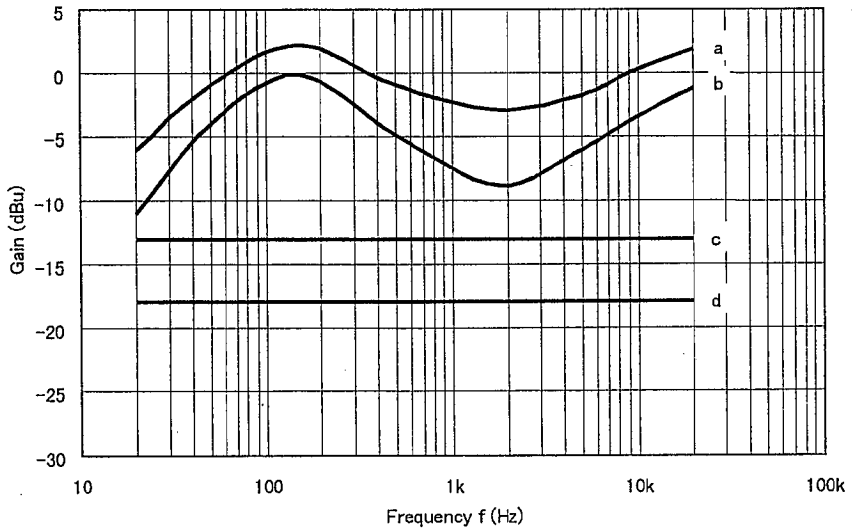


■TYPICAL CHARACTERISTICS

TruSurround GAIN STRUCTURE
Tru4 Mode (V^+=12V)
a:Vin=0dBu(Rear Lch) → Vout=Lch
b:Vin=0dBu(Rear Lch) → Vout=Rch



TruSurround GAIN STRUCTURE
3D-STEREO Mode (V^+=12V)
a:Vin=0dBu(Lch) → Vout=Lch, SPACE VR max, CENTER VR max
b:Vin=0dBu(Lch) → Vout=Rch, SPACE VR max, CENTER VR min
c:Vin=0dBu(Lch) → Vout=Rch, SPACE VR min, CENTER VR max
d:Vin=0dBu(Lch) → Vout=Lch, SPACE VR min, CENTER VR min



MEMO